EVALUATION REPORT

2021-2024 CDM FRAMEWORK ENERGY MANAGER PROGRAM PY2023

Date:	30 August 2024
Prepared for:	The Independent Electricity System Operator (IESO)
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EXECUTIVE SUMMARY

E.1 PROGRAM DESCRIPTION

The 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, was retained by the Independent Electricity System Operator (IESO) to evaluate its 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 was phased out in 2023. EcoMetric completed a process evaluation for PY2022 to help the IESO achieve a successful program transition to the Strategic Energy Management (SEM) program.

The EcoMetric team conducted an Impact Evaluation of the EM program for PY2023.

E.2 EVALUATION OBJECTIVES

The goals of the PY2023 evaluation were to:

- Annually verify energy and summer peak demand savings.
- Conduct annual cost effectiveness (CE) analyses and report on key indicators of cost effectiveness, including the Program Administrator Cost (PAC) test, and the Levelized Unit Energy Cost (LUEC) metric.
- 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.
- Estimate job impacts of the program.

E.3 EVALUATION APPROACH SUMMARY

For the 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, non-energy benefits and job impacts.

E.4 SUMMARY OF RESULTS

Table 1 summarizes the key impacts of the EM program in PY2023, including true-ups from PY2022[1]. Further details on these impacts can be found in Section 3.

Table 1: EM Non-Incented Impact Results Summary

Impact	Verified Results
Non-Incented Measures Evaluated and Reported	212 measures
Total Gross Verified First-Year Energy Savings	18,149 MWh
Program Level Energy Realization Rate	97%
Total Gross Verified Summer Peak Demand Savings	1.98 MW
Program Level Demand Realization Rate	107%
Total Net Verified First Year Energy Savings	16,951 MWh
Total Net Verified Summer Peak Demand Savings	1.85 MW
Program Level Net to Gross Ratio	93%
Total Net Verified Energy Savings that Persist through 2026 (MWh)	13,632 MWh
Cost Effectiveness – Program Administrator Cost Test Ratio	2.47
Cost Effectiveness – Levelized Unit Energy Cost	$0.02/kWh

E.5 KEY FINDINGS AND RECOMMENDATIONS

The following sections present a high-level summary of the key findings and recommendations for the PY2023 evaluation.

Finding 1: Overall, supporting documentation for measures and projects was better quality and more complete than in prior years. Energy managers and technical reviewers are generally documenting non-incented measures well and providing adequate detail about the equipment specifications and changes.

[1] True-ups from PY2022 refer to projects that were installed in 2022 but not finalized in time to be included in time for the PY2022 evaluation reporting.

Finding 2: Verified savings for a majority (60%) of the projects were within +-5% of claimed estimates, for both energy and peak demand.

Finding 3: Claimed savings could not be recreated for a small subset of lighting, motor, HVAC, and compressed air measures within four projects.

Recommendation 1: Submitted savings claims should be accompanied by calculations and/or narrative clearly explaining or showing how the savings estimates were determined.

Finding 4: Operating parameters such as average hourly demand and weekly HOU were overestimated for multiple projects, including lighting and compressed air measures.

Recommendation 2: Calculations for savings claims should consider site-specific schedules and operating parameters. Peak demand savings should reflect the actual expected average demand reduction during peak periods as defined by the program. This may or may not be equal to the total connected load reduction, depending on equipment schedules and facility operations.

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 for 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 incentivizes 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 2023 (PY2023) impact and cost effectiveness evaluation of the IESO's EM program.

EcoMetric conducted a process evaluation for PY2022 on behalf of the IESO to ensure they achieve an effective transition to the SEM program.

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 PY2023 Impact and Cost Effectiveness Evaluation were to:

- Annually verify energy and summer peak demand savings.
- Conduct annual cost effectiveness (CE) analyses and report on key indicators of cost effectiveness, including the Program Administrator Cost (PAC) test and the Levelized Unit Energy Cost (LUEC) metric.
- 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.
- Estimate job impacts of the program.

2 METHODOLOGY

This section of the report outlines the methodologies used in the PY2023 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: engineering analysis, interval billing analysis, telephone surveys, documentation review, and best practice review. 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 PY2023 for the gross savings verification.

For each organization, the EcoMetric team reviewed all completed non-incented 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.

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 Completed Samples
Gross Savings Verification	Non-Incented Measures	212	212
Gross Savings Verification	Energy Managers/Organizations	15	15

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 PY2023.

2.3 NET SAVINGS VERIFICATION

EcoMetric did not perform any new net-to-gross (NTG) research for the program for this evaluation year. For PY2023 analysis, EcoMetric used historical NTG rates from prior evaluation years (for more information, see report titled '*Evaluation Report: 2021-2024 CDM Framework Energy Manager Program PY2022*' and dated 29 September 2023 (https://ieso.ca/-/media/Files/IESO/Document-Library/conservation/EMV/2022/PY2022-21-24-CDM-EM-Evaluation-Report.pdf). No new NTG research was performed during the PY2023 evaluation effort since the EM program was thought to be ending.[3]

2.4 COST EFFECTIVENESS ANALYSIS

EcoMetric used the IESO CDM Cost Effectiveness Tool to estimate non-incented 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, incremental project costs, and EM salaries.

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 OTHER ENERGY EFFICIENCY BENEFITS APPROACH

2.5.1 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.

3 EcoMetric has since learned that IESO will roll out a new Energy Manager program in the future, with partnership and funding coming from Natural Resources Canada (NRCan).

2.5.2 NON-ENERGY BENEFITS ESTIMATION

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.

2.5.3 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 RESULTS

3.1 GROSS VERIFIED SAVINGS RESULTS

Gross verified savings results for the PY2023 EM program are summarized in Table 3. In total, five non-incented measures completed in PY2023 were evaluated and reported.

An additional 207 non-incented measures completed in PY2022 are included in the PY2023 reporting as true-ups. The PY2022 true-ups were part of the PY2023 evaluation sample; EcoMetric did not use historical savings realization rates to update the savings results from the PY2022 evaluation.

The total gross verified energy savings for the EM program in PY2023 are 69 MWh, representing 101% of reported savings. True-up projects from PY2022 totaled 18,079 MWh of gross verified energy savings, representing about 97% of reported savings. When combined, the total gross verified energy savings for the EM program are 18,149 MWh—97% of reported savings.

Total gross verified summer peak demand savings for the EM program are 1.98 MW, representing 107% of total reported savings.

As the current version of the Energy Manager program is ending, EcoMetric compiled a summary of savings results for the 2021-2024 CDM Framework. Table 3 below shows gross verified savings results for the PY2023 evaluation as well as totals for the Framework (includes all projects from PY2022 and PY2023). For the framework, the EM program achieved 24,847 MWh and 3.53 MW of peak demand in gross verified savings.

Table 3: PY2023 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)
2023	5	101%	69	96%	0.01
2022 True-Ups	207	97%	18,079	107%	1.97
PY2023 Total	**212**	**97%**	**18,148**	**107%**	**1.98**
2022	113	91%	6,699	96%	1.55
Framework Total	**325**	**95%**	**24,847**	**102%**	**3.53**

The main drivers of the EcoMetric team's adjustments to gross reported savings for the PY2023 evaluation included:

- Issues with the level of documentation provided by energy managers to substantiate reported savings for a subset of lighting, motor, HVAC, and compressed air measures.

- Inaccurate estimation of peak coincidence by energy managers in summer peak demand savings calculations.
- Omittance of HVAC interactive factors for interior lighting measures.
- Overestimation of operating hours in relation to energy savings by energy managers.
- An improvement to regression-based savings calculations for a chiller measure.
- Several project-specific adjustments to gross savings calculations.

Project-specific findings and recommendations can be found in Appendix A.

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 93% for the PY2023 and PY2022 true-up projects, based on historical NTG ratios.

Total net first-year savings for non-incented EM projects evaluated in PY2023 (including PY2022 true-ups) was 16,951 MWh, and net peak demand savings were 1.85 MW. Eighty percent of net energy savings and seventy six percent of net peak demand savings persist through 2026.

As the current version of the Energy Manager program is ending, EcoMetric compiled a summary of savings results for the 2021-2024 CDM Framework. As seen in Table 4 below, total non-incented net savings for the framework (PY2022 and PY2023 combined) are 23.254 GWh and 3.304 MW peak demand.

Table 4: PY2023 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)
2023	5	93%	65	65	0.011	0.011
2022 True-Ups	207	93%	16,886	13,567	1.840	1.387
PY2023 Total	**212**	**93%**	**16,951**	**13,632**	**1.851**	**1.399**
2022	113	94%	6,303	3,911	1.453	1.154
Framework Total	**325**	**94%**	**23,254**	**17,543**	**3.304**	**2.553**

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, the Energy Performance Program (EPP), and the Local Initiatives Program (LIP). 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.

Across PY2023 and PY2022 true-ups, five organizations with an IESO-funded energy manager completed 33 measures achieving 1,121 MWh of reported energy savings and 0.187 MW of reported summer peak demand savings in the Prescriptive Retrofit program as shown in Table 5. The organizations with IESO-funded energy managers achieved 0.5% of the total reported summer peak demand savings for Prescriptive Retrofit.

In LIP, one large municipal participant with an IESO-funded energy manager completed 22 measures achieving 2,641 MWh and 0.379 MW of reported energy and summer peak demand savings, respectively, in PY2023. The organization with an IESO-funded energy manager achieved about 44% of the total reported energy savings for LIP BizEnergySaver in PY2023.

In EPP, two organizations with reported savings in PY2023 had IESO-funded energy managers. The organizations achieved 1,342 MWh and 0.019 MW of reported energy and summer peak demand savings, respectively, in PY2023. The organizations with IESO-funded energy manager achieved 17% of the total reported energy savings for EPP in PY2023.

In total, IESO-funded energy managers achieved reported savings of 23,893 MWh and 2.432 MW across the IESO's commercial and industrial portfolio.

Table 5: 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 (includes PY2022 true-ups)	33	1,121	0.187
LIP BizEnergySaver	22	2,641	0.379
EPP	2	1,342	0.019
TOTAL	**51**	**5,104**	**0.585**

4 COST EFFECTIVENESS RESULTS

As shown in Table 6, the EM non-incented program in PY2023 sample frame is cost effective from the Program Administrator Cost (PAC) test perspective using a benefit/cost threshold of 1.0. For PAC, benefits totaled $5,773,305, while costs totaled $2,332,842 in PY2023 sample frame. The levelized cost (LC) of electricity for PY2023 was $0.02/kWh.

The EM program was closed in 2022. The PY2023 values are skewed based on the costs, as the analysis only included benefits from five measures actually implemented in PY2023. The total PAC value of 2.47 indicates that the program is cost effective.

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.

EcoMetric conducted a cost effectiveness analysis that includes all of the benefits and costs from the program throughout the entire 2021-2024 CDM Framework. Detailed in Table 6, the EM non-incented program in this framework is cost effective from the PAC test perspective with a ratio of 2.16. The levelized cost of electricity for the program in this framework is $0.02/kWh.

Table 6 PY2023 EM Non-Incented Cost Effectiveness Results

Program Year	PAC Costs	PAC Benefits	PAC Ratio	LC $/kWh
2023	$1,004,513	$14,440	0.01	3.52
2022 True-Ups	$1,328,329	$5,758,866	4.34	0.01
PY2023 Total	**$2,332,842**	**$5,773,305**	**2.47**	**0.02**
2022	$1,041,740	$1,518,543	1.46	0.03
Total	**$3,374,582**	**$7,291,849**	**2.16**	**0.02**

5 OTHER ENERGY EFFICIENCY BENEFITS

5.1 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 3,846 metric tonnes of CO_2 equivalent (CO_2e) for PY2023, as summarized in Table 7. 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 PY2023 non-incented measures, net GHG reductions total 33,595 tonnes of CO_2e.

For the 2021-2024 CDM framework, first-year GHG reductions total 5,268 tonnes and 41,061 tonnes over the lifetime of the non-incented measures.

Table 7 PY2023 EM Non-Incented Avoided Greenhouse Gas Emissions

Program Year	First Year GHG Impacts (tonnes CO2e)	Lifetime GHG Impacts (tonnes CO2e)
2023	14	66
2022 True-Ups	3,832	33,529
PY2023 Total	**3,846**	**33,595**
2022	1,422	7,466
Framework Total	**5,268**	**41,061**

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.

5.2 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.

In PY2020-2021, Dunsky Energy + Climate Advisors assessed the Non-Energy Benefits (NEBs) from energy efficiency projects funded by the IESO from 2017-2019. This included the quantification of NEBs in the seven sectors served by the IESO programs and an assessment of how those values might be included in cost-effectiveness testing.

NEBs refer to the value that DSM programs offer participants beyond simply energy savings. Table 8 summarizes the current NEBs values used in the evaluation of the IESO 2021-2024 CDM Framework Energy Performance Program (PY2023).

Table 8 details business sector NEBs incorporated in program administrator benefit-cost ratios. For PY2023 (including PY2022 true-ups), NEBs for the EM non-incented program totaled $2,379,296. 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 33% of the $7,211,406 in total benefits achieved by the EM non-incented projects in PY2023 and PY2022 true-ups from the PAC test perspectives.

Table 8: PY2023 EM Non-Incented Non-Energy Benefits, including PY2022 True-Ups

Non-Energy Benefit	Measure Type	$/net kWh	Total Benefits from NEBs
Thermal Comfort	HVAC, Envelope	0.050	$864,569
Reduced Building & Equipment O&M	All	0.080	$1,383,310
Improved Indoor Air Quality	HVAC, Envelope	0.007	$121,040
Reduced Spoilage	HVAC, Refrigeration	0.0002	$3,458
Air Quality	All	0.0004002	$6,920
Total			**$2,379,296**

5.3 JOB IMPACTS

As summarized in Table 9, the EM program created an estimated 523 jobs in 2021-2024 CDM Framework. Of these 523 jobs, 316 were direct, 33 were indirect, and 174 were induced. The majority of jobs (491) were created in Ontario. In terms of full-time equivalent (FTE), the program created an estimated 465 jobs.

Table 9: 2021-2024 CDM Framework EM Non-Incented Job Impacts

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
PY2023				
Direct	6	6	6	6
Indirect	0	0	-1	-1
Induced	2	2	3	3
PY2023 Total	**8**	**8**	**8**	**8**
PY2022				
Direct	299	299	310	310
Indirect	23	31	26	34
Induced	108	127	147	171
PY2022 Total	**430**	**457**	**483**	**515**
GRAND TOTAL	**438**	**465**	**491**	**523**

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 those 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).

Table 10 summarizes the cumulative job impacts of the EM program in this framework.

Table 10: Cumulative EM Non-Incented Job Impacts

Program Year	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
PY2023	8	8	8	8
PY2022	430	457	483	515
GRAND TOTAL	**438**	**465**	**491**	**523**

5.3.1 JOB IMPACTS BY INDUSTRY

Table 11 summarizes the job impacts by industry for the EM program in 2021-2024 CDM Framework. 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. Other industries where substantial jobs were created include retail trade, accommodation and food services, wholesale trade, and administrative and support services. In total, the jobs impacts from the EM program reached 47 different industries in StatCan's I/O model.

Table 11: EM Non-Incented Job Impacts by Industry

Industry	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Other provincial and territorial government services	302	303	312	312
Retail trade (except cannabis)	33	35	46	49
Accommodation and food services	12	15	17	21
Wholesale trade	12	15	13	16
Administrative and support services	6	7	9	10
Health care and social assistance	6	6	10	10
Depository credit intermediation and monetary authorities	6	7	6	7
Other finance, insurance and real estate services and management of companies and enterprises	5	7	7	9
Personal services and private households	5	5	7	8
Repair construction	4	4	5	5
Computer systems design and other professional, scientific, and technical services	4	4	5	6
Machinery manufacturing	4	7	4	7
Publishing, pay/specialty services, telecommunications and other information services	3	3	3	4
Other municipal government services	3	3	3	4
Other	33	44	44	55
GRAND TOTAL	**438**	**465**	**491**	**523**

5.3.2 JOB IMPACTS BY MODEL SHOCK

EcoMetric estimated job impacts of the EM program by 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 detailed in Table 12, the demand shock resulted in 484 jobs supported in Ontario and 515 throughout Canada. The primary jobs that were

supported by the EM program were energy managers and other energy services professionals. Economic activity across the value chain serving the participants and supporting their projects resulted in 203 indirect and induced jobs across Canada.

Table 12: EM Non-Incented Job Impacts from Goods and Services Shock

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Direct	302	302	312	312
Indirect	21	28	24	31
Induced	109	127	148	172
GRAND TOTAL	**432**	**457**	**484**	**515**

The job impacts of the business reinvestment shock are summarized in Table 13. 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 ten total jobs supported in Canada, nine of which are in Ontario.

Table 13: EM Non-Incented Job Impacts from Business Reinvestment Shock

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Direct	4	4	5	5
Indirect	2	3	2	3
Induced	1	2	2	2
GRAND TOTAL	**7**	**9**	**9**	**10**

The program funding shock represents the increase in Ontario residents' hydro bills from funding the EM program. EcoMetric estimates that $1.1M of the $3.3M 2021-2024 CDM Framework EM Program budget was supplied by the residential sector [4]. As this shock represents less money available to the residential sector for spending throughout the economy, the job impacts are negative. Summarized in Table 14, the program funding shock resulted in two eliminated jobs in Canada. However,

[4] The IESO estimates that 35% of the portfolio's funding is supplied by the residential sector.

compared to the jobs supported by the demand for goods and services and reinvestment shocks, the EM program's job impacts are net positive by a large margin.

Per $1M in funding, the EM program in this framework supported 141 FTEs throughout Canada. Much of these job impacts were driven by the economic activity surrounding the design and implementation of the non-incented measures, especially larger capital-intensive HVAC, fans and motors, pumps, and refrigeration projects.

Table 14: EM Non-Incented Job Impacts from Program Funding Shock

Job Impact Type	Ontario FTE	Canada Total FTE	Ontario Jobs	Canada Total Jobs
Direct	-1	-1	-1	-1
Indirect	0	0	-1	-1
Induced	0	0	0	0
GRAND TOTAL	**-1**	**-1**	**-2**	**-2**

6 KEY FINDINGS AND RECOMMENDATIONS

This section includes the key findings and recommendations for the EM program. Project specific findings and recommendations are included in Appendix A.

Finding 1: Overall, supporting documentation for measures and projects was better quality and more complete than in prior years. Energy managers and technical reviewers are generally documenting non-incented measures well and providing adequate detail about the equipment specifications and changes.

Finding 2: Verified savings for a majority (60%) of the projects were within +-5% of claimed estimates, for both energy and peak demand.

Finding 3: Claimed savings could not be recreated for a small subset of lighting, motor, HVAC, and compressed air measures within four projects.

Recommendation 1: Submitted savings claims should be accompanied by calculations and/or narrative clearly explaining or showing how the savings estimates were determined.

Finding 4: Operating parameters such as average hourly demand and weekly HOU were overestimated for multiple projects, involving lighting and compressed air measures.

Recommendation 2: Calculations for savings claims should take into account site-specific schedules and operating parameters. Peak demand savings should reflect the actual average expected demand reduction during peak periods as defined by the program. This may or may not be equal to the total connected load reduction, depending on equipment schedules and facility operations.

Appendix A Project-Specific Findings and Recommendations

This appendix includes key project-specific findings and recommendations from the PY2023 impact evaluation.

Finding A1: The submitted savings calculation for annual energy (kWh) savings used peak kW savings for every hour of year (8,760).

Recommendation A1: Peak demand savings should reflect the actual expected demand reduction during peak periods. This may or may not be equal to the total connected load reduction, depending on equipment schedules and facility operations.

Finding A2: The submitted savings calculation for annual energy (kWh) savings assumed operation of 7 days per week operation, while actual operation is only 5 days per week.

Recommendation A2: Calculations for savings claims should take into account site-specific schedules and operating parameters.

Finding A3: The evaluator made minor adjustments to inputs in the savings calculations for lighting measures and HVAC measures to reflect actual parameters and operating schedules:

- DLC-tested fixture wattages
- Peak coincidence
- Annual HOU estimates
- Fixture wattages.
- Motor efficiency
- Chiller load factor

Recommendation A3: Calculations for savings claims should take into account site-specific schedules, operating parameters, and interactive effects where feasible and/or relevant. Inputs related to equipment specifications such as wattage and efficiency should come from third-party (ex: DLC, Energy Star) tested values where available, and not solely rely on manufacturer information.

Finding A4: The evaluator was unable to recreate savings for multiple lighting measures based on the documentation provided for the project. Calculations for one measure in particular were very poor – the evaluator was forced to use RRs from other similar measures to estimate savings for that measure.

Recommendation A4: Submitted savings claims should be accompanied by calculations and/or narrative clearly explaining or showing how the savings estimates were determined.

Finding A5: The submitted savings calculation for certain interior lighting measures did not account for HVAC interactive factors. HVAC interactive factors account for the reduction in waste heat generated by efficient lighting systems – particularly LED fixtures – and the corresponding impact on a facility's heating and cooling systems.

Recommendation A5: Calculations for savings claims should account for site-specific interactive effects where feasible and/or relevant. HVAC interactive factors are typically deemed values based on facility heating and cooling types and can be found in a variety of technical reference manuals.

Finding A6: For one project where no peak demand savings were claimed, the evaluator found the measures did achieve peak coincident demand savings; verified savings for the project are greater than zero.

Recommendation A6: Submitted savings claims should include and all legitimate estimates of energy and demand savings associated with a measure.

Finding A7: The submitted calculations for an HVAC measure used SEER in peak demand savings calculation.

Recommendation A7: Peak demand savings calculations for HVAC measures should generally use EER for the efficiency inputs, not SEER.

Finding A8: For a chiller measure within one project, the evaluator utilized a slightly different approach for regression modeling compared to the submitted calculations, resulting in higher peak demand savings and lower kWh savings.

Recommendation A8: Energy savings calculations should take into account various load factors throughout each hour of the year, as opposed to solely being based on peak hour operation.

Appendix B Detailed Methodologies

B.1 Gross Savings Analysis

B.1.1 Data Sources

Table 15 contains a list of the data sources used from verifying gross savings.

Table 15: Data & Information Sources Used for Impact Evaluation

Item	Description	Source
Reported (Reported) participation and 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 and 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.

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. 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 PY2023. 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

The EcoMetric team verified summer coincident peak demand impacts for each project based on the IESO-defined peak periods summarized in Table 16. 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 16: 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: Dec- Jan	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: Dec- Jan	Weekdays 6pm-8pm	Weighted average of the top hour in each of 3 months per IESO weights