IMPACT AND PROCESS EVALUATION REPORT

INTERIM FRAMEWORK ENERGY MANAGER PROGRAM PY2021

Date:	31 August 2022
Prepared for:	Independent Electricity System Operator (IESO)
Prepared by:	EcoMetric Consulting, LLC

ACKNOWLEDGEMENTS

EcoMetric would like to thank Jessei Kanagarajan, Alice Herrera, and Jimmy Lu from the Independent Electricity System Operator (IESO) for their assistance in managing this evaluation effort. With their support and guidance, the evaluation team was able to complete their activities as efficiently and successfully as possible.

TABLE OF CONTENTS

FIGURES

TABLES

EXECUTIVE SUMMARY

E.1 PROGRAM DESCRIPTION

The Energy Manager (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 Process Systems Upgrades Program (PSUP), Business 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 EcoMetric 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 Energy Manager program evaluation discussed in this section. Common non-incented measures include optimization, capital equipment upgrades, operational and maintenance (O&M), and behavioural measures.

In April 2019, the IESO began to centrally deliver all provincial energy efficiency programs in Ontario by implementing a new Interim Framework (IF) following a directive from the Ministry of Energy, Northern Development and Mines. The IF replaced the Conservation First Framework (CFF) with an updated Save on Energy Programs portfolio and was in effect from April 1, 2019, through December 31, 2020.

E.2 EVALUATION GOALS AND OBJECTIVES

This report documents the findings from the impact and process evaluation conducted for the EM program in Program Year (PY) 2021.

The goals of the PY2021 evaluation were to:

- Annually verify energy and summer peak demand savings.
- Assess program attribution (net-to-gross or NTG), including free-ridership.
- Conduct annual cost-effectiveness 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 impacts in tonnes of CO_2 equivalent using IESO's Cost-Effectiveness Tool.
- Estimate job impacts of the program.
- Monitor the overall effectiveness and comprehensiveness of key program elements.
- Analyze and make recommendations to improve the program.

E.3 EVALUATION RESULTS

This section summarizes the results of the PY2021 EM non-incented program impact and process evaluation.

E.3.1 IMPACT EVALUATION RESULTS

The PY2021 EM non-incented gross verified savings are summarized in Table 1 and Table 2. In total, 149 non-incented measures completed in PY2021 were evaluated and reported as part of the sample frame. An additional 140 non-incented measures completed in PY2019 and PY2020 are included in the PY2021 report as true ups.1

The total gross verified energy savings for the EM non-incented program in PY2021 are 14,722 MWh, representing 105% of reported savings. True-up projects from PY2019 and PY2020 totaled 18,955 MWh of gross verified energy savings, representing almost 100% of reported savings. When combined, the total gross verified energy savings for PY2021 and PY2019, and PY2020 true-up projects are 33,677 MWh—102% of reported savings. Total gross verified summer peak demand savings for the EM non-incented program are 11.99 MW, representing 105% of total reported savings.

The program-level NTG for the EM non-incented measures was 81% for the PY2021 projects, reflecting a free-ridership score of 19%. Spillover was not assessed for the program as part of this evaluation.[2] Total net first-year savings for PY2021 non-incented EM projects was 11,925 MWh, and net peak demand savings were 1.62 MW. Including true-ups from PY2019 and PY2020, total net first-

1 Adjustment factors (realization rates and net to gross ratios) for true-up projects were calculated during the evaluation of the program year they were installed. EcoMetric applied these adjustment factors to the true-up projects in this report.

[2] Historically, EcoMetric has found no spillover in the Energy Manager program. The non-incented path for energy managers captures any spillover from the IESO-funded energy managers.

year savings was 29,174 MWh and net peak demand savings totaled 10.71 MW. Ninety-one percent of the energy savings achieved by the PY2021 sample frame persist through 2022.

Table 1: PY2021 EM Non-Incented Energy Savings Summary

Program Year	Measures Evaluated & Reported	Energy Realization Rate	Gross Verified Energy Savings (MWh)	NTG Ratio	Net Verified Energy Savings (MWh)	Net Verified Energy Savings Persisting at 2022 (MWh)
2021	149	105%	14,722	81%	11,925	11,790
2020 True Ups	124	100%	15,190	91%	13,823	12,645
2019 True Ups	16	100%	3,765	91%	3,426	2,106
TOTAL	**289**	**102%**	**33,677**	**89%**	**29,174**	**26,541**

Table 2: PY2021 EM Non-Incented Summer Peak Demand Savings Summary

Program Year	Projects Evaluated & Reported	Demand Realization Rate	Gross Verified Summer Peak Demand Savings (MW)	NTG Ratio	Net Verified Summer Peak Demand Savings (MW)	Net Verified 2022 Summer Peak Demand Savings (MW)
2021	149	104%	2.00	81%	1.62	1.62
2020 True Ups	124	105%	8.91	91%	8.11	8.03
2019 True Ups	16	105%	1.07	91%	0.98	0.48
TOTAL	**289**	**105%**	**11.99**	**89%**	**10.71**	**10.13**

E.3.2 COST EFFECTIVENESS EVALUATION RESULTS

As shown in Table 3, the EM non-incented program in PY2021 is not cost effective from the TRC or PAC test perspectives using a benefit/cost threshold of 1.0.[3] The cost effectiveness of the program in PY2021 was negatively affected by the high project costs for several large and costly HVAC measures

[3] The EM non-incented cost effectiveness analysis for PY2021 only includes projects implemented in the calendar year 2021.

completed, and more administrative support and guidance for the participants under contract was required of the IESO and technical reviewers due to impacts from COVID-19.

IESO-funded energy managers provide value to participating organizations outside of kWh and kW savings including identifying natural gas and water savings, developing sustainability strategies, and improving energy data collection and analysis. The benefits of these additional services from IESO-funded energy managers were not quantified or included in this analysis, but they certainly provide value to the organizations the energy managers work in.

Table 3: PY2021 EM Non-Incented Cost Effectiveness Results

TRC Costs	TRC Benefits	TRC Ratio	PAC Costs	PAC Benefits	PAC Ratio	LC $/kWh
$30,228,401	$4,844,781	**0.16**	$4,376,480	$4,212,853	**0.96**	0.05

E.4 KEY FINDINGS AND RECOMMENDATIONS

The key findings and recommendations derived from the impact evaluation are listed in this section.

Finding 1: Supporting documentation provided by the energy managers for many of the smaller projects (< 100 MWh) was inadequate to determine how savings were calculated and reviewed. Of the 149 non-incented measures from PY2021, 128 were less than 100 MWh. Savings for the smaller projects accounted for 22% of the program's total in PY2021. These smaller projects include optimization, O&M, behavioural, and equipment upgrades. While savings for behavioural and O&M measures can be more difficult to substantiate with supporting documentation, half of the smaller projects were equipment upgrades such as HVAC and lighting. Basic information on the equipment and its operations is sufficient to substantiate savings estimates, but many of these projects had inadequate supporting documentation.

This is a persisting issue that EcoMetric provided findings and recommendations for in the PY2020 evaluation report. The level of details required by the IESO and the structure of the Quarterly Submission Reports are sufficient to verify savings for smaller projects. However, the technical reviewer is accepting these projects without enough information to verify savings.

The IESO responded by adding more details and guidelines for the documentation required in the EM Quarterly Submission Reports[4] for projects with savings of less than 100 MWh. For these smaller projects, the IESO requires a description of the baseline condition, description of the post-project condition, estimated persistence of savings, and a description of steps taken to ensure persistence of savings. The IESO recently added more details to the EM Quarterly Submission Reports to clarify what is necessary to provide for each theme of the project details. However, EcoMetric found that many EMs did not provide enough details to verify savings estimates, even at the most basic level. For example, a non-incented lighting project would not include details on the number or wattage of fixtures in either the baseline or post-project period. The level of details required by the IESO and the structure of the Quarterly Submission Reports are sufficient to verify savings for smaller projects. However, the technical reviewer is accepting these projects without enough information to verify savings.

For larger projects, the level of documentation provided by the energy managers and technical reviewers was sufficient to verify savings accurately and thoroughly. The exception was one large optimization, and BAS controls project that lacked reported savings for one major measure in the larger project, resulting in EcoMetric's inability to determine the driver of the energy realization rate.

> **Recommendation 1:** Require that the technical reviewer only accept non-incented measures that have sufficient documentation for savings verification. The technical reviewer is not required to conduct an engineering review of every measure, but they must accept every measure for inclusion in the energy manager's progress towards their non-incented savings target. Provide a list of required information for common projects that achieve less than 100 MWh. For example, a lighting project would require baseline wattages, efficient wattages, number and type of fixtures or bulbs retrofitted, and the annual hours of use.

Finding 2: Following a trend EcoMetric saw between PY2019 and PY2020, non-incented projects in PY2021 generally showed improved attention to detail in the peak demand savings calculations. In prior years, EcoMetric often found peak demand savings values set to missing or zero in the program

[4] EM Quarterly Submission file is an Excel document where EMs submit details on incented and non-incented measures implemented at participating organizations and track savings and progress towards goals over their tenure.

tracking data. This was not an issue in the PY2021 sample frame. However, several EMs would claim the change in connected load as summer peak demand savings without consideration of coincidence.

> **Recommendation 2:** The IESO should develop guidelines for calculating peak demand savings aimed at energy managers. These guidelines would be beneficial for the program in the 2021-2024 CDM Framework, which focuses on achieving peak demand savings. As the program shifts toward a Strategic Energy Management design, guidance and training for participants should focus on the difference between peak demand savings and changes in connected load.

Finding 3a: In PY2021, IESO-funded energy managers were responsible for 55,350 MWh of reported energy savings and 7.98 MW of reported summer peak demand savings across the programs they enabled savings in. This represents 12% and 11% of the total savings in the EM, Retrofit, PSUP, and EPP programs, respectively. IESO-funded energy managers are major enablers of energy and summer peak demand savings across the IESO's portfolio of programs.

Finding 3b: IESO-funded energy managers implement larger projects and achieve more energy savings at their facilities, on average, than the general population. In the PY2021 Retrofit program, projects led by IESO-funded energy managers averaged 66,355 kWh reported energy savings while the rest of the population averaged 37,735 kWh. Average Retrofit energy savings for facilities with an IESO-funded energy manager were 124,338 kWh compared to 97,467 kWh for facilities without an energy manager.

In PSUP, an organization with an IESO-funded energy manager implemented the project with the highest level of reported energy and summer peak demand savings in PY2021—accounting for one-third of the total reported energy savings and nearly two-thirds of the total reported summer peak demand savings.

These findings further support the results from the PY2020 holistic evaluation of IESO-funded energy managers, where they achieved 11% of the savings in the programs they participated in.

Recommendation 3: As the EM program transitions towards a Strategic Energy Management design in the 2021-24 CDM Framework, include training and resources on how to achieve savings and receive incentives through the other programs in the IESO portfolio. Structure the program to reward participating organizations that achieve savings both through the SEM program and in other programs by offering an incentive booster for reaching portfolio-wide savings goals.

1 INTRODUCTION

1.1 EVALUATION GOALS AND OBJECTIVES

The Independent Electricity System Operator (IESO) retained EcoMetric Consulting, LLC, to evaluate the 2019-2020 Interim Framework (IF) 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 goals of the PY2021 evaluation were to:

- Annually verify energy and summer peak demand savings.
- Assess program attribution (net-to-gross or NTG), including free-ridership.
- Conduct annual cost-effectiveness 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 impacts in tonnes of CO_2 equivalent using IESO's Cost-Effectiveness Tool.
- Estimate job impacts of the program.
- Monitor the overall effectiveness and comprehensiveness of key program elements.
- Analyze and make recommendations to improve the program.

This report contains the impact and process evaluation findings conducted for the Energy Manager (EM) program in Program Year (PY) 2021. Energy managers identify and help to implement non-incented improvements for the organizations they support. These non-incented projects are the focus of the Energy Manager program evaluation discussed throughout this report.

In April 2019, the IESO began to centrally deliver all provincial energy efficiency programs in Ontario by implementing a new Interim Framework following a directive from the Minister of Energy, Northern Development and Mines. The IF replaced the Conservation First Framework (CFF) with an updated Save on Energy Programs portfolio and was in effect from April 1, 2019, through December 31, 2020. Energy managers started the process of completing the non-incented measures in the second half of 2019. Projects implemented in PY2019 and PY2020 are characterized as true ups in this report.

1.2 PROGRAM DESCRIPTION

The Energy Manager 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 Process Systems Upgrades Program (PSUP), Business 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 EcoMetric 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 Energy Manager program evaluation discussed in this section. Common non-incented measures include optimization, capital equipment upgrades, operational and maintenance (O&M), and behavioural measures.

2 METHODOLOGY

This section of the report outlines the methodologies used in the PY2021 evaluation of the EM program. More detailed descriptions of the evaluation methodology are included in Appendix B.

2.1 EVALUATION APPROACH

Methods used to conduct this evaluation include virtual 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 SAMPLE DESIGN

EcoMetric's focus for the evaluation of the EM program is the non-incented projects completed by the energy managers. The sample frame for the PY2021 impact evaluation was all participating organizations with reported kWh savings from non-incented projects completed in PY2021 in the program tracking data on April 1st, 2022 (n=27). EcoMetric used the energy manager as the sampling unit for the non-incented EM program gross and net impact evaluation resulting in a large evaluation sample of non-incented measures. EcoMetric selected a sample of 15 energy managers and their participating organizations for the impact evaluation. Each organization with over 1,000 MWh of reported savings (n=5) was placed into a certainty stratum, and a random sample (n=10) of the remaining energy managers with reported savings of less than 1,000 MWh were selected to complete the sample.

For each sampled energy manager, EcoMetric reviewed all completed non-incented measures with reported kWh savings—both those that received a technical review and ones that did not receive a technical review. The technically reviewed measures accounted for 66% of the first-year energy savings in the sample frame, and the measures that did not receive a technical review accounted for the remaining 34% of the reported energy savings in the sample. The evaluation sample included 93% of all reported non-incented savings. Since a large share of the program savings was evaluated, the sampling error was limited. The relative precision of the energy realization rate was ±3.1% at the 90% confidence level.

Completing the invoicing process for a project is a requirement for savings to be reported. Twenty-one energy managers were invoiced by the IESO, and EcoMetric reported the savings for all of their non-incented measures.

Non-incented measures evaluated and reported in PY2021include lighting retrofits, lighting controls and scheduling, mining operation upgrades, pump variable frequency drives, compressed air, HVAC, building automation systems, optimization, operation, and maintenance measures, among others.

2.2 DATA COLLECTION

The primary data source for non-incented Energy Manager projects 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. No site inspections were conducted for the PY2021 evaluation due to COVID-19 restrictions, but several "virtual" inspections were conducted via smartphone video application.

2.3 GROSS SAVINGS VERIFICATION

EcoMetric performed energy and peak demand savings analyses for all non-incented measures. Energy savings were annualized, regardless of the time-of-year or duration of measured data available. EcoMetric 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 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.

2.4 NET SAVINGS ANALYSIS

EcoMetric 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 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 PY2021 continues to utilize the enhancements made to the NTG questionnaire for the Conservation First Framework (CFF) evaluation. Results from the prior NTG spillover assessments from PY2013 through PY2017 sites did not identify any spillover attributable to any of the programs in the industrial portfolio, so the team did not assess participant spillover for PY2021. The EM program is designed to capture spillover as non-incented measures, so any additional spillover is challenging to identify. As in the past, the basis of free-ridership analysis for the IESO's industrial

programs was 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.

EcoMetric calculated an NTG ratio, the ratio of net verified savings to gross verified savings, at the program level for all sampled participating organizations. EcoMetric applied these program-level NTG ratios to the gross verified savings for all non-incented measures evaluated and reported in PY2021. For true-up measures, the historical program-level NTG ratios corresponding to the evaluation for the program year the measures were implemented were applied.

2.5 COST EFFECTIVENESS ANALYSIS

EcoMetric used the IESO Conservation and Demand Management (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 outlined in the IESO CDM Cost-Effectiveness Guide.

2.6 OTHER ENERGY EFFICIENCY BENEFITS

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 JOB IMPACTS ESTIMATION

EcoMetric leveraged the Statistics Canada (StatCan) custom input/output (I/O) economic model to estimate the job impacts of the EM program. The StatCan I/O model simulates the economic and employment impacts of economic activity related to the program. The economic activity related to the EM program was leveraged as "shocks", which act as inputs into the model to show the direct, indirect, and induced impacts on the number of jobs created by the program. The I/O model uses regional and national multipliers to estimate the economy-wide effects of the economic activity induced by the program. The I/O model used three shocks to determine the job impacts of the EM program:

- Demand for goods and services related to the program
- Business reinvestment
- Program funding

EcoMetric and StatCan developed the shocks using the net verified savings for the sample frame summarized in Section 3.2. The output of the model expresses job impacts in "person-years"—representing a job for one person for one year.

3 IMPACT EVALUATION

This section details the results from the impact evaluation of the EM non-incented program in PY2021.

3.1 GROSS VERIFIED SAVINGS RESULTS

Gross verified savings results for the PY2021 Energy Manager non-incented program are summarized in Table 4. In total, 149 non-incented measures completed in PY2021 were evaluated and reported as part of the sample frame. An additional 140 non-incented measures completed in PY2019 and PY2020 are included in the PY2021 report as true ups.

The total gross verified energy savings for the EM non-incented program in PY2021 are 14,722 MWh, representing 105% of reported savings. True up projects from PY2019 and PY2020 totaled 18,955 MWh of gross verified energy savings, representing almost 100% of reported savings. When combined, the total gross verified energy savings for PY2021 and PY2019 and PY2020 true up projects are 33,677 MWh—102% of reported savings. Total gross verified summer peak demand savings for the EM non-incented program are 11.99 MW, representing 105% of total reported savings.

Table 4: PY2021 EM Non-Incented Gross Verified Savings Results

Program Year	Projects Evaluated	Energy Realization Rate (%)	Gross Energy Savings (MWh)	Peak Demand Realization Rate (%)	Gross Summer Peak Demand Savings (MW)
2021	149	105%	14,722	104%	2.00
2020 True Ups	124	100%	15,190	105%	8.91
2019 True Ups	16	100%	3,765	105%	1.07
TOTAL	**289**	**102%**	**33,677**	**105%**	**11.99**

Non-incented projects implemented by energy managers commonly include behavioural and O&M measures, which have a shorter persistence than equipment retrofit projects.

While EcoMetric applied the program-level realization rates to all non-incented measures evaluated and reported in PY2021, individual energy manager energy realization rates ranged between 73% and 156%. Peak demand realization rates ranged between 65% and 159%.

Finding 1: Supporting documentation provided by the energy managers for many of the smaller projects (< 100 MWh) was inadequate to determine how savings were calculated and reviewed. Of the 149 non-incented measures from PY2021, 128 were less than 100 MWh. Savings for the smaller

projects accounted for 22% of the program's total in PY2021. Table 5 provides a breakdown of the PY2021 non-incented measures in each of the four categories that drive the level of M&V and supporting documentation required by the program. Smaller projects in PY2021 included optimization, O&M, behavioural, and equipment upgrades. While savings for behavioural and O&M measures can be more difficult to substantiate with supporting documentation, half of the smaller projects were equipment upgrades such as HVAC and lighting. Basic information on the equipment and its operations is sufficient to substantiate savings estimates, but many of these projects had inadequate supporting documentation.

Table 5: PY2021 EM Non-Incented Measures by Size

Program Year	Number of Measures	Gross Energy Savings (MWh)	Percent of PY2021 Program Savings
Less than 100 MWh/year	128	3,158	22%
100 – 250 MWh/year	11	1,629	11%
250 – 500 MWh/year	6	1,974	13%
Greater than 500 MWh/year	4	7,961	54%
TOTAL	**149**	**14,722**	

The IESO responded by adding more details and guidelines for the documentation required in the EM Quarterly Submission Reports[5] for projects with savings of less than 100 MWh. For these smaller projects, the IESO requires a description of the baseline condition, description of the post-project condition, estimated persistence of savings, and a description of steps taken to ensure persistence of savings. The IESO recently added more details to the EM Quarterly Submission Reports to clarify what is necessary to provide for each theme of the project details. However, EcoMetric found that many EMs did not provide enough details to verify savings estimates, even at the most basic level. For example, a non-incented lighting project would not include details on the number or wattage of fixtures in either the baseline or post-project period. The level of details required by the IESO and the structure of the Quarterly Submission Reports are sufficient to verify savings for smaller projects. However, the technical reviewer is accepting these projects without enough information to verify savings.

[5] EM Quarterly Submission file is an Excel document where EMs submit details on incented and non-incented measures implemented at participating organizations and track savings and progress towards goals over their tenure.

For larger projects, the level of documentation provided by the energy managers and technical reviewers was sufficient to verify savings accurately and thoroughly. The exception was one large optimization, and BAS controls project that lacked reported savings for one major measure in the larger project, resulting in EcoMetric's inability to determine the driver of the energy realization rate.

> **Recommendation 1:** Require that the technical reviewer only accept non-incented measures that have sufficient documentation for savings verification. The technical reviewer is not required to conduct an engineering review of every measure, but they must accept every measure for inclusion in the energy manager's progress towards their non-incented savings target. Provide a list of required information for common projects that achieve less than 100 MWh. For example, a lighting project would require baseline wattages, efficient wattages, number and type of fixtures or bulbs retrofitted, and the annual hours of use.

Finding 2: Following a trend EcoMetric saw between PY2019 and PY2020, non-incented projects in PY2021 generally showed improved attention to detail in the peak demand savings calculations. In prior years, EcoMetric often found peak demand savings values set to missing or zero in the program tracking data. This was not an issue in the PY2021 sample frame. However, several EMs would claim the change in connected load as summer peak demand savings without consideration of coincidence.

> **Recommendation 2:** The IESO should develop guidelines for calculating peak demand savings aimed at energy managers. These guidelines would be beneficial for the program in the 2021-2024 CDM Framework, which focuses on achieving peak demand savings. As the program shifts toward a Strategic Energy Management design, guidance and training for participants should focus on the difference between peak demand savings and changes in connected load.

More detailed project-specific findings and recommendations are included in Appendix A.

3.2 NET VERIFIED SAVINGS RESULTS

Table 6 summarizes the EM non-incented net savings below. The program-level NTG for the EM non-incented measures was 81% for the PY2021 projects, reflecting a free-ridership score of 19%. Spillover was not assessed for the program as part of this evaluation. Total net first-year savings for non-incented EM projects evaluated in PY2021 was 29,174 MWh, and net peak demand savings were

10.71 MW. Ninety-one percent of the energy savings achieved by the PY2021 sample frame persist to 2022.

Energy managers were perceived by customers as key players in project identification, analysis, and documentation. While in a few cases, the customers indicated they would likely have pursued the projects in question regardless of whether they had an energy manager. In most cases, the interviewees 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 6: PY2021 EM Non-Incented Net Verified Savings Results

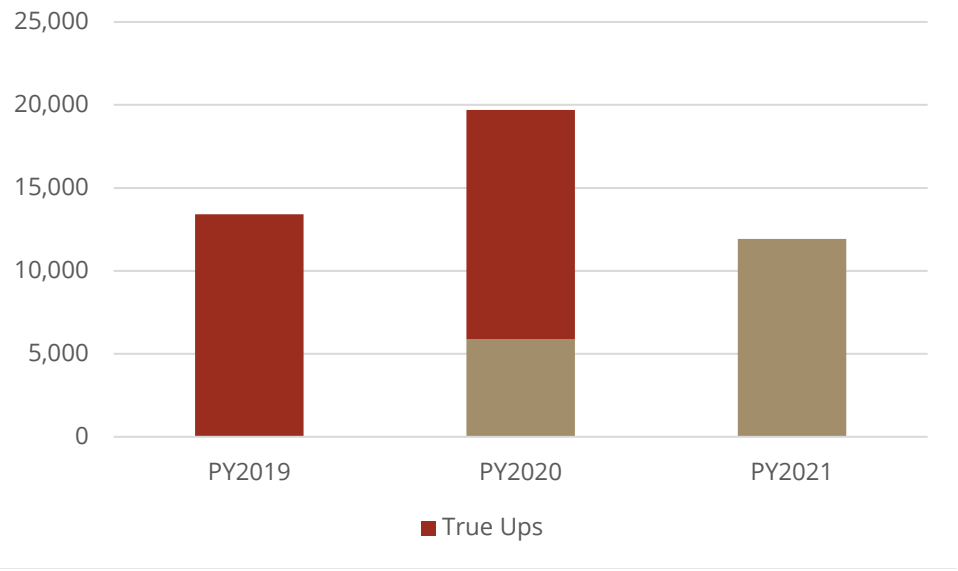
Program Year	Projects Evaluated & Reported	NTG Ratio	Net Energy Savings (MWh)	Net 2022 Energy Savings (MWh)	Net Summer Peak Demand Savings (MW)	Net 2022 Summer Peak Demand Savings (MW)
2021	149	81%	11,925	11,790	1.62	1.62
2020 True Ups	124	91%	13,823	12,645	8.11	8.03
2019 True Ups	16	91%	3,426	2,106	0.98	0.48
TOTAL	**289**	**89%**	**29,174**	**26,541**	**10.71**	**10.13**

3.2.1 TOTAL IF ENERGY MANAGER NET SAVINGS

Figure 1 summarizes the net energy savings achieved in the EM program throughout the IF. **As part of the IF, the EM program has achieved 45,037 MWh of net first-year energy savings through non-incented measures, representing 88% of gross verified energy savings. Eighty percent of these savings persist through 2022, totaling 36,197 MWh.**

Through discussions with the IESO and its technical reviewer, EcoMetric learned that there is still a large backlog of PY2021 EM reviews to be completed. EcoMetric expects a significant amount of PY2021 true up projects in the PY2022 evaluation, resulting in a major increase in net savings.

Figure 1: Total IF EM Non-Incented Net Verified Energy Savings (MWh)



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 90% is achieved through the IESO's incented programs such as Business Retrofit (Retrofit), PSUP, and EPP. Due to the wide range of eligible measures and relative ease of participation, most energy managers' incented energy savings come from measures implemented through the Retrofit program. PSUP provides incentives for engineering studies and implementation of large, complex energy efficiency projects, mainly in the industrial sector. EPP is a whole-building pay-for-performance program that rewards savings from capital and non-capital measures.

Table 7 summarizes the reported energy and summer peak demand savings IESO energy managers were responsible for in the IF PY2021. Projects implemented by IESO-funded energy managers achieved 55,350 MWh of reported energy savings in PY2021, accounting for 12% of total energy savings across the IESO programs they participated in. In terms of summer peak demand savings, IESO-funded energy managers achieved 7.98 MW of reported savings, accounting for 11% of total demand savings.

In EPP, one of the two participating organizations with reported savings in PY2021 had an active IESO-funded energy manager. This energy manager achieved over half of the reported savings for the program. In PSUP, an organization with an IESO-funded energy manager implemented the largest project in the entire sample frame of 14 projects, representing 3,856 MWh of reported energy savings.

Table 7: Energy Manager Savings in PY2021 IESO Programs

Program	PY2021 Energy Manager Reported Energy Savings (MWh)	Percent of Total PY2021 Program Energy Savings	PY2021 Energy Manager Reported Summer Peak Demand Savings (MW)	Percent of Total PY2021 Program Demand Savings
Retrofit	36,695	8%	5.62	8%
PSUP	3,856	34%	0.35	64%
EPP[6]	741	51%	0.09	51%

Finding 3a: In PY2021, IESO-funded energy managers were responsible for 55,350 MWh of reported energy savings and 7.98 MW of reported summer peak demand savings across the programs they enabled savings in. This represents 12% and 11% of the total savings in the EM, Retrofit, PSUP, and EPP programs, respectively. IESO-funded energy managers are major enablers of energy and summer peak demand savings across the IESO's portfolio of programs.

Finding 3b: IESO-funded energy managers implement larger projects and achieve more energy savings at their facilities, on average, than the general population. In the PY2021 Retrofit program, projects led by IESO-funded energy managers averaged 66,355 kWh reported energy savings while the rest of the population averaged 37,735 kWh. Average Retrofit energy savings for facilities with an IESO-funded energy manager were 124,338 kWh compared to 97,467 kWh for facilities without an energy manager.

In PSUP, an organization with an IESO-funded energy manager implemented the project with the highest level of reported energy and summer peak demand savings in PY2021—accounting for one-third of the total reported energy savings and nearly two-thirds of the total reported summer peak demand savings.

These findings further support the results from the PY2020 holistic evaluation of IESO-funded energy managers, where they achieved 11% of the savings in the programs they participated in.

[6] Includes the performance periods in PY2020 and PY2021. EPP is a multi-year pay for performance program.

Recommendation 3: As the EM program transitions towards a Strategic Energy Management design in the 2021-24 CDM Framework, include training and resources on how to achieve savings and receive incentives through the other programs in the IESO portfolio. Structure the program to reward participating organizations that achieve savings through the SEM program and in other programs by offering an incentive booster for reaching portfolio-wide savings goals.

4 COST EFFECTIVENESS EVALUATION

As shown in Table 8, the EM non-incented program in PY2021 is not cost effective from the TRC or PAC test perspectives using a benefit/cost threshold of 1.0[7]. The cost effectiveness of the program in PY2021 was negatively affected by the high project costs for several large and costly HVAC measures completed, and more administrative support and guidance for the participants under contract was required of the IESO and technical reviewers due to impacts from COVID-19.

IESO-funded energy managers provide value to participating organizations outside of kWh and kW savings including identifying natural gas and water savings, developing sustainability strategies, and improving energy data collection and analysis. The benefits of these additional services from IESO-funded energy managers were not quantified or included in this analysis, but they certainly provide value to the organizations the energy managers work in.

Table 8: PY2021 EM Non-Incented Cost Effectiveness Results

TRC Costs	TRC Benefits	TRC Ratio	PAC Costs	PAC Benefits	PAC Ratio	LC $/kWh
$30,228,401	$4,844,781	**0.16**	$4,376,480	$4,212,853	**0.96**	0.05

Finding 4: The TRC ratio for the EM program was significantly affected by two large and costly HVAC measures. These measures did not achieve sufficient energy savings to create benefits from avoided costs to offset the high project costs.

Recommendation 4: Consider screening large, capital-intensive projects for cost effectiveness before accepting them as non-incented measures. These large projects would be a better fit for a program like PSUP, where extensive engineering studies and M&V are required to ensure the feasibility and cost effectiveness of the project before the investment is made.

[7] The EM non-incented cost effectiveness analysis for PY2021 only includes projects implemented in the calendar year 2021.

The full cost of the energy managers' salaries and administrative costs related to marketing and training of energy managers is included in the cost effectiveness of the EM non-incented program. Energy managers' main focus is to identify and implement projects through the IESO's incented programs, such as Business Retrofit and PSUP.

In the PY2020 evaluation report, EcoMetric recommended that the salaries paid to energy managers and administrative spending related to the outreach and training of energy managers should be distributed amongst the programs the energy managers are achieving savings. As the holistic impact Section 3.3 highlights, IESO-funded energy managers are major assets to drive savings across the IESO portfolio and spend much of their time and focus on implementing projects through incented programs. Reported energy savings from non-incented measures only accounted for 25% of the total reported savings IESO-funded energy managers achieved in PY2021. Meanwhile, 66% of the reported energy savings achieved by energy managers were incented by Retrofit, 7% by PSUP, and 1% by EPP.

Table 9 summarizes the PY2021 cost effectiveness results for the Energy Manager non-incented program, where 25% of the energy managers' salaries and administrative costs are included—corresponding to the 25% electric energy savings achieved through non-incented measures by the energy managers that year.

With the costs associated with energy managers distributed based on the amount of savings achieved through the non-incented program path, the PAC ratio increases to 3.85, and the levelized cost per kWh drops to $0.01/kWh. The TRC only increases to 0.18 due to the high project costs related to a few major non-incented measures. Following this methodology, the cost effectiveness of the Business Retrofit and PSUP programs would also be affected as their costs increase, but the energy manager impact on these programs in terms of savings and costs is small, and the results would not dramatically change.

Table 9: PY20201 EM Non-Incented Alternative Cost Effectiveness Results

TRC Costs	TRC Benefits	TRC Ratio	PAC Costs	PAC Benefits	PAC Ratio	LC $/kWh
$26,946,041	$4,844,781	**0.18**	$1,094,120	$4,212,853	**3.85**	0.01

5 OTHER ENERGY EFFICIENCY BENEFITS

5.1 AVOIDED GREENHOUSE GAS EMISSIONS

Net first-year greenhouse gas (GHG) reductions total 3,140 metric tonnes of CO_2 equivalent (CO_2e) for the PY2021 sample frame, as summarized in Table 10. 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 PY2021 sample frame projects, net GHG reductions total 40,287 tonnes of CO_2e.

For the PY2021 sample frame, the cost of first-year GHG emissions reductions is $13,460 per tonne of CO_2e from the total resource cost perspective. Emissions reduction costs for the EM non-incented program increased compared to PY2020 from the TRC perspective due to the capital-intensive HVAC measures implemented in PY2021.

Table 10: PY2021 EM Non-Incented Greenhouse Gas Emissions Impacts

Program Year	First Year GHG Impacts (tonnes CO_2e)	First Year GHG Reduction Costs ($/tonne CO_2e) (Total Resource Costs)
2021	1,378	$21,941
2020 True Ups	1,487	$7,161
2019 True Ups	275	$4,228
Total	**3,140**	**$13,460**

Finding 5: EcoMetric's interviews with energy managers and program participants in PY2020 found that energy management at commercial and industrial facilities has an increasing focus on decarbonization. However, GHG impacts are only calculated by the evaluation contractor well after project commissioning and performance.

Recommendation 5: Provide energy managers participants with an emissions tool to calculate their reduction of greenhouse gas emissions associated with the purchase of electricity.[8] For simple emissions reductions calculations based on annual kWh and peak kW savings, the GHG module of the IESO CE Tool would be a good framework to leverage for the tool.

5.2 JOB IMPACTS SUMMARY RESULTS

As summarized in Table 11, the EM program created an estimated 429 jobs in PY2021, including PY2019 and PY2020 true up projects. Of these 429 jobs, 256 were direct jobs, 38 were indirect jobs, and 135 were induced jobs. Nearly all the jobs created from the program were local, with 405 of the 429 total jobs created in Ontario. In terms of full-time equivalent (FTE), the program created an estimated 387 total jobs.

Jobs and FTEs are expressed in person-years, meaning each job or FTE represents one job for one person for one year.

Direct jobs include all jobs created by EM program activity, including the energy managers themselves, administrative jobs, contractors hired to complete projects, engineers, and inspectors, among many others. Indirect jobs include the additional jobs created from economic activity related to program participation, including equipment and supply distribution centers, delivery drivers, and manufacturing, among many others. Induced jobs include the jobs supported by the "ripple effects" of economic activity from EM program participation (i.e., the re-spending of income and benefits resulting from EM program activity).

[8] Emissions associated with the purchase of electricity are commonly referred to as Scope 2 emissions.

Table 11: EM Non-Incented Job Impacts

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
PY2021				
Direct	181	181	185	184
Indirect	15	19	18	21
Induced	59	68	79	91
PY2021 Total	**255**	**268**	**281**	**296**
PY2020 True Ups				
Direct	58	59	59	59
Indirect	9	9	9	12
Induced	23	28	32	37
PY2020 Total	**90**	**96**	**100**	**108**
PY2019 True Ups				
Direct	13	13	13	13
Indirect	4	4	4	5
Induced	4	6	7	7
PY2019 Total	**21**	**23**	**24**	**25**
Grand Total	**366**	**387**	**405**	**429**

The EM non-incented program in the IF has resulted in the creation of 429 jobs throughout Canada, most of which are direct jobs in Ontario's other provincial and territorial government services industries.

Table 12 summarizes the cumulative job impacts of the EM program in the IF, including the job impacts from the PY2020 evaluation that covered PY2019 and PY2020. In total, the EM program in the IF has created 497 jobs across Canada, 467 of which are in Ontario.

Table 12: Cumulative IF EM Non-Incented Job Impacts

Program Year	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
PY2021	255	268	281	296
PY2020	132	140	144	156
PY2019	36	40	42	45
Grand Total	**423**	**448**	**467**	**497**

5.2.1 EM NON-INCENTED JOB IMPACTS BY INDUSTRY

Table 13 summarizes the job impacts by industry for the EM non-incented program in PY2021, including PY2019 and PY2020 true ups. Over half of the jobs created by the program are in the other provincial and territorial government services sector, where the I/O model places the IESO-funded energy managers and their energy management teams. The wholesale and retail trade and manufacturing sectors also account for 103 total jobs created throughout Canada. The program funding shock, represented by the portion of EM program funding covered by Ontario's residential sector, resulted in job losses in the retail trade and accommodation and food services sectors. These sectors are some of the largest industries in the province in terms of the number of workers, so the program funding shock impacted them the most.

Table 13: EM Non-Incented Job Impacts by Industry

Industry	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Other provincial and territorial government services	222	235	245	258
Wholesale Trade	27	28	30	32
Retail Trade	34	36	37	39
Manufacturing	27	28	30	32
Finance, insurance, real estate, rental, and leasing and holding companies	20	21	22	24
Engineering Construction	13	14	15	16
Non-residential building construction	20	21	22	24
Professional, scientific, and technical services	13	14	15	16
Accommodation and food services	13	14	15	16
Administrative and support, waste management and remediation services	7	8	7	8
Other services (except public administration)	7	8	7	8
Health care and social assistance	7	7	7	8
Transportation and Warehousing	7	7	7	8
Government Health Services	6	7	7	8
Total	**423**	**448**	**467**	**497**

5.2.2 EM NON-INCENTED JOB IMPACTS BY MODEL SHOCK

As described in Section 2.6.2, job impacts of the EM non-incented program were estimated leveraging three shocks in the StatCan I/O model: demand for goods and services related to the program, business reinvestment, and program funding. The shock that resulted in the largest number of jobs created was the demand for goods and services related to the EM non-incented program. As summarized in Table 14, the demand shock resulted in 405 jobs created in Ontario and

430 total jobs throughout Canada. Nearly all of these jobs are direct job impacts in Ontario, primarily representing energy managers and other energy services professionals. The complex value chain of equipment and the high number of projects also resulted in 173 indirect and induced jobs created throughout Canada.

Table 14: EM Non-Incented Job Impacts from Demand for Goods and Services Shock

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Direct	252	252	257	257
Indirect	26	32	31	38
Induced	85	101	117	135
Total	**363**	**385**	**405**	**430**

The job impacts of the business reinvestment shock are summarized in Table 15. This shock represents the amount of bill savings the participating organizations reinvest in their company to spur further economic activity. The business reinvestment shock resulted in 15 total jobs created in Canada, 14 of which are in Ontario.

In the process and NTG interviews with EM program participants, EcoMetric asked participants directly what percentage of bill savings they planned to reinvest. EcoMetric then applied this percentage to each participants' bill savings calculated based on net energy savings multiplied by IESO's retail electricity rate. Overall, the rate of reinvestment averaged 68%.

Table 15: EM Non-Incented Job Impacts from Business Reinvestment Shock

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Direct	6	7	8	8
Indirect	4	3	3	4
Induced	2	3	3	3
Total	**12**	**13**	**14**	**15**

The final shock, program funding, represents the increase in Ontario residents' hydro bills from funding the EM program. The IESO estimates that 35% of the portfolio's funding is supplied by the residential sector. EcoMetric applied this 35% to the total $1.3M EM non-incented program budget across PY2019 and 2020, resulting in a shock of ~$490,000. As this shock represents less money available to the residential sector for spending throughout the economy, the job impacts are negative.

The job impacts of the program funding shock are summarized in Table 16. Overall, the program funding shock resulted in -16 total jobs across Canada. These jobs were from the service industry, the largest industry in Ontario in terms of the number of jobs. Compared to the jobs created by the program through the demand shock, the jobs eliminated through program funding are relatively minor. In fact, per $1M in program funding, the EM program created 45 net FTEs throughout Canada. Much of this job creation was driven by the economic activity surrounding the design and implementation of the non-incented measures, including the large HVAC projects that had budgets over $1M.

Table 16: EM Non-incented Job Impacts from Program Funding Shock

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Direct	-6	-6	-8	-9
Indirect	-2	-3	-3	-4
Induced	-1	-2	-2	-3
Total	**-9**	**-11**	**-14**	**-16**

6 FINDINGS AND RECOMMENDATIONS

Table 17 presents the conclusions and recommendations from the PY2021 evaluation findings for the EM non-incented program.

Throughout the IF, the IESO has worked with energy managers to identify barriers to project documentation and develop strategies to overcome them. EcoMetric saw the guidance and instructions improve in the EM Quarterly Submission Reports, where energy managers submit their non-incented projects and claimed savings. However, EcoMetric found that supporting documentation for projects smaller than 100 MWh was still lacking sufficient depth and detail to verify savings for many projects. To ensure guidelines are followed, technical reviewers should not accept measures that do not include sufficient documentation to verify savings.

As summarized in the impact evaluation Section 3.1, EcoMetric has seen an improvement in the accuracy of summer peak demand savings calculations in the program. This is an important development as the IESO transitions to the demand-focused 2021-2024 CDM framework. To support this momentum, the IESO should provide guidelines and training on accurately estimating summer peak demand savings.

The second annual analysis of IESO-funded energy managers' impacts across the IESO portfolio of programs continues to support the finding that these energy managers are critical vehicles to enable savings across the portfolio. As the market shifts towards a SEM approach in the 2021-2024 CDM Framework, the IESO should continue to leverage their Capability Building Initiatives to provide in-depth training and resources to commercial and industrial organizations in Ontario so they can take ownership of their energy efficiency.

Table 17: EM Non-Incented Evaluation Findings and Recommendations

Findings and Conclusions		Recommendations	
EM Impact Evaluation Results (Section 3)			
1	Supporting documentation provided by the energy managers for many of the smaller projects (< 100 MWh) was inadequate to determine how savings were calculated and reviewed. Of the 149 non-incented measures from PY2021, 128 were less than 100 MWh. Savings for the smaller projects accounted for 22% of the program's total in PY2021. Smaller projects in PY2021 included optimization, O&M, behavioural, and equipment upgrades. While savings for behavioural and O&M measures can be more difficult to substantiate with supporting documentation, half of the smaller projects were equipment upgrades such as HVAC and lighting. Basic information on the equipment and its operations is sufficient to substantiate savings estimates, but many of these projects had inadequate supporting documentation. The IESO responded by adding more details and guidelines for the documentation required in the EM Quarterly Submission Reports for projects with savings of less than 100 MWh. For these smaller projects, the IESO requires a description of the baseline condition, description of the post-project condition, estimated persistence of savings, and a description of steps taken to ensure persistence of savings. The IESO recently added more details to the EM Quarterly Submission Reports to clarify what is necessary to provide for each theme of the project details. However, EcoMetric found that many EMs did not provide enough details to verify savings estimates, even at the most basic level. For example, a non-incented lighting project would not include details on the number or wattage of fixtures in either the baseline or post-project period. The level of details required by the IESO and the structure of the Quarterly Submission Reports are sufficient to verify savings for smaller projects. However, the technical reviewer is accepting these projects without enough information to verify savings. For larger projects, the level of documentation provided by the energy managers and technical reviewers was sufficient to verify savings accurately and thoroughly. The exception was one large optimization, and BAS controls project that lacked reported savings for one major measure in the larger project, resulting in EcoMetric's inability to determine the driver of the energy realization rate.		Require that the technical reviewer only accept non-incented measures that have sufficient documentation for savings verification. The technical reviewer is not required to conduct an engineering review of every measure, but they must accept every measure for inclusion in the energy manager's progress towards their non-incented savings target. Provide a list of required information for common projects that achieve less than 100 MWh. For example, a lighting project would require baseline wattages, efficient wattages, number and type of fixtures or bulbs retrofitted, and the annual hours of use.

Findings and Conclusions		Recommendations	
2	Following a trend EcoMetric saw between PY2019 and PY2020, non-incented projects in PY2021 generally showed improved attention to detail in the peak demand savings calculations. In prior years, EcoMetric often found peak demand savings values set to missing or zero in the program tracking data. This was not an issue in the PY2021 sample frame. However, several EMs would claim the change in connected load as summer peak demand savings without consideration of coincidence.	2	The IESO should develop guidelines for calculating peak demand savings aimed at energy managers. These guidelines would be beneficial for the program in the 2021-2024 CDM Framework, which focuses on achieving peak demand savings. As the program shifts toward a Strategic Energy Management design, guidance and training for participants should focus on the difference between peak demand savings and changes in connected load.
3a	In PY2021, IESO-funded energy managers were responsible for 55,350 MWh of reported energy savings and 7.98 MW of reported summer peak demand savings across the programs they enabled savings in. This represents 12% and 11% of the total savings in the EM, Retrofit, PSUP, and EPP programs, respectively. IESO-funded energy managers are major enablers of energy and summer peak demand savings across the IESO's portfolio of programs.	3	As the EM program transitions towards a Strategic Energy Management design in the 2021-24 CDM Framework, include training and resources on how to achieve savings and receive incentives through the other programs in the IESO portfolio. Structure the program to reward participating organizations that achieve savings through the SEM program and in other programs by offering an incentive booster for reaching portfolio-wide savings goals.
3b	IESO-funded energy managers implement larger projects and achieve more energy savings at their facilities, on average, than the general population. In the PY2021 Retrofit program, projects led by IESO-funded energy managers averaged 66,355 kWh reported energy savings while the rest of the population averaged 37,735 kWh. Average Retrofit energy savings for facilities with an IESO-funded energy manager were 124,338 kWh compared to 97,467 kWh for facilities without an energy manager. In PSUP, an organization with an IESO-funded energy manager implemented the project with the highest level of reported energy and summer peak demand savings in PY2021—accounting for one-third of the total reported energy savings and nearly two-thirds of the total reported summer peak demand savings. These findings further support the results from the PY2020 holistic evaluation of IESO-funded energy managers, where they achieved 11% of the savings in the programs they participated in.		See Recommendation 3

Findings and Conclusions		Recommendations	
	EM Cost Effectiveness Evaluation Results (Section 4)		
4	The TRC ratio for the EM program was significantly affected by two large and costly HVAC measures. These measures did not achieve sufficient energy savings to create benefits from avoided costs to offset the high project costs.	4	Consider screening large, capital-intensive projects for cost effectiveness before accepting them as non-incented measures. These large projects would be a better fit for a program like PSUP, where extensive engineering studies and M&V are required to ensure the feasibility and cost effectiveness of the project before the investment is made.
	EM Other Energy Efficiency Benefits (Section 5)		
5	EcoMetric's interviews with energy managers and program participants in PY2020 found that energy management at commercial and industrial facilities has an increasing focus on decarbonization. However, GHG impacts are only calculated by the evaluation contractor well after project commissioning and performance.	5	Provide energy managers participants with an emissions tool to calculate their reduction of greenhouse gas emissions associated with the purchase of electricity. For simple emissions reductions calculations based on annual kWh and peak kW savings, the GHG module of the IESO CE Tool would be a good framework to leverage for the tool.
	Project-Specific Key Findings and Recommendations (Appendix A)		
A1	The reported savings in the program tracking data for one large project did not match the updated reported calculations by the energy manager. The savings provided by the energy manager and accepted by the technical reviewer were much lower than the reported and verified savings calculations resulting in an energy realization rate well above 100%.	A1	Ensure that savings calculated by the energy manager and accepted by the technical reviewer are accurately reflected in the program's tracking database, which is used to report savings.
A2	The reported savings for one project, a variable frequency drive (VFD) on a high-efficiency HVAC fan, were calculated assuming a 100% motor load factor throughout the life of the project. Supporting documentation provided by the energy manager outlined the assumption of an 80% motor load factor for the system. There was no metered data to support the 100% motor load factor. EcoMetric used the motor load factor provided by the energy manager of 80%, which we believed to be reasonable for this project.	A2	Unless supported by documentation or data, check if the assumptions and factors provided by the energy manager are reasonable and use them when calculating energy savings.

Appendix A KEY PROJECT SPECIFIC FINDINGS AND RECOMMENDATIONS

This appendix includes key project-specific findings and recommendations from the PY2021 impact evaluation.

Finding A1: The reported savings in the program tracking data for one large project did not match the updated reported calculations by the energy manager. The savings provided by the energy manager and accepted by the technical reviewer were much lower than the reported and verified savings calculations resulting in an energy realization rate well above 100%.

> **Recommendation A1:** Ensure that savings calculated by the energy manager and accepted by the technical reviewer are accurately reflected in the program's tracking database, which is used to report savings.

Finding A2: The reported savings for one project, a variable frequency drive (VFD) on a high-efficiency HVAC fan, were calculated assuming a 100% motor load factor throughout the life of the project. Supporting documentation provided by the energy manager outlined the assumption of an 80% motor load factor for the system. There was no metered data to support the 100% motor load factor. EcoMetric used the motor load factor provided by the energy manager of 80%, which we believed to be reasonable for this project.

> **Recommendation A2:** Unless supported by documentation or data, check if the assumptions and factors provided by the energy manager are reasonable and use them when calculating energy savings.

Appendix B DETAILED METHODOLOGIES

B.1 Gross Savings Analysis

B.1.1 Data Sources

Table 18 contains a list of the data sources used from verifying gross savings.

Table 18: 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 projects 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. No site inspections were conducted for the PY2021 evaluation due to COVID-19 restrictions, but several "virtual" inspections were conducted via smartphone video application.

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 towards their goals. The independent contractor or technical reviewer reviews projects 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 projects 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. EcoMetric 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 projects 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 EcoMetric 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 projects, further investigation involved an email exchange, phone discussion, and/or virtual onsite inspection with the energy manager for the project. The purpose of these interactions was typically to clarify EcoMetric'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 virtual onsite inspections involved connecting with a facility representative via a video call application.

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

B.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. EcoMetric 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 audits, and as stated above, in many cases, including a virtual review of the equipment installation and operating parameters.

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

EcoMetric 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 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.

B.1.3 Summer Peak Demand Analysis

EcoMetric verified summer coincident peak demand impacts for each project based on the IESO-defined peak periods summarized in Table 19. 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 19: 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

B.2 Net Savings Analysis

B.2.1 Net Savings Data Collection

For PY2021 projects, EcoMetric implemented the NTG questionnaire originally developed for the Conservation First 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 IESO 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 approach 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 possibly influenced the decision to implement the project. Spillover was not assessed during the PY2021 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. This included a refresher session on interviewing tone, follow-up questions, time management, and avoiding leading questions, as well as pre-tests of interview scripts and pilot testing with initial recruited participants.
- 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 sends 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

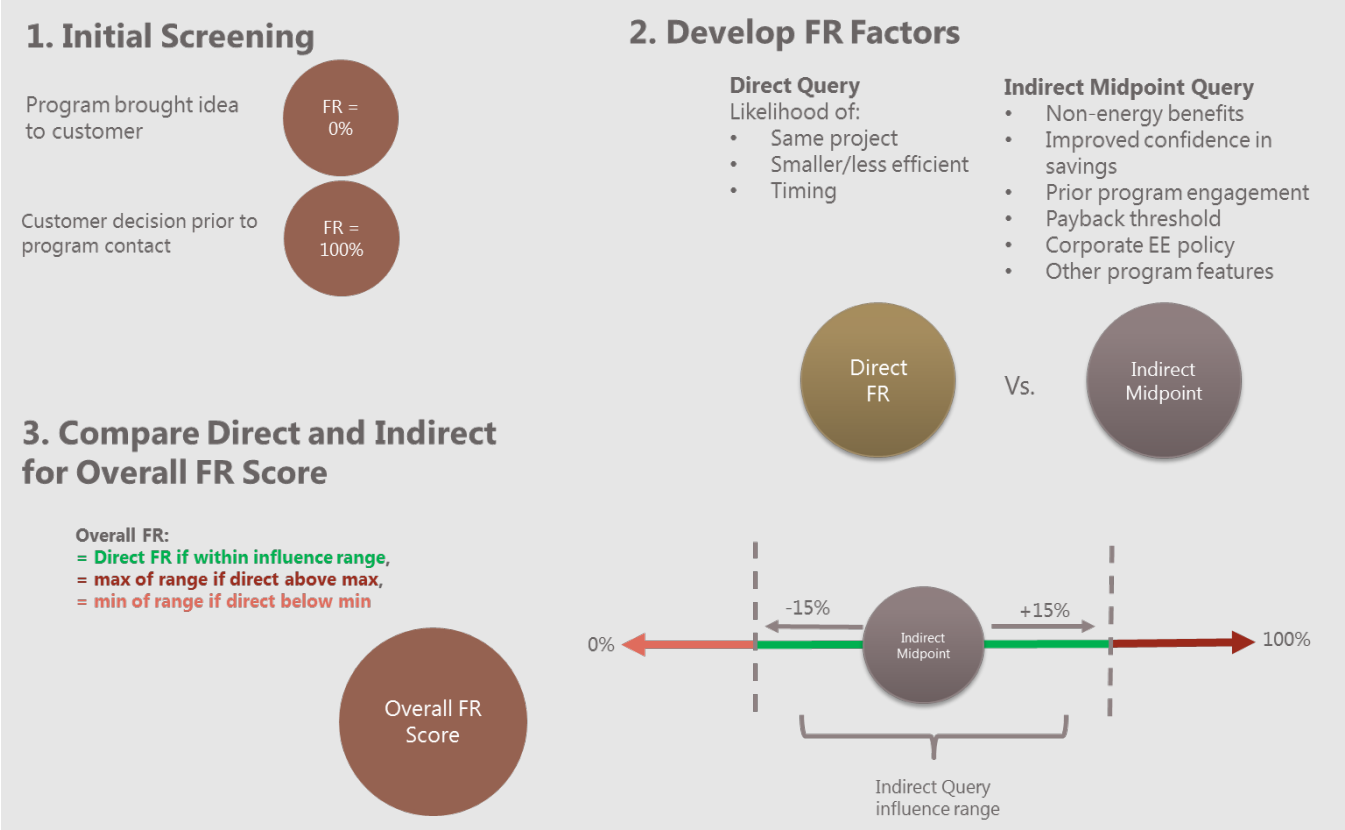
and logs each contact attempt (time, date, target, result) in a contact tracking system. EcoMetric worked with IESO to conduct another contact attempt for any sites that were not responsive to initial recruitment efforts.

- 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 that 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.

B.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 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 then computed by considering the direct query and the range. Figure 2 presents a graphical representation of the calculation approach.

Figure 2: Free-ridership Methodology



EcoMetric 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.

B.3 Cost Effectiveness Assumptions

- Project costs and benefits are included only for non-incented Energy Manager measures in-service starting in 2021.
- Incentives are not included for Energy Manager measures, as the only measures included in this analysis are non-incented. Incremental lifecycle measure costs (when provided) are included at a measure-specific level. EcoMetric sourced the measure costs from project documentation, when available, and the technical reviewer's measure-level database.
- Program admin costs (CE Tool Budget Inputs) were provided by the IESO Evaluation Team for PY2021.

- EcoMetric developed and utilized custom measure-specific load shapes for Energy Manager cost effectiveness analysis where possible to improve the accuracy of the avoided cost calculations. Where custom load shapes are unavailable, EcoMetric utilized the most appropriate IESO-provided load shape based on measure technology and premise type.

B.4 Job Impacts Methodology

EcoMetric leveraged the Statistics Canada (StatCan) custom input/output (I/O) economic model to estimate the job impacts of the EM program. The StatCan I/O model simulates the economic and employment impacts of economic activity related to the program. The economic activity related to the EM program was leveraged as "shocks", which act as inputs into the model to show the direct, indirect, and induced impacts on the number of jobs created by the program. The I/O model uses regional and national multipliers to estimate the economy-wide effects of the economic activity induced by the program. The I/O model used three shocks to determine the job impacts of the EM program:

- Demand for goods and services related to the program
- Business reinvestment
- Program funding

The demand for goods and services related to the EM program shock represents the spending on goods and services to participate in the program. This includes spending on capital measures, hiring contractors and consultants, all labor costs related to program participation, and the administrative costs for the IESO. EcoMetric derived the value of this shock from the estimated project costs for each project.

The business reinvestment shock represents the amount of savings from reduced energy bills that the participants reinvest in the local economy. The portion of project costs not covered by IESO incentives was deducted from the total bill savings for each facility. EcoMetric calculated the energy bill savings using the net energy savings from the impact evaluation and the IESO's electricity retail rates. As for the amount of reinvestment, the team collected primary data from the participants through the process and NTG interviews. EcoMetric asked participants what percentage of their bill savings they plan on reinvesting.

Finally, the program funding shock represents the incremental increase in electricity bills in Ontario's residential sector used to fund the program. EcoMetric sourced the EM program budget data from the IESO, as well as the assumption of the share of the residential sector's funding portion of the program.

The I/O model generates three job impacts: direct, indirect, and induced. Direct jobs include all jobs created by EM program activity, including the energy managers themselves, administrative jobs, contractors hired to complete projects, engineers, and inspectors, among many others. Indirect jobs include the additional jobs created from economic activity related to program participation, including equipment and supply distribution centers, delivery drivers, and manufacturing, among many others. Induced jobs include the jobs supported by the "ripple effects" of economic activity from EM program participation (i.e., the re-spending of income and benefits resulting from EM program activity).

The model outputs job impacts in the total number of jobs and full-time equivalent (FTE). The total number of jobs does not take into account the number of hours worked. Total jobs are represented by full-time, part-time, and temporary jobs. FTEs, on the other hand, are total jobs converted to represent only full-time jobs. This is determined by the average full-time hours worked in the business or government sectors. Both total jobs and FTEs are measured in person-years, meaning one job for one person for one year.