Interim Framework London Hydro Strategic Energy Management PY2021 Evaluation Results

Submitted to IESO

in partnership with NMR Group

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Acronyms and Abbreviations

CDD	Cooling degree day
CDM-IS	Content data management information system
CE	Cost effectiveness
CUSUM	Cumulative summation, typically of model residuals
EM&V	Evaluation, measurement, and verification
EUL	Effective useful life
FR	Free-Ridership
GHG	Greenhouse gas
GW or GWh	Measurement of demand (GW) or energy (GWh) equivalent to 1,000,000,000 W or Whr
HDD	Heating degree day
HOU	Hours of use
HVAC	Heating, ventilation, and air conditioning
IDI	In-depth interview
IESO	Independent Electricity System Operator
IF	Interim framework
kW or kWh	Measurement of demand (kW) or energy (kWh) equivalent to 1,000 W or Whr
LDC	Local distribution company
LED	Light emitting diode
MW or MWh	Measurement of demand (MW) or energy (MWh) equivalent to 1,000,000 W or Whr
NRA	Non-routine adjustment, too account for NREs in regression models
NRE	Non-routine event, such as the impact of COVID-19 on facility operation
NTG	Net-to-gross
PY	Program year
SEM	Strategic energy management
SO	Spillover

1. Executive Summary

The Independent Electricity System Operator (IESO) retained Resource Innovations (formerly Nexant Inc.), and their sub-contractor NMR Group, Inc., to conduct an evaluation of the London Hydro Strategic Energy Management (SEM) local program as part of the 2021 Interim Framework (IF) evaluation cycle. This report provides an overview of the impact and process evaluation results, key findings and recommendations for projects reported between January 1st, 2020, and August 31st, 2021.

The London Hydro SEM local program was administered by London Hydro and included participation from additional neighboring LDCs. The program sought to provide SEM best practices to mid-size industrial energy consumers through incentives for low-cost energy saving measures, training sessions, and learner-directed coaching.

1.1. Evaluation Goals and Objectives

The following are the goals and objectives of the evaluation of the London Hydro SEM program:

- Conduct a sample of audits on completed projects to verify the installation of equipment and evaluate operating parameters through desk reviews and site visits;
- 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; and
- Conduct cost effectiveness analysis and estimate Greenhouse Gas (GHG) emissions reduction
- Provide recommendations on program improvements based on feedback obtained through the evaluations.

1.2. Impact Evaluation

An impact evaluation was performed to analyze the impact of the program and quantify the savings realized as an outcome of providing SEM training and implementing energy-efficiency projects. Twenty-six participants were enrolled in the program, of which twelve participants were able to demonstrate savings at program completion. The net verified impact results of the London Hydro SEM local program are presented in Table 1-1.

Table 1-1: Impact Results

Savings	Gross Reported Savings	Realization Rate	Gross Verified Savings	Net-to-Gross Ratio	Net Verified Savings	Net Verified Savings in 2022
Energy (MWh)	3,947.0	98.2%	3,875.7	102.0%	3,951.9	3,951.9
Summer Peak Demand (kW)	490.5	79.1%	387.9	100.0%	387.2	387.2

1.3. Process Evaluation

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, LDC program staff, program delivery vendor staff, and participants. For each respondent type, a customized interview guide or survey instrument was developed to ensure responses produced comparable data and allowed for the inference of meaningful conclusions. Table 1-2 presents the survey methodology, the total population invited to participate in the surveys or interviews, the total number of completed surveys or interviews, and the sampling error at the 90% confidence level for each respondent type. Additional detail regarding the process evaluation methodology can be found in Appendix C.

Table 1-2: Process Evaluation Primary Data Sources

Respondent Type	Methodology	Population	Full Completes	Partial Completes	Total Completes	90% CI Error Margin
IESO Program Staff	Phone In-depth Interviews (IDIs)	1	1	0	1	0%
LDC and Program Delivery Vendor Staff	Phone IDIs	1	1	0	1	0%
Participants	Web and Phone Survey	49*	6	1	7**	34.5%

*Please note that the total population of unique participating companies is equal to 12. However, for the purposes of the participant survey, the survey team reached out to multiple contacts associated with a unique participating company if the primary contact was not responsive to initial survey outreach attempts and if additional contact information was available.

**Please note that the total completes for the process evaluation (n=7) is greater than the total completes for the NTG evaluation (n=4) since the NTG survey questions were only asked of participants who had savings associated with their projects.

Key Findings and Recommendations

Finding 1. The information in the program population dataset was ambiguous, leading to high uncertainty in total program savings and in developing an evaluation approach. Reported energy and demand savings provided in the program population dataset was unclear. The dataset included savings for each measure that received an incentive through the London Hydro SEM program, as well as the total claimed program savings of each participant. Consultation with the implementer

determined that the total claimed program savings had already included the savings from measures that received an incentive. Project installation costs for measures that received an incentive were not included in the population dataset.

- **Recommendation 1a.** It is recommended that the IESO provide oversight to future SEM program offerings in a manner that is consistent with other IESO energy efficiency programs.
- **Recommendation 1b.** Report energy and demand savings for measures that received an incentive, as well as savings at each facility that are not attributable to measures that received an incentive, as separate items in the population dataset. This can be done by subtracting savings attributable to incentivized measures from total facility savings.
- **Recommendation 1c.** Include actual project cost data for all energy conservation measures at participating facilities, including those that did not receive an incentive.

Finding 2. Program name and application ID for measures that received an incentive from other IESO programs was not readily available. It is necessary to adjust London Hydro SEM savings for measures that received an incentive from other IESO programs, such as the Save On Energy Retrofit Program, in order to isolate the impact of the London Hydro SEM program. This proved difficult for the evaluation team as the program name and application ID of these measures was not readily available in some cases.

- **Recommendation 2.** Include the program name and application ID in the participant savings report packages for all projects that received an incentive and necessitated an adjustment to claimed program savings. This will allow the evaluation team to quickly verify necessary adjustments using CDMIS or other applicable program databases.

Finding 3. Reported demand savings did not consistently adhere to the IESO definition of peak demand savings. Approximately 13% of program reported demand savings were found to be attributable to measures that provide savings on evenings and weekends. The gross verified demand savings for these measures was determined by adjusting demand savings for coincidence with the IESO summer peak demand definition. The demand realization rate for these measures was found to be 0%.

- **Recommendation 3.** Report demand savings for measures that received an incentive as demand savings that are coincident with the IESO summer peak demand period definition.

Finding 4. Program free-ridership (FR) was very low in 2021, relative to other C&I programs, at 0.2%. The program's NTG was high at 102.0%, with a correspondingly low FR score at 0.2% and a relatively low Spillover (SO) at 2.2%. Three of four survey participants who responded to the NTG questions said they would have cancelled or postponed the upgrade or new energy management practice in the program's absence, and another did not know what they would have done. The low FR overall indicates the program is reaching the participants who would not have made upgrades without the program.

Finding 5. The COVID-19 pandemic necessitated flexibility in program delivery that proved to be beneficial. The SEM program shifted to a virtual delivery model and reallocated incentive and travel funds to workshops and one-on-one coaching. London Hydro and program delivery vendor staff agreed that some of the adaptions necessitated by the pandemic, especially those relating to virtual delivery, enhanced the program in many ways and would be worth continuing, at least to some degree, following the pandemic.

- Recommendation 4. Consider a hybrid model going forward where activities best suited for virtual are delivered virtually and those that would most benefit from in-person are delivered in person.

Finding 6. The most important aspects of the SEM program to participants were interactions with other program participants, use of digital tools, and one-on-one coaching. Five out of six participants assigned a rating of 4 or 5 to these features on a scale from 1 to 5, where 1 meant "not at all important" and 5 meant "extremely important." These three aspects were ranked more highly than cohort training workshops, executive roundtables, and rebates for low-cost hard-wired energy conservation measures.

- Recommendation 5. Continue one-on-one coaching and activities that encourage participants to interact with one another and use digital tools, such as cohort competitions and remote hunts for energy waste. Where resource constraints require prioritization, prioritize these activities over others.

2. Introduction

The London Hydro SEM Program was designed as pilot initiative that offered SEM best practices to the mid-sized industrial sector. Recruitment began in August 2019, and a kick-off workshop with participants was held in January 2020. The program concluded on October 31st, 2021.

The program consisted of educational workshops to deliver training on SEM principles, participant coaching and consulting, as well as incentives for low-cost energy conservation measures. Energy savings were the result of traditional conservation measures, as well as changes to facility practices as a results of SEM training.

2.1. Participation

Twelve facilities were enrolled in the pilot were able to demonstrate verifiable savings. These facilities represented a variety of mid-sized industrial facilities throughout the region. Participation and energy savings by facility type are shown in Figure 2-1 and Figure 2-2.

Figure 2-1: Participating Facilities by Industry Type

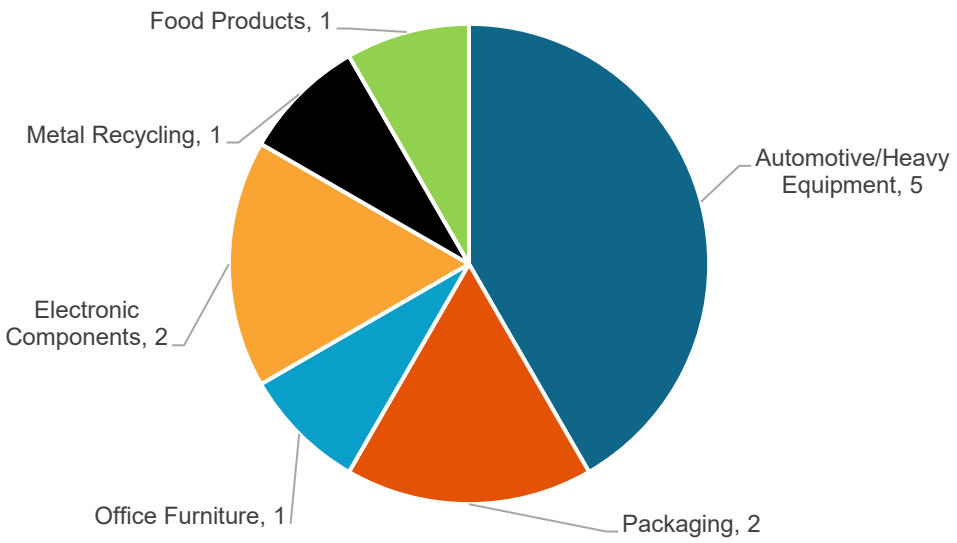
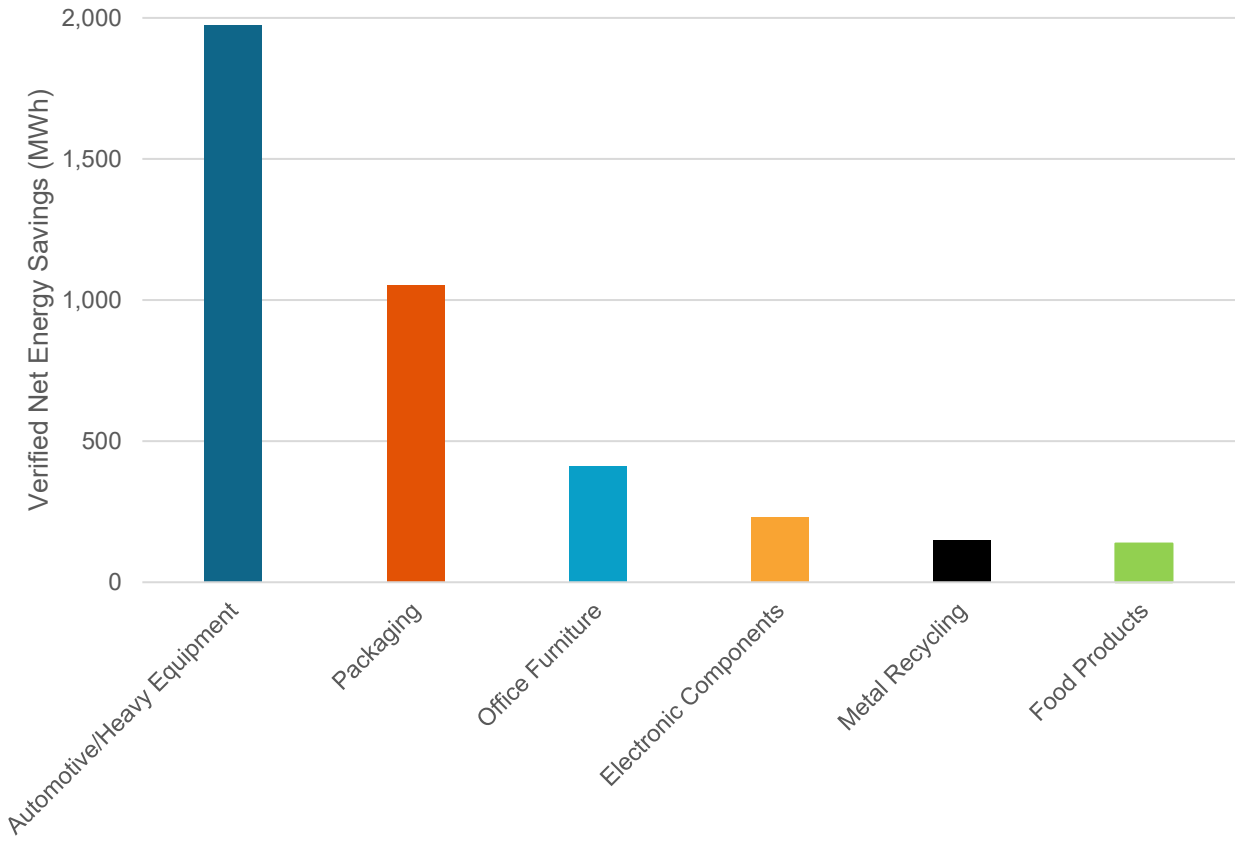
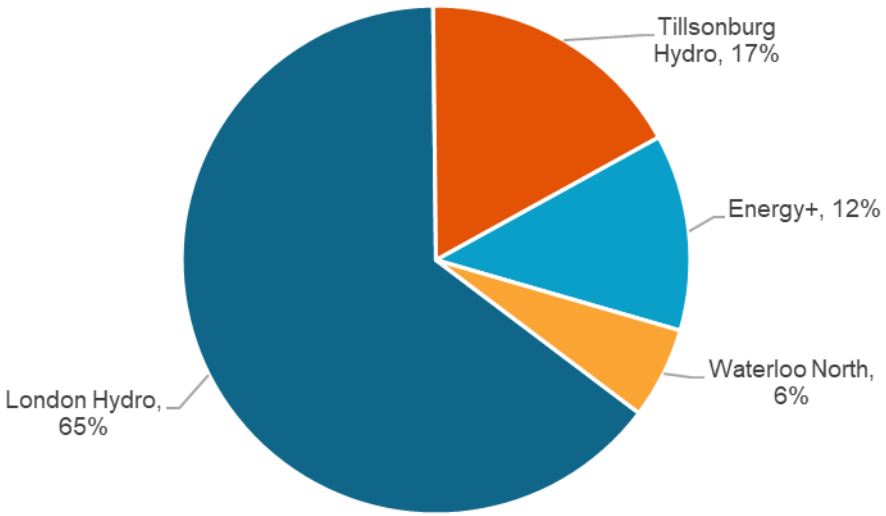


Figure 2-2: Net Verified Energy Savings by Industry Type



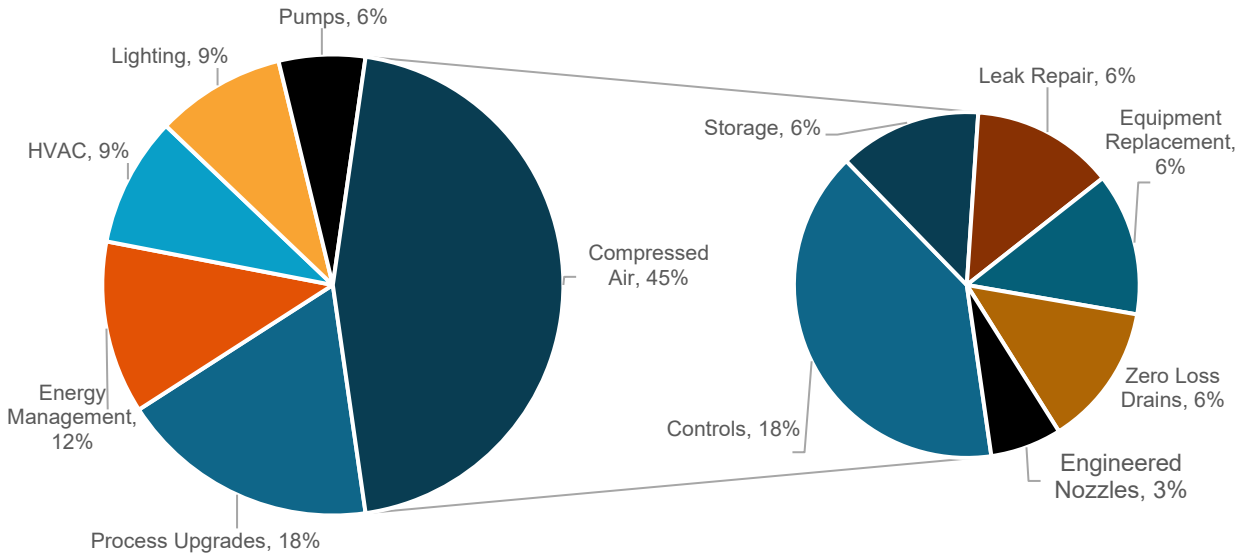
The majority of energy savings (65%) were due to participation by London Hydro customers, followed by Tillsonburg Hydro, Energy+, and Waterloo North customers. Figure 2-3 shows first year net verified energy savings contributions by LDC.

Figure 2-3: First-Year Net Energy Savings by LDC



Energy savings were the result of a variety of energy conservation measures reported by each participating facility. The majority (45%) of measures reported by participants were related to compressed air systems. Figure 2-4 shows a summary of the number of reported measures at participating facilities by measure category

Figure 2-4: Number of Measures by Measure Category

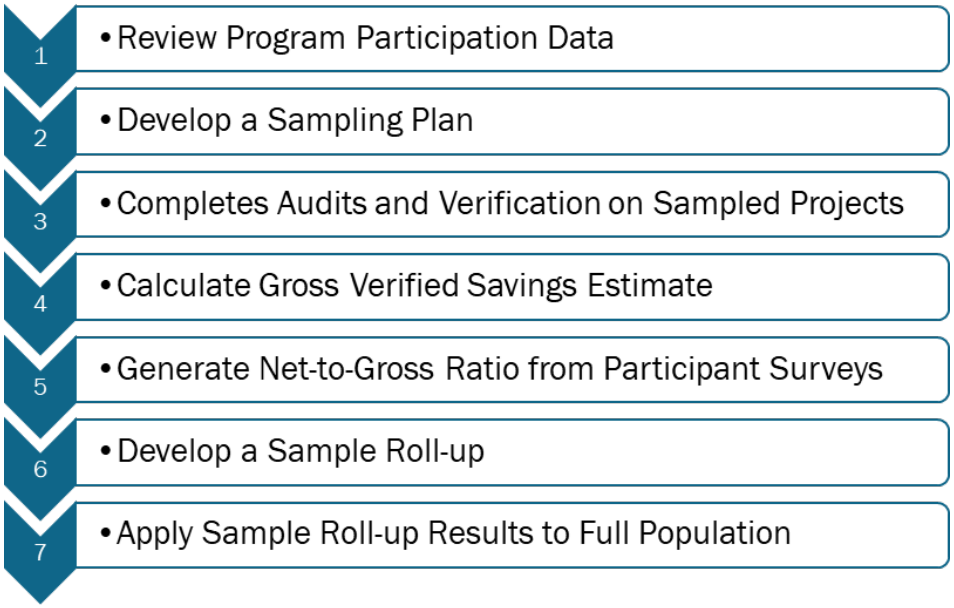


3. Impact Evaluation

3.1. Methodology

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

Figure 3-1: Impact Evaluation Methodology



3.2. Participation and Sampling

Program participation is defined as a company or facility that was enrolled in the London Hydro SEM program. Participation is applicable to both the impact and process evaluations, and the group of stakeholders targeted for data collection differs depending on the goal of the evaluation research task. Impact evaluation participation is determined by completed project, and samples were drawn using reported energy savings as the key variable. Thus, the impact evaluation analyzed gross verified savings for 9 of the 12 participants as part of the London Hydro SEM program, covering 95% of the reported energy savings, and the process evaluation covered the full 49 customers that began the program.

3.3. Impact Evaluation Results

The gross energy savings evaluation sought to verify savings to a confidence of 90% and a precision of 10%. The sampling approach and subsequent savings analysis achieved 7.5% precision at 90% confidence, with an overall realization rate of 98.2% gross and net verified energy impacts, realization rate, and precision, are shown in Table 3-1.

Table 3-1: Energy Savings Impacts

Reported Energy Savings (MWh)	Energy Realization Rate	Gross Verified Energy Savings (MWh)	Precision at 90% Confidence	Net-to-Gross Ratio	Net Verified Energy Savings (MWh)	Net Verified Energy Savings in 2022 (MWh)
3,947.0	98.2%	3,875.7	7.5%	102.0%	3,951.9	3,951.9

Summer peak demand savings achieved a 79.1% realization rate primarily due to some projects being assigned demand savings when not meeting the required peak definition. Gross and net verified impacts, realization rates, and precision, are shown in Table 3-2.

Table 3-2: Summer Peak Demand Impacts

Reported Summer Peak Demand Savings (MW)	Summer Peak Demand Realization Rate	Gross Verified Summer Peak Demand Savings (MW)	Precision at 90% Confidence	Net-to-Gross Ratio	Net Verified Summer Peak Demand Savings (MW)	Net Verified Summer Peak Demand Savings in 2022 (MW)
0.49	79.1%	0.39	12.5%	99.8%	0.39	0.39

Program savings are primarily determined through the use of pre-post regression models for each participating facility, as well as savings calculated through engineering methods for retrofits incented through the London Hydro SEM program. The use of a pre-post model captures savings attributable to all energy management activities at the facility. This includes savings from retrofits incented by the London Hydro SEM program, retrofits incented by other programs, retrofits that did not receive an incentive, and changes in energy consumption due to process and behavioral adjustments at each facility. Savings due to projects that received an incentive from another program were removed from the gross verified savings for each participant.

3.3.1. Impact Evaluation Findings

The London Hydro SEM program achieved an energy realization rate of 98% and a summer peak demand realization rate of 79%. Below is a summary of the most significant factors contributing to program realization rates. A detailed list of all factors affecting realization rates can be found in Section 3.4.1.

Energy realization rate is 98.2%

- The reported energy savings were largely justifiable for each unique participant.
  - The majority of energy realization rates were close to 100%, as seven of nine participants achieved a realization rate between 86.7% and 107.1%. However, two participants produced significant variance, as they achieved energy realization rates of 79.2% and 431.4%.

- The participant with the largest reported savings, which accounted for 27% of the program reported energy savings, achieved a 98% energy realization rate.

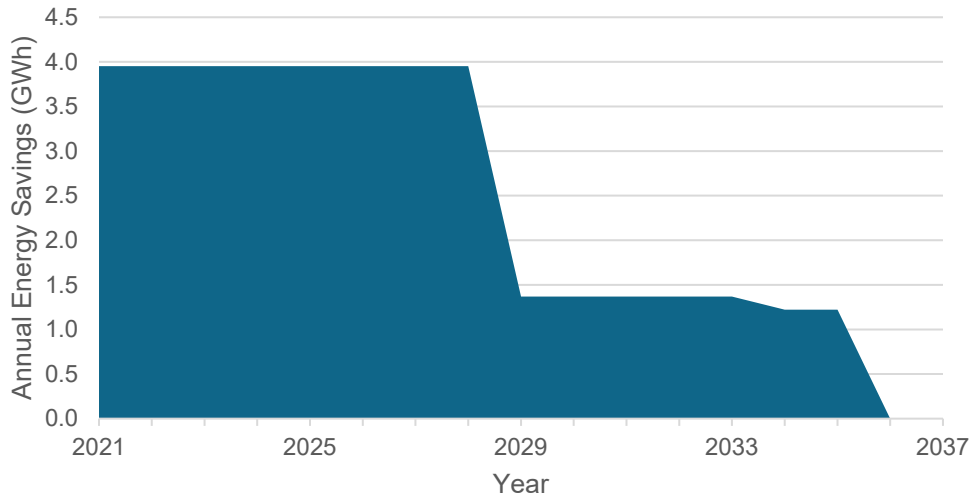
Summer peak demand realization rate is 79.1%

- The main driver of the summer peak demand realization rate are two participants that produced low summer peak demand realization rates. It was found that the savings for these two participants was primarily the result of the implementation of measures to reduce energy consumption on evenings and weekends. These projects accounted for 13% of the program reported summer peak demand savings.

The use of a pre-post regression approach creates some limitations in disaggregating savings. This analysis method captures all energy savings associated with a meter, regardless of the source of the savings. This makes it difficult to determine the portion of facility savings associated with each energy conservation measure, except in cases where measure savings were reported to an energy efficiency program. For example, savings associated with retrofits that received an incentive from the Save On Energy Retrofit Program can be accurately estimated with data available in CDMIS. Baseline and savings adjustments were performed to account for savings that were attributable to other energy efficiency programs.

The evaluation team considered the EUL of each known SEM measure at each participating facility. The minimum measure EUL at each facility was applied to the facility's net savings in order to produce a conservative estimate of program lifetime net savings. Given that all known measures have an EUL of eight years or greater, the annual verified energy and demand savings are projected to persist until the end of the framework accounting period (2022) as shown in Figure 3-2.

Figure 3-2: Annual Net Energy Savings



3.4. Project Level Impact Evaluation Findings

Figure 3-3 and Figure 3-4 show the net verified first year energy savings for each participant in the sample. The majority of program savings are attributable to four participants, as these facilities account for 79% of program net verified energy savings and 73% of program net verified summer peak demand savings.

Figure 3-3: Sample First-Year Net Energy Savings by Participant

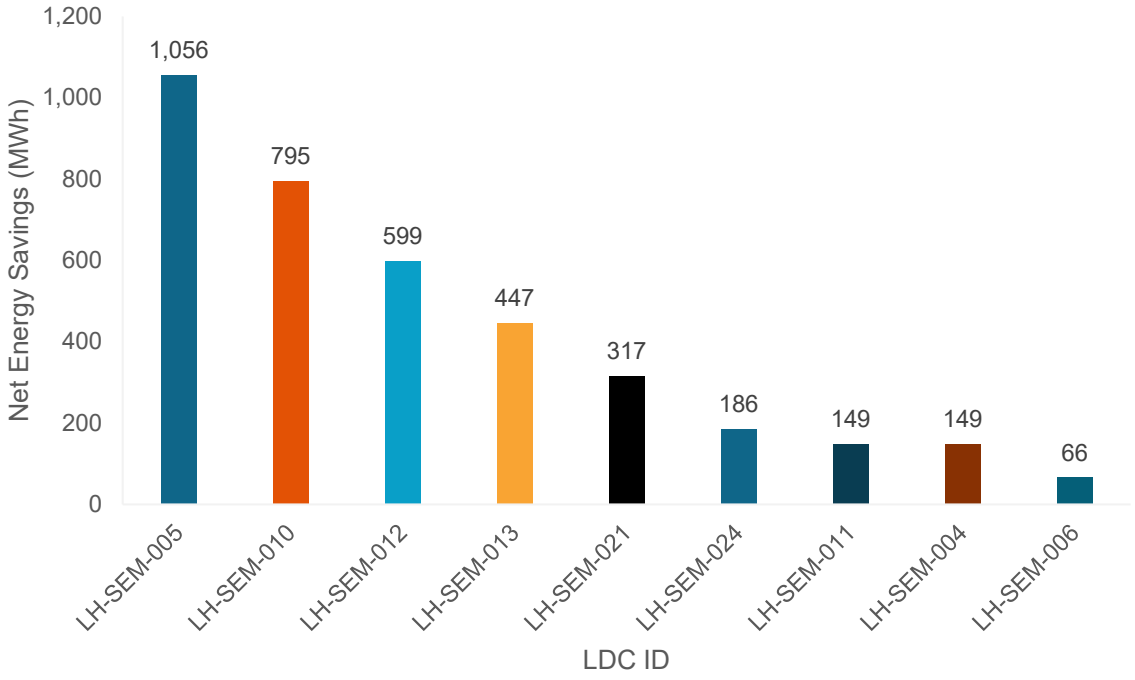
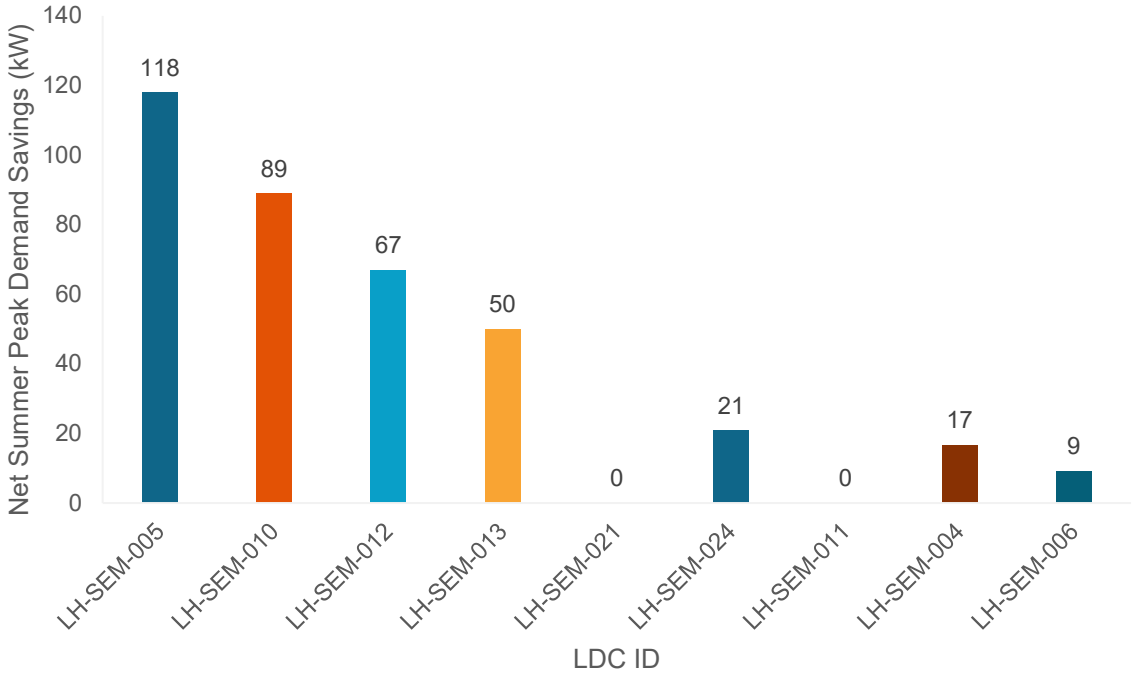


Figure 3-4: Sample First-Year Net Summer Peak Demand Savings by Participant



3.4.1. Realization Rates

Table 3-3 presents reported savings and realization rates for each participant in the sample.

Table 3-3: Sample Reported Savings and Realization Rates by Participant

LDC ID	Reported Energy Savings (MWh)	Energy Realization Rate	Reported Summer Peak Demand Savings (kW)	Summer Peak Demand Realization Rate
LH-SEM-005	1,054.6	98.2%	120.4	98.2%
LH-SEM-010	985.0	79.2%	112.4	79.2%
LH-SEM-012	677.4	86.7%	77.3	86.7%
LH-SEM-013	409.0	107.1%	46.7	107.0%
LH-SEM-024	210.0	86.9%	24.0	86.8%
LH-SEM-011	147.8	98.9%	56.9	0.0%
LH-SEM-004	137.0	106.4%	15.6	106.6%
LH-SEM-021	72.0	431.4%	8.2	0.0%
LH-SEM-006	65.0	99.7%	7.4	123.4%
Sample Total	**3,757.9**	**98.2%**	**468.9**	**79.1%**

There were several factors that caused realization rates to deviate from 100%. These factors, in order of significance, are:

- Reported Demand Savings Definition:
  - Capital measures that received an incentive frequently reported demand savings as the average demand savings when the equipment is operating. This does not match the IESO definition of peak demand savings, particularly in cases where savings are realized during evening or on weekends.
- Model Adjustments due to Save On Energy Retrofit Projects:
  - One reported savings model did not account for Save On Energy projects that took place during the baseline period.
  - One reported savings model adjusted for a portion of all Save On Energy Retrofit projects associated with the participant, including those that were not at the address of the participating facility. The gross verified savings models adjusted for the total Save On Energy Retrofit savings of projects at the facility address, and no adjustment for applications associated with non-participating addresses.
- Model Non-Routine Adjustments (NRAs) due to COVID-19:
  - One participant reported a facility shutdown and adjustments to facility HVAC controls due to COVID-19. This HVAC adjustment resulted in increased energy consumption at the facility. The reported savings model for this participant adjusted for COVID-19 impacts by comparing the reporting period average residuals before facility shutdown to the reporting period average residuals after the facility resumed operation. This method was not applied by the evaluation team as there are expected to be varying residuals for all data points within a modelling period. This can be seen when examining a CUSUM of baseline period residuals for a model. The evaluation team instead compared the residuals in the reporting period after COVID-19 adjustments were made to residuals in the baseline period one year prior. It is expected that this method effectively captures the impact of COVID-19 while minimizing the impact of variation in model residuals.
- Annual HOU for Program Incented Measures:
  - Engineered reported savings for incented capital measures frequently calculated annual HOU as weekly HOU multiplied by 52 weeks-per-year. This method neglects one day in each calendar year, which effects energy and demand savings calculations.
- Model Independent Variables:
  - For one participant in the sample, the evaluation team was unable to produce a reliable gross verified savings model utilizing the same independent variables specified in the reported savings model. The evaluation team investigated several sets of independent variables in order to produce a gross verified savings model that met acceptable regression criteria.
- Degree Day Reference Temperatures:
  - Gross verified savings models occasionally adjusted CDD and HDD reference temperatures, rather than maintain the reference temperature stipulated in the corresponding reported savings model. This was done to maintain consistent reference temperatures, except in cases where there was a physical justification for a particular reference temperature.

3.5. Net-to-Gross

Table 3-4 presents the results of the PY2021 SEM program Net-to-Gross (NTG) evaluation. The program achieved a weighted NTG ratio of 102.0% for energy and 99.8% for summer demand. The evaluation team targeted and achieved 90% confidence and 10% precision levels in the savings results.

Table 3-4: SEM Program Net-to-Gross Results

Unique Participants	NTG Responses	Savings Weighted Free-Ridership	Spillover – Energy	Spillover – Summer Demand	Weighted Net-to-Gross – Energy	Weighted Net-to-Gross – Summer Demand	Energy NTG Precision at 90% Confidence
12	4*	0.2%	2.2%	0.0%	102.0%	99.8%	± 1.6%

*Please note that the total completes for the NTG evaluation (n=4) is less than the total completes for the process evaluation (n=7) since the NTG survey questions were only asked of participants who had savings associated with their projects.

As seen in Table 3-4, participant feedback indicates low levels of FR at 0.2%. Three of the four respondents reporting energy savings from the SEM program said they would have cancelled or postponed the upgrade or new energy management practice in the program's absence, and another did not know what they would have done. All four respondents reporting energy savings through the program said the following program features were very influential in their decision to install equipment or implement new energy management practices: (1) SEM energy coaching geared to their company, (2) audit or technical study results from the program, and (3) previous experience with any energy saving program.

Participant feedback indicates relatively low levels of SO at 2.2%. Two of the four respondents reporting energy savings through the program also reported installing energy-efficient equipment for which they did not receive an incentive following their participation in the SEM program. These two participants said the SEM program was influential in their decision to install the additional equipment. Additional details regarding the NTG methodology can be found in Appendix B. Additional analyses performed to assist in the interpretation of these values can be found in Appendix D.1.

3.6. Cost Effectiveness

A cost effectiveness analysis was conducted using IESO CE Tool V7.1. The London Hydro SEM Program passed both the Total Resource Cost and Program Administrator Cost tests. The results of CE test are presented in Table 3-5.

Table 3-5: Cost Effectiveness Results

Cost Effectiveness Test	Parameter	Value
Total Resource Cost (TRC)	TRC Cost ($)	$1,109,141
	TRC Benefit ($)	$1,722,049
	TRC Net Benefit ($)	$612,909
	TRC Net Benefit (Ratio)	1.55
Program Administrator Cost (PAC)	PAC Cost ($)	$1,051,206
	PAC Benefit ($)	$1,497,434
	PAC Net Benefit ($)	$446,229
	PAC Net Benefit (Ratio)	1.42
Levelized Unit Energy Cost (LUEC)	$/kWh	$0.04
	$/kW	$352.34

3.6.1. Avoided Greenhouse Gas Emissions

The evaluation team used IESO CE TOOL V7.1 to estimate avoided GHG emissions attributable to the London Hydro SEM Program. Avoided GHG results are shown in Table 3-6.

Table 3-6: Avoided GHG Emissions

First Year GHG Avoided (Tonnes CO_2 Equivalent)			Lifetime GHG Avoided (Tonnes CO_2 Equivalent)		
Electric	Gas	Total	Electric	Gas	Total
452.7	0.0	452.7	6,214.1	0.0	6,214.1

4. Process Evaluation

A process evaluation was performed to better understand the design and delivery of the SEM program. IESO program staff, LDC program staff, program delivery vendor staff interviews, and participant surveys were utilized to gather primary data to support this evaluation. In the sections below, if the number of respondents to a question is under 20, counts are shown rather than percentages. The results should be considered as directional given the small number of respondents.

4.1. IESO Program Staff, LDC Program Staff, and Program Delivery Vendor Staff Perspectives

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

4.1.1. Key Findings

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

- The COVID-19 pandemic necessitated flexibility in program delivery and resource allocation (e.g., switching to a virtual delivery, reallocation of incentive funds to workshops and one-on-one coaching).
- London Hydro and the program delivery vendor collaborated effectively to recruit and retain many participating customers, despite the challenges presented by the pandemic.
- Both London Hydro and program delivery vendor staff agreed that some of the adaptions necessitated by the pandemic, especially those relating to virtual delivery, enhanced the program in many ways and would be worth continuing, at least to some degree, following the pandemic.
- The most significant barrier to SEM participation was that it often did not rank highest among customers' competing priorities, according to London Hydro staff.
- London Hydro and program delivery vendor staff suggested broadening the scope of the program to align with customers other priorities (such greenhouse gas reduction) to encourage additional participation.
- London Hydro staff also suggested seeking out ways to streamline the program to reduce the time and resources required to participate (e.g., building internal teams and assigning key roles early in the participation process to ensure staff buy-in).
- Both London Hydro and program delivery vendor staff stressed the importance of offering programs for longer durations to ensure customers have the time needed to institute changes.

4.1.2. Design and Delivery

The SEM program was delivered by one program delivery vendor to mid-size industrial customers. IESO program staff and London Hydro staff indicated they worked well with the vendor, which focused on engagement, recruitment, and training. IESO program staff thought the vendor had effective recruitment process, noting that it can be challenging to engage customers in energy management program models. Both IESO program staff and the program delivery vendor staff noted that London Hydro's strong relationship with its customers also encouraged trust in the program.

Program delivery vendor staff reported having an efficient and supportive relationship with IESO staff and emphasized the importance of open communication between all three entities (IESO, London Hydro, and program delivery staff). The vendor appreciated the support available from the IESO for program changes, extensions, and reporting needs.

The program was delivered through a cohort model which was composed of four key aspects: (1) group workshops, (2) one-on-one coaching, (3) internal team coaching, and (4) executive roundtables. The one-on-one coaching was tailored to the individual or the team. The executive roundtables involved interfacing with the organization at various levels to encourage working as a cohesive team. The COVID-19 pandemic compelled the program delivery vendor to prioritize activities and put aside those that were least valuable at the time. Suspending lower priority activities alleviated administrative burdens and delivery delays.

4.1.3. Outreach and Marketing

Due to the COVID-19 pandemic, the SEM program shifted from a largely in-person delivery approach to a virtual delivery model. Program delivery vendor staff said the virtual delivery helped with maintaining customer engagement during this time. For example, the virtual setting made it easier for participants to attend events since no travel was required. Additionally, meetings could be held on short notice and more often. London Hydro staff agreed that the virtual setting had advantages, including the ability to redistribute resources allocated to travel to other, more valuable aspects of the program given the ongoing pandemic. That said, London Hydro and program delivery vendor staff recommended resuming one- to two-thirds of the program to an in-person delivery post-pandemic. They believed that this would further program engagement and facilitate complex projects that need more hands-on attention.

4.1.4. Barriers and Opportunities

According to London Hydro staff, the most significant barrier to participant recruitment was that competing priorities demanded customers' time and resources. London Hydro staff suggested expanding the program to include some of these other priorities, such as greenhouse gas reduction; program delivery vendor staff echoed this suggestion. London Hydro staff also recommended streamlining the process to reduce the time and resources required to participate. One idea was to have customers build their teams early on, either at the beginning of the program or even prior to program launch, so they "can hit the ground

when they're able to join." Doing so could facilitate the process of assigning key roles (e.g., the Energy Champion, the Energy Team, the Executive Sponsor) and could help ensure staff buy-in across the company.

Both London Hydro staff and program delivery vendor staff noted the importance of programs being conscious of customer timelines to complete projects or institute operational changes. Offering programs for a longer duration could better meet customer needs.

Program delivery vendor staff discussed the pros and cons of the program incentives. They agreed that they were an effective sales tool in recruiting participants. However, they were not necessarily congruent with the core principle of SEM, which is behavioral and operational change. The incentives were for measures installed directly by the program delivery vendor, but relatively few measures were installed due to the COVID-19 pandemic. Underspent incentive funds were reallocated to workshops and one-on-one coaching. In general, program delivery vendor staff believed the flexibility in program delivery necessitated by the pandemic (such as reallocation of incentive funds) had improved the program and should be continued in the future where possible.

4.2. SEM Participant Perspectives

The following subsections highlight the feedback received from the participant survey.[1]

4.2.1. Key Findings

Key findings from participants' responses include the following:

- Most respondents' companies were manufacturing firms that owned their facilities. Most respondents had primary or shared responsibility for making operational improvements and/or budget or expenditure decisions pertaining to upgrades.
- All respondents participated in training subsidized by IESO or London Hydro. On average, respondents attended 5.3 training sessions.
- The most important aspects of the SEM program to respondents were interactions with other program participants, use of digital tools, and one-on-one coaching.
- One-half of the respondents felt the required weekly reporting of electricity data and baseline modeling was reasonable, while the other half found it took too much effort.
- Only two respondents offered recommendations for improving the SEM program, including assistance with generation and storage projects and sustainable energy models.

[1] Please note that seven out of 12 unique program participants answered the participant process survey questions. Additionally, one of the seven process survey participants dropped out part way through the survey and did not answer all the questions. The point at which this participant drops out of the survey is noted in Section 4.2.3.

- The most frequently mentioned impacts of the COVID-19 pandemic on respondents' businesses were workforce issues, supply chain delays or shortages, more remote work, and increased cleaning and safety measures.

4.2.2. Participant Characteristics

Most of the respondents' businesses were in manufacturing. Most respondents' companies owned their facilities, heated with gas, and cooled with central AC or air source heat pumps. Respondents' facilities were typically between 50,001 and 200,000 square feet. Figure D-8 and Figure D-9 in Appendix D.2 display characteristics of respondents' businesses.

Respondents' roles included engineering (three), administrative or managerial (three), and facility maintenance (one). Respondents had primary or shared responsibility for upgrades and/or operational improvement. Figure D-10 and Figure D-11 in Appendix D.2 display characteristics of respondents' roles and responsibilities.

Around one-half (three) of the respondents had applied to other Save On Energy programs in 2021: two had applied to the Retrofit Program and one had applied to the Process and Systems Upgrade program. All respondents were Enbridge Gas customers; however, only one had applied to any Enbridge Gas programs. This customer applied to (1) the fixed incentives for energy-efficient equipment and (2) the industrial studies and assessments programs.

4.2.3. Recommendations for Program Improvement

Respondents were asked to rate the importance of various SEM program aspects. The most highly rated program aspects were (1) interactions with other program participants, (2) use of digital tools, and (3) one-on-one coaching. Figure D-13 in Appendix D.2 displays the count of respondents who assigned a rating of 4 or 5 to the full range of program aspects.[2]

Respondents were also asked if they believed the SEM program's weekly reporting of electricity consumption data and baseline modeling was an effective method for verifying energy savings, or if they would suggest an alternative. One-half of the respondents (three) stated that the reporting requirement was reasonable and worked well for their company. The other half (three) said they found the reporting requirement took too much effort; however, none suggested an alternative.

Only two respondents offered recommendations for improving the SEM program. These included (1) providing assistance with generation and storage projects, and (2) incorporating sustainable energy models into the program.

[2] At this point in the survey, one respondent dropped out. Therefore, n=6 for this and subsequent questions.

4.2.4. COVID-19 and Health and Safety

Respondents reported that the COVID-19 crisis impacted their companies' operations in multiple ways in 2021. The most frequently mentioned impacts were workforce issues (such as layoffs or difficulty hiring), supply chain delays or shortages, more remote work, and increased cleaning and safety measures. Figure D-14 in Appendix D.2 displays the full range of impacts respondents reported.

Save on Energy representatives visited three respondents' facilities to perform site inspections or metering. These respondents reported that the representatives completely (two) or mostly (one) adhered to the relevant health and safety standards associated with the COVID-19 crisis.

5. Findings and Recommendations

Finding 1. The information in the program population dataset was ambiguous, leading to high uncertainty in total program savings and in developing an evaluation approach. Reported energy and demand savings provided in the program population dataset was unclear. The dataset included savings for each measure that received an incentive through the London Hydro SEM Program, as well as the total claimed program savings of each participant. Consultation with the implementer determined that the total claimed program savings included savings attributable to measures that received an incentive. Project installation costs for measures that received an incentive were not included in the population dataset.

- **Recommendation 1a.** It is recommended that the IESO provide oversight to future SEM program offerings in a manner that is consistent with other IESO energy efficiency programs.
- **Recommendation 1b.** Report energy and demand savings for measures that received an incentive, as well as savings at each facility that are not attributable to measures that received an incentive, as separate items in the population dataset. This can be done by subtracting savings attributable to incentivized measures from total facility savings.
- **Recommendation 1c.** Include actual project cost data for all energy conservation measures at participating facilities, including those that did not received an incentive.

Finding 2. Program name and application ID for measures that received an incentive from other IESO programs was not readily available. It is necessary to adjust London Hydro SEM savings for measures that received an incentive from other IESO programs, such as the Save On Energy Retrofit Program, in order to isolate the impact of the London Hydro SEM program. This proved difficult for the evaluation team as the program name and application ID of these measures was not readily available in some cases.

- **Recommendation 2.** Include the program name and application ID in the participant savings report packages for all projects that received an incentive and necessitated an adjustment to claimed program savings. This will allow the evaluation team to quickly verify necessary adjustments using CDMIS or other applicable program databases.

Finding 3. Reported demand savings did not consistently adhere to the IESO definition of peak demand savings. Approximately 13% of program reported demand savings were found to be attributable to measures that provide energy savings on evenings and weekends. The gross verified demand savings for these measures was determined by adjusting demand savings for coincidence with the IESO summer peak demand definition. The demand realization rate for these measures was found to be 0%.

- **Recommendation 3.** Report demand savings for measures that received an incentive as demand savings that are coincident with the IESO summer peak demand period definition.

Finding 4. Program free-ridership (FR) was very low in 2021, relative to other C&I programs, at 0.2%. The program's NTG was high at 102.0%, with a correspondingly low FR score at 0.2% and a relatively low SO at 2.2%. Three of four survey participants who responded to the NTG questions said they would have cancelled or postponed the upgrade or new energy management practice in the program's absence, and another did not know what they would have done. The low FR overall indicates the program is reaching the participants who would not have made upgrades without the program.

Finding 5. The COVID-19 pandemic necessitated flexibility in program delivery that proved to be beneficial. The SEM program shifted to a virtual delivery model and reallocated incentive and travel funds to workshops and one-on-one coaching. London Hydro and program delivery vendor staff agreed that some of the adaptions necessitated by the pandemic, especially those relating to virtual delivery, enhanced the program in many ways and would be worth continuing, at least to some degree, following the pandemic.

- **Recommendation 4.** Consider a hybrid model going forward where activities best suited for virtual are delivered virtually and those that would most benefit from in-person are delivered in person.

Finding 6. The most important aspects of the SEM program to participants were interactions with other program participants, use of digital tools, and one-on-one coaching. Five out of six participants assigned a rating of 4 or 5 to these features on a scale from 1 to 5, where 1 meant "not at all important" and 5 meant "extremely important." These three aspects were ranked more highly than cohort training workshops, executive roundtables, and rebates for low-cost hard-wired energy conservation measures.

- **Recommendation 5.** Continue one-on-one coaching and activities that encourage participants to interact with one another and use digital tools, such as cohort competitions and remote hunts for energy waste. Where resource constraints require prioritization, prioritize these activities over others.

Finding 7. SEM participation often did not rank highest among customers' competing priorities. The most significant barrier to SEM participation was that it often did not rank highest among customers' competing priorities, according to London Hydro staff.

- **Recommendation 6.** Consider broadening the scope of the program to align with customers other priorities to encourage additional participation. These could include assistance with greenhouse gas reduction, generation and storage projects, and sustainable energy models. Additionally, seek out ways to streamline the program to reduce the time and resources required to participate.

Appendix A Gross Verified Savings Methodology

The data collected during the project audit activities was used to calculate energy and summer peak demand savings for each facility in the sample. The sum of the sample gross verified energy and demand savings represents estimates of the savings due to participation in the London Hydro SEM program. Gross verified savings were determined through two methods, and all calculations were subject to quality control checks.

A.1 Pre-Post Regression Methodology

The primary method was the development of a pre-post regression model to determine energy savings at each facility. This was done by normalizing annual electricity consumption through a least squares method using a unique set of independent variables for each facility. The models were validated by calculating a set statistics to ensure that regression fit criteria were met. The regression criteria evaluated were:

- T-ratio and P-value: to determine correlation of each independent variable to model predicted energy consumption.
  - T-ratio > 2
  - P-value = Low
- Coefficient of Variation of Root Mean Square Error: Ratio of Root Mean Square Error to mean of electricity consumption. Calculated using both IPMVP and RETScreen methods.
  - CV(RMSE) < 15%
- Adjusted R^2: Regression fit statistic (R^2) adjusted for the number of independent variables in the model.
  - Adjusted R^2 > 75%
- Net Bias Determination Error: quantifies the tendency of the model to underestimate or overestimate savings.
  - NBDE < 0.005%
- Baseline Final CUSUM: the cumulative summation of model residuals during the baseline period.
  - Baseline Final CUSM = Low

Acceptable regression models were used to predict facility energy consumption in the absence of program participation. This was compared to the actual energy consumption of the facility in order to determine energy savings. The energy savings calculated through this method were then adjusted to account for energy conservation measures that were attributable to other programs, such as the Save On Energy Retrofit program.

A.2 Engineering Methodology

Engineering methods were used to determine gross verified savings for measures that received an incentive at a participating facility in cases where an acceptable pre-post

regression could not be created. These engineering methods aligned with the methods used to determine project-level savings in the evaluation of the Save On Energy Retrofit Program.

A.3 Realization Rate

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

Equation A-1: Realization Rate

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

Where:

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

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

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

Appendix B Detailed Net-to-Gross Methodology

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

An effective questionnaire was developed to assess FR and SO. The approach has been used successfully in many previous evaluations. The NTG ratio presented in Equation 5-2 is defined as follows:

Equation 5-2: Net-to-gross Ratio

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

Where FR is free-ridership and SO is spillover.

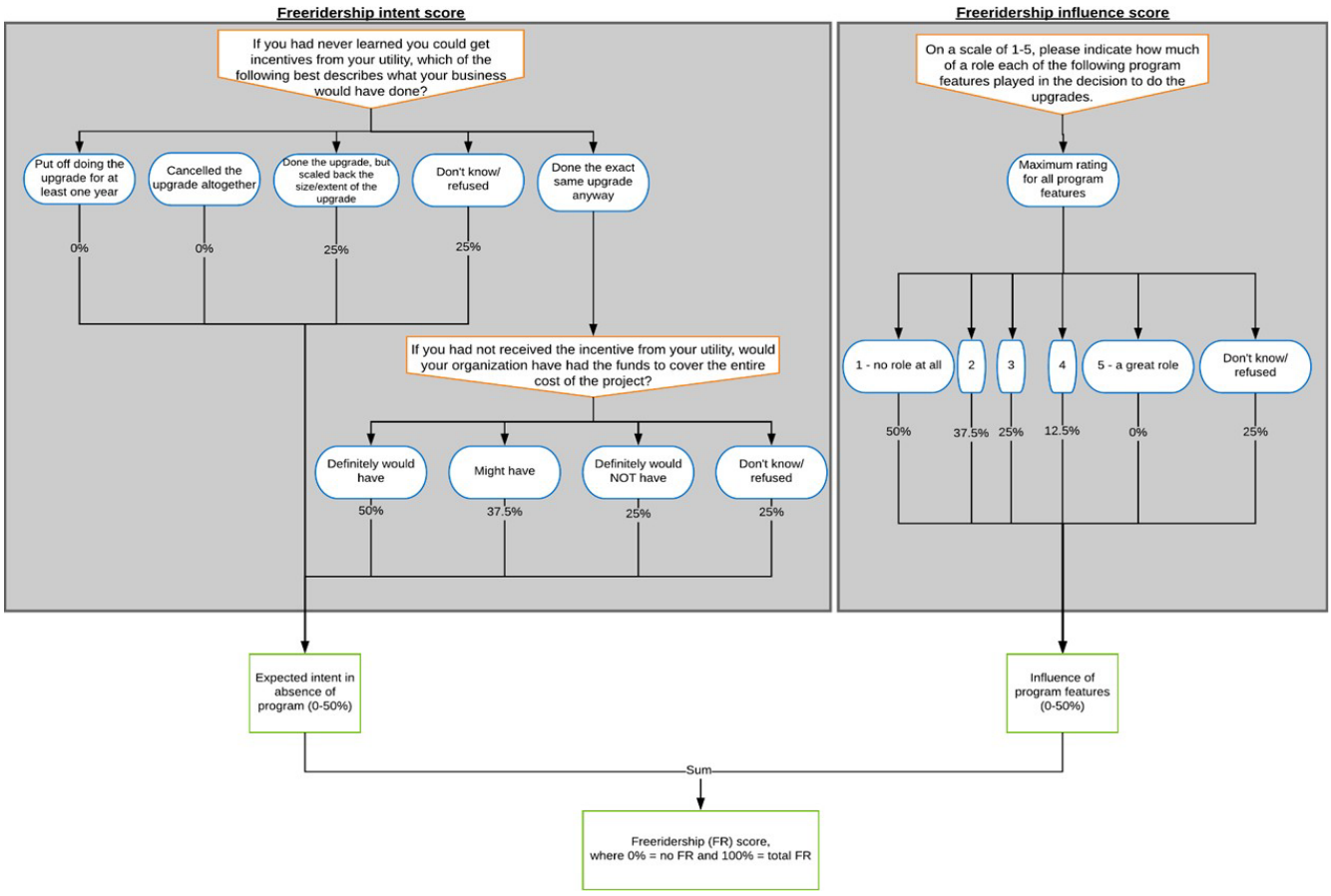
B.1 Free-Ridership Methodology

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

- Intention of the expected behaviour in the program's absence
- 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 B-1 illustrates the FR methodology.

Figure B 1: Free-ridership Methodology



Intention Component

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

> Question 1: If you had never learned you could get incentives from the Save on Energy SEM Program, which of the following best describes what your business would have done? Your business would have…
>
> 1. Put off doing the upgrade or implementing the new energy management practices were for at least one year
> 2. Cancelled the upgrade or the implementation of the new energy management practices altogether
> 3. Done the upgrade or implemented to new energy management practices but scaled back on the size, equipment efficiency, or scope of the upgrade or practices.
> 4. Done the exact same upgrade or implemented the same energy management practices anyway

98. Don't know
99. I'd rather not answer

[ASK ONLY IF RESPONSE TO QUESTION 1=4: Done the exact same upgrade anyway] Question 2: If you had not received the incentive from the Save on Energy SEM Program, would you say your company definitely would have, might have, or definitely would NOT have had the funds, internal or other, to cover the entire cost of the upgrade?

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

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

Table B-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 provides an answer of 1 or 2 (would postpone or cancel the upgrade), the respondent would receive an FR intention score of 0% (on a scale from 0% to 50%, where 0% is associated with no FR and 50% is associated with high FR). If a respondent answered 3 (would have done the project but scaled back the size or extent) 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 list form. As mentioned above, for each respondent, the evaluation team calculated an intention score, 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%

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%
- The 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 their 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 was "not at all influential" and 5 means it "was "extremely influential." The potential influence includes the following:

- Availability of the program incentive
- Energy coaching geared to my company provided by SEM

- Information or recommendations provided to you by an Save on Energy representative
- The results of any audits or technical studies done through this or another program provided by the IESO or London Hydro
- Information or recommendations provided from contractors, vendors, or suppliers associated with the program
- Information from Enbridge Gas
- Information from another government entity other than IESO
- Marketing materials or information provided by the IESO or London Hydro about the program (email, direct mail, etc.)
- Information or resources from the IESO or SEM website
- Information or resources from IESO social media
- Previous experience with any energy saving program
- Others (identified by the respondent)

Table B-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. 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 B-2: Key to Free-Ridership Influence Score

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

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

- Maximum rating of 1 (no influencing factor had a role in the decision to do the project) = 50%

- Maximum rating of 2 = 37.5%
- Maximum rating of 3 = 25%
- Maximum rating of 4 = 12.5%
- Maximum rating of 5 (at least one influence factor had a great role) = 0%
- Respondent does not know how much influence any factor had = 25%

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

B.2 Spillover Methodology

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

- ENERGY STAR Appliance: type and quantity
- Fan: type, size, quantity
- HVAC: air conditioner replacement, above code minimum: tonnage and quantity
- Lighting: type, quantity, wattage, hours of operation, location, and fixture length
- Lighting – controls: type of control, type and quantity of lights connected to control, hours of operation, and percentage of time the timer turns off lights
- Motor/Pump Upgrade: type, end-use, horsepower, and efficiency quantity
- Motor/Pump Drive Improvement (VSD and Sync Belt): type, end-use, horsepower, and quantity
- Others (identified by the respondent): description of the upgrade, size, quantity, hours of operation

For each equipment type, the respondent reports installing without a program incentive.

The survey instrument asks about the extent of influence that earlier involvement in the program had on the decision to carry out the upgrades. Influence is reported using a scale from one (1) to five (5), where one indicates it played no role at all and five indicates it played a great role. Suppose the influence score is between 3 and 5 for a particular equipment type. In that case, the survey instrument solicits details about the upgrades to estimate the quantity of energy savings that the upgrade produced.

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

- Maximum rating of 1 or 2 (no influence) = 0%

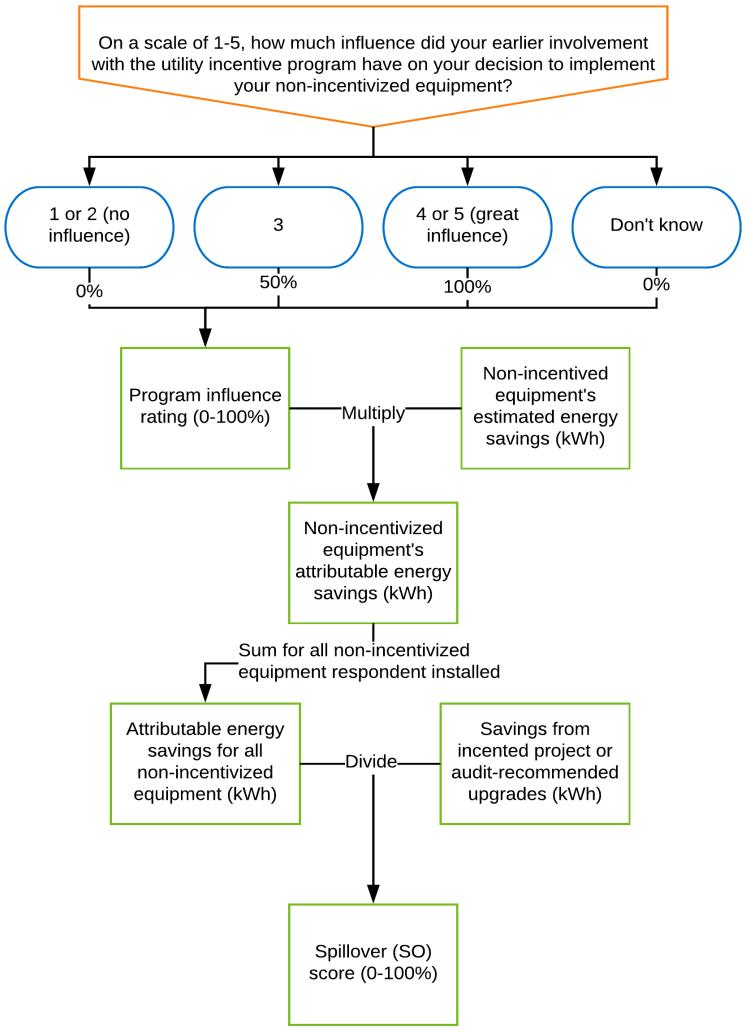
- Maximum rating of 3 = 50%
- Maximum rating of 4 or 5 (great influence) = 100%
- Respondent does not know how much influence any factor had = 0%

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

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

Figure B-2 illustrates the SO methodology.

Figure B 2: Spillover Methodology



B.3 Identification of Project or Upgrade for NTG Assessment

Participants were asked to consider all their completed projects in 2021 through the particular program in question. This approach allowed for the respondent's NTG value across all the projects they completed in 2021 to be applied rather than just one.

B.4 Other Survey Questions

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

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

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

B.5 Net-to-Gross Survey Implementation

The survey was implemented over the web and the 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 weblink if they had responded to the phone survey.

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

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

Appendix C Detailed Process Evaluation Methodology

This appendix provides additional detail about the process evaluation methodology. A summary of the methodology was provided in Section 4.

C.1 In-Depth Interview and Survey Methodology

The process evaluation collected primary data from key program actors, including the IESO program staff, LDC program staff, program delivery vendor staff, and participants (Table C-1). Data were collected using different methods including web surveys, telephone surveys, or telephone-based IDIs, depending on what was 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 C-1: Process Evaluation Primary Data Sources

Respondent Type	Methodology	Population	Full Completes	Partial Completes	Total Completes	Response Rate	90% CI Error Margin
IESO Program Staff	Phone In-depth Interviews (IDIs)	1	1	0	1	100%	0%
LDC Program Staff	Phone IDIs	1	1	0	1	100%	0%
Program Delivery Vendor Staff	Phone IDIs	1	1	0	1	100%	0%
Participants	Web and Phone Survey	49*	6	1	7**	12%	34.5%

*Please note that the total population of unique participating companies is equal to 12. However, for the purposes of the participant survey, the survey team reached out to multiple contacts associated with a unique participating company if the primary contact was not responsive to initial survey outreach attempts and if additional contact information was available.

**Please note that the total completes for the process evaluation (n=7) is greater than the total completes for the NTG evaluation (n=4) since the NTG survey questions were only asked of participants who had savings associated with their projects.

IESO, LDC and Program Delivery Vendor Staff Interviews

IDIs were completed with one member from the IESO program staff, one member from the LDC program staff, and one member from the program delivery vendor staff (Table C-2). The purpose of

the interview was to better understand the perspectives of the IESO program staff and the program delivery vendor staff related to the program design and delivery.

The interview topics covered included program roles and responsibilities, program design and delivery, marketing and outreach, applicant representative and contractor 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, LDC program staff, and program delivery vendor staff using in-house staff (rather than through a survey lab). The interviews were completed between May 10 to May 12 of 2022. Each interview took approximately one hour to complete.

Table C-2: IESO, LDC, and Program Delivery Vendor Staff IDI Disposition

Disposition Report	IESO Program Staff	LDC Program Staff	Program Delivery Vendor Staff	Total
Completes	1	1	1	3
No Response	0	0	0	0
Unsubscribed	0	0	0	0
Partial Complete	0	0	0	0
Bad Contact Info (No Replacement Found)	0	0	0	0
Total Invited to Participate	1	1	1	3

SEM Participant Survey

The purpose of the participant survey was to better understand the participant perspectives related to program experience. A total of six participants completed the survey from a sample of 49 unique contacts (Table C-3). In addition, one participant completed most (but not all) of the survey. This participant's feedback is included for the questions this participant answered.

The survey topics included FR and SO, energy management training path or certification, reasons for installing or not installing additional energy-efficient equipment upgrades, importance of program aspects, effectiveness of reporting requirements, program improvement recommendations, firmographics, and impacts of the COVID-19 pandemic.

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

The survey was delivered both over the phone and web in partnership with the Resource Innovations survey lab using Qualtrics survey software. NMR staff worked closely with the survey lab to test survey programming and perform quality checks on data collected.

The survey was implemented between April 12 and May 6 of 2022. It took an average of 21 minutes[3] to complete after removing outliers.[4] Weekly email reminders were sent to non-responsive contacts throughout web survey fielding.

Table C-3: Participant Survey Disposition

Disposition Report	Web	Phone	Total
Completes	5	1	6
Emails bounced	2	-	2
Bad Contact Info (No Replacement Found)	-	-	-
Unsubscribed	-	-	-
Partial Complete	4	-	4
Screened Out	-	2	2
Busy	-	2	2
Callback	-	3	3
Hard Refusal	-	1	1
No answer	-	7	7
No Eligible Respondent	-	3	3
Non-working #	-	2	2
Voicemail	-	53	53
Agreed to Complete Online	-	1	1
Wrong Number	-	-	-
No Response	21	-	21
Total Invited to Participate	32	75	107

[3] It took an average of 20 minutes to complete online and 26 minutes to complete over the phone.
[4] Note that the survey was designed to allow the respondent to come back to it at a later time to complete 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.

Appendix D Additional NTG and Process Results

This appendix provides additional results in support of the NTG and process evaluations.

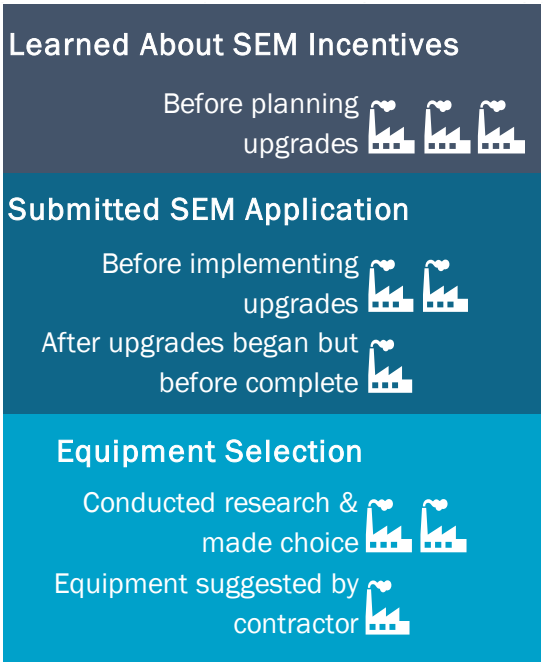
D.1 Additional Participant Net-to-Gross Results

This section includes detailed FR and SO results associated with the NTG for SEM participants.

Free-Ridership (FR)

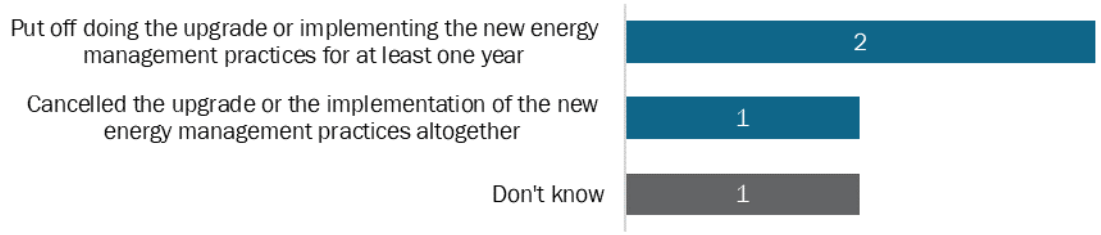
The extent of FR within the program was assessed by surveying SEM program participants to understand their experiences and plans before learning about the program, what they would have done in the program's absence, and how influential the program was on their decision to implement the energy-efficient upgrades. Seven program participants completed the survey, including four who reported energy savings (three from installing upgrades and/or new energy management practices and one from implementing new energy management practices only), and three who did not report any savings.

Respondents who installed upgrades through the SEM program (n=3) were asked about the timing of their decisions, actions, and choices. All three respondents learned about the SEM energy-efficiency incentives before they started planning for the upgrades. Additionally, two of the three respondents submitted the application before implementing the upgrades, while one respondent submitted the application after starting, but before completing the upgrade, in order to stick to an internal schedule. Finally, two of the three respondents conducted research and made their own choice of the equipment installed, while one installed the equipment suggested by their contractor. While responses to these questions did not directly impact the FR score, they provide context for understanding the participants' decision-making processes.



Respondents who reported energy savings from the SEM program (n=4) were asked what they would have done in the program's absence (Figure D-1). Two out of four respondents would have put off doing the upgrade or new energy management practices for at least one year. One respondent would have cancelled the upgrade or new energy management practices altogether, and another did not know what they would have done.

Figure D-1: Actions in the Absence of Program (n=4)*

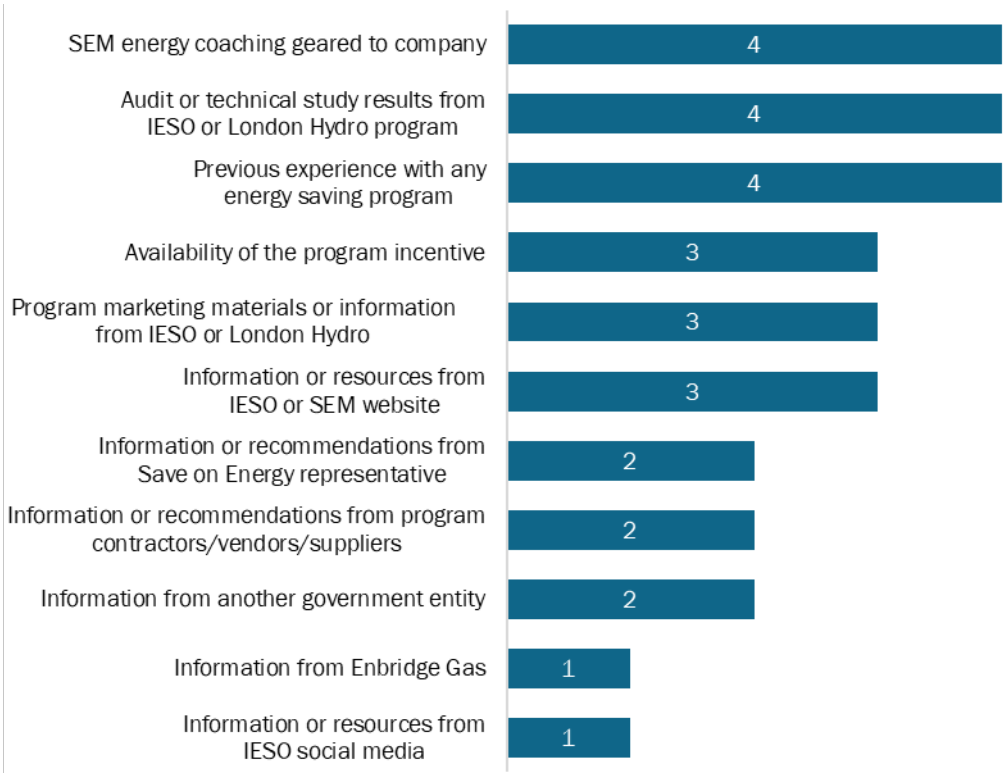


*Counts displayed rather than percentage due to small n.

Respondents who reported energy savings from the SEM program (n=4) were also asked how influential various SEM program features were on their company's decision to install energy-efficient upgrades and/or implement new energy management practices. They rated each feature's influence on a scale from one 1 to 5, where 1 meant "not at all influential" and 5 meant "extremely influential." Figure D-2 displays the count of respondents who assigned a rating of 4 or 5 for each feature. The most influential features were (1) SEM energy coaching geared to the company, (2) audit or technical study results from the program, and (3) previous experience with any energy saving program: all four respondents assigned a rating of 4 or 5 to these features. This question, which focuses on the program's influence, along with the prior question about customer intentions, was used to estimate the FR score.

Figure D-2: Influence of Program Features on Decision to Install Upgrades/Implement New Practices

(Rating of 4 or 5 on a scale from 1 to 5; n=4)*

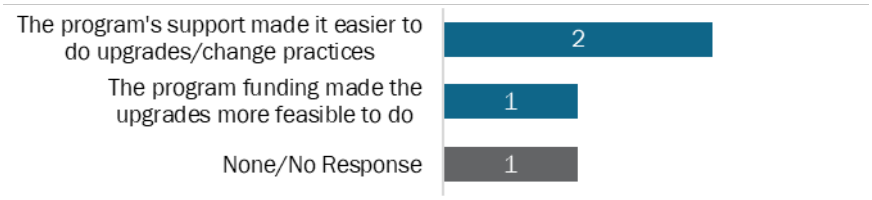


*Counts displayed rather than percentage due to small n.

Respondents who reported energy savings were then asked whether any other factors played "a great role" in influencing their company to install the energy-efficient equipment or institute new energy management practices at the time that they did. One respondent replied, "The coaches were great and really helped us implement our program with everything going on with COVID." Another respondent mentioned the importance of lowering their company's carbon footprint.

Respondents who reported energy savings were asked to explain in their own words what impact, if any, the financial support or technical assistance they received from the SEM program had on their decision to install the program incentivized equipment or institute the new practices at the time that they did. Figure D-3 shows that two of the four respondents said the program's support made it easier to do upgrades and/or change practices, one said the program funding made upgrades more feasible, and one provided no response.

Figure D-3: Program Impact on Decision to Install Equipment/Institute New Energy Management Practices (n=4)*

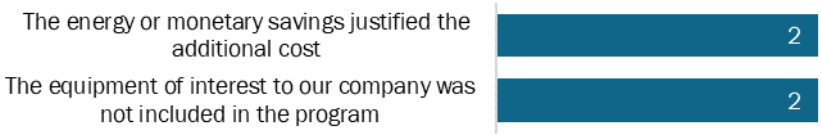


*Counts displayed rather than percentage due to small n.

Spillover (SO)

To estimate the SO rate, participants were asked if they installed any energy-efficient equipment or instituted any new management practices in 2021 for which they did not receive an incentive following their participation in the SEM program. Four of the seven respondents replied "yes," including two reporting savings and two reporting no savings. These four were asked (1) why their business installed this equipment without an incentive and (2) if a Save on Energy representative recommended additional energy-efficient upgrades during the program duration. Two respondents said the energy or monetary savings justified the additional cost, and two said the equipment of interest was not included in the program (Figure D-4). In addition, all four respondents said that "no," a Save on Energy representative had not recommended additional upgrades during the program duration.

Figure D-4: Reasons for Installing Upgrades without Incentives (n=4)*

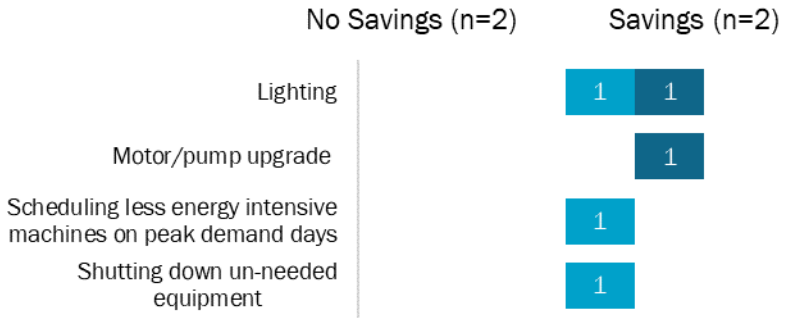


*Counts displayed rather than percentage due to small n.

Figure D-5 displays the types of non-incentivized equipment and energy management practices implemented by companies after the conclusion of their SEM project. Two respondents installed lighting equipment, one respondent made a motor/pump upgrade, and one respondent made two changes, including: (1) scheduling less energy intensive machines on days which could result in a peak day and (2) implementing audits in order to shut down un-needed equipment.

Figure D-5: Types of Upgrades Installed after Program Participation

(Multiple responses allowed; n=4)*



*Counts displayed rather than percentage due to small n.

These four respondents were then asked what level of influence their participation in the SEM program had on their decision to install the additional equipment or implement new practices. Participants rated the program's influence on a scale from 1 to 5, where 1 meant the program was "not at all influential" and 5 meant it was "extremely influential." Table D-1 displays the average rating for each type of equipment or energy management practice. Respondents indicated that the SEM program was very influential on their decisions to install energy-efficient lighting, schedule less energy intensive machines on peak demand days, and shut down un-needed equipment: the average rating for these measures was 4. In addition, the respondent who upgraded motors/pumps indicated the SEM program was somewhat influential, assigning a rating of 3. Respondents were asked for the equipment characteristics necessary to calculate energy savings (Table D-2). The team used this information to calculate an energy spillover rate of 2.2%. SO savings were primarily driven by the installation of 1,060 LED exterior bulbs and 500 linear or troffer LED fixtures.

Table D-1: Program Influence on Equipment Installed Outside the Program

(Multiple responses allowed; n=4)*

Type of Equipment Installed	Count of Respondents	Average Influence Score
Lighting	2	4
Motor/Pump Upgrade	1	3
Scheduling less energy intensive machines on peak demand days	1	4
Shutting down un-needed equipment	1	4

*Counts displayed rather than percentage due to small n.

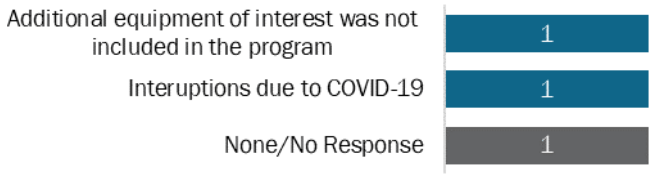
Table D-2: Spillover Measures – Additional Equipment and Energy Management Practices (n=4)

Type of Equipment Installed	Count of Respondents with Spillover Projects	Number Installed	Size or Type
LED exterior	2	1,060	1,000 Pole mount 60 Against building
LED linear or troffer	1	500	n/a
Motor/Pump Upgrade	1	1	Standard efficiency 1.1-5.0 hp
Shutting down un-needed equipment	1	n/a	n/a
Scheduling less energy intensive machines on peak demand days	1	n/a	n/a

*Counts displayed rather than percentage due to small n.

Respondents who did not install additional energy-efficient upgrades following their participation in the SEM program were asked why they did not do so (Figure D-6). One respondent said additional equipment of interest was not included in the program, one said it was due to interruptions caused by the COVID-19 pandemic, and the third did not provide a response.

Figure D-6: Reasons for not Installing Additional Energy-Efficient Equipment Upgrades (n=3)*



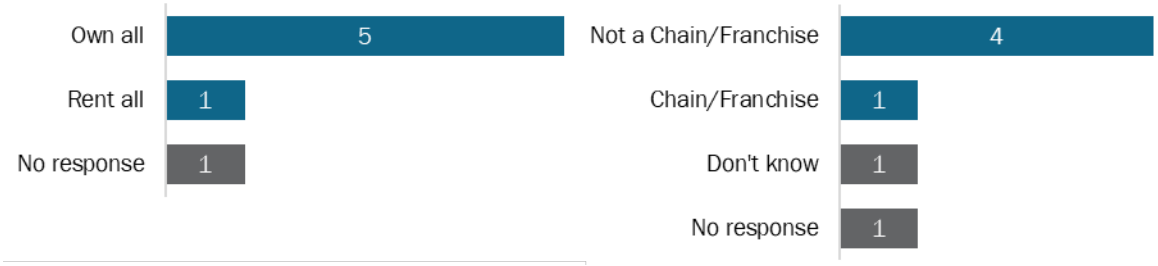
*Counts displayed rather than percentage due to small n.

D.2 Additional Participant Process Results

This section provides additional detail regarding the process evaluation results collected as part of the participant survey.

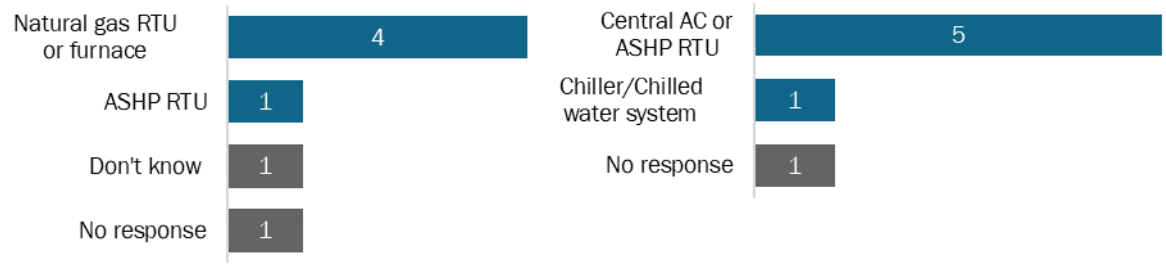
The majority of respondents' businesses (six) were in manufacturing, such as automotive, chemical, metal, machinery, and furniture manufacturing. Most respondents' companies (five) owned their facilities, and only one respondent's company was a chain or franchise (Figure D-7). Most respondents (four) heated their facilities with gas roof top units (RTUs) or furnaces, and most (five) cooled with central AC or air source heat pump (ASHP) RTUs (Figure D-8). Most respondents' (four) facilities were between 50,001 and 200,000 square feet (Figure D-9).

Figure D-7: Company and Facility Ownership (n=7)*



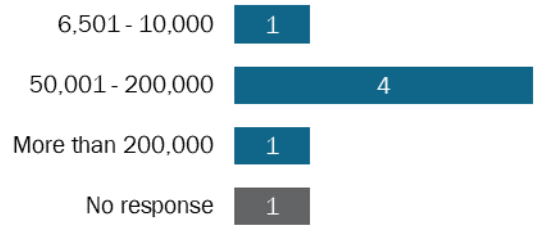
*Counts displayed rather than percentage due to small n.

Figure D-8: Heating and Cooling Systems (n=7)*



*Counts displayed rather than percentage due to small n.

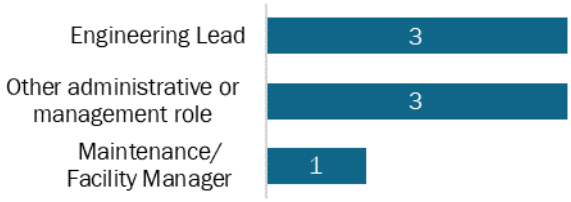
Figure D-9: Square Footage of Facilities (n=7)*



*Counts displayed rather than percentage due to small n.

Three respondents were engineering leads, three held an administrative or managerial role, and one was a maintenance/facility manager (Figure D-10).

Figure D-10: Respondent Title (n=7)*



*Counts displayed rather than percentage due to small n.

Figure D-11 displays respondents' responsibilities for actions taken by their company as part of the SEM program. Note that some respondents had multiple responsibilities. Three respondents shared responsibility for budget or expenditure decisions pertaining to upgrades, three had primary responsibility for operational improvements made, and two had shared responsibility for operational improvements made. Additionally, one respondent indicated that their company intended to make operational improvements in the next three years.

Figure D-11: Respondent Responsibilities

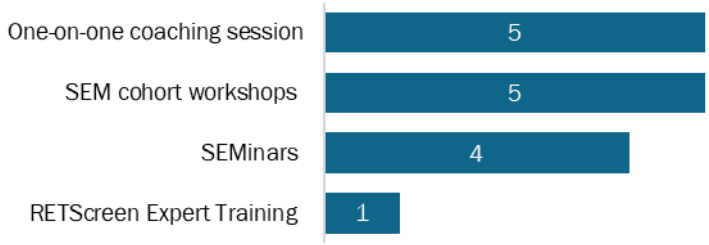
(Multiple responses allowed; n=7)*

*Counts displayed rather than percentage due to small n.

All seven respondents reported participating in training subsidized by IESO or London Hydro such as the training sessions offered as part of the SEM Program (Figure D-12). Five out of seven respondents participated in one-on-one coaching sessions with the program delivery vendor and/or SEM cohort workshops. Additionally, four respondents participated in SEMinars and one respondent completed RETScreen Expert Training. In total, the seven participants reported completing 37 trainings, for an average of 5.3 trainings per respondent.

Figure D-12: Types of Subsidized Training

(Multiple responses allowed; n=7)*



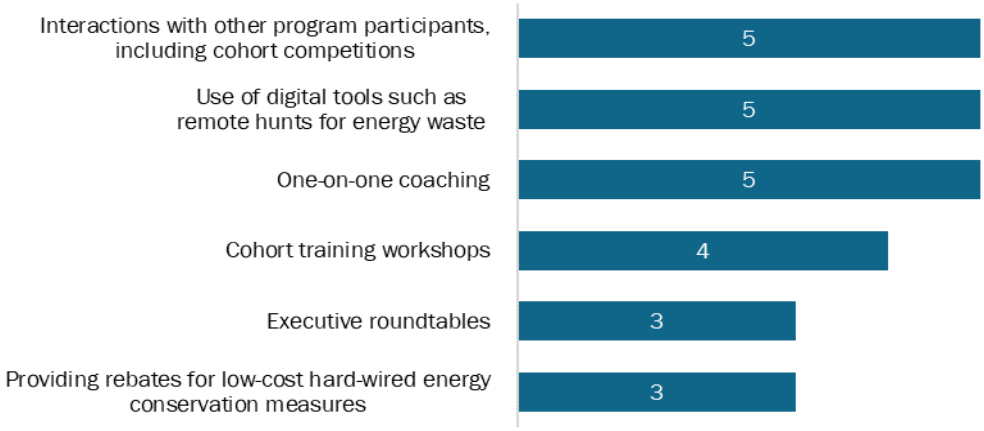
*Counts displayed rather than percentage due to small n.

Figure D-13 displays the count of respondents who assigned a rating of 4 or 5 to each program feature on a scale from 1 to 5, where 1 meant "not at all important" and 5 meant "extremely important."[5] Five out of six respondents assigned a rating of 4 or 5 to: (1) interactions with other program participants, (2) use of digital tools, and (3) one-on-one coaching.

[5] At this point in the survey, one respondent dropped out. Therefore, n=6 for this and subsequent questions.

Figure D-13: Importance of Save on Energy SEM Program Components

(Rating of 4 or 5 on a scale from 1 to 5; n=6)*

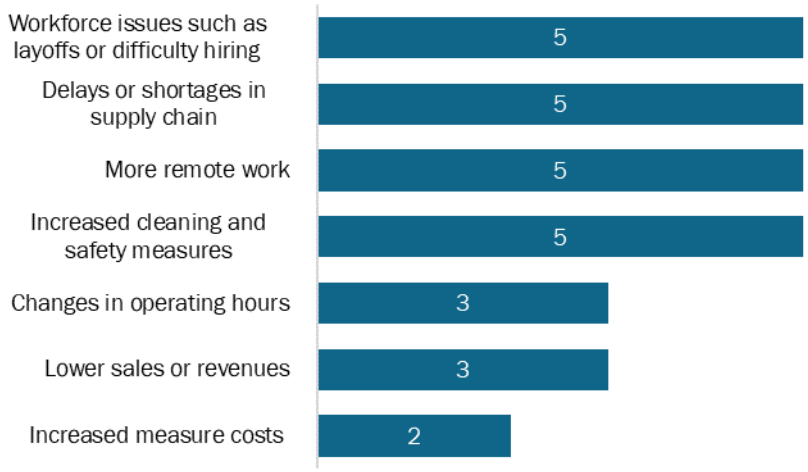


*Counts displayed rather than percentage due to small n.

As seen in Figure D-14, most respondents (five out of six) reported experiencing workforce issues such as layoffs or difficulty hiring, delays or shortages in the supply chain, more remote work, and increased cleaning and safety measures. In addition, half of the respondents (three) reported experiencing changes in operating hours and lower sales or revenues. One-third of the respondents (two) noted increased measure costs.

Figure D-14: Impacts to Business Operations from COVID-19

(Multiple responses allowed; n=6)*



*Counts displayed rather than percentage due to small n.