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NMR Group, Inc.

2019 Interim Framework Retrofit Evaluation Report

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

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 2019 Interim Framework (IF) Retrofit program. The Retrofit program offers incentives to industrial, commercial, institutional and multi-family residential facilities interested in upgrading existing equipment with energy-efficient alternatives. The program offers two types of applications; prescriptive which offers a list of pre-approved equipment for a set per unit incentive, and custom where applicants propose an upgrade with the incentive dependent on the energy or demand savings attributed to the improvement.

This executive summary provides a high-level overview of the impact and process evaluation results along with key findings and recommendations for the Retrofit program during the April 1, 2019 through December 31, 2019 evaluation period.

1.1 Evaluation Goals and Objectives

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

- Conduct audits of completed projects to verify the installation of equipment and evaluate operating parameters through desk reviews
- 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
- Provide recommendations on program improvements based on feedback obtained through the evaluations

1.2 Results

1.2.1 Impact Evaluation

A total of 245 evaluation projects were completed under the 2019 IF Retrofit program, achieving11 GWh of net verified energy savings and 2.3 MW summer demand savings. The majority of net verified energy savings are attributed to commercial office buildings (25%), retail (18%), industrial and manufacturing (18%) and multi-family residential buildings (17%).

There were a total of 110 custom track projects completed under the 2019 Retrofit program. These projects accounted for nearly two-thirds (63%) of the first year net verified savings. Custom lighting projects account for 49% of custom track the first year net verified energy savings with custom non-lighting projects accounting for the remaining 51%. The remaining program savings were attributed to 135 prescriptive track projects, with nearly all the net verified energy savings generated by lighting equipment replacements (98%).

The net verified impact results of the 2019 Retrofit program are presented in Table 1.1 and Table 1.2

Table 1.1 Energy Impacts[1]

Track	Measure Type	Reported Energy Savings (MWh)	Realization Rate[2]	Gross Verified Energy Savings (MWh)	Net-to-Gross Ratio	Net Verified Energy Savings (MWh)	Lifetime Net Verified Energy Savings (MWh)	Net Verified Energy Savings at 2022 (MWh)
Prescriptive	Lighting	2,619	165.5%[3]	4,334	91.6%	3,970	47,249	3,639
Prescriptive	Non-Lighting	53	128.0%	67	91.6%	62	906	62
Custom	Lighting	3,557	104.6%	3,722	91.6%	3,409	40,912	3,409
Custom	Non-Lighting	3,834	101.1%	3,875	91.6%	3,550	47,712	3,550
Total		**10,063**	**119.2%**	**11,999**	**91.6%**	**10,991**	**136,779**	**10,659**

[1] Totals may not sum to the listed value due to rounding errors

[2] Lighting measure realization rates include interactive effects

[3] Applied prescriptive energy realization rate is 133.8%. This value of 165.5% incorporated the sample realization rate for prescriptive lighting and the impact of the baseline lighting study, *IESO Business Programs: Lighting Baseline Shift Study*, April 30th, 2018

Table 1.2| Summer Peak Demand Impacts

Track	Measure Type	Reported Demand Savings (kW)	Realization Rate[4]	Gross Verified Demand Savings (kW)	Net-to-Gross Ratio	Net Verified Demand Savings (kW)	Net Verified Energy Savings at 2022 (kW)
Prescriptive	Lighting	618.1	162.1%[5]	1,001.8	99.1%	992.8	949.1
Prescriptive	Non-Lighting	19.0	109.5%	20.8	99.1%	20.6	20.6
Custom	Lighting	635.7	129.9%	825.7	99.1%	818.2	818.2
Custom	Non-Lighting	416.5	110.5%	460.2	99.1%	456.1	456.1
Total		**1,689.2**	**136.7%**	**2,308.4**	**99.1%**	**2,287.6**	**2,244.0**

[4] Lighting measure realization rates include interactive effects

[5] See footnote 3 above. Applied prescriptive demand realization rate is 128.4%. This value of 162.1% value incorporated the sample realization rate for prescriptive lighting and the impact of the baseline lighting study, *IESO Business Programs: Lighting Baseline Shift Study*, April 30th, 2018

1.2.2 Process Evaluation

To better understand the program design and delivery in 2019, a process evaluation was carried out. Primary data was collected 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 4 within the body of the report.

1.3 Key Findings and Recommendations

Finding 1: Participation in the prescriptive non-lighting track remains minimal.

- **Recommendation 1:** Increase the promotion or incentive level, specifically for non-VFD measures, to improve non-lighting equipment uptake.

Finding 2: Deemed savings assumptions for many prescriptive lighting measures are conservative.

- **Recommendation 2:** Review and adjust the base case and retrofit case wattage assumptions applied to these prescriptive measures. Updated savings assumptions may support a business case for increased incentive rates and result in greater uptake.

Finding 3: Program free-ridership was moderately high in 2019 at 28.7%.

- **Recommendation 3:** Maintain focus on minimizing FR. Key areas include (1) identifying and targeting customers who would not make upgrades without program support and (2) screening applications for customers who have not already started implementing measures.

Finding 4: Opportunities exist to improve the overall application process. Participants, applicant representatives, and contractors provided several suggestions for improving the application process.

- **Recommendation 4:** Identify ways to simplify the application process to improve the program experience for both the participants and those who support the program's delivery. Consider reducing the number of application steps, avoiding repetitive steps, clarifying information needs, and minimizing the time needed to complete the application process.

Finding 5: The new Application Portal presented challenges to some users. Nearly one in four participants (22%) reported one or more issues.

- **Recommendation 5:** Continue to enhance the Application Portal and its customer support to meet its various users' needs as the program evolves.

Finding 6: A desire for additional training exists among applicant representatives and contractors. Training on program and application rules, program offerings, marketing techniques, and receiving support when applying were commonly requested topics.

- **Recommendation 6:** Offer additional training opportunities on topics that will provide the applicant representatives and contractors with the knowledge they need to effectively support the program.

Finding 7: Satisfaction with program communications is good, but room for improvements exists. Applicant representatives and contractors were less satisfied than participants with the Retrofit program communications they received from the IESO.

- **Recommendation 7:** Improve the IESO communications with program participants and program partners to improve the quality and consistency of technical advice and customer support timeliness.

Finding 8: Additional cross-program promotion opportunities exist. Over one-half (51%) of the Retrofit participants had not applied to any other energy-efficiency programs in 2019.

- **Recommendation 8:** Continue to identify cross-program promotion opportunities, which can be achieved through two means. Firstly, promoting other program opportunities to all participating Retrofit customers at both the start and end of the participation process. Secondly, ensuring that participating customers in particular segments, such as small businesses, are aware of the other program opportunities designed with their business segment in mind.

2. Evaluation Goals and Objectives

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

- Complete project reviews and verification audits
- Verify energy and demand savings with a 10% precision at 90% confidence while considering the following:
    - Measures installed through the program
    - 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 the IESO program staff, program delivery vendor staff, applicant representatives, contractors, and participants
- Provide recommendations on program improvements based on feedback obtained through the evaluations
- Full review of prescriptive input assumptions (PIA) for non-lighting measures in the prescriptive track including benchmarking deemed savings, effective useful life (EUL), and incremental costs
- Verify and benchmark 8760 load shapes

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, respectively, job impacts in Section 6, prescriptive input assumptions in Section 7, 8760 load shape review in Section 8, and findings and recommendations in Section 9.

3. Evaluation Methodology

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

- Sampling projects
- Performing project audits on sampled sites
- Comparing the gross reported savings to the savings established by desk reviews to determine realization rates
- Estimating net-to-gross ratios and net savings through the use of attribution surveys

3.1 Impact Evaluation Methodology

Independently verifying the energy and demand savings and attributing these savings first requires selecting sample projects that represent the program's population. Creation of a representative sample ensures 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 for the program assuming a coefficient of variation (CV) of 0.5

The total 2019 targeted sample size was 89 projects out of a full program population of 245 projects.

3.1.1 Impact Evaluation Sampling Plan

A Retrofit sampling plan was developed with confidence and precision targets of 90% and 10%, respectively, across Ontario. Based on an assumed Cv of 0.5, a sample size of 89 evaluation projects was determined and divided into four strata. A stratum is defined to include all projects within a reported track (prescriptive/custom) and measure type (lighting/non-lighting) as presented in Table 3.1.

Table 3.1 | Impact Sampling Plan

Strata	Total Projects	Projects in Sample	Precision (at 90% confidence)
Prescriptive Lighting	127	43	± 5.3%
Prescriptive Non-lighting	8	3	± 5.3%
Custom Lighting	62	24	± 5.3%
Custom Non-lighting	48	19	± 5.3%

3.1.2 Project Counts

Due to the broad range of measures incentivized through the Retrofit program, several variables are considered when defining a unique project, and include:

- Application identification (ID)
- Track (prescriptive/custom)
- Measure type (lighting/non-lighting)

As a result, a number of IESO-defined projects were split into various evaluation projects, often due to different tracks within the same application or different measure types installed within the same track. This sorting process resulted in a greater count of evaluation projects, thus exceeding the count of projects reported by the IESO.

3.1.3 Project Audits

Subsequent to the sampling process, project audits representing the entire Retrofit population were completed. Sampled projects received Level 1 audits. Level 1 audits 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 Retrofit program often includes Level 2 audits with on-site visits and extensive metering to estimate equipment hours of use and operational load. However, the 2019 evaluation cycle was disrupted by the COVID-19 pandemic with corresponding facility closures and social distancing requirements, leading to the disruption of on-site visits. In instances where on-site visits were not possible, desk reviews were performed.

3.1.4 Reported Savings

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

3.1.5 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 a specific stratum, the verified savings are compared to the reported savings to define the stratum realization rate. This realization rate is then applied to all projects' gross reported savings in a stratum's population to estimate the stratum verified savings. Equation 3.1 shows the formula for calculating a stratum's realization rate.

Equation 3.1| 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 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.

Interactive Effects for Lighting Equipment

The Retrofit program incentivizes the installation of lighting equipment that has higher efficiency levels compared to commonly installed lamps and fixtures. Ideally, these 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.

3.1.6 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 3.2.

Equation 3.2| Lifetime Energy Savings

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

Where:

EUL = Estimated useful life of the retrofitted equipment

3.1.7 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| Lifetime Savings

$$Savings_{net} = Savings_{\text{verified}} \times NTG$$

Where:

$Savings_{net}$ = Net verified savings impact (kW or kWh)

$Savings_{verified}$ = Verified savings (kW or kWh)

NTG = Net-to-gross

To estimate the program's direct influence 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 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 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 influenced by the participant's experience with the program and 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, and these results were then combined to develop overall FR, SO, and NTG values.

Additionally, the participant survey collected data to assess if rebound effects occurred due to the program-supported upgrades. An example of the lighting-specific rebound effect involves leaving efficient lighting turned on for extended periods relative to lighting usage prior to program participation.. An example of the heating and cooling-specific rebound effect includes increasing or decreasing the thermostat settings for extended periods relative to the thermostat settings prior to program participation. These questions were not used to calculate the NTG score and were only collected to provide additional context.

FR and SO questions were also included in the applicant representative and contractor survey. However, since only a small number of contractors responded to the survey, these results were not included as part of the NTG calculation. This approach could be reconsidered if contractors provide sufficient survey input in future program years.

Additional detail regarding the NTG evaluation methodology can be found in Section 9.

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 the IESO program staff, program delivery vendor staff, applicant representatives, contractors, and participants. For each respondent type, a customized interview guide or survey instrument was developed to ensure responses produced comparable data and allowedallowed for the inference of meaningful conclusions.

Table 3.2 presents 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 regarding each surveyed group.

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

Table 3.2| Process Evaluation Primary Data Sources

Respondent Type	Methodology	Population	Completed	90% CI Error Margin
IESO Program Staff	Phone In-depth Interviews (IDIs)	5	5	0.0%
Program Delivery Vendor Staff	Phone IDIs	1	1	0.0%
Applicant Representatives and Contractors	Web Survey	89	29	n/a*
Participants	Web and Phone Survey	171	58[6]	8.9%

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

IESO Program Staff and Program Delivery Vendor Staff Interviews

In-depth interviews (IDIs) were completed with five members of the IESO program staff and one member of the program delivery vendor staff. The appropriate staff to interview were identified in consultation with the IESO EM&V staff. Interview topics included:

[6] The Retrofit program NTG results are based on survey responses provided by 62 respondents. These respondents were a mix of *full* (completed the entire survey) and *partial* respondents (completed a portion of the survey before dropping out). All 62 respondents fully answered the NTG questions, but some did not complete the remaining survey questions, which focused on process topics. Because of this, the Retrofit program process evaluation results include fewer respondents than the NTG results (for a total of 58).

- program roles and responsibilities,
- program design and delivery,
- marketing and outreach,
- market actor engagement,
- program strengths and weaknesses, and

suggestions for improvement.

Applicant Representative and Contractor Survey

A total of 89 unique companies in the sample were emailed to request their participation in a web-survey. A total of 23 applicant representatives and contractors responded to this request and completed the survey. The sample was developed from program records provided by the IESO EM&V staff. The survey topics included:

- firmographics,
- program roles and responsibilities,
- audits and/or projects completed,
- training and education,
- interactions with the Retrofit Application Portal as well as the overall application process,
- impacts of the shift to the Interim Framework on program delivery,
- impacts of the new incentive cap on project scope,
- satisfaction with program-specific communications from IESO,
- how customers heard about the program,
- barriers to participation,
- program improvement suggestions,
- FR and SO,
- jobs impacts, and
- impacts of the COVID-19 crisis

Participant Survey

A total of 171[7] unique companies in the sample were contacted by phone or email to request their participation in a web and phone-based survey. A total of 58 participants responded to this request and completed the survey. The sample was developed from program records provided by the IESO EM&V staff. The survey topics included:

[7] Survey outreach quantities vary by each individual group of stakeholders. A total of 171 unique participants worked with 89 applicant representatives or contractors to complete 245 projects within the program.

- firmographics,
- experiences with and suggestions for improvement of the Retrofit Application Portal,
- impacts of the new incentive cap on project scope,
- satisfaction with program-specific communications from the IESO,
- FR and SO,
- rebound effects,
- job impacts,
- participation in other programs, and
- impacts of the COVID-19 crisis

3.3 Job Impacts Assessment

The analysis of job impacts utilized the Statistics Canada[8] (StatCan) Input-Output (IO) model to estimate the direct, indirect, and induced job impacts. IO models are used to analyze the propagation of exogenous economic shocks throughout an economy. The models represent relationships, or flows, of inputs and outputs between industries. When an Energy Efficiency (EE) program such as the Retrofit program is funded and implemented, it creates a set of "exogenous shocks"—or events occurring outside of the system—such as demand for specific products and services and additional reinvestment by businesses from energy bill savings. These shocks propagate throughout the economy, and their impacts can be measured in terms of variables such as economic output and employment.

[8] Statistics Canada is the Canadian government agency commissioned with producing statistics to help better understand Canada, its population, resources, economy, society, and culture.

3.3.1 Statistics Canada IO Model

The Industry Accounts Division of StatCan maintains two versions of the Canadian IO model: a national and an interprovincial model[9]. The models are classical Leontief-type open-IO models[10], where some production is consumed internally by industries, while the rest is consumed externally. The models provide detailed information on the impact of exogenous demands on industry outputs. The impacts are quantified in terms of production, value-added components (such as wages and surplus), expenditures, imports, employment, energy use, and industry pollutant emissions. The StatCan IO Model is composed of input, output, and final demand tables. The IO tables are published annually with a lag of approximately three years, so the model used for this analysis represents the Canadian economy from 2016. The model has been used to estimate employment impacts from a wide range of economic shocks, including structural changes to the Canadian economy[11], the bovine spongiform encephalitis (BSE) crisis in the early-mid 2000's[12], and the construction of hydropower projects[13].

The supply and use tables (SUTs) for the Canadian IO model break the economy down into 240 industries and 500 supply and use product classifications (SUPCs). They represent the economic activity of a specific Canadian province or the whole country. The SUTs show the Canadian economy's structure, with goods and services flowing from production or import (supply tables) to intermediate consumption or final use (use tables). Intermediate consumption refers to domestic industries using goods and services to produce other products and services. Final use includes consumption of products by households, non-profit institutions serving households, and governments, including capital formation, inventory changes, and exports. Provincial SUTs are similar to national SUTs, but for the addition of interprovincial trade to go along with international imports and exports.

StatCan offers the IO Model as a service but not as a product. StatCan economists work with researchers to develop the data and required inputs to develop and answer specific research questions using the model. The end product is a set of outputs from running the model.

3.3.2 Approach

The process of using the StatCan IO model followed three steps:

1. Developed a specific set of research questions to address with the IO model, reflecting the exogenous shocks caused by the program.

[9] Statistics Canada - Industry Accounts Division System of National Accounts; (2009). User's Guide to the Canadian Input-Output Model. Statistics Canada. Ret

[10] Ghanem, Ziad; (2010). The Canadian and Inter-Provincial Input-Output Models: The Mathematical Framework. Statistics Canada – Industry Accounts Division.

[11] Gera, S & Masse, P; (1996). Employment Performance in the Knowledge-Based Economy, Gouvernement du Canada - Industrial Organization 14, Gouvernement du Canada - Industry Canada.

[12] Samarajeewa, S. et al.; (2006). Impacts of BSE Crisis on the Canadian Economy: An Input-Output Analysis. Prepared for the Annual Meeting of the Canadian Agricultural Economics Society.

[13] Desrochers, R. et al.; (2011). Job Creation and Economic Development Opportunities in the Canadian Hydropower Market. Canadian Hydropower Association.

2. Developed model inputs, which consisted of exogenous shock values (in dollars) to simulate the effects of the Retrofit program.
3. Ran the model and interpreted the results

Appendix D covers each step in more detail.

4. Impact Evaluation

The delivery of the Interim Framework (IF) Retrofit program started on April 1, 2019, and the evaluation of the 2019 program year includes the projects submitted after April 1, 2019 and post approved/paid before December 31, 2019.

4.1 Participation

A total of 245 evaluation projects with unique application IDs were completed under the IF Retrofit program in 2019. Using the first character of each facilities postal code the location of completed projects is summarized in Table 4.1.

Table 4.1| Project Count by Postal Code

First Character of Postal Code	Nexant Defined Region	Project Count
L	Central	102
M	Toronto	66
N	Southwestern	49
K	Eastern	22
P	Northern	6

For additional details the heat map presented in Figure 4.1 illustrates the geographic distribution of 2019 Retrofit projects across Ontario based on the first three characters of the postal code. Red, orange and yellow color scales show areas with a greater denisty of projects, and the green overlay represents additional areas of program activity. Projects were concentrated in the Greater Toronto Area (GTA) with additional clusters of projects along the perimeter of the GTA, in Ottawa, and larger cities in southwest Ontario.

Figure 4.1| 2019 Retrofit projects distribution in Ontario

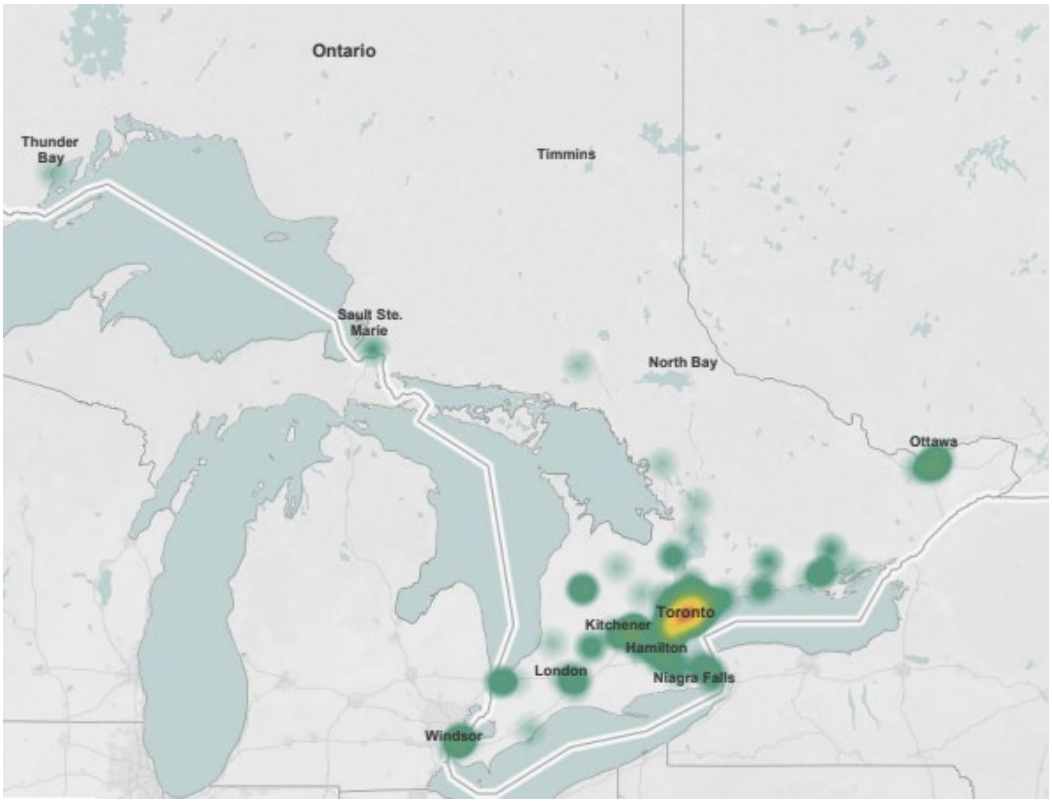
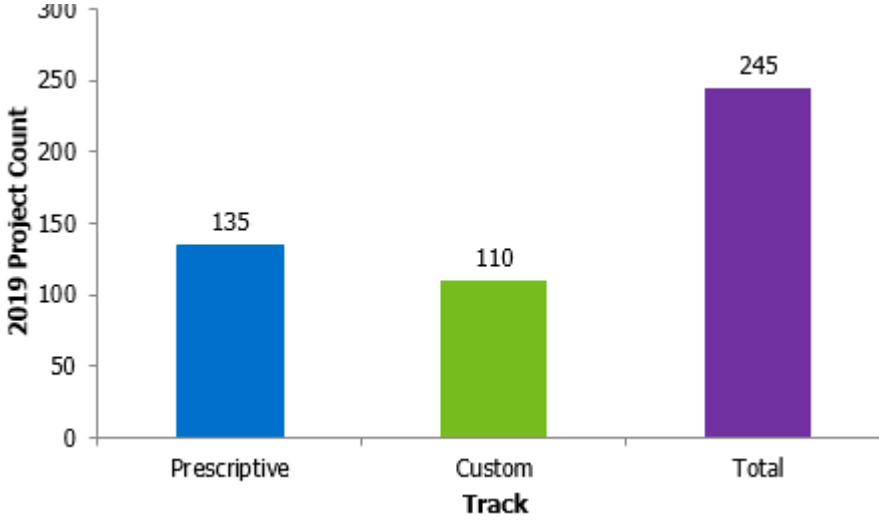


Figure 4.2 presents the count of projects completed within each track for the 2019 IF Retrofit program.

Figure 4.2| Project Count by Track



4.2 Impact Results

Table 4.2 and Table 4.3 present the province-wide results of the 2019 Retrofit program impact evaluation. Baseline shift adjustment factors have been considered for applicable lighting measures.

Table 4.2| Energy Impacts[14]

Track	Measure Type	Reported Energy Savings (MWh)	Realization Rate*	Gross Verified Energy Savings (MWh)*	Net-to-Gross Ratio	Net Verified Energy Savings (MWh)	Lifetime Net Verified Energy Savings (MWh)	Net Verified Energy Savings at 2022 (MWh)	Net Interactive Natural Gas Savings* (Therms)
Prescriptive	Lighting	2,619	165.5%[15]	4,334	91.6%	3,970	47,249	3,639	-72,964
Prescriptive	Non-Lighting	53	128.0%	67	91.6%	62	906	62	0
Custom	Lighting	3,557	104.6%	3,722	91.6%	3,409	40,912	3,409	-62,608
Custom	Non-Lighting	3,834	101.1%	3,875	91.6%	3,550	47,712	3,550	0
Total		**10,063**	**119.2%**	**11,999**	**91.6%**	**10,991**	**136,779**	**10,659**	**-135,572**

***Includes Interactive Effects:** The reported savings achieved through the 2019 Retrofit program did not include interactive effects observed on the HVAC equipment's operation through the installation of more efficient lighting fixtures. Nexant added interactive effects to the program realization rates to account for the influence of lighting savings on heating and cooling loads at the project site.

[14] Totals may not sum to the listed value due to rounding errors

[15] The applied prescriptive energy realization rate is 133.8%, as explained in Section 4.2. This value of 165.5% incorporated the sample realization rate for prescriptive lighting and the impact of the baseline lighting study, *IESO Business Programs: Lighting Baseline Shift Study*, April 30th, 2018

Table 4.3| Summer Peak Demand Impacts

Track	Measure Type	Reported Demand Savings (kW)	Realization Rate[16]	Gross Verified Demand Savings (kW)	Net-to-Gross Ratio	Net Verified Demand Savings (kW)	Net Verified Summer Demand Savings at 2022 (kW)	Net Verified Summer Demand Savings at 2022 (kW)
Prescriptive	Lighting	618.1	162.1%[17]	1,001.8	99.1%	992.8	949.1	949.1
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[16] Lighting measure realization rates include interactive effects

[17] The applied prescriptive demand realization rate is 128.4%, as explained in Section 4.2. This value of 162.1% value incorporated the sample realization rate for prescriptive lighting and the impact of the baseline lighting study, *IESO Business Programs: Lighting Baseline Shift Study*, April 30th, 2018

Figure 4.3 and Figure 4.4 present the 2019 net verified energy and demand savings in comparison with an estimation of the 2022 net verified savings for each program track. For the 2019 population, the prescriptive track accounted for 55% of all projects but only represented 36% of the first year net verified energy savings with an average savings of 30 MWh/project. Though the custom track contained a lower portion of program projects (45%) than the prescriptive track, it accounted for 63% of the program's first year net verified energy savings due to a larger average project size of 63 MWh. Similarly, the custom track accounts for 56% of the program's first year net verified demand savings. The custom track generated more savings for the 2019 IF Retrofit program than the prescriptive track, which is consistent with historical program performance.

Figure 4.3| Net Verified Energy Savings by Track

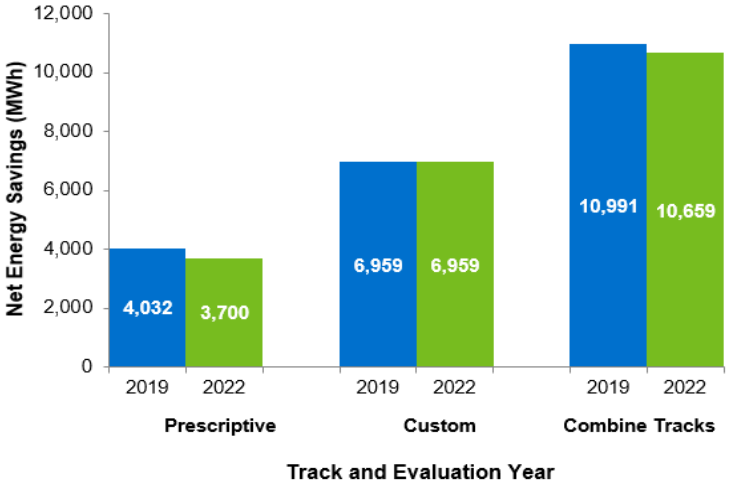


Figure 4.4| Net Verified Demand Savings by Track

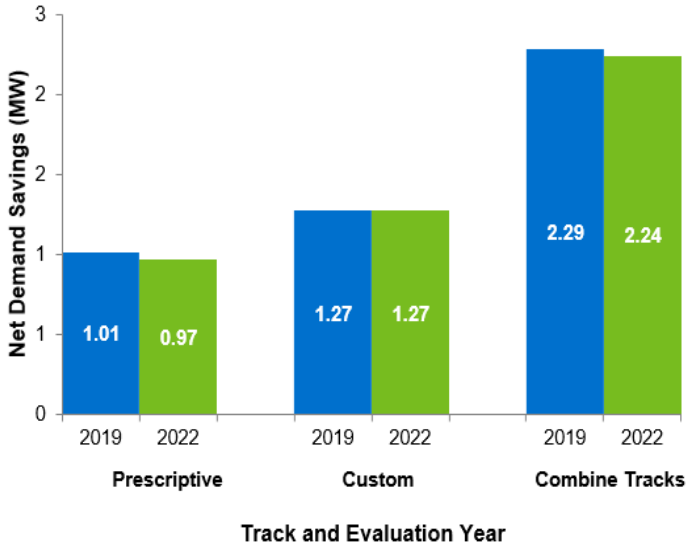


Figure 4.5 presents the 2019 net verified energy savings across program tracks and measure types (lighting/non-lighting). Prescriptive (36%) and custom lighting (31%) projects accounted for majority of the program's first year net verified energy savings. Remaining savings are generated by custom non-lighting measures (32%) prescriptive non-lighting projects (1%). A similar trend is observed for the net verified demand savings, where lighting measures accounted for 80% of the first year net verified demand savings. Figure 4.6 presents the first year net verified demand savings across program tracks and measure types. The savings distribution emphasizes the widespread acceptance and substantial implementation of lighting measures through both the prescriptive and custom tracks.

Figure 4.5| Net Verified First Year Energy Savings by Track and Type

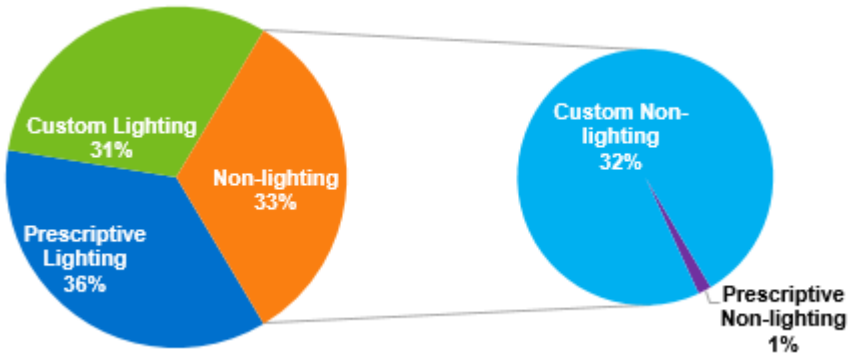


Figure 4.6| Net Verified First Year Demand Savings by Track and Type

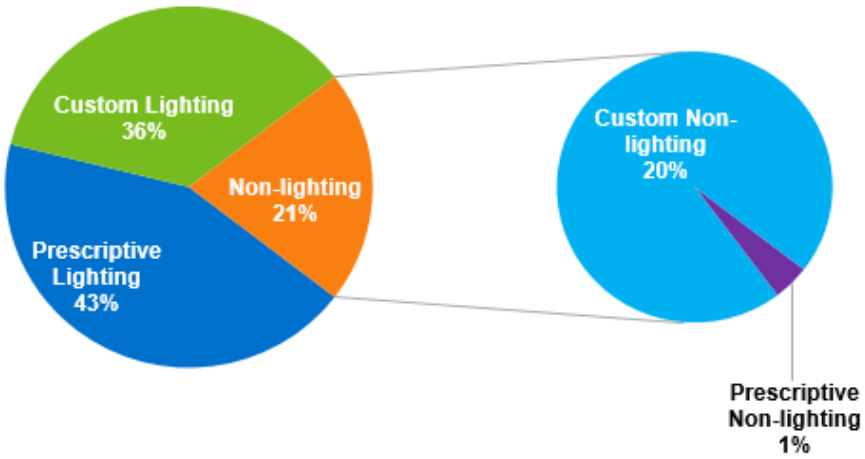


Figure 4.7 and Figure 4.8 present the distribution of the first year net verified energy and demand savings by building type. Program participation contains a diverse mix of commercial, industrial, and multi-family residential facilities with strong representation from several sub-sectors. This broad range of building types served by the program is a strength that mitigates the risk of a downturn in applications from any given sub-sector due to economic circumstances or other unforseen factors.

Figure 4.7| First-year Net Verified Energy Savings by Building Type

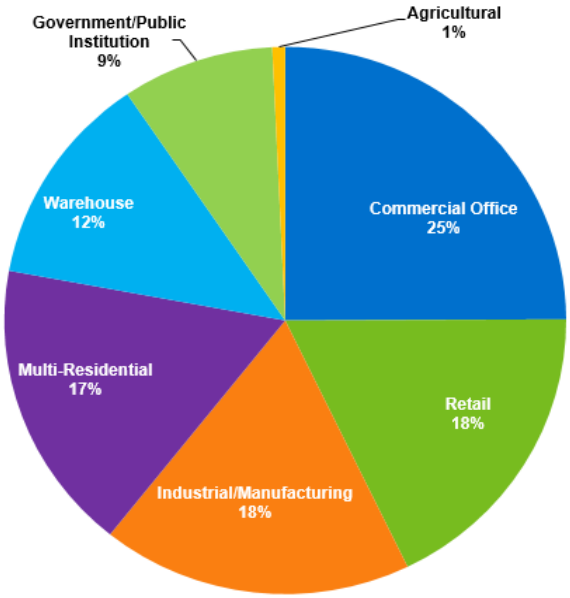
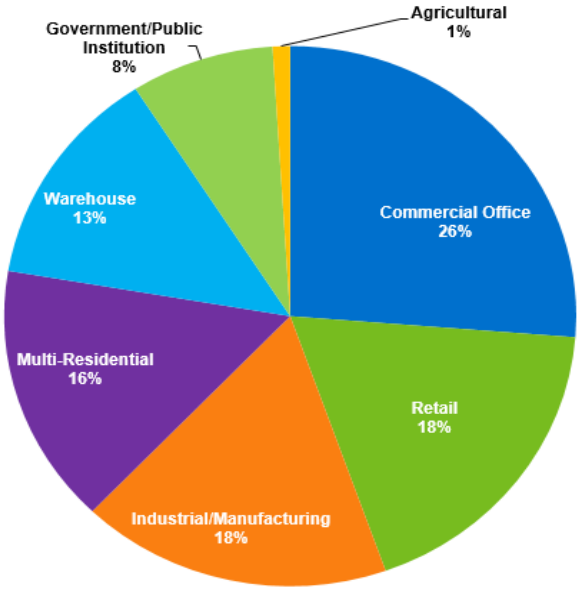


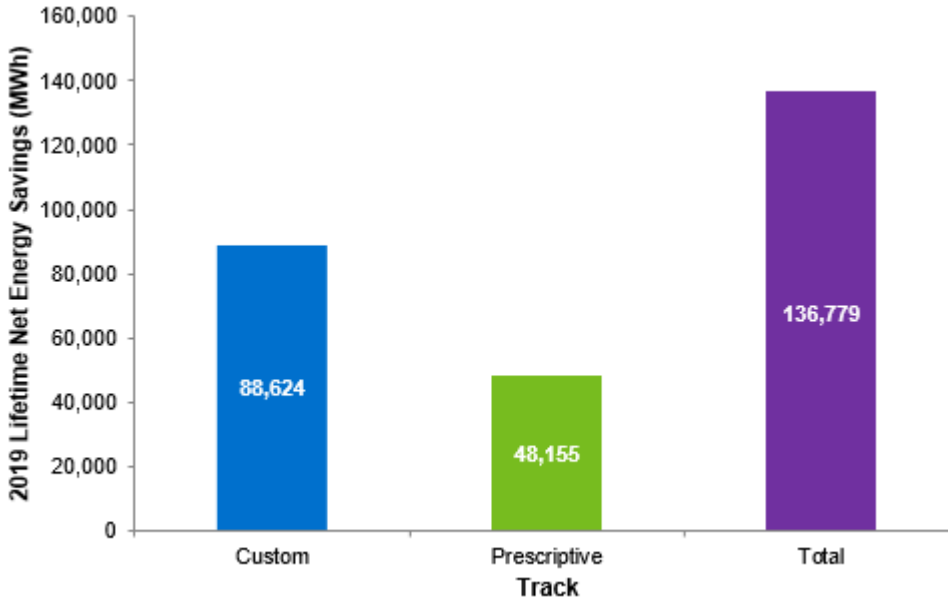
Figure 4.8| First-year Net Verified Demand Savings by Building Type



Commercial office buildings account for one-quarter (25%) of the first year net verified energy and demand savings. Retail, industrial manufacturing, and multi-family residential facilities are the next highest contributors, with each accounting for 16% to 18% of the program's net verified savings. Together, these four subsectors account for close to 80% of the energy and demand savings.

The 2019 IF Retrofit program is projected to achieve 136,779 MWh of lifetime net verified energy savings, as presented in Figure 4.9. These savings are based on the installed measures and their respective effective useful lives (EUL) and any adjustments to lighting measures influenced by the lighting baseline study.[18]

Figure 4.9| Lifetime Net Energy Savings by Track



As per Retrofit program requirements any equipment implemented through each project must be operated and maintained for a continuous period of four years. Therefore, savings claimed in the first year of operation there will persist annually and be attributable to the program until the effective useful life (EUL) of the equipment is exhausted. The EUL for a given measure is dependent on the type of equipment installed and it's assumed hours of operation. As measures reach their EUL program attributed savings will go to zero and over time the annual saving claimed by the 2019 Retrofit program will decrease. Within the Interim Framework savings for the current evaluation year (2019) and final year of the framework (2022) are tracked and verified. The first year net verified savings and estimated net verified savings in 2022 are provided in Table 4.2 and Table 4.3.

The persistent savings in 2022 are 97% of the first year net energy savings and 98% of the first year demand savings. The slight reduction in savings in the year 2022 compared to the first year savings is due to LED Reflectors, which have a EUL of 3 years, leading the measure to reach the end of its useful life before 2022.

[18] The lighting baseline study (*IESO Business Programs: Lighting Baseline Shift Study*, April 30th, 2018) considered if the baseline lighting equipment assumptions in the prescriptive track aligned with the market penetration of new technologies. As a results of this study some lighting measures are given an adjustment during the evaluation that can shift their reported savings to new higher or lower values.

4.2.1 Prescriptive Track

The prescriptive track provides pre-approved measures for quick system upgrades and includes per-unit incentives for lighting and non-lighting equipment. Applications for prescriptive projects have minimal documentation requirements or post-retrofit measurement and verification to reduce friction between applicants and the measures they want to adopt. The majority of the measures installed under the prescriptive track in 2019 were lighting measures (98%) with minimal (2%) first year net verified energy savings contribution from non-lighting measures.

Prescriptive Lighting Measures

A total of 52% of all completed Retrofit projects in 2019 were prescriptive lighting projects. They Provided almost 3,970 MWh of first year net verified energy savings and 993 kW first year net verified demand savings. The two most common lighting measures installed within this track are high bay LEDs and A-shape LED lamps. Together at 21% and 20%, they account for approximately half of the first year net verified energy savings. Additional savings are derived from exterior lights, LED troffers, LED tubes, and reflectors (Figure 4.10). These figures demonstrate that the end-uses which contribute the largest amounts of net verified energy savings are the same measures that contribute the most to the net verified demand savings. Exterior lighting is the only exception to this pattern due to its limited contribution to the summer peak demand savings, since their night-time operation occurs outside the peak demand period.

Figure 4.10| Prescriptive Lighting Measures Net Verified Energy Savings

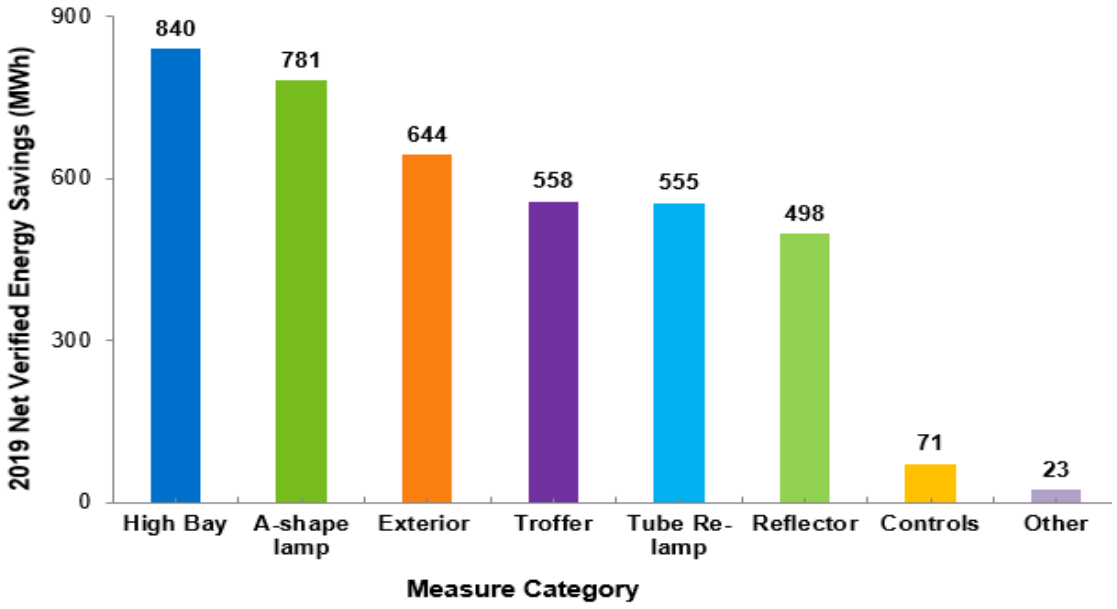
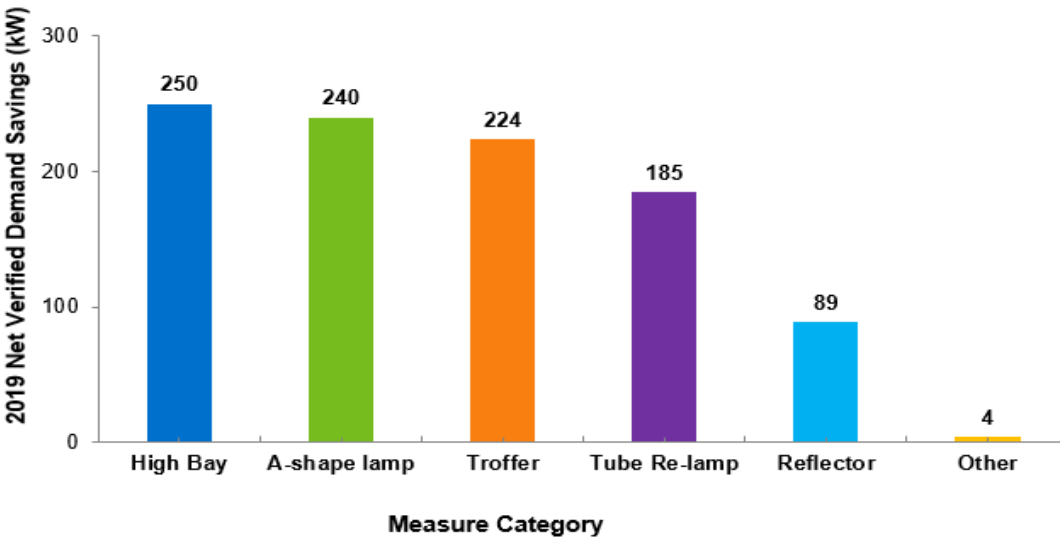


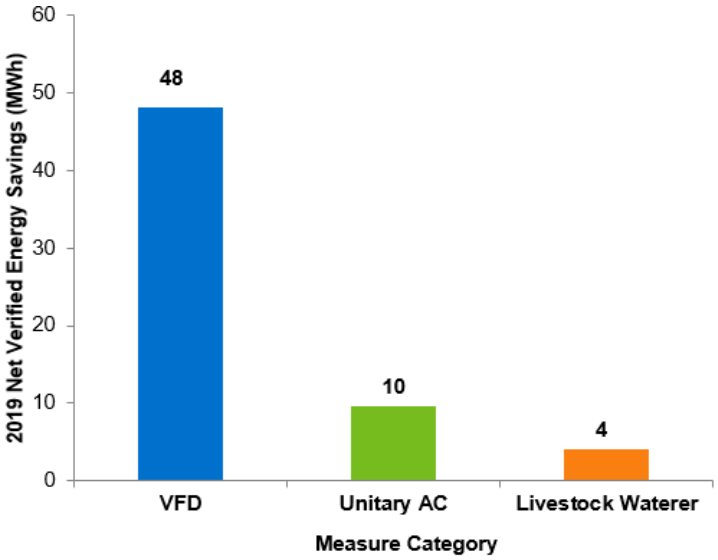
Figure 4.11| Prescriptive Lighting Measures Net Verified Demand Savings



Prescriptive Non-lighting Measures

Prescriptive non-lighting measures account for under 2% of the prescriptive track first year net verified energy savings at 62 MWh. Variable frequency drives contribute nearly 78% of these energy savings, as Unitary AC replacements (16%), and livestock waterers (7%) comprise the remaining savings (Figure 4.12). Measures installed in 2019 were less diverse and included only the three end-uses mentioned previously above mentioned end-uses.

Figure 4.12|Prescriptive Non-lighting Measures Net Verified Energy Savings



4.2.2 Custom Track

The custom track was designed to offer flexibility for more complex projects, including unique process-based improvements. Custom track incentives are estimated from the project's energy or demand savings with incentives of $0.05/kWh or $400/kW for lighting measures or $0.10/kWh or $800/kW for non-lighting measures and capped at 50% of project costs. Historically, the custom track was a large contributor to the Retrofit program savings – a pattern that is also observed in 2019. Overall, 63% of the Retrofit program net verified energy savings are from the custom track.

Custom Lighting Measures

Through the review of participant provided measure names and program provided project documentation the evaluation identified the majority of custom lighting first year net verified energy savings (70%) were provided by LED tube re-lamp and high bay fixtures. Additional savings were generated through other lighting applications such as ambient lighting, exterior lamps, low bay, reflectors, and A-shape lamps. Figure 4.13 and Figure 4.14 present the first year net verified energy and demand savings for each lighting measure within the custom track.

Figure 4.13 | Custom Lighting Measures Net Verified Energy Savings

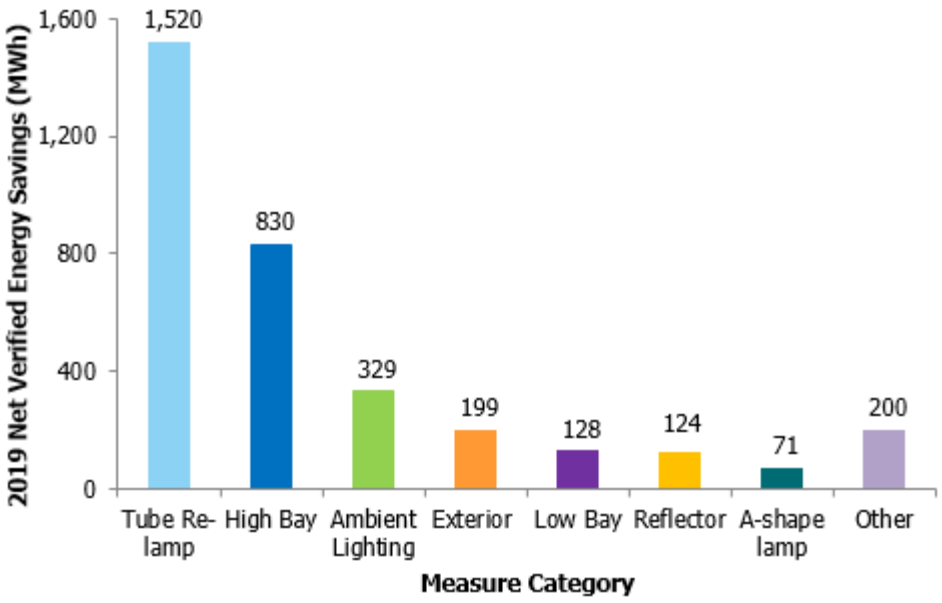
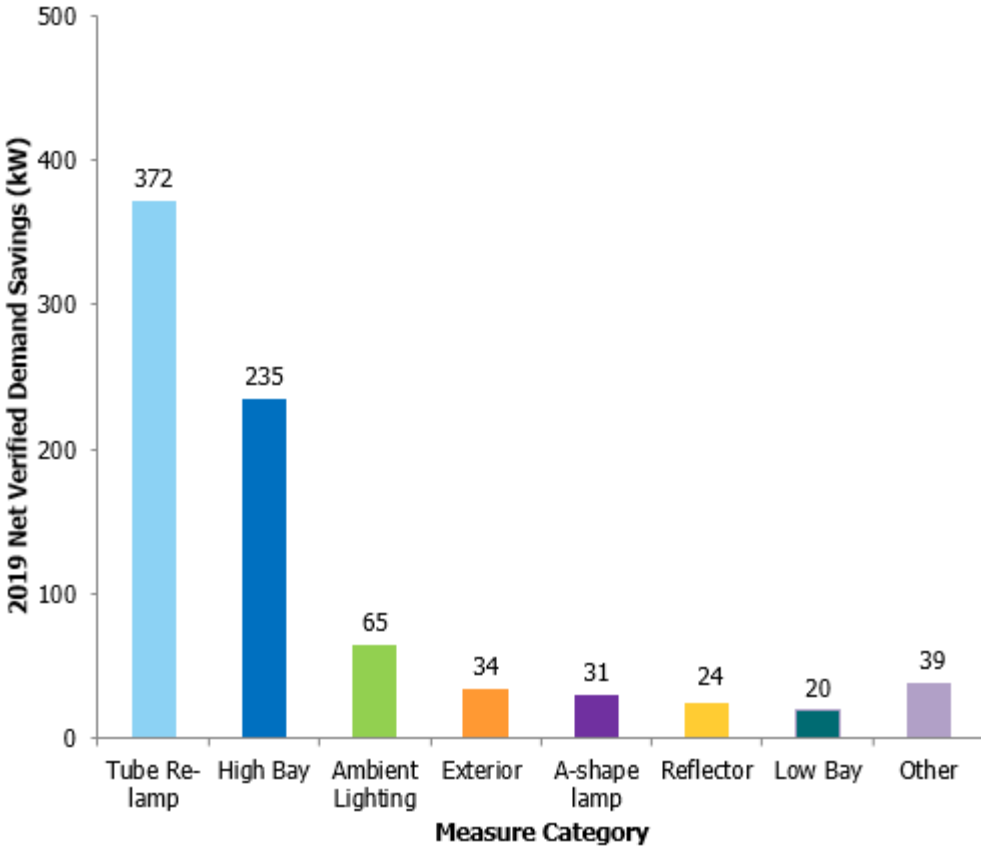


Figure 4.14 | Custom Lighting Measures Net Verified Demand Savings



As mentioned the two most common lighting measures installed within custom track are LED tube re-lamp and high bays. Both first year net verified energy and demand savings for high bay measures are spread equally between the custom and prescriptive tracks, whereas a much greater percentage of LED tube re-lamp first year net verified energy and demand savings were observed to be generated through the custom track.

The first year net verified energy savings generated by LED tube re-lamp measures through the custom track (1,520 MWh) is over three times greater than the first year net verified energy savings generated by these measures through the prescriptive track (555 MWh). The first year net verified demand savings generated by LED tube re-lamp measures through the custom track (372 kW) is nearly two times greater than the first year net verified demand savings generated by this measure through the prescriptive track (185 kW). Overall the average custom LED tube re-lamp project size (55 MWh net verified savings) is almost two times larger than the average prescriptive LED tube re-lamp project size (25 MWh net verified savings).

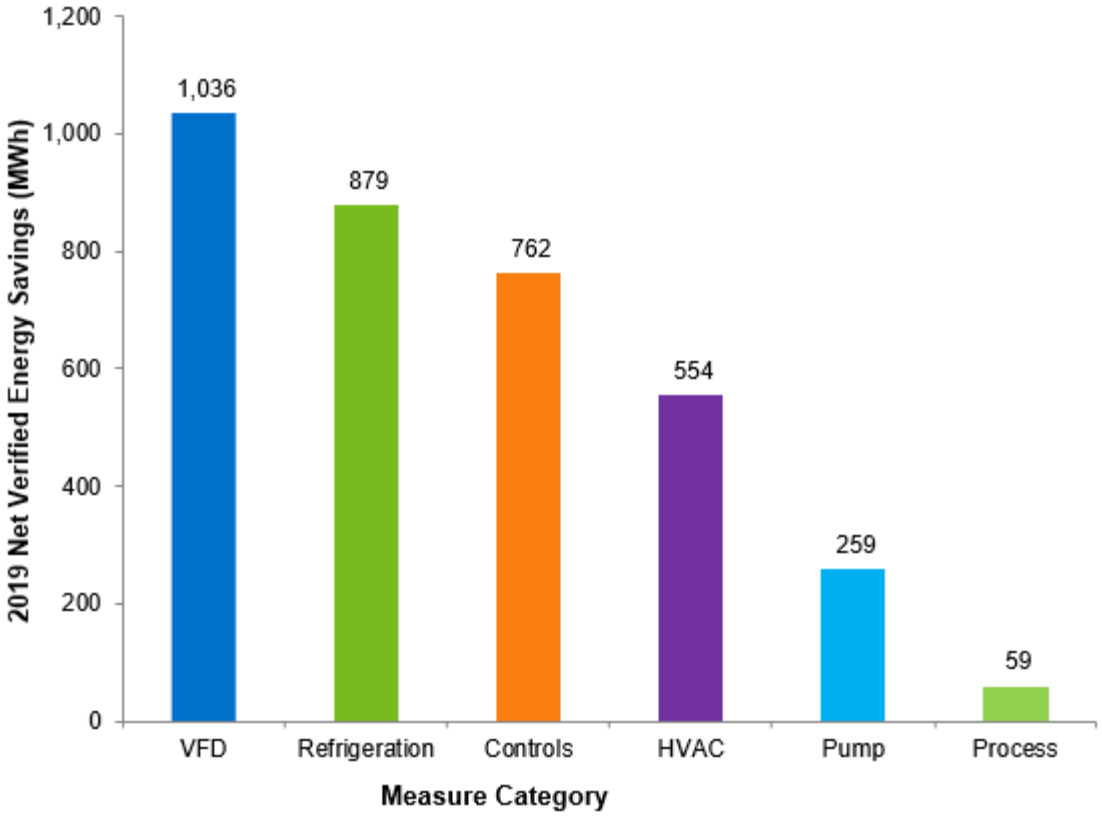
The custom track provides flexibility to utilize the actual operating hours of the equipment within the worksheet, as opposed to prescriptive track which assumed operating hours for each measure based on the facility type. In cases where the equipment's actual operating hours are greater than the prescriptive track assumption, utilizing the custom track results in greater energy savings and incentives. For example, the weighted average of operating hours for LED tube re-lamp measures in retail sector verified under the custom track is (4,429 hours) whereas the operating hours assumed by prescriptive track for LED tube re-lamp in retail sector is (3,610 hours).

Custom Non-lighting Measures

Custom non-lighting measures include the installation or replacement of a wide range of measures for non-lighting end-uses. Custom non-lighting measures accounted for nearly one-third (32%) of the program's first year net verified energy savings. These projects averaged over 6,474 MWh of first year net verified energy savings per project, which is nearly 10 times larger than the average net verified energy savings of projects in the prescriptive non-lighting strata (7.7 MWh).

As presented in Figure 4.15, the variable frequency drives (VFD) measure is the highest contributor to the custom non-lighting savings (30%), followed by refrigeration (evaporator motor replacements) (25%) and the adoption of control systems (21%).

Figure 4.15 | Custom Non-Lighting Measures and Net Verified Energy Savings



In comparison to the prescriptive track at 48 MWh, the net verified energy savings created by VFD measures in the custom track is approximately 20 times greater at 1,036 MW. The count of custom projects with VFD measures is seven times more than prescriptive VFD projects, so these custom VFD projects are larger in both quantity and savings. The popularity of this measure in the custom track is driven by the flexibility to utilize actual operating conditions of the equipment within the appplication. In cases where the equipment's actual operating hours is greater than prescriptive track assumptions, utilizing the custom track results in greater energy savings and incentives. For example, the average hours of operation for VFD measures submitted through custom track in the evaluation sample was 8,760 hours whereas the assumed hours of operation for this measure within prescriptive worksheet was 4,000 hours.

4.3 Realization Rates

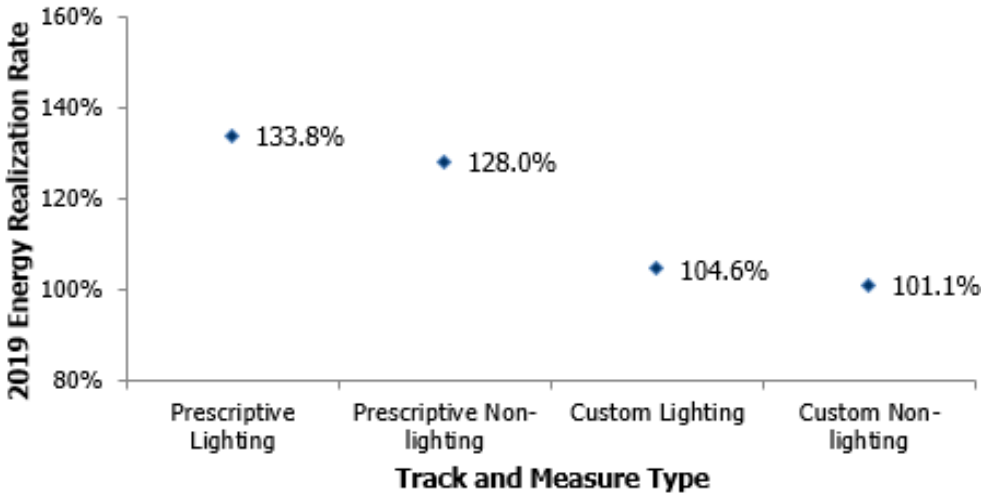
The calculation of the energy and peak demand savings from equipment retrofits will depend on three primary inputs: the baseline or retrofit equipment wattages, operating hours or operating loads, and the quantity of installed equipment. Realization rates were estimated as the ratio of verified sample savings over reported sample savings. A difference between the verified and reported values across these three primary inputs will result in an adjustment in savings through the realization rate.

Due to in-person interaction restrictions imposed by the COVID-19 pandemic, site audits for the 2019 Retrofit program evaluation were not feasible, leading to project verification and data collection solely through desk reviews. The data used for the impact evaluation analysis was limited to what was available in the program database, project documents collected by the program, and data collected from participants during phone interviews. Overall, participants were able to confirm the measures' implementation, the measure types, facility hours of use, and the quantity of measures. In instances where the participants could not recall the exact quantity of measures or the base case wattage, project documents such as invoices or application inputs were referenced for the purposes of completing the analysis.

4.3.1 Energy

The energy realization rates based on the sampled Retrofit projects were determined to be 133.8% for the prescriptive track and 104% for custom projects (Figure 4.16).

Figure 4.16| Track and Measure Type Energy Realization Rates



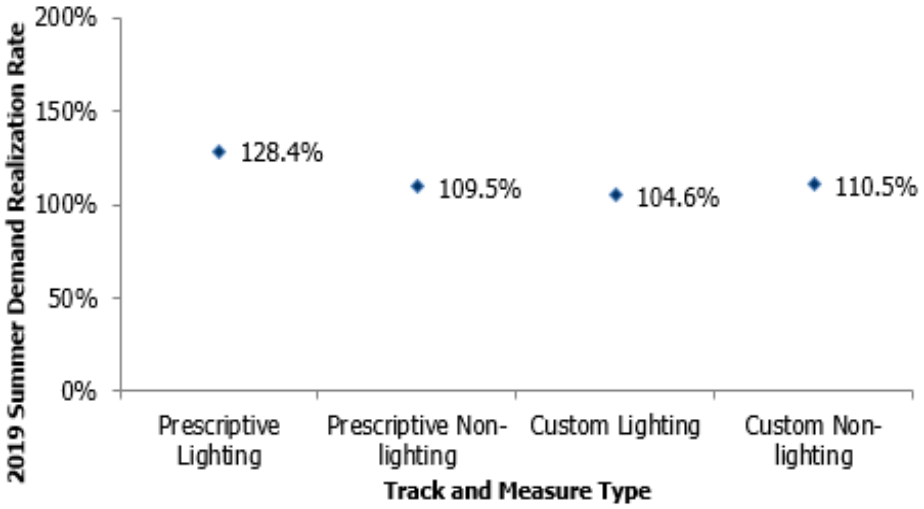
The primary driver of the energy realization rate above 100% for prescriptive projects is the inconsistency between verified equipment wattages (baseline and retrofit) and the program input assumptions. Specifically, higher verified base case wattages for omni-directional A-shape lamps and LED troffers increased the gross verifed savings for these projects leading to a realization rate higher than 100% for this track.

The realization rate for custom projects is slightly higher than 100% due to higher verified hours of operation.

4.3.2 Summer Demand

The summer peak demand realization rates are presented in Figure 4.17. Similar to the energy realization rates, the summer peak demand realization rates are higher than 100% for both the prescriptive and custom tracks. Higher values are attributed to a larger verified base case power draw, lower retrofit measure wattages, and greater hours of operation that are coincident with the IESO's summer peak demand definition.

Figure 4.17| Track and Measure Type Summer Peak Demand Realization Rates



Interactive effects were added to the program realization rates for both energy and demand savings to account for the influence of lighting savings on heating and cooling loads at project sites.

4.4 Net-to-Gross (NTG)

The NTG evaluation results are presented in the following subsections and 11.3 presents additional details.

4.4.1 Net-to-gross Results

Table 4.4 presents the results of the 2019 Retrofit program NTG evaluation. Confidence and precision levels of 90% and 10%, respectively, were targeted. However, due to low project volume and participation, 85% confidence and 15% precision levels were achieved when calculating the program's NTG. The following subsections summarize the completed analyses for the interpretation of these values.[19]

[19] The Retrofit program NTG results are based on survey responses provided by 62 respondents. These respondents were a mix of *full respondents* (completed the entire survey) and *partial* respondents (completed a portion of the survey before dropping out). All 62 respondents fully answered the NTG questions, but some did not complete the remaining survey questions, which focused on process topics. Because of this, the Retrofit program process evaluation results include fewer respondents than the NTG results (for a total of 58).

Table 4.4 | Retrofit Program Net-to-gross Results

Program Delivery Method	NTG Responses	Savings Weighted FR*	Energy SO*	Demand SO*	Energy Savings Weighted NTG*	Demand Savings Weighted NTG* %
Central Delivery	62	28.7%	20.3%	27.8%	91.6%	99.1%

4.4.2 Key Findings

Key findings from the NTG analysis include the following:

- Participant feedback indicates moderately high levels of FR at 28.7%.
    - Close to one-third (32%) 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 two-thirds (62%) of respondents reported that they would not have completed an upgrade, would have postponed it, or would have completed a scaled-back version of it in the program's absence, which indicates low FR among these respondents.
    - Over four-fifths (81%) of respondents' decisions to participate in the program was influenced by the information or recommendations provided by contractors, vendors, or suppliers associated with the program.
- About one-half (49%) of respondents selected energy-efficient equipment based on their contractor's suggestions, emphasizing their important role in helping drive customers to efficient equipment decisions.
- Participation in the program resulted in a relatively high SO at 20.3%, which helped offset the FR. Close to one-fifth (18%) 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 Retrofit program 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.

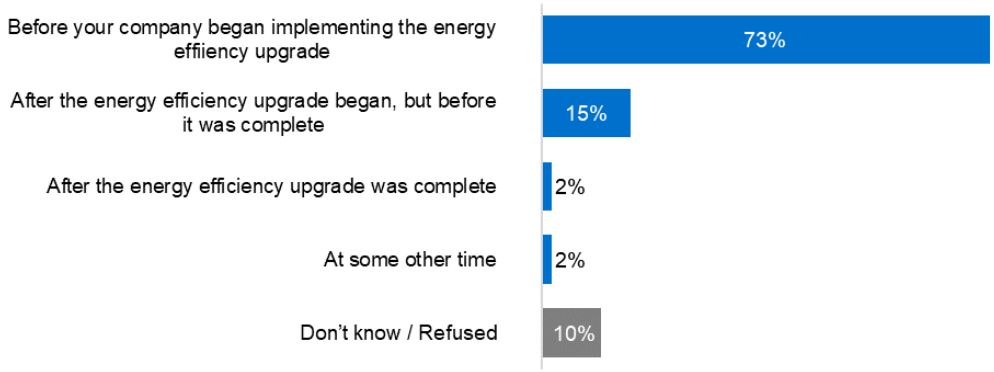
Nearly nine out of every ten respondents (82%) stated they first learned they could get energy-efficiency incentives through the Retrofit program before starting to plan their upgrades (Table 4.5). This may suggest that the program was influential in many of these respondents' decisions to begin the project. The remainder of the respondents (18%) learned about the program after planning had started but before beginning the project. While responses to this question did not directly impact the FR score, they provided additional context for understanding the participants' decision-making processes.

Table 4.5 | When Participants First Learned about the Program (n=62)

When Participants First Learned About the Program	%
Before you started planning this upgrade	82%
After you started planning, but before you started implementing this upgrade	18%

Participants were then asked about the timing of their application to the program in relation to the start of their energy-efficient upgrades (Figure 4.18). Three out of four respondents (73%) indicated they applied before their company began implementing the upgrade, suggesting that most participants apply to the program as intended. Another one-sixth (15%) did so after their energy-efficiency upgrades began, but before their completion. Similar to the previous question, this question is not used to calculate the FR score but provides additional context regarding participant intentions.

Figure 4.18 | Timing of Program Application (n=62)

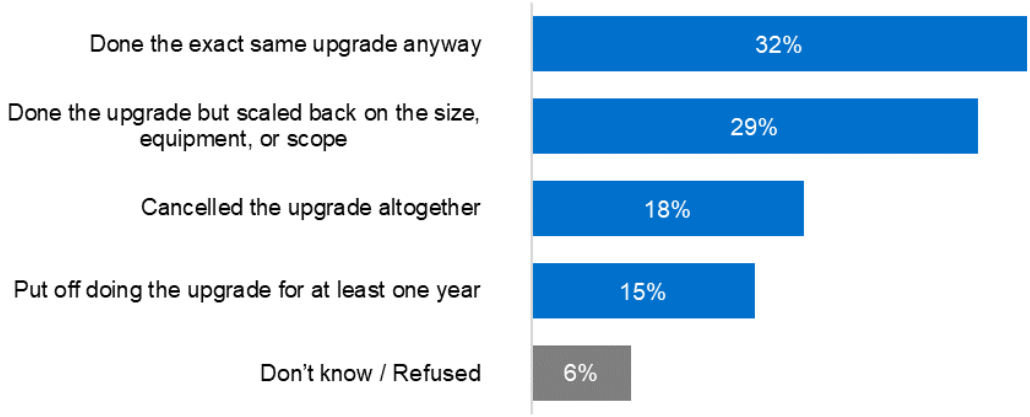


*Does not add to 100% due to rounding.

Respondents whose companies submitted a Retrofit program application after starting an energy-efficiency upgrade were asked their reasoning for doing so. The most common reasons were sticking to an internal schedule (3 respondents), having difficulty submitting their application (2 respondents), and completing work for an unplanned replacement (2 respondents). The responses suggest that many of these respondents would have applied earlier if it had been possible.

Respondents were then asked what they would have done in the program's absence (Figure 4.19). Overall, their responses suggest moderate FR as close to one-third would have done the "exact same upgrade" anyway (32%), which is indicative of partial or full FR for these respondents. However, almost two-thirds of the remaining respondents (62%) would have put off, cancelled, or installed less expensive or less efficient equipment without the program's support. Responses from this participant intent question were factored into the FR analysis.

Figure 4.19 | Actions in Absence of Program (n=62)

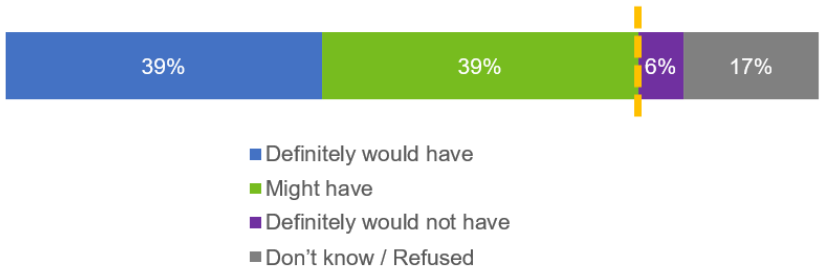


*Does not add to 100% due to rounding.

Respondents who indicated that they would have installed less energy-efficient or less expensive equipment were then asked to describe how much they would have reduced the project's size, scope, or efficiency. Two-thirds of these respondents (67%) would have scaled it back by a moderate amount. These results indicate that the program allowed these participants to increase the size and/or extent of their projects beyond what they would have been able to achieve on their own. The remaining participants were split between those who would have scaled back their projects by a small amount (17%), those who would have scaled it back by a large amount (11%), and those who did not know how their project scope would have changed (6%). This question was not used to calculate the FR score though it was used to provide additional context around participant intentions.

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 4.20). More than one-third (39%) of respondents said they definitely would have had the funds to cover all project costs, and the same number of respondents (39%) said they might have had the funds. Roughly one-half as many (17%) respondents stated they did not know or refused to answer. Only one respondent (6%) said they definitely would not have had the necessary funds. This indicates some degree of FR but also suggests that the program may have helped a portion of these participants to complete projects they might not have been able to otherwise. This participant intent question was factored into the FR analysis.

Figure 4.20|Availability of Funds in Absence of Program Incentives (n=20)*

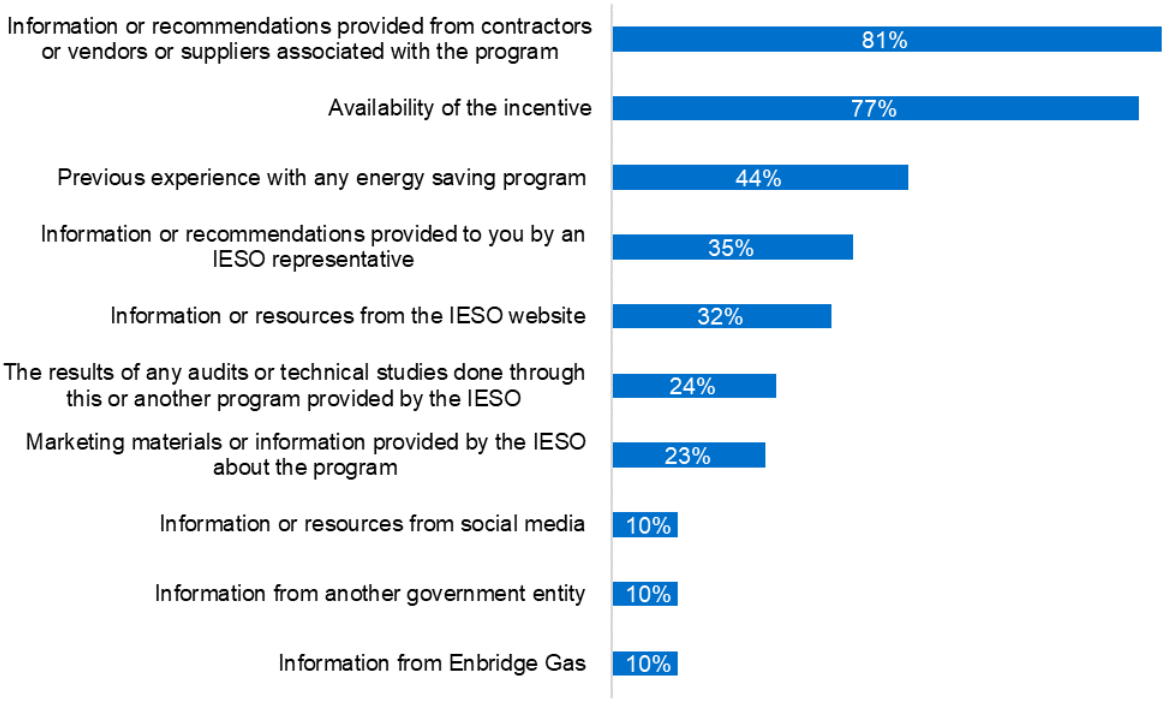


*Does not sum to 100% due to rounding.

Respondents were asked how influential various program features were on their decision to install energy-efficient equipment (Figure 4.21). Participants rated each feature's influence on a scale from one (1) to five (5), where one indicates it had "no influence at all" and five indicates it was "extremely influential." The highest-rated responses were the recommendations from contractors, vendors, or suppliers (81% with a 4 or 5 rating) and the availability of incentives (77% with a 4 or 5 rating). The next most-influential program feature was a previous experience with energy-saving programs (45% with a 5 rating). 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 contractor, vendor, and supplier networks' strength in driving Retrofit 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 the Retrofit program.

Figure 4.21 | Influence of Program Features on Participation (n=58) (Rating of 4 or 5 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 (Table 4.6). The most common responses included saving on energy costs (26%), recommendations by contractors, suppliers, or consultants (26%), and previous equipment reaching its end life and the reliability and/or performance of new equipment (15% each).

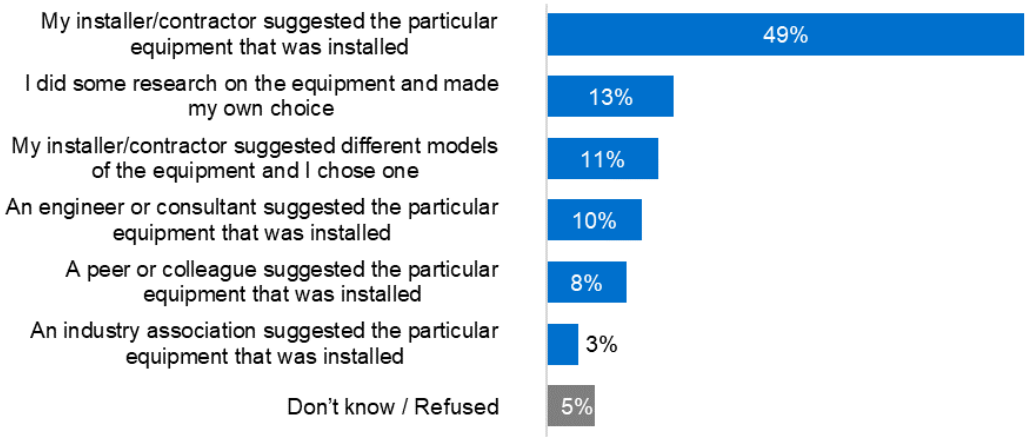
Table 4.6|Other Influential Factors on Upgrade Decision (Open end and multiple response allowed; n=27)*

Influence on Participation	%
Saving on energy costs	26%
Recommendations by contractors, suppliers, or consultants	26%
Previous equipment reaching end of life	15%
Reliability and/or performance of new equipment	15%
Reduced environmental harm	7%
Company carbon footprint goals	4%
Cost-benefit analysis	4%
IESO training	4%
Industry practices	4%
Size of incentives	4%
Word of mouth	4%

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

As shown in Figure 4.22, about one-half (49%) of surveyed participants selected equipment based on their installer's or contractor's suggestions – more than four times the number of participants that either made the choice based on their own research (13%), chose from a shortlist their installer or contractor provided (11%), or followed an engineer's or consultant's suggestions (10%). This reinforces the importance of contractors' role in helping drive customers to efficient equipment decisions.

Figure 4.22 | Equipment Selection Process (n=61)*



*Does not sum to 100% due to rounding.

In summary, FR results among the Retrofit program participants indicate moderately high FR levels at 28.7%. Nearly two-thirds (61%) of respondents reported they would not have completed an upgrade, would have postponed it, or would have completed a scaled-back version of it in the program's absence. However, the remaining one-third (32%) would have done the "exact same upgrade" anyway, suggesting there is still 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 Retrofit program. Almost one-fifth (18%) reported installing new equipment.

Table 4.7 displays the types of non-incentivized equipment installed by companies after their Retrofit project was completed. Some survey respondents installed multiple types of equipment. Non-incentivized HVAC equipment and lighting were the most common equipment types installed (five respondents each).

Table 4.7|Types of Upgrades Installed after Program Participation (Multiple response allowed; n=11)*

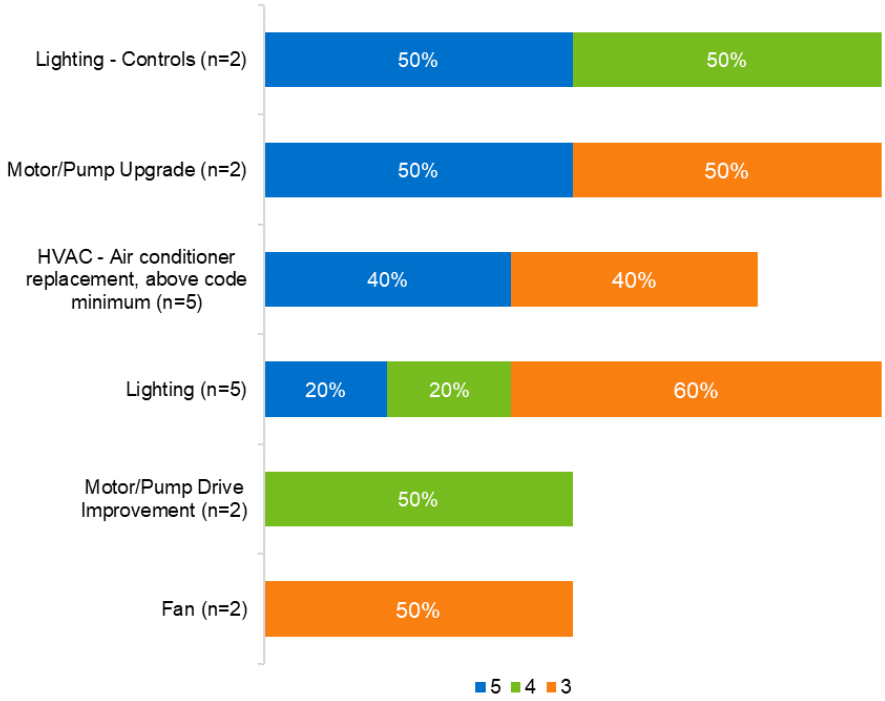
Upgrade	Respondents
HVAC - Air conditioner replacement, above code minimum	5
Lighting	5
ENERGY STAR Appliance	2
Fan	2
Lighting - Controls	2
Motor/Pump Drive Improvement	2
Motor/Pump Upgrade	2
Boiler	1

*Counts displayed rather than percentage due to small n.

Respondents were then asked what level of influence their participation in the Retrofit program 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 had "no influence at all" and five indicates the program was "extremely influential."

The percent of survey respondents influenced by the program (a score of 3 or higher) is shown in Figure 4.23 for each equipment type. SO in lighting controls was most-lyinfluenced by the Retrofit program, as respondents rated both projects a 4 or 5. Some of the motor/pump upgrades, HVAC, lighting, and fans received neutral ratings (3), indicating partial SO, or one-half of the savings attributable as SO.

Figure 4.23 | Program Influence on Equipment Installed outside the Program (Multiple response allowed; n=11) (Rating of 3 through 5 on a scale from 1 to 5)



Participants who had 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 primarily driven by the installation of 1,428 new LED linear bulbs completed by four respondents, as well as six (6) new motor/pump drive improvement projects completed by one respondent.

4.4.5 Rebound Effect

Respondents were asked a series of questions to determine whether any rebound effects occurred among those Retrofit program upgrades included lighting, heating, cooling, insulation, or weatherization. These questions were not used to calculate the NTG score but were instead collected to provide additional context around participant behaviors.

There was little evidence of the rebound effect among most respondents. Less than 1 in 20 (2%) of respondents reported leaving their lights on for longer periods after their upgrades. On average, these respondents reported an additional two hours of lighting use.

One respondent who installed air conditioning through the program reported they changed their thermostat temperature settings after their upgrade, specifically lowering their summertime temperature setting by 5 C°.

5. Process Evaluation

5.1 IESO Program Staff and Program Delivery Vendor Staff Perspectives

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

5.1.1 Key Findings

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

- The Retrofit program experienced major transitions in 2019 related to moving to a central delivery model and introducing the new Retrofit Application Portal.

The IESO staff and program delivery vendor staff worked together to manage the transition in 2019, addressing challenges as they arose. Such remediations included providing customers and delivery partners with information and resources to help address confusion with the new program and retooling the Application Portalp to better meet the program's needs as it evolvedes.

- The IESO staff emphasized the importance of continuing to further streamline the program.

The IESO staff and program delivery vendor staff also highlighted that it is important to make it as easy as possible for customers to participate in the program and for program delivery partners to support the program.

5.1.2 Design and Delivery

Several major changes occurred to the Retrofit program's design and delivery beginning in 2019. As the new Interim Framework was introduced, the Retrofit program transitioned to a central delivery model administered by the IESO. Around the same time as the transition, a new online Application Portal was introduced, built and managed by the IESO. Other program design changes occurred, including minimum cost caps for prescriptive projects.

The IESO staff indicated that coordination across teams and vendors has generally gone well, as they have worked to transition the program to the new delivery model and streamline their new processes. They continue to learn more about how to best support customers as they engage more with vendors and hear from customers about their needs.

5.1.3 Outreach and Marketing

The Retrofit program was minimally advertised in 2019, given the transition to the new framework and delivery approach. Nonetheless, both the IESO staff and program delivery staff stated they still saw a lot of interest in the program from customers and have heard positive feedback about the program. As of 2020, three program delivery vendors are responsible for performing outreach and marketing specific to their geographic zones. The IESO maintains its province-wide effort for the Save on Energy-branded marketing, communication and support.

Additionally, in 2019, the IESO worked with subject matter experts at various organizations, including the Canadian Institute of Energy Training (CIET), to help program delivery partners understand certain technologies and the process for selling them.

5.1.4 Application Portal

The IESO staff involved with the new Retrofit Application Portal provided insights into the steps involved in bringing it to fruition. They indicated some initial hurdles that they overcame early onupon the launch of the portal, including slow data migration and the fact that the portal had to be re-tooled to meet the new central delivery model's needs almost immediately following the portal's launch. However, the IESO staff believe the portal will serve the program well going forward now that these initial hurdles have been addressed. They also indicated that the new system is very reliable, and there is little downtime unless otherwise planned. The user experience has been improved compared to the prior iCon system, and features have been added to enable easier management of applications by the users. The IESO made additional updates in anticipation of 2020, given the transition to a regional delivery model. Enhancements to the system will continue, including the ability for applicant representatives to upload applications in bulk.

5.1.5 Barriers and Opportunities

As the transition to the new Interim Framework and Application Portal occurred in 2019, many customers, applicant representatives, and other delivery partners had inquiries and needed extra support. The IESO staff indicated that it took some time to provide support services. However, they have since introduced a support line, developed frequently asked questions (FAQs), offered more vendor webinars, and sent out more e-mail updates and newsletters. The IESO staff also stated that many of the challenges causing customer confusion were addressed.

The IESO staff suggested regular engagement with the three program delivery vendors as the regional delivery begins in 2020 to ensure analogous interpretation of guidelines and seamless program delivery.

Additional program improvementAlternate opportunities as suggested by the IESO staff and program delivery vendor staff included:

- improving the speed of customer payments,
- providing additional resources for Application Papplication ortal support,
- researching the feasibility of additional prescriptive offerings,
- increasingincrease focus on non-lighting upgardes,
- providing better measure verification,
- offering support for monitoring/targeting,
- reorganizing eligible measure information so it can be better understood from the perspective of customers, and
- continuing to look for ways to streamline the program.

Both the IESO staff and program delivery vendor staff emphasized the importance of enabling a simple process to facilitate customer participation in the program and an effortless procedure for program support by the delivery vendors.

5.2 Applicant Representative and Contractor Perspectives

The following subsections highlight the feedback received from the applicant representative and contractor survey.

5.2.1 Key Findings

Key findings from the applicant representative and contractor survey include the following:

- Respondents were predominately applicant representatives (65%) or both applicant representatives and contractors (31%).
- Two in five respondents (44%) rated their communications with the IESO staff positively, nearly one in three (31%) provided a negative rating, and just over one in four (26%) provided a neutral rating.
- Respondents' most-requested training and education topics were program and application rules (35%), program offerings (26%), marketing techniques (22%), and how to receive support when they or a customer are applying (17%).
- In reviewing the Application Portal, respondents were mainly neutral or negative. The two most common complaints were difficulty registering customers (5 respondents) and slow customer support (2 respondents).
- Respondents' suggestions for improving the application process focused on streamlining the process (68%) and clarifying upfront all required information (64%).
- Some respondents stated that the application process was longer (30%) and/or more complex (22%) under the Interim Framework than under the Conservation First Framework.
- More than one-half of respondents (52%) reported no impact on customer participation due to the Retrofit program's new prescriptive track incentive cap.
- More than three-fifths of respondents (68%) reported that the COVID-19 pandemic had slowed or halted their companies' operations as of the time of the survey.

5.2.2 Firmographics

Nearly two out of three respondents (65%) were applicant representatives in the Retrofit program, as presented in Figure 5.1. Nearly one in three (31%) identified as both an applicant representative and a contractor. The remaining respondent was a contractor only.

Figure 5.1 | Respondents' Role in Retrofit Program (n=23)

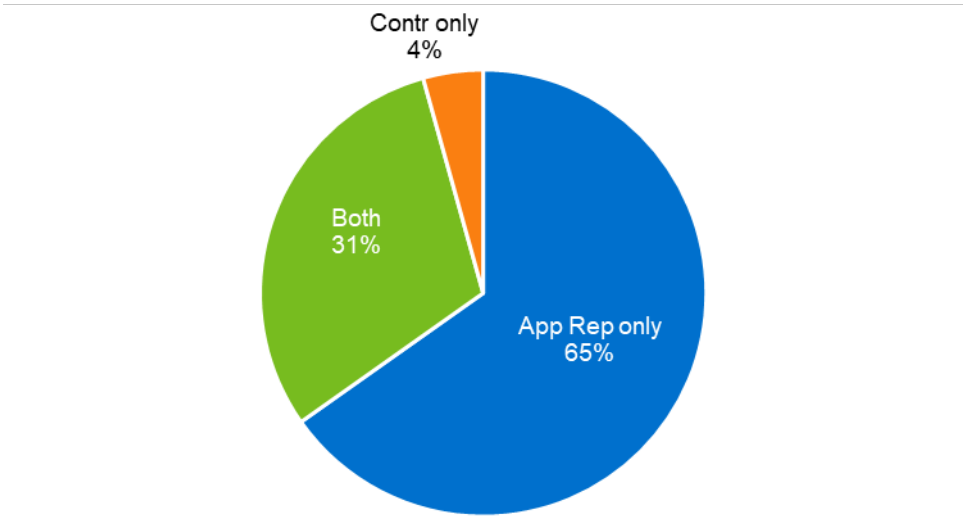


Table 5.1 shows the number of full- and part-time employees at the respondents' companies. One in five (22%) were affiliated with companies that had five or fewer full-time positions. Another one in five (17%) were affiliated with companies that had between five and ten full-time positions. Very few respondents reported having any part-time positions.

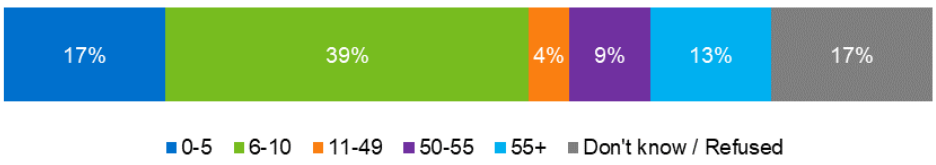
Table 5.1| Respondents' Full- and Part-time Employees (n=23)

Number of Employees	Full-Time	Part-Time
0-5	22%	9%
6-10	17%	0%
11-20	4%	0%
20+	4%	0%
Don't know/I'd rather not answer	52%	52%
None	0%	39%

*Does not sum to 100% due to rounding.

The breakdown of the respondents' company age is presented in Figure 5.2. One in five respondents (17%) were affiliated with companies that had been in business for less than five years. More than one-half of respondents (56%) were affiliated with companies that had been in business for less than ten years. Another one in five (22%) were affiliated with older businesses that had been in operation for more than 50 years.

Figure 5.2 | Respondents' Company Age (n=23)*

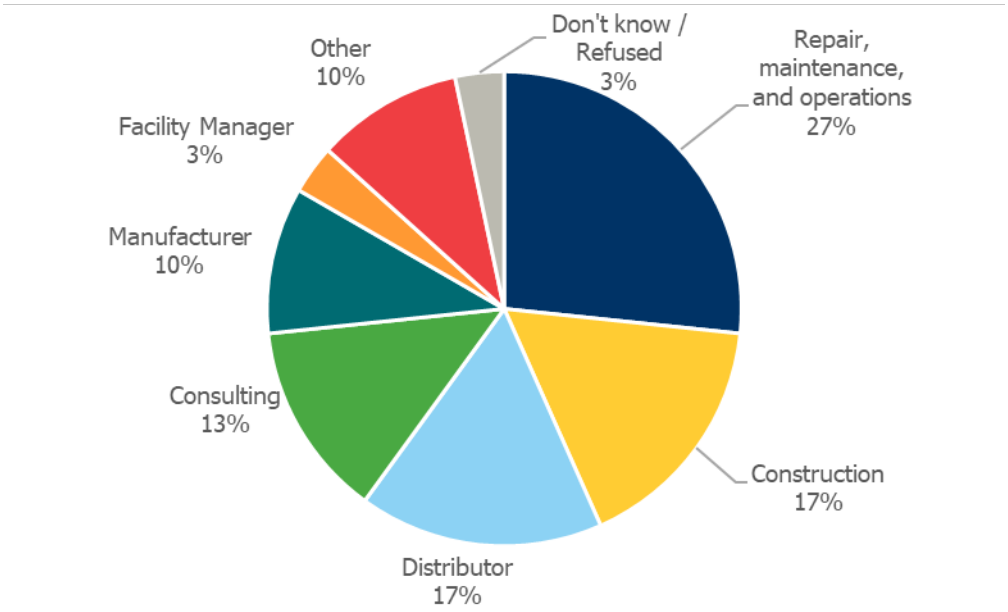


*Does not sum to 100% due to rounding.

Respondent business categories varied, as presented in Figure 5.3. Over one in four (27%) worked in repair, maintenance, and operations. Nearly one in five (17%) worked in construction and/or distribution.

Figure 5.3| Respondents' Business Category

(Open end and multiple responses allowed; n=22)*



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

5.2.3 Project Background

Both applicant representatives and contractors were asked to provide background information about the projects they supported.

Applicant Representatives

On average, the 22 respondents who were applicant representatives reported representing an average of 39 customers. One respondent represented 200 customers.

Contractors

Of the eight responding contractors, six provided details on the total number of projects their company completed through the program in 2019. The only installed equipment types reported by the respondents were lighting and/or lighting controls. In aggregate, respondents reported a total of 384 projects, 163 (42%) of which were through the Retrofit program. Nearly two-thirds (63%) of the projects completed were through the custom track.

Only four respondents provided an estimate of the percentage of sales that went through the Retrofit program. Three answered with 10% or less, which is well below the final respondent's answer of 80%. When respondents were asked to provide sales estimates by equipment type, all respondents only reported lighting and/or lighting controls. Two respondents stated that 80% or more of their lighting sales went through the program, while another reported only 10%. In addition, one respondent stated that all their lighting controls sales went through the program.

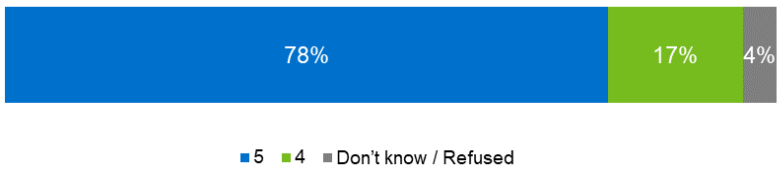
Two respondents accounted for over two-thirds of the project volume, but only 30% of their projects went through the program. The other six respondents accounted for far fewer projects, but nearly nine out of every ten of their 2019 projects went through the Retrofit program. In general, contractors with larger project volumes reported lower participation rates. As a result, there exist opportunities for greater promotion of the Retrofit program among larger contractors.

5.2.4 Outreach, Training, and Education

Respondents reported high communication levels with their business customers about the Retrofit program's availability, as presented in Figure 5.4. They rated how often they inform their business customers about the program's availability using a scale from one (1) to five (5), where one indicates "never" and five indicates "always." Nearly all (95%) respondents either always or almost always communicate about the program with their business customers, suggesting strong program support.

Figure 5.4 | Respondents' Frequency of Communicating with Business Customers (n=23)*

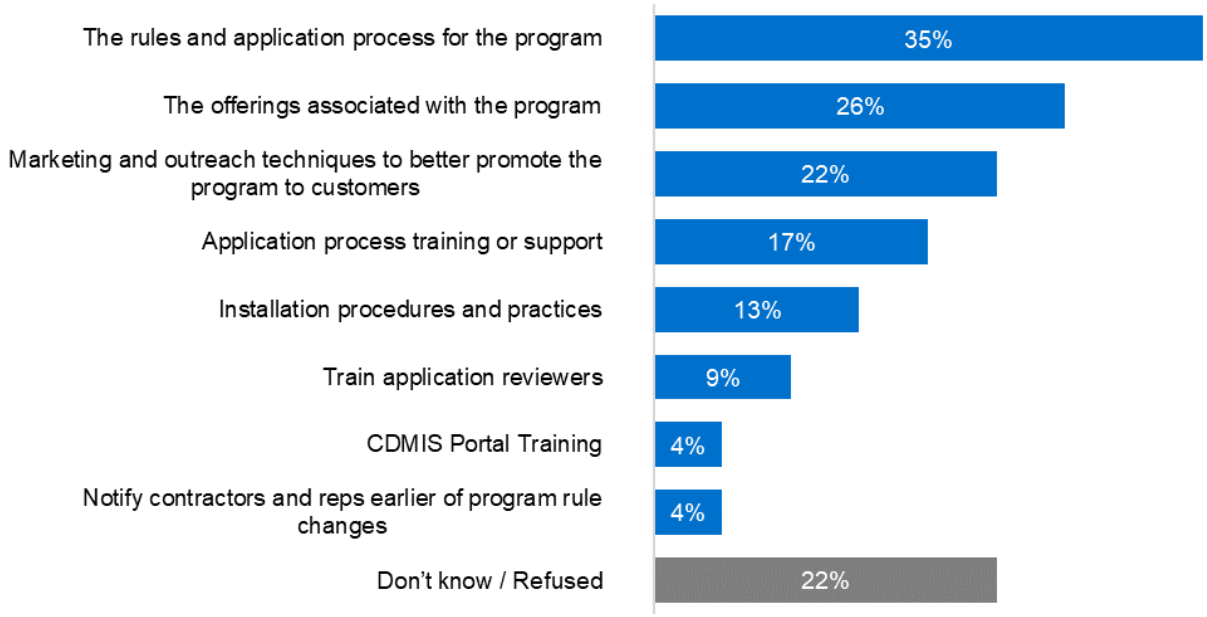
(Rating of 4 to 5 on a scale from 1 to 5)



*Does not add to 100% due to rounding.

Respondents provided input on what types of training and education would most support their work with the Retrofit program (Figure 5.5). The most commonly requested training included those that covered program and application rules (35%), program offerings (26%), marketing techniques (22%), and how to receive support when they or a customer are applying (17%). As seen in Section 5.2.5, respondents' program experience ratings and improvement suggestions reflect the necessity for training on application rules and processes.

Figure 5.5 | Recommended Training and Education Topics (Multiple responses allowed; n=23)

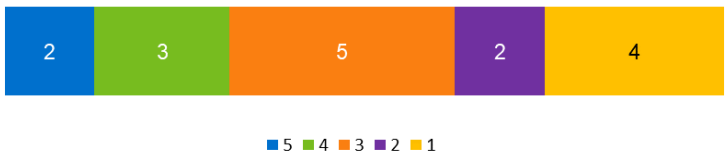


5.2.5 Program Experience and Improvement Suggestions

More than three-fourths (78%) of respondents stated they signed clients up for a Retrofit Application Portal account. Respondents were asked to rate how easy and straightforward it was to sign clients up for a portal account on a scale from one (1) to five (5), where one indicates "unduly difficult and complicated" and five indicates "appropriately easy and straightforward," as presented in Figure 5.6. Respondents' who helped sign clients up for an account most commonly provided a neutral response, accounting for one-third of the ratings provided (5 respondents). Those with negative responses explained their rating. The most frequent explanations were difficulty registering customers (5 respondents) and slow customer support (2 respondents).

Figure 5.6 | Assessment of Application Portal (n=16)*

(Rating on a scale from 1 to 5)

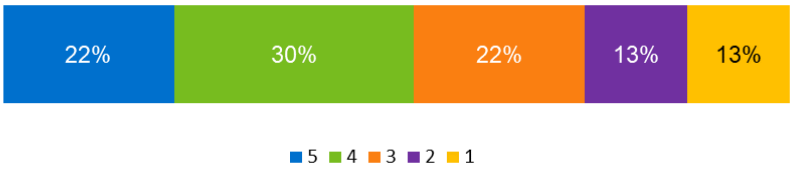


*Counts displayed rather than percentage due to small n.

Respondents were nearly unanimous (91%) reporting that they did most of the work involved in completing and submitting applications. Those with this role accessed client data as needed for submissions. The two respondents who did not report doing most of the work were applicant representatives, and they reported working closely with the client to help complete their applications. Respondents rated how easy and straightforward the overall application process was on a scale from one (1) to five (5), where one indicates "unduly difficult and complicated," and five indicates "appropriately easy and straightforward," as presented in Figure 5.7. Just over one-half (52%) provided a 4 or 5 rating.

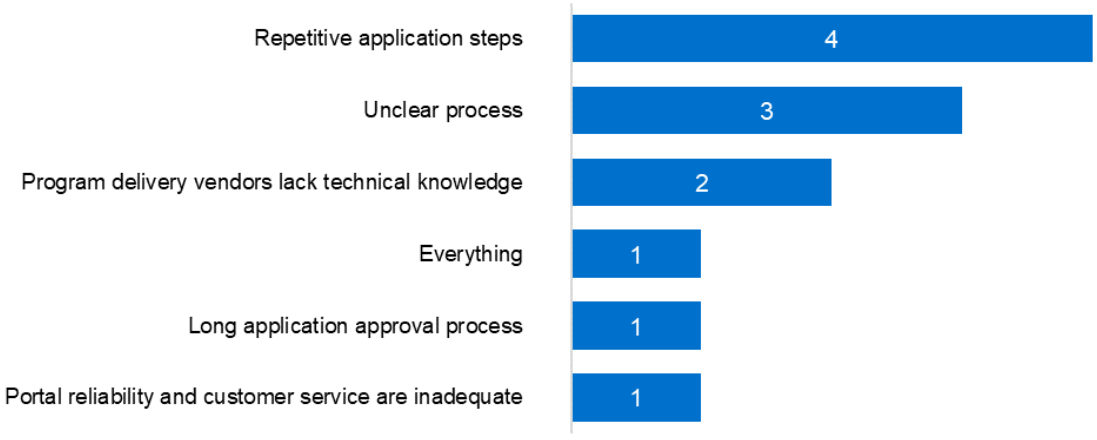
Figure 5.7 | Assessment of Overall Application Process (n=23)

(Rating on a scale from 1 to 5)



Respondents who provided negative ratings about the application process explained their difficulties with it, as presented in Figure 5.8. They most often reported repetitive application steps (4 respondents) and an unclear application process (3 respondents).

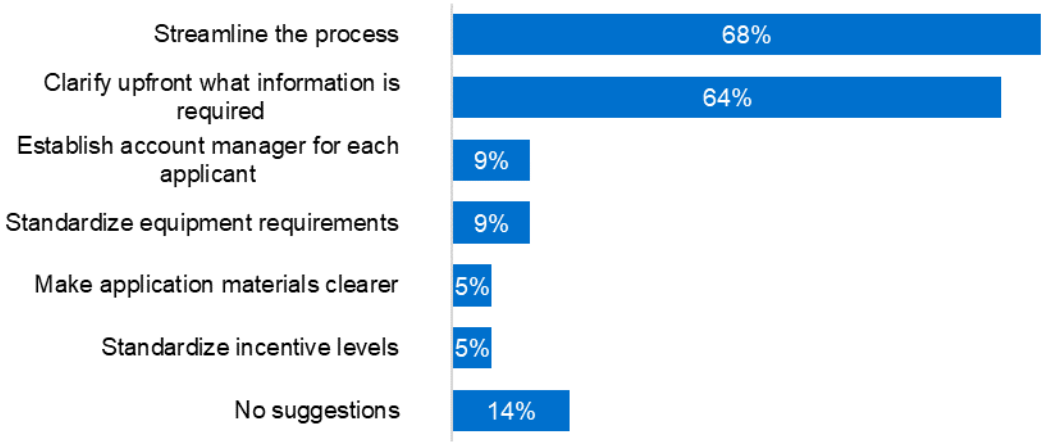
Figure 5.8 | Difficulties with Application Process
(Open end and multiple responses allowed; n=6)*



*Counts displayed rather than percentage due to small n.

As presented in Figure 5.9, respondents' suggestions for improving the application process were split between streamlining the process (68%) and clarifying upfront all required information (64%). Other responses were closely related to these two themes and included standardizing and simplifying program materials and requirements.

Figure 5.9 | Suggested Improvements for Application Process
(Open end and multiple responses allowed; n=22)*

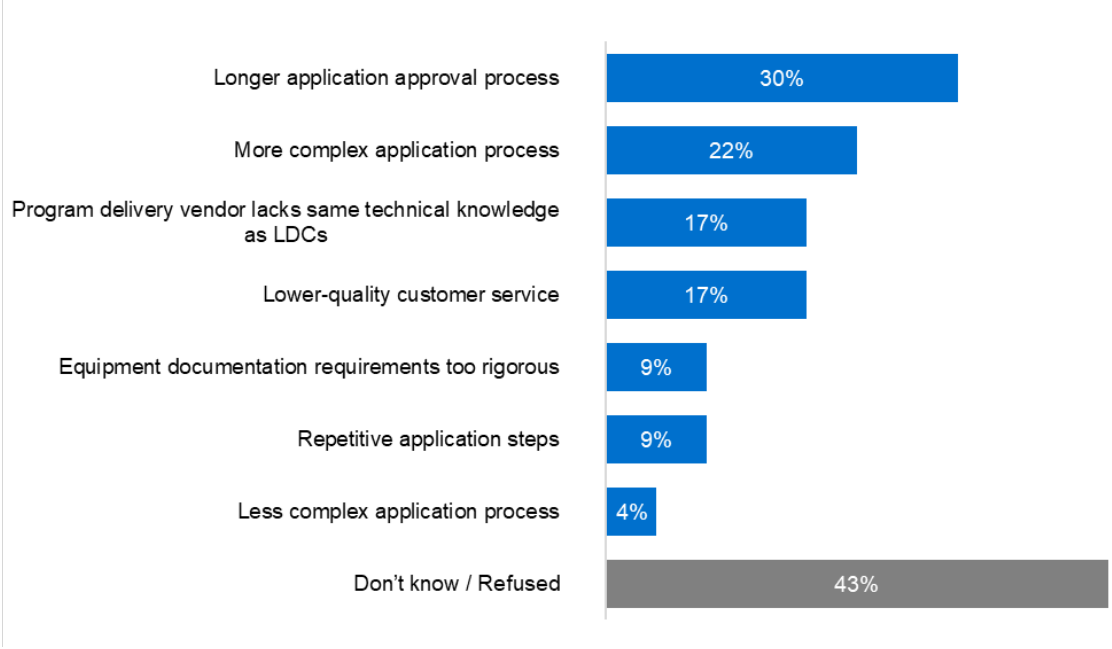


*Does not sum to 100% due to multiple response.

If the respondent had experience with both the Conservation First Framework and the Interim Framework, they were asked to describe any differences they may have observed between each program delivery (Figure 5.10). The most often-cited differences in delivery between the two frameworks were a longer (30%) and/or more complex (22%) application process under the Interim Framework. Some respondents also stated the program delivery vendors lacked the same technical expertise and/or customer service quality (17% each) for the Retrofit program in the current framework compared to what was offered under the previous framework.

This type of feedback may be expected given that 2019 was the first program year of the new framework, and no delivery vendors were supporting the program aside from the transitional vendors, which had a limited role. However, starting in 2020, program delivery vendors will aid the IESO in delivering the program, which will likely result in greater satisfaction with the program's support provided. Note that the responses support the feedback received about suggestions for improving the application process in 2019, as presented in Figure 5.9 and Figure 5.10.

Figure 5.10 | Changes in Program Delivery Under Interim Framework (Open end and multiple responses allowed; n=23)*

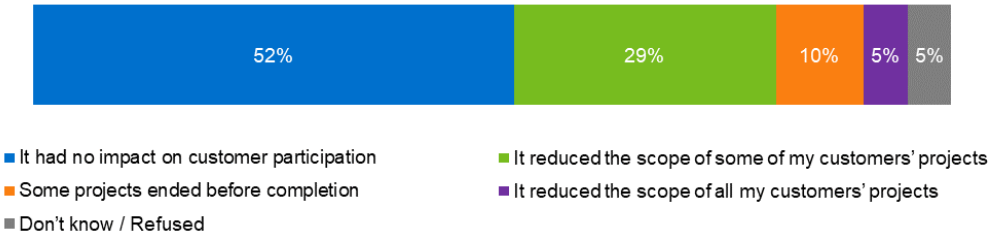


*Does not sum to 100% due to multiple response.

5.2.6 Incentive Cap

Respondents described the impacts, if any, of the Retrofit program's prescriptive track incentive cap of 50% of the total project cost, which went into effect in May of 2019 (Figure 5.11). A slim majority (52%) reported no impact on customer participation. The rest reported at least some scope reduction, including two respondents for whom some projects ended before completion and another for whom the incentive cap reduced all their projects' scope. When asked to quantify the extent of the scope reduction, responses ranged from 1% to 100% with no clear pattern, as presented in Table 5.2.

Figure 5.11| Assessment of Retrofit Program Prescriptive Incentive Cap (n=21)*



*Does not add to 100% due to rounding.

Table 5.2| Retrofit Program Prescriptive Incentive Cap Scope Reduction (n=7)*

Scope Reduction	Respondents
Reduced scope by 1% to 10% on average	2
11% to 25% on average	1
26% to 50% on average	1
76% or more on average	1
Don't know	2

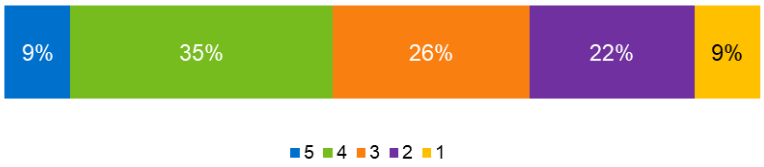
*Counts displayed rather than percentage due to small n.

5.2.7 IESO Communications

Respondents were asked to rate their satisfaction with the Retrofit-specific IESO communications on a scale from one (1) to five (5), where one indicates "not at all satisfied" and five indicates "extremely satisfied" (Figure 5.12). Nearly one-half of respondents (43%) provided a positive rating, one in three (31%) provided a negative rating, and one in four (26%) provided a neutral rating. This suggests an opportunity to strengthen the IESO's communication with the applicant representatives and contractors.

Figure 5.12 | Assessment of Retrofit-specific Communications with IESO (n=23)*

(Rating on a scale from 1 to 5)



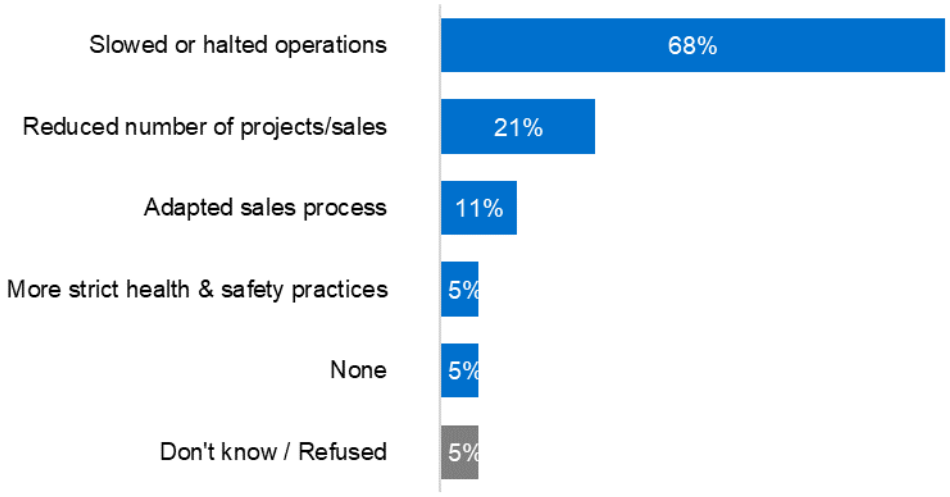
*Does not add to 100% due to rounding.

Those with negative responses that provided suggestions for improving the IESO's communications mentioned improving customer support timeliness (2 respondents).

5.2.8 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. More than three-fifths (68%) reported that the COVID-19 pandemic had slowed or halted their companies' operations as of the time of the survey, as presented in Figure 5.13. Relative few reported a reduced number of sales (21%) or adapted sales processes (11%).

Figure 5.13 | Changes to Business Operations due to COVID-19 (Open end and multiple responses allowed; n=19)*



*Does not add to 100% due to rounding.

5.3 Retrofit 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:

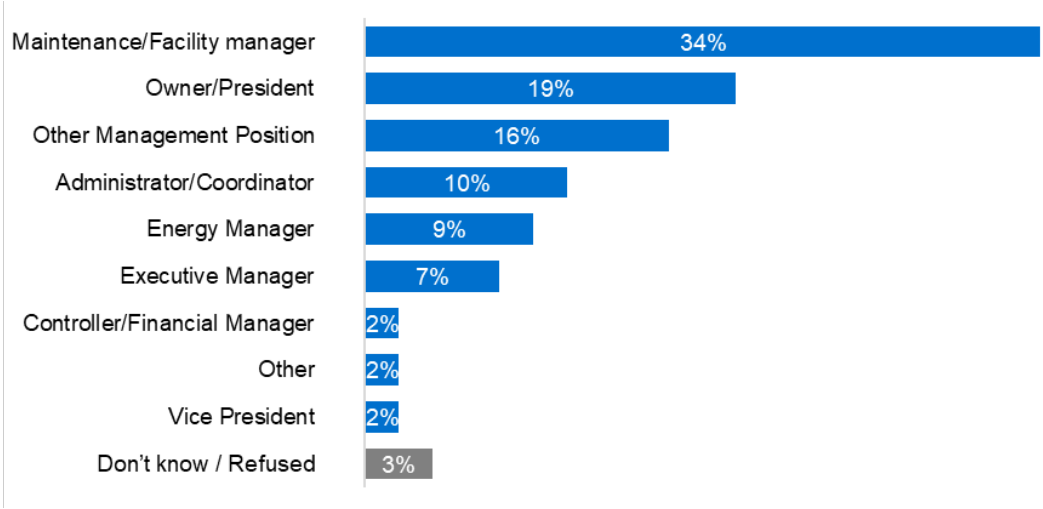
- Equal proportions of respondents (29% each) either had primary responsibility for submitting their applications or shared that responsibility with a contractor.
- One in four respondents (22%) said they had challenges with the Retrofit Application Portal. More than one-half mentioned that the main issues were uploading documents (8 respondents) and/or malfunctioning components of the website (7 respondents).
- The most common suggestions respondents provided for improving the application process included improving the Application Portalap functionality (9 respondents), streamlining the overall application process (for example, reducing the number of steps) (9 respondents), and minimizing the time needed to complete the process (6 respondents).
- Nearly two-thirds (64%) reported that the program's prescriptive track incentive cap of 50% had no impact on their participation.
- Two in five respondents (41%) were completely satisfied with the Retrofit program communications they received from IESO.
- Nearly one-half (49%) of respondents had participated in other IESO energy-efficiency programs in 2019. Of those, one in four (28%) had participated in the SBL program.
- Two in five (41%) responding participants said the COVID-19 pandemic had halted their company's operations, though not necessarily permanently.

5.3.2 Firmographics

Participants were asked various questions for the collection of information on their job title, ownership status, responsibilities in relation to the program, and training received. Details on the participants' companies (for example, primary activities, chain or franchise status, facility floor space, types of heating and cooling equipment, ceiling height, number of floors, and whether the facility had participated in other business programs) were also gathered during the survey.

As presented in Figure 5.14, more than one-third of respondents (34%) were maintenance/facility managers at the participating company. Another one-fifth (19%) were owners and/or presidents of the company. Nearly every other respondent indicated holding either an administrative or managerial role.

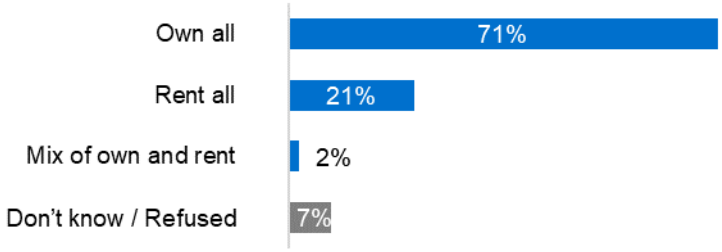
Figure 5.14 | Titles of Respondent (Multiple response allowed; n=58)*



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

Respondents predominately owned the facilities for which they applied for retrofits or upgrades, as presented in Figure 5.15. Nearly three in four (71%) owned all the affected facilities, while one in five (21%) were exclusively renting them.

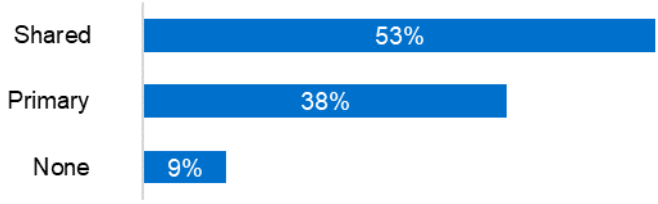
Figure 5.15 | Ownership Status (n=58)*



*Does not add to 100% due to rounding.

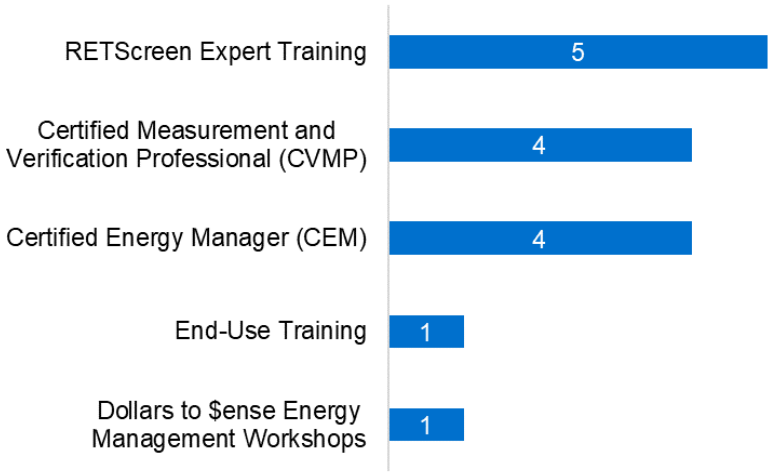
Respondents also specified whether they had primary or shared responsibility for the budget and/or expenditures related to the Retrofit program project. A slim majority (53%) shared such responsibilities, while more than one-third (38%) had the primary responsibility (Figure 5.16). A relative few (9%) said they had no responsibilities at all in the matter.

Figure 5.16 | Responsibility for Budget and Expenditures (n=58)



Likewise, fewer than one in ten (9%) confirmed participation in the IESO's subsidized training programs. Of those that had training experience, all referenced RETScreen Expert Training (Figure 5.17). All but one mentioned both the Certified Energy Manager (CEM) and the Certified Measurement and Verification Professional (CVMP) training.

Figure 5.17 | Participation in IESO-Subsidized Training (Multiple response allowed; n=5)*



*Counts displayed rather than percentage due to small n.

As presented in Table 5.3, manufacturing (19%), retail (16%), non-profit (14%), and transportation/warehousing (10%) were the most common primary business activities that respondents associated with their companies. Respondents also cited government (7%) and/or healthcare services (5%). Of the 14% of respondents who confirmed belonging to a chain or franchise, manufacturing and retail were the most common business activities reported, accounting for three-quarters (75%) of this group.

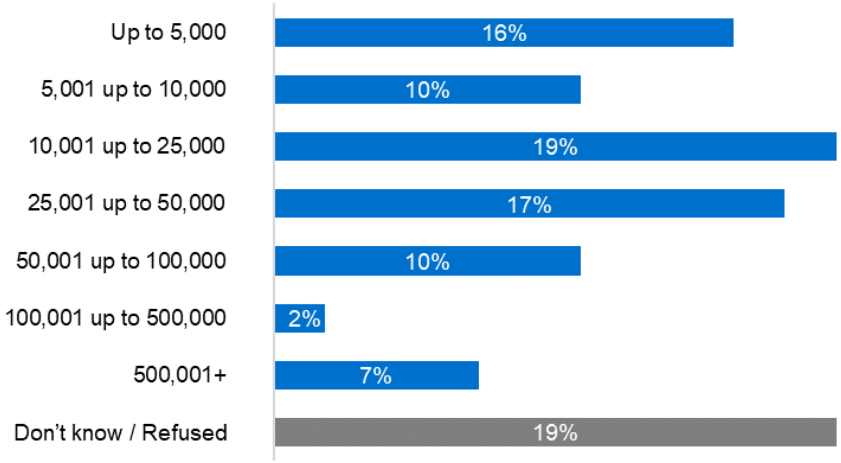
Table 5.3 | Primary Activity at Facility(ies)
(Multiple response allowed; n=58)*

Primary Activity	%
Manufacturing	19%
Retail and wholesale	16%
Non-profit	14%
Transportation and warehousing	10%
Government services	7%
Healthcare services	5%
Arts, entertainment, recreation, advertising, and travel	3%
Construction	3%
Educational services	3%
Lodging and food service	3%
Other services	3%
Repair, maintenance, and operations	3%
Agriculture, forestry, husbandry, mining, and extraction	2%
Arts, entertainment, recreation, advertising and travel	2%
Residential	2%
Scientific, technical, and information services	2%
Waste management and remediation	2%

*Does not sum to 100% due to rounding.

Participants were asked to provide the total area of their facilities, along with information on the types of heating and/or cooling equipment in use there. The most-frequent facility sizes were between 10,001-25,000 sq. ft. (19%), 25,001-50,000 sq. ft. (17%), and 5,000 sq. ft. or less (16%) (Figure 5.18).

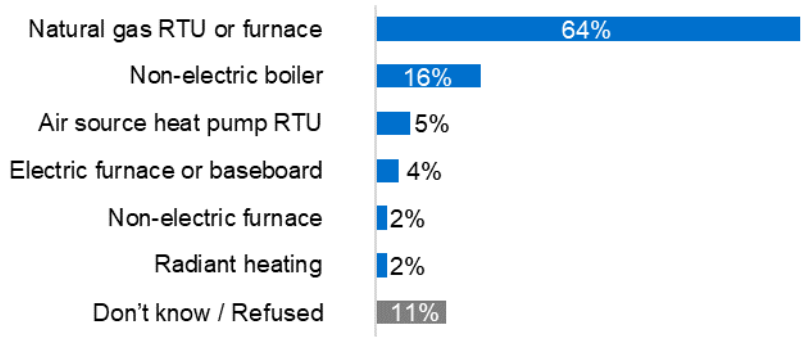
Figure 5.18 | Total Square Footage for All Buildings (n=58)



Almost two-thirds of responding participants (64%) reported a natural gas rooftop unit (RTU) or furnace heating at their facilities. Another one-sixth (16%) reported that they heated their facilities with a non-electric boiler (

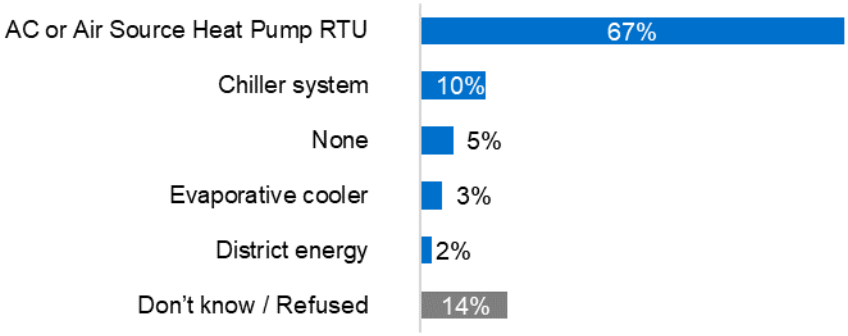
Figure 5.19). On the cooling side, similar proportions reported an air conditioner or air source heat pump RTU (67%), followed by one-tenth (10%) with a chiller system (Figure 5.20).

Figure 5.19 | Facility Primary Heating System (Multiple response allowed; n=58)*



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

Figure 5.20 | Facility Primary Cooling System (Multiple response allowed; n=58)*



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

Roughly three-quarters (77%) of responding participants provided average ceiling heights for the facilities where they made upgrades (Table 5.4). The average ceiling height for the vast majority (74%) that answered in feet was 14.4 ft. Two respondents (3%) answered in meters, with an average height of 5.7 m, or 18.7 ft.

Table 5.4 | Average Facility Height (n=58)

Units	%
Feet	74%
Meters	3%
Don't know / Refused	22%

*Does not sum to 100% due to rounding.

Nearly all responding participants (95%) provided the number of floors at the facilities where they made upgrades. The mean number of floors was three, but the median number of floors was one.

When the respondents were asked whether they had participated in other IESO energy-efficiency programs, nearly one-half (49%) of respondents reported that they had (Table 5.5). Roughly one in four (28%) had also participated in the SBL program. Relatively few participated in any of the other programs.

Table 5.5 | Participation in Additional Energy-Efficiency Programs (Multiple response allowed; n=58)*

Additional Programs	%
Small Business Lighting Program	28%
Energy Manager Program	5%
Process and Systems Upgrade Program	4%
Enbridge programs	2%
Refrigeration Efficiency Program	2%
Don't know/Refused	16%
No other programs	51%

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

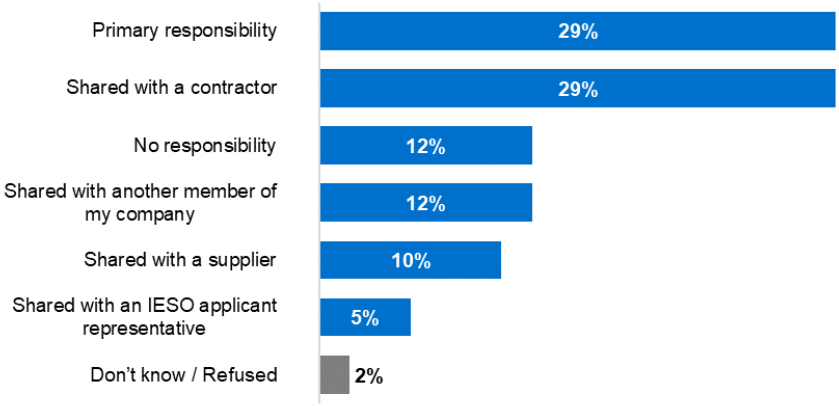
5.3.3 Application Process

As presented in Figure 5.21, an equal number of respondents either had the primary responsibility or shared responsibilities with a contractor for submitting their Retrofit program applications (29% each). The remaining applicants did not have a responsibility (12%), shared it with a member of their company (12%), or shared it with a supplier (10%). Only 5% reported sharing the responsibility with an IESO applicant representative.

These findings differ from the applicant representative and contractor survey results (Section 5.2), where 91% of respondents (mostly applicant representatives) reported doing "most of the work involved in completing and submitting the application(s) and accessing the relevant data from client(s)." This discrepancy may result from the program participants or applicant representatives over-stating their roles, participants potentially forgetting the applicant representative's role, and/or differences in sampled groups.

Among responding participants who stated they had no responsibility for submitting applications, most (4 respondents) had contractors submit them. Others had a supplier (2 respondents) or a member of their own company (1 respondent) submit them.

Figure 5.21 | Responsibility for Application Submission (n=58)*

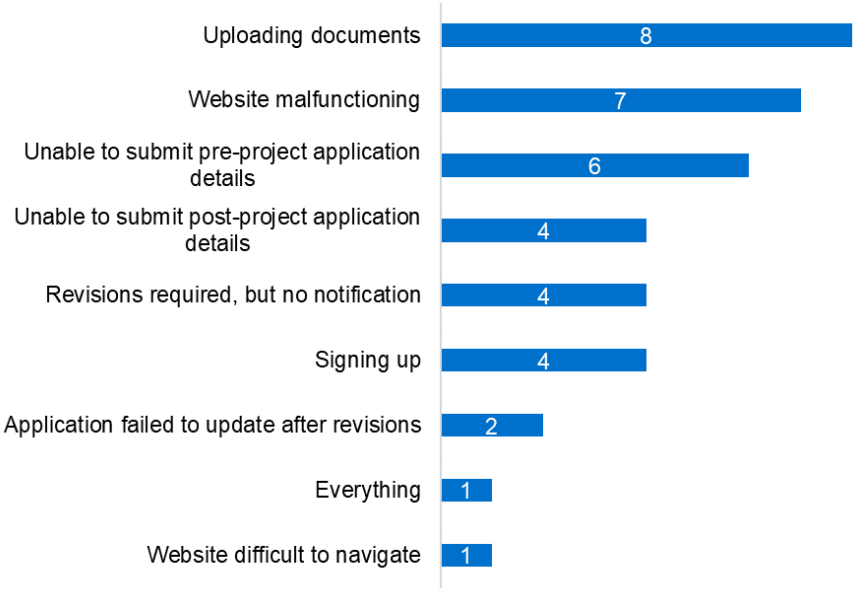


*Does not sum to 100% due to rounding.

One in four respondents (22%) stated they had an issue with the Retrofit Application Portal. Figure 5.22 presents that, of those with issues, more than one-half mentioned that the main issues were related to uploading documents (8 respondents) and/or malfunctioning components of the website (7 respondents).

Figure 5.22 | Description of Application Portal Issues

(Open end and multiple response allowed; n=13)*

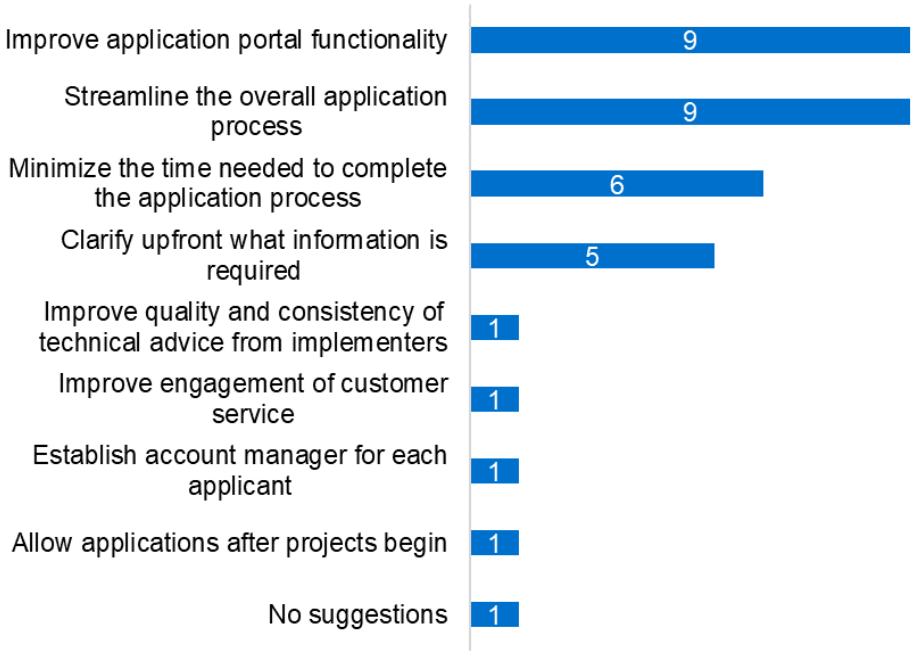


*Counts displayed rather than percentage due to small n.

Respondents were asked for suggestions on improving the Application Portalap or the overall application process. Some suggestions included improving the Application aportal functionality (9 respondents), streamlining the overall application process (for example, reducing the number of steps) (9 respondents), and minimizing the time needed to complete the process (6 respondents) (Figure 5.23).

Figure 5.23 | Suggestions for Improving Portal and Overall Application Process

(Open end and multiple response allowed; n=12)*

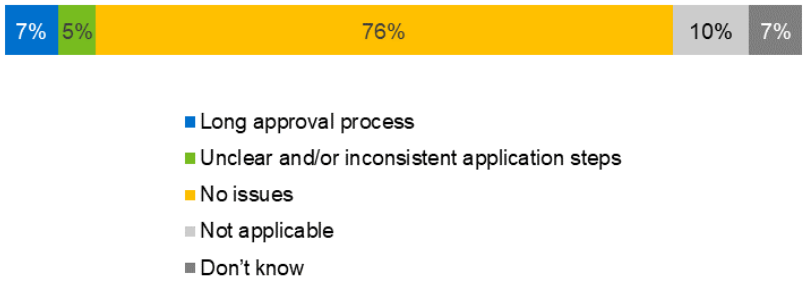


*Counts displayed rather than percentage due to small n.

When respondents were asked to detail any issues with assigning responsibilities to applicant representatives, close to three-fourths (76%) did not report any issues (Figure 5.24). Those that reported issues cited either a long approval process (7%) or unclear and/or inconsistent application steps (5%).

Figure 5.24 | Applicant Representative Registration Issues

(Open end and multiple response allowed; n=46)*

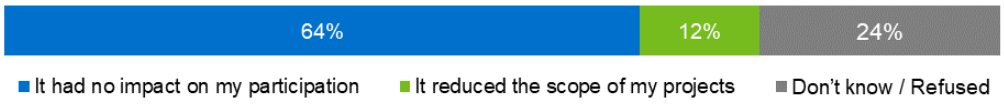


*Does not sum to 100% due to multiple response.

5.3.4 Incentive Cap

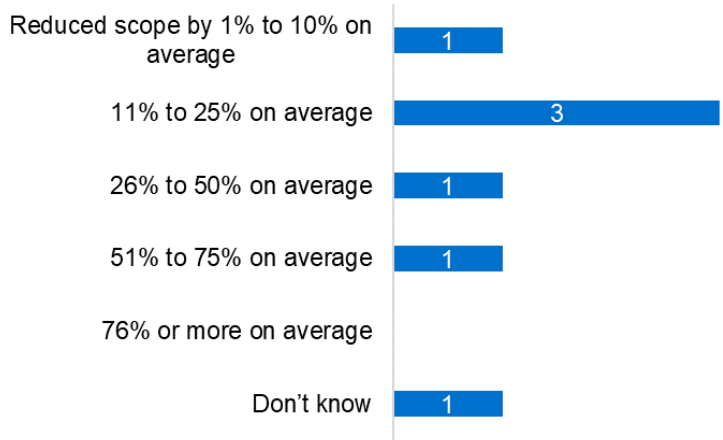
Nearly two-thirds (64%) of respondents reported that the Retrofit Program's prescriptive track incentive cap of 50% of the total project cost, which was implemented in May of 2019, had no impact on their participation (Figure 5.25). In contrast, one-half (52%) of Retrofit applicant representatives and contractors (Section 5.2) stated the same response, albeit with a smaller sample size.

Figure 5.25 | Impact of Retrofit Program Prescriptive Incentive Cap (n=58)



Among the 12% of responding participants who reported scope reduction due to the incentive cap, most (4 respondents) stated their projects were reduced in scope by 25% or less (Figure 5.26).

Figure 5.26 | Scope Reduction from Prescriptive Incentive Cap (n=7)*

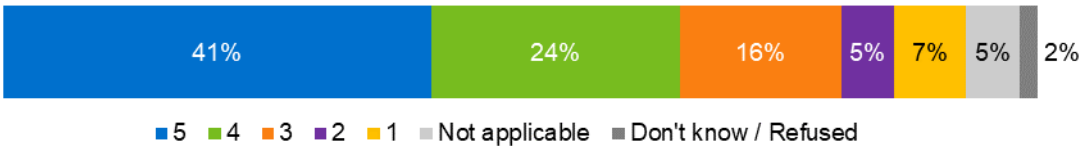


*Counts displayed rather than percentage due to small n.

5.3.5 IESO Communications

Respondents were asked to rate their satisfaction with Retrofit-specific IESO communications on a scale from one (1) to five (5), where one indicates "not at all satisfied" and five indicates "extremely satisfied" (Figure 5.27). More than two-fifths (41%) were completely satisfied, and another one in four (24%) rated their satisfaction as a four. Only one in eight (12%) gave a rating of one or two. These respondents mainly suggested improving the quality and consistency of technical advice (2 respondents).

Figure 5.27 | Assessment of IESO Communications (n=58)
(Rating on a scale from 1 to 5)



5.3.6 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. Nearly two of every five respondents (41%) said it had halted their company's operations, though not necessarily permanently (Table 5.6). This was almost twice the number who reported severe drops in sales (21%). It was also more than twice the number who had reduced staff (15%), adapted their safety and maintenance practices (13%), or slowed operations (13%) to some extent.

Table 5.6 | Impacts to Business Operations of COVID-19
(Open end and multiple response allowed; n=39)*

Impacts	%
Halted operations	41%
Slowed sales severely	21%
Reduced staff	15%
Adapted maintenance practices	13%
Slowed operations	13%
Little to none	8%
Remote work	8%
Increased sales	3%
Reduced income	3%
Slow reopening	3%
Slowed sales	3%

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

6. Retrofit Job Impacts

This section presents the job impact analysis results, which are summarized in Table 6.1. As the two right columns indicate, the analysis estimated that the 2019 Retrofit program would create 151 total jobs in Canada, with 136 of the jobs being created in Ontario. Of the 151 estimated total jobs, 79 are direct jobs, 36 are indirect jobs, and 35 are induced. In terms of Full Time Equivalents (FTE), the numbers are slightly less, with 111 FTEs created in Ontario and 122 FTEs created nation-wide. Of these 122 FTEs, 68 fall under the direct category, while the indirect and induced categories account for 27 FTEs each. In total, the Retrofit program created 29.3 jobs per million dollars of investment (program budget).

Table 6.1| Summary of Total Job Impacts

Job Impact Type	Ontario FTE (person-years)	Nation-wide FTE (person-years)	Ontario Total Jobs (person-years)	Nation-wide Total Jobs (person-years)	Total Jobs per $1M Investment (person-years)
Direct	66	68	77	79	15.3
Indirect	23	27	29	36	7.0
Induced	22	27	30	35	6.8
Total[1]	**111**	**122**	**136**	**151**	**29.3**

[1]Columns may not add to totals due to rounding. Real values are rounded to the nearest whole number and the whole numbers do not sum exactly to the whole number total in every column

Section 6.1 details the values of the inputs used in the model runs. Section 6.2 presents the analysis results (including details of job impacts and assumptions) as well as responses to the Contractor survey related to job impacts.

6.1 Inputs

The Input-Output (IO) model was used to estimate the impacts of three economic shocks—one representing the demand for energy-efficient products and services from the Retrofit program, a second from the increased business reinvestment due to bill savings (and net of project funding), and a third from the residential portion of program funding. Table 6.2 below presents the demand shock's input values representing the products and services related to the Retrofit program. Each measure installed as part of the program was categorized according to the StatCan IO Supply and Use Product Classifications (SUPCs).

The first ten rows of Table 6.2 contain the categories corresponding to products, which were the measures installed in businesses, and the last row contains the services. Of the ten product categories, Heating and cooling equipment had the highest total cost at $1.2 million, and Lighting fixtures was second highest at $1.1 million. Each measure's cost was divided into labour and non-labour, as the IO Model required this distinction to determine direct impacts versus indirect. The labour costs were determined by examining a random sample of invoices from the program. Utilizing the 90/10 methodology for the full set of 245 projects would have required examining 54 invoices. The analysis used a sample size of 68 invoices to be conservative. Of the 68 invoices examined, 26 had specified the portion of the project cost for labour versus materials. The weighted average labour percentage for these projects was 34 percent. Thus, the demand shock for each SUPC was assumed to be 34 percent labour and 66 percent non-labour.

The single service category in Table 6.2, Office administrative services, included general overhead and administrative services associated with program delivery. The labour and non-labour amounts are not specified for this category, as the IO Model includes built-in assumptions.

Table 6.2| Summary of Input Values for Demand Shock

Job Impact Type	Non-Labour ($ Thousands)	Labour ($ Thousands)	Total Demand Shock ($ Thousands)
Heating and cooling equipment (except household refrigerators and freezers	802	413	1,215
Lighting fixtures	696	359	1,055
Electric light bulbs and tubes	637	328	966
Switchgear, switchboards, relays and industrial control apparatus	256	132	388
Pumps and compressors (except fluid power)	202	104	307
Shopping centers, plazas, malls, and stores	29	15	44
Industrial and commercial fans, blowers, and air purification equipment	22	11	33
Electric motors and generators	13	6	19
Measuring, control, and scientific instruments	9	5	14
Agricultural, lawn and garden machinery and equipment	1	1	2
Subtotal	**2,667**	**1,374**	**4,041**
Office administrative services	-	-	4,170
Total			**8,211**

The second shock modelled by the IO Model was the business reinvestment shock. This shock represented the amount that businesses would reinvest and thus inject back into the economy. The net amount that businesses have available to either reinvest, pay off debt, or distribute to owners/shareholders ($13.2 million) is comprised of the net electricity bill savings (NPV = $16.3 million), and the portion of Retrofit project costs not covered by incentives ($3.1 million). The portion of this $13.2 million to be reinvested was estimated using the surveys administered to participants as part of the Retrofit process evaluation. The surveys included several questions about what businesses would do with the money they saved on their electricity bills, as well as the type of business. Overall, respondents indicated that 73 percent of bill savings would be reinvested. The remaining savings would either be used to pay off debt or disbursed to owners/shareholders.

To properly model the business reinvestment shock effects, the IO Model required the reinvestment estimates by industry. Each industrial category has a production function in the model, and these functions were adjusted to account for the reinvestment shock. Table 6.3 presents the input values for the business reinvestment shock by industry. The total business expenditure shock was $9.6 million over 15 industries, as presented in the table.

Table 6.3| Summary of Input Values for Business Reinvestment Shock

Job Impact Type	Business Reinvestment Shock ($ Thousands)
Manufacturing	2,192
Retail trade	1,728
Non-profit institutions serving households	1,201
Educational services	632
Arts, entertainment and recreation	464
Finance, insurance, real estate, rental and leasing and holding companies	464
Other activities of the construction industry	464
Health care and social assistance	400
Other municipal government services	400
Other services (except public administration)	400
Transportation and warehousing	400
Accommodation and food services	232
Administrative and support, waste management and remediation services	232
Crop and animal production	232
Professional, scientific and technical services	169
Total	**9,611**

The third model input is the household expenditure shock.[20] This shock represents the incremental increase in electricity bills to the residential sector from funding the program. The assumption is that the IESO programs are funded by all customers in proportion to the overall electricity consumption. Thus, the residential funding portion was 35 percent of the $5.2M program budget, or $1.8M.

6.2 Results

The StatCan IO Model generated results based on the input values detailed in Section 6.1. Table 6.4 presents the results of the model run for the demand shock for products and services. This shock accounts for about two-thirds of job impacts. As the two right columns show, the model estimated that the demand shock would create 98 total jobs (measured in person-years) in Canada, of which 91 will be in Ontario. Of the 98 jobs, 53 were direct, 21 indirect and 24 induced. In terms of FTEs, the numbers are slightly lower. A total of 73 FTEs were estimated to be created in Ontario and 79 in total across Canada. Of those 79 FTEs, 45 were direct, 16 indirect and 18 induced. Direct job impacts were realized exclusively in Ontario, as presented in the table. As we move to indirect and induced jobs, impacts are dispersed outside of the province.

Table 6.4| Job Impacts from Demand Shock

Job Impact Type	Ontario FTE (person-years)	Nation-wide FTE (person-years)	Ontario Total Jobs (person-years)	Nation-wide Total Jobs (person-years)
Direct	45	45	53	53
Indirect	13	16	18	21
Induced	15	18	20	24
Total	**73**	**79**	**91**	**98**

Table 6.5 displays the results of the model run for the business reinvestment shock. Job impacts generated by business investments were equal to 28 direct FTEs and 22 direct jobs. Overall, business investments were responsible for 54 FTEs and 67 total jobs across Canada.

[20] The model is actually run with a normalized value of $1 million in extra household expenditures and the job results can be scaled by the actual demand shock.

Table 6.5| Job Impacts from Business Reinvestment Shock

Job Impact Type	Ontario FTE (person-years)	Nation-wide FTE (person-years)	Ontario Total Jobs (person-years)	Nation-wide Total Jobs (person-years)
Direct	26	28	21	22
Indirect	12	15	15	19
Induced	9	11	12	15
Total	**47**	**54**	**58**	**67**

The third shock was the reduction in household spending from the increase in electricity bills to fund the program. Table 6.6 presents the job impacts from the model run, representing the number of jobs attributed to reduced household spending. This amount could have been spent in other sectors of the economy but was instead spent on funding the Retrofit program. The model estimated a reduction of 11 FTEs and 14 total jobs across Canada due to the decreased household spending.

Table 6.6| Job Impacts from Residential Funding Shock

Job Impact Type	Ontario FTE (person-years)	Nation-wide FTE (person-years)	Ontario Total Jobs (person-years)	Nation-wide Total Jobs (person-years)
Direct	-5	-5	-7	-7
Indirect	-2	-4	-4	-4
Induced	-2	-2	-2	-4
Total	**-9**	**-11**	**-13**	**-14**

Other factors included in the research questions were the impact of program funding on the non-residential sector and the impact of reduced electricity consumption. The StatCan IO Model does not adjust production functions for all industries experiencing marginally higher electricity price changes. This portion of the shock is modelled by assuming that surplus would be reduced by the extra amount spent on electricity. The model captures energy bill increases from program funding as an impact on direct GDP (value-added) and not as a reduction in employment. The GDP impact is equivalent to the profit loss resulting from the increase in electricity bills from program funding.

The economic impact of the reduction of electricity production due to the increase in energy efficiency was another potential economic shock. Technically speaking, it can be estimated using StatCan Input-Output multipliers without running the model. However, the IO model is linear and not well suited to model small decreases in electricity production. Total electricity demand has been increasing over time and is projected to continue increasing. The relatively small decrease in overall consumption attributed to the Retrofit program savings slow the consumption growth rate over time. However, it would likely not result in job losses in the utility industry or upstream suppliers. The IO model's linearity indicates that it will provide estimates regardless of the size of the impact. Given the nature of electricity production, it is reasonable to conclude that the linear IO multiplier is not appropriate for estimating job impacts. This analysis assumes that job losses from decreased electricity production are negligible.

Table 6.7 presents the total estimated job impacts by type, calculated by combining the jobs estimated in Table 6.4, Table 6.5, and Table 6.6. Of the 79 estimated direct jobs, 77 were in Ontario. A slightly smaller proportion of the indirect and induced jobs were in Ontario. A total of 29 out of 36 indirect jobs and 30 out of 35 induced jobs were estimated to be created within the province. The FTE estimates were slightly lower overall than the total jobs, with 111 FTEs (of all types) created in Ontario and 122 FTEs added nationwide. All but two direct FTEs (66 of 68) were added in Ontario, with this number representing approximately 60% of the total FTEs added in Ontario and 55% of all FTEs created across Canada.

Table 6.7| Summary of Total Job Impacts

Job Impact Type	Ontario FTE (person-years)	Nation-wide FTE (person-years)	Ontario Total Jobs (person-years)	Nation-wide Total Jobs (person-years)	Total Jobs per $1M Investment (person-years)
Direct	66	68	77	79	15.3
Indirect	23	27	29	36	7.0
Induced	22	27	30	35	6.8
Total	**111**	**122**	**136**	**151**	**29.3**

Table 6.8 displays the job impacts in more detail, with jobs added by type and industry category. Industries are sorted from top to bottom by those with the most impacts to the least, with industries that showed no impacts not included in the table. The table shows that the industry with the largest job impacts was Administrative and support, waste management and remediation services. This category is large, non-specific, and reflects the need to hire individuals to fill a wide range of roles based on program needs (for example, office administration, call centre operations, program management, etc.). Retail trade and Non-residential building construction were the industries with the next most added jobs, each with 12 total jobs added.

Table 6.8| Job Impacts from Demand Shock

Job Impact Type	Ontario FTE (person-years)	Nation-wide FTE (person-years)	Ontario Total Jobs (person-years)	Nation-wide Total Jobs (person-years)
Administrative and support, waste management and remediation services	48	49	59	60
Retail Trade	8	9	11	12
Non-residential building construction	9	9	12	12
Professional, scientific and technical services	7	8	9	11
Manufacturing	6	9	7	9
Wholesale trade	7	8	7	8
Finance, insurance, real estate, rental, and leasing and holding companies	5	6	6	7
Transportation and warehousing	3	3	3	4
Accommodation and food services	2	3	3	4
Other services (except public administration)	2	2	3	3
Government education services	2	2	3	3
Information and cultural industries	2	2	2	3
Engineering construction	2	2	2	2
Residential building constructions	2	2	2	2
Repair construction	1	2	2	2
Health care and social assistance	1	1	1	2
Other federal government services	1	1	1	1
Other municipal government services	1	1	1	1
Arts, entertainment and recreation	0	1	1	1

Job Impact Type	Ontario FTE (person-years)	Nation-wide FTE (person-years)	Ontario Total Jobs (person-years)	Nation-wide Total Jobs (person-years)
Non-profit institutions serving households	0	1	1	1
Educational services	0	0	1	1
Crop and animal production	0	0	0	1
Total	**111**	**122**	**136**	**151**

7. Prescriptive Input Assumption Review

As part of the 2019 Retrofit program evaluation and in preparation for upcoming energy efficiency frameworks, a Prescriptive Input Assumption (PIA) review of non-lighting measures offered through the Retrofit program was completed. This review included the verification of the measure substantiation sheets provided by the IESO. A full review of the energy and demand savings assumed for a given measure, the equipment's effective useful life, and incremental costs was completed. Deemed savings, savings algorithms, and parameter inputs were referenced against all applicable, regional, and relevant secondary data sources, including Technical Reference Manuals from Pennsylvania, Wisconsin, Illinois, Vermont, and Maine.

The Results of this Prescriptive Input Assumption review will be reflected in the upcoming Measures and Assumptions List (MAL) update.

8. 8760 Load Shape Review

As part of the 2019 Retrofit program evaluation and in preparation for upcoming energy efficiency frameworks, a review entailing the end-use of specific load shapes referenced in the Measures and Assumptions List and applied in the Retrofit program cost-effectiveness tool was completed. This review included verifying load shapes provided by the IESO based on the end-use for a given measure. Load shapes were referenced against all applicable, regional, and relevant secondary data sources, including Commercial Load shapes available from the State of Illinois Commercial Load Shapes, EPRI Load Shape Library, and the California Database for Energy Efficiency Resources (DEER). The review consisted of inspecting each load shape for reasonability, comparing against similar load shapes in other jurisdictions, then either:

- Accept as is
- Recommend removing
- Modify existing load shape

The results of this 8760 load shape review will be reflected in the upcoming Measures and Assumptions List (MAL) update.

9. Findings and Recommendations

Finding 1: Participation in the prescriptive non-lighting track remains minimal

Based on the 2019 impact analysis, it was found that prescriptive non-lighting measures have a very low participation rate and, consequently, a lower percentage of overall net savings. The majority of savings are attributed to variable frequency drives (VFD), unitary air-conditioning (AC) and livestock waterers.

> **Recommendation 1:** Increase the promotion or incentive level, specifically for non-VFD measures, to improve non-lighting equipment uptake.

Finding 2: Deemed savings assumptions for many prescriptive lighting measures are conservative

Lighting baseline and retrofit equipment power draw were verified to be substantially lower than program assumed values. This was observed most commonly for:

- Omni-Directional A-shape Lamps per unit baseline power was 250% higher than reported (14W compared to 6W, n=5)
- Omni-Directional A-shape Lamps per unit retrofit power was 50% higher than reported (3W compared to 2W, n=5)
- LED Troffers per unit baseline power was 32% higher than reported (115W compared to 85W, n=12)
- LED Reflectors per unit baseline power was 36% lower than reported (41W compared to 64W, n=4)

> **Recommendation 2:** Review and adjust the base case and retrofit case wattage assumptions applied to these prescriptive measures. Updated savings assumptions may support a business case for increased incentive rates and result in greater uptake.

Finding 3: Deemed hours of use (HOU) assumptions for some prescriptive lighting measures are consistent higher than evaluated HOU.

Lighting hours of use (HOU) for the LED Tube Re-lamping and LED High Bays measures were verified to be higher than program assumed values. The 21% reduction in HOU for LED Re-lamps (2,969 compared to 3,759, n=9) and 16% reduction for LED High Bays (2,764 compared to 3,308, n=7) were major drivers of low realization rates for these measures.

> **Recommendation 3:** Review the HOU input assumptions applied to the LED Tube Re-lamping and LED High Bay measures to determine if they are consistent with lamp operation in the field.

Finding 4: Hours of use for a limited number of custom lighting projects exceeded the hours of use provided on their project application

Out of the 24 custom lighting projects evaluated, four (17%) contained lighting HOU higher than reported by the applicant.

> **Recommendation 4:** Applicants and Technical Reviewers should ensure an accurate HOU for the facility is being reported in the submitted worksheet. In facilities where the HOU varies in different parts of the building, multiple worksheets may be submitted to reflect an accurate HOU per each area.

Finding 5: Program free-ridership was moderately high in 2019 at 28.7%

The program's NTG was high in 2019 at 91.6%. FR was found to be moderately high at 28.7%. The program's SO of 20.3% helped offset the FR and led to the strong NTG. Nearly two-thirds (62%) of participants said they would not have completed an upgrade, would have postponed it, or would have completed a scaled-back version of it in the absence of the program. However, the remaining one-third (32%) would have done the same upgrade anyway, suggesting that there is still room for FR improvements in future program years.

> **Recommendation 5:** Maintain focus on minimizing FR. Key areas include (1) identifying and targeting customers who would not make upgrades without program support and (2) screening applications for customers who have not already started implementing measures.

Finding 6: Opportunities exist to improve the overall application process

The most common suggestions for improving the application process . They included werestreamlining the process by reducing the number of application steps or avoiding repetitive application steps (reported by 9 participants and 14 applicant representatives and contractors), clarifying what information is needed (reported by 5 participants, 14 applicant representatives and contractors), and minimizing the time needed to complete the application (reported by 6 participants).

> **Recommendation 6:** Identify ways to simplify the application process to improve the program experience for both the participants and those who support the program's delivery. Consider reducing the number of application steps, avoiding repetitive steps, clarifying information needs, and minimizing the time needed to complete the application process.

Finding 7: The new Application Portal presented challenges to some users

Close to one in four participants (22%) said they experienced challenges with the Retrofit Application Portal. Of the participants who experienced these challenges, more than one-half mentioned issues uploading documents and/or malfunctioning components of the website as the main issues. Common challenges mentioned by applicant representatives and contractors were difficulty registering customers and slow customer support.

> **Recommendation 7:** Continue to enhance the Application Portal and its customer support to meet its various users' needs as the program evolves.

Finding 8: A desire for additional training exists among applicant representatives and contractors

The most-requested training and education topics mentioned by applicant representatives and contractors were program and application rules (35%), program offerings (26%), marketing techniques (22%), and how to receive support when they or a customer are applying (17%).

> **Recommendation 8:** Offer additional training opportunities on topics that will provide the applicant representatives and contractors with the knowledge they need to effectively support the program.

Finding 9: Satisfaction with program communications is good, but room for improvement exists

Over three-fifths (65%) of participants were satisfied or completely satisfied with the Retrofit program communications they received from the IESO. However, only two-fifths of surveyed applicant representatives and contractors (44%) gave their communications with the IESO a positive rating, suggesting room to improve IESO's communications, especially with the applicant representatives and contractors. Common suggestions included improving the quality and consistency of technical advice and improving customer support timeliness.

> **Recommendation 9:** Improve the IESO communications with program participants and program partners to improve the quality and consistency of technical advice and customer support timeliness.

Finding 10: Additional cross-program promotion opportunities exist

Given that over one-half (51%) of respondents had not applied to any other energy-efficiency programs in 2019 besides the Retrofit program, opportunities exist to further promote the Save on Energy programs to Retrofit customers.

> **Recommendation 10:** Continue to identify cross-program promotion opportunities, which can be achieved through two means. Firstly, promoting other program opportunities to all participating Retrofit customers at both the start and end of the participation process. Secondly, ensuring that participating customers in particular segments, such as small businesses, are aware of the other program opportunities designed with their business segment in mind.

10. 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 presented in Equation 10.1 is defined as follows:

Equation 10.1| Net-to-gross Ratio

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

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

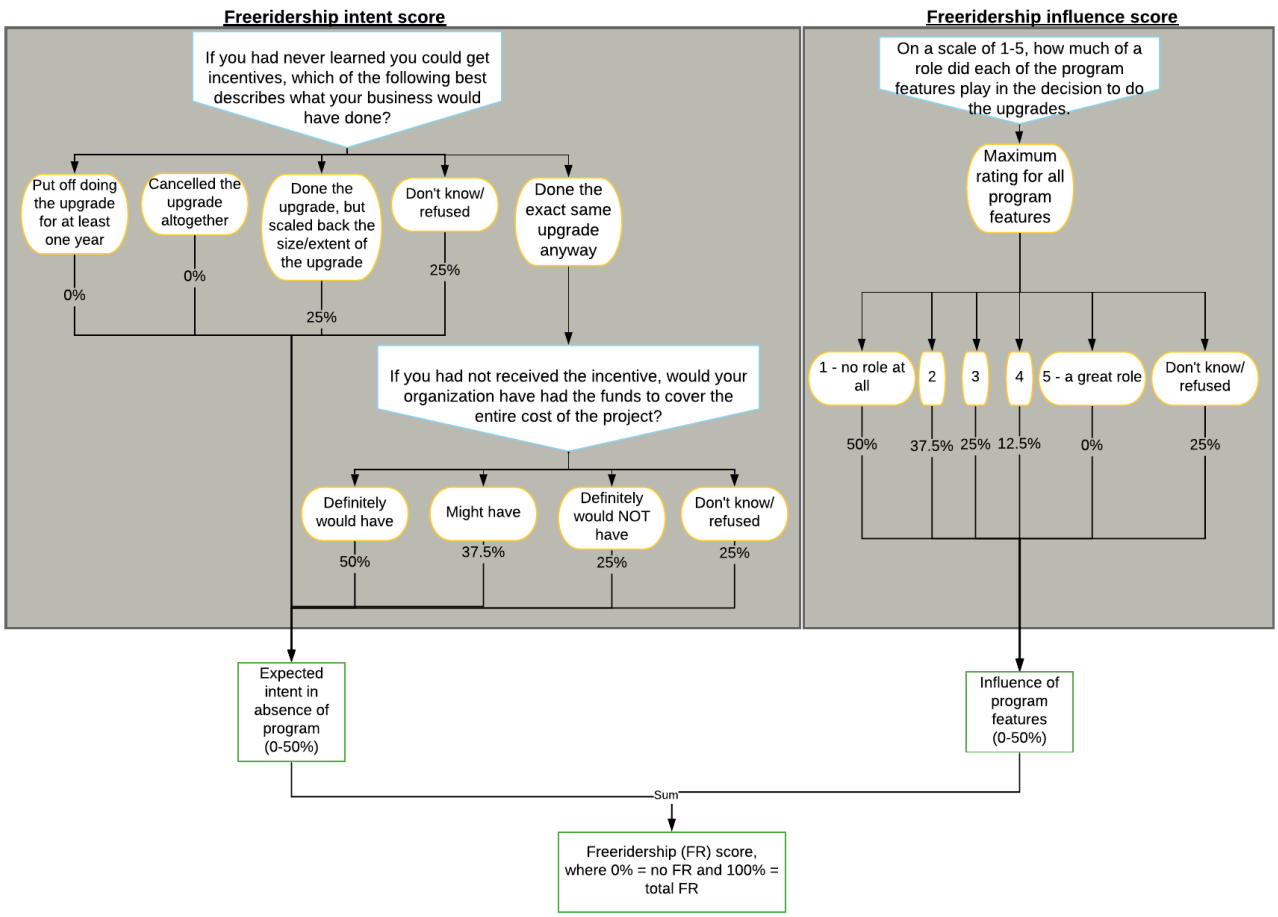
10.1 A.1 Free-ridership Methodology

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

- Intention of the expected behavior 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 10.1 illustrates the FR methodology.

Figure 10.1 | Free-ridership Methodology



Intention Component

The FR score's intention component asks participants how the evaluated project would have differeddifferent 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?

100. 1. Definitely would have

101. 2. Might have

102. 3. Definitely would NOT have

103. 99. Don't know

104. 98. Refused

Table 10.1 indicates the possible intention scores a respondent could have received depending on their responses to these two questions.

Table 10.1|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 providesprovided 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 of it) 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 incentives
- Information or recommendations provided by IESO staff (if applicable)
- The results of any audits or technical studies that were done (if applicable)
- Information or recommendations provided from contractors or vendors or suppliers associated with the program
- Information from Enbridge Gas
- Information from another government entity
- Marketing materials or information provided by the IESO about the program (email, direct mail, etc.)
- Information or resources from the IESO website
- Information or resources from social media
- Previous experience with any energy saving program
- Others (identified by the respondent)

Table 10.2 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 10.2|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 a 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.

10.2 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 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:

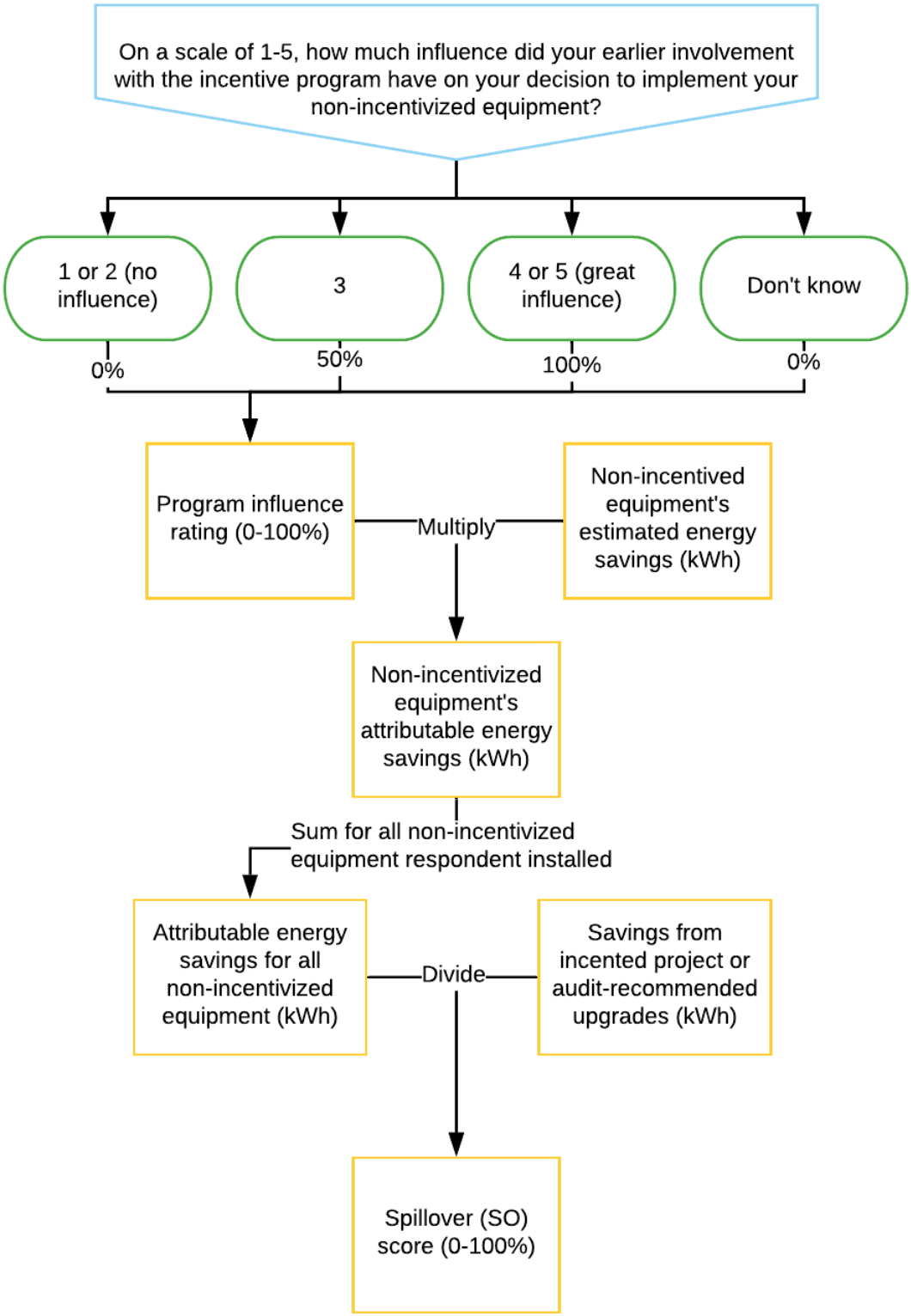
- Maximum rating of 1 or 2 (no influence) = 0%
- Maximum rating of 3 = 50%
- Maximum rating of 4 or 5 (great influence) = 100%
- Respondent does not know how much influence any factor had = 0%

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 10.2 illustrates the SO methodology.

Figure 10.2 | Spillover Methodology



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

Participants were asked to consider all their completed projects in 2019 through the particular program in question. This approach allowed for the respondent's NTG value across all the projects they completed in 2019 to be applied rather than just one.

10.4 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 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 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.

10.5 A.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 weblink to the appropriate contact to fill it out if they were not the appropriate contact to do so.

11. 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 IESO program staff, program delivery vendor staff, applicant representatives, contractors, and participants (Table 11.1). Data was collected using different methods, web surveys, telephone-based IDIs, depending on the most suitable for a particular respondent group. 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 IESO EM&V staff approved the survey instruments and interview guides. 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 11.1|Process Evaluation Primary Data Sources

Respondent Type	Methodology	Population	Completed	90% CI Error Margin
IESO Program Staff and Implementation Staff	Phone (IDIs)	5	5	0.0%
Program Delivery Vendor Staff	Phone IDIs	1	1	0.0%
Applicant Representatives and Contractors	Web Survey	89	29	n/a*
Participants	Web and Phone Survey	171	58[21]	8.9%

*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.

11.1 B.1 IESO Program Staff and Program Delivery Vendor Staff Interviews

IDIs were completed with five members from the IESO program staff and one member from the program delivery vendor staff (Table 11.2). The purpose of the interview was to better understand the IESO program staff's and the program delivery vendor staff's perspectives related to the program design and delivery.

[21] The Retrofit program NTG results are based on survey responses provided by 62 respondents. These respondents were a mix of *full* respondents (completed the entire survey) and *partial* respondents (completed a portion of the survey before dropping out). All 62 respondents fully answered the NTG questions, but some did not complete the remaining survey questions, which focused on process topics. Because of this, the Retrofit program process evaluation results include fewer respondents than the NTG results (for a total of 58).

Table 11.2|IESO Program Staff and Program Delivery Vendor Staff IDI Disposition

Disposition Report	IESO Program Staff	Program Delivery Vendor	Total
Completes	5	1	6
No Response	0	0	0
Unsubscribed	0	0	0
Partial Complete	0	0	0
Bad Contact Info (No Replacement Found)	0	0	0
Total Invited to Participate	**5**	**1**	6

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. Telephone IDIs were conducted with the IESO program staff and program delivery vendor staff using in-house staff (rather than through a survey lab). The interviews were completed between May 26 and June 5, 2020. Each interview took approximately 45 minutes to complete.

11.2 B.2 Applicant Representative and Contractor Survey

A total of 29 application representatives and contractors (23 completes; 3 partial completes) were surveyed from a sample of 89 unique companies (Table 11.3). The purpose of the survey was to better understand the applicant representative and contractors' perspectives related to program delivery.

Table 11.3|Applicant Representative and Contractor Survey Disposition

Disposition Report	Total
Completes	23
No Response	56
Unsubscribed	0
Partial Complete	3
Screened Out	5
Bad Contact Info (No Replacement Found)	2
Total Invited to Participate	**89**

The survey topics included firmographics, program roles and responsibilities, audits and/or projects completed, training and education, interactions with the Retrofit Application Portal as well as the application process overall, impacts of the shift to the Interim Framework on program delivery, impacts of the new incentive cap on project scope, and satisfaction with program-specific communications from IESO, how customers heard about the program, barriers to participation, program improvement suggestions, FR and SO, jobs impacts, and impacts of the COVID-19 crisis.

The sample was developed from the program records provided by the IESO EM&V 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 the NMR staff using Qualtrics survey software. Survey implementation was conducted between May 21 and June 18 of 2020. The survey took an average of 16 minutes to complete after removing outliers.[22] Weekly e-mail reminders were sent to non-responsive contacts through web survey fielding.

11.3 B.3 Participant Survey

A total of 58 participants were surveyed from a sample of 171 unique contacts (Table 11.4). The purpose of the survey was to better understand the participant perspectives related to program experience.

Table 11.4|Participant Survey Disposition

Disposition Report	Total
Completes	58
No Response	74
Unsubscribed	10
Partial Complete	11
Screened Out	15
Bad Contact Info (No Replacement Found)	3
Total Invited to Participate	**171**

The survey topics included firmographics, experiences with and improvement suggestions for the Retrofit Application Portal, impacts of the new incentive cap on project scope, and satisfaction with program-specific communications from IESO, FR, SO, rebound, job impacts, participation in other programs, and the impacts of the COVID-19 crisis.

The sample was developed from program records provided by the IESO EM&V 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 both over the phone and over the web in partnership with the Nexant survey lab using Qualtrics survey software. NMR staff worked closely with the Nexant survey lab to test the programming of the surveys and to perform quality checks on all data collected. The sTheurvey implementation was conducted between May 27 and June 26 of 2020. The survey took an average of 17 minutes to complete after removing outliers.[22] Weekly e-mail reminders were sent to non-responsive contacts through web survey fielding.

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

12. Appendix C Additional Net-to-gross Evaluation Results

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

12.1 C.1 Applicant Representative and Contractor NTG Results

This appendix provides a summary of the FR and SO results collected as part of the Retrofit applicant, representative and contractor survey. Given that only a small number of contractors responded to the survey, these results were not used to calculate the Retrofit program's NTG. Only the FR and SO results collected as part of the participant survey were used to calculate NTG.

Contractor FR. The applicant representative and contractor survey collected feedback from respondents to better understand contractors' perspectives on the extent of FR within the Retrofit program. Contractors were asked to estimate the percentage of various equipment types that would have been installed with the same efficiency level had there been no incentive available through the program. Five contractors responded to the questions in the survey.

Four of the five surveyed contractors stated that at least some of their projects would have installed the same equipment with the same efficiency level in the Retrofit program's absence. Two reported that between 10-15% of their projects would have done so. The other two reported one-fourth (24%) and nearly two-thirds (63%) of their projects would have done so.

Of those projects that would have installed the same equipment with the same efficiency level in the program's absence, all four contractors reported that equal amounts would have gone through prescriptive and custom tracks.

The contractors were asked to estimate the percentage of various equipment types that would have been installed with the same efficiency level had there been no incentive available through the program. One contractor stated 80% of their lighting would have been installed, another stated 20% of their lighting would have been installed, and another stated 50% of their lighting controls would have been installed. The fourth contractor did not know what percentage they would have installed if there had been no program incentive.

Contractor SO. To estimate SO, contractors were asked if they installed any energy-efficient equipment that did not receive incentives. One contractor stated that 25 of their projects had efficient equipment that would have been eligible to receive an incentive from the Retrofit program but did not. This respondent rated the program's influence on the decision to install that equipment as a four out of five on a scale from one (1) to five (5), where one indicates the program had "no influence at all" and five indicates the program was "extremely influential." The remaining surveyed contractors said they had no such projects.

12.2 C.2 Additional Participant NTG Results

This portion of the appendix provides additional detail regarding the NTG results for the Retrofit participants.

Figure 12.1 | Influence on Upgrade Decision Expanded Results (n=58)

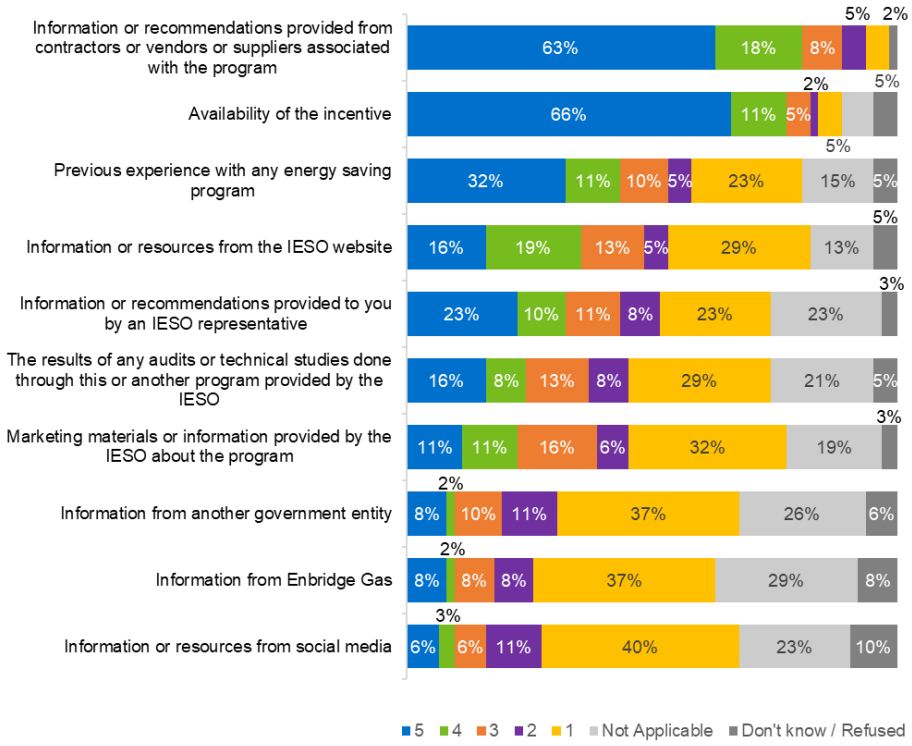


Table 12.1 | Reasons for Beginning Installations before Retrofit Program Application (n=10)

Reasons for Upgrade Timing	Respondents
Needed to stick to an internal schedule to complete upgrade	3
Difficulty submitting the application through the program application system	2
Needed to complete work for an unplanned replacement for recently failed existing equipment	2
Needed a quote before submitting application	1
The upgrade and application happened at the same time	1
Time or resource constraints at your company	1

Table 12.2 | Scaled Back Size or Extent of Upgrade in Absence of Program Incentives (n=18)

Scope Reduction	Respondents
A large amount	2
A moderate amount	12
A small amount	3
Don't know / Refused	1

Table 12.3|Availability of Funds in Absence of Program Incentives (n=18)

Availability of Funds	Respondents
Definitely would have	7
Might have	7
Definitely would not have	1
Don't know / Refused	3

Table 12.4|Program Influence on Equipment Installed Outside the Program (Multiple response allowed; n=11)

Equipment	5-Extremely Influential	4	3	2	1- Not at all Influential
Lighting - Controls	50%	50%	--	--	--
Motor/Pump Upgrade	50%	--	50%	--	--
HVAC - Air conditioner replacement, above code minimum	40%	--	40%	--	20%
Lighting	20%	20%	60%	--	--
Motor/Pump Drive Improvement	--	50%	--	50%	50%
Fan	--	--	50%	50%	--
ENERGY STAR Appliance	--	--	50%	--	50%
Other	--	--	--	100%	--

Table 12.5|Type of Lighting Installed (Multiple response allowed; n=5)

Spillover Lighting	Respondents
LED exterior	4
LED linear	4
LED screw base	1*

*Installed 500 11-20W bulbs

Table 12.6|LED Exterior Lighting Mount (n=4)

Location	Respondents	Equipment
Under canopy	2	104
Against building	2	110

Table 12.7|Quantity of LED Linear Lamps (n=4)

Respondents	Equipment	Max Installed
4	1428	1,174

Table 12.8|Lighting Controls and Lighting Type (Multiple response allowed; n=2)

Control Type	LED exterior	LED linear	LED screw base	Refused
Occupancy Sensor	1	1	1	1
Timer	0	0	0	0

Table 12.9|End Uses of Motor/Pump Upgrades (n=2)

End-use	Efficiency	Respondents	Equipment	Max Installed
Process	Premium	2	36	33

Table 12.10|Size of Motor/Pump Drive Improvements Installed (n=1)

Size	Respondents	Equipment
6 hp	1	6

Table 12.11|Size of Air Conditioners Installed (n=4)

Size	Respondents	Equipment
Less than 5.4 Tons (65,000 Btuh)	1	2
5.4-11.4 Tons (65,000-137,000 Btuh)	2	3
11.41-20 Tons (137,000-240,000 Btuh)	1	3

Table 12.12|Lighting Rebound Effects (n=47)

Rebound	Respondents	%	Average Increase in HOU	Average Decrease in HOU
Yes	1	2%	2	--
No	45	94%	--	--
Don't know / Refused	1	4%	--	--

Table 12.13|Thermostat Rebound Effects (n=3)

Rebound	Respondents	Average Summer Degrees Change	Average Winter Degrees Change
Yes	2	5	--
No	1	--	--

13. Appendix D Job Impacts Methodology

13.1 D.1 Developed Specific Research Questions

The first step in modelling the job impacts from the Retrofit program was determining which specific research questions (RQs) the model would answer. In a scenario without the program's existence, customers receive electricity from the IESO and pay for it via the monthly billing process. Implementing the Retrofit program introduces a set of economic supply and demand shocks to different economic sectors. The four research questions below illustrate these shocks:

1) **What are the job impacts from new demand for EE measures and related program delivery services?** Funds collected for the Retrofit program generate a demand for efficient equipment and appliances. They also generate demand for services related to program delivery, such as general overhead for program implementation and staffing. This demand creates jobs among firms that supply these products and services. Third party implementers collect funds from the IESO to cover a portion of the project cost, while the participant covers the remainder of costs.
2) **What are the job impacts from business reinvestments?** Once energy-efficient equipment is installed, the customers realize annual energy savings for the measure's useful life. Businesses can choose to use this money to pay off debt, disburse it to shareholders as dividends, or reinvest it in the business. This additional money and the decision to save or spend has implications for additional job creation. For instance, additional business spending on goods and services generates demand that can create jobs in other economic sectors.
3) **What are the job impacts from funding the EE program?** The IESO EE programs are funded via volumetric bill charges for all customers—both residential and non-residential. This additional charge can reduce the money that households have for savings and for spending on other goods and services, which results in a negative impact on jobs in the Canadian economy.
4) **What are the job impacts from reduced electricity production?** The energy efficient measures will allow businesses to receive the same benefit while using less electricity. The program as a whole will reduce the demand for electricity in the commercial sector. This reduced demand could have upstream impacts on the utility industry (for example, generation) and related industries, such as companies in the generator fuel supply chain.

13.2 D.2 Developed Model Inputs

The second step in modeling job impacts was to gather the data required for the StatCan IO model to answer each of the research questions. Model input data included the dollar values of the exogenous shocks from program implementation. The sources of data for each research question were as follows:

5) **Demand for EE measures and related program delivery services:** The StatCan IO Model divides the Canadian economy into 240 industry classifications and 500 SUPCs. Each measure installed as part of the program was classified into one of the SUPCs. The dollar value for each product-related demand shock was calculated using the project cost and measure savings data from the impact evaluation (see Section 6). Services that were part of the implementation process were also classified into SUPCs. These services were entirely program administrative services, the value of which was obtained from program budget actuals.

It was necessary to specify the amount of each demand shock attributed to labour versus non-labour. A representative sample of invoices for the product categories was used to estimate the average labour versus non-labour cost proportions. For the service categories, the IO model contained underlying estimates that defined the portion of labour versus overhead (non-labour).

6) **Business energy bill savings:** This value was calculated for the model as the net present value (NPV) of the discounted future stream of energy bill savings by participants. It was calculated by multiplying the net energy savings (in kWh) in each future year by that future year's retail rate ($/kWh). This calculation was performed for each future year through the end of the measure's expected useful life (EUL). Savings beyond the EUL were assumed to be zero. Project-level net energy savings were obtained using the impact evaluation results and already accounted for other calculation parameters (for example, discount rate, measure EULs, and retail rate forecast).

Customers' intentions for reinvesting, saving, or distributing to owners/shareholders the money saved on energy bills were obtained via a short section on the participant surveys, as follows:

J1. How do you anticipate your company will spend the money it saves on its electricity bill from the energy efficient equipment upgrade?

1. Pay as dividends to shareholders or otherwise distribute to owners
2. Retain as savings
3. Reinvest in the company (labor/additional hiring, materials, equipment, reduce losses, etc.)
4. Split – Reinvest and pay as dividends/retain as savings

96. Other, please specify:
98. Don't know
99. Refused

J2. Do you anticipate the distribution of these electricity bill savings to be treated differently than any other earnings?

1. Yes – More distributed to shareholders/owners
2. Yes – More to savings
3. Yes – More to reinvestment
4. No

98. Don't know
99. Refused

J3. Approximately what would be the split between distribution, retention, and reinvestment of money saved on electricity bills? [ALLOW MULTIPLE RESPONSE OPTION]

1. Percent distribute [NUMERIC RESPONSE BETWEEN 0 AND 100]
2. Percent save/retain earnings [NUMERIC RESPONSE BETWEEN 0 AND 100]
3. Percent reinvest [NUMERIC RESPONSE BETWEEN 0 AND 100]

For estimating job impacts, the key input value was the amount of bill savings that businesses would reinvest as opposed to paying down debt or redistributing to shareholders.

7) **Retrofit funding:** a volumetric charge on electricity bills funds the IESO EE programs, and, volumetrically, residential customers accounted for 35 percent of energy consumption and non-residential customers accounted for 65 percent in 2019. The overall program budget was distributed between these two customer classes by these percentages and used as input values for the analysis.
8) **Reduced electricity production:** The NPV of retail savings (estimated as part of RQ2) was also the input for examining the potential impact of producing less electricity.

13.3 D.3 Run Model and Interpret Results

Determining the Retrofit program's total job impacts required considering possible impacts from each of the four shocks represented by the research questions. Addressing the four research questions above required three runs of the StatCan IO model, as certain components of the shocks could be consolidated and others addressed without full runs of the model. The three shocks that were modelled were as follows:

9) Demand shock as outlined in RQ1, representing the impact of the demand for EE products and services due to the Retrofit program.
10) Business Reinvestment shock representing the net amount of additional spending that the commercial sector would undertake as described in RQ2. This was estimated by taking the NPV of energy bill savings and subtracting the amount of project costs covered by participants.
11) Household Expenditure shock representing the portion of household funds captured by increased bill charges and thus acts as a negative shock on the economy (RQ3). This was estimated by taking the portion of program funding paid for by increases to residential electricity bills.

The model output generated three types of job impact estimates:

Direct Impacts

Jobs created during the initial round of spending from the exogenous shocks. For the demand shock for EE products and services, direct impacts would be from adding employees to install measures and handling administrative duties. For the business reinvestment shock, direct impacts could be internal jobs created by businesses reinvesting savings back into the company. They could also be jobs created by businesses buying additional goods and services with energy bill savings.

Indirect Impacts

Job impacts due to inter-industry purchases as firms respond to the directly affected industries' new demands. These include jobs created up supply chains due to the EE program's demand – such as manufacturing goods or the supply of inputs.

Induced Impacts

Job impacts due to changes in the production of goods and services in response to consumer expenditures induced by households' incomes (wages) generated by the production of the direct and indirect requirements.

The IO model provides estimates for each type of job impact in the unit of *person-years*, or a job for one person for one year. It further distinguishes between two types of job impacts:

> **Total number of jobs:** This covers both employee jobs and self-employed jobs (including persons working in a family business without pay). The total number of jobs includes full-time, part-time, temporary jobs and self-employed jobs. It does not take into accounts the number of hours worked per employee.
>
> **Full-time Equivalent (FTE) number of jobs:** This includes only employee jobs converted to full-time equivalence based on the overall average full-time hours worked in either the business or government sectors.

Model run results are presented in terms of the above job impact types (direct, indirect, and induced) and also the type of job (total jobs vs. FTEs). These results—along with the model input shock values—are presented and discussed in Section 6.

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