ECOMETRIC

EVALUATION REPORT

2021-2024 CDM FRAMEWORK ENERGY PERFORMANCE PROGRAM PY2022

Date: 29 September 2023

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EXECUTIVE SUMMARY

The Independent Electricity System Operator (IESO) retained EcoMetric Consulting, LLC (EcoMetric) to evaluate the 2021-2024 CDM Framework Energy Performance Program (EPP) administered in Ontario.

E.1 PROGRAM DESCRIPTION

EPP provides a performance-based whole-building approach to incenting energy efficiency improvements, giving customers greater flexibility in measure selection. In this pay-for-performance (P4P) model, building-specific energy models are used to determine a baseline, which is then compared to metered consumption at the end of each pay-for-performance period to determine three annual performance payments.

E.2 EVALUATION OBJECTIVES

The goals of the Program Year (PY) 2022 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 CO2 equivalent using IESO's Cost-Effectiveness Tool.
- Assess the effectiveness and accuracy of the modeling methods used by participants and technical reviewers.
- Monitor the overall effectiveness and comprehensiveness of key program elements.
- Analyze and make recommendations to improve the program.

E.3 SUMMARY OF RESULTS

Table 1 summarizes the key impacts of EPP in PY2022. Further details on these impacts can be found in Section 3. The timeline of a P4P program with annual performance periods like EPP results in smaller sample sizes in early evaluations of the program. **Just two facilities were ready for evaluation in PY2022, so the impacts of the program this year are not typical of future years when the sample sizes are expected to be more robust.** Furthermore, the cost-effectiveness results are skewed in PY2022 as benefits from just two facilities are compared to higher administrative costs as the program ramps up. **There are 138 facilities under contract as of June 2023, so EcoMetric expects future evaluation samples and impacts to greatly increase.**

Table 1: PY2022 EPP Impact Results Summary

Impact	PY2022 Result
Facility Performance Periods Evaluated and Reported	2
Total Gross Verified First-Year Energy Savings	274 MWh
Program Level Energy Realization Rate	95%
Total Gross Verified Summer Peak Demand Savings	0 MW
Program Level Demand Realization Rate	N/A
Total Net Verified First Year Energy Savings	176 MWh
Total Net Verified Summer Peak Demand Savings	0 MW
Program Level Net to Gross Ratio	64%
Total Net Verified Energy Savings that Persist through 2026 (MWh)	176 MWh
Cost Effectiveness – Program Administrator Cost Test Ratio	0.19
Cost Effectiveness – Levelized Unit Energy Cost	$0.17/kWh

EPP participants reported overall satisfaction with EPP and found it to be a useful tool in driving their energy efficiency initiatives. Initial participant interviews have revealed some free ridership within the program, but EcoMetric expects the program-level free ridership rate to decrease as more participants complete their performance periods and are added to the sample frame. Participants were particularly satisfied with the ease of access to the program. Persistent pain points for the participants and their Energy Service Providers were the application and modeling phases, which were often lengthy and costly.

COVID-19 produced many challenges for EPP participants as major changes to occupancy and operations resulted in energy consumption that was difficult to predict and model, especially for office, retail, and university buildings. However, **participants were generally satisfied with the IESO's support throughout the pandemic, specifically the measurement and verification guidelines provided on making non-routine adjustments (NRAs).**

Many participants plan to complete electrification projects to address greenhouse gas (GHG) emissions within the next three months to three years. Overall, participants are increasing their focus on decarbonization goals and GHG reduction. Energy Service Providers interviewed by EcoMetric also echoed this sentiment, revealing that the organizations they work for are increasingly focusing on GHG reductions as part of their overall sustainability plans. **The IESO has adjusted EPP to fit within this changing sustainability landscape and allows for NRAs to eliminate the impact of electrification projects on participant baselines and savings. However, only one-third of participants were aware of these program rules.**

Continuing the trend from EcoMetric's interviews with EPP participants in the IF, participants are interested in centralized M&V software to perform program modeling as opposed instead of hiring a modeling Energy Service Provider. EcoMetric's benchmarking of P4P programs in the US found a shift towards the aggregator model and centralized M&V to reduce the burden on participants. The benchmarking study also revealed that P4P programs in the US are focused on commercial and institutional customers, and the few that market to industrial customers have had little uptake from the sector.

E.4 KEY FINDINGS AND RECOMMENDATIONS

Impact Finding 1: The majority of EPP participants are not submitting their Savings Reports within the contracted 60 days of completing their performance period. As such, the technical review, evaluation, and reporting of program impacts have been delayed.

Impact Recommendation 1: Increase the technical support throughout the first performance period to identify issues with completing Savings Reports early. To ensure program savings impacts, particularly peak demand reductions, are verified and reported efficiently enough so the IESO can leverage them for system planning, grant submission extensions on a limited basis for extreme cases. To identify bottlenecks and recommend solutions to alleviate them, EcoMetric will conduct a participant journey analysis in the PY2023 evaluation to track the timeline of EPP participation from application phase to incentive payout.

Impact Finding 2: Baseline models submitted by participants differ significantly from final technical review baseline and final verified savings models. Participants are required to update their baseline models multiple times during the program application and savings review process. EcoMetric observed three separate participant baseline model runs were completed between application and final savings verification.

Impact Finding 3: Hourly and daily baseline consumption models in all cases did not include temporal independent variables. Temporal variables can include month, hour of the day, day of week, or even hour or hour of week for hourly consumption-based models. In all cases, when EcoMetric included temporal variables, the goodness of fit model metrics improved. Temporal variables, especially month indicators, produce model residual values (difference between model prediction and actual energy value) that are near zero. This creates more accurate consumption data peak reduction estimates. Temporal variables can also replace production and occupancy variables if they are predictably time-based. One concern with including temporal variables is that not all variable levels may result in statistically significant coefficients when models are built using ordinary least squares regression.

Impact Recommendation 3: In most cases, baseline models should include temporal variables. If customer application models and/or final technically reviewed models do not include temporal variables, it should be understood why they were excluded, especially for hourly consumption models.

Process Finding: Only about one-third of participants were aware that the EPP program rules allow participants to make a non-routine adjustment to their approved energy models for electrification projects.

Process Recommendation: EcoMetric will provide the IESO evaluation team and program team with a list of organizations unaware of this opportunity for direct marketing by the IESO. EcoMetric believes the material detailing the electrification adjustment opportunity is robust on the IESO's website, but an additional email blast to participants with a link to this specific information would be beneficial.

1 INTRODUCTION

1.1 PROGRAM DESCRIPTION

EPP provides a performance-based whole-building approach to incenting energy efficiency improvements, giving customers greater flexibility in measure selection. In this pay-for-performance (P4P) model, building-specific energy models are used to determine a baseline, which is then compared to metered consumption at the end of each pay-for-performance period to determine a performance payment. The consumption data is robust in the program, as two years of M&V data is a program requirement, and the participants are required to use a billing analysis Savings Report developed by the IESO.

Measures in EPP include capital and non-capital efficiency measures, with performance being rewarded at the same rate. With measure savings being calculated at the whole-building level for customers, the cost of implementing the program and administrative burden are greatly reduced. Following the transition from the Interim Framework to the 2021-2024 CDM Framework, the length of the performance period was increased from two years to three. Another update to the program design was the addition of a peak demand savings incentive adder and an up-front incentive to help offset early project costs.

1.2 EVALUATION OBJECTIVES

The Independent Electricity System Operator (IESO) retained EcoMetric Consulting, LLC, to evaluate the 2021-2024 CDM Framework Energy Performance Program (EPP) administered in Ontario.

The goals of the Program Year (PY)2022 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 CO2 equivalent using IESO's Cost-Effectiveness Tool.
- Assess the effectiveness and accuracy of the modeling methods used by participants and technical reviewers.
- Monitor the overall effectiveness and comprehensiveness of key program elements.

- Make recommendations to improve the program.

This report contains the impact, process, and cost effectiveness evaluation findings conducted for the EPP program in PY2022.

2 METHODOLOGY

This section of the report outlines the methodologies used in the PY2022 evaluation of EPP. More detailed descriptions of the evaluation methodology are included in Appendix A.

2.1 EVALUATION APPROACH

Methods used to conduct this evaluation include energy modeling, engineering analysis, documentation review, best practice review, and interviews with program participants and their energy service providers.

One overarching theme guiding this evaluation is the smaller sample sizes compared to other industrial programs. To be ready for evaluation and reporting, facilities must have completed at least their first year of performance, deliver a Savings Report summarizing their estimated savings, and have their technical review and incentive payment processed. This timeline can often last over two years from when the participating organization first delivers their EPP application.

EcoMetric's PY2022 sample frame is detailed in Table 2. For the verification of gross energy and demand savings, EcoMetric evaluated all performance periods that had completed the required Savings Report by February 28, 2023. The Savings Report is a program document that summarizes the participants' annual savings and completed measures for their participating facilities. Along with the Savings Report, participants provide the whole-building meter data for the performance period. For the net savings analysis and process evaluation, EcoMetric attempted to interview all participants active in the program.

In total, three facilities were evaluated as part of the impact sample frame. All three facilities began their first performance period in 2021. EcoMetric was unable to contact one of the facilities for a net savings evaluation, so it will be included in the PY2023 evaluation.

For the net savings verification, EcoMetric developed the sample frame to include all organizations with at least one facility under contract in EPP as of February 28, 2023—resulting in 29 participating organizations. EcoMetric was able to complete interviews with six of these organizations. These interviews consisted of questions only related to net-to-gross.

For the process evaluation, EcoMetric developed the sample frame to include all participating organizations with facilities that had finished their first performance period by the February 28th cutoff so that they could speak on their program experience from application through Savings Report phases. This resulted in 12 participating organizations. EcoMetric was able to complete interviews with nine participating organizations in this sample. These interviews consisted of both net-to-gross questions and process evaluation questions.

Also, as part of the process evaluation, EcoMetric conducted an in-depth interview with one program manager at the IESO and seven energy service providers (ESPs) that were hired by active participants to help with modeling, project identification, and implementation.

Table 2: PY2022 EPP Sample Size

Evaluation	Component	Population	Completed
Gross Savings Verification	Facilities	3	2
Net Savings Verification	Participating Organizations	29	6
Net Savings Verification + Process Evaluation	Participating Organizations	12	9
Process Evaluation	Energy Service Providers	22	7
Process Evaluation	IESO Program Staff	1	1
Process Evaluation - Benchmarking	P4P Programs	5	5

2.2 GROSS SAVINGS VERIFICATION

EcoMetric performed energy and peak demand savings analyses for two facilities that completed their first performance period. EcoMetric calculated energy and peak demand realization rates, the ratio of gross verified savings to reported savings, at the facility-level. EcoMetric applied these facility-level realization rates to the reported savings for the corresponding facilities in the sample frame. With the limited sample frame in PY2022, EcoMetric took a deep dive into the models and procedures conducted by the technical reviewers to provide detailed recommendations to improve reported savings calculations and the models behind them as the program continues to ramp up.

A more detailed description of EcoMetric's gross savings verification methodology is included in Appendix A.

2.3 NET SAVINGS VERIFICATION

Net-to-gross (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 the program. The calculation of NTG factors includes *free-ridership*, defined as the savings customers would have achieved in the absence of the program's influence, and *spillover*, defined as energy savings influenced by the program but not formally incentivized and/or claimed by the program. The primary method of determining a program NTG ratio is through direct query telephone interviews with decision-maker(s) at participating customer organizations. EcoMetric combined the NTG data collection with the process evaluation data collection through in-depth interviews with program participants.

EcoMetric analyzed interview data to calculate two core components of free-ridership: 1) **Intention** to implement the energy efficiency measure(s) in the absence of program funds, and 2) **Influence** of the program in the decision to carry out the energy efficiency measure(s). Each of these components is scored from zero to 50, resulting in a combined free-ridership score between zero and 100.

Total Free-ridership score = Intention score + Influence score

To estimate spillover and any potential influence of participation on subsequent facilities that received incentive funding, EcoMetric asked participants and vendors about influenced projects, the degree of program influence, the project size, and whether they received program support.

The free-ridership (FR)[1] and spillover (SO)[2] factors will be used to estimate net savings using the following formula:

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

EcoMetric calculated the aggregate results for free-ridership and spillover for each participant and applied the results to all of the participant's facilities in the sample frame.

2.4 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, measures' effective useful lives, energy savings load shapes, and incremental project costs.

[1] The energy savings customers would have achieved in the absence of the program's influence.
[2] The energy savings influenced by the program but not formally incentivized and/or claimed by the program.

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.

2.5 PROCESS EVALUATION APPROACH

The research questions and objectives that informed the development of the PY2022 EPP process evaluation were defined in the evaluation kickoff meetings held in January 2023. EcoMetric met with the IESO evaluation and EPP program teams to discuss research objectives and specific questions to include in the process data collection and analysis. Process evaluation research questions and objectives identified include:

- Assess participant experience with the program.
- Assess whether and to what extent EPP builds internal capacity for commercial, industrial, and institutional participants to pursue energy-efficient equipment and practices.
- Explore the decision-making criteria of participation in EPP vs. Retrofit or an SEM program.
- Assess participants' opinions on the updated EPP in the 2021-2024 CDM Framework
- Assess the impact of COVID-19 on participants' energy efficiency plans.
- Document participant sector and building types and investigate whether any differences in program exist between different participant types.
- Assess effectiveness of program processes

EcoMetric leveraged three primary data collection activities to explore key research topics and gather market actor perspectives to complete the process evaluation:

- IESO Program Staff interview: in-depth interview over the phone with key IESO staff with intimate knowledge of the design and delivery of EPP.
- Participant interviews: In-depth interviews over the phone were attempted with all current participating organizations.
- Energy Service Provider (ESP) interviews: In-depth interviews over the phone were attempted with all consultants hired by EPP participants to help with program participation.

Furthermore, EcoMetric conducted a benchmarking study of five P4P programs in the U.S. to identify best practices in program designs and their results with reaching industrial customers.

2.6 OTHER ENERGY EFFICIENCY BENEFITS APPROACH

2.6.1 AVOIDED GREENHOUSE GAS EMISSIONS ESTIMATION

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

2.6.2 NON-ENERGY BENEFITS

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

3 IMPACT EVALUATION RESULTS

This section details the results from the impact evaluation of EPP in PY2022. Only two sampled met the requirements with full Year 1 Performance period savings.

Due to the nature of EPP as a pay for performance (P4P) program, impacts are often evaluated and reported over a year and a half to two years after facilities' applications and baseline models are approved. Furthermore, **EcoMetric's analysis of the EPP tracking system shows that 49 out of 62 facilities that should have their Savings Reports submitted by July 2023 have not done so.**

There are currently 138 facilities under contract in EPP, committed to achieving at least 20,597 MWh electric savings and 3 MW peak demand savings. Future evaluation reports, whereby the sample size is more robust, will be more reflective of the considerable scale of impacts EPP can achieve in a typical program year.

Greater detail on the program's challenges with facility throughput is provided in Section 7: Key Findings and Recommendations.

3.1 GROSS VERIFIED SAVINGS RESULTS

The PY2022 EPP gross verified savings are summarized in Table 3. In total, two facilities were evaluated for savings impacts. Both facilities completed their first performance period (Year 1) in PY2022. No EPP participant had yet finished their second performance period (Year 2) by the sample cutoff of February 28, 2023. A third completed facility review was pushed to the PY2023 evaluation sample frame due to outstanding final documentation.

Because it was unknown which projects would make the final evaluation cutoff, EcoMetric reviewed three additional participant baseline models to help identify and support program findings and recommendations. EcoMetric reviewed detailed application materials, measure performance plans, baseline models, and final technical reviewed savings calculations for all six available participants, while the impacts of the two facilities that were ready for evaluation and fully reviewed are included in this report's impact savings totals.

In Year 1 (PY2022), the two fully evaluated EPP facilities achieved 274 MWh of gross verified energy savings, realizing 94.9% of reported savings. Total gross verified summer peak demand savings for EPP are 0 MW. One participant only completed heating efficiency upgrades, resulting in zero claimed summer peak reductions. The other participant's peak demand savings were reduced to zero due to netting out a concurrent Business Retrofit project that claimed peak savings during PY2022.[3]

Table 3: PY2022 EPP Gross Verified Savings Results

Program Year	Performance Periods Evaluated & Reported	Energy Realization Rate	Gross Verified Energy Savings (MWh)	Gross Summer Peak Demand Savings (MW)
2022 – Year 1 Performance	2	94.9%	274	0

Major drivers of the adjustments to reported savings reviewed by the EcoMetric team included the addition of temporal and other independent variables to improve the model fit, enhanced outlier screening, adjusting daily to hourly meter data preparation, and correcting baseline models for generally accepted statistical procedures. **Overall, the realization rate of 94.9% shows that the reported savings and models behind them were generally accurate.**

EcoMetric conducted a deep dive into the applicants' and technical reviewers' completed models and identified several areas of room for improvement in modeling processes and methodologies. Findings and Recommendations from these efforts can be found in Section 7.

3.2 NET VERIFIED SAVINGS RESULTS

The PY2022 EPP net verified savings are summarized in Table 4. **The program-level NTG ratio[4] for EPP was 64% for the PY2022 sample frame, reflecting a free-ridership score of 36%. No spillover was found in PY2022. However, this program-level NTG ratio is representative of just the two facilities in the PY2022 sample frame, where one participant had a free-ridership score of 100%.** This participant confirmed that the scope, size, and efficiency of their upgrades would have been the same without EPP incentives and support and that the projects they completed in their performance period were already in the organization's budget before their participation in the program. In future evaluations, the larger sample will be more reflective of the population of participating organizations under contract for the EPP.

[3] EPP participants can concurrently participate in the IESO's Business Retrofit program, but savings from Retrofit projects must be removed from the whole-building analysis of EPP-enrolled facilities.
[4] The NTG Ratio applies to both energy and peak demand savings.

As EPP is a whole-building P4P program, there is no spillover at enrolled facilities as all savings are captured in the facility-level meter-based analysis. EcoMetric investigated spillover at participating organizations' facilities that are not yet enrolled. Three additional projects were identified, but the participants expected to receive IESO incentives for them all.

Total net first-year savings for EPP were 176 MWh, and net peak demand savings were 0 MW. One-hundred percent of the energy savings achieved by the sample frame is assumed to persist into 2026.

Table 4: PY2022 EPP Net Verified Savings Results

Program Year	Performance Periods Evaluated & Reported	NTG Ratio	Net Energy Savings (MWh)	Net 2026 Energy Savings (MWh)	Net Summer Peak Demand Savings (MW)	Net 2026 Summer Peak Demand Savings (MW)
2022 – Year 1 Performance	2	64%	176	176	0	0

4 COST EFFECTIVENESS RESULTS

This section details the cost effectiveness results of EPP in PY2022.

As shown in Table 5, EPP is not cost effective from the Program Administrator Cost (PAC) test perspective using a benefit/cost threshold of 1.0. For PAC, benefits totaled $26,356, while costs totaled $135,635. The LUEC of electricity for the program is $0.17/kWh. PY2022's PAC ratio is exceptionally low at 0.19. This program year's cost effectiveness results are not reflective of the program overall, as the benefits of just two facilities are being compared to the full program administrative costs.

Table 5: PY2022 EPP Non-Incented Cost Effectiveness Results

PAC Costs	PAC Benefits	PAC Ratio	LC $/kWh
$135,635	$26,356	**0.19**	**0.17**

The program's cost effectiveness is expected to increase in the coming years, as more facilities join and contribute benefits from avoided energy and demand.

5 PROCESS EVALUATION RESULTS

5.1 PARTICIPANT SURVEY RESULTS

EcoMetric conducted fifteen interviews with Energy Performance Program participants. Nine out of fifteen respondents answered additional process-related questions. This section summarizes the key findings on EPP participants' experience with the program.

5.1.1 EPP PROGRAM AWARENESS

EPP participants learned about the program from a wide variety of sources. Two respondents had a solid familiarity with EPP because they participated in past IESO information sessions. Two additional respondents learned about EPP through marketing materials and advertising. Other respondents learned about EPP via word of mouth from a vendor, contractor, or third-party consultant. These respondents relied heavily on these contacts for program information.

5.1.2 PARTICIPANT EXPERIENCE

More than 80% of participants found EPP to be a useful tool in driving their energy efficiency initiatives. This high satisfaction rating was also highlighted in the results of the IESO-conducted Customer Satisfaction (CSAT) Research, with a key takeaway being that "for most, the program meets and exceeds expectations." However, as with any program, the IESO could enhance its offerings to improve future participant satisfaction.

Several respondents reported that EPP financial incentives and program technical support were significant drivers in their energy efficiency efforts. One respondent claimed that their positive experience with EPP led them to recommend it to other organizations. EPP enhanced this organization's awareness and approach to undertaking energy efficiency projects. When asked about their experience with past EPP measures and the influence it had on the decision to proceed with new energy efficiency measures, the respondent stated the following:

> *"Well, yes, it [was impactful] because it showed how easy [implementing energy efficiency measures] was and what's out there."*

This sentiment was echoed by another respondent who claimed that the ease of access to the program and the overall convenience were key benefits.

One respondent claimed that program participation facilitated more consistent and in-depth reviews when replacing infrastructure. When asked what the organization has learned because of participation in EPP, the following was stated:

> *"We've learned more about the baselines, [and] the importance of establishing a baseline."*

Prior to involvement in EPP, departments at this organization would typically replace old equipment with like-for-like without researching newer, potentially more efficient technologies. The organization now takes a more comprehensive approach to replacements, considering energy efficiency and cost-effectiveness.

Program participation led organizations to take a "big picture" approach to equipment replacements and upgrades, which enhanced decision-making processes.

Similar to findings from the IESO CSAT research, participants reported a positive experience with EPP, attributing this to the financial incentives and program support. In contrast, the dissatisfaction of two of the respondents was primarily linked to perceived shortcomings in technical support and technical reviewer responsiveness. One respondent noted that the application process was complicated, which posed a barrier to program participation. The application and baseline modeling process has been a consistent pain point for EPP participants going back to the Interim Framework.

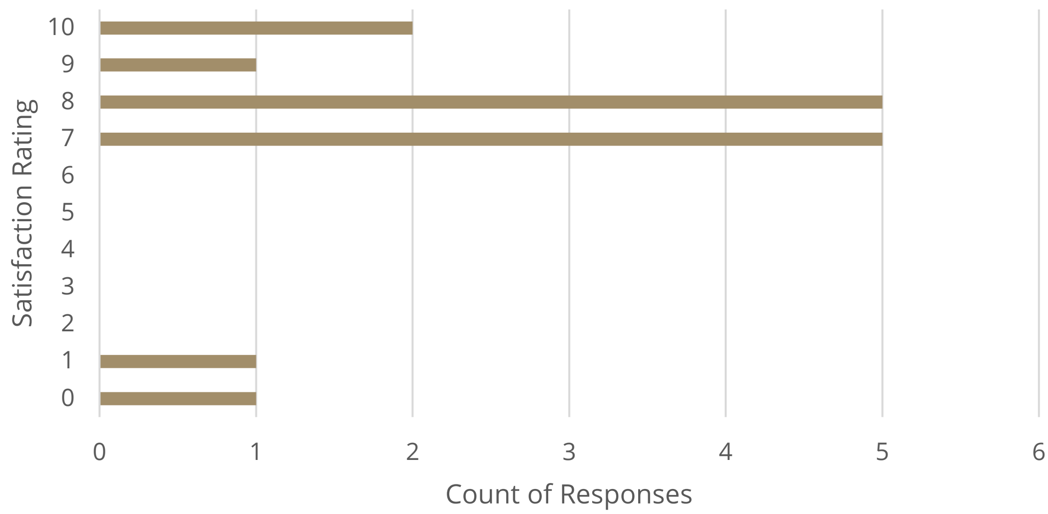
Another respondent mentioned that their organization was unable to generate an hourly demand model, preventing the organization from participating in the kW peak demand savings incentive offering as part of the program. Lastly, one respondent mentioned that their organization was not satisfied with EPP because the expected rebate did not materialize. In this specific instance, the rebate estimation was provided to the organization by a contractor. As such, there was an expressed preference for other programs with guaranteed rebates.

5.1.3 COVID-19 IMPACTS

Impacts from COVID-19 range from minor to significant, which presented a unique set of challenges to various organizations. Following the pandemic, the IESO developed M&V guidance and enhanced support for program participants. Figure 1 demonstrates that most participants were satisfied with the IESO's program support during the COVID-19 pandemic. A satisfaction rating scale of 0-10 was used, where 0 was "extremely dissatisfied" and 10 was "extremely satisfied." **Thirteen out of fifteen participants were satisfied with IESO's support during the COVID-19 pandemic, represented by a**

satisfaction score of 7 or higher. A majority of respondents found the IESO M&V guidance for EPP participants impacted by interruptions during the pandemic helpful, while only two were either not aware of or did not utilize this guidance.

Figure 1: Participant Satisfaction with IESO Program Support During the Pandemic (n=15)



One respondent stated that COVID-19 had only a minor impact as the nature of the operation was expected to run continuously, even during a pandemic. In fact, this respondent claimed that COVID-19 had the opposite effect on their organization as it forced them to "think outside the box" to continue making progress toward their energy efficiency and sustainability plans.

Other respondents claimed there was a change in occupancy at certain properties, such as retail and office sites. This led to increased energy usage due to enhanced ventilation protocols but was often offset by shorter run times. For specific types of retail properties, such as grocery stores, COVID-19 affected operating hours. This led to increased energy usage, when compared to a baseline, due to extended lighting and HVAC operations.

In contrast, universities faced empty campuses, which led to lower consumption of power and natural gas. Energy projects were placed on hold, and priorities shifted to initiatives such as indoor air quality. In summary, COVID-19 led to operational changes across various organizations, which corresponded with shifts in energy use patterns and the implementation of projects.

5.1.4 FUTURE PROJECTIONS AND ADDITIONAL INSIGHTS

A common theme among participants was their commitment to ongoing energy efficiency initiatives. One respondent mentioned several projects in the pipeline that are not yet enrolled in EPP. Measures included LED retrofits, installation of variable frequency drives on pumps and motors, building automation, and electrification. Two respondents indicated intentions of implementing energy efficiency measures at other facilities.

Seven out of nine respondents said their organization plans to complete electrification projects to address GHG emissions within the next three months to the next three years. This response coincides with the IESO EPP CSAT study, with a key takeaway being that corporations are increasingly focusing on GHG reduction. The other two respondents claimed electrification was too expensive. A couple respondents mentioned assistance such as incentives or funding would be helpful to complete these electrification projects. **Only about one-third of participants were aware that EPP program rules allow participants to make a non-routine adjustment to their approved baseline energy model for electrification projects.**

Five out of nine respondents indicated interest in centralized M&V software to perform program required modeling as opposed to hiring an energy service provider. Respondents were interested in M&V software features such as user-friendliness and capabilities such as the development and comparison of baseline models, pre-retrofit modeling, and calculation of non-routine adjustments.

5.2 ENERGY SERVICE PROVIDER INTERVIEW RESULTS

EcoMetric conducted interviews with seven Energy Service Providers (ESPs). Two out of seven of the ESPs provided limited responses to interview questions, as their commitments to the participating organizations were limited to program paperwork.

Responses to the question "What has the organization done differently or learned as a result of participation in EPP?" varied. Two respondents claimed that performance and energy monitoring has always occurred within the organizations they work for. Other respondents mentioned that EPP helped them provide education and training for clients.

One respondent answered this question in detail, and stated the following:

> *"The most significant impact would have been for the person in charge of the energy calculation to learn the requirements of the program. Previously calculations were done monthly, and now they are conducted on an hourly/daily basis. [This] has helped earlier detection of any problems."*

This respondent also mentioned challenges associated with EPP, such as more detailed scenarios that need to be accounted for when making calculations. For example, the occupancy of the buildings is known monthly rather than an hourly or even daily basis. There is a lack of access to this type of data, forcing them to use monthly data instead, which poses a challenge to using the EPP model.

When asked about how EPP fits into the organization's overall sustainability goals, most respondents found the program support helpful. Specific examples include helping the ESPs with selling energy efficiency to their clients, and incentives that help to provide a convincing argument to customers. One respondent stated the following:

> *"It allows us to combine our typical LED retrofits with other systems to create larger sustainability options."*

Two out of seven ESP respondents said their organization recently completed or plans to complete (in the next six months) electrification projects to address GHG emissions. The other four respondents claimed their organization is not yet considering electrifying facilities for the following reasons: (1) everything is already electric, and an internal system has been implemented and/or (2) electrification is either not a priority or is too expensive. One respondent suggested that additional resources and funding would be helpful to complete these electrification projects.

Two ESPs mentioned challenges associated with long installation periods and a complex application process. Another respondent claimed that meeting baseline model requirements was a challenge. It was suggested that more information and incentives be provided.

5.3 PAY FOR PERFORMANCE PROGRAM BENCHMARKING

EcoMetric conducted a Pay for Performance (P4P) program benchmarking review as part of the EPP process evaluation. EPP may be shifting towards an aggregator model where much of the program delivery and modeling burden is placed on a third party. The benchmarking review identifies trends and documents best practices in P4P programs across North America. Table 6 below summarizes each of the P4P programs analyzed as part of this benchmarking study.

Table 6: North American Pay for Performance Program Summary

Program Name	Description
Energy Trust of Oregon Commercial P4P	Rewards property managers and owners with financial benefits proportional to the energy savings realized at their buildings, as monitored through meter readings
New Jersey Commercial P4P	Comprehensive, whole-building approach for achieving energy savings in planned buildings
Con Edison and NYSERDA	Experimental P4P Pilot Program designed to explore alternative incentive models that emphasize energy savings performance at the utility meter and the sustainability of these savings over time
Seattle City Light Deep Retrofit P4P	Provides incentive payments that are based on actual energy savings as measured at the electric meter
Pacific Gas & Electric's (PG&E) Whole Building Performance Based Program Offering	Supports property owners in their energy efficiency investments by allowing them to monitor savings and ensure the longevity of their energy-saving measures as well as contribute to their climate action plans

5.3.1 SAVINGS GOALS AND PROGRAM ELIGIBILITY

Eligibility for these programs spanned a broad spectrum of participants, encompassing commercial, municipal, educational, and institutional customers. **None of the programs that EcoMetric reviewed had significant participation from the industrial sector. In fact, almost all programs are aimed at the commercial and institutional sectors.** EcoMetric believes this is a direct result of the difficulty in modeling industrial building energy consumption due to their varied and often unpredictable patterns from complex processes.

Measurement and verification procedures required comprehensive energy usage data, usually over a minimum of 12 months. Savings goals varied across programs, as these goals coincided with unique program elements. Table 7 summarizes the P4P program's savings goals and how those savings are calculated.

Table 7: P4P Program Savings Goals and M&V

Program Name	Participant Savings Goal
Energy Trust of Oregon Commercial P4P	Goal = 5% reduction in baseline energy consumption. Measurement and verification (M&V) procedures require a minimum of 12 months of energy usage data and can be conducted by participant or an ESP they hire.
New Jersey Commercial P4P	Goal = 5% below the current energy code for commercial and industrial buildings and 15% for multifamily buildings. The program operates via a network of 47 approved partners who serve as energy consultants that offer technical services directly to property owners and managers through specific contracts.
Con Edison Business Energy Pro and NYSERDA	Participants must meet specific criteria including having an active account with Advanced Metering Infrastructure installed and actively used for billing, a minimum 13-months of available billing data, an average annual electric peak demand of less than 300 kW, and more. The Pilot Evaluation Contractor is responsible for processing and documenting non-routine adjustments, ensuring transparency and accountability.
Seattle City Light Deep Retrofit P4P	Goal = 15% reduction of annual consumption from capital improvements. M&V procedures adhere to "IPMVP Option C - Whole Facility, and the Bonneville Power Administration M&V Protocol".
Pacific Gas & Electric's (PG&E) Whole Building Performance Based Program Offering	Seeks to leverage the benefits of smart meter investments and bring the advantages of site-level Normalized Metered Energy Consumption (NMEC) to commercial and public sector buildings. NMEC represents a new direction in energy efficiency, centering on measuring, monitoring, and incentivizing energy savings at the meter level.

Overall, these P4P programs highlighted the importance of flexibility and adaptability in managing energy savings initiatives. **They emphasized the importance of comprehensive technical support and rigorous verification procedures in driving successful energy savings outcomes. Moving forward, these insights can inform our approach to refining the EPP program process, particularly as the IESO shift towards a centralized M&V solution for EPP.**

6 OTHER ENERGY EFFICIENCY BENEFITS

This section details the benefits achieved by EPP beyond kWh and kW savings. However, with just two facilities in the sample, these impacts are minimal. **Future evaluation reports where the sample size is more robust will be more reflective of the considerable scale of other energy efficiency benefits EPP achieves in a typical program year.**

6.1 AVOIDED GREENHOUSE GAS EMISSIONS

An often overlooked impact of electric energy efficiency measures is the avoided greenhouse gas emissions from the avoided generation, transmission, and distribution of electricity in Ontario's grid. **Net first-year greenhouse gas (GHG) reductions total 42 metric tonnes of CO_2 equivalent (CO_2e),** as summarized in Table 8. As EPP projects focus on electricity savings, these GHG reductions are derived from the avoided generation of electricity. **Over the lifetime of the PY2022 evaluated projects, net GHG reductions total 186 tonnes of CO_2e.**

The cost of first-year GHG emissions reductions is $3,219 per tonne of CO_2e from the program administrator cost perspective. EcoMetric expects this cost to decline greatly in future evaluations as more facilities will be achieving GHG reductions to offset program administration costs of the IESO.

Table 8: PY2022 EPP Avoided Greenhouse Gas Emissions

Program Year	First Year GHG Impacts (tonnes CO_2e)	First Year GHG Reduction Costs[5] (\$/tonne CO_2e)	Lifetime GHG Impacts (tonnes CO_2e)
2022	42.13	$3,219	185.86

6.2 NON-ENERGY BENEFITS

Benefits created by measures completed in EPP facilities 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.

[5] Program Administrator Costs

In 2021, Dunsky conducted an in-depth study that evaluated the value and impact of NEBs of six IESO CDM programs from 2017-2019. EcoMetric leveraged the business sector NEBs detailed in Table 9 in the Total Resource Cost (TRC) and Societal Cost (SC) tests for EPP**. In PY2022, NEBs for EPP totaled $24,677.** 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 48% of the $51,032 in total benefits achieved by EPP in PY2022 from the TRC and SC test perspectives.

Table 9: PY2022 EPP Non-Energy Benefits

Non-Energy Benefit	Measure Type	$/net kWh	Total TRC and SC Benefits from NEBs
Thermal Comfort	HVAC, Envelope	0.050	$8,967
Reduced Building & Equipment O&M	All	0.080	$14,347
Improved Indoor Air Quality	HVAC, Envelope	0.007	$1,255
Reduced Spoilage	HVAC, Refrigeration	0.0002	$36
Air Quality	All	0.0004002	$72
Total			$24,677

6.3 JOB IMPACTS

As the majority of EPP participants did not have their first year of performance and Savings Reports ready for review at the time of the PY2022 evaluation, the EcoMetric team will conduct a job impacts analysis that includes a more robust sample of facilities in the upcoming PY2023 evaluation.

7 KEY FINDINGS AND RECOMMENDATIONS

7.1 IMPACT FINDINGS AND RECOMMENDATIONS

EcoMetric compiled findings and associated recommendations across the current program lifecycle starting with initial application performance planning through final technical reviewed savings calculations. The findings cover measure performance plans, baseline modeling, concurrent program participation, and peak demand reporting.

7.1.1 PROGRAM DESIGN

Due to the nature of the annual P4P program design, impacts are often evaluated and reported over a year and a half to two years after facilities' applications and baseline models are approved. **The facility pipeline for EPP is strong with 138 facilities under contract as of July 2023.** EPP participants commit to the goal of saving a minimum of 5% over their baseline electric consumption by the end of their second year of performance. **In total, these 138 facilities committed to achieving at least 20,597 MWh electric savings and 3 MW peak demand savings.**

In the early stages of a program like EPP, this can result in small evaluation sample sizes as participants complete their first performance year—as we see in this PY2022 evaluation report. After EPP participants complete their performance year, they must submit their Savings Report within 60 days. The Savings Report details measures implemented during the performance period and the estimated savings they achieved.

However, an analysis of the EPP tracking system shows that 49 out of 62 facilities that should have their Savings Reports submitted by July 2023 have not done so. Eleven of these facilities should have been ready for evaluation by the PY2022 sample frame cutoff of February 28, 2023. Participants' Savings Reports are overdue an average of 89 days with the longest being overdue 245 days. EcoMetric understands that COVID-19 impacts on business operations has presented a major hurdle for facilities that started their first performance period in 2021 and early 2022. The IESO has been considerate of these challenges and allowed for extensions in the delivery of Savings Reports.

The IESO has also provided a total of $62,485 in pre-project incentives[6] to facilities that have not met the 60-day Savings Report submission deadline.

Finding 1: The majority of EPP participants are not submitting their Savings Reports within the contracted 60 days of completing their performance period. As such, the technical review, evaluation, and reporting of program impacts has been delayed.

Recommendation 1: Increase the technical support throughout the first performance period to identify issues with completing Savings Reports early. To ensure program savings impacts, particularly peak demand reductions, are verified and reported efficiently enough so the IESO can leverage them for system planning, grant submission extensions on a limited basis for extreme cases. To identify bottlenecks and recommend solutions to alleviate them, EcoMetric will conduct a participant journey analysis in the PY2023 evaluation to track the timeline of EPP participation from application phase to inventive payout.

Finding 2: Baseline models submitted by participants differ significantly from final technical review baseline and final verified savings models. Participants are required to update their baseline models multiple times during the program application and savings review process. EcoMetric observed three separate participant baseline model runs were completed between application and final savings verification.

Recommendation 2: Consider expanding the technical reviewer's role to build the application baseline models. Based on recent evaluations, the technical review team is spending time rerunning models while addressing multiple participant model issues that ultimately replace participant submitted models. By having the technical review team take over model development, redundancy will be reduced and back-and-forth communications between participants, participant contractors, and the technical review team will be minimized.

7.1.2 PERFORMANCE PLANS

Finding 3: Energy savings Performance Plans are often difficult to reconcile with final measured performance savings, especially when savings fail to reach program targets or are lower than

[6] The IESO offers a one-time pre-project incentive to offset modeling and early project implementation costs. It is calculated as follows: Baseline Energy Consumption x 2.5% x $0.04/kWh.

expected. Application reviewers typically approve application performance plans based on subjective assessments by technical reviewers, relying on their knowledge and experiences.

Recommendation 3: Introduce preliminary savings estimates for each performance plan activity or measure. This can be achieved through deemed values, engineering estimates, or by setting savings goals for O&M type activities. Objective savings estimates will expedite the review process of final savings by providing program staff, technical reviewers, and evaluators with an understanding of the expected savings levels. Having expected savings will facilitate quicker troubleshooting when savings goals are not met.

Finding 4: Participants often delay projects with significant savings until the end of the performance period. In many cases, participants do not complete all planned projects.

Recommendation 4: Promote better alignment between Performance Plans, measure installations, and the start dates of the performance period with customer Performance Plans. This will help ensure that participants do not postpone significant measures until the last moment and increase the likelihood of completing all planned measures. Focus technical support on the development and commitment to the Performance Plans to ensure success.

Finding 5: In cases where the measures specified in the Performance Plan application are not installed by participants or there are discrepancies between the planned and final projects, explicit documentation regarding delays or changes in project scope is often lacking.

Recommendation 5: Establish a direct comparison between the measures approved in Performance Plans' and the final measure checklists during technical reviews. Use this comparison to identify measures that were not completed or experienced changes in scope. Additionally, if unplanned measures were implemented during the performance period and not included in the initial application, document them as additional planned measures.

7.1.3 CROSS-PROGRAM PARTICIPATION

Finding 6: It is a common occurrence for participants to complete Business Retrofit Program measures during their EPP baseline and/or performance periods. Technical reviewers need to properly account for savings achieved through the Business Retrofit Program, either by adjusting baselines or subtracting savings and demand reductions from the model estimates. However, during evaluation, EcoMetric is often unclear as to what the primary end use is for these Retrofit measures. Understanding the end use of these measures is critical for an evaluator's assessment of the accuracy of the methodology used to net out their savings from EPP baselines and savings calculations.

Recommendation 6: Clarify the rules regarding cross-program participation for EPP participants. When participants are concurrently involved in multiple programs, technical reviewers should ascertain the primary end use of the installed measures that were incented by a program other than EPP. Technical reviewers can adjust hourly baseline models for EPP participants more precisely, rather than applying a blanket adjustment. This approach will enable a more accurate estimation of peak demand when integrating model-based savings with adjustments for incented measures from other programs with deemed savings.

7.1.4 BASELINE MODELS

Finding 7: Customer and technical reviewed baseline models are frequently divided into multiple discrete models. For instance, the baseline year may be split into three separate models: holidays, weekdays, and weekends. This practice is likely employed to isolate similar days or time periods and improve model metrics. However, it often leads to exceedingly small models that may contain fewer than ten data points (e.g., holiday only models). Using multiple models also creates unnecessary model documentation, complexity, and uncertainty in final savings results.

Recommendation 7: Promote simplicity in application baseline models by using a single model per site. Different time periods or holidays can be incorporated into a single model using appropriately defined indicator (dummy) variables. Adopting one model per participant site will streamline analysis, simplify savings calculations, and eliminate the need for small sample models.

Recommendation 8: Relax the regression coefficient T-Statistic (T-stat) M&V guideline requiring individual coefficient statistical test coefficient be greater than two. Dummy temporal variables may not all be equally important and some variable levels may not meet this requirement. For example, if monthly indicator variables were included in the baseline model, you may see two- or three-month indicators with lower coefficient statistical test values in shoulder energy months where weather is mild. It is unnecessary to remove those individual month levels when the overall model goodness of fit metrics meet program guidelines.

Recommendation 9: Consider changing or removing Energy Performance Program M&V Procedures Section 5.7 language around creating multiple baseline models. Also, consider altering M&V guidelines Appendix C – Illustrative Example to using single dummy variables instead of multiple models as a best practice.

Finding 8: Hourly and daily baseline consumption models in all cases did not include temporal independent variables. Temporal variables can include month, hour of the day, day of week or even hour or hour of week for hourly consumption based models. In all cases, when EcoMetric included temporal variables the goodness of fit model metrics improved. Temporal variables, especially month indicators, produce model residual values (difference between model prediction and actual energy value) that are near zero. This creates more accurate consumption data peak reduction estimates. Temporal variables can also replace production and occupancy variables if they are predictably time-based. One concern with including temporal variables is that not all variable levels may result in statistically significant coefficients when models are built using ordinary least squares regression.

Recommendation 10: In most cases, baseline models should include temporal variables. If customer application models and/or final technically reviewed models do not include temporal variables, it should be understood why they were excluded, especially for hourly consumption models.

Finding 9: Both participants and technical reviewers are substituting Standard Error of Regression (SER) for Root Mean Square Error (RMSE). SER is a standard Microsoft Excel-based regression output metric labeled as Standard Error listed between the Adjusted R Square and number of observations. SER is calculated by dividing the Sum of Squared Residuals (SSR) by the number of input data observations minus the number of independent variables and the degrees of freedom. The last step is to take the square root. RMSE is calculated similarly, but the SSR values are only divided by the number of observations minus degrees of freedom. For small one or two variable models, the SER and RMSE values will be close in value. However, for hourly models with potential dozens if not hundreds of independent variable model inputs, the two calculations will differ. The SER will be smaller than the RMSE and understate the CV(RMSE) goodness of fit metric.

Recommendation 11: SER should not be used instead of RMSE when calculating baseline model CV(RMSE).

Finding 10: Participant and technical review models do not document the method for choosing final heating and cooling degree variable balance points. When evaluated degree day balance points (base temperatures) do not align with either participant or technical reviewed model inputs, the reasons for those differences are indeterminable.

Recommendation 12: EcoMetric recommends that methods for choosing cooling and heating degree day/hour setpoints be documented as part of the application and technical review model narratives.

Finding 11: Participant and technical reviewer outlier removal often lacks details or context as requested in the current EPP M&V Guidelines Section 6.5. Participants and technical reviewers are not documenting outlier detection methods and/or reasons for removing a data point from baseline models.

Recommendation 13: Encourage outlier detection screening and documentation for removed data points. Visuals are key for demonstrating outlier decisions.

Finding 12: The steps participants and technical reviewers use to prepare meter data model input are not clearly documented. Two examples include consistently treating data as hour ending or beginning and adjusting hourly data for daylight savings. Meter data is usually delivered hour ending so that hourly consumption with a timestamp of 0:00 will refer to 11pm to midnight the previous day. Furthermore, typical meter data is output in standard time and not daylight savings adjusted. In many cases, it is unclear if the data is adjusted prior to modeling. This can be detected by checking for an extra hour the first Sunday in November and a missing hour the second Sunday in March. Both hour ending consistency and daylight savings time adjustment inconsistencies will impact final peak demand reduction estimates and incentive calculations.

Recommendation 14: Require that participants and technical reviewers consistently treat hourly meter data as hour beginning or hour ending. Hourly data standard verses daylight savings status should be verified by technical reviewers and adjusted appropriately prior to modeling and savings calculations.

Finding 13: Out of the 138 facilities currently participating in EPP, only 53 have elected to participate in the peak demand incentive adder. The incentive adder offers $50/kW for summer peak demand savings realized with the annual incentive capped at 20% of baseline summer peak demand. To participate in the incentive adder, models must be hourly to calculate peak demand reduction. In process interviews with participants, EcoMetric identified hourly modeling as a pain point.

Recommendation 15: Consider increasing the incentive adder value to attract more participants. The IESO's plan to leverage centralized M&V software for hourly modeling should eliminate the pain point for participants and increase the uptake of the peak demand incentive adder.

Finding 14: The technical review documents display screenshots of load shape tools that calculate peak demand using outdated versions of IESO Cost Effectiveness Tools, rather than utilizing the current versions. (Note that this finding applied to daily model CDM framework models not included in the PY2022 sample frame).

Recommendation 16: Ensure that the technical review teams assess peak demand accurately, particularly when it is not directly measured using model data. This can be achieved by using the load shapes and coincidence factors from the most up-to-date IESO Cost Effectiveness Tool.

Finding 15: Model based peak demand estimates were not provided for all projects.

Recommendation 17: We recommend that hourly consumption data based peak demand savings be calculated for all projects regardless of participants' decision to opt into the peak demand incentive adder. Technical reviewers should be directed that per M&V guidelines, baseline model outputs using daily electrical energy can be used to determine energy savings only, but not peak demand savings. (Note that this finding was from CDM Framework 2022 project review that was shifted to the 2023 evaluation)

7.2 PROCESS FINDINGS AND RECOMMENDATIONS

7.2.1 PARTICIPANT EXPERIENCE

Finding 16: The IESO's CSAT research found that participants were generally satisfied with EPP and that the program met or exceeded their expectations. EcoMetric's interviews found that dissatisfaction was attributed to a lack of technical support and responsiveness. The application process was also identified as an obstacle to program participation. These sentiments were echoed in findings from IESO's CSAT study.

Recommendation 18: Assign one specific technical reviewer to each facility to ensure the participants and their ESPs communicate with a single point of contact that can improve responsiveness and continuity throughout the application and baseline modeling process.

Finding 17: Only about one-third of participants were aware that the EPP program rules allow participants to make a non-routine adjustment to their approved energy models for electrification projects.

Recommendation 19: EcoMetric will provide the IESO evaluation team with a list of organizations unaware of this opportunity for direct marketing by the IESO Business Advisors. EcoMetric believes the material detailing the electrification adjustment opportunity is robust on the IESO's website, but an additional email blast to participants with a link to this specific information would be beneficial.

7.2.2 COVID-19 IMPACTS

Finding 18: Based on participant interviews COVID-19 impacted the occupancy and energy consumption of retail, office, and university buildings the most, resulting in lower energy usage. This resulted in the delay or cancellation of planned energy efficiency projects.

Recommendation 20: Consider adding case studies specific to these building types for handling COVID-related non-routine adjustments in the program's M&V Guidance Documents. Focus technical support on these building types to ensure performance plans and models are adjusted properly.

A.1 Gross Savings Analysis

Customer supplied and technical reviewed application materials along with final savings reports and baseline model documentations were the primary reviewed savings verification data sources. Correspondence between IESO EPP program staff, technical reviewers, and program participants were considered when determining verified energy savings. Final technical reviewed savings were treated as the ex-ante savings prior to determining final verified savings and not submitted participant savings reports. Project level audits were conducted on all available EPP projects spanning application to final technical reviewed savings reports. The other major evaluation task was rerunning final savings models and evaluating alternative model versions that may be impacting energy savings and/or increasing savings accuracy. Figure 2 details the project level audit and savings verification process for each reviewed project.

Figure 2: Project Audit Protocol

Review available project documents
- Verify accuracy and completion of interval data
- Verfiy sub-metering data if applicable
- Verify aggregation of buildings if applicable

Review Baseline Model Report
- Confirm baseline model meets program requirements for statistical significance and variance
- Verify the integrity and quality of baseline data
- Review and confirm adjustments

Review Model Regression and Baseline Validation Tool
- Confirm baseline consumption data
- Verify regression formulas and weather input data
- Verify model statistics meet program requirements
- Review baseline adjustments in detail

Recreate Model Regression
- Confirm model regression can be recreated using available data
- Record discrepancies and adjustments made by the evaluation team
- Confirm schedules, and non-routine adjustments with facility contact, COVID impacts and approved adjustments.
- Build a pre-post model using performance period data and compare to savings summary report

Alternative Modeling
- Acquire site specific hourly detailed weather and customer specific variables
- Produce alternative hourly and daily baseline models
- Evaluate for potential performance improvement
- Report on savings/precision estimate variances

Review Savings Summary Report
- Assess the accuracy of savings calculations
- Review performance period data and modeling results
- Review monthly and daily data, and align with implemented measures to see if the implementation dates align with the expected savings

Finalize Verified Savings and Realization Rates
- Calculate realization rate for every project evaluated
- Report reasons for realization rates other than 100%
- Calculate demand savings and hourly load shapes for each project
- Calculate weighted average EULs for each project

A.1.1 Key Verified Savings Inputs

Verified savings baseline models and associated savings model calculations differed from final technical reviewed model savings. The primary evaluation savings model changes were adding temporal and other independent variables, enhanced outlier screening, adjusting daily to hour meter data preparation, and correcting baseline models for generally accepted statistical practices. Table 11 highlights the difference between technical reviewed and final verified savings baseline model metrics and savings.

Table 10: Key Verified Savings Inputs

	Number of Baseline Models	Number of Model Parameters	Savings (kWh)	RMSE	CV(RMSE)	R^2
Facility A						
Claimed	2	2 (each model)	184,513	83	18.9%	84%
Verified	1	180*	200,936	63	14.1%	91%
Percent (%) Change			+8.9%	-24.1%	-25.4%	+8.3%
Facility B						
Claimed	1	2	104,462	22.1	6.9%	77%
Verified	1	180*	73,362	11.8	3.6%	93%
Percent (%) Change			-29.8%	-46.6%	-47.8%	+20.8%

*Full Time of Week (TOW) parameterization method with (167 variables per week, month (11), and degree day (2))

A.1.2 Data Sources

Table 12 contains a list of the data sources used from verifying gross savings.

Table 11: Data & Information Sources Used for Evaluation

Item	Description	Source
Reported (Ex-Ante) participation & savings	Savings by facility	Technical Reviewer & IESO
Participant contact information	For survey administration	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
Greenhouse gas (GHG) factors	Emissions factors based on generation mix of the electrical grid	IESO

Savings reports and meter data submitted by the participants for each facility site will be the primary data sources for EPP projects in the gross impact evaluation.

A.1.3 Effective Useful Life Estimation

EPP projects at facilities can have several diverse energy-saving measures completed throughout the program's performance period. To assess the persistence of energy and demand savings resulting from EPP, EcoMetric a weighted average approach to develop a single Effective Useful Life (EUL) for the multiple measures completed at each facility. EcoMetric estimated measure savings using engineering algorithms and industry references. Each individual measure was assigned an EUL based on IESO Measure and Assumption Lists (MALs), Technical Reference Manuals (TRMs) in similar jurisdictions, or industry norms. Facility-level EULs allowed for the analysis of the long-term savings impact of EPP on a diverse set of projects and facilities. EcoMetric calculated a weighted average EUL for each facility based on the estimated savings for each individual measure.

As EPP awards savings from capital and O&M measures at the same rate, behavioural measures can be popular in the program. As these measures are dependent on human behaviour, such as remembering to turn off lights, it is often difficult to assign a measure persistence to determine lifetime savings. EcoMetric followed the guidance provided by the IESO for evaluating behavioural measures implemented in non-residential sectors.[7]

A.2 Cost Effectiveness Assumptions

- Program administrative costs (CE Tool Budget Inputs) were provided by the IESO Evaluation Team for PY2022.
- EcoMetric utilized the most appropriate IESO-provided load shape based on measure technologies and premise type.

[7] IESO Memorandum: "Non-Residential Behavioural Measure Persistence". September 18, 2019.