EVALUATION REPORT

2021-2024 CDM FRAMEWORK ENERGY MANAGER PROGRAM PY2022

Date:	29 September 2023
Prepared for:	The Independent Electricity System Operator (IESO)
Prepared by:	EcoMetric Consulting, LLC, and DNV Energy Insights Inc.

TABLE OF CONTENTS

FIGURES

TABLES

EXECUTIVE SUMMARY

E.1 PROGRAM DESCRIPTION

On behalf of the Independent Electricity System Operator (IESO), EcoMetric Consulting, LLC (EcoMetric) and subcontractors DNV Energy Insights USA, Inc (DNV) and Dunsky Energy + Climate Advisors (Dunsky), collectively referred to as the EcoMetric team, have evaluated IESO's Energy Manager (EM) program to support the IESO in their transition from an EM program to a new Strategic Energy Management (SEM) program as part of the IESO's 2021-2024 Conservation and Demand Management (CDM) Framework.

The EM program has played a critical role in helping participating facilities find energy savings and implement incented and non-incented improvements for their organizations. However, the EM program will not run after program year (PY) 2022 and is expected to be fully phased out by mid-2023 once final reports are approved.

The EcoMetric team conducted an Impact Evaluation of the EM program for PY2022 and a Process Evaluation for PY2022-23 to help the IESO achieve a successful program transition.

E.2 EVALUATION OBJECTIVES

The goals of the PY2022 evaluation were to:

- Annually verify energy and summer peak demand savings.
- Assess program attribution (net-to-gross or NTG), including free-ridership.[1]
- Conduct annual cost effectiveness (CE) analyses and report on key indicators of cost effectiveness, including the Total Resource Cost (TRC) test, Program Administrator Cost (PAC) test, and the Levelized Unit Energy Cost (LUEC) metric.
- Annually estimate the net greenhouse gas (GHG) impacts in tonnes of CO2 equivalent using IESO's Cost effectiveness Tool.

[1] Net-to-gross helps us determine what portion of the project savings is attributable to IESO programs versus what the customer would have done or saved in the absence of incentive programs (free ridership). NTG also helps us determine spillover, or savings only influenced by the program not incentivized or claimed. The team did not assess spillover for PY2022 given prior NTG assessments did not identify any spillover attributable to the EM program.

- Analyze and make recommendations to improve the program.

E.3 EVALUATION APPROACH SUMMARY

The EcoMetric team used a variety of methods and approaches to assess the EM program impacts and better understand the program's transition from EM to SEM. For our impact evaluation, the team performed energy and peak demand savings analyses for all non-incented measures (gross savings verification). The team then conducted a net savings verification to determine the portion of project savings attributable to IESO programs and the free ridership score. To best estimate measure-level costs and benefits, the EcoMetric team conducted cost effectiveness analyses using the CDM CE Tool provided by IESO. The team also analyzed other energy efficiency benefits of the program, including avoided greenhouse gas emissions and non-energy benefits.

For the process evaluation, the team conducted program material reviews and in-depth interviews with EMs and IESO program staff and service providers (implementers) to gain insight into SEM transition-related topics and challenges. The EcoMetric team also conducted participant surveys to learn more about the SEM transition from the perspective of decision-makers within organizations that employ energy managers. Lastly, the EcoMetric team reviewed four SEM programs in the U.S. and Canada to evaluate the IESO's current offerings through the Save on Energy Program. Section 2 provides detailed information about our methodology and approach.

E.4 SUMMARY OF RESULTS

Table 1 summarizes the key impacts of the EM program in PY2022. Further details on these impacts can be found in Section 3.

Table 1: PY2022 EM Non-Incented Impact Results Summary

Impact	PY2022 Results
Non-Incented Measures Evaluated and Reported	113 measures
Total Gross Verified First-Year Energy Savings	6,699 MWh
Program Level Energy Realization Rate	91%
Total Gross Verified Summer Peak Demand Savings	1.55 MW
Program Level Demand Realization Rate	96%
Total Net Verified First Year Energy Savings	6,303 MWh
Total Net Verified Summer Peak Demand Savings	1.45 MW
Program Level Net to Gross Ratio	94%
Total Net Verified Energy Savings that Persist through 2026 (MWh)	3,911 MWh
Cost Effectiveness – Program Administrator Cost Test Ratio	1.46
Cost Effectiveness – Levelized Unit Energy Cost	$0.03/kWh

E.4.1 PROCESS EVALUATION RESULTS

Interviewed energy managers reported overall satisfaction with their EM program experience and had limited suggestions for program changes if it were to continue. Despite the program sunsetting, all interviewed Ems, and most surveyed EM participants reported their organization currently plans to continue the EM position.

IESO program staff and implementers emphasized that the SEM program design is still in progress, so key decisions regarding program implementation are still in flux. However, many interviewed EMs thought the SEM program would be comparable to the EM program in terms of the effort required to participate, which may not be the case.

Our benchmarking of four SEM programs (PacifiCorp or Rocky Mountain Power-Utah; ComEd and Nicor Gas-Illinois; BC Hydro-British Columbia; Efficiency One-Nova Scotia) found that newer programs with limited experience are more susceptible to participation barriers. Incidents of utility unpreparedness and data collection issues impeded participation. The team also found that SEM program implementers have not properly tracked participant non-routine events (for example, with models not always properly accounting for short-term changes, new equipment, or issues that occurred on-site), which can lead to misrepresentation of apparent savings.

E.5 KEY FINDINGS AND RECOMMENDATIONS

The following sections present a high-level summary of the key findings and recommendations for the PY2022 Impact Evaluation, the PY2022-23 Process Evaluation, and the SEM Benchmarking process.

E.5.1 IMPACT KEY FINDINGS AND RECOMMENDATIONS

Impact Finding 1: A significant share of Operational and Maintenance (O&M) and Retrocommissioning (RCx) non-incented measures submitted by Energy Managers do not have sufficient supporting documentation to verify savings impacts accurately and confidently. One impactful example of this was an energy management project at an office building claiming 1.8 GWh of annual energy savings where no information was provided on the measures implemented, and no data was provided to support the savings estimation. Due to the lack of information, EcoMetric did not include this project in the PY2022 sample frame.

The data and product documentation that the program requires Energy Managers to provide for each measure depends on the magnitude of estimated peak demand savings. The majority of these O&M and RCx measures fall within the lowest threshold of less than 15 kW where Energy Managers are required to provide information on the baseline condition, post-measure condition, and the assumptions and methodology behind savings estimates.

Impact Recommendation 1: Regardless of the size of the submitted savings for these measures, required supporting documentation for all O&M and RCx should include:

- Description of each energy-saving action taken.
- Date of each energy-saving measure or action.
- Detailed description of pre- and post-implementation conditions.
- Detailed description of assumptions and parameters used to estimate kWh and peak kW savings impacts.
- Utility bills for the baseline and performance period (ideally 12+ consecutive months for each period).
- Evidence indicating how other energy efficiency (EE) measures (incented/non-incented) implemented at the same facility and/or how non-routine adjustments were accounted for in the savings analysis.

Require that the technical reviewer only accept non-incented O&M and RCx measures that have the above documentation provided. Technical reviewers must either conduct an engineer review to verify

EM submitted savings or accept each non-incented measure for inclusion in the energy manager's progress toward their savings target.

EcoMetric also recommends that the energy manager retract the 1.8 GWh measure submission until sufficient supporting documentation is collected for savings verification.

Impact Finding 2: Energy Managers did not estimate or submit peak demand savings for five non-incented measures where the EcoMetric team expected to see reported peak demand impacts. The supporting documentation provided by the Energy Manager was insufficient for EcoMetric to estimate a peak demand reduction for these measures.

Impact Recommendation 2: Provide further guidance to Energy Managers or future SEM participants on the calculation and submission of peak demand savings estimates. Require that all measures submitted that achieve kWh savings include a peak demand savings estimate. If the estimate is 0 kW, require that the participant provide a brief explanation of the savings estimation.

E.5.2 PROCESS KEY FINDINGS AND RECOMMENDATIONS

Process Finding 1: 12 of 15 surveyed EM program participants were aware of the SEM program. Many did not apply to participate. Those who did not apply reported receiving inadequate information about the SEM program. Four of five interviewed energy managers thought participation in the SEM program would take the same or less time than participating in the EM program. Interviewed program staff and implementers believe there is a disconnect in what SEM applicants and potential participants anticipate about the time commitment, involvement, and value of the program compared to what the SEM program can realistically offer.

Process Recommendation 1: Program staff and the SEM implementer(s) should further refine the communications around SEM value, involvement, and time commitment to ensure customers receive adequate information about the IESO SEM program. Lack of adequate information was reported to be a barrier to SEM participation.

It is valuable to re-evaluate the list of ideal participant characteristics after at least one cycle of the program. This can help with clarifying conditions and requirements under which past participants may enroll in a second term of engagement.

Process Finding 2: Primary and secondary data indicate that executive buy-in and engagement will be critical for SEM program participation and satisfaction. 87% of EM projects were reported to have included challenges, mainly related to financial and logistical issues, which suggest they may carry over into SEM program participation. Non-routine events (NREs) will distort apparent program savings if not properly tracked.

Process Recommendation 2: Unlike the EM program, where the energy manager wage was subsidized, the SEM program is attempting to encourage the organizations to develop organizational systems toward continuous improvements that would persist when key staff leaves or moves into different roles in an organization. The theory is that this continuous improvement will lead to energy savings and possibly non-energy benefits. Ensuring these benefits occur is critical in maintaining executive buy-in and engagement. Thus, the program should carry over lessons learned from the EM program that are relevant to SEM, including:

- Regularly monitoring participation experience (including enrollment trends, drop-outs, and satisfaction) to ensure the SEM program provides value to current and future participants
- Assessing whether current incentive level caps serve as barriers to generating expected savings
- Tracking participant NRE timing and their effect on facility energy use

1 INTRODUCTION

1.1 PROGRAM DESCRIPTION

The Independent Electricity System Operator (IESO) retained the EcoMetric team to evaluate the 2021-2024 Conservation and Demand Management (CDM) Framework Industrial Programs administered in Ontario. The industrial programs incentivize equipment measures, engineering studies, and energy management services for commercial and industrial facilities in Ontario.

The EM program's transition to a Strategic Energy Management (SEM) program is part of the IESO's 2021-2024 CDM Framework implemented to help electricity users save on energy costs and Ontario to address electricity needs across the province. According to the IESO, the new SEM program is designed to help organizations increase profitability, reduce costs, and achieve carbon reduction and environmental goals.[2]

The EM program subsidizes the salary of a trained energy manager to work directly with participating facilities to find energy savings, identify smart energy investments, secure financial incentives, and unleash competitive advantage. Energy managers can identify capital improvements eligible for incentive payments through the Prescriptive Retrofit or Energy Performance Program (EPP). The savings from these projects accrue to the program that incents the improvement.

Energy managers can also identify and help to implement non-incented improvements for the organizations they support. Since 2016, EM contracts require that 10% of the savings goal must be through non-incented improvements. IESO tasked the EcoMetric team with verifying the energy savings from these non-incented projects while examining the EM cost effectiveness and program processes. A broader perspective was taken to document the value of EM thoroughly since EM is an enabling program that drives participation and savings in other programs. These non-incented projects are the focus of the EM program evaluation discussed in this section. Common non-incented measures include optimization, capital equipment upgrades, operational and maintenance (O&M), and behavioral measures.

2 https://saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Energy-Manager-Program

This report includes the methodology, results, key findings, and recommendations of the program year (PY)2022 Impact Evaluation and the PY2022-2023 Process Evaluation of the IESO's EM program. EcoMetric and DNV (referred to as "the EcoMetric team") have conducted this evaluation on behalf of the IESO to ensure they achieve an effective program transition.

1.2 EVALUATION OBJECTIVES

The industrial programs incentivize equipment measures, engineering studies, and energy management services for commercial and industrial facilities in Ontario.

The goals of the PY2022 Impact Evaluation were to:

- Annually verify energy and summer peak demand savings.
- Assess program attribution (net-to-gross or NTG), including free-ridership.[3]
- Conduct annual cost effectiveness (CE) analyses and report on key indicators of cost effectiveness, including the Program Administrator Cost (PAC) test, Levelized Unit Energy Cost (LUEC) metric, and Total Resource Cost (TRC) test.
- Annually estimate the net greenhouse gas (GHG) impacts in tonnes of CO_2 equivalent using IESO's Cost effectiveness Tool.
- Analyze and make recommendations to improve the program.

The goals of the PY2022 Process Evaluation (including SEM benchmarking) were to address the following research questions:

- How effective are key EM program elements?
- What is the program theory and logic for transitioning the EM to the SEM program design? What drove the decision to transition?
- How well is the transition from the Energy Manager to SEM initiative going?

3 Net-to-gross helps us determine what portion of the project savings is attributable to IESO programs versus what the customer would have done or saved in the absence of incentive programs (free ridership). NTG also helps us determine spillover, or savings only influenced by the program not incentivized or claimed. Note The team did not assess spillover for PY2022 given prior NTG assessments did not identify any spillover attributable to the EM program.

- What are the challenges relating to the transition? Are there: 1) issues with the program transition communications, 2) transition impacts on the participation, 3) complications, if any, around SEM tracking and data protocols/processes, and 4) incentive and application processes if the new program began to operate?
- What are the customer motivations and barriers to participating in the SEM program?
- Where are the opportunities to improve the transition or delivery of SEM? How can the IESO increase the participation of industrial customers in SEM?

2 METHODOLOGY

This section of the report outlines the methodologies used in the PY2022 evaluation of the EM program. More detailed descriptions of the evaluation methodology are included in Appendix C.

2.1 EVALUATION APPROACH

Methods used to conduct this evaluation include on-site inspections and measurement, engineering analysis, interval billing analysis, telephone surveys, documentation review, best practice review, and interviews with program participants and IESO-funded energy managers. This section explains the evaluation approach in more detail, including the overall sample design and basic descriptions of the methods applied.

2.1.1 SAMPLING APPROACH

With the limited participation in the program early in the 2021-2024 CDM Framework, the EcoMetric team conducted a census of all non-incented measures completed in PY2022 for the gross savings verification.

For each organization, the EcoMetric team reviewed all completed projects with reported kWh or peak kW savings – both those that received a technical review and those that were accepted by the technical reviewers. A portion of all EM projects undergo an in-depth technical review before the final reported savings estimates are stored in the program tracking system. The remainder of non-incented measures are accepted by the technical reviewers if they are determined to meet program eligibility requirements.

For the net savings verification and process evaluation, the EcoMetric team attempted interviews with all 28 participating EMs who had submitted annual reports with non-incented measures to the IESO by the PY2022 sample cutoff of February 28, 2023. Out of those 28, the EcoMetric team was able to complete 15 interviews. While gross savings verification relied on non-incented measures accepted or reviewed by the technical review team, net savings and process interviews were conducted for all organizations with submitted measures to ensure their decision-making and experiences were fresh in their minds.

Table 2 shows the sample size for the impact evaluation of the EM program.

Table 2: Energy Manager Sample Size

Evaluation	Component	Population	Number of Completes
Gross Savings Verification	Non-Incented Measures	137	137
Gross Savings Verification	Energy Managers/Organizations	12	12
Net Savings and Process Evaluation In-Depth Interviews	Energy Managers/Organizations	28	15
Process Evaluation In-Depth Interviews	IESO Program Staff and Implementers	5	5
Process Evaluation In-Depth Interviews	IESO-funded Energy Managers	9	5
Process Evaluation Benchmarking	SEM Programs	4	4

2.2 GROSS SAVINGS VERIFICATION

The EcoMetric team performed energy and peak demand savings analyses for all non-incented measures that were reviewed or accepted by technical reviewers. To collect primary data from participants and support gross savings verification, the EcoMetric team conducted five on-site visits throughout Ontario. The EcoMetric team annualized the energy savings regardless of the time-of-year or duration of measured data available. The EcoMetric team calculated energy and peak demand realization rates, the ratio of gross verified savings to reported savings, at the program-level for all sampled measures. EcoMetric applied these program-level realization rates to the reported savings for all non-incented measures evaluated and reported in PY2022.

2.3 NET SAVINGS VERIFICATION

The EcoMetric team calculated net savings and net-to-gross (NTG) ratios to incorporate free ridership factors for the projects evaluated. NTG is the process of determining what portion of project savings is attributable to the influence of the IESO programs versus what the customer would have done in the absence of incentive programs. The calculation of NTG factors typically includes both free ridership, defined as the savings customers would have achieved in the absence of the program's influence (commonly called the counterfactual condition), and spillover, defined as savings influenced by the program but not formally incentivized or claimed by the program.

The approach for PY2022 continues to utilize the enhancements made to the NTG questionnaire for the Conservation First Framework (CFF) and Interim Framework (IF) evaluations. Results from prior NTG spillover assessments did not identify any spillover attributable to the EM program, so the team

did not assess spillover for PY2022. As in the past, the basis of free ridership analysis for the IESO's industrial programs was a direct query (interviews with past participants) about the theoretical counterfactual condition. This method is considered best practice for programs with large savings per project, unique applications, and low participant counts.

2.4 COST EFFECTIVENESS ANALYSIS

EcoMetric used the IESO CDM Cost Effectiveness Tool to estimate measure-level costs and benefits, aggregated to program- and portfolio-level cost effectiveness. Program administrative costs were provided to EcoMetric by the IESO. Other key inputs for the cost effectiveness analysis include lifetime electric energy and demand savings, measure lives, energy savings load shapes, and incremental project costs.

EcoMetric states benefits and costs in present value terms, using the appropriate discount and inflation rates conforming to the IESO's requirements are outlined in the IESO CDM Cost Effectiveness Guide.

2.5 PROCESS EVALUATION APPROACH

In the PY2022 evaluation, the EcoMetric team conducted a comprehensive process evaluation by collecting data from a broad range of program and market actors. The team looked at four sources of data regarding the EM program and the transition of EM into SEM: 1) In-depth interviews with IESO and program delivery vendor staff, 2) In-depth interviews with energy managers, 3) A survey of decision-makers in organizations participating in EM (referred to as "EM participants"), and 4) A review of four SEM programs (referred to as "benchmarking review"). The EcoMetric team conducted in-depth interviews via phone or video calls. Participant surveys were conducted via phone by a professional subcontracted survey team and combined with the NTG survey questions to avoid over-contacting participants and streamline the data collection process. The EcoMetric team reviewed online materials (including webpages detailing information about the programs and evaluation reports) for four SEM programs, which were selected based on geographical and meteorological similarities.

2.6 OTHER ENERGY EFFICIENCY BENEFITS APPROACH

2.6.1 AVOIDED GREENHOUSE GAS EMISSIONS ESTIMATION

EcoMetric estimated net greenhouse gas (GHG) impacts for each project by utilizing measure-level energy savings load shapes based on metered data and emissions factors (EFs) provided by the IESO at the annual and hourly level and aggregated to the eight IESO peak periods as defined in the IESO's Conservation and Demand Management Energy Efficiency Cost Effectiveness Tool.

2.6.2 NON-ENERGY BENEFITS

EcoMetric estimated non-energy benefits (NEBs) by utilizing sector-based $/kWh NEBs values provided by the IESO and defined in the IESO's Conservation and Demand Management Energy Efficiency Cost Effectiveness Tool.

3 IMPACT EVALUATION RESULTS

This section details the results from the impact evaluation of the EM program in PY2022.

3.1 GROSS VERIFIED SAVINGS RESULTS

Gross verified savings results for the PY2022 EM program are summarized in Table 3. In total, **113 non-incented measures completed in PY2022 were evaluated and reported as part of the sample frame**. The overall sample included 127 measures, but two organizations had not yet been invoiced by the IESO at the time of reporting. Completing the invoicing process for the program incentives is an IESO requirement for reporting.

The total gross verified energy savings for the EM program in PY2022 were 6,699 MWh, representing 91% of reported savings. Total gross verified summer peak demand savings for the EM program were 1.55 MW, representing 96% of total reported savings.

Table 3: PY2022 EM Non-Incented Gross Verified Savings Results

Program Year	Measures Evaluated & Reported	Energy Realization Rate (%)	Gross Energy Savings (MWh)	Peak Demand Realization Rate (%)	Gross Summer Peak Demand Savings (MW)
2022	113	91%	6,699	96%	1.55

While EcoMetric applied the program-level realization rates to all non-incented measures evaluated and reported in PY2022, individual energy realization rates ranged between 35% and 130%. Peak demand realization rates ranged between 53% and 109%.

The main drivers of the EcoMetric team's adjustments to gross reported savings included:

- Issues with the level of documentation provided by energy managers to substantiate reported savings for O&M and RCx measures.
- Under reporting of summer peak demand savings by energy managers.
- An improvement to compressed air leak repair and purge air reduction savings calculations.
- Rounding errors in MWh savings in Energy Managers' Quarterly Submissions
- Several project-specific adjustments to gross savings calculations

Details on these issues and the EcoMetric team's recommendations to improve reported savings estimations can be found in Section 7. Project-specific findings and recommendations can be found in Appendix B.

3.2 NET VERIFIED SAVINGS RESULTS

Table 4 summarizes the EM non-incented net savings. **The program-level NTG for the EM non-incented measures was 94% for the PY2022 projects, reflecting a free ridership score of 6%.** Spillover was researched and found to be zero in multiple prior evaluations, so it was not assessed for the program as part of this evaluation and assumed not to be present. **Total net first-year savings for non-incented EM projects evaluated in PY2022 was 6,303 MWh, and net peak demand savings were 1.45 MW.**

Sixty-two percent of EM program energy savings persist through 2026 due to the high number of O&M measures that typically have effective useful lives of three years or less.

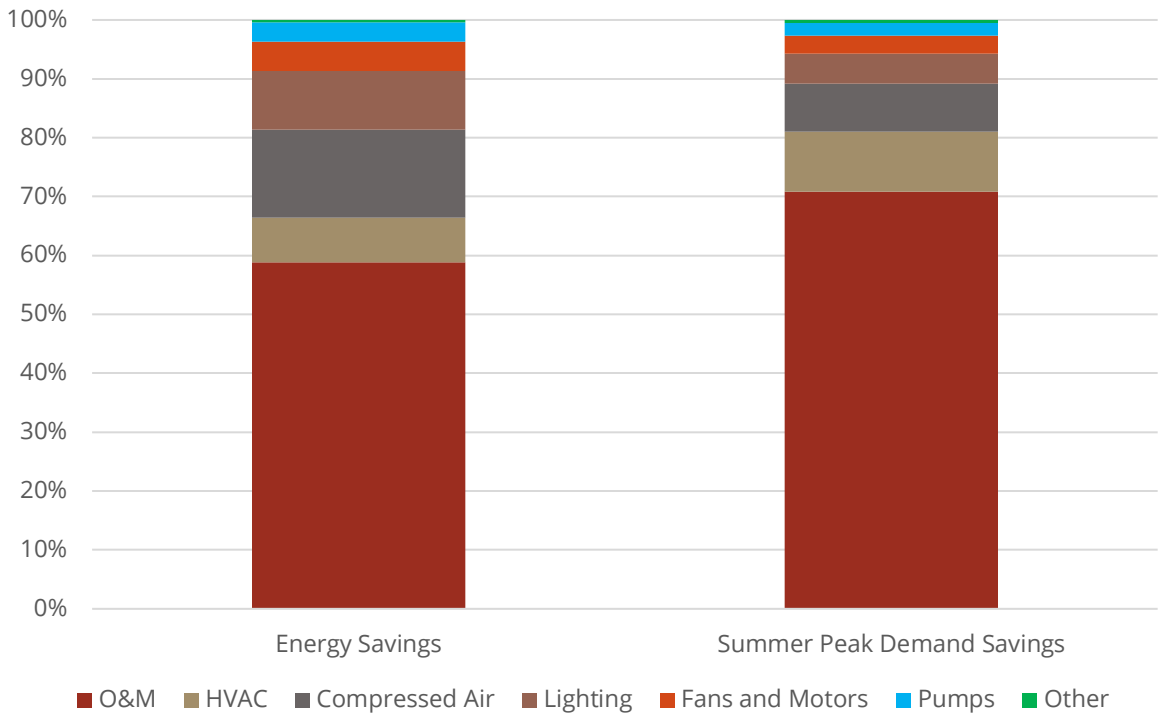
Energy managers were perceived by participants as key players in project identification, analysis, and documentation. While in a few cases participants indicated they had already considered the projects in question and would likely have pursued them regardless of whether they had an energy manager, most participants felt that energy managers were instrumental in identifying feasible projects, speeding up project implementation, and ensuring that all required documentation and savings estimates were accounted for.

Table 4: PY2022 EM Non-Incented Net Verified Savings Results

Program Year	Projects Evaluated & Reported	NTG Ratio	Net Energy Savings (MWh)	Net 2026 Energy Savings (MWh)	Net Summer Peak Demand Savings (MW)	Net 2026 Summer Peak Demand Savings (MW)
2022	113	94%	6,303	3,911	1.454	1.154

As depicted in Figure 1, **the majority of net first year energy and summer peak demand savings in the EM program came from O&M measures in PY2022.** These measures included HVAC retrocommissioning, BAS system updates, process-specific optimizations, and others. Other impactful non-O&M measures included RTU unit replacements, compressed air leak repairs, LED lighting, variable frequency drives (VFDs), and efficient pumps.

Figure 1: PY2022 EM Net Verified First Year Savings by Measure Type



3.3 ENERGY MANAGER HOLISTIC IMPACTS

While at least 10% of IESO-funded energy managers' energy savings goals must come from non-incented measures, the remaining savings are achieved through the IESO's incented programs such as Prescriptive Retrofit and the Energy Performance Program (EPP). Historically, most of the energy savings achieved by IESO-funded energy managers are from Prescriptive Retrofit due to the wide range of eligible measures and relative ease of participation. Furthermore, as the 2021-2024 CDM Framework is in the early stages of implementation, there were just two incented program options for energy managers—Prescriptive Retrofit and EPP.[4] In PY2022, organizations with IESO-funded energy managers completed 222 measures achieving 6,795 MWh of reported energy savings and 1.035 MW of reported summer peak demand savings in the Prescriptive Retrofit program as shown

[4] EPP is a whole-building pay-for-performance program that rewards savings from capital and non-capital measures.

in Table 5. Organizations with IESO-funded energy managers achieved 3.5% of the total reported summer peak demand savings for the Prescriptive Retrofit program in PY2022.

In EPP, one of the two organizations with reported savings in PY2022 had an IESO-funded energy manager. This organization achieved 104,462 kWh and 1 kW of reported energy and summer peak demand savings, respectively, in PY2022. IESO-funded energy managers' impacts on the EPP program are likely to increase in PY2023 as they are embedded in six of the 29 organizations with facilities enrolled in EPP as of 1Q2023.

In total, IESO-funded energy managers achieved reported savings of 14,187 MWh and 2.65 MW across the IESO's commercial and industrial portfolio in PY2022. The EcoMetric team expects the energy managers' impacts to increase in the upcoming and final evaluation of the EM program in PY2023 as more non-incented measures are ready for evaluation and reporting.

Table 5: PY2022 Energy Manager Reported Savings from Incented Projects

Program	Measures Completed	Reported Energy Savings from EMs (MWh)	Reported Summer Peak Demand Savings from EMs (MW)
Prescriptive Retrofit	222	6,795	1.035
EPP	5	0.1045	0.001

4 COST EFFECTIVENESS RESULTS

This section details the cost effectiveness results of the EM non-incented program in PY2022.

As shown in Table 6, **the EM non-incented program is cost effective from the PAC test perspective using a benefit/cost threshold of 1.0.** For PAC, benefits totaled $1,518,543, while costs totaled $1,041,740. **The levelized cost (LC) of electricity for the program was $0.03/kWh. PY2022's PAC ratio of 1.46 increased when compared to the PY2021 EM program[5] PAC ratio of 0.96.** Improvement in the ratio can be mainly attributed to lower PAC costs in PY2022.

Table 6: PY2022 EM Non-Incented Cost Effectiveness Results

PAC Costs	PAC Benefits	PAC Ratio	LC $/kWh
$1,041,740	$1,518,543	**1.46**	**0.03**

Given the nature of the PAC test and its reliance on measuring energy and capacity related avoided costs (benefits), comparing the cost effectiveness of individual measures within the same program when administrative costs are pooled together can be challenging.

To present an additional point of view to the cost effectiveness results outlined above, Table 7 outlines three distinct program measures with the highest nominal PAC benefits along with their associated First Year Energy Savings (MWh). The weight of PAC benefits and First Year Energy Savings relative to program totals are shown for comparison. This information may present program administrators with measure refinement opportunities when administrative resources are limited.

[5] In PY2021, the EM program was under the IESO's Interim Framework. However, the PAC ratios are comparable as the program design and delivery remained largely unchanged as it developed into the 2021-2024 CDM Framework.

Table 7: PY 2022 EM Non-Incented Highest PAC Benefit Measures

Measure Description	PAC Benefits	Benefits Weight	First Year Energy Savings (MWh)	First Year Energy Savings Weight
TMP Refiners Idling	$262,766	17%	656	10%
Baghouse Fan Optimization	$211,282	14%	1,356	20%
LED Retrofits	$59,884	4%	158	2%

As shown in Table 7, large industrial based measures provide significant PAC benefits while also delivering notable first-year energy savings.

Provided incentive payments are reasonable, large measures with a cost-effective PAC ratio can create opportunities for smaller measures with potentially cost ineffective PAC ratios (at the individual level) to be pursued within an energy efficiency program portfolio.

Table 8 outlines the bottom three distinct program measures with the lowest non-zero nominal PAC Benefits along with their associated First Year Energy Savings (MWh) and weights.

Table 8: PY 2022 EM Non-Incented Lowest PAC Benefit Measures

Measure Description	PAC Benefits	Benefits Weight	First Year Energy Savings (MWh)	First Year Energy Savings Weight
L5R13-0052: Exhaust Fan Replacement	$46	~0%	0.07	~0%
L5R13-0049: Exhaust Fan Replacement	$89	~0%	0.14	~0%
L5R13-0047: Exhaust Fan Replacement	$118	~0%	0.18	~0%

Smaller measures, such as the ones listed in Table 8, provide reduced PAC benefits and energy savings, which may lower the overall costs effectiveness of a given program depending on the administrative input required to process these measures.

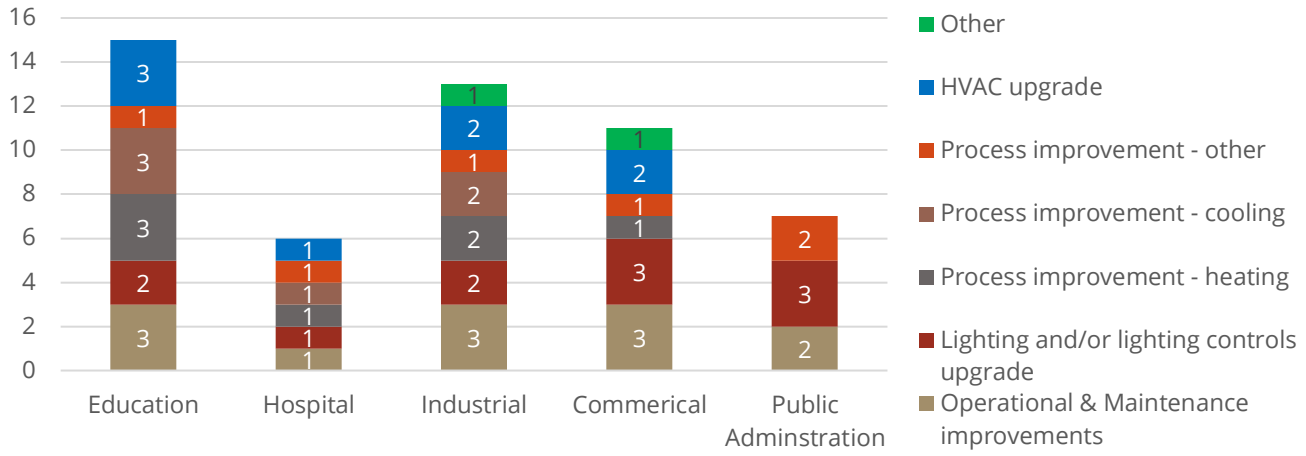
5 PROCESS EVALUATION RESULTS

Below are the results of the PY2022 comprehensive process evaluation. The EcoMetric team has presented our findings about the EM program first, followed by findings about the transition to the SEM program.

5.1 ENERGY MANAGER PROGRAM

The most common projects implemented by EM participants were operational and maintenance improvements, followed by lighting upgrades and process improvement. Figure 2 shows that across industries, surveyed EM participants implemented a variety of projects.

Figure 2: Projects Implemented by EM Program Participants
(Source: Survey of EM Participants, n=14)



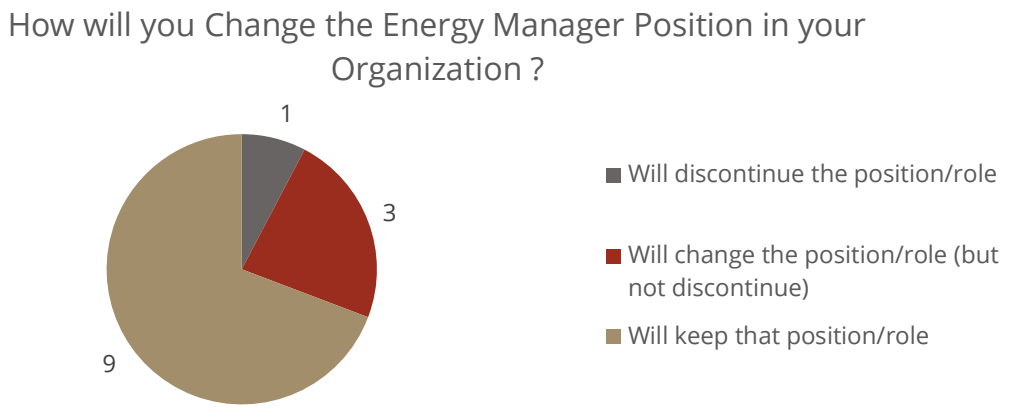
87% of surveyed EM participants reported experiencing challenges while implementing projects. Respondents reported that there were challenges across projects, and there was not a clear project that posed more challenges than others. The most reported concern was financial, followed by issues related to program participation, as seen in Table 9.

Table 9: Challenges Reported across Projects
(Source: Survey of EM Participants, n=12)

Challenge Category	What Were the Challenges You Experienced? Responses Provided Below.	Count
Wider economic issue	COVID-19	3
	Supply chain issues, pricing issues, labor shortages	
	Inflation costs and supply chain issues	
Logistical issue	Installation delays	11
	Difficulty in setting up monitoring of energy savings of the installed equipment/upgrade	
	Finding the right contractor	
	Logistics-related issues to meet project schedule.	
	Approval of project, installation of project	
	Managing the whole thing from people to projects	
Program issue	Unclear on program requirements for estimating savings	14
	Access to adequate information of program requirements	
	Related to the incentive period, The team had supply chain issues which prohibited us from being able to install more motors within the IESO incentive period.	
	Difficulty in establishing the baseline (consumption prior to the project/upgrade)	
	Contracting terms with IESO were not adequate (had to be negotiated)	
Financial concern	Estimated project payback was not what we team wanted it to be	19
	Access to upfront capital	
	Budget and timing challenges	
	Unfamiliarity/skeptical about project's energy savings benefits	

All interviewed energy managers and most surveyed EM participants reported their organization currently plans to continue the Energy Manager position in some capacity once the Energy Manager program ends. The EcoMetric team acknowledges that these responses may be skewed, as survey and interview respondents were still employed at their organizations. Interviews with program staff and implementers revealed awareness that some employees are no longer employed at their previous organizations and would not have been reached through these data collection efforts. Only one survey respondent reported that their organization will be discontinuing the Energy Manager role. Two survey respondents declined to answer the question (Figure 3).

Figure 3: Anticipated Changes to the Energy Manager Position in Participating Organizations (Source: Survey of EM Participants, n=13)



Interviewed energy managers reported they were satisfied with their EM program experience and had limited suggestions for changes to the program if it were to become available again. The most common suggestions for changes to the program included incorporating more lessons learned and case studies.

All five interviewed energy managers indicated they had utilized EM support services in the past year, and said those services were beneficial. Interviewees reported using coaching/receiving answers to general inquiries and attending training sessions or webinars. Four interviewees said they want to see the direct line of communication and coaching sessions maintained as the EM program sunsets, and one interviewee said they want to see the training sessions maintained. Interviews with program staff and implementers revealed that these support services will continue for now.

5.1.1 TRANSITION INTO THE SEM PROGRAM

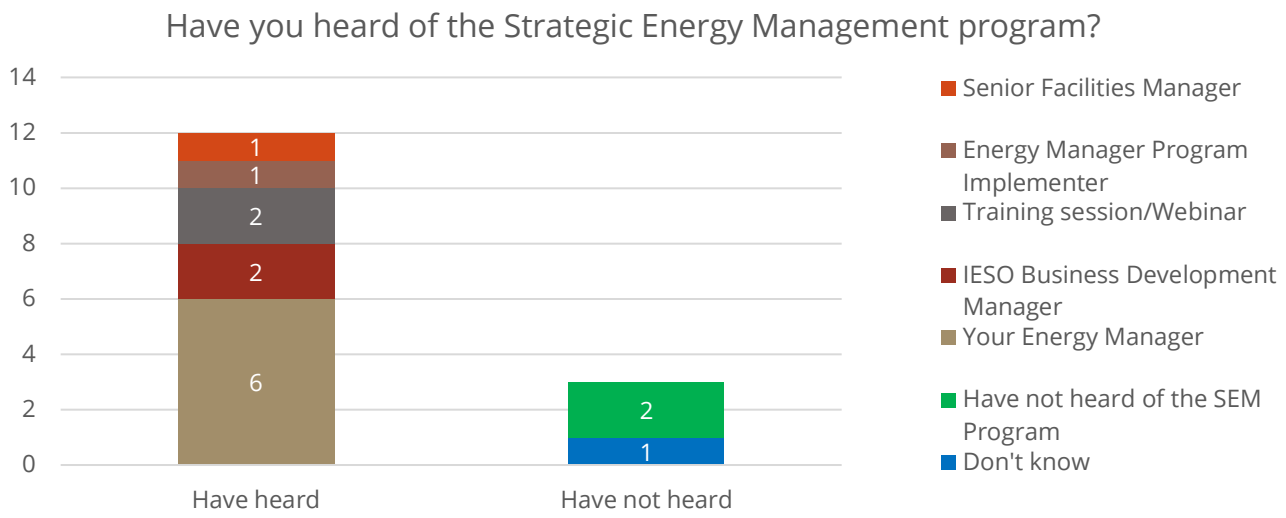
Development of the SEM program is in progress. Interviews with program staff and implementers highlighted that decisions about the program design and implementation are still in flux. Interviews indicated that determining the make-up of cohorts had not yet been decided – whether there would be assignment based on a first-come, first-serve basis or if the participants would be separated by sector, previous SEM experience, or some other method.

It is unclear whether the SEM participation rate is adequate. At the time of the interviews, approximately one dozen applications had been received. Some program staff felt this was a healthy number of leads. Others wanted to see more applications as there was concern with the expectations participants had for the program as well as the rate of retention.

Similarly, it is too early to tell how effective the SEM program will be in generating savings. Interviewees noted they were unsure about whether the savings for the SEM program would be larger, smaller, or the same as the EM program. The program staff and implementation team remain optimistic that the SEM program will create a culture change in organizations, which may have a positive impact on completed projects and attributable savings. In addition to savings, interviewees noted the number of participants/cohorts, participant engagement, uptake for other programs, and changes to employment and hour allocations would be tacked as key metrics for the SEM program.

All interviewed energy managers reported previously hearing about the SEM program, as well as 80% of surveyed EM participants. All energy managers who completed an in-depth interview learned about the SEM program as a direct result of the EM program participation – either through the EM ceremony (1 respondent) or a conversation with a program implementer (4 respondents). Of the surveyed EM participants who were aware of the SEM program, most learned of SEM from their energy manager staff (Figure 4).

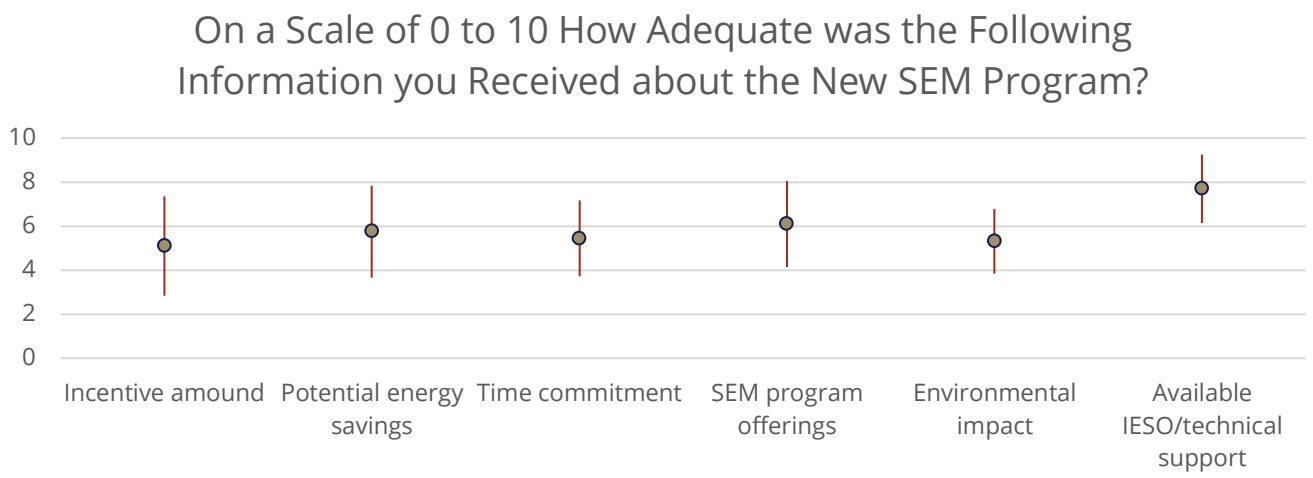
Figure 4: How EM Program Participants Heard of the SEM Program
(Source: Survey of EM Participants, n=15)



Surveyed EM participants reported that information on the SEM program was inadequate. Interviews with program staff and implementers acknowledged concern over whether enough information had been shared with potential SEM participants in the early stages of the program. This was seen in the survey EM participant responses when respondents were asked to rate how adequate the information they received on the SEM program was on a scale of 0 to 10. Respondents were most unsure of information regarding SEM incentive amount, environmental impact, and time commitment, with average responses being 5.1, 5.3, and 5.4, respectively. This is further confirmed by interviews with program staff and implementers – where it was revealed that there have been

questions received pertaining to the level of effort, as well as the incentive amount. Respondents felt information regarding the available IESO/technical support was the most adequate, with the average response being 7.7 out of 10. Figure 5 shows the average response across SEM-related areas inquired about.

Figure 5: Average Adequacy of Information Provided about the SEM Program
(Source: Survey of EM Participants, n=10)



Surveyed EM participants who have already applied to the SEM program reported that they found information on SEM more adequate than those who have not applied. Figure 6 below shows the average response for how adequate information was received across areas by whether the respondents had applied to the SEM program. Those who have applied reported much higher scores on the adequacy of information. This indicates that for those who have not applied, the availability of information may be a barrier to application.

Figure 6: Average Adequacy of Information Provided about the SEM Program by Whether Respondents Applied (Source: Survey of EM Participants, n=11)

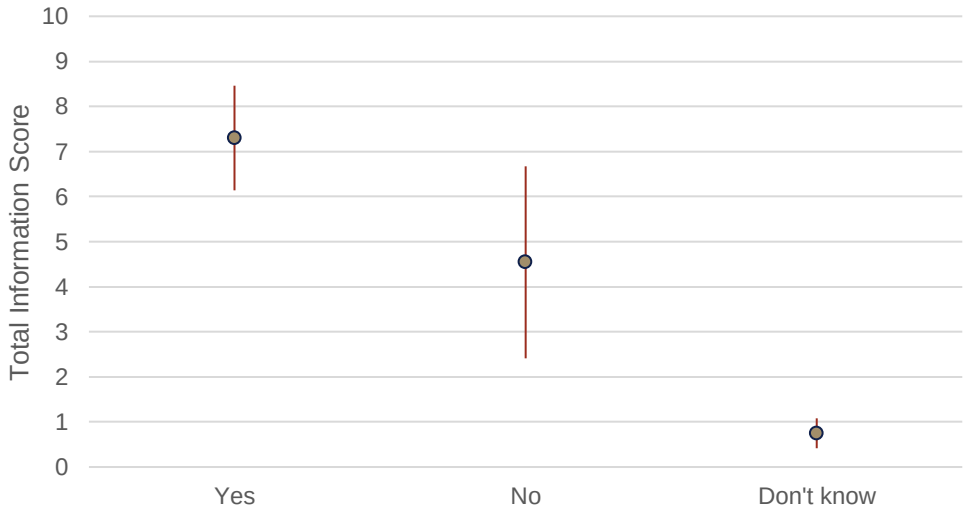


Table 10 lists verbatim responses from respondents on why they have not yet applied to the SEM program.

Table 10: What is Stopping Potential Participants from Applying to the SEM Program? (Source: Survey of EM Participants, n=7)

What is stopping you from participating in the SEM program at your facility?
At this point, I'm pretty sure the Energy Manager thought there were some good ideas in the program but I suspect it's an issue of capacity so we haven't been able to prioritize that as a project at this time.
Nothing yet, it's just a matter of time before we participate.
The team need to have the executives onboard with the application before proceeding with application.
The team need time to understand the program, The team need time to go in detail

All interviewed energy managers reported that their organization already applied to the SEM program and have received information resulting in knowledge about the program. When asked what they have heard about the SEM program so far, interviewees mentioned: 1) the broad organizational support which is a pre-requisite for participation, 2) participating in a cohort of peers, 3) preliminary knowledge of what training will be available through the program, and 4) the incentive amount being less than what was offered through the EM program. Interviews with program staff indicated that setting an incentive less than that offered within the EM program was a deliberate

choice, as a direct consideration of SEM program participants being motivated by all available SEM activities, as opposed to solely an incentive benefit.

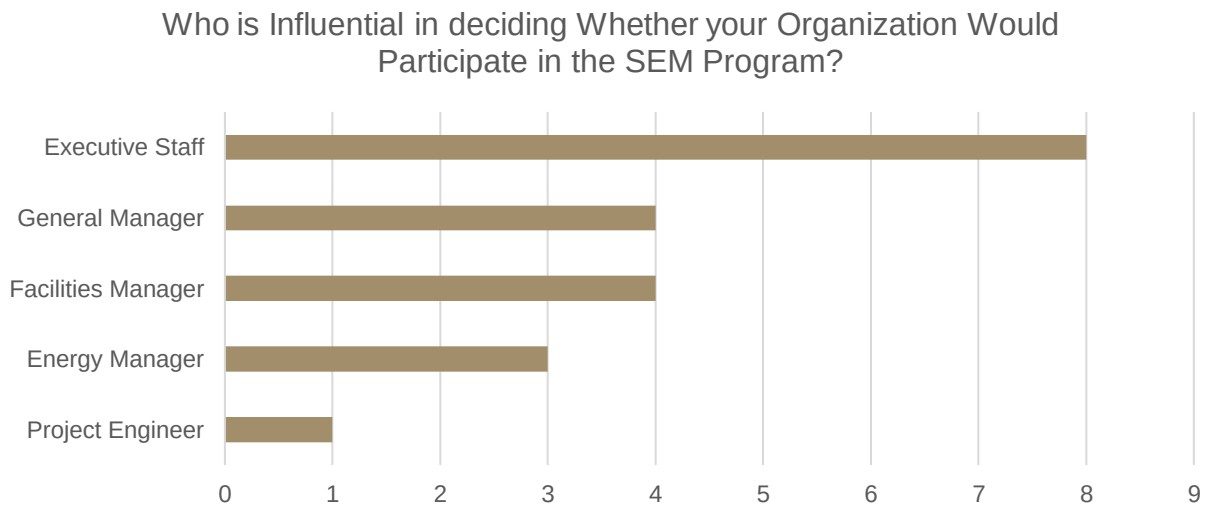
Most interviewed energy managers indicated that fiscal considerations resulted in their organization applying to the SEM program. Four of five interviewees said that a top motivation for applying to the program included energy savings and receiving an incentive. One interviewee said their organization was interested in the ability to learn more about ISO certification and become increasingly sustainable.

Many interviewed energy managers thought the SEM program would be comparable to the EM program and would take a similar amount of effort to participate. Three of five interviewees thought it would be like the EM program based on their knowledge of the SEM program. Two of the five interviewees thought the SEM program would differ from the EM program. Further, three of the five interviewees said they thought the SEM program would take the same amount of effort as the EM program. One interviewee said they thought SEM participation would be less effort than EM participation. One interviewee said they thought SEM participation would be more effort than EM participation.

Interviewed energy managers believe that participation in the SEM program will help their organization achieve a variety of benefits – foremost, implementing a continuous improvement process that can last. All interviewed program staff and implementers indicated that they believed this program would encourage organizations to create systems for continuous energy performance improvement, which aligns with the interviewed energy managers' responses. When asked on a scale of 0-10, where 0 means "will not help us achieve," and 10 means "will completely help us achieve," interviewed energy managers averaged responses were between 6.5 and 7.9 for five different benefits – increase profitability (6.5), reduce environmental impact (7.2), increase customer satisfaction (7.2), develop the next generation of sustainability leaders (7.4), and implement a continuous improvement process that can last (7.9).

Executive leadership approval is integral to participation in the SEM program. More than half of surveyed EM participants reported that executive staff were either part of the decision or the sole decision makers. Two of five interviewed energy managers also indicated that senior leadership would determine participation in the SEM program.

Figure 7: Person(s) Responsible for Determining if Organizations Participate in the SEM Program (Source: Survey of EM Participants, n=15)



All interviewed energy managers indicated their company either had or was in the process of developing internal decarbonization, energy reduction, or non-energy goals. Three of the five energy managers said their organization already had goals in place and believe the SEM program will help them move forward with those goals. Two of the five said they are in the process of developing goals and believe that SEM program participation will have a positive impact on the development of those goals.

All interviewed energy managers said their company has at least some sort of automated system in place to manage building/energy equipment consumption. All five energy managers keep a record of energy consumption data, two-track non-routine events, three-track plan or unplanned shutdowns of the facility, and three-track changes in product lines.

All interviewed energy managers reported that their company has at least one energy efficiency action and/or upgrade currently being considered for completion. Interviewed energy managers most often mentioned additional building automation and lighting as projects being considered for completion. Heating/heat recovery was named by two energy managers as projects that were determined to not be implemented.

5.2 STRATEGIC ENERGY MANAGEMENT PROGRAM BENCHMARKING

The EcoMetric team conducted a jurisdictional scan of SEM programs across North America to identify best practices, document lessons learned, and benchmark IESO's current offerings through the Save on Energy Program. This review built off previously conducted SEM benchmarking work and

included additional secondary research on leading SEM programs. This section summarizes the key findings from this review of North American SEM programs.

The team identified and reviewed four SEM programs in the U.S. and Canada:

1. PacifiCorp (Rocky Mountain Power)- Utah
2. ComEd and Nicor Gas – Illinois
3. BC Hydro – British Columbia
4. Efficiency One – Nova Scotia

5.2.1 PROGRAM OVERVIEWS

IESO's SEM Save on Energy Program provides participants (commercial, institutional, or industrial customers) assistance with both the upfront implementation of energy management practices as well as the adoption of continuous energy improvement systems.[6] The program requires participants to implement in-house energy management teams that employ SEM milestones and energy efficiency measures. The EcoMetric team reviewed the following utility SEM programs, summarized below, to offer IESO insights into an effective SEM program delivery.

PacifiCorp Utah. Rocky Mountain Power (RMP), a division of PacifiCorp, provides SEM services, including coaching, analysis, and support to its Utah customers.[7] Through the implementation of energy management programs and incentives, SEM offerings encourage behavioral changes. Customers must have an internal energy manager to engage with RMP for at least 18 months and can either choose to join a cohort of similar businesses or receive one-on-one consultations with RMP energy engineers.

ComEd and Nicor Gas Illinois. The jointly managed ComEd/Nicor SEM program operates on a day-to-day basis by an external implementor and seeks to maximize energy savings through incremental

6 https://saveonenergy.ca/en/For-Business-and-Industry/Programs-and-incentives/Strategic-Energy-Management-Program

7 https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/environment/dsm/utah/RMP_2014_UT_SEM_Evaluation_Report_Final.pdf

energy efficiency, O&M improvements, and process improvements.[8] The program educates participants on behavioral changes, equipment upgrades, expanding custom and prescriptive savings, and process efficiency.

BC Hydro British Columbia. BC Hydro offers varying levels of participation in their SEM suite of programs.[9] Their Industrial Cohort program coaches participants on long-term continuous energy management and incorporates both group learning and one-on-one SEM training.

Efficiency One Nova Scotia. Efficiency Nova Scotia is a franchise owned by EfficiencyOne, and the SEM program works with C&I customers to bolster energy management support from senior-level members.[10] The program provides project management SEM support, helps set goals and keeps track of progress, facilitates workforce education, and tracks and reports energy use. Efficiency Nova Scotia has a suite of programs specific to industrial customers who use a minimum of 15 GWh in electricity annually and offers multi-year engagements to help manage complex projects and achieve energy savings.

5.2.2 INCENTIVE LEVELS

IESO SEM benchmark: $0.02/kWh of confirmed electricity savings with a maximum of $100,000 in any 12-month period. Enabling incentives of up to $5,000 over the program's duration are also available to program participants.

Two of the programs the team reviewed provided incentives based on the energy savings associated with the program, and both offered an incentive of $0.02/kWh of verified savings. BC Hydro capped this incentive at $5,000 but offered an additional $2,000 for achieving specific milestone targets. They also incentivized industrial programs through an offering of up to $7,000 in bonus funding per business participant. Specific BC Hydro custom project incentives include:

8 https://library.cee1.org/system/files/library/13219/ComEd_Nicor_SEM_EPY8_GPY5_Evaluation_Report_2016_12_16_Final.pdf
9 https://www.bchydro.com/powersmart/business/programs/energy-management.html
10 https://www.efficiencyns.ca/business-program/strategic-energy-management/

- Distribution: $0.02 - $0.05 per kWh depending on the project payback period. The maximum incentive was $500,000, a one-year payback, or 75% of the project cost (whichever was the least).
- Transmission: $0.04 per kWh with a maximum incentive of $1 million or 75% of the project cost (whichever was the least).

RMP incentivized operational and behavioral measures but did not include capital equipment expenses in traditional incentive offerings. However, customers may qualify for capital equipment incentives if they identify measures during their SEM engagement and can attribute these savings to SEM.

5.2.3 PARTICIPATION LEVELS, RETENTION RATE, SAVINGS

Many of the reviewed SEM programs were in the early stages of program timelines or had recently completed the first round of participation; retention and participation results are preliminary.

Efficiency One Nova Scotia had the most complete program EcoMetric team was able to review. Efficiency One's program duration lasts one year with an optional second-year add-on. The program had 18 unique customers enrolled between 2015 and 2020, with projections to add 1 to 2 new participants per year. Post-engagement participation rates averaged 50%, and the average amount of time each customer was enrolled was 2-3 years. Expected annual energy savings were projected at 3-4% in the first year and 1-2% in subsequent years. The program's performance resulted in 2 GWh saved in 2019 and 7.3 GWh in lifetime net energy savings (0.3 GWh incremental annual net demand savings).

BC Hydro offers a 2-year Industrial Cohort Program. It is a fully funded program led by energy experts, with about 12 industrial customer participants. With a large industrial population of about 201 customers, this program serves about 6% of BC Hydro's eligible population. The program teaches how to save energy at individual businesses in both the short term and long term and offers a holistic approach to energy management. Participants attend about 8 group workshops over a 2-year timeframe and experience one-on-one coaching sessions to maximize strategic energy management learning opportunities. Businesses are eligible if they use between 4 and 20 gigawatt-hours of electricity each year.

For **ComEd and Nicor Gas,** 8 out of 10 sites reported SEM largely influenced the installation of capital projects onsite. Natural gas capital projects resulted in an additional 497,221 therms savings above claimed SEM savings. Eight original SEM participants from the program's pilot year continued their involvement in the subsequent program year.

5.2.4 BARRIERS TO PARTICIPATION

The study team examined barriers to participation in SEM programs, which varied across geographies and program types, but some common issues emerged regarding the following:

Program organization and participant understanding of offerings.

- Newer programs experienced difficulties due to limited experience and underwent adaptations in real time as utilities learned best practices.
- There were challenges related to data accuracy and sharing, setting realistic and understandable goals, time commitment among participants, and clear expectations and roles among program staff.
- Participants experienced confusion surrounding the timing of incentives. SEM programs often prioritized capital expense project opportunities, but when customers applied for associated rebates and incentives they were placed on waitlists.

Utility preparedness and data collection.

- One program found that most applicants had completed a prior feasibility study before undertaking an SEM program.
- Utility billing systems did not necessarily support fully automated data collection and reporting.

Interval meter data would benefit savings models, but utilities found that few customers utilized interval data meters.

6 OTHER ENERGY EFFICIENCY BENEFITS

6.1 AVOIDED GREENHOUSE GAS EMISSIONS

An often overlooked impact of electric energy efficiency measures is the avoided greenhouse gas emissions from the avoided generation, transmission, and distribution of electricity in Ontario's grid. **Net first-year greenhouse gas (GHG) reductions total 1,422 metric tonnes of CO_2 equivalent (CO_2e),** as summarized in Table 11. As EM non-incented projects focus on electricity savings, these GHG reductions are derived from the avoided generation of electricity. **Over the lifetime of the PY2022 evaluated non-incented measures, net GHG reductions total 7,466 tonnes of CO_2e.**

The cost of first-year GHG emissions reductions is $334 per tonne of CO_2e from the program administrator cost perspective.

Table 11: PY2022 EM Non-Incented Avoided Greenhouse Gas Emissions

Program Year	First Year GHG Impacts (tonnes CO_2e)	First Year GHG Reduction Costs[11] ($/tonne CO_2e)	Lifetime GHG Impacts (tonnes CO_2e)
2022	1,422	$334	7,466

Through interviews with IESO-funded EMs, the EcoMetric team is aware that EMs pursue measures to reduce fossil fuel consumption within the organizations they work with. In fact, many of these organizations prioritize GHG reductions in their sustainability and energy management plans. To track these impacts, the IESO added a natural gas tracking sheet to the EM Quarterly Submission form for EMs to populate with details of their natural gas-focused measures.

6.2 NON-ENERGY BENEFITS

Benefits created by energy manager's non-incented measures extend well beyond just avoided kWh and kW. Non-energy benefits (NEBs) for these commercial measures can include thermal comfort for building occupants, reduced building and equipment maintenance, improved air quality, and reduced product spoilage.

[11] Program Administrator Costs

In 2021, Dunsky conducted an in-depth study that evaluated the value and impact of NEBs of six IESO CDM programs from 2017-2019. EcoMetric leveraged the business sector NEBs detailed in Table 12 in the Total Resource Cost (TRC) and Societal Cost (SC) tests for the EM program. **In PY2022, NEBs for the EM program totaled $884,583.** Benefits from reduced building and equipment operations and maintenance represented 58% of the NEBs for the program, followed by thermal comfort at 36%.

Overall, NEBs accounted for 37% of the $2,403,126 in total benefits achieved by the EM program in PY2022 from the TRC and SC test perspectives.

Table 12: PY2022 EM Non-Incented Non-Energy Benefits

Non-Energy Benefit	Measure Type	$/net kWh	Total TRC and SC Benefits from NEBs
Thermal Comfort	HVAC, Envelope	0.050	$321,130
Reduced Building & Equipment O&M	All	0.080	$514,291
Improved Indoor Air Quality	HVAC, Envelope	0.007	$45,001
Reduced Spoilage	HVAC, Refrigeration	0.0002	$1,286
Air Quality	All	0.0004002	$2,573
Total			**$884,583**

6.3 JOB IMPACTS

As the majority of energy managers did not have their first year of participation and non-incented measures ready for review at the time of the PY2022 evaluation, the EcoMetric team will conduct a job impacts analysis that includes all of the program's non-incented measures in the 2021-2024 CDM Framework in the upcoming PY2023 evaluation. As the program shifts towards a Strategic Energy Manager model, this will be the conclusive evaluation of the EM program.

7 KEY FINDINGS AND RECOMMENDATIONS

7.1 IMPACT EVALUATION

Finding 1: A significant share of Operational and Maintenance (O&M) and Retrocommissioning (RCx) non-incented measures submitted by Energy Managers do not have sufficient supporting documentation to verify savings impacts accurately and confidently. One impactful example of this was an energy management project at an office building claiming 1.8 GWh of annual energy savings where no information was provided on the measures implemented, and no data was provided to support the savings estimation. Due to the lack of information, EcoMetric did not include this project in the PY2022 sample frame.

The data and product documentation that the program requires Energy Managers to provide for each measure depends on the magnitude of estimated peak demand savings. The majority of these O&M and RCx measures fall within the lowest threshold of less than 15 kW, where Energy Managers are required to provide information on the baseline condition, post-measure condition, and the assumptions and methodology behind savings estimates.

Recommendation 1: Regardless of the size of the submitted savings for these measures, required supporting documentation for all O&M and RCx should include, at the very least:

- Description of each energy-saving action taken
- Date of each energy-saving measure or action
- Detailed description of pre- and post-implementation conditions
- Detailed description of assumptions and parameters used to estimate kWh and peak kW savings impacts
- Utility bills for the baseline and performance period (ideally 12+ consecutive months for each period)
- Evidence indicating how other EE measures (incented/non-incented) implemented at the same facility and/or how non-routine adjustments were accounted for in the savings analysis

Require that the technical reviewer only accept non-incented O&M and RCx measures that have the above documentation provided. Technical reviewers must either conduct an engineer review to verify EM submitted savings or accept each non-incented measure for inclusion in the energy manager's progress toward their savings target.

EcoMetric also recommends that the energy manager retract the 1.8 GWh measure submission until sufficient supporting documentation is collected for savings verification.

Finding 2: Energy managers did not estimate or submit peak demand savings for five non-incented measures where the EcoMetric team expected to see reported peak demand impacts. The supporting documentation provided by the Energy Manager was insufficient for the team to estimate a peak demand reduction for these measures.

Recommendation 2: Provide further guidance to EMs or future SEM participants on the calculation and submission of peak demand savings estimates. Require that all measures submitted that achieve kWh savings include a peak demand savings estimate. If the estimate is 0 kW, require that the participant provide a brief explanation of the savings estimation.

Finding 3: For compressed air leak repair and purge air reduction measures across two energy managers, submitted savings were calculated by multiplying the leakage cubic feet per minute (CFM) and reduced purge CFM by average specific energy consumption (SEC, kW/cfm) of all compressors. The average SEC was calculated by taking the ratio of average power and average flow for all compressors from the measured trend data. The reported peak demand savings were calculated by calculating the average SEC and multiplying it by leakage CFM. This approach averages the power consumption over the operating flow range.

For verified savings calculations, EcoMetric used the National Renewable Energy Laboratory's (NREL) recommended BIN-analysis method, which is based on actual trend data and not average power consumption over the operating flow range. This resulted in a reduction in verified savings of 47% for peak demand and 53% for energy for one project and a reduction of 30% for peak demand and 65% for energy for another project.

Recommendation 3: The IESO should issue guidelines that require the use of NREL's protocol *"Chapter 22: Compressed Air Evaluation Protocol from The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures".*[12] This protocol provides two ways of calculating savings with respect to compressed air systems. IESO should provide guidelines for participants to leverage the BIN-analysis method (Section 3.1.3) for calculating energy savings for all

[12] https://www.nrel.gov/docs/fy17osti/68577.pdf

compressed air leak repair and purge air reduction measures. In this method, savings are calculated based on actual trend data and gives a more accurate savings value.

Finding 4: For several lighting measures, reported savings calculations did not use HVAC interactive effects or summer peak coincidence factors. HVAC interactive effects consider the indirect effect of lighting measures on a building's HVAC energy usage due to the reduction in heat emitted from LEDs compared to baseline technologies. Coincidence factors represent the portion of load reduction that occurs during specified peak periods. HVAC interactive factors can increase or decrease peak demand and energy savings, while coincidence factors generally reduce peak demand savings. Without additional details regarding the lighting schedules and heating and cooling system types in the spaces that house the lights, EcoMetric is unable to estimate the electric and/or gas impacts from the omission of these factors.

Recommendation 4: For lighting measures that fit into the prescriptive measures in IESO's Measures and Assumptions List (MAL), reported savings calculations should use the peak demand savings factors from the MAL to calculate summer peak demand. The IESO should develop HVAC interactive effects and coincidence factors for common commercial building types to be used to calculate energy and peak demand savings for custom lighting projects. These factors should be provided to energy managers and technical reviewers for use in reported savings calculations.

Finding 5: Six of the 12 energy managers that the EcoMetric team reviewed rounded the reported MWh energy savings in their Quarterly Submissions to three or less decimal places. Many of these measures were smaller in scale (< 100 kWh), so the rounding created discrepancies with verified savings that were not rounded.

Recommendation 5: Require that energy managers round to six decimal places for energy savings reported in MWh units.

7.2 PROCESS EVALUATION

Finding 6: 12 of 15 surveyed EM program participants were aware of the SEM program. Many did not apply to participate. Those who did not apply reported receiving inadequate information about the SEM program.

Finding 7: 4 of 5 interviewed energy managers thought that participation in the SEM program would take the same or less time than participating in the EM program.

Finding 8: Interviewed program staff and implementers believe there is a disconnect in what SEM applicants and potential participants anticipate about the time commitment, involvement, and value proposition of the program compared to what the SEM program can realistically offer.

Recommendation 6: Program staff and the SEM implementer(s) should further refine the communications around SEM value, involvement, and time commitment to ensure customers receive adequate information about the IESO SEM program. Lack of adequate information was reported to be a barrier to SEM participation.

It is valuable to re-evaluate the list of ideal participant characteristics after at least one cycle of the program. This can help with clarifying conditions and requirements under which past participants may enroll in a second term of engagement.

Finding 9: Most, but not all, survey respondents indicated their organization would, at least in some fashion, continue to fund the energy manager position.

Finding 10: Primary and secondary data indicate that executive buy-in and engagement will be critical for SEM program participation and satisfaction.

Finding 11: 87% of EM projects were reported to have included challenges, mainly related to financial and logistical issues, which suggest they may carry over into SEM program participation.

Finding 12: Non-routine events (NREs) will distort apparent program savings if not properly tracked.

Recommendation 7 (for findings 9-12): Unlike the EM program where the energy manager wage was subsidized, the SEM program is attempting to encourage the organizations to develop organizational systems toward continuous improvements that would persist when key staff leaves or moves into different roles in an organization. The theory is that this continuous improvement will lead to energy savings and possibly non-energy benefits. Ensuring these benefits occur is critical in maintaining executive buy-in and engagement. Thus, the program should carry over lessons learned from the EM program that are relevant to SEM, including:

- Regularly monitoring participation experience (including enrollment trends, drop-outs, and satisfaction) to ensure the SEM program provides value to current and future participants
- Assessing whether current incentive level caps serve as barriers to generating expected savings
- Tracking participant NRE timing and their effect on facility energy use

Finding 13: Non-routine events (NREs) will distort apparent program savings if not properly tracked.

Finding 14: Two of five energy managers who were interviewed report that their companies are already tracking NREs.

Recommendation 8: Program implementers should carefully track participant NRE timing and their effect on facility energy use.

Finding 15: SEM programs with higher caps on incentives showed promising levels of participation and savings.

Finding 16: Four out of five interviewed energy managers said that a top motivation for applying to the program included energy savings and receiving an incentive.

Recommendation 9: Re-assess enrollment and retention rates after one program cycle to assess whether current incentive level caps are a barrier to generating expected savings.

Finding 17: Energy managers were perceived by participants as key players in project identification, analysis, and documentation. Most participants felt that energy managers were instrumental in identifying feasible projects, speeding up project implementation, and ensuring that all required documentation and savings estimates were accounted for

Recommendation 10: In marketing and outreach for the SEM program or a similar enabling program that supports energy managers, consider including testimonials from EM program participants about how full-time energy managers can be key players in identifying and successfully implementing energy efficiency projects that achieve their full savings potential.

7.3 DECARBONIZATION

Finding 18: IESO-funded energy managers' GHG reduction impacts are likely being underestimated. Tracking systems are in place for non-electric impacts, but they are not being used by the energy managers.

Recommendation 11: The IESO should require participating energy managers to track natural gas impacts in their quarterly submissions. While the IESO may not be able to claim any natural gas savings, these impacts can be used to better understand the important GHG reductions the EM program is enabling. This requirement would result in a detailed tracking system of holistic impacts driven by the energy managers to share with the organizations they work with.

Appendix A Net Verified Savings Summary Table

Table 13: PY2022 Energy Manager Non-Incented Net Verified Savings

	PY2021	PY2022	PY2022	PY2023			Total
	PY2021	PY2022	PY2021 True Ups	PY2023	PY2022 True Ups	PY2021 True Ups	
Energy Savings (GWh)	-	6.303	-	-	-	-	6.303
Peak Demand Savings (MW)	-	1.454	-	-	-	-	1.454

Appendix B Project-Specific Findings and Recs

This appendix includes key project-specific findings and recommendations from the PY2022 impact evaluation.

Finding A1: The reported savings calculations for an Air Handling Unit (AHU) and Variable Frequency Drive (VFD) project did not consider a loading factor for the post installation case. Nameplates or specification sheets were not provided for the AHUs, and the efficiency values were not matching with NEMA standards.
Recommendation A1: The load factor should be considered for both pre- and post-installation consumption calculations for fans and motors projects. If nameplates or specifications are not available for efficient units, use the most appropriate NEMA efficiency standards.

Finding A2: The reported savings calculations for an LED lighting retrofit with a metal halide baseline did not consider ballast factors. The reported savings used 400 Watts as the fixture input wattage for a 400W metal halide lamp, which only includes the nominal lamp wattage (400W) and does not account for the power to drive the ballast.
Recommendation A2: All lighting projects should consider the ballast factor for fixture power, not just the lamp rated power. The example project should have considered an input wattage of 455W to include the ballast power for the 400W metal halide lamp.

Finding A3: The reported savings calculations for a duct sealing project used IPMVP Option C whole building analysis when the measure only included the reduction of VFD setpoints for two HVAC fans. Entire buildings have complex system interactions and operational changes that can affect energy consumption at a much higher level than two HVAC fans. It is very likely that many other factors were affecting energy consumption at the whole building level beyond the reduced setpoints for the fans. EcoMetric determined that IPMVP Option A Retrofit Isolation was more appropriate to estimate savings.
Recommendation A3: Encourage the energy manager and technical reviewer to use appropriate measurement and verification options based on the project's measurement boundary. Option C should only be used if energy savings from the measure(s) is expected to be at least 10% of the buildings' overall consumption measured on a monthly basis.

Appendix C Detailed Methodologies

C.1 Gross Savings Analysis

C.1.1 Data Sources

Table 14 contains a list of the data sources used from verifying gross savings.

Table 14: Data & Information Sources Used for Impact Evaluation

Item	Description	Source
Reported (Reported) participation & savings	Savings by program, project, & measure	Technical Reviewer
Participant contact information	For project-specific interviews and site visit coordination	Technical Reviewer & IESO
Project files	Including M&V data & documentation	Technical Reviewer & IESO
Reporting template(s)	For impact reporting	IESO
Cost-effectiveness parameters	Avoided costs, admin costs, discount rate	IESO

The primary data source for non-incented Energy Manager measures in the gross impact evaluation sample was the program tracking data, calculation workbooks, and other supporting documentation submitted by the participating organization's energy manager. This information was supplemented with interviews and supplemental data requests to the energy managers in the sample. The EcoMetric team completed five site visits to visually inspect the measures and collect additional data.

The IESO retains an independent contractor to perform technical reviews of a subset of non-incented savings claims and track the progress of energy managers toward their goals. The independent contractor or technical reviewer reviews measures corresponding to at least 30% of the savings from non-incented projects submitted by each energy manager annually and typically focuses their reviews on projects with the largest energy savings. For measures receiving a technical review, the technical reviewer's calculations, notes, and adjustments were key inputs as they are the source of the reported savings estimates. The EcoMetric team also reviewed the quarterly and annual term reports prepared by the technical reviewer for each sampled participant. The intent of this initial review is to gain a detailed understanding of each upgrade and how it saves the facility energy.

For measures that were not technically reviewed, supporting calculations and documentation were requested directly from the energy managers when not available from the technical reviewer. In several cases, supporting documentation from the technical reviewer was not available until very late

in the evaluation period. Further, when the EcoMetric team requested that energy managers provide missing supporting documentation, many energy managers expressed that the documentation had already been supplied to the technical reviewer.

For certain measures, further investigation involved an email exchange, phone discussion, and/or onsite inspection with the energy manager for the measure. The purpose of these interactions was typically to clarify the team's understanding of the approach and assumptions used to calculate reported savings, as well as to inquire about additional documentation that was deemed necessary to perform verified savings calculations.

The EcoMetric team used several distinct data-collection techniques to fulfill evaluation objectives, as explained below.

C.1.2 Gross Savings Verification Methods

Project Documentation Review

Project documentation was provided mainly by the IESO's technical reviewer and, in some cases, by the energy manager. Project files utilized for review and analysis included project incentive applications, quarterly and annual energy manager submission files, engineering workbooks, equipment cut sheets, invoices, email exchanges, technical drawings, M&V plans and reports, and digital photos.

Project Audits

Project audits verify the accuracy of savings calculations, assumptions, and M&V conducted by the technical reviewer, contractors, customers, and any other parties involved in the application, implementation, and technical review process. The EcoMetric team performed audits for each project in the sample, utilizing technology-specific methods and tools and testing the calculations and assumptions used to estimate reported savings for each project.

Level 1 audits consist of a desk review of project documentation and supporting calculations, including applications, savings worksheets, M&V plans, M&V reports, engineering studies, metered data, invoices, and any other documents made available.

Level 2 audits expand upon the work conducted in the Level 1 audit and as stated above, in many cases, include a virtual review of the equipment installation and operating parameters.

Data collected from the Level 1 and Level 2 audit activities enabled the team to verify energy and demand savings for each EM project.

The EcoMetric team calculated energy and peak demand realization rates, the ratio of gross verified savings to reported savings, at the program level for all sampled measures. The team applied these program-level realization rates to the reported savings for all non-incented measures evaluated and reported in PY2021. For true-up measures, the historical program-level realization rates corresponding to the evaluation for the program year the measures were implemented were applied.

C.1.3 Summer Peak Demand Analysis

The EcoMetric team verified summer coincident peak demand impacts for each project based on the IESO-defined peak periods summarized in Table 15. High-resolution energy savings load shapes, vital for calculating on-peak demand savings, were developed for each project as possible and used to account for the seasonal, daily, and hourly variations in operating schedules and energy consumption. When project documentation did not include sufficient data to develop load shapes, EcoMetric leveraged existing load shapes contained in the IESO's Conservation and Demand Management Energy Efficiency Cost-Effectiveness Tool based on the best fit for project and facility type.

Table 15: IESO EM&V Protocol Peak Period Definitions

Definition Source	Months	Days and Hours	Calculation of Demand Savings
EM&V Protocols: Standard Peak Calculation	Summer: Jun-Aug	Weekdays 1pm-7pm	Average over entire peak period
EM&V Protocols: Standard Peak Calculation	Winter: Jan-Dec	Weekdays 6pm-8pm	Average over entire peak period
EM&V Protocols: Alternative Peak Protocols for Weather-Dependent Measures	Summer: Jun-Aug	Weekdays 1pm-7pm	Weighted average of the top hour in each of 3 months per IESO weights
EM&V Protocols: Alternative Peak Protocols for Weather-Dependent Measures	Winter: Jan-Dec	Weekdays 6pm-8pm	Weighted average of the top hour in each of 3 months per IESO weights

C.2 Net Savings Analysis

C.2.1 Net Savings Data Collection

For PY2022 projects, the EcoMetric team implemented the NTG questionnaire originally developed for the Conservation First Framework and then also implemented during the Interim Framework to provide consistency in the evaluation approach across program frameworks. The traditional free ridership approach first establishes a gross baseline (e.g., industry standard practice) and then conducts a free ridership interview to determine the degree of influence the program had in moving the customers from the gross baseline to the high-efficiency alternative that was installed. This is an excellent approach for straightforward measures, for those where only two efficiency options are available (the binary choice of the high or low-efficiency options), and when the questionnaire must be written to cover diverse technologies. All measures in the EM program fit this approach.

The primary data collection method for NTG data was through in-depth self-report interviews. This approach was consistent with the CFF and IF approaches and is allowed by the IESO's Evaluation, Measurement, and Verification Protocol v4.0. The general NTG process is as follows:

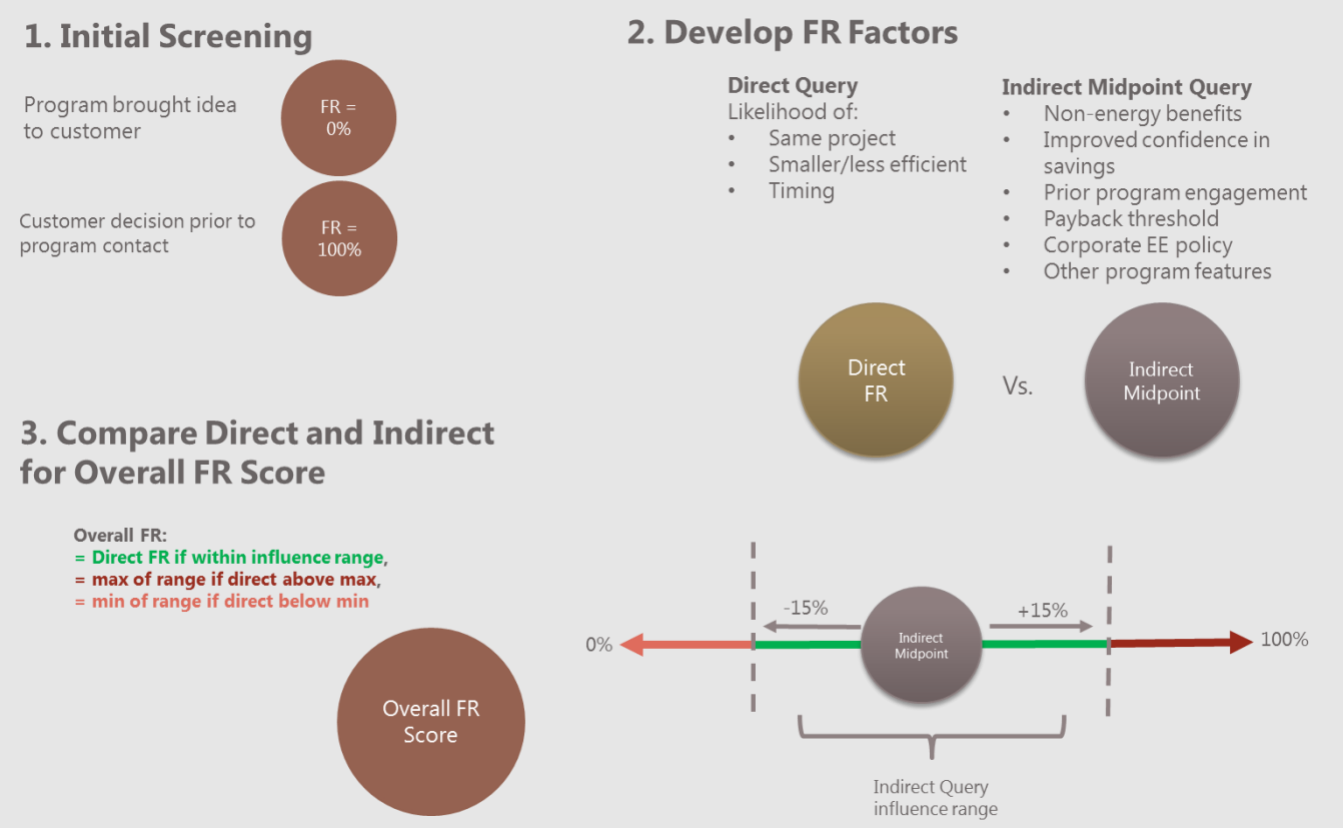
- The NTG surveys addressed the free ridership component of net savings analysis, calculating both a direct free ridership score and an indirect score that incorporates questions about program influence and any other factors that influenced the decision to implement the project. Spillover was not assessed during the PY2022 evaluation.
- Prior to roll-out of the NTG survey instruments, EcoMetric conducted training exercises to ensure that the team had the appropriate training and expertise to conduct the interviews.
- EcoMetric takes considerable steps to ensure that interviews are conducted with the primary decision-maker(s) involved in the decision-making, or at the very least, aware of the decision-making criteria for the project. The EcoMetric team works with IESO to identify the primary decision-makers for each project by first reviewing the project files and customer contact information.
- Once likely decision-makers are identified, the IESO sent personalized recruitment emails to these contacts notifying them of the upcoming interview. EcoMetric then contacted the customers directly, screening them prior to starting the interview to confirm that they were the decision-maker or involved/aware of the decision-making process. EcoMetric leveraged a combination of email and phone messages to customers at different times of day and week and logs each contact attempt (time, date, target, and result) in a contact tracking system. EcoMetric worked with IESO to conduct another contact attempt for any sites that were not responsive to initial recruitment efforts.

- In preparation for the interviews, the EcoMetric staff reviewed the project files for each customer to understand the projects completed, timelines, and any other unique characteristics of each customer. For customers who implemented multiple projects during the study year, EcoMetric investigated the two projects with the largest electricity savings to capture the most savings without creating an excessive burden on the interviewee.
- After completing each interview, the interviewer reviewed and clarified notes and submitted the interview results for quality control (QC). During the QC, results were reviewed for completeness and consistency.

C.2.2 Net Savings Data Analysis

The collected free ridership data was analyzed first by computing a direct query-based free ridership from responses on the likelihood of implementing the project absent the program and likely size, efficiency, and timing of implementation. After estimating free ridership using this direct method, EcoMetric team analysts calculated a probable free ridership range based on a series of questions about program influence and other factors that possibly influenced the decision to implement the project. The final project free ridership was computed by considering the direct query and the range. Figure 8 presents a graphical representation of the calculation approach.

Figure 8. Free Ridership Methodology



The EcoMetric team computed the free-rider (FR) factors to estimate net savings as shown in the following formula:

*Net savings = verified gross savings * (1 – FR)*

For example, an individual project with 1,000,000 kWh/year of tracking savings, a 95% realization rate, and 10% free ridership would have verified gross savings of 950,000 kWh/year, an NTG ratio of 0.90 (1-FR = 1 - 0.10), and verified net savings of 855,000 kWh/yr.

C.3 Process Evaluation

Table 16 includes a summary of data collection activities.

Table 16: Energy Manager Evaluation Activities

Item	Description
IESO program staff and implementer in-depth interviews	The purpose of these interviews is to obtain a more detailed understanding of the EM program transition to SEM, how the SEM program is promoted and communicated to energy managers and their organizations, and what challenges staff are facing in sunsetting the EM program and scaling the SEM program in the 2021-2024 Conservation and Demand Management (CDM) Framework.
Program material reviews	Review of documents pertaining to the EM program transition to SEM.
Energy Manager in-depth interviews	The purpose of these interviews is to obtain a more detailed understanding of the EM program transition to SEM, how the SEM program is promoted and communicated to energy managers and their organizations, and what challenges energy managers are facing in sunsetting the EM program and transitioning to the SEM program in the Conservation and Demand Management (CDM) Framework.
Participant surveys	The purpose of the participant surveys is to gather information to complete NTG ratio calculations, better understand the participant experience as well as inquire about the Strategic Energy Management (SEM) interest, SEM communications, and challenges associated with either the transition or conclusion of the EM program.
Program benchmarking review	Review four programs with similar geographies and meteorological activity to compare participation levels, retention rates, savings, and barriers to participation.

C.3.1 IESO and Program Delivery Vendor Staff

The team interviewed five IESO program design and delivery staff (including implementation staff). These interviews documented program transition status and challenges as well as SEM design, such as anticipated SEM incentive structure, programmatic activities, marketing and outreach, the application process, tracking and reporting procedures, QA/QC practices, and challenges and barriers for participants to enroll in SEM.

C.3.2 Energy Manager Interviews

The team interviewed five IESO-funded Energy Managers that the IESO program team identified for their interest in the new SEM model. These Energy Managers have been in communication with the IESO's program team throughout the transition, and it is expected that they have spent time reviewing the revised program terms and conditions and may have begun transitioning their processes to align with the SEM requirements. These interviews documented the Energy Managers' perspectives on the new program design, including opportunities and challenges for participants in

SEM, how their roles will evolve in this new program model, and the support and resources they will need to have success.

C.3.3 EM Participants Survey

Participant process surveys were combined with net-to-gross (NTG) survey questions to avoid over-contacting participants and streamline the data collection process. These surveys leveraged the impact and net-to-gross samples detailed in Table 2 and gathered information on customer motivations to participate in programs (specifically the new SEM program), how easy it was for them to navigate the transition if applicable (i.e., SEM application process, usability of program resources, adjusting processes to meet program requirements), interest in future SEM offerings, and future upgrade plans. The surveys will be conducted via phone.

C.3.4 SEM Program Benchmarking Review

The EcoMetric team conducted a SEM program benchmarking review. The benchmarking review documented best practices in similar SEM programs across North America. For the studies, the team aggregated program metrics from similar programs (making use of previously conducted work) and focused on cost-effective best practices of SEM programs. Based on feedback from the IESO program team in the kickoff meetings, the team focused on marketing and outreach practices as well as the success of SEM programs in reaching industrial customers.