2021-2024 CDM Framework: PY2022 Energy Affordability Program Evaluation Report

September 5, 2023

SUBMITTED TO:
Independent Electricity System Operator

SUBMITTED BY:
NMR Group, Inc. in partnership with Resource Innovations, Inc.

NMR Group, Inc.

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Acronyms

Acronym	Definition
AC	Air Conditioner
AV	Audiovisual
CDM	Conservation and Demand Management
CF	Correction Factor
CI	Confidence Interval
DHW	Domestic Hot Water
DSM	Demand Side Management
EAP	Energy Affordability Program
EM&V	Evaluation Measurement and Verification
EUL	Effective Useful Life
FTE	Full-time equivalent
HOU	Hours of Use
IDI	In-depth Interview
IESO	Independent Electricity System Operator
IO	Input-Output
ISR	In-Service Rate
KW	Kilowatt
KWH	Kilowatt-hours
LEAP	Low-Income Energy Assistance Program
LED	Light-emitting Diode
LPM	Liters Per Minute
MAL	Measures and Assumptions List
MW	Megawatt
MWh	Megawatt-hour
NPV	Net Present Value
NTGR	Net-to-Gross Ratio
OESP	Ontario Electricity Support Program
PAC	Program Administrator Cost Test
PY	Program Year
RR	Realization Rate
StatCan	Statistics Canada
SUPC	Supply and Use Product Classification
SUT	Supply and Use Table
TRM	Technical Reference Manual

Executive Summary

NMR Group, Inc. (NMR), in partnership with subcontractor, Resource Innovations, Inc (formerly Nexant)., (collectively, "the NMR team") and under contract to the Independent Electricity System Operator (IESO), performed an evaluation of the Energy Affordability Program (EAP) for Program Year 2022 (PY2022).

Program Description

EAP provides support to income-eligible electricity consumers by helping them to lower their monthly electricity costs and to increase their home comfort through energy-saving upgrades. EAP offers two service tiers to eligible participants determined by the participant's level of income:

- Comprehensive Support (Tier 1) offers free, comprehensive home energy needs assessment conducted by a trained energy professional (referred to as an "energy auditor throughout this report) who will help identify energy-efficient upgrades available for the homes. The upgrades may be installed during or after an in-home visit. The tier is targeted towards low-income consumers, providing full program offerings with professional measure installation and removal/disposal of replaced equipment.
- Energy Saving Kit (Tier 2) provides free, tailored Energy Saving Kits that are customized to meet the needs of the customer. The tier is targeted to moderate income consumers, providing a more limited program offering.

Evaluation Objectives

The EAP evaluation sought to address several research objectives in PY2022, including the following:

- Verify gross energy and demand savings;
- Estimate realization rates (RRs);
- Estimate the net-to-gross ratio (NTGR) for Energy Saving Kit (Tier 2) moderate income offering. Comprehensive Support (Tier 1) has a deemed value of 1.0 for NTGR since it is a direct install low-income offering;
- Conduct cost-effectiveness analyses;
- Estimate the avoided greenhouse gas (GHG) emissions;
- Perform a process evaluation;
- Conduct a non-energy benefits (NEBs) analysis, and
- Analyze job impacts for the program.

SUMMARY OF RESULTS

The impact evaluation results for EAP are displayed in Table 1. The overall RR for PY2021 is 94% for energy savings and 87% for demand savings.

Table 1: EAP PY2022 Results

Metric	Units	Evaluated
Participation	Projects	27,772
Participation	Homes	27,690
Reported Energy Savings	MWh	11,207
Reported Demand Savings	MW	0.91
Gross Energy RR	--	0.94
Gross Demand RR	--	0.87
Gross Verified Energy Savings	MWh	10,541
Gross Verified Demand Savings	MW	0.79
Comprehensive Support (Tier 1) Net-to-Gross Ratio (NTGR)	--	1.00
Energy Saving Kit (Tier 2) Net-to-Gross Ratio Energy (NTGR)	--	0.82
Energy Saving Kit (Tier 2) Net-to-Gross Ratio Demand (NTGR)	--	1.32
Net Verified Annual Energy Savings (First Year)	MWh	10,524
Net Verified Annual Demand Savings (First Year)	MW	0.79
Net Verified Persisting Energy Savings to PY2026	MWh	10,524
Net Verified Persisting Demand Savings to PY2026	MW	0.79
Program Administrator Cost (PAC) Test Ratio	--	0.25
Levelized Delivery Cost (Energy)	$/kWh	0.18
Levelized Delivery Cost (Demand)	$/kW	2,294

KEY FINDINGS AND RECOMMENDATIONS

This section provides a subset of the most important PY2022 evaluation key findings and recommendations. Section 7 provides all the key findings and recommendations.

Finding 1: EAP saw 117 weatherization projects occur in PY2022, but on a per-project basis produced one-half the gross verified savings compared to PY2021 results from the Home Assistance Program (HAP, n=220) and EAP (n=20). Weatherization projects accounted for 2% of the program's total claimed savings, up from 1% in PY2021. The PY2022 average of 1,827 kWh in gross verified savings per project was over 50% lower than the PY2021 EAP average of 4,141 kWh. Multiple factors likely contributed to this per-project decline in EAP savings, though the comparison with PY2021 is limited by small sample size (n=20). EAP per-project weatherization savings are also lower than the equivalent values from HAP evaluations from PY2019 through PY2021 (3,240 kWh, 3,669 kWh, and 4,333 kWh, respectively), which should be noted increased year-over-year and were based on larger sample sizes. Among individual PY2022 EAP weatherization measures, attic insulation showed the largest decline in verified energy savings per project of any weatherization measure compared to PY2021—a 64% drop compared to HAP and 68% drop compared to EAP. Attic insulation and draftproofing, which tend to have lower average savings than basement and wall insulation, accounted for a larger portion

of verified weatherization energy savings in PY2022 EAP (69%) than PY2021 HAP (60%) and PY2021 EAP (62%).

- **Recommendation 1a.** Continue to position weatherization as a critical measure for EAP given its potential for high savings, non-energy benefits, and pairing with HVAC upgrades. Balancing increased uptake of weatherization projects with sustained per-project savings is key. Achieving this balance requires developing better estimates of potential weatherization savings in participant homes by expanding tracking data to better identify homes with electric baseboards and furnaces (see **Recommendation 3a**). Likewise, to sustain or increase uptake, the program should consider expanding the scope of program impacts to include potential greenhouse gas (GHG) emissions reductions from electrification and/or low-GHG insulative materials. Strategies to sustain or increase per-project savings include increasing the target of vented attic insulation from R51 to R60 or higher, subject to cost-effectiveness testing.
- **Recommendation 1b.** Work with delivery agents to conduct longitudinal research on EAP and HAP weatherization model (Hot2000) inputs and outputs (e.g., type, R-value, and coverage area of pre-existing insulation) to monitor for trends and examine potential underlying causes of per-project declines in weatherization savings.

Finding 2: Energy Saving Kit (Tier 2) uptake remained low in PY2022, and opportunities remain to increase participation in future years. Kits were distributed to 103 participants and accounted for over 90,000 kWh of gross verified savings. This represents a sharp 58% decline in the total kits distributed to participants compared to PY2021. These kits provide an average of 890 kWh in gross verified savings per participant, compared to 437 kWh in average gross verified savings per Comprehensive Support (Tier 1) project. However, participants are of moderate income and have a NTGR applied to account for net verified savings, which reduced savings down to 75,000 kWh. While most surveyed Energy Saving Kit (Tier 2) participants (five of seven) indicated that they were completely satisfied with the process of applying for and receiving the Energy Savings Kit, IESO staff expressed that the requirement to prove income qualification may have been a barrier to participation. Delivery vendors noted that customers' income levels tend to either make them eligible for Comprehensive Support (Tier 1) or ineligible altogether.

- **Recommendation 2a.** Expand income eligibility criteria for Energy Saving Kits (Tier 2) to be inclusive of more households.
- **Recommendation 2b.** Consider enhancing the Energy Savings Kit to increase its appeal to customers and spark more interest in them. This could be done by including a higher quantity of the equipment with the highest participant satisfaction ratings (LEDs), replacing the measure with the participant lowest satisfaction rating (clothes drying rack) with a different model, or adding a higher value or more modern equipment type, such as smart thermostats.
- **Recommendation 2c.** IESO's efforts to update Energy Saving Kit (Tier 2) eligibility and increase marketing should include developing and distributing educational materials (e.g., pictures, links to tutorial videos, or written guidance for measures) covering measure installation and/or maintenance, especially for measures that are not commonly installed (e.g., aerators, block heater timers). This may encourage greater installation rates of

measures delivered through mailed kits. Installation rates for Energy Saving Kit (Tier 2) were not assessed in the PY2022 or PY2021 evaluations due to low incidence. However, low measure installation rates could impact future savings potential, so the program should consider approaches like educational outreach to ensure high installation rates.

Please note that a similar recommendation related to better educating customers about the Energy Saving Kits was included in the PY2021 evaluation as well. In response to the recommendations in PY2021, the IESO indicated they are developing an Energy Saving Kit (Tier 2)-focused marketing campaign, as well as refreshing collateral based on participant feedback. The IESO also noted that the program currently provides installation instructions along with the Energy Saving Kit and live-agent support during call center hours for participants requiring assistance with kit installations. Given that low kit incidence continues to be of relevance in PY2022, a related recommendation has been provided again.

Finding 3: Discrepancies in the demand factor used to calculate savings were the main driver of the overall demand RR of 87%, and multiple measures' demand RRs of 50% or below. The MAL specifies use of the summer peak demand factor (SPDF) from a particular load profile for each program measure. However, desk reviews turned up instances of winter peak factors used without justification to calculate claimed demand savings. Elsewhere, the demand factors used did not match the heating/cooling system recorded in project files and/or were inconsistently applied to measures. Some of the data that would help to reduce discrepancies in demand savings calculations are already collected in data collection forms, such as building or equipment type.

- **Recommendation 3a.** Work with program staff, program delivery vendors, auditors, and contractors to consistently incorporate information already collected on-site (e.g., building type, mechanical equipment, and heating fuel) into tracking data. Where feasible, expand tracking data to include additional specifications (e.g., equipment efficiency, capacity).
- **Recommendation 3b.** Develop protocols to validate delivery agents' reported savings for measures whose substantiation sheets have different reported savings depending on building type, cooling system, etc. Ensure that the MAL also documents these different reported savings.
- **Recommendation 3c.** Align future updates to the peak demand savings calculations in the substantiation sheets with the load profiles assigned for each program measure in the latest MAL.
- **Recommendation 3d.** Establish data validation protocols to flag which demand factor is used to calculate savings provided to program vendors via IESO Measure Lists. Likewise, establish transparent criteria for claiming peak demand savings during the winter peak period, e.g., the Ontario electric system experiences winter peaks in two consecutive years.

Finding 4: Altogether, 1% of the EAP PY2022 program population was flagged in tracking data as having a health and safety upgrade. By comparison, desk reviews of 130 EAP project files turned up seven cases (5%) where on-site auditors and contractors documented health and safety barriers such as clutter and/or moisture. Five of these seven cases lacked any flag indicating the presence of a barrier. Tracking health and safety barriers is key to improving

occupant comfort and understanding the potential for increasing the uptake of high-savings measures like weatherization. Previous evaluations [1] have recommended an emphasis on weatherization upgrades due to high per-unit savings and co-benefits of increased occupant comfort and improvements in indoor air quality.

- **Recommendation 4a.** Improve the quality and comprehensiveness of health, safety, and comfort data collected on-site and contained in the program tracking data. This could include additional required fields in program tracking data for any projects where auditors and contractors identify a health and safety barrier (e.g., what barrier[s] did they observe, what measures were they unable to install as a result).
- **Recommendation 4b.** Develop a participant journey map for homes with observed health and safety barriers. Equip auditors and contractors with the time and resources to provide guidance on how participants can remediate any observed health and safety barriers. This could include referrals to contractors that could conduct the necessary remediation, and program incentives specifically tied to these steps. In addition, these journey maps can extend into follow-up plans for participants to receive certain energy-efficiency measures that weren't installed due to health and safety concerns after remediation has occurred.

Finding 5: Additional program promotion opportunities exist. Auditors, contractors, IESO staff, and delivery vendor staff all recommended that the program conduct additional marketing efforts. Auditors and contractors cited marketing and outreach as the aspect in greatest need of program improvement (average rating of 2.9 on a scale from 1 to 5, where 1 meant "not at all satisfied" and 5 meant "completely satisfied"). Auditors and contractors also indicated that the greatest barriers to program participation were customer concerns about whether the program was real or a scam (mentioned by 87%) and lack of program awareness among customers (mentioned by 61%). To address these barriers, auditors and contractors most commonly recommended increasing outreach and marketing (mentioned by 35%). Some auditors and contractors provided specific recommendations, such as advertising the program's legitimacy and coordinating with local municipalities to promote the program in remote communities, tailoring marketing by region and season, and involving community organizations in program outreach. IESO and delivery vendor staff suggested that, where feasible, the program consider reviving some of the targeted mass marketing strategies that were used in past program years, focusing additional effort on Energy Saving Kits, and coordinating marketing efforts with delivery vendors. Delivery vendor staff suggested region and season specific marketing efforts.

- **Recommendation 5a.** Increase and diversify marketing efforts to boost overall program awareness and reduce customer skepticism of the legitimacy of the program. This could also include reviving some mass marketing activities such as radio, TV, billboards, or print ads, as well as expanding on existing digital marketing activities like banner ads, video testimonials, and social media campaigns.

[1] See Finding 1 in the 2021-2024 CDM Framework: PY2021 Energy Affordability Program Evaluation Report; see also Recommendation 2a in the Interim Framework: First Nations Conservation Program Evaluation Report.

- **Recommendation 5b.** Ensure marketing messaging includes direct language emphasizing the program's safety and legitimacy, as well as its no-cost nature and energy-saving potential.
- **Recommendation 5c.** Coordinate with local municipalities to promote the program regionally and/or in remote communities.
- **Recommendation 5d.** Provide tailored marketing to specific regions or by season. Consider highlighting equipment of particular interest to a given region or employing messaging that may resonate the most during a given season.
- **Recommendation 5e.** Continue collaborations with EAP Roundtable and community-based organizations to help promote the program and address concerns about the program's legitimacy.

Please note that a similar recommendation related to program promotion opportunities was included in the PY2021 evaluation as well. In response to the recommendations in PY2021, the IESO indicated that it remains committed to exploring opportunities for collaboration and cross-promotion, stating that they would review program collateral, as well as leveraging the EAP Roundtable participants for additional cross-promotion opportunities. Additionally, they noted beginning co-branded marketing with Enbridge and that co-branding of bill inserts would soon be rolling out. Given that this topic continues to be of relevance in PY2022, related recommendations have been provided again.

Section 1 Introduction

The Independent Electricity System Operator (IESO) retained NMR Group, Inc. (NMR), in partnership with subcontractor, Resource Innovations, Inc. (formerly Nexant), (collectively, "the NMR team") to conduct an evaluation of the Program Years (PY) 2021-2022 of the 2021-2024 Conservation and Demand Management Framework (CDM) low-income program. This report includes results, findings, and recommendations for the Program Year 2022 (PY2022) evaluation and is specific to the Energy Affordability Program (EAP).

1.1 Program Description

EAP provides support to income-eligible electricity consumers by helping them lower their monthly electricity costs and increase their home comfort through energy-saving upgrades. EAP offers two service tiers to eligible participants, determined by the participant's level of income:

- Comprehensive Support (Tier 1) offers free, comprehensive home energy needs assessment conducted by a trained energy professional (referred to as the "EAP auditor" throughout this report). The upgrades may be installed during or after an in-home visit. The tier is targeted towards low-income consumers, providing full program offerings with professional measure installation and removal/disposal of replaced equipment. During the in-home visit, the energy professional will also provide participants with educational information and materials on how to reduce their electricity use, lower their energy bills and make their homes more comfortable.
- Energy Saving Kit (Tier 2) provides free, customized Energy Saving Kits. The tier is targeted to moderate income consumers, providing a more limited program offering.

1.1.1 Delivery

Under the CDM Framework, EAP is a centrally managed program designed and administered by the IESO. A program delivery vendor under contract with the IESO is responsible for managing the program's delivery, including marketing and outreach, managing and training an energy auditor and installation contractor network for in-home energy audits and program-eligible equipment installations as part of the Comprehensive Support (Tier 1) offering, overseeing the procurement and distribution of the Energy Saving Kits as part of the Energy Saving Kit (Tier 2) offering, and other daily program management activities. During audits, the Comprehensive Support (Tier 1) program participants receive educational materials and tips on saving energy and any necessary training.

1.1.2 Eligibility

To be eligible to participate in the program as a Comprehensive Support (Tier 1) participant, the participant must (1) be a resident of an eligible social housing property or (2) be an individual who owns, rents, or leases their residence; is listed as the primary or secondary utility account holder; and meets one of the following criteria:

- Has an annual household income for the previous year that does not exceed the program eligibility limits
- Received assistance from an eligible assistance program in the past 12 months
- Received a Low-Income Energy Assistance Program (LEAP) grant or was part of the Ontario Electricity Support Program (OESP) in the past 12 months
- Qualified to participate in a natural gas low-income Demand Side Management (DSM) program during the past 12 months

To be eligible to participate in the program as an Energy Saving Kit (Tier 2) participant, the participant must (1) be an individual who owns, rents, or leases a residence in Ontario listed as the primary or secondary utility account holder, (2) not meet the eligibility for Comprehensive Support, and (3) have an annual household income for the previous year that does not exceed the program eligibility limits.

1.1.3 Measures

The measures offered by EAP to Comprehensive Support (Tier 1) participants are classified into one of three tracks. The basic track encompasses measures that are easily installed on-site by the EAP auditor, such as energy-saving light bulbs, high-efficiency showerheads, and faucet aerators. Basic measures that conserve water usage and insulate water heater piping and storage tanks are only provided to customers with electric water heaters. The extended measures track includes measures that require a separate installation, such as appliances. The weatherization track is offered to homes that are eligible for insulation upgrades and is only available for homes that are electrically heated.

The measures offered by EAP to Energy Saving Kit (Tier 2) participants are provided as part of an Energy Saving Kit, which may include free energy-saving measures for self-installation like energy-saving light bulbs, efficient shower heads, faucet aerators, and/or clothes drying lines. The contents of the Energy Saving Kit are dependent on the household needs and eligibility and customized for each type of home. If the home and/or the hot water are heated by electricity, the participant may qualify for energy-saving water measures and/or weather-stripping. Additionally, the Energy Saving Kit may include a block heater timer.

1.2 Evaluation Objectives

The evaluation sought to address several research objectives in PY2022, including the following:

- Verify gross energy and demand savings with a 90% level of confidence at 10% precision for the program
- Estimate realization rates (RRs). Comprehensive Support (Tier 1) has a deemed value of 1 for the net-to-gross ratio (NTGR) since it is a low-income program; while Energy Saving Kit (Tier 2) includes moderate income participants and has a calculated NTGR
- Conduct cost-effectiveness analyses
- Estimate the avoided greenhouse gas (GHG) emissions from electricity savings using the IESO Cost Effectiveness Tool

- Perform a process evaluation by addressing key research questions of interest to the program
- Estimate non-energy benefits (NEBs) using results from participant surveys
- Conduct a jobs impact analysis to estimate the number of direct and indirect jobs attributable to the program

Section 2 Methodology

A summary of the impact evaluation, process evaluation, NEBs estimation, and jobs impact analysis methodologies is presented in this section. Detailed descriptions of these methodologies are provided in Appendix A.

2.1 Impact Evaluation Methodology

To complete the PY2022 impact evaluation, the NMR team performed the following activities:

- Reviewed program tracking data
- Conducted desk reviews using project file documentation
- Analyzed in-service rates (ISRs) and hours of use (HOU) using participant survey data
- Incorporated results from the PY2019 review of technical reference manuals (TRM) from other jurisdictions[2]

These are standard practices to compare evaluated savings with reported savings. The results from the tracking data review and the desk reviews were used to calculate the realization rates (RRs) for the Comprehensive Support (Tier 1) participants. For Energy Saving Kit (Tier 2) participants, the RRs were calculated based on a review of the Energy Saving Kit contents, which included a review of the savings values applied for each measure dis tributed in the mailed kit. A detailed description of the impact sampling methodology, activities, and process to calculate gross verified savings are provided in Appendix A.1.

2.1.1 Net Verified Energy and Demand Savings

For the Comprehensive Support (Tier 1) offering, the NMR team applied an NTGR value of 1.0 to maintain consistency with other low-income, direct installation programs in other jurisdictions. The NTGR value of 1.0 indicates that participants would not have installed the measures without program intervention. The 1.0 NTGR value also indicates that the installation of these measures was 100% influenced by the program. In addition, the net persisting savings for 2026 are a key metric for EAP, which signifies the amount of savings that persist to the end of the Framework. For the Energy Saving Kit (Tier 2) offering, to calculate the net verified savings, the NMR team calculated the portion of gross verified savings attributable to EAP. The NMR team determined the net verified savings by multiplying the gross verified savings by the NTGR ratio, as shown in Equation 1.

[2] See “Secondary Data Review of TRMs” (Appendix A.1.3) in the Detailed Methodology section of PY2019 HAP Evaluation. Appendix B of the same report contains additional details on adjusted measure-level inputs and savings parameters. Note that PY2019 adjustments also included measure-level updates to effective useful life (EUL) and incremental costs, which are presented in the Appendix B.3 of the PY2019 HAP evaluation report. The PY2020 evaluation applied the updated EULs and incremental costs that resulted from the PY2019 evaluation.

Equation 1: Net Verified Savings

$$Savings_{net} = Savings_{verified} \times NTG$$

Where:

$\text{Savings}_{\text{net}} = \text{Net savings impact (kW or kWh)}$

$\text{Savings}_{\text{verified}} = \text{Verified savings (kW or kWh)}$

$\text{NTGR} = \text{Net-to-gross Ratio}$

To estimate the direct influence of the Energy Saving Kit (Tier 2) offering in generating net verified energy savings, the NMR team implemented attribution surveys to collect inputs used to calculate free-ridership (FR) and spillover (SO) to estimate the NTGR. FR refers to the program savings attributable to free riders, who are program participants who would have implemented a program measure or practice in the program's absence. SO represents installations influenced by the participant's experience with the program, completed without receiving any program incentives or other financial support. The NTGR is defined by Equation 2, where FR is the participant FR percentage, and SO is the participant SO percentage.

Equation 2: Net-to-Gross Ratio

$$NTGR = 100\% - FR + SO$$

The NMR team calculated the FR and SO for a single project for each sampled participant and then combined these results to develop overall FR, SO, and NTGR values. Additional details regarding the NTGR evaluation methodology can be found in Appendix A.2.

2.2 Cost-Effectiveness Evaluation Methodology

The NMR team completed the cost-effectiveness analysis in accordance with the IESO requirements as set forth in the IESO *Cost-Effectiveness Guide for Energy Efficiency*[3] and using IESO's *Cost-Effectiveness Tool*. The energy and demand savings results from the impact evaluation were inputs into the IESO *Cost-Effectiveness Tool*, as was administrative cost and incentive information supplied from IESO. A more detailed description of the cost-effectiveness methodology is provided in Appendix A.3.

2.3 Process Evaluation Methodology

The process evaluation focused on program design and delivery. The NMR team evaluated program processes through interviews and surveys with relevant program actors, including the IESO staff, program delivery vendor staff, social housing providers, auditors, contractors, and participants. For each respondent type, the NMR team developed a customized interview guide or survey instrument to ensure responses produced comparable data and to allow the NMR team

[3] *Cost Effectiveness Guide for Energy Efficiency Version 4*, Independent Electricity System Operator, January 20 2021, https://www.ieso.ca/-/media/Files/IESO/Document-Library/EMV/CDM_CE-TestGuide.ashx

to draw meaningful conclusions. For each respondent type, Table 2 shows the survey methodology, the total number of completed surveys, the total population that the NMR team invited to participate in the survey or interviews and the sampling error at the 90% CI. A detailed description of the process evaluation methodology is provided in Appendix A.4.

Table 2: Process Evaluation Primary Data Sources

Respondent Type	Methodology	Fielding Firm	Completed	Population	90% CI Error Margin
EAP IESO Staff and Program Delivery Vendor Staff	Phone IDIs	NMR Staff	4	4	0%
EAP Social Housing Providers	Phone IDIs	NMR Staff	2	2	0%
EAP Auditors and Contractors	Web	Survey Lab	23	59	N/A%*
EAP Participants	Web	Survey Lab	1,056**	4,856***	2.2%

*Error margin not displayed if the respondent count is below 30 unless census is achieved. **1,048 Comprehensive Support (Tier 1) and 8 Energy Saving Kit (Tier 2).
***4,812 Comprehensive Support (Tier 1) and 44 Energy Saving Kit (Tier 2).

2.4 NON-ENERGY BENEFITS METHODOLOGY

The NEBs methodology for the PY2022 EAP followed the same methodology as the two previous studies, the *PY2021 EAP Evaluation Report* and the *Non-Energy Benefits Study: Phase II*, which assessed the NEBs from energy-efficiency projects funded by the IESO over 2017 – 2021.[4] Additional detail regarding NEBs methodology can be found in Appendix A.5.

2.5 JOBS IMPACT ANALYSIS METHODOLOGY

The NMR team quantified the number of full time equivalent (FTE) net job impacts as well as total net job impacts (both direct and indirect jobs) resulting from the investment and activities of each program. We relied on primary and secondary data collection and Statistics Canada[5] (StatCan) Input-Output (IO) modeling to quantify net jobs impacts. IO models are used to analyze the propagation of exogenous economic shocks throughout an economy. The models represent relationships, or flows, of inputs and outputs between industries. When an energy-efficiency program such as EAP is funded and implemented, it creates a set of "shocks" to the economy, such as demand for specific products and services, and additional household expenditures from energy bill savings. The shocks and their impacts can be measured variables economic output

[4] Dunsky. (July 2021). *Non-Energy Benefits: Phase II; Quantified Benefits and Qualitative Insights*. https://www.ieso.ca/-/media/Files/IESO/Document-Library/conservation-reports/Non-Energy-Benefits-Study-Phase-II.ashx

[5] Statistics Canada is the Canadian government agency commissioned with producing statistics to help better understand Canada, its population, resources, economy, society, and culture.

and employment. A detailed description of the job impact analysis methodology is provided in Appendix A.6.

Section 3 Impact Evaluation

This section provides the impact evaluation results. Details regarding the impact methodology can be found in Section 2 and Appendix A.1. Detailed impact results, rationale and drivers of realization rates (RRs), and general insights from the impact evaluation activities by measure category can be found in Appendix B.1.

3.1 High-Level Results

3.1.1 Program Level Savings

Table 3 provides reported, gross verified, net first-year, and net-persisting energy and demand savings for the entire EAP for PY2022. The program gross verified RR is 94% for energy savings and 87% for demand savings.

The gross verified savings for Comprehensive Support (Tier 1) participant measures have an NTGR of 1.0 applied to them, meaning gross verified and net verified savings are equal. For Comprehensive Support (Tier 1), the results presented in this section refer to the gross verified savings and can be considered equivalent to net verified first year savings.

For Energy Saving Kit (Tier 2), an NTGR was applied to the results. Details on the NTGR calculations are provided in Section 3.2. Gross verified savings values include the realization rate calculated from the tracking data review and the net verified first year savings apply the NTGR for Energy Saving Kit (Tier 2) participants.

Note that all measure lifetimes and the associated net savings persist beyond 2026. Net persisting savings to 2026 is a key metric to assess EAP performance compared to the savings targets established for EAP in the CDM Framework.

Table 3: Program Level Reported, Gross Verified, and Net First Year Savings

Metric	Units	Evaluated
Reported Energy Savings	MWh	11,207
Reported Demand Savings	MW	0.91
Gross Energy RR	--	0.94
Gross Demand RR	--	0.87
Gross Verified Energy Savings	MWh	10,541
Gross Verified Demand Savings	MW	0.79
Comprehensive Support (Tier) 1 Net-to-Gross Ratio (NTGR)	--	1.00
Energy Saving Kit (Tier 2) Net-to-Gross Ratio Energy (NTGR)	--	0.82
Energy Saving Kit (Tier 2) Net-to-Gross Ratio Demand (NTGR)	--	1.32
Net Verified Annual Energy Savings (First Year)	MWh	10,524
Net Verified Annual Demand Savings (First Year)	MW	0.79
Net Verified Persisting Energy Savings to PY2026	MWh	10,524
Net Verified Persisting Demand Savings to PY2026	MW	0.79

3.1.2 Gross Verified Energy Savings Key Results

The overall energy realization rate for the program is 94% for energy savings. Table 4 highlights the gross verified energy savings for each measure-category, and key drivers that influenced each RR. There were multiple instances where reported savings from 2021 or 2020 versions of the Measures and Assumptions List (MAL) were used to claim savings for projects in 2022.[6] For example, smart power bars have a notably high RR (150%) due reported savings values associated with a MAL listing for power bars with integrated timers, which is no longer delivered by EAP.

Miscellaneous measures include block heater timers, indoor clothes drying racks, programmable thermostats, and smart thermostats. Impacts for both energy and demand savings are detailed at the measure level in Appendix B.

Table 4: Gross Verified Energy Savings Results by Measure Category (kWh)

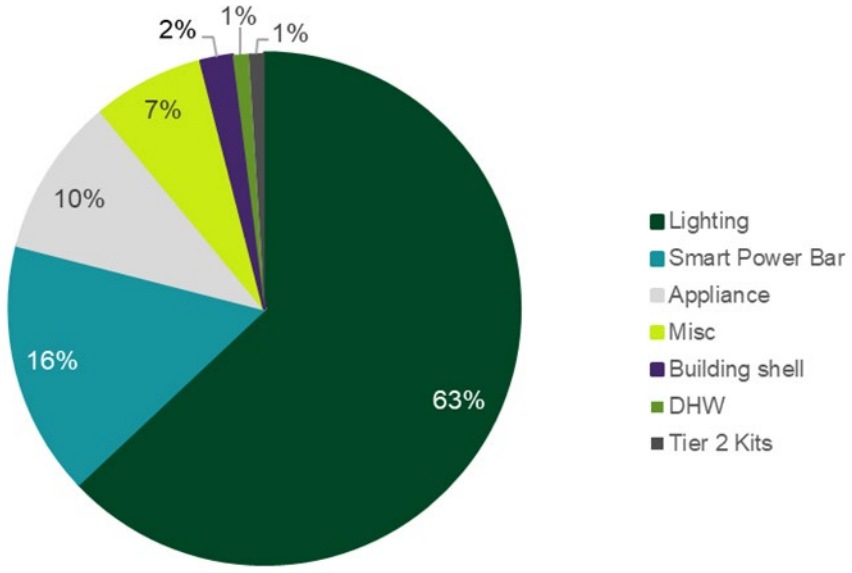
Measure Category	Reported Savings – Energy - (kWh)	Verified Savings – Energy - (kWh)	RR – Energy	Drivers of RR
Lighting end-use	7,533,823	6,619,642	88%	• PY2019 savings updates which lowered baseline wattage and HOU values • Reported savings from outdated MAL used for some measures • ISR of 95%

[6] The program delivery agent associated with these misstated savings is no longer affiliated with EAP.

Measure Category	Reported Savings – Energy - (kWh)	Verified Savings – Energy - (kWh)	RR – Energy	Drivers of RR
Miscellaneous measures	816,324	783,356	96%	• Indoor clothes rack savings updates (PY2019) and ISRs • Indoor clothes rack and block heater timer ISRs of 94% and 86%, respectively • Thermostats use PY2021 RR of 92% due to low incidence in PY2022
Appliance end-use	1,274,020	1,062,242	83%	• Significantly lower energy consumption of existing refrigerators than in default reported savings • Dehumidifier HOU adjustment of 157% • Wide range of freezer RRs (32% to 212%) depending on appliance size • Reported savings from outdated MAL used for compact freezers
Domestic hot water (DHW) end-use	167,291	123,186	74%	• Reported savings from outdated MAL used for showerheads, aerators, and pipe wrap
Building shell end-use	240,549	213,816	89%	• Updates to building energy model inputs based on desk reviews
Power bar end-use	1,098,749	1,647,286	150%	• Reported savings from outdated MAL entry (power bar with timer)
Tier 2 kits	75,833	91,688	121%	• Kit measures and quantities calculated with substantiated values
Total	**11,206,588**	**10,541,215**	**94%**	

The gross verified energy savings for EAP were dominated by lighting end-use measures, which covered a little more than one-half (63%) of total program savings (Figure 1). Smart power bars, appliances, and miscellaneous measures (primarily clothes drying racks and block heater timers) were the next largest end-use categories for PY2022. Building shell end-use accounted for 2% of gross verified savings. Energy Saving Kits that are distributed to Energy Saving Kit (Tier 2) participants accounted for only 1.3% of gross verified savings for EAP.

Figure 1: PY2022 EAP Gross Verified Energy Savings by End-Use



3.1.3 Gross Verified Demand Savings Key Results

The overall energy realization rate for the program is 87% for demand savings. Table 5 highlights the gross verified demand savings for each measure-category. Key drivers that influenced the RR are also summarized for each category. As with gross verified energy savings, there were multiple instances where reported savings from 2021 or 2020 versions of the MAL were used to claim savings for projects in 2022.[7]

Table 5: Gross Verified Demand Savings Results by Measure Category (kW)

Measure Category	Reported Savings – Demand (kW)	Verified Savings – Demand (kW)	RR – Demand	Drivers of RR
Lighting end-use total	510.8	450.6	88%	• PY2019 savings updates which lowered baseline wattage and HOU values • Reported savings from outdated MAL used for some measures • ISR of 95%

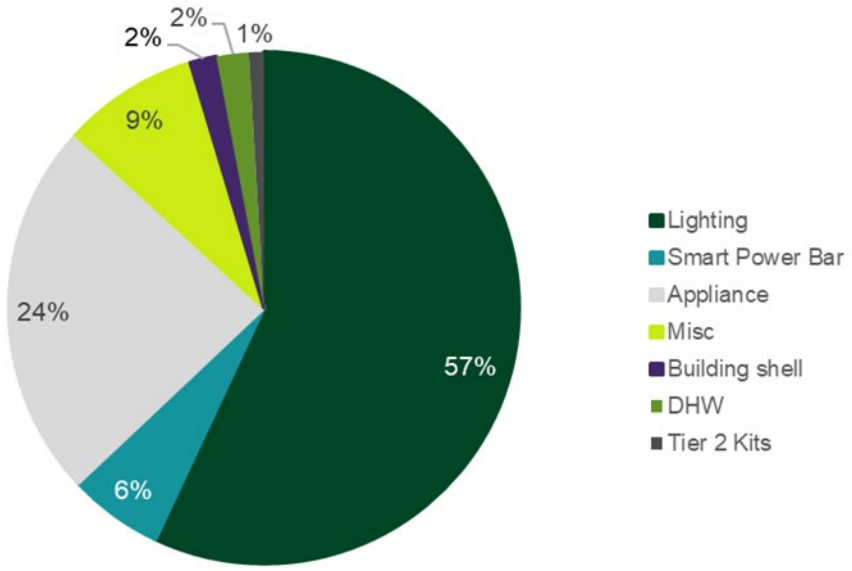
[7] The program delivery agent associated with these misstated savings is no longer affiliated with EAP.

Measure Category	Reported Savings – Demand (kW)	Verified Savings – Demand (kW)	RR – Demand	Drivers of RR
Miscellaneous measures[8]	124.6	67.5	54%	• Reported savings from outdated MAL entry for indoor clothes rack • Indoor clothes rack ISR of 94%
Appliance end-use total	195.4	188.3	96%	• Significantly lower energy consumption of existing refrigerators than in default reported savings • Dehumidifier HOU adjustment of 157% • Reported savings from outdated MAL used for compact freezers
Domestic hot water (DHW) end-use total	19.6	16.1	82%	• Reported savings from outdated MAL used for showerheads, aerators, and pipe wrap
Building shell end-use	23.6	13.2	56%	• Updates to building energy model inputs based on desk reviews • Inconsistent application of peak demand factor to calculate reported savings
Power bar end-use	32.6	47.4	145%	• Reported savings from outdated MAL entry (power bar with timer)
Tier 2 kits	6.9	7.6	109%	• Kit measures and quantities calculated with substantiated values
Total	**913.5**	**790.7**	**87%**	

Figure 2 displays the proportion of gross verified demand savings by end-use category for EAP. The gross verified demand savings were primarily attributed to lighting end-use and appliance end-use categories (57% and 24%, respectively). Miscellaneous measures (virtually all clothes drying rack) covered another 9% of gross verified demand savings for EAP. Smart Power Bars accounted for 6% of gross verified demand savings for EAP.

[8] Miscellaneous measures include block heater timers, indoor clothes drying racks, programmable thermostats, and smart thermostats.

Figure 2: PY2021 EAP Gross Verified Demand Savings by End-Use



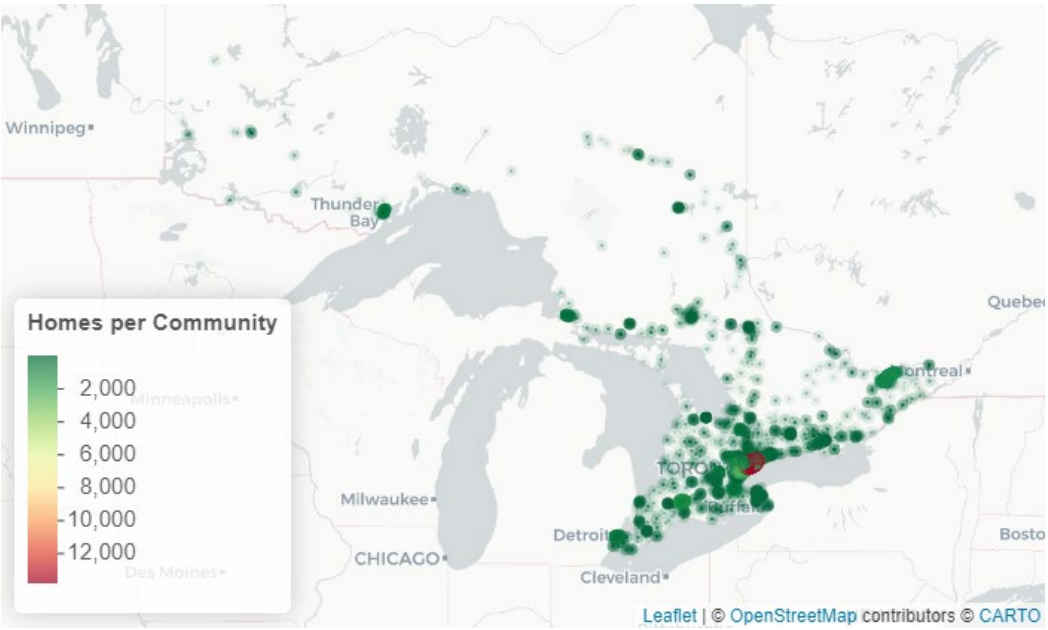
3.1.4 Geographic Distribution of EAP Participant Projects

Figure 3 shows the geographic distribution of evaluated PY2022 EAP project homes across Ontario.[9] Green dots represent buildings where there are few other EAP participant projects within the same community, while red dots represent higher densities of participant homes. The Greater Toronto Area was by far the main hot spot for PY2022 EAP participation, indicated by the high concentration of red and yellow dots in the map below. Toronto, Mississauga, Brampton, Scarborough, and Ottawa are the top five communities by building count, but Toronto accounts for more than the top ten communities combined. For the participant projects within these five communities, 8% are single-family and 92% are multifamily properties. Toronto represents virtually all multifamily participant projects (99%), followed by Scarborough (73%), Mississauga (72%), Ottawa (70%), and Brampton (66%). Participation among homes in Northern Ontario increased in absolute terms, i.e., there were 28% more applications in PY2022 than PY2021. However, Northern Ontario participation decreased from 10% of all EAP applications in PY2021 to 4% of applications in PY2022.[10]

[9] There were 27,690 unique building addresses for the 27,772 projects. This value represents the physical addresses in the tracking data and is referred to as the EAP participant program home count.

[10] See Section 3.1.4 of the PY2021 Energy Affordability Program Evaluation Report, available on the IESO website: https://www.ieso.ca/-/media/Files/IESO/Document-Library/conservation/EMV/2021/PY2021-21-24-CDM-EAP-Evaluation-Report.ashx.

Figure 3: PY2022 EAP Participant Home Distribution across Ontario



3.2 NET-TO-GROSS RATIO EVALUATION

Table 6 provides the results of the NTGR evaluation for Energy Saving Kit (Tier 2) participants. The team targeted 90% confidence and 10% precision levels in the savings results; however, due to low Energy Saving Kit (Tier 2) project volume and survey participation, these levels were not achieved. Instead, 85% confidence and 15% precision levels were considered when calculating NTGR, and 85% confidence and 10.3% precision levels were achieved.

Energy Saving Kit (Tier 2) participant feedback indicates moderately high levels of FR at 24.9%. Two out of eight respondents showed no indication of free-ridership since they said they would have put off the upgrade for at least one year (one respondent) or cancelled their upgrade all together (one respondent) if the program had not been available to them. Other respondents were considered partial free riders if they reported that they would have scaled back on the size, efficiency, or scope of their project (one respondent) or if they did not know what they would have done in the absence of the program (five respondents). Participation in the program resulted in a relatively moderate SO at 6.6%. SO savings were primarily driven by the installation of new Light-emitting Diode (LED) lighting measures and a low-flow showerhead.

Additional analyses performed to assist in the interpretation of these values can be found in in Appendix B.4. The net verified results for Energy Saving Kit (Tier 2) are described in further detail in Section B.1.7.

Table 6: NTGR Results

Unique Participants	NTGR Responses	Savings Weighted FR	SO, Energy	SO, Summer Demand	NTGR, Energy	NTGR, Summer Demand	Energy Precision (85/15)
44	8	24.9%	6.6%	57.0%	81.6%	132.0%	± 10.3%

Section 4 Cost-Effectiveness Evaluation

This section provides the cost-effectiveness evaluation results. Details regarding the cost-effectiveness methodology can be found in Section 2.2 and Appendix A.3.

The EAP cost-effectiveness results are presented in Table 7. In PY2022, the Program Administrator Cost (PAC) test ratio for EAP was less than 1.00, meaning the program benefits were less than their respective costs. This is consistent with findings for low-income programs in other jurisdictions, and comparable to EAP's PY2021 PAC test results, which had a PAC ratio of 0.31.

Table 7: Program Level Cost-Effectiveness Key Metrics

Cost-Effectiveness Test	PY2022
PAC	
PAC Costs ($)	$17,033,729
PAC Benefits ($)	$4,334,832
PAC Net Benefits ($)	-$12,698,897
PAC Net Benefit (Ratio)	0.25
Levelized Delivery Cost	
$/kWh	$0.18
$/kW	$2,294

Measure level PAC ratios show a range of 0.01 to 8.12. The measures with the highest PAC ratios above 2.00 include the Energy Savings Kits provided to Energy Saving Kit (Tier 2) participants. Within the direct install measures of Comprehensive Support (Tier 1) participants, the highest PAC ratios were derived from measures with relatively low up-front cost and little labor required to install, which were the faucet aerators, low-flow showerheads, LED A-Shape lamps, and LED Nightlights.. All these measures yielded PAC ratios of 2.00 or greater.

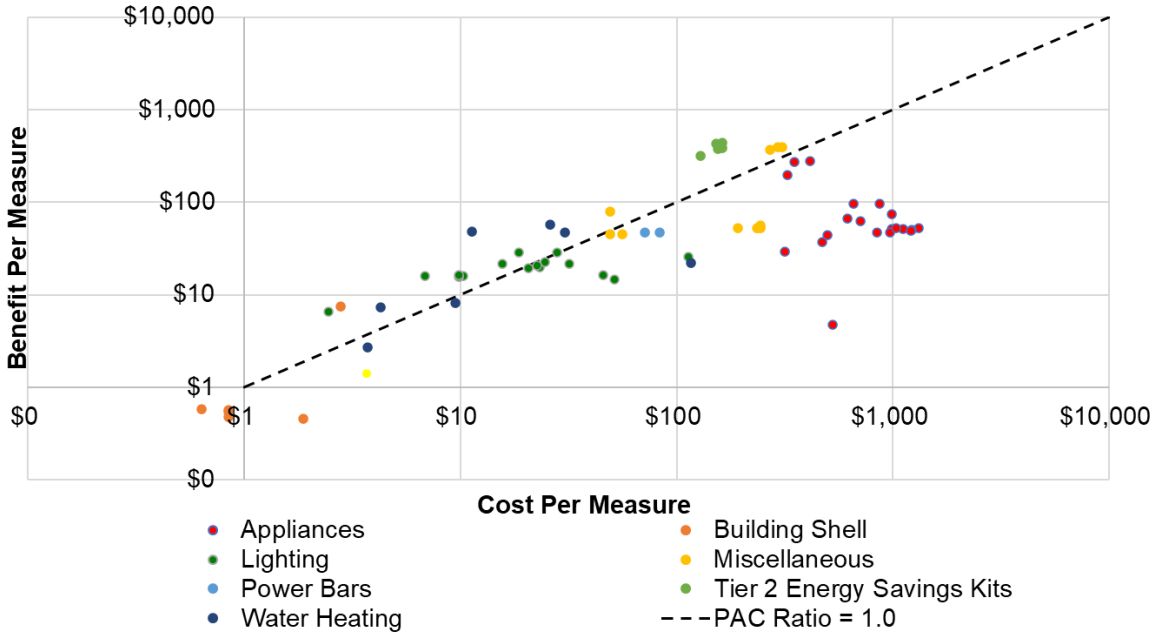
Measures producing very low PAC ratios, 0.13 or less, included all freezer, refrigerator, and room air conditioner measures. A factor contributing to the low PAC ratios is the relatively high cost of these measures in relation to their delivered savings.

Energy Savings Kits and direct install measures that had PAC ratios of 1.00 or greater contributed 64% of the program's energy savings. This means that the remaining 36% of program savings were contributed by measures with less than 1.00 PAC ratios. Of these low PAC ratio measures, ENERGY STAR Qualified 17.0-18.4 cubic foot refrigerators had by far the largest influence, contributing 21% of the PAC costs while only contributing 2% of the program's energy savings. Freezer Replacement (ENERGY STAR Qualified <7.5 cu ft) had the highest PAC cost per kWh saved at $47.20 per kWh but only accounted for 3% of the PAC costs. The program average incentive per kWh saved was $0.97 per kWh.

Figure 4 below more generally provides the relative costs and benefits by end use. We observe that while household appliances offer good benefits, their costs are by far the highest, pulling down their PAC ratio. Clustered below approximately $100 in cost each are water heating,

lighting, and plug loads (block heater timer and power bars measures. While these measures are low cost and generally have the best measure-level PAC ratios, they provide relatively smaller benefits per measure.

Figure 4: PAC Benefits vs. Costs by End Use*



*Note: x and y axes use a logarithmic scale.

Section 5 Process Evaluation

The following subsections outline the process evaluation results. Details regarding the process methodology can be found in Section 2.2 and Appendix A.4 and additional results can be found in Appendix C.

5.1 IESO and Program Delivery Vendor Staff Perspectives

The following subsections highlight the feedback received from the IESO and program delivery vendor staff about the design and delivery of EAP in PY2022.

5.1.1 High-Level Results

High-level results from the IESO and program delivery vendor staff interviews include:

- The program had a successful transition year, launching a co-delivery approach in collaboration with the Enbridge Gas Home Winterproofing Program (HWP) and onboarding new regional program delivery vendors offering a one window approach for customers who receive both energy and gas audits and installations in a coordinated visit.
- The program largely met both the IESO staff and delivery vendor staff's expectations for the year despite challenges such as increasing labor costs and the ramp-up period associated with the vendor transition.
- The program saw strong demand for appliances, but limitations in the range of available models, ongoing supply chain constraints, and equipment metering requirements that constrain program delivery vendors' ability to deliver appliances to some customers.
- Program delivery vendor staff stressed the importance of additional marketing of the program with a focus on electric-heat customers, Energy Savings Kits, and marketing coordination across partners such as with Enbridge Gas.

5.1.2 Design and Delivery

IESO staff and delivery vendor staff reported that the program is running well overall. They noted that the transition to multiple delivery vendors with geographically distinct territories allowed the program to focus more on distinct regional needs; for example, some regions have a greater need to find delivery solutions for remote areas or translation of program materials. IESO staff indicated that the launch of a co-delivery collaboration with the Enbridge Gas HWP was successful, with both EAP and HWP bringing in many leads and reducing administrative burdens for both programs. The program delivery vendors reported that the collaboration reduced the need for income qualification because, if a customer had already qualified for HWP, they would also qualify for EAP. Both IESO and program delivery vendor staff reported that program tracking and reporting are working well overall, with a program data dashboard in place and regular meetings between IESO staff and the program delivery vendors. Program costs, primarily the cost of labor and some measures such as insulation, were reported by program delivery vendors as a current implementation challenge.

5.1.3 Customer Engagement

IESO and delivery vendor staff reported that customers participate in the program for a number of reasons, primarily to reduce bills, to replace old or poorly functioning equipment, and, for weatherization customers, to improve the comfort of their home by reducing drafts and maintaining the indoor temperature. Customers are generally happy with the offerings; the common requests that program delivery vendors hear from customers include more appliance types and models (e.g., stove replacements and a wider range of sizes and colors for refrigerators) and cold climate air source heat pumps. Both IESO and delivery vendor staff noted that the Energy Saving Kit (Tier 2) offering has seen low uptake due to variety of reasons, including low awareness of the offering, the fact that a small segment of customers meet the income criteria, and a requirement to provide income verification which can be a deterrent to some customers, even if they may qualify, because they do not want to share the information.

5.1.4 Barriers and Opportunities

According to IESO staff, the first year of co-delivery with Enbridge Gas' HWP was very beneficial to EAP delivery and program uptake. IESO staff noted that the program can build on this success by exploring co-marketing, co-branding, and increasing overall marketing coordination to maximize the use of available budgets.

IESO staff indicated that the transition from one program delivery vendor to a new set of regional program delivery vendors constrained program results in PY2022 due to the ramp-up period as the new program delivery vendors established processes and relationships. The strong program tracking and reporting capabilities and processes that were in place by the end of the program year are expected to drive success in future years.

Energy Savings Kits continued to see low participation in PY2022. IESO and program delivery vendor staff noted that additional marketing is needed to drive demand. Program delivery vendors noted that customers' income levels tend to either make them eligible for Comprehensive Support (Tier 1) or ineligible altogether. Program delivery vendor staff suggested that streamlining the application process, particularly the requirement to prove income qualification, may reduce barriers to participation. Potential enhancements to the kits recommended by program delivery vendors include air sealing measures and additional education or materials.

IESO and program delivery vendor staff shared that delivering program services to geographically remote areas presented unique challenges. Travel time and cost can deter auditors and contractors from scheduling work there. In addition, IESO and program delivery vendor staff reported that because EAP offered lower fees to auditors compared to other similar programs, it has been challenging to engage auditors to service outlying areas. Delivery vendor staff noted that they are researching ways to overcome barriers to serving remote areas. Increasing participation in remote areas of northern Ontario may increase weatherization uptake due to a reported prevalence of homes with electric heat in this region.

Both IESO and program delivery vendor staff indicated that many customers are interested in seeing the program offer additional appliance type, color, and model options. Multiple program delivery vendor staff noted that customers would like to replace their cooking stoves and have more choices of refrigerator size and color. Clothes washers were also noted as a desired

measure. Program delivery vendors called for simplifying measure qualification requirements, such as setting a straightforward equipment age criterion for more measures and relaxing metering requirements in certain situations.

Program understanding and accessibility were not cited as major concerns, but IESO and program delivery vendor staff noted potential areas of improvement. Some staff stated that awareness and understanding of the program is low among some customers, including participants; one program delivery vendor suggested that customer education could be added to the program intake and approval process to help customers understand what the program does and does not offer and the benefits of participating. Both IESO and program delivery vendor staff reported that the income verification process presents a barrier for some customers; for example, because it relies on the prior year's income information, customers who have had a change in financial circumstances may be ineligible until the following year.

The COVID-19 pandemic was not noted as much of an issue compared to PY2021, though both Program delivery vendor staff cited continuing supply chain limitations as one barrier in providing appliances to customers. Another delivery vendor reported that customer reluctance to allow program staff into their homes may still have been a factor limiting the uptake of some measures, including weatherization.

5.2 Auditor and Contractor Perspectives

The following subsections highlight the feedback received from the auditor and contractor survey. Results are presented as counts if sample size is below 20. Additional results can be found in Appendix C.1.

5.2.1 High-Level Results

High-level results from the auditor and contractor survey include the following:

- Auditors and contractors were satisfied with the program overall (average rating of 4.2 on a scale from 1 to 5, where 1 meant "not at all satisfied" and 5 meant "very satisfied").
- Auditors and contractors perceived the greatest barriers to program participation to be customer concerns about whether the program was real (mentioned by 87% of respondents) and lack of program awareness (mentioned by 61% of respondents).
- Over two-fifths (43%) of respondents reported that the program measure eligibility criteria affect the frequencies with which some measure types are installed, whereas around one-fifth (22%) reported that the criteria did not affect the frequency of installation.
- All four contractors who responded to a question about costs said that costs have increased for specific measures over the last year, and that they have done so more quickly than the rate of inflation.
- Auditors and contractors provided recommendations for program improvement with the most common recommendations relating to improving program outreach and marketing (mentioned by 31% of respondents), as well as better communications to customers about how the program is funded and reinforcing that there is no cost to participate (mentioned by 23% of respondents).

5.2.2 Auditor and Contractor Profile

Of the 23 respondents who completed the survey, 15 performed in-home energy audits (auditors), 4 installed program-eligible equipment (contractors), and 4 respondents did both. Responding auditors and contractors indicated that they have an average of 8 full-time employees and 3 part-time employees working at their company. The average number of years respondent companies had been in business was 11.

5.2.3 Program Barriers

The most commonly identified barriers to program participation, as reported by the surveyed auditors and contactors, were concerns about the program's legitimacy (i.e., distrust that the program is real or is free) (87%), followed by low program awareness among customers (61%). Over one-fifth of respondents (22%) noted that they believe customers do not think the upgrades are worth the trouble of participating.

Barriers to Participation	
Concern about program legitimacy	✓
Unaware of the program	✓
Did not think upgrades were worth the trouble of participating	✓
Did not prioritize getting efficiency upgrades given other priorities	✓
Eligible equipment does not meet Customer's needs	✓
Not enough marketing and outreach	✓
Remote communities can be difficult to service	✓
Weather conditions	✓
Social housing provider internal processes	✓
Customers who are not able-bodied have trouble moving belongings	✓

The most common recommendation for overcoming barriers to program participation was to increase outreach and marketing (suggested by 35% of respondents). Some respondents offered specific marketing and outreach suggestions, such as utilizing TV, radio, billboards, social media ads or banners, or including community organizations in program outreach. Over one-fourth (22%) of respondents recommended better advertising the program's legitimacy and safety. A full list of program barriers and recommendations to address barriers can be found in and in Appendix C.1.2.

5.2.4 Measure Eligibility Criteria

Surveyed auditors and contractors shared their perspectives on the program's measure eligibility criteria. Over two-fifths (43%) of respondents reported that the program's measure eligibility criteria affect the frequencies with which some measure types are installed. Over one-fifth (22%) reported that the criteria did not affect the frequency of installation, and one-third (35%) either did not know or declined to provide a response. Close to one-third (30%) of respondents elaborated when asked how the measure types are affected, with one respondent reporting that "due to the requirements laid out for installed upgrades, many times, upgrades are not eligible for installation." Additional feedback about the measures affected by the measure eligibility criteria can be found in Table 29 in Appendix C.1.3.

All 23 respondents suggested adjustments to measure eligibility criteria for the program to consider in the future. The most common suggestion was to offer a wider variety of equipment

types or models (52%). Around two-fifths (39%) of respondents suggested reviewing equipment age requirements and one-third (35%) suggested relaxing the requirements in general. Additional feedback about suggestions for adjusting the measure eligibility criteria can be found in Figure 36 in Appendix C.1.3.

Around one-half (11 out of 23, or 48%) of respondents provided additional context about their recommended adjustments to measures eligibility criteria. Most commonly, respondents recommended offering a wider variety of colors and sizes for fridges and freezers (four respondents) and providing upright freezers to all customers to allow for easier access for the elderly (three respondents). Many other responses were mentioned by one respondent each, such as increasing refrigerator age requirements and relaxing water measure GPM requirements. Additional feedback about these recommended adjustments to measures eligibility criteria can be found in Appendix C.1.3.

5.2.5 Measure-Related Costs and Cost Caps

Four of the eight surveyed contractors shared their perspectives on whether and how costs of program-related measures have increased over the last year. They indicated that costs have increased for specific measures, and that they have done so more quickly than the rate of inflation. Respondents most frequently mentioned that material costs have increased (four respondents) followed by labor and mileage costs (three respondents each), among others. Additional feedback around increased costs associated with program-related measures can be found in Figure 38 in Appendix C.1.4.

Increased Costs Associated with Program Measures	
Material costs	✓
Labor	✓
Mileage costs	✓
Insurance	✓
Supplies/equipment	✓

5.2.6 Program Satisfaction

All 23 surveyed auditors and contractors rated their satisfaction with the program. The aspect of the program that respondents were most satisfied with was the program website (average rating of 4.3 on a scale from 1 to 5, where 1 meant “not at all satisfied” and 5 meant “completely satisfied”), followed by the training they received from the program delivery vendor (average rating of 4.2). Program marketing and outreach were cited as the aspects most in need of improvement (average rating of 2.9). The average satisfaction rating with the program overall was 4.2.

The two respondents who indicated they were not satisfied with the training(s) they received from the program delivery vendor provided context on why they were not satisfied. One respondent was not able to attend the online training due to poor internet speed and said that the meeting was not recorded and/or not made accessible after the fact. They also noted that the delivery vendor was not responsive to their inquiries about the training. The second respondent felt there was minimal training provided by the program. Additional feedback on program satisfaction can be found in Appendix C.1.5.

5.2.7 Recommendations for Program Improvement

Over four-fifths (19 of 23, or 83%) of respondents provided recommendations for energy-efficient equipment or services that they would like to see included in the program, with around one-half (10 of 19, or 53%) of these respondents recommending the inclusion of heat pumps.

Over one-fourth (5 of 19, or 26%) of respondents recommended kitchen equipment such as stoves and ovens. Respondents also recommended window and door weatherization (3 of 19, or 16%), washers and dryers (2 of 19, or 11%), and domestic hot water upgrades (2 of 23, or 11%). Additional feedback on recommendations for additional program equipment or services be found in in Appendix C.1.6.

RClose to three-fifths (13 of 23, or 57%) of respondents provided recommendations for improving the program. Of these, close to one-third (4 of 13, or 31%) recommended increased outreach and marketing, and over one-fifth (3 of 13, or 23%) recommended better messaging to customers about how the program is funded and that participation is free. Respondents also recommended increasing funding for auditors and contractors (3 of 13, or 23%), better preparing clients for visits (2 of 13, or 15%), and shifting income and eligibility verification to in-office staff (2 of 13, or 15%). Additional feedback on program improvement recommendations can be found in Appendix C.1.6.

Program Improvement Recommendations	
Increase outreach and marketing	✓
Better messaging to customers that the program is free and how it is funded	✓
Increase funding for auditors and contractors	✓
Better prepare clients for visits	✓
Shift income and eligibility verification to in-office staff	✓
Program staff/auditors to better inform customers of work to be completed	✓
Share a list of verified auditors with customers	✓

5.2.8 Additional Program Feedback

Over one-half (12 of 23, or 52%) of respondents provided additional feedback regarding their experiences with the program. The most common response was that the program is great and well received by customers (3 of 12, or 25%). Under one-fifth of respondents said that and that the program has a positive impact on saving energy across Canada (2 of 12, or 17%) and that clients' characteristics are changing over time (2 of 12, or 17%). Around one-tenth of respondents (1 of 12, or 8%) provided feedback that the program is expecting too much from auditors and contractors given the compensation provided. One respondent said that the financial instability of one of the PY2022 program delivery vendors resulted in some auditors and contractors not receiving payment for completed work. Another respondent said the new delivery vendor has helped increase the professionalism of the program. Additional details on this program feedback can be found in Figure 42 in Appendix C.

5.3 PARTICIPANT PERSPECTIVES

The following subsections highlight the feedback received from the participant survey. Results are presented as counts if sample size is below 20. Additional results can be found in Appendix C.2.

5.3.1 High-Level Results

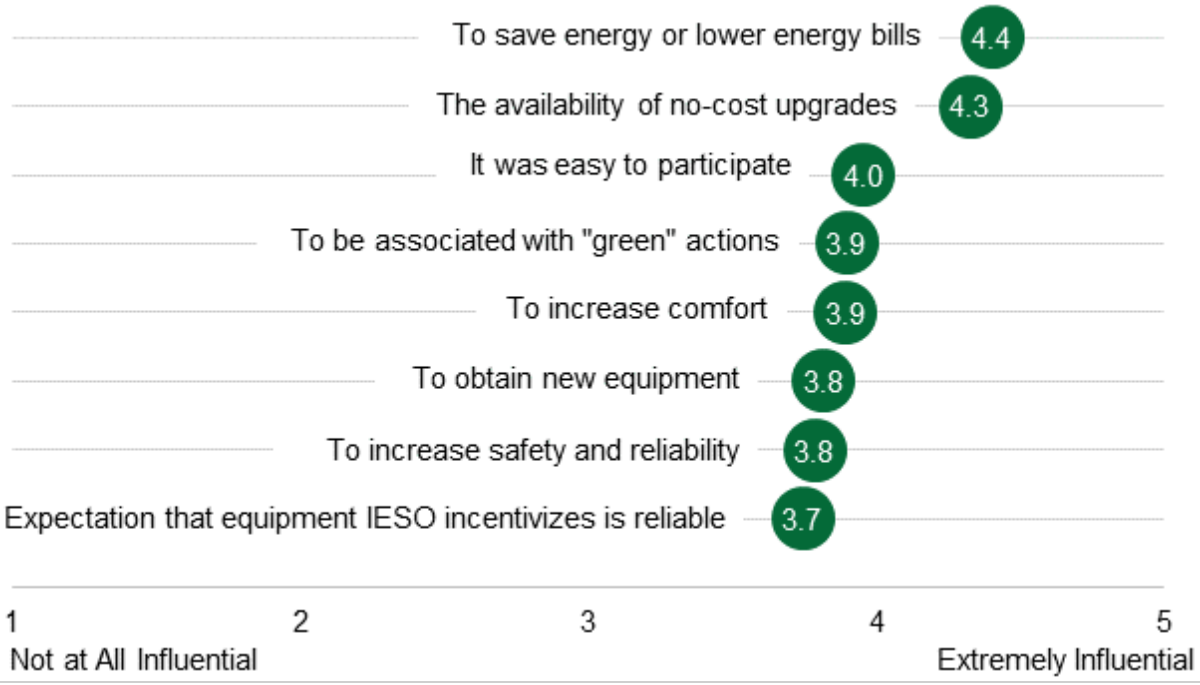
High-level results from the participant survey include the following:

- The primary motivation for applying was to save energy or lower energy bills (average rating of 4.4 on a scale from 1 to 5, where 1 means the motivating factor played "no role at all" and 5 means it played "a great role").
- Over three-fifths (62%) of Comprehensive Support (Tier 1) respondents said their energy auditor discussed additional ways to save energy at the time of the audit.
- Three-fourths (75%) of respondents said the equipment and services provided through EAP adequately met their needs.
- Close to one-third (31) of respondents offered recommendations for improving the program. The top two recommendations were to relax eligibility requirements for income eligibility for the program and/or for specific measures (e.g., offering more model options, changing age thresholds for equipment upgrades, expanding home age eligibility for insulation) and to ensure auditors and contractors are properly trained (e.g., customer service training, ensuring that all work is completed and proper equipment is installed, cleaning up after site visit, explaining the work completed, explaining energy saving tips).

5.3.2 Program Motivation and Application

Figure 5 displays respondents' average ratings for the level of influence various factors had on their decision to participate in the program. Respondents rated the influence of each factor using a scale from 1 to 5, where 1 meant "not at all influential" and 5 meant "extremely influential." The most influential factors were to save energy or lower energy bills and the availability of the no-cost upgrades, with average ratings of 4.4 and 4.3, respectively.

Figure 5: Factors Influencing Program Participation (n=1,053)

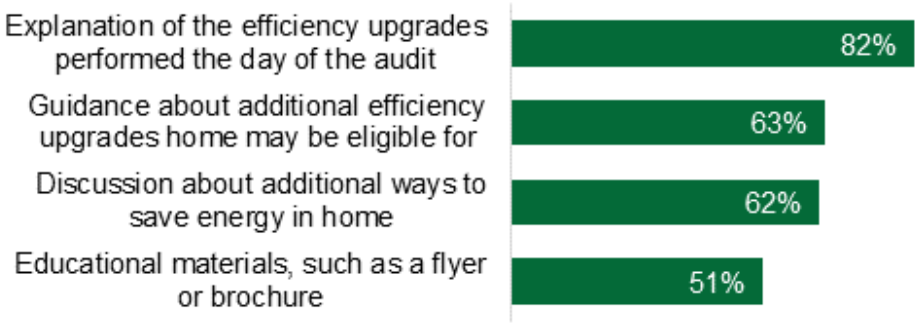


About two-thirds (68%) of respondents applied for the program online. Most respondents (74%) were satisfied with the length of time it took to complete the initial screening to participate in EAP. A large majority of respondents (93%) said it was not difficult to provide proof of income. Additional feedback on the program application process can be found in Appendix C.2.2.

5.3.3 Program Education

Energy auditors provided various resources to Comprehensive Support (Tier 1) participants at the time of the audit. As shown in Figure 6, over four-fifths (82%) of respondents said the auditor explained the efficiency upgrades performed on the day of the audit. Additionally, over three-fifths (63%) said the auditor offered guidance about additional upgrades for which they may be eligible or discussed additional ways to save energy in the home (62%). Around one-half (51%) of respondents said the auditor provided education materials, such as flyers or brochures. Respondents found these resources moderately useful: the average rating was 3.8 on a scale from 1 to 5, where 1 meant "not at all useful" and 5 meant "extremely useful".

Figure 6: Resources Provided by Energy Auditor (n=1,046; Multiple Response)*

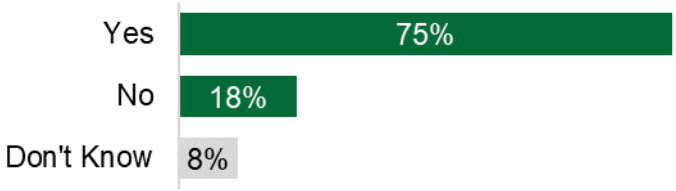


*Does not sum to 100% due to multiple responses.

5.3.4 Program Experience

Three-fourths (75%) of Comprehensive Support (Tier 1) and Energy Saving Kit (Tier 2) respondents said the equipment and services provided through EAP adequately met their needs (Figure 7). Energy Saving Kit (Tier 2) respondents found the LED bulbs to be the most useful items in the Energy Saving Kit and were satisfied with the kit application process. Additional feedback on kit usefulness and Energy Saving Kit (Tier 2) respondent satisfaction with them can be found in Appendix C.2.3.

Figure 7: Equipment Adequately Met Needs (n=1,053)*

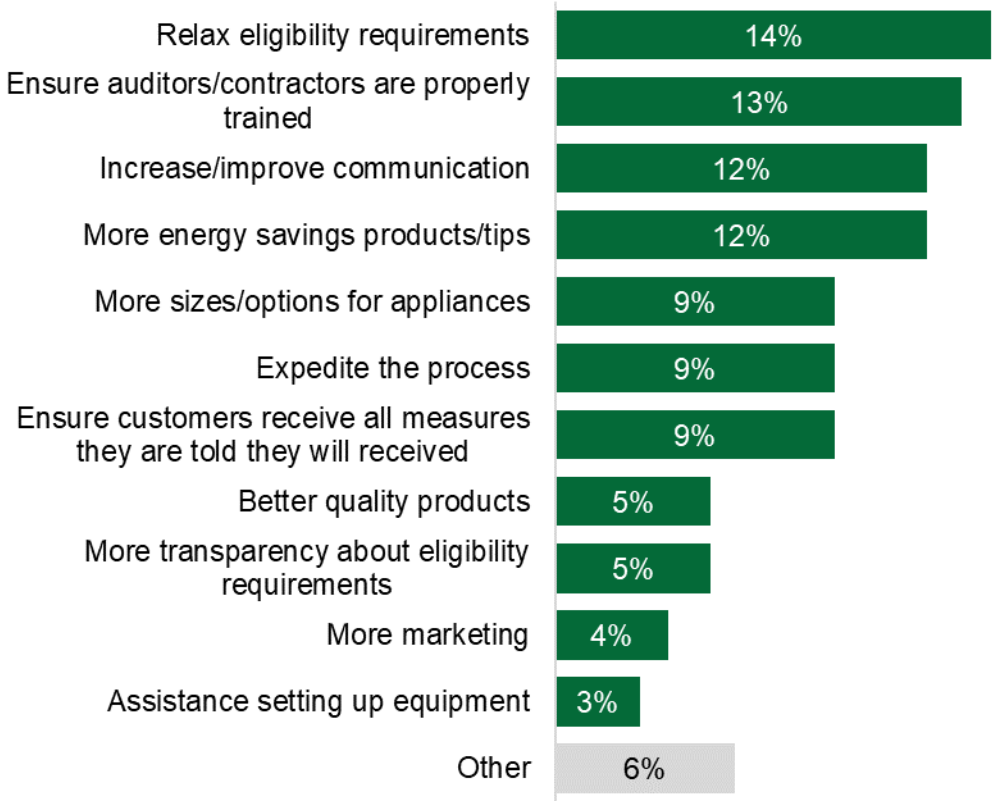


*Does not sum to 100% due to rounding.

5.3.5 Recommendations for Program Improvement

Close to one-third (31%) of all respondents offered recommendations for improving the program. Figure 8 shows that the most common recommendation was to relax eligibility requirements for the program's income eligibility requirements and/or for specific measures (e.g., offering more model options, changing age thresholds for equipment upgrades, expanding home age eligibility for insulation) (14%), followed by ensuring auditors and contractors are properly trained (e.g., customer service training, ensuring that all work is completed and proper equipment is installed, cleaning up after site visit, explaining the work completed, explaining energy saving tips) (13%), increasing/improving communication (12%), and offering more energy savings products and/or tips (12%). Additional feedback on recommended additional equipment and services can be found in Appendix C.2.4.

Figure 8: Recommendations for Program Improvement (n=328; Multiple Response)*



*Does not sum to 100% due to multiple responses.

5.4 Social Housing Perspectives

The following subsections highlight the feedback received from in-depth interviews completed with the social housing providers.

5.4.1 High-Level Results

High-level results from social housing providers include the following:

- Overall, social housing providers indicated that participating in the program was easy and beneficial to both the tenants and the social housing groups. They appreciated the program for providing free equipment upgrades and increased energy savings.
- Auditors, delivery agents, and installers were reported to be professional and easy to communicate with.
- Distinct barriers described include equipment model limitations, the cost of paying for tenant intervention services, and difficulty of transitioning between delivery vendors.
- Recommendations suggested by social housing providers include creating a fund to cover the cost of alternate equipment models not available through the program, providing financial assistance for tenant intervention services to help prepare for equipment installation, and offering large-ticket items through the program.

5.4.2 Program Awareness and Motivations

One interviewed social housing provider described their role as administrative and the other described their role as being responsible for managing energy projects and water sustainability. One social housing provider recalled being introduced to the program through its outreach efforts, while the other had previously participated in the program's predecessor, the Home Assistance Program, for several years. The latter provider decided to participate again in PY2022 after having positive experiences with the earlier versions of the program.

Both interviewees reported being motivated to participate in the program due to its overall cost savings, relating to both utility bills paid by the tenants and relating to the assistance with equipment upgrade costs. Cost savings, in turn, allow the social housing providers to redirect funds towards programs critical to the communities they serve. Other motivations mentioned included the program's engagement efforts, reduced electricity consumption, and the benefit of implementing user-friendly equipment in homes.

5.4.3 Experiences

Social housing providers described their experiences with the application procedures. They typically collect information on heating, number of units, number of tenants, incomes (depending on the resident mix at the property), and other information to populate the applications. They submit the completed application to the program delivery vendor who then follows up with audit scheduling and inspections.

One interviewed social housing provider mentioned frequent, positive interactions with auditors, describing them as very sociable and approachable, as well as punctual for their scheduled inspections. The other social housing provider indicated that they typically did not interact with auditors, as the auditors were approved for key access to residential buildings in advance.

5.4.4 Barriers

Barriers and challenges reported by the social housing providers varied between the two providers interviewed. One interviewed provider noted that the equipment model options available through the program were not compatible with all their housing units, which prevented those units from participating in the upgrades. Another barrier mentioned was the challenge of asking tenants to prepare their units for new equipment installation (e.g., clearing out a refrigerator for removal). This provider had to provide intervention services to assist tenants who needed support in this process, which created an additional financial cost.

Additionally, the other provider mentioned the challenge of the transition from one delivery vendor to another. They recalled it being hard to keep track of the progress each unit had made prior to and after the vendor switch. They attributed this difficulty to the lack of electronic records available for reference from the first delivery vendor, which made it difficult and time consuming to track down the paper record of each unit's progress towards completion.

5.4.5 Recommendations for Improvement

To address barriers to participation, the social housing providers offered some recommendations for program improvement. To address limitations in the equipment available through the program,

one social housing provider suggested the creation of a fund to support customers who need to purchase alternate models not directly available through the program. To reduce the internal cost of preparing units for equipment removal and installation, the other social housing provider indicated that financial assistance from the program for tenant intervention services (e.g., the cost of hiring third party security services to enter tenant units, which is a requirement) would be beneficial. Both social housing providers mentioned they would appreciate being able to procure large-ticket items, such as boilers, windows, and insulation through the program as additional, long-term savings opportunities.

Section 6 Other Energy-Efficiency Benefits

6.1 Avoided Greenhouse Gas Emissions

The NMR team used the IESO's *Cost Effectiveness Tool* to calculate avoided GHG emissions. The NMR team calculated avoided GHG emissions for the first year and for the lifetime of the measures. Table 8 provides the results of these calculations for PY2022.

Table 8: Avoided GHG Emissions in PY2022

Avoided (Tonnes CO_2 equivalent)	PY2022
First Year	2,396
Lifetime	25,962

Table 9 provides the average PAC cost per tonne of avoided lifetime GHG emissions by end use for PY2021 and PY2022. PAC costs include the total program administrative expenses plus the cost of incentives. Overall, the average cost per tonne avoided lifetime GHG emissions for all measures increased by 36% from PY2021 to PY2022, increasing from $287 per tonne to $392 per tonne. Individual measures within each end use were weighted by their lifetime energy savings contribution to their end use's total lifetime energy savings. For PY2022, Energy Savings Kits, Water Heating and Lighting measure end uses were on the low end of average cost per tonne, all at or below $100 per tonne. In agreement with the CE results, the efficiency aerators and showerhead measures had the lowest average cost per tonne among all measures. On the opposite end, the highest cost per tonne is for appliance measures, which includes equipment types of freezers, refrigerators, dehumidifiers, and window air conditioner units. Refrigerators, freezers, and window air conditioning units all had high cost per tonne of avoided lifetime GHG emissions above $2,600 per tonne. The second highest average cost in PY2022 is for building shell end use, which contains measures for attic insulation, basement insulation, wall insulation, and draftproofing. The observation that the appliance end use require the highest cost per tonne of avoided lifetime GHG emissions mirrors the observation from the CE analysis, which found that refrigerators, freezers, and room air conditioners yielded the lowest PAC ratios. Also included in Table 9 is the percentage of lifetime energy savings contributed by each end use towards total PY2022 savings.

Table 9: Average PAC Cost Per Tonne Avoided Lifetime GHG Emissions by End Use

End Use	End Use Contribution to PY2022 Lifetime Energy Savings	Average Cost Per Tonne Avoided Lifetime GHG Emissions PY2021	Average Cost Per Tonne Avoided Lifetime GHG Emissions PY2022
Energy Savings Kits	1%	$73	$71
Water Heating	1%	$163	$99
Lighting	69%	$159	$100
Power Bars	10%	$282	$233
Miscellaneous	3%	$285	$253
Building Shell	4%	$215	$307
Appliances	12%	$1,948	$2,831
Program Average	100%	$287	$392

* PY2021 results updated to align with PY2022 calculation methodology and correct for data analysis errors.

6.2 NON-ENERGY BENEFITS

This section provides the NEBs from EAP in PY2022. Additional detail regarding NEBs methodology and results can be found in Section 6.2. Please note that the PY2022 NEB results are presented in this section for informational purposes only. The team used the Phase II study NEBs values within the PY2022 Cost Effectiveness calculator rather than the PY2022 NEBs participant evaluation survey values per IESO guidance. This will allow the IESO to collect additional NEBs data in future evaluation years.[11]

6.2.1 Key Findings

Key findings from the NEBs analysis include the following:

- Using the **hybrid, minimum approach**, the PY2022 NEBs values were $0.19/kWh for thermal comfort, $0.14/kWh for reduced financial stress, and $0.04/kWh for improved air quality.

6.2.2 Quantified NEBs Values

The PY2022 EAP participant survey included 562 participants who had experienced at least one NEB from the measures installed through the program. The EAP participant survey asked about participant experiences with three NEBs:

- **Thermal comfort:** Improvement in ability for building to maintain a comfortable temperature.
- **Reduced financial stress:** Reduced stress related to making bill payments or reduced worries about shut-offs due to bill non-payment.

[11] The team estimated the PY2022 Cost-Effectiveness using the Phase II study NEBs values ($/kWh), which were substantially higher for EAP (55% adder) than the equivalent adder used for the Interim Framework programs (15% adders).

- **Improved indoor air quality:** Reduction in air pollutants in indoor environment.

Three-fifths (60%) of PY2022 participants experienced NEBs from improved thermal comfort, more than one-half (54%) experienced NEBs from reduced financial stress, and 14% experienced NEBs from improved indoor air quality (Figure 9).

Figure 9: Participant Observation of NEBs, Phase II, PY2021, & PY2022

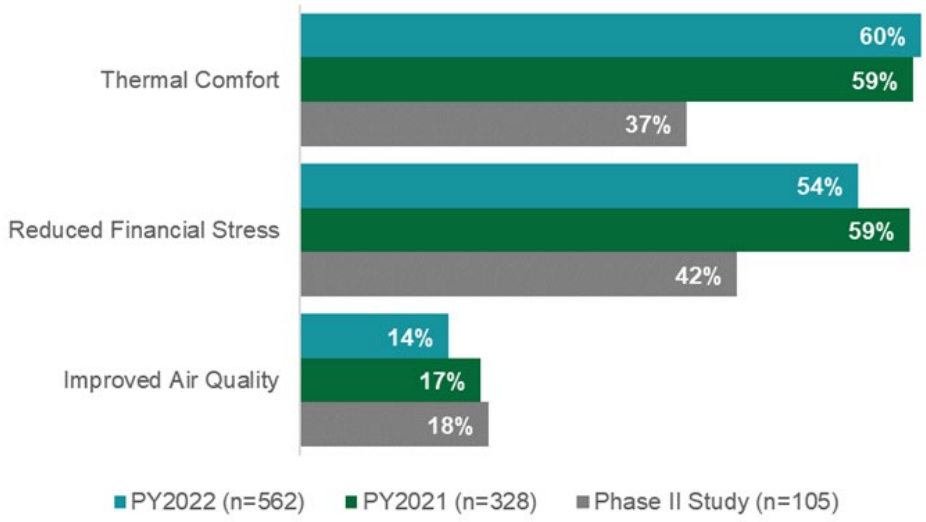


Table 10 shows quantified NEBs values for Phase II, PY2021, and PY2022 based on the hybrid, minimum ($/kWh) valuation, the approach recommended by the Phase II study.[12] PY2022 EAP respondents valued thermal comfort NEBs highest ($0.19/kWh) followed by reduced financial stress ($0.14/kWh), and improved air quality ($0.04/kWh).

This feedback corresponds to the NEBs that auditors and contractors reported their customers might have experienced due to their participation in EAP, where the majority (78%) indicated that their customers experienced reduced financial stress, nearly two thirds (65%) indicated their customers had experienced improved thermal comfort, and approximately one-third (35%) indicated their customers had experienced improved indoor air quality. To see all auditor and contractor feedback associated with the NEBs, refer to Figure 56 in Appendix D.

[12] Dunsky. (July 2021). *Non-Energy Benefits: Phase II; Quantified Benefits and Qualitative Insights*. https://www.ieso.ca/-/media/Files/IESO/Document-Library/conservation-reports/Non-Energy-Benefits-Study-Phase-II.ashx

Table 10: Quantified NEBs ($/kWh) PY2022, PY2021 & Phase II

NEB	PY2022	PY2021	Phase II
Thermal comfort	$0.19	$0.22	$0.08
Reduced financial stress	$0.14	$0.15	$0.09
Improved indoor air quality	$0.04	$0.04	$0.03

The Phase II study found that program participants placed a great deal of value on NEBs. In many cases, the value of the NEBs exceeded the value of the participant energy savings. This was also the case in both PY2021 and PY2022, with most respondents reporting NEBs having an equal or higher value on a yearly basis than the amount of their electricity bill or savings. Furthermore, when asked if they had to pay for a certain benefit, independently from the energy savings, nearly three-fifths (57%) of participant estimates were of an equal or higher value per year than the amount of their electricity bill or savings. This highlights that there are factors beyond energy savings that may motivate participation in energy efficiency or contribute to positive customer experiences with programs.

6.3 JOBS IMPACT ANALYSIS

This section provides the jobs impact analysis results. Details regarding the jobs impact analysis methodology can be found in Section 2.4 and Appendix A.6 and additional results can be found in Appendix E.

6.3.1 High-Level Results

- The analysis used an input-output model which estimated that EAP will create 169 total jobs in Canada, of which 152 will be in Ontario.
- Most of the jobs stem from the demand created for energy-efficient products and services related to program delivery.
- EAP is estimated to create approximately 10 jobs per $1 million of program spend.

6.3.2 Input Values

The model was used to estimate the impacts of two economic shocks – one representing the demand for energy-efficient products and services from EAP and the other from the increased household expenditures due to bill savings (and net of program funding). Table 11 shows the input values for the demand shock representing the products and services related to EAP. Each measure installed as part of EAP was categorized according to the StatCan IO Supply and Use Product Classifications (SUPCs).

Table 11: Summary of Input Values for Demand Shock

Category Description	Non-Labor ($ Thousands)	Labor ($ Thousands)	Total Demand Shock ($ Thousands)
Major appliances	6,275	797	7,072
Electric light bulbs and tubes	1,810	0	1,810
Small electric appliances	432	432	864
Other miscellaneous manufactured products	407	0	407
Switchgear, switchboards, relays and industrial control apparatus	99	67	166
Plastic and foam building and construction materials	132	0	132
Non-metallic mineral products, n.e.c.	7	15	22
Office administrative services	-	-	1,643
Other professional, scientific and technical services	-	-	4,917
Total			**17,034**

Table 12 shows the calculations and input value for the household expenditure shock.[13] This shock represents the net additional amount that households would inject back into the economy through spending. Additional background and details about the household expenditure shock inputs can be found in Appendix E.

Table 12: Summary of Input Values for Household Expenditure Shock

Description	Demand Shock *($ Thousands)*
Net Present Value (NPV) of energy bill savings	18,742
Residential portion of program funding	(5,962)
Net bill savings to residential sector	**12,781**
Percent spent on consumption (vs. saved)	37%
Total Shock	**4,756**

6.3.3 Model Results

Impacts from the StatCan I-O model are generated separately for each shock and added together to calculate overall program job impacts. In the case of EAP, this means that two different sets of job impacts are combined into the overall jobs impacts. Table 13 shows the total estimated job impacts by type – combining the impacts from the demand and household reinvestment shocks. The majority (154 out of the 171 estimated total jobs) were in Ontario. All but one of the direct jobs created were created in Ontario. A slightly smaller share of the indirect and induced jobs was in Ontario, with 56 out of 65 indirect and 33 out of 40 induced total jobs within the province. The

[13] The model is actually run with a normalized value of $1 million in extra household expenditures and the job results can be scaled by the actual demand shock.

Full-Time Equivalent (FTE) job estimates are slightly less, with a total of 120 FTEs (of all types) created in Ontario and 134 FTEs added throughout Canada. Calculating relative program performance as a function of jobs created per $1 million of program budget is helpful in comparing different program years. EAP was estimated to create 10.1 total jobs per $1 million of investment in PY2022, compared to 12.6 jobs created per $1 million of investment in PY2021. A possible cause of this shift is differences in the economic model between years; StatCan updates the model with revamped assumptions on an annual basis, and as such changes within the broader Canadian economy may have driven the slightly lower jobs impacts per $1 million of program spend in PY2022 compared to PY2021.

Table 13: Total Job Impacts by Type

Job Impact Type	FTE *(in person-years)* Ontario	FTE *(in person-years)* Total	Total Jobs *(in person-years)* Ontario	Total Jobs *(in person-years)* Total	Total Jobs per $1 million Investment *(in person-years)*
Direct	52	53	65	66	3.9
Indirect	44	51	56	65	3.8
Induced	24	30	33	40	2.4
Total	**120**	**134**	**154**	**171**	**10.1**

A more detailed write up of the model impacts, including a breakout of impacts by industry and verbatims from program auditors and contractors, can be found in Appendix E.

Section 7 Key Findings and Recommendations

This section provides the key findings and recommendations for the PY2022 evaluation.

Finding 1: EAP saw 117 weatherization projects occur in PY2022, but on a per-project basis produced one-half the gross verified savings compared to PY2021 results from the Home Assistance Program (HAP, n=220) and EAP (n=20). Weatherization projects accounted for 2% of the program's total claimed savings, up from 1% in PY2021. The PY2022 average of 1,827 kWh in gross verified savings per project was over 50% lower than the PY2021 EAP average of 4,141 kWh. Multiple factors likely contributed to this per-project decline in EAP savings, though the comparison with PY2021 is limited by small sample size (n=20). EAP per-project weatherization savings are also lower than the equivalent values from HAP evaluations from PY2019 through PY2021 (3,240 kWh, 3,669 kWh, and 4,333 kWh, respectively), which should be noted increased year-over-year and were based on larger sample sizes. Among individual PY2022 EAP weatherization measures, attic insulation showed the largest decline in verified energy savings per project of any weatherization measure compared to PY2021—a 64% drop compared to HAP and 68% drop compared to EAP. Attic insulation and draftproofing, which tend to have lower average savings than basement and wall insulation, accounted for a larger portion of verified weatherization energy savings in PY2022 EAP (69%) than PY2021 HAP (60%) and PY2021 EAP (62%).

- **Recommendation 1a.** Continue to position weatherization as a critical measure for EAP given its potential for high savings, non-energy benefits, and pairing with HVAC upgrades. Balancing increased uptake of weatherization projects with sustained per-project savings is key. Achieving this balance requires developing better estimates of potential weatherization savings in participant homes by expanding tracking data to better identify homes with electric baseboards and furnaces (see **Recommendation 3a**). Likewise, to sustain or increase uptake, the program should consider expanding the scope of program impacts to include potential greenhouse gas (GHG) emissions reductions from electrification and/or low-GHG insulative materials. Strategies to sustain or increase per-project savings include increasing the target of vented attic insulation from R51 to R60 or higher, subject to cost-effectiveness testing.
- **Recommendation 1b.** Work with delivery agents to conduct longitudinal research on EAP and HAP weatherization model (Hot2000) inputs and outputs (e.g., type, R-value, and coverage area of pre-existing insulation) to monitor for trends and examine potential underlying causes of per-project declines in weatherization savings.

Finding 2: Energy Saving Kit (Tier 2) uptake remained low in PY2022, and opportunities remain to increase participation in future years. Kits were distributed to 103 participants and accounted for over 90,000 kWh of gross verified savings. This represents a sharp 58% decline in the total kits distributed to participants compared to PY2021. These kits provide an average of 890 kWh in gross verified savings per participant, compared to 437 kWh in average gross verified savings per Tier 1 project. However, participants are of moderate income and have a NTGR applied to account for net verified savings, which reduced savings down to 75,000 kWh. While most surveyed Energy Saving Kit (Tier 2) participants (five of seven) indicated that they

were completely satisfied with the process of applying for and receiving the Energy Savings Kit, IESO staff expressed that the requirement to prove income qualification may have been a barrier to participation. Delivery vendors noted that customers' income levels tend to either make them eligible for Comprehensive Support (Tier 1) or ineligible altogether.

- **Recommendation 2a.** Expand income eligibility criteria for Energy Saving Kits (Tier 2) to be inclusive of more households.
- **Recommendation 2b.** Consider enhancing the Energy Savings Kit to increase its appeal to customers and spark more interest in them. This could be done by including a higher quantity of the equipment with the highest participant satisfaction ratings (LEDs), replacing the measure with the participant lowest satisfaction rating (clothes drying rack) with a different model, or adding a higher value or more modern equipment type, such as smart thermostats.
- **Recommendation 2c.** IESO's efforts to update Energy Saving Kit (Tier 2) eligibility and increase marketing should include developing and distributing educational materials (e.g., pictures, links to tutorial videos, or written guidance for measures) covering measure installation and/or maintenance, especially for measures that are not commonly installed (e.g., aerators, block heater timers). This may encourage greater installation rates of measures delivered through mailed kits. Installation rates were not assessed for the Energy Saving Kit (Tier 2) in the PY2022 or PY2021 evaluations due to low incidence. However, low measure installation rates could impact future savings potential, so the program should consider approaches like educational outreach to ensure high installation rates.

Please note that a similar recommendation related to better educating customers about the Energy Saving Kits was included in the PY2021 evaluation as well. In response to the recommendations in PY2021, the IESO indicated they are developing an Energy Saving Kit (Tier 2)-focused marketing campaign, as well as refreshing collateral based on participant feedback. The IESO also noted that the program currently provides installation instructions along with the Energy Saving Kit (Tier 2) kit and live-agent support during call center hours for participants requiring assistance with kit installations. Given that low kit incidence continues to be of relevance in PY2022, a related recommendation has been provided again.

Finding 3: Discrepancies in the demand factor used to calculate savings were the main driver of the overall demand RR of 87%, and multiple measures' demand RRs of 50% or below. The MAL specifies use of the summer peak demand factor (SPDF) from a particular load profile for each program measure. However, desk reviews turned up instances of winter peak factors used without justification to calculate claimed demand savings. Elsewhere, the demand factors used did not match the heating/cooling system recorded in project files and/or were inconsistently applied to measures. Some of the data that would help to reduce discrepancies in demand savings calculations are already collected in data collection forms, such as building or equipment type.

- **Recommendation 3a.** Work with program staff, program delivery vendors, auditors, and contractors to consistently incorporate information already collected on-site (e.g., building

type, mechanical equipment, and heating fuel) into tracking data. Where feasible, expand tracking data to include additional specifications (e.g., equipment efficiency, capacity).

- **Recommendation 3b.** Develop protocols to validate delivery agents' reported savings for measures whose substantiation sheets have different reported savings depending on building type, cooling system, etc. Ensure that the MAL also documents these different reported savings.
- **Recommendation 3c.** Align future updates to the peak demand savings calculations in the substantiation sheets with the load profiles assigned for each program measure in the latest MAL.
- **Recommendation 3d.** Establish data validation protocols to flag which demand factor is used to calculate savings provided to program vendors via IESO Measure Lists. Likewise, establish transparent criteria for claiming peak demand savings during the winter peak period, e.g., the Ontario electric system experiences winter peaks in two consecutive years.

Finding 4: Altogether, 1% of the EAP PY2022 program population was flagged in tracking data as having a health and safety upgrade. By comparison, desk reviews of 130 EAP project files turned up seven cases (5%) where on-site auditors and contractors documented health and safety barriers such as clutter and/or moisture. Five of these seven cases lacked any flag indicating the presence of a barrier. Tracking health and safety barriers is key to improving occupant comfort and understanding the potential for increasing the uptake of high-savings measures like weatherization. Previous evaluations[14] have recommended an emphasis on weatherization upgrades due to high per-unit savings and co-benefits of increased occupant comfort and improvements in indoor air quality.

- **Recommendation 4a.** Improve the quality and comprehensiveness of health, safety, and comfort data collected on-site and contained in the program tracking data. This could include additional required fields in program tracking data for any projects where auditors and contractors identify a health and safety barrier (e.g., what barrier[s] did they observe, what measures were they unable to install as a result).
- **Recommendation 4b.** Develop a participant journey map for homes with observed health and safety barriers. Equip auditors and contractors with the time and resources to provide guidance on how participants can remediate any observed health and safety barriers. This could include referrals to contractors that could conduct the necessary remediation, and program incentives specifically tied to these steps. In addition, these journey maps can extend into follow-up plans for participants to receive certain energy-efficiency measures that weren't installed due to health and safety concerns after remediation has occurred.

Finding 5: Additional program promotion opportunities exist. Auditors, contractors, IESO staff, and delivery vendor staff all recommended that the program conduct additional marketing efforts. Auditors and contractors cited marketing and outreach as the aspect in greatest need of program improvement (average rating of 2.9 on a scale from 1 to 5, where 1 meant "not at all

[14] See Finding 1 in the 2021-2024 CDM Framework: PY2021 Energy Affordability Program Evaluation Report; see also Recommendation 2a in the Interim Framework: First Nations Conservation Program Evaluation Report.

satisfied" and 5 meant "completely satisfied"). Auditors and contractors also indicated that the greatest barriers to program participation were customer concerns about whether the program was real or a scam (mentioned by 87%) and lack of program awareness among customers (mentioned by 61%). To address these barriers, auditors and contractors most commonly recommended increasing outreach and marketing (mentioned by 35%). Some auditors and contractors provided specific recommendations, such as advertising the program's legitimacy and coordinating with local municipalities to promote the program in remote communities, tailoring marketing by region and season, and involving community organizations in program outreach. IESO and delivery vendor staff suggested that, where feasible, the program consider reviving some of the targeted mass marketing strategies that were used in past program years, focusing additional effort on Energy Saving Kits, and coordinating marketing efforts with delivery vendors. Delivery vendor staff suggested region and season specific marketing efforts.

- **Recommendation 5a.** Increase and diversify marketing efforts to boost overall program awareness and reduce customer skepticism of the legitimacy of the program. This could also include reviving some mass marketing activities such as radio, TV, billboards, or print ads, as well as expanding on existing digital marketing activities like banner ads, video testimonials, and social media campaigns.
- **Recommendation 5b.** Ensure marketing messaging includes direct language emphasizing the program's safety and legitimacy, as well as its no-cost nature and energy-saving potential.
- **Recommendation 5c.** Coordinate with local municipalities to promote the program regionally and/or in remote communities.
- **Recommendation 5d.** Provide tailored marketing to specific regions or by season. Consider highlighting equipment of particular interest to a given region or employing messaging that may resonate the most during a given season.
- **Recommendation 5e.** Continue collaborations with EAP Roundtable and community-based organizations to help promote the program and address concerns about the program's legitimacy.

Please note that a similar recommendation related to program promotion opportunities was included in the PY2021 evaluation as well. In response to the recommendations in PY2021, the IESO indicated that it remains committed to exploring opportunities for collaboration and cross-promotion, stating that they would review program collateral, as well as leveraging the EAP Roundtable participants for additional cross-promotion opportunities. Additionally, they noted beginning co-branded marketing with Enbridge and that co-branding of bill inserts would soon be rolling out. Given that this topic continues to be of relevance in PY2022, related recommendations have been provided again.

Finding 6. Additional opportunities for enhancing auditor and contractor training and education exist. While most auditors and contractors reported receiving training on the offerings associated with the program (78%) and program rules (78%), fewer received trainings on the application process (30%), marketing and outreach techniques (26%), or on customer service (4%). The most common requests for additional training or support from the auditors and contractors was to increase marketing and outreach support (mentioned by 29% of auditors and contractors), offering additional training and information (24%), better communication (24%), and

receiving clarification on program rules and eligibility requirements (18%). Of the one-fifth (20%) of participants who took the opportunity to provide additional feedback about their experience with the auditor or contractor, over one-tenth (15%) indicated they had a negative experience with the auditor or contractor. Almost one-half (49%) of participants said the auditor did not provide educational materials during the site visit. Additionally, the second most recommended opportunity for program improvement mentioned by participants was to ensure auditors and contractors were properly trained.

- **Recommendation 6.** Ensure program delivery vendors are offering frequent, consistent, and well-rounded training and support to program auditors and contractors through a variety of ways (e.g., in person, through follow-up questions, through online trainings, and sharing recordings from online trainings). Consider offering program-specific training on customer service and interactions and on the importance of providing educational materials to the customer while on site. This could boost the confidence of auditors and contractors who may have never received a training of this type before while improving the customer's experience with the program.

Finding 7: Measure eligibility criteria may be hindering the ability to achieve measure uptake targets and higher customer satisfaction. Many auditors and contractors (43%) reported that the program's measure eligibility criteria affect the frequency with which some measure types are installed. To address this issue, auditors and contractors most commonly suggested offering a wider variety of equipment types and models (52%), reviewing equipment age requirements (39%), and relaxing the measure eligibility requirements in general (35%). Delivery vendors called for simplifying measure qualification requirements, such as setting a straightforward equipment age criterion for more measures. The most common suggestion for program improvement from participants was to relax the eligibility requirements for the program and/or specific measures.

- **Recommendation 7.** Review existing equipment age and size requirements and consider setting more straightforward age criterion for more equipment types. Respondents recommended reviewing AC units and dehumidifiers.
- Refer also to Section 8 as part of the Equipment Suggestions related to offering additional equipment through the program and increasing equipment quality through offering a wider variety of options.

Please note that a similar recommendation related to measure eligibility criteria opportunities was included in the PY2021 evaluation as well. In response to the recommendations in PY2021, the IESO indicated that it was reviewing internal processes that would ensure the measure offerings are regularly updated, including a review of the eligibility criteria which may be limiting measure uptake. Given that this topic continues to be of relevance in PY2022, related recommendations have been provided again.

Finding 8: The first year of collaboration with the Enbridge Home Winterproofing Program (HWP) was beneficial to EAP delivery. In PY2022, the IESO undertook a joint procurement with Enbridge Gas to offer customers a one-window approach to accessing the EAP and the Enbridge Home Winterproofing Program (HWP). Both IESO and delivery vendor staff reported that the

launch of this co-delivery collaboration was successful and recommended further exploring co-marketing approaches in collaboration with Enbridge in the future.

- **Recommendation 8.** Continue to build on the collaboration, further exploring co-marketing, co-branding, and increasing overall marketing coordination with Enbridge's HWP.

Finding 9. The first year of offering the program through regional delivery vendors may have constrained PY2022 program results due to ramp up period. The transition to multiple delivery vendors with geographically distinct territories allowed the program to focus more on distinct regional needs; for example, some regions have a greater need to find delivery solutions for remote areas or translation of program materials. While IESO and delivery vendor staff viewed this transition favorably, they noted that it took more time than anticipated to ramp up program delivery. Additionally, the bankruptcy of one delivery vendor meant that the program needed to pivot quickly to ensure existing applications and participants continued to be served.

- **Recommendation 9.** Continue to support, train, and communicate with delivery vendors as they strive to meet their delivery goals in future program years. For example, the IESO could coordinate with the delivery vendors to identify geographic areas or specific building types (e.g., social housing, home types beyond single-family homes, etc.) that may be experiencing lower uptake.

Finding 10: Social housing providers generally found EAP easy to participate in but recommended additional assistance to further support tenants' needs. Social housing providers indicated that it was easy to participate in the program and that it benefits the tenants and the social housing groups. Distinct barriers include equipment model limitations, the cost of paying for tenant intervention services, and difficulty of transitioning between delivery vendors. Social housing providers recommended creating a fund to cover the cost of alternate equipment models not available through the program, providing financial assistance for tenant intervention services to help prepare for equipment installation, and offering large-ticket items (e.g., boilers, windows, insulation) through the program.

- **Recommendation 10a.** Consider opportunities to include equipment models not available through the program. For example, consider the feasibility of 1) creating a fund to cover these models, 2) incorporating additional models into the program where there is bulk demand, or 3) providing information or flyers pointing to other offerings from the Federal government or other provincial organizations.
- **Recommendation 10b.** Consider the feasibility of providing financial assistance for tenant intervention services to help prepare for equipment installation (e.g., assistance with moving furniture or other items in the home).
- **Recommendation 10c.** Please note that the suggestions of including larger-ticket items is included in Section 8 as part of the Equipment Suggestions progress update on process topics.

Finding 11: Income eligibility criteria present participation barriers for some customers. Both IESO and program delivery vendor staff reported that the income eligibility criteria present a barrier for some customers; for example, because it relies on the prior year's income information,

customers who have had a change in financial circumstances may be ineligible until the following year.

- **Recommendation 11.** Adjust the income verification process to be more permissive of certain customer application cases. For example, provide flexibility in enrolling customers who have had a change in financial circumstances that would allow them to apply to the program more quickly.

Section 8 Progress Updates on Process Topics

This section provides progress updates on common process evaluation research topics. These topics have typically been included as Key Findings and Recommendations in previous year's evaluation reports. Because these topics may be of continued interest to monitor, they are included here for additional consideration.

Process Progress Update 1 - Program costs, primarily the cost of labor, equipment, and transportation, can deter auditors and contractors from scheduling work. IESO and delivery vendor staff described how program costs related to labor, equipment, and transportation, and particularly when associated with customers in geographically remote areas, have introduced some challenges for the program. For example, the time and cost required to travel to remote locations can deter auditors and contractors from scheduling work there. Delivery vendor staff also explained that this challenge is exacerbated because they have found that EAP may provide lower fees to auditors and contractors compared to other programs, though IESO staff indicated that they recently worked to better align these fees to be more competitive. Four of eight surveyed contractors indicated that costs of program-related equipment increased over the last year (the remaining four said they did not know if these costs had risen) and they believe these costs increased more quickly than the rate of inflation over the last year. Contractors mentioned that material costs had increased (four respondents) followed by labor and mileage costs (three respondents).

- **Improvement Opportunity 1a.** Consider whether additional increases to fees paid to auditors and contractors may be warranted. Doing so may further increase contractor willingness to participate in the program and to serve geographically remote areas.
- **Improvement Opportunity 1b.** Consider further increases to measure cost caps that consider increased costs related to labor, equipment, and transportation.
- **Improvement Opportunity 1c.** To minimize program costs associated with serving geographically remote customers, group site visits in similar areas together to minimize driving time and related expenses for auditors and contractors. Additionally, to support the development of a local workforce that is capable of performing program audits or installations, identify opportunities to partner with community-based organizations who may specialize in workforce development. Finally, survey auditors and contractors to better understand their perspectives on what types of support they may need when delivering the program in geographically remote areas.

Process Progress Update 2 - Expanding the scope of equipment offerings was a common improvement suggestion. While most participants (75%) indicated that the equipment and services provided through EAP adequately met their needs, they provided many suggestions for additional equipment to consider including in the program, most frequently mentioning additional insulation (23%), weatherstripping (18%), and windows (17%). IESO and delivery vendor staff noted that there was strong demand for appliances, but limitations in the range of available models and ongoing supply chain constraints may hinder vendors' ability to deliver the desired appliance types or models to some customers. IESO and delivery vendor staff also noted that customers frequently mentioned interest in cold climate air source heat pumps, cooking stoves, and more

choices of refrigerator sizes and colors. Similarly, auditors and contractors most commonly recommended offering a wider variety of equipment types or models (52%) and a wider variety of colors and sizes for refrigerators (36%).

- **Improvement Opportunity 2a.** Consider offering additional types of equipment that may align with program goals and customer interests (e.g., additional insulation, weatherstripping, windows, cold climate air source heat pumps).
- **Improvement Opportunity 2b.** Consider offering a wider variety of options (e.g., sizes, colors) for appliances, especially for refrigerator offerings.

Appendix A Detailed Methodology

This appendix provides the methodology applied for various components of the EAP evaluation: impact, NTGR, cost-effectiveness, process, NEBs, and jobs impacts.

A.1 IMPACT METHODOLOGY

This appendix provides additional details about the impact evaluation methodology. A summary of the methodology was provided in Section 3.1.

A.1.1 Impact Sampling

The NMR team sampled EAP at the project level for the desk reviews (Table 14). Initially, the projects were examined to determine what measures and combination of measures were most common across projects to ensure that strata could be created without excluding any measure categories. Projects were then binned based on the level of deemed gross savings for the entire project. These bins were the high-savers (projects whose summed measure savings were in the top 20% of savings), medium-savers (projects whose summed measure savings were in-between 33rd and 80th percentile of savings) and low-savers (projects whose summed measure savings were in the lowest 33% of total distributed savings).

The NMR team used the projects in the top 20% of savings as the sample frame for desk reviews. Initial allocations did not yield enough sample points to obtain the desired confidence levels for some of the critical measures of interest. In addition, project data were not available to request from all program vendors. To address these deficiencies, the NMR team re-ran the allocation, oversampling projects with low-incidence measures dehumidifiers, refrigerators, freezers, pipe insulation, and window air conditioners. These steps resulted in a final sample size of 130.This approach balanced competing needs, so that the desk review sample include the most program savings possible while covering as many low-incidence measures as possible with the available data.

Table 14: Desk Review Sample Summary

n	Avg. # of Measures per Project	Avg. kWh Deemed Savings per Project
130	5.7	1,586

A.1.2 Program Tracking Database Review

The NMR team review checked for consistency between measures and the Measures and Assumptions List (MAL) values and verified the accuracy of reported savings calculations based on the IESO substantiation sheet algorithms for prescriptive measures that were updated as a part of the PY2019 HAP impact evaluation.[15] The NMR team also leveraged the database to calculate gross and verified net savings for the entire population. Equation 3 shows the program tracking data correction factor calculation, which aligned reported savings with the updated

[15] Note that weatherization measures do not have prescribed values in the MAL and the NMR team evaluated savings for these measures on a case-by-case basis during the desk reviews.

evaluation substation sheet savings values. A correction factor equal to one indicates that there were no errors or inconsistencies in the reported savings calculations.

Equation 3: Program Tracking Data Correction Factor

$$Tracking\ Data\ Correction\ Factor\ (CF) = Deemed\ savings\ value\ (PY2019\ Updated\ Substantiation\ Sheet\ Savings) \div Reported\ Saving$$

A.1.3 In-Service Rate (ISR) and Hours of Use (HOU) Analysis

The NMR team surveyed EAP participants to verify the number of measures installed and in use on their premises. The NMR team applied the PY2022 ISR findings to verified savings calculations for all measures that achieved the desired sampling error (10%) at a 90% confidence level based on the participant survey. Three additional measures achieved the desired sampling error when combining PY2022 and PY2021 ISR findings.[16]

The NMR team also surveyed participants to determine HOU for measures more directly impacted by occupant usage. Only two measures achieved the desired sampling error (10%) at a 90% confidence level based on the participant survey, detailed below:

Lighting. The NMR team updated lighting HOU based on PY2022 participant survey results. Survey respondents indicated greater lighting usage (3.1 hours) than documented in IESO substantiation sheets (3.0).

Dehumidifiers. The NMR team updated two values determining dehumidifier usage – hours per day and days per year – based on PY2022 survey results. Survey respondents reported usage over 50% greater than the levels documented in IESO substantiation sheets.

The results for the ISR and HOU aspects of the participant surveys are discussed in Section 3.2 and Appendix B.2, respectively.

A.1.4 Engineering Desk Reviews

The engineering desk reviews consisted of a review of a sample of 130 projects that the NMR team selected as part of the program tracking database review and sampling process. Program delivery vendors provided the NMR team with documentation for the sampled projects. The NMR team conducted a thorough review of the detailed project documents, which consisted of application forms, invoices, appliance shipment confirmation, energy models, photos, and auditor data collection forms.

A.1.5 Prescriptive Measures

The NMR team assessed prescriptive measure quantities and measure descriptions based on the documentation provided for the sampled projects. The NMR team conducted additional research to determine the actual nominal energy usage for appliance measures based on existing and new equipment model numbers (when available) to reflect savings estimates more accurately

[16] Aerators, showerheads, and thermostats achieved the desired sampling error once the NMR team incorporated PY2021 findings. Window air conditioners were the only measure that did not have an ISR due to low sample size.

from these measures. The NMR team used the program tracking data review, the PY2019 review of other TRM's, and the desk review to calculate measure-specific RRs, which the NMR team then applied to the population. The NMR team calculated measure-specific ISR values from participant survey results and then applied them to gross savings calculations. In addition, some measures received HOU adjustments because of the participant surveys. Equation 4 shows the gross verified savings calculation for prescriptive measures. Note that if there were no corrections as a result of the program tracking data review (e.g. line items removed due to a credit adjustment or incomplete project work) nor adjustments made during the PY2019 substantiation sheet savings review (Equation 3), the RR would only reflect any discrepancies found during the desk review (i.e., quantity discrepancies or installed measure inconsistencies).

The inputs for the equation are described below:

- **Gross verified savings:** The evaluated savings after all evaluation activities, outside of NTGR, are conducted.
- **Reported unit savings:** The savings associated with installing one unit of a particular measure (e.g. one light bulb or 3' of pipe insulation) according to the IESO's substantiation sheets and MAL.
- **Desk review RR:** The ratio of reported to verified savings for a particular measure based on review of project files. For example, some measures have discrepancies in quantity or type between data sources or may exist in program tracking data but not in project file documentation.
- **Adjusted TRM CF:** A factor applied to ensure that reported savings align with deemed savings values defined in substantiation sheets (outlined in Equation 3).
- **ISR:** For each measure, the percentage of units distributed to participants that are still in use. This factor accounts for measures distributed to participants that are not used. For example, survey respondents indicated that 95% of lightbulbs distributed by the program were still in use, which is then applied to the savings value for the measure.
- **HOU adjustment:** For each measure where hours of use appear in its substantiation sheet algorithm, this factor represents the ratio of self-reported HOU (via the participant survey) to deemed hours of use (as defined in substantiation sheets).
- **Measure quantity:** The number of measures that a participant received. For example, a participant received 20 lightbulbs would have the per-unit savings value multiplied by 20.

Equation 4: Gross Verified Savings – Prescriptive Measures

$$Gross\ Verified\ Savings = Reported\ Unit\ Savings \times Desk\ Review\ RR \times Adjusted\ TRM\ CF \times ISR \times HOU\ adjustment \times Measure\ Quantity$$

A.1.6 Weatherization Measures

The NMR team verified weatherization measures – which include installation of insulation in attics, basements, and walls, as well as air sealing – through a review of HOT2000 energy model files, photo verification, and audit documentation. Savings for the weatherization measures are generally calculated from pre- and post-retrofit upgrades with HOT2000 energy modeling

software. The NMR team performed a more detailed and comprehensive engineering analysis of the weatherization measures by reviewing the HOT2000 files and recalculating the savings based on the weatherization upgrades outlined in the project documentation. The NMR team compared savings results from the desk review to the reported savings to determine a RR, which we then applied to the reported savings for the population of weatherization projects. Note that calculating demand savings for weatherization projects calls for different summer peak demand factors depending on the presence of a cooling system in the home.[17] Equation 5 shows the gross verified savings calculation for weatherization measures.

Equation 5: Gross Verified Savings – Weatherization Measures

$$Gross\ Verified\ Savings = Reported\ Savings \times Realization\ Rate$$

A.2 NET-TO-GROSS RATIO EVALUATION METHODOLOGY

This appendix provides additional details about the NTGR evaluation methodology. A summary of the methodology was provided in Section 2.1.1.

The following sub-sections provide detail on the sampling plans for collecting NTGR data for the Energy Saving Kit (Tier 2) offering, the instruments used to assess FR and SO, the implementation of the data collection, and the analysis methods. Please note that for the Comprehensive Support (Tier 1) offering, the NMR team applied a NTGR of 1.0 to maintain consistency with other low-income, direct installation programs in other jurisdictions. The NTGR of 1.0 indicates that participants would not have installed the energy-efficiency measures without program intervention.

The NMR team developed an effective questionnaire to assess FR and SO for the Energy Saving Kit (Tier 2) offering. The approach has been used successfully in many previous evaluations. The NTGR is defined as follows (Equation 6).

Equation 6: NTGR

$$NTGR = 100\% - FR + SO$$

A.2.1 Free-Ridership Methodology

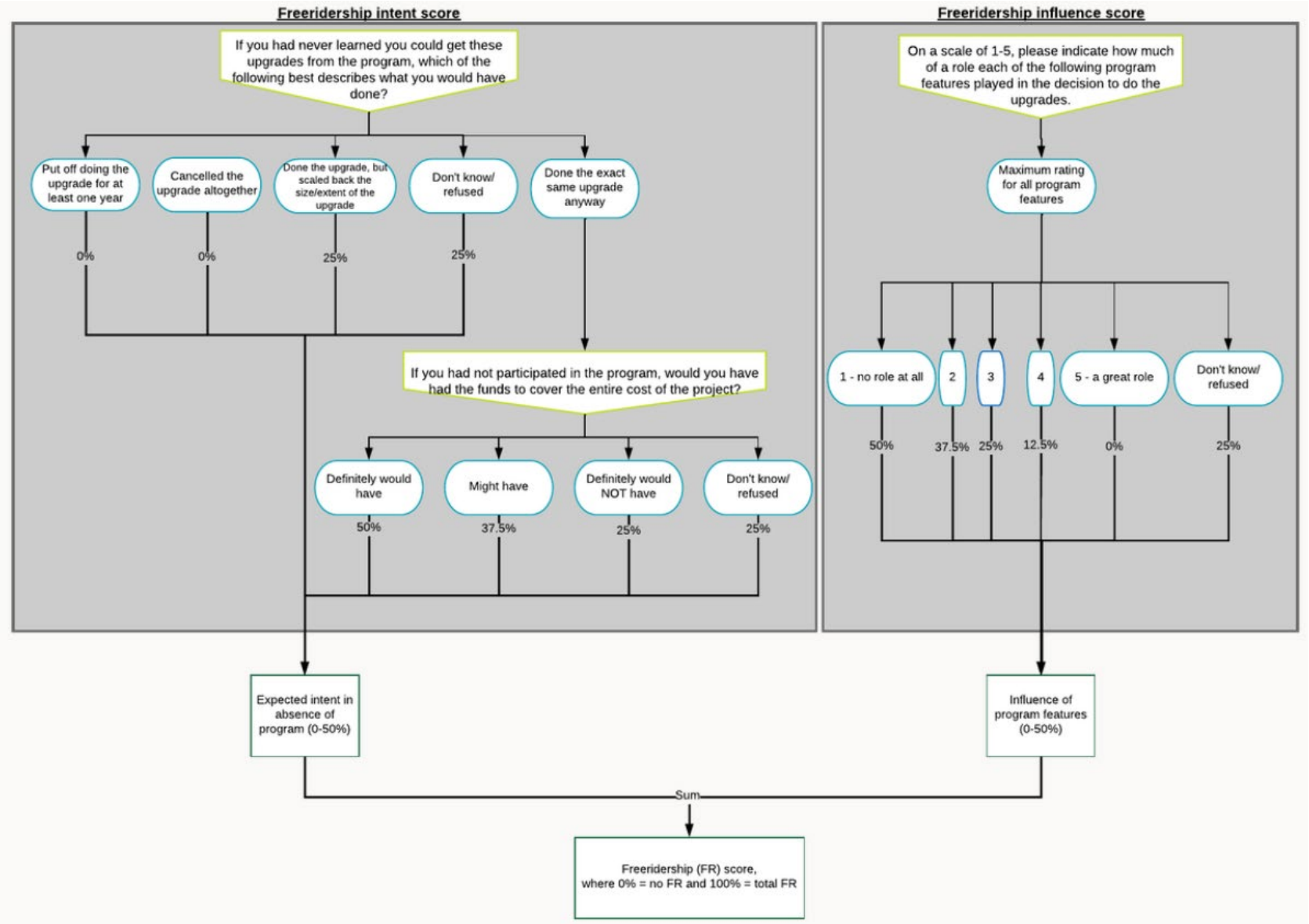
The survey addressed the attribution of savings for each sampled Energy Saving Kit (Tier 2) project or type of equipment through two main components:

- Intention of the expected behavior in the absence of the program
- Influence of various program features, such as the availability of the upgrades at no cost, program marketing and outreach, and any information or recommendations provided by an IESO representative

[17] The PY2022 Prescriptive Measures Assumptions List's weatherization entries specify summer peak demand factors associated with either the "EM&V-Residential-Electric Heating" or "EM&V-Residential-Electric_Heating_and_Cooling" load profiles.

Each component produces scores ranging from 0 to 50. The two components are summed to produce a total FR score ranging from 0 (not a free rider) to 100 (complete free rider). The total score is interpreted as a percentage (0% to 100%) to calculate the mean FR level for a given program. Figure 10 illustrates the FR methodology.

Figure 10: FR Methodology



Intention Component

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

> Question 1: If you had never learned you could get these upgrades through the Energy Affordability Program, which of the following best describes what you would have done? You would have...
>
> 1. Put off doing the upgrade for at least one year
> 2. Cancelled the upgrade altogether
> 3. Done the upgrade but scaled back on the efficiency
> 4. Done the exact same upgrade anyway (Ask Question 2)
> 98. Don't know
> 99. Refused
>
> [ASK ONLY IF RESPONSE TO QUESTION 1=4: Done the exact same upgrade anyway]
> Question 2: If you had not participated in the Energy Affordability Program, would you say you definitely would have, might have, or definitely would NOT have had the funds to cover the cost of the upgrades?
>
> 1. Definitely would have
> 2. Might have
> 3. Definitely would NOT have
> 4. Don't know
> 5. Refused

Table 15 indicates the possible intention scores a respondent could have received depending on their responses to these two questions.

If a respondent provided an answer of 1 or 2 (would postpone or cancel the upgrade), the respondent would receive an FR intention score of 0% (on a scale from 0% to 50%, where 0% is associated with no FR and 50% is associated with high FR). If a respondent answered 3 (would have done the project but scaled back the size or extent of it) or said they did not know or refused the question, the respondent would receive an FR intention score of 25% (associated with moderate FR). If the respondent answered 4 (would have done the exact same project anyway), they are asked the second question before an FR intention score can be assigned.

The second question asks the participants who had said they would have done the exact same project if they definitely would have, might have, or definitely would not have had the funds to cover the cost of the upgrades if they had not received them from the program. If the respondent answered 1 (definitely would have had the funds), the respondent would receive a score of 50% (associated with high FR). If the respondent answered 2 (might have had the funds), they would receive a slightly lower FR score of 37.5%. If the respondent answered 3 (definitely would not

have had the funds) or did not know or refused the question, the respondent would receive an FR intention score of 25% (associated with moderate FR).

Table 15: Key to FR Intention Score

Question 1 Response	Question 2 Response	Intention Score (%)
1 or 2	Not asked	0 (no FR for intention score)
3, 98 (Don't Know), or 99 (Refused)	Not asked	25
4	3, 98 (Don't Know), or 99 (Refused)	25
4	2	37.5
4	1	50 (high FR for intention score)

The bullet points below display the same FR intention scoring approach in a list form. As mentioned above, for each respondent, the NMR team calculated an intention score, ranging from 0% to 50%, based on the respondent's report of how the project would have changed had there been no program:

- Project postponement or cancellation = 0%
- Reduction in size or scope or use of less energy efficient equipment = 25%
- Respondent does not know what they would have done in the absence of the program = 25%
- No change and respondent states they would not have made funds available = 25%
- No change but respondent is not sure whether they would have made funds available = 37.5%
- No change and respondent confirms they would have made funds available = 50%

Influence Component

The influence component of the FR score asks each respondent to rate how much of a role various potential program-related influence factors had on their decision to do the upgrade(s) in question. Influence is reported using a scale from one (1) to five (5), where one means "not at all influential" and five means "extremely influential." The potential influence includes the following:

- Availability of the upgrades at no cost to you Information or recommendations provided to you by an IESO representative
- Information or recommendations provided from auditors or contractors associated with the program
- Marketing materials or information provided by IESO about the program (email, direct mail, etc.)
- Information or resources from IESO's website
- Information or resources from IESO's social media
- Previous experience with any energy saving program
- Others (identified by the respondent)

Table 16 indicates the possible influence scores a respondent could receive depending on how they rated the influence factors above. For each respondent, the program influence is set equal to the maximum influence rating that a respondent reports across the various influence factors. For example, suppose the respondent provided a score of 5 (extremely influential) to at least one of the influence factors. In that case, the program is considered to have had a great influence in their decision to do the upgrade, and the influence component of FR is set to 0% (not a free rider).

Table 16: Key to FR Influence Score

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

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

- Maximum rating of 1 (no influence factor had a role in the decision to do the project) = 50%
- Maximum rating of 2 = 37.5%
- Maximum rating of 3 = 25%
- Maximum rating of 4 = 12.5%
- Maximum rating of 5 (at least one influence factor had a great role) = 0%
- Respondent does not know how much influence any factor had = 25%

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

A.2.2 Spillover Methodology

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

- ENERGY STAR® appliance
- ENERGY STAR® LED
- Lighting controls (lighting timers, occupancy sensors)
- High efficiency heating, cooling, or water heating equipment (central air conditioning, furnace, boiler, water heater)

- Weatherstripping around doors and windows
- Programmable or smart thermostat
- Smart power bar
- Low-flow showerhead
- Faucet aerator
- Others (identified by the respondent): description of upgrade, size, quantity, hours of operation

For each equipment type that the respondent reports installing without program support, the survey instrument asks about the extent of influence that earlier involvement in the program had on the decision to carry out the upgrades. Influence is reported using a scale from 1 to 5, where 1 means “not at all influential” and five means “extremely influential.” In the case that the influence score is between 3 and 5 for a particular equipment type, the survey instrument solicits details about the upgrades to estimate the quantity of energy savings that the upgrade produced.

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

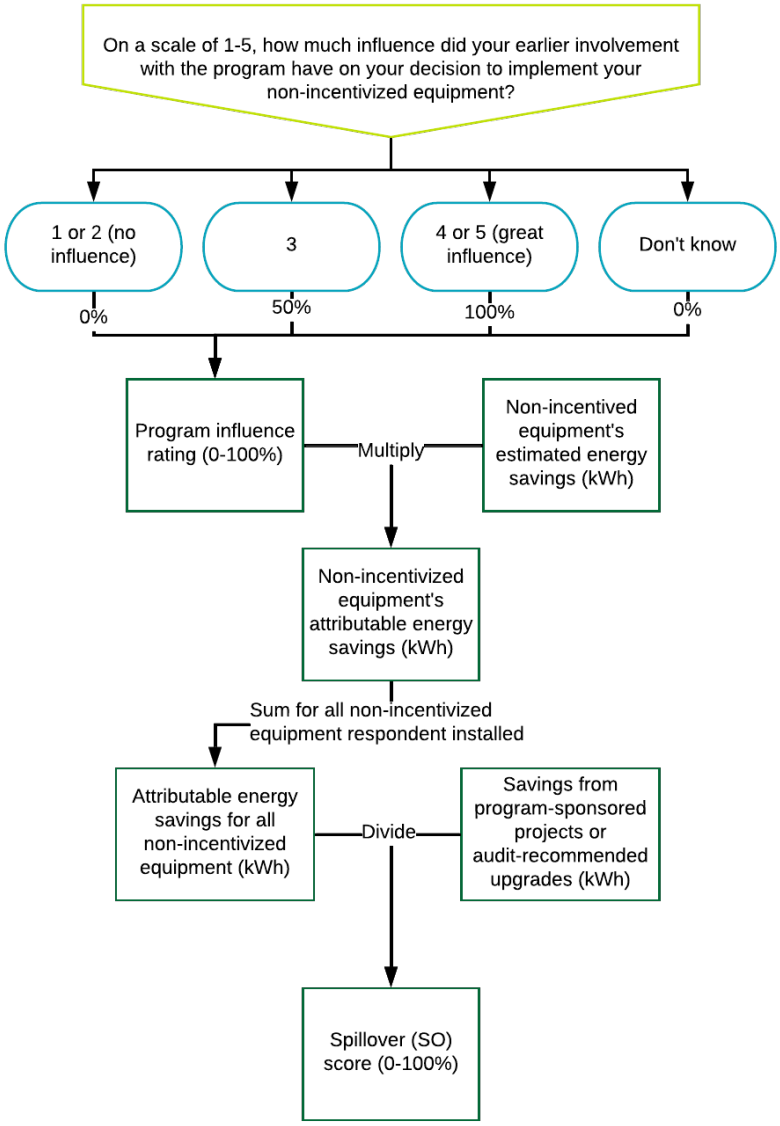
- Maximum rating of 1 or 2 (no influence) = 0%
- Maximum rating of 3 = 50%
- Maximum rating of 4 or 5 (great influence) = 100%
- Respondent does not know how much influence any factor had = 0%

The NMR team used the following procedure to calculate an SO percentage for each respondent:

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

Figure 11 illustrates the SO methodology.

Figure 11: SO Methodology



A.2.3 Other Survey Questions

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

- Whether the respondent is the person primarily involved in decisions about upgrading equipment. If the respondent is not the appropriate contact, they are asked to forward the survey weblink on to the appropriate contact.
- Whether the respondent was the homeowner or tenant.
- When the respondent first learned about the program, relative to the upgrade in question (before planning; after planning, but before implementation).
- How the respondent learned about the program.

The responses to these questions are not included in the algorithms for calculating FR or SO but do provide additional context. The first question ensures that the appropriate person responded to the survey. The other questions provide feedback about responsibility for the relationship of the respondent to the property where the upgrade was performed, and how and when program influence occurs.

A.2.4 Net-to-Gross Survey Implementation

The NMR team implemented the NTGR survey over the web as part of a larger survey that collected NTGR, impact, and process-related feedback from participants. The NMR team assumed that all contacts who responded were the appropriate contacts to answer the questions. The introductory text in the survey asked the respondent to forward the survey weblink to the appropriate contact to fill it out if they were not the appropriate contact to do so.

A.3 COST-EFFECTIVENESS METHODOLOGY

This appendix provides additional details about the cost-effectiveness methodology. A summary of the methodology was provided in Section 2.2.

The cost-effectiveness analysis was completed using IESO's *Cost Effectiveness Tool* and in accordance with the IESO *Cost Effectiveness Guide for Energy Efficiency.*[18] The tool was populated with the following key information from the evaluation:

- First year energy and demand savings
- EUL
- End use load profile
- Incremental equipment and installation cost
- Net to gross ratios for energy savings and demand savings
- Adjustments in savings over the life of the program

Additionally, the IESO provided the following information for use in the cost-effectiveness calculation:

- Program administrative costs
- Incentive amounts

The IESO Cost Effectiveness Tool provides many outputs and varying levels of granularity. While the NMR team leveraged various outputs to develop findings and recommendations, the key outputs the team selected to directly present in this report are as follows:

- PAC test costs, benefits, and ratio
- Levelized delivery cost by kWh and kW

[18] *Cost Effectiveness Guide for Energy Efficiency Version 4*, Independent Electricity System Operator, January 20 2021, https://www.ieso.ca/-/media/Files/IESO/Document-Library/EMV/CDM_CE-TestGuide.ashx

A.4 PROCESS EVALUATION METHODOLOGY

This appendix provides additional details about the process evaluation methodology. A summary of the methodology was provided in Section 2.2.

A.4.1 Research Question Development

Table 17 provides a list of the key research questions and the data sources used to investigate each. The team developed these research questions at the beginning of the PY2022 evaluation period in January and February 2022. They were written in consultation with the IESO program staff and the IESO Evaluation Measurement and Verification (EM&V) staff. Before finalizing the research questions, the NMR team reviewed the timing of the related survey instruments to ensure that the number of research questions addressed within them did not result in a survey that would be too time consuming for respondents to complete. After finalizing research questions, they were adapted for inclusion in the interview guides and survey instruments, which were, in turn, reviewed and approved by the IESO EM&V and program staff (refer to Appendix A.4.2 for more information on the interview and survey methodology).

Table 17: EAP Process Evaluation Research Questions and Data Sources

Research Questions	Document & Records Review	IESO & Delivery Vendor Interviews	Participant Survey	Auditor & Contractor Survey
Is sufficient data being captured to effectively verify program processes and savings?	✓	✓		
What are the goals and objectives of the program, and how well is the program doing in terms of meeting them?		✓		
What strategies were effective in terms of driving participation and increasing program awareness? What strategies were not as effective? Were the strategies implemented as planned from the delivery vendor, participant, and auditor/contractor perspectives?		✓	✓	✓
What are the programs strengths, barriers, and areas of improvement (e.g., ability of representative to answer questions, quality of measures, and time to complete installations)?		✓	✓	✓
What were the experiences of auditors and contractors in delivering the program?				✓
Do the current range of program equipment/services meet customer needs? What suggestions exist for additional equipment/services?		✓	✓	✓
How, if at all, is measure eligibility criteria affecting measure uptake targets (e.g., for appliances and weatherization)? How, if at all, should measure eligibility criteria be adjusted?		✓		✓

Research Questions	Document & Records Review	IESO & Delivery Vendor Interviews	Participant Survey	Auditor & Contractor Survey
Energy Saving Kit (Tier 2) uptake remains very low relative to forecasted uptake. How can this be improved? Is there a more efficient/ effective way of distributing kits? What are delivery vendor and Energy Saving Kit (Tier 2) participant perspectives on the usefulness and value of the Home Energy Kits? What barriers and improvement opportunities exist for the Home Energy Kits?		✓	✓	
From the perspective of the delivery vendors and contractors, have costs increased overall or for certain measures? If they have increased, are they increasing at the same rate as inflation? From the perspective of the delivery vendors, how far off is the insulation cost cap from the market rate?		✓		✓
Is the length of the initial screening call prohibitive to participation? Is the need to include proof of income prohibitive to participation? How many leads were rejected for this reason?		✓	✓	
How many prospective leads are rejected because their income is higher than the threshold for Comprehensive Support (Tier 1)? For Energy Saving Kit (Tier 2)?		✓		✓
The IESO undertook a joint procurement with Enbridge Gas to offer customers a one-window approach to accessing EAP and the Enbridge Home Winterproofing Program (HWP). Are there any opportunities for improvement in delivery?		✓		

A.4.2 In-Depth Interview and Survey Methodology

During the process evaluation, the NMR team collected primary data from key program actors, including the IESO staff, the program delivery vendor staff, social housing providers, participants, auditors, and contractors. (Table 18). We collected the data using different methods, depending on what was most suitable for a particular respondent group (e.g., web surveys or telephone-based-IDIs). This data, when collected and synthesized, provides a comprehensive understanding of the delivery of the PY2022 program.

The NMR team directly carried out or managed all process evaluation data collection activities and developed all survey instruments, interview guides, and sample files for use in the interviews and surveys. The survey instruments and interview guides were approved by the IESO EM&V staff, and the data used to develop the sample files came from program records supplied either by the IESO EM&V staff or the program delivery vendor.

The NMR team conducted in-depth telephone interviews with the IESO staff, the program delivery vendor staff, and the social housing provider staff using in-house staff (rather than through a survey lab). The NMR team fielded EAP participant and EAP auditor and contractor surveys as web-based surveys in partnership with the Resource Innovations survey lab based in Toronto. The NMR team designed the survey instruments and developed the sample lists. The Resource Innovations survey lab then programmed and distributed the surveys using Qualtrics survey software. The NMR team worked closely with the Resource Innovations survey lab to test the programming of each survey and to perform quality checks on all data collected.

Table 18: Process Evaluation Primary Data Sources

Respondent Type	Methodology	Fielding Firm	Completed	Population	90% CI Error Margin
EAP IESO Staff and Program Delivery Vendor Staff	Phone IDIs	NMR Staff	4	4	0%
EAP Social Housing Providers	Phone IDIs	NMR Staff	2	2	0%
EAP Auditors and Contractors	Web	Resource Innovations Survey Lab	23	59	N/A%*
EAP Participants	Web	Resource Innovations Survey Lab	1,056**	4,856***	2.2%

*Error margin not displayed if the respondent count is below 30 unless census is achieved. **1,048 Comprehensive Support (Tier 1) and 8 Energy Saving Kit (Tier 2).
***4,812 Comprehensive Support (Tier 1) and 44 Energy Saving Kit (Tier 2).

The following subsections provide additional details about the process evaluation methodology.

A.4.3 IESO Staff and Program Delivery Vendor Staff Interviews

The NMR team completed one interview with an IESO staff member and three interviews with three program delivery vendor staff members to gain a detailed understanding of EAP in PY2022 (Table 19). The purpose of the interviews was to better understand program design, delivery, and barriers, and solicit suggestions for improvement.

The interview topics included program roles and responsibilities; program design and delivery; Energy Saving Kit (Tier 2); program measurement and tracking; market actor engagement; customer participation; market impacts; Enbridge collaboration; program strengths and weaknesses; and suggestions for improvement.

The NMR team identified the appropriate staff to interview in consultation with the IESO EM&V staff. Each interview took approximately sixty minutes to complete. The NMR team conducted IDIs via phone with the IESO staff and the program delivery vendor staff from mid-April to early May 2023.

Table 19: EAP IESO Staff and Program Delivery Vendor Staff Interview Disposition

Disposition Report	Count
Completes	4
Emails Bounced	-
Bad Contact Info (No Replacement Found)	-
Unsubscribed	-
Partial Complete	-
Screened Out	-
No Response	-
Total Invited to Participate	4

A.4.4 Social Housing Providers

The NMR team completed two interviews with social housing provider staff members to gain a detailed understanding of EAP in PY2022 (Table 20). The purpose of the interviews was to better EAP understand social housing provider perspectives related to program experience.

The interview topics included program roles and responsibilities; awareness and motivations; program experiences; satisfaction; barriers; savings opportunities; program strengths and weaknesses; and suggestions for improvement.

The NMR team identified the appropriate staff to interview in consultation with the IESO EM&V staff. Each interview took approximately thirty minutes to complete. The NMR team conducted IDIs via phone with the social housing provider staff in late April 2023.

Table 20: EAP Social Housing Provider Interview Disposition

Disposition Report	Count
Completes	2
Emails Bounced	-
Bad Contact Info (No Replacement Found)	-
Unsubscribed	-
Partial Complete	-
Screened Out	-
No Response	-
Total Invited to Participate	2

A.4.5 Auditor and Contractor Survey

The NMR team surveyed 23 EAP auditors and contractors from a sample of 59 auditors and contractors (Table 21). The purpose of the survey was to better understand EAP auditor and contractor perspectives related to program delivery.

The interview topics included role in the program; firmographics; training and education received; outreach and marketing to customers; measure eligibility criteria; measure-related cost caps; program barriers; satisfaction with various aspects of the program; suggestions for program improvement, including additional equipment or services to consider as well as the program overall; NEBs; and job impacts.

The NMR team developed the survey sample with support from the program delivery vendor, who provided a contact list of 44 auditors, 14 contractors, and 1 who is both an auditor and a contractor. The NMR team employed a census-based approach to reach the largest number of respondents possible given the small number of unique contacts.

The NMR team delivered the survey over the web in partnership with the Resource Innovations survey lab using Qualtrics survey software. Survey implementation was conducted between April 5 and May 1 of 2023. The survey took an average of 21 minutes to complete after removing outliers.[19] The NMR team sent weekly e-mail reminders to non-responsive contacts over the course of web survey fielding.

Table 21: EAP Auditor and Contractor Survey Disposition

Disposition Report	Count
Completes	23
Emails Bounced	2
Bad Contact Info (No Replacement Found)	-
Unsubscribed	-
Partial Complete	3
Screened Out	5
No Response	26
Total Invited to Participate	59

A.4.6 Participant Survey

The NMR team surveyed 1,056 EAP participants from a sample of 4,856 unique contacts (Table 22). The purpose of the survey was to better understand EAP participant perspectives related to program experience.

The survey topics included ISRs; HOU; NTGR (for Energy Saving Kit (Tier 2) respondents only); how participants applied to the program; the initial screening call; proof of income requirements; motivations for doing the upgrades; education and materials provided by the energy auditor; Energy Saving Kits usefulness and satisfaction; suggestions for program improvement, including additional equipment or services to consider as well as improving Energy Saving Kit and the program overall; NEBs, job impacts; and demographics.

The NMR team developed the sample from program records provided by the IESO EM&V staff. Given the measure-level survey completion goals, the NMR team developed a stratified random sample of a subset of participants for inclusion in the survey sample.

The NMR team delivered the survey over the web in partnership with the Resource Innovations survey lab using Qualtrics survey software. The NMR team conducted survey implementation between March 14 and April 12, 2023. The survey took an average of 17 minutes to complete

[19] Note that the survey was designed to allow the respondent to come back to the survey at a later time to complete it if they preferred. The average survey time was calculated with this in mind and assumed that any survey that took 40 minutes or more to complete was likely completed by a respondent who took a break before completing the survey.

after removing outliers.[20] The NMR team sent weekly e-mail reminders to non-responsive contacts over the course of web survey fielding.

Table 22: EAP Participant Survey Disposition

Disposition Report	Count
Completes	1,056
Emails Bounced	28
Bad Contact Info (No Replacement Found)	-
Unsubscribed	-
Partial Complete	91
Screened Out	446
No Response	3,235
Total Invited to Participate	4,856

A.4.6.1 Participant Sampling Plan

The NMR team sampled EAP participants using individual projects as the sampling unit. The project-level allocation of sample weighted the data at the measure level to ensure that the results accurately reflected measure categories across projects. NMR initially binned projects into three categories based on their level of deemed gross savings:

- high savers (participants whose summed measure savings were in the top 20% of savings)
- medium savers (participants whose summed measure savings were in-between 33% and 80% of total distributed savings), and
- low savers (participants whose summed measure savings were in the lowest 33% of total distributed savings)

The NMR team used these savings bins as the sampling strata and refer to them as the high-, medium-, and low-savings strata. Sampling by these strata ensures that participants across the binned savings categories would be proportionately represented in the sample.

The NMR team used Neyman Allocation[21] to optimally sample projects from each of the three strata given the overall number of sample points desired. After initially drawing the sample by the savings strata based on the project-level savings, NMR then examined the selected sample to assess how well they represented the population of measures installed across the projects. Ideally, NMR wanted the sample for each measure to be large enough to include at least 70 completions for each measure. However, this assessment revealed that the initial allocations did not yield enough sample points to obtain the desired confidence levels for HOU and ISR for some of the critical measures of interest. To address these deficiencies, the NMR team re-ran the allocation, oversampling low-incidence projects with block heater timers, smart power bars,

[20] Note that the survey was designed to allow the respondent to come back to the survey at a later time to complete it if they preferred. The average survey time was calculated with this in mind and assumed that any survey that took 40 minutes or more to complete was likely completed by a respondent who took a break before completing the survey.
[21] See Chapter 11 of the Uniform Methods Project for examples of Neyman Allocation in evaluation. https://www.nrel.gov/docs/fy17osti/68567.pdf

thermostats, and showerheads. Likewise, the NMR team verified that sampled projects provided adequate coverage of the different IESO regions surveyed. Table 23 shows the original sample plan. As seen in Table 22, the survey response was very successful, resulting in 1,056 survey completes. Table 24 compares the number of program participants in the population that installed each measure category with the number of participants contacted for the survey, and who completed the survey.

Table 23: EAP Participant Sample Plan Summary

Project Strata	Project Count	Measure Count	90% Error Margin
Top 20% of Savings	465	5,710	3.7%
Middle 47% of Savings	1,630	4,354	2.0%
Bottom 33% of Savings	835	1,054	2.8%

Table 24: EAP Participant Survey Project Counts and Completes by Measure Category

Measure Category	Projects in Population	Invited to Participate	Completed Survey
Lighting	20,686	4,445	834
Dehumidifiers	613	441	115
Freezers	1,428	994	252
Refrigerators	3,546	1,948	491
Window Air Conditioners	125	102	30
Weatherization – Building Shell	117	43	10
Smart Power Bars	5,717	3,564	650
Aerators	414	221	25
Showerheads	286	185	34
Pipe / Tank Wrap	340	203	25
Block Heater Timers	734	592	82
Indoor Clothes Drying Racks	4,625	3,129	506
Thermostats	241	86	18

A.5 Non-Energy Benefits Methodology

This appendix provides additional details about the NEBs estimate methodology. A summary of the methodology was provided in Section 2.4.

A.5.1 Participant Survey

The two previous studies, the *PY2021 EAP Evaluation Report* and the *Non-Energy Benefits Study: Phase II* assessed the NEBs from energy efficiency projects funded by the IESO in over the 2017 – 2021 period.[22] The PY2022 evaluation applied the same methodology as the previous

[22] Dunsky. (July 2021). *Non-Energy Benefits: Phase II; Quantified Benefits and Qualitative Insights*. https://www.ieso.ca/-/media/Files/IESO/Document-Library/conservation-reports/Non-Energy-Benefits-Study-Phase-II.ashx

studies to assess NEBs, using two different types of questions to determine the value of NEBs that program participants realized by installing program measures:

- **Relative scaling:** Relative scaling questions ask participants to state the value of an item of interest relative to some base. For this survey, participants were asked to state the value of each NEB relative to the annual electricity bill savings that they estimated or, if they could not estimate savings, their annual electricity bill.
- **Willingness-to-pay:** Willingness-to-pay questions ask participants to assign the dollar value they would be willing to pay for the item of interest. In this case, participants were asked what they would be willing to pay for each relevant NEB.

All survey respondents were asked to value all NEBs using both techniques. The data collected from these questions was then used to quantify the NEBs.

A.5.2 NEBs Quantification

For each individual NEB, the total value across all participants was divided by the total gross savings values across all participants. This was completed using both Relative Scaling and Willingness to Pay NEB values. Two hybrid approaches were then calculated in order to be more representative of the sample:

- **Hybrid, relative scaling priority** in which we give priority to the relative-scaling response value. In this approach, we only consider the willingness-to-pay if the participant did not answer the relative scaling question.
- **Hybrid, minimum approach** in which we consider the lowest non-null response between the relative scaling and the willingness-to-pay questions.

As a final step we calculated the average value ($/kWh) for each NEB weighted by energy savings across all participants. Table 25 shows the average NEB values based on two different calculation approaches:

- **Average (per participant):** A $/kWh value was calculated for each individual participant, then all values were averaged.
- **Average (overall):** Refers to an overall average value where total NEB benefits ($'s) were summed across all participants and then divided by the total energy savings (kWh) across all participants.

Table 25: Quantified NEBs by Participant and by Savings, Phase II, PY2021, & PY2022

Average	Reduced financial stress	Thermal comfort	Improved indoor air quality
Hybrid (min approach) ($/kWh)			
PY2022 - Per participant	0.36	0.43	0.06
PY2022 - Overall	0.14	0.19	0.04
PY2021 - Per participant	0.25	0.34	0.05
PY2021 - Overall	0.15	0.22	0.04

Average	Reduced financial stress	Thermal comfort	Improved indoor air quality
Phase II - Per participant	0.13	0.14	0.04
Phase II - Overall	0.09	0.08	0.02
Hybrid (RS-priority) ($/kWh)			
Per participant	0.73	0.86	0.16
Overall	0.31	0.43	0.12
Per participant	0.57	0.64	0.23
Overall	0.33	0.4	0.11
Per participant	0.18	0.17	0.04
Overall	0.09	0.09	0.02

All recommended values in the Phase II study were based on the hybrid, minimum approach. More details on methodology and NEBs quantification can be found in the Phase II study.

A.6 JOBS IMPACT METHODOLOGY

This appendix provides additional details about the job impact methodology. A summary of the methodology was provided in Section 2.5.

The analysis of job impacts utilized the StatCan IO model to estimate direct and indirect job impacts. IO models are used to analyze the propagation of exogenous economic shocks throughout an economy. The models represent relationships, or flows, of inputs and outputs between industries. A system of linear equations represents how certain industries' outputs become the inputs for other industries, while other outputs become consumer goods. When an energy-efficiency program such as EAP is funded and implemented it creates a set of "shocks" to the economy, such as demand for specific products and services, and additional household expenditures from energy bill savings. The shocks propagate throughout the economy and their impacts can be measured in terms of variables such as economic output and employment.

A.6.1 Statistics Canada IO Model

The Industry Accounts Division of StatCan maintains two versions of a Canadian IO model: a national, and an interprovincial model [23]. The models are classical Leontief-type open-IO models [24], where some production is consumed internally by industries, while the rest is consumed externally. The models provide detailed information on the impact of exogenous demands for industry outputs. The impacts are quantified in terms of production, value-added components (such as wages and surplus), expenditures, imports, employment, energy use, and pollutant emissions by industry. The StatCan IO Model is composed of input, output, and final demand tables. IO tables are published annually with a lag of approximately three years, so the model used for this analysis represents the Canadian economy from 2019. The model has been used to model employment impacts from a wide range of economic shocks, including structural changes

[23] Statistics Canada - Industry Accounts Division System of National Accounts; (2009). User's Guide to the Canadian Input-Output Model. Statistics Canada. Ret

[24] Ghanem, Ziad; (2010). The Canadian and Inter-Provincial Input-Output Models: The Mathematical Framework. Statistics Canada – Industry Accounts Division.

to the Canadian economy[25], the bovine spongiform encephalitis (BSE) crisis in the early-mid 2000s[26], and the construction of hydropower projects[27].

The supply and use tables (SUTs) for the Canadian IO model break the economy down into 240 industries and 500 SUPCs. They represent the economic activity of a specific Canadian province, or of the whole country. The SUTs show the structure of the Canadian economy, with goods and services flowing from production or import (supply tables) to intermediate consumption or final use (use tables). Intermediate consumption refers to domestic industries using goods and services to produce other products and services. Final use includes consumption of products by households, non-profit institutions serving households, and governments; capital formation; changes in inventory; and exports. Provincial SUTs are similar to national SUTs, but for the addition of interprovincial trade to go along with the international imports and exports.

StatCan offers the IO Model as a service but not as a product. StatCan economists work with researchers to develop the data and inputs to develop and answer specific research questions using the model. The end product is a set of outputs from running the model.

A.6.2 Approach

The process for using the StatCan IO model followed three steps:

1. Developed specific set of research questions to address with the IO model, reflecting the exogenous shocks caused by the program.
2. Developed model inputs, which consisted of exogenous shock values (in dollars) to simulate the effects of EAP.
3. Ran the model and interpreted the results.

The following sub-sections cover each step in more detail.

A.6.2.1 Developed Specific Research Questions

The first step in modeling the job impacts from EAP was to determine which specific research questions (RQs) the model would answer. In a scenario without the existence of EAP, customers receive electricity from IESO and pay for it via the monthly billing process. Delivering EAP introduces a set of economic supply and demand shocks to different sectors of the economy. The four research questions below illustrate these shocks:

1. **What are the job impacts from new demand for energy-efficient measures and related program delivery services?** Funds collected for EAP generate a demand for efficient equipment and appliances. They also generate a demand for services related to program delivery, such as audits at customer premises, call center operations, and

[25] Gera, S & Masse, P; (1996). Employment Performance in the Knowledge-Based Economy, Gouvernement du Canada - Industrial Organization 14, Gouvernement du Canada - Industry Canada.
[26] Samarajeewa, S. et al.; (2006). Impacts of BSE Crisis on the Canadian Economy: An Input-Output Analysis. Prepared for the Annual Meeting of the Canadian Agricultural Economics Society.
[27] Desrochers, R. et al.; (2011). Job Creation and Economic Development Opportunities in the Canadian Hydropower Market. Canadian Hydropower Association.

general overhead for program implementation and staffing. This demand creates jobs among firms that supply these products and services.

2. **What are the job impacts from household energy bill savings?** Once energy-efficient equipment is installed in households, the customers realize annual energy savings for the useful life of the measures. Households can choose to put this money into savings or to spend it on goods and services in the economy. This additional money and the decision to save or spend has implications for additional job creation. For instance, additional household spending on goods and services generates demand that can create jobs in other sectors of the economy.
3. **What are the job impacts from funding the energy-efficiency program?** IESO energy-efficiency programs are funded via volumetric bill charges for all customers – both residential and non-residential. This additional charge can reduce the money that households have for savings and for spending on other goods and services. It also impacts non-residential customers. This additional bill charge results in a negative impact on jobs in the Canadian economy.
4. **What are the job impacts from reduced electricity production?** The energy-efficient measures will allow households to receive the same benefit while using less electricity. The program as a whole will reduce the demand for electricity in the residential sector. This reduced demand could have upstream impacts on the utility industry (e.g., generation) and related industries, such as companies in the generator fuel supply chain.

A.6.3 Developed Model Inputs

The second step in modeling job impacts was to gather the data required for the StatCan IO model to answer each of the research questions. Model input data included the dollar values of the exogenous shocks from program delivery. The sources of data for each research question were as follows:

1. **Demand for energy-efficient measures and related program delivery services.** The StatCan IO Model divides the Canadian economy into 240 industry classifications and 500 SUPCs. Each measure installed as part of the program was classified into one of the SUPCs. The dollar value for each product-related demand shock was calculated using the measure cost and quantity data from the impact evaluation (see Appendix E.1).
    - Services that were part of the delivery process were also classified into SUPCs. The vast majority of these services were either audits or program administrative services. Customer audits had flat fees for calculating the value of the demand shock and the value of administrative services was obtained from program budget actuals.
    - It was necessary to specify the amount of each demand shock attributed to labor versus non-labor. For the product categories, we used the labor versus non-labor cost estimate proportions from the measure research conducted as part of the cost-effectiveness analysis. For the service categories, the IO model contained underlying estimates that defined the portion of labor versus overhead (non-labor).

2. **Household energy bill savings.** This value was calculated for the model as the net present value (NPV) of the discounted future stream of energy bill savings by participants. It was calculated by multiplying net energy savings[28] (in kWh) in each future year by that future year's retail rate ($/kWh). This calculation was performed for each future year through the end of the measure's expected useful life (EUL). Savings beyond the EUL were assumed to be zero. Measure-level energy saving estimates were obtained from the impact evaluation. The other calculation parameters (discount rate, measure EULs, and retail rate forecast) align with the cost-effectiveness analysis.

   - Customers' intentions for whether to spend or save the money saved on energy bills was obtained via a short section on the customer surveys. The percentages that indicated what the customers would do with the bill savings were obtained from the participant surveys through the following two questions:

     J1. What do you anticipate you will do with the money saved on electricity bills from the energy-efficient equipment upgrades?

     1. Pay down debt or put the money into savings
     2. Purchase more goods and/or services
     3. Split – put some money into savings/debt payments and use some money to purchase more goods/services
     4. Other. Please specify.
     98. Don't know
     99. I'd rather not answer

     [BASE: IF RESPONDENT WILL SPLIT MONEY SAVED IN VARIOUS WAYS (J1=3)]

     J2. Approximately what would be the split between savings/debt payments and purchasing more goods/services? [ALLOW MULTIPLE RESPONSE OPTION]
     1. Percent saved or used to pay down debt [NUMERIC RESPONSE BETWEEN 0 and 100]
     2. Percent used to purchase more goods and services [NUMERIC RESPONSE BETWEEN 0 and 100]
     98. Don't know
     99. I'd rather not say

   - For estimating job impacts, the key input value was the amount of bill savings that customers would spend—as opposed to save.

[28] The net-to-gross ratio for HAP is 1, so the net energy savings are the same as gross savings.

3. **EAP funding.** IESO energy-efficiency programs are funded by a volumetric charge on electricity bills and, volumetrically, residential customers accounted for 35 percent of consumption and non-residential customers accounted for 65 percent in 2021[29]. The overall program budget was distributed between these two customer classes by these percentages.
4. **Reduced electricity production.** The NPV of retail savings (estimated as part of RQ2) was also the input for examining a potential impact of producing less electricity.

A.6.3.1 Run Model and Interpret Results

Determining the total job impacts from EAP required considering possible impacts from each the four shocks represented by the research questions. Addressing the four research questions above required only two runs of the StatCan IO model, as certain components of the shocks could be consolidated, and others addressed without full runs of the model. The two shocks that were modeled were as follows:

1. Demand shock as outlined in RQ1, representing the impact of the demand for energy-efficient products and services due to EAP.

2. Household expenditure shock representing the net amount of additional spending that the residential sector will undertake. This was estimated by taking the NPV of energy bill savings and subtracting the residential contribution to program funding. Thus, the model run combined RQ2 with the residential component of RQ3.

The model output generated three types of job impact estimates: direct, indirect, and induced impacts – as described in Section 2.5.

[29] Annual Planning Outlook – A view of Ontario's electricity system needs; 2022. IESO.

Appendix B Additional Impact Evaluation Results

This appendix provides additional results associated with the impact evaluation activities. Higher-level results were provided in Section 3.

B.1 Detailed Impact Results

Table 26 provides the detailed measure-level results of the impact evaluation. The savings values in the table represent the measure-level savings for the entire population. The quantity of measures installed in PY2022 is also included. The proportion of total program savings is also included to show the representative impact of each measure's energy and demand savings on EAP. RRs for energy and demand are displayed in the table.

Table 26: Total Gross Verified Savings by Measure Type

Measure	Quantity Installed	Reported Savings - Energy (kWh)	Reported Savings - Demand (kW)	Verified Savings - Energy (kWh)	Verified Savings - Demand (kW)	Percent of Program Savings - Energy (kWh)	Percent of Program Savings - Demand (kW)	RR - Energy	RR - Demand
Lighting end-use									
6W LED MR 16 / PAR 16	8,486	292,134	18.13	319,752	22.47	3.0%	2.8%	109.5%	124.0%
11W LED A Shape	146,308	6,276,539	438.84	5,307,881	372.96	50.4%	47.2%	84.6%	85.0%
11W LED MR 16	390	13,923	0.78	13,814	0.65	0.1%	0.1%	99.2%	83.1%
14W LED A Shape	3,094	142,121	9.28	141,011	7.71	1.3%	1.0%	99.2%	83.1%
16W LED PAR 20	430	19,737	1.29	19,583	1.07	0.2%	0.1%	99.2%	83.1%
16W LED PAR30 & PAR38	2,235	115,725	8.94	111,398	7.83	1.1%	1.0%	96.3%	87.6%
23W LED A Shape	7,129	437,035	28.52	471,728	33.15	4.5%	4.2%	107.9%	116.2%
23W LED PAR	461	24,341	1.84	24,151	1.53	0.2%	0.2%	99.2%	83.1%
23W LED Wet Location Rated PAR lamp	950	46,587	3.06	44,674	3.14	0.4%	0.4%	95.9%	102.7%
LED Downlight	20	1,234	0.08	1,224	0.07	0.0%	0.0%	99.2%	83.1%
LED Nightlight	5,603	164,448	0	164,426	0	1.6%	0.0%	100.0%	NA
Lighting Total	**175,106**	**7,533,823**	**510.75**	**6,619,642**	**450.57**	**62.8%**	**57.0%**	**87.9%**	**88.2%**
Appliances									
Refrigerator Replacement (10.0-12.5 cu ft)	916	165,069	21.69	101,607	13.54	1.0%	1.7%	61.6%	62.4%
Refrigerator Replacement (12.5-15.5 cu ft)	677	105,869	13.54	119,453	15.42	1.1%	1.9%	112.8%	113.9%
Refrigerator Replacement (15.5-16.9 cu ft)	1,321	270,901	34.47	163,392	21.16	1.6%	2.7%	60.3%	61.4%
Refrigerator Replacement (17.0-18.4 cu ft)	2,118	463,249	59.61	247,391	32.12	2.3%	4.1%	53.4%	53.9%
Freezer Replacement (<7.5 cu ft)	513	18,088	2.57	5,712	0.78	0.1%	0.1%	31.6%	30.2%
Freezer Replacement (7-12 cu ft)	380	35,878	4.75	56,483	7.65	0.5%	1.0%	157.4%	161.1%
Freezer Replacement (12-14.5 cu ft)	335	35,132	4.69	74,589	10.12	0.7%	1.3%	212.3%	215.8%
Freezer Replacement (14.5-16.0 cu ft)	272	28,020	3.81	32,775	4.45	0.3%	0.6%	117.0%	116.8%
Dehumidifier Replacement (14.2-21.2 l/day)	396	96,155	30.08	135,555	42.27	1.3%	5.3%	141.0%	140.5%
Dehumidifier Replacement (21.3-25.4 l/day)	152	30,169	9.32	72,784	22.35	0.7%	2.8%	241.3%	239.8%
Dehumidifier Replacement (25.5-35.5 l/day)	91	16,653	5.1	44,192	13.51	0.4%	1.7%	265.4%	264.9%

Measure	Quantity Installed	Reported Savings - Energy (kWh)	Reported Savings - Demand (kW)	Verified Savings - Energy (kWh)	Verified Savings - Demand (kW)	Percent of Program Savings - Energy (kWh)	Percent of Program Savings - Demand (kW)	RR - Energy	RR - Demand
Window Air Conditioner Replacement (6,000-7,999 BTU/hr)	38	1,580	1.01	1,407	0.81	0.0%	0.1%	89.1%	80.2%
Window Air Conditioner Replacement (8,000-9,999 BTU/hr)	83	4,883	3.19	4,530	2.71	0.0%	0.3%	92.8%	85.1%
Window Air Conditioner Replacement (10,000-1200 BTU/hr)	31	2,374	1.58	2,373	1.45	0.0%	0.2%	99.9%	91.6%
Appliance Total	**7,323**	**1,274,020**	**195.4**	**1,062,242**	**188.34**	**10.1%**	**23.8%**	**83.4%**	**96.4%**
DHW									
Efficient Aerators (Bathroom) < 3.8 Liters Per Minute (Lpm)	335	13,239	1.25	8,095	0.73	0.1%	0.1%	61.1%	58.6%
Efficient Aerators (Kitchen) < 5.7 Lpm	399	53,063	8.42	47,669	9.21	0.5%	1.2%	89.8%	109.5%
Efficient Showerheads (standard) < 4.8 Lpm	185	32,601	3.14	31,286	2.84	0.3%	0.4%	96.0%	90.5%
Efficient Showerhead (handheld) < 4.8 Lpm	193	42,191	3.98	26,781	2.43	0.3%	0.3%	63.5%	61.0%
Hot Water Tank Pipe Insulation - ½ " (per foot)	946	19,854	2.24	5,246	0.48	0.0%	0.1%	26.4%	21.2%
Hot Water Tank Pipe Insulation - ¾ " (per foot)	148	4,362	0.38	2,193	0.2	0.0%	0.0%	50.3%	52.9%
Hot Water Tank Insulation - Fiberglass R10	21	1,979	0.2	1,915	0.2	0.0%	0.0%	96.8%	100.5%
DHW Total	**2,227**	**167,291**	**19.6**	**123,186**	**16.09**	**1.2%**	**2.0%**	**73.6%**	**82.1%**
Power Bars									
Tier 2 Advanced Power Strip (APS)	7,096	1,098,749	32.6	1,647,286	47.39	15.6%	6.0%	149.9%	145.4%
Power Bar Total	**7,096**	**1,098,749**	**32.6**	**1,647,286**	**47.39**	**15.6%**	**6.0%**	**149.9%**	**145.4%**
Miscellaneous									
Block Heater Timer	737	176,203	0	151,535	0	1.4%	0.0%	86.0%	NA
Indoor Clothes Drying Rack	5,428	488,254	122.38	483,892	65.46	4.6%	8.3%	99.1%	53.5%
Programmable Thermostat - Low Voltage	4	5,286	0	4,863	0	0.0%	0.0%	92.0%	NA
Programmable Thermostat - Line Voltage	112	13,686	0	20,803	0	0.2%	0.0%	152.0%	NA
Smart Thermostat - Low Voltage	7	5,871	1.75	5,401	1.61	0.1%	0.2%	92.0%	92.0%
Smart Thermostat - Low Voltage (with C-wire)	2	1,677	0.5	1,543	0.46	0.0%	0.1%	92.0%	92.0%

Measure	Quantity Installed	Reported Savings - Energy (kWh)	Reported Savings - Demand (kW)	Verified Savings - Energy (kWh)	Verified Savings - Demand (kW)	Percent of Program Savings - Energy (kWh)	Percent of Program Savings - Demand (kW)	RR - Energy	RR - Demand
Smart Thermostat - Line Voltage	478	89,028	0	81,905	0	0.8%	0.0%	92.0%	NA
Smart Thermostat - Line Voltage (controller unit)	192	35,760	0	32,899	0	0.3%	0.0%	92.0%	NA
Line-voltage Smart Thermostat - Baseboard Heater	3	559	0	514	0	0.0%	0.0%	92.0%	0.0%
Miscellaneous Total	**6,963**	**816,324**	**124.63**	**783,356**	**67.53**	**7.4%**	**8.5%**	**96.0%**	**54.2%**
Building Shell									
Attic Insulation	95,570	80,962	6.38	69,643	4.75	0.7%	0.6%	86.0%	74.5%
Basement Insulation	42,755	59,329	5.65	43,995	6.37	0.4%	0.8%	74.2%	112.7%
Comprehensive Draftproofing	80,416	75,141	11.23	77,482	1.9	0.7%	0.2%	103.1%	16.9%
Wall Insulation	21,089	25,117	0.32	22,695	0.19	0.2%	0.0%	90.4%	59.4%
Building Shell Total	**239,830**	**240,549**	**23.58**	**213,816**	**13.21**	**2.0%**	**1.7%**	**88.9%**	**56.0%**
Tier 2 Kits									
Energy Savings Kits - Option 1 (B)	68	44,322	3.78	54,531	4.08	0.5%	0.5%	123.0%	107.9%
Energy Savings Kits - Option 2 (B+EHW)	20	18,985	1.8	22,364	2.03	0.2%	0.3%	117.8%	113.1%
Energy Savings Kits - Option 3 (B+W)	7	5,072	0.53	6,264	0.62	0.1%	0.1%	123.5%	116.3%
Energy Savings Kits - Option 4 (B+BHT)	2	1,840	0.18	2,082	0.12	0.0%	0.0%	113.2%	65.2%
Energy Savings Kits - Option 5 (B+EHW+W)	6	5,614	0.65	6,446	0.72	0.1%	0.1%	114.8%	111.2%
Tier 2 Kits Total	**103**	**75,833**	**6.95**	**91,688**	**7.58**	**0.9%**	**1.0%**	**120.9%**	**109.1%**
Program Total	**438,648**	**11,206,588**	**913.52**	**10,541,215**	**790.7**	**100.0%**	**100.0%**	**94.1%**	**86.6%**

B.1.1 Lighting

The NMR team verified the savings for lighting measures using the project file data and lighting specific information collected by the EAP auditors. There are various light bulb products that are offered by the program for direct installation based on the replaced bulb type. The overall energy RR for lighting measures was 88%. In addition, the NMR team applied the PY2022 ISR results from the participant survey to the gross verified savings. The impact of adjustments to lighting measures represents a primary driver to the programs overall RR as lighting measures account for nearly two-thirds (63%) of total verified energy savings for the program.

The lighting end-use category is dominated by A-line type bulbs. The 11-watt A-line bulb contributes to half (50%) of the program energy savings, while the next highest contributor is 23-watt A-line bulbs at 5% of program savings. A-line bulbs are very common bulb shapes in residential settings, often used in both hard-wired and plug-in fixtures. In addition, A-line bulbs are easily swapped out, whereas other bulb shapes are common in certain fixture types that may not be common in the EAP participant home (i.e., candelabra shaped bulbs in a chandelier-type fixture or a reflector shaped installed into a recessed fixture). The RR for lighting demand savings was 88%.

B.1.2 Appliances

The NMR team verified the savings for appliances using the project file data and equipment-specific information collected by EAP auditors. The NMR team applied model number lookups to incorporate project-specific values into the desk reviewed savings calculations – instead of default reported savings input assumptions – for the installed equipment and, where possible, the existing equipment. This model-specific data typically included the size or capacity of the equipment and its annual energy consumption. During the desk reviews, the NMR team found that 9% of the appliances replaced were not in the same size category as their replacement. In these cases, the appliance was aligned with the corresponding size category to calculate the proportion of energy savings that are associated with replace on failure (i.e., associated with the verified baseline size rather than the existing equipment's). For example, if an 18 cubic foot refrigerator replaced one that was 15 cubic feet, the baseline energy usage would be calculated using the 15 cubic foot (existing) energy consumption for a portion of the equipment life (typically represents one third of the savings) and using the 18 cubic foot (replace on failure baseline) energy consumption to determine the remaining two-thirds of energy savings.

The RR for energy savings was 83%, but the RR varied significantly between appliances. Freezers and dehumidifiers had very high realization rates, while Refrigerators tended to have lower RRs. Appliances accounted for 10% of total program gross verified energy savings. The demand RRs (96%) were higher than the energy RRs for appliances and accounted for 24% of the program gross verified demand savings.

Refrigerators. The NMR team calculated verified savings based on project-specific annual energy consumption derived from model number lookups for the installed refrigerators and the existing equipment, while the reported savings used the minimum requirements for meeting the ENERGY STAR efficiency specifications. The application of actual annual energy consumption values provides a more accurate savings estimate that does not rely solely on using the minimum

ENERGY STAR specifications. During the desk reviews, the NMR team observed that some of the EAP documentation included metered energy usage for the primary refrigerator. However, metered data was not consistently documented, and in many cases where it was documented the metered time was less than one hour.[30]

Refrigerators accounted for 631,843 kWh in energy savings (63% RR) and 82.2 kW in demand savings (64% RR).

Freezers. The NMR team calculated verified savings for freezers in a similar way to refrigerators, leveraging model numbers to look up annual energy consumption and comparing it against the ENERGY STAR minimum values used in deemed savings.

Freezers accounted for 169,559 kWh in energy savings (145% RR) and 23 kW in demand savings (145% RR). The high RRs for freezers seem to be partially due to the fact that the specific models offered by the program are on the low end of the size categories that freezers are grouped into, and therefore have lower energy consumption than the midpoint of each category, which is used to calculate the prescribed savings. In addition, the model number look up for specific annual energy consumption of existing appliances attributed to the high RR.

Dehumidifiers. Typically, the NMR team limited the data used to verify savings for dehumidifiers to the specific capacity of the equipment (liters per day). The efficiency of the dehumidifiers offered by the program was consistent with the minimum ENERGY STAR specifications, so verified savings were relatively consistent with deemed savings. However, the NMR team adjusted the HOU for dehumidifiers based on the responses from the PY2022 participant survey. Participants indicated that they were using dehumidifiers more frequently and for a longer duration than deemed savings values suggested. Dehumidifiers accounted for 252,531 kWh in gross verified savings (177% RR) and 78.1 kW in gross verified demand savings (176% RR).

Window Air Conditioners. Like other appliances, the NMR team calculated verified savings for window air conditioners by looking up the capacity and efficiency of the installed equipment. These metrics were relatively consistent with the ENERGY STAR minimum specifications used in deemed savings. Window air conditioners accounted for a minimal amount of program savings, with only 8,310 kWh (94% RR) in gross verified energy savings and 5 kW in gross verified demand savings (86% RR).

B.1.3 Weatherization – Building Shell

For weatherization, the NMR team calculated verified savings with the HOT2000 energy modeling tool that is used by EAP auditors to input the shell details of the participant building. Shell upgrades are only offered to participants with electric heat. EAP auditors create two models of the home: (1) an initial model that represents the existing conditions of the home observed during the initial audit and (2) the final model that includes the values from air sealing and insulation

[30] The NMR team notes that there may be an opportunity to conduct additional secondary research to determine whether using one hour of metered usage data in place of the annual energy usage (based on the model number) or the default substantiation value can be supported in evaluated savings calculations. This would involve searching for evidence on the average 24-hour load profile of refrigerators to determine the level of variation that occurs throughout the day.

improvements as a result of the program. The tool compares the modeled energy usage of the initial and final energy models, which the NMR team replicated to verify savings.

Weatherization measures accounted for 213,816 kWh of gross verified energy savings (RR of 89%) and 13.2 kW in gross verified demand savings (RR of 56%). Comprehensive draftproofing was the leading measure for energy savings, accounting for 77,482 kWh of verified savings with a RR of 103%. However, draftproofing also had the lowest demand savings RR (17%) of any evaluated measure, due to reported demand savings that applied peak demand factors much higher than specified in the MAL.

B.1.4 Smart Power Bars

The smart power bar includes a sophisticated infrared or occupancy sensor that shuts off the equipment based on occupant behavior. Smart power bars accounted for 1,647,286 kWh of gross verified energy savings (RR of 150%). The high RR for the smart power bar is due to the reported savings for smart power bars applying the power bar with timer measure savings value, a legacy measure that is no longer delivered by EAP in PY2022. The NMR team also observed this reported savings value in other residential IESO programs that no longer deliver power bars with timers. In addition, the NMR team updated the smart power bar savings values as a part of the PY2019 prescriptive savings review.[31]

On the demand side, smart power bars were responsible for 47.4 kW of demand savings (RR of 145%). This accounted for 6% of total program demand savings.

B.1.5 Domestic Hot Water

Domestic hot water (DHW) measures are only offered to participants with electric water heating systems. The NMR team primarily verified savings for water heating measures by confirming the water heater fuel-type and that the measure types and quantities in the project files matched the program tracking data.

DHW measures accounted for 123,185 kWh of gross verified energy savings (RR of 74%) and the gross verified demand savings were 16.1 kW (RR of 82%). The NMR team updated the deemed savings values for pipe wrap, aerators, and showerheads during the PY2019 substantiation sheet review. The lower RRs for pipe wrap measures were due to reported savings calculations referencing the total linear feet of insulation installed, which is standard data collection practice by auditors in the field, while the input assumption for reported savings values is in three feet increments. This resulted in an overestimation of reported savings by a multiple of three.[32] While these were drivers to lower RRs for this end-use category, DHW measures only represented 1% of gross verified energy savings and 2% of gross verified demand savings.

B.1.6 Miscellaneous Measures

[31] Smart power bar savings values reflect Tier 2 advanced power bars, which are installed with audiovisual (AV) equipment. The NMR team confirmed this product and installation scenario occurred in PY2021 with the program delivery vendor staff.

[32] The program delivery vendor associated with these misstated savings is no longer affiliated with EAP.

The NMR team verified savings for the miscellaneous measure category by confirming the measure type and the quantity installed matched between the project files and the program tracking data, as well as through the substantiation sheet reviews. During the desk review, the NMR team determined that the correct heating system was applied for line (electric baseboards) and low (electric furnaces) thermostats. In addition, the NMR team adjusted the savings associated with homes that did not have permanent cooling to reflect only savings from the heating system. Programmable and smart thermostats were only offered to participants with electric heat.

Miscellaneous measures accounted for 783,356 kWh of gross verified energy savings (RR of 96%) and the gross verified demand savings were 67.5 kW (RR of 54%). Most measures in this end-use category do not claim demand savings, apart from indoor clothes drying racks and low voltage smart thermostats. The RR for drying racks reflects the PY2019 substantiation adjustment. As noted above for thermostats, during the desk review, the NMR team removed the savings associated with cooling for homes without permanent cooling as they were not applicable. This also impacted demand savings for this measure as demand savings occur during the summer months.

B.1.7 Energy Saving Kit (Tier 2)

The NMR team calculated gross verified savings based on substantiation sheets for the individual measures (and their quantities) distributed in each kit. The Energy Saving Kits did not have ISR or HOU adjustments from the participant survey, however the NTGR was calculated based on survey results for EAP (see Table 27).

Table 27: Energy Saving Kit (Tier 2) Gross and Net Verified Savings

Measure	Gross Verified Savings - Energy (kWh)	Gross Verified Savings - Demand (kWh)	NTGR - Energy (kWh)	NTGR - Demand (kWh)	Net Verified Energy Savings	Net Verified Demand Savings
Energy Savings Kits (Pre-set) - Option 1 (B)	54,531	4.08	0.82	1.32	44,715	5.39
Energy Savings Kits (Pre-set) - Option 2 (B+EHW)	22,364	2.03	0.82	1.32	18,338	2.68
Energy Savings Kits (Pre-set) - Option 5 (B+EHW+W)	6,446	0.72	0.82	1.32	5,286	0.95
Energy Savings Kits (Pre-set) - Option 3 (B+W)	6,264	0.62	0.82	1.32	5,136	0.82
Energy Savings Kits (Pre-set) - Option 4 (B+BHT)	2,082	0.12	0.82	1.32	1,707	0.16
Tier 2 Program Total	**91,688**	**7.58**	**0.82**	**1.32**	**75,184**	**10.00**

B.2 In-Service Rate

Figure 12 displays the energy-efficiency upgrades Comprehensive Support (Tier 1) respondents confirmed receiving. The majority of respondents (76%) received LEDs. Over one-half of

respondents received a power bar (59%) and nearly one-half of respondents received a drying rack (46%) or a refrigerator (45%). Just under one-fourth (23%) of respondents received a freezer.

Figure 12: Energy-Efficiency Upgrades Comprehensive Support (Tier 1) Participants Received (n=1,098)

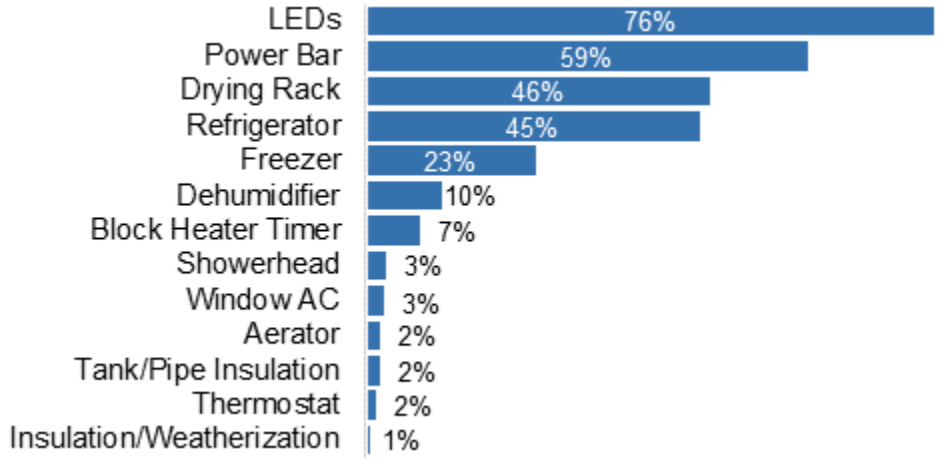


Figure 13 displays the ISRs for respondents' upgrades. All or nearly all the window Acs (100%), dehumidifiers (99%), freezers (99%), and refrigerators (98%) respondents received were still installed and functional at the time of the survey. Only power bars (89%) and block heater timers (86%) had an ISR below 90%.

Figure 13: Energy-Efficiency Upgrade ISRs

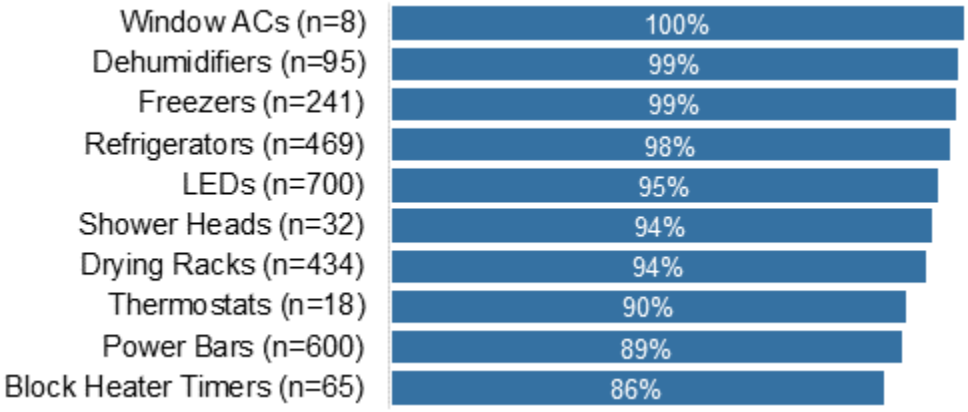
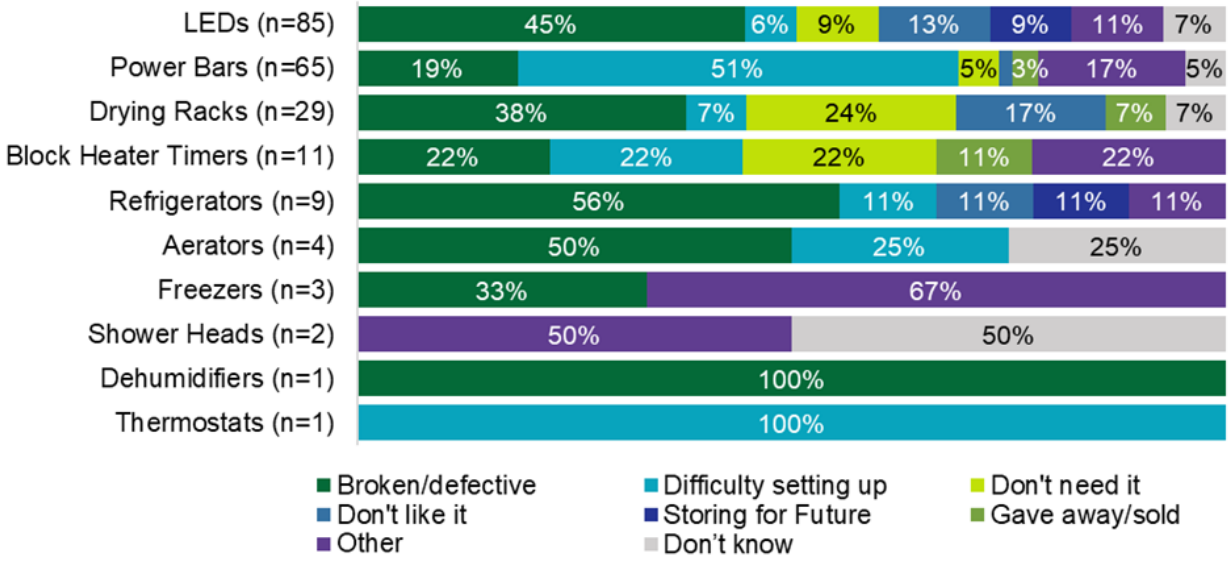


Figure 14 displays the reasons respondents gave for uninstalling or removing upgrades. The most common reason for uninstalling or removing LEDs (45%), drying racks (38%), refrigerators (56%), aerators (50%), and dehumidifiers (100%) was that they were broken or defective. Around one-half (51%) of respondents who uninstalled or removed power bars had difficulty setting them up.

Figure 14: Reasons Respondents Uninstalled or Removed Upgrades



*May not sum to 100% due to rounding.

B.3 Hours of Use

The participant survey collected HOU information for several upgrades that homeowners received through the program in PY2022.

Figure 15 and Figure 16 display the average number of program-provided LEDs installed by room type and the average hours per day respondents used their LEDs. The highest number of LEDs installed occurred in bedrooms (average of 4.0 bulbs) and the highest hours per day of use occurred in kitchens (average of 4.7 hours).

Figure 15: Number of LEDs Installed by Room Type

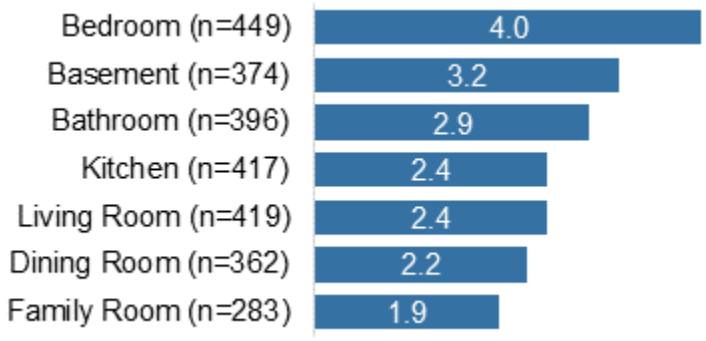
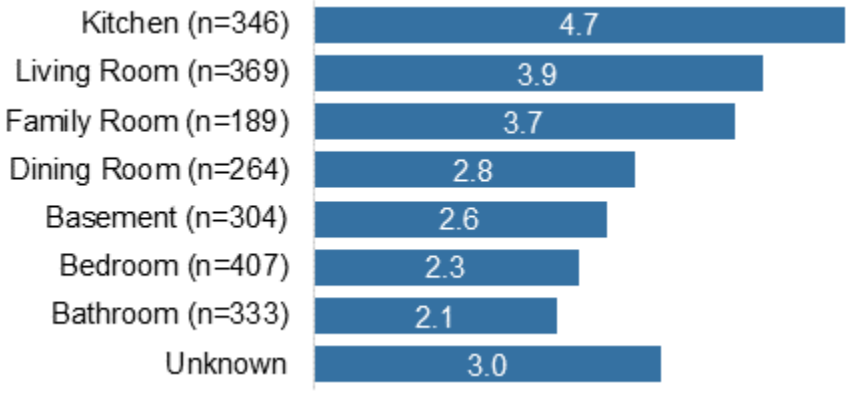


Figure 16: Hours per Day LEDs in Use by Room Type



To gain an understanding of the frequency with which showerheads are used, the survey asked respondents to estimate the average number of showers taken in the participating household per week as well as the average duration per shower. Respondents reported an average of 6.7 showers taken per week per household. In addition, respondents reported an average shower duration of 12 minutes. Figure 17 and Figure 18 display the distribution of shower frequency and duration among respondents.

Figure 17: Showers per Week (n=29)

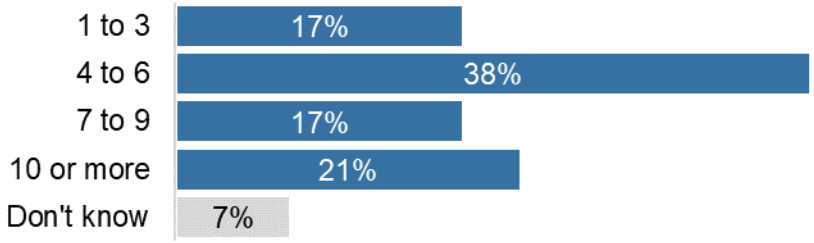


Figure 18: Minutes per Shower (n=26)

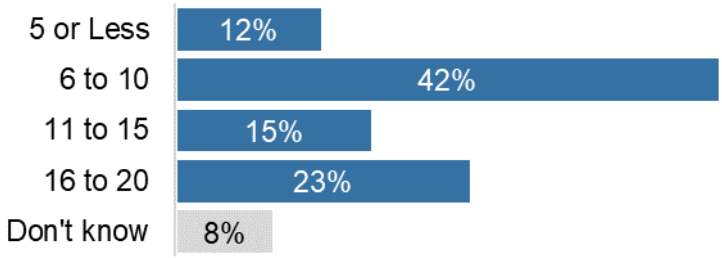
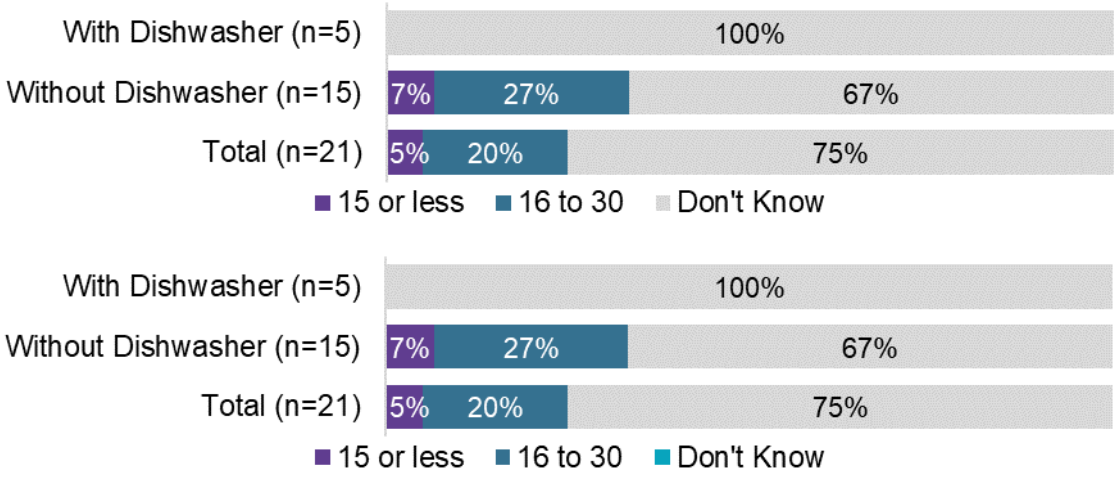


Figure 19 displays the minutes per day respondents with and without dishwashers used their kitchen aerators. Most respondents (75%) could not estimate their daily kitchen aerator use. Among respondents who could estimate their daily kitchen aerator use, the average was 23 minutes per day.

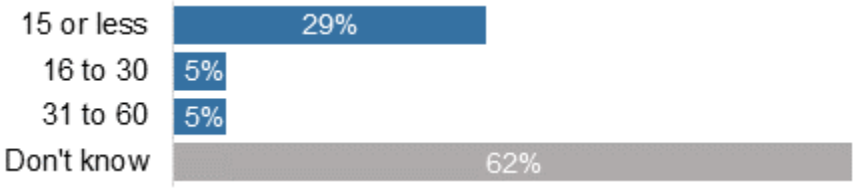
Figure 19: Minutes per Day Kitchen Aerator in Use*



*May not sum to 100% due to rounding.

Figure 20 displays the minutes per day respondents reporting using their bathroom aerators. On average, respondents reported using them for 11 minutes per day.

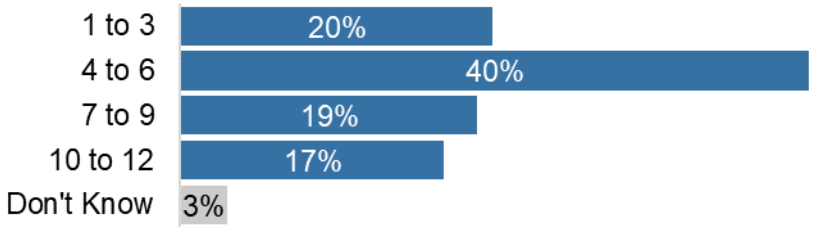
Figure 20: Minutes per Day Bathroom Aerator in Use (n=21)*



*Does not sum to 100% due to rounding.

On average, respondents used their dehumidifiers for 6.1 months of the year, 6.2 days per week, and 15.7 hours per day. Figure 21, Figure 22, and Figure 23 display the distribution of months per year, days per week, and hours per day respondents used their dehumidifiers.

Figure 21: Months per Year Dehumidifier in Use (n=94)*



*Does not sum to 100% due to rounding.

Figure 22: Days per Week Dehumidifier in Use (n=94)

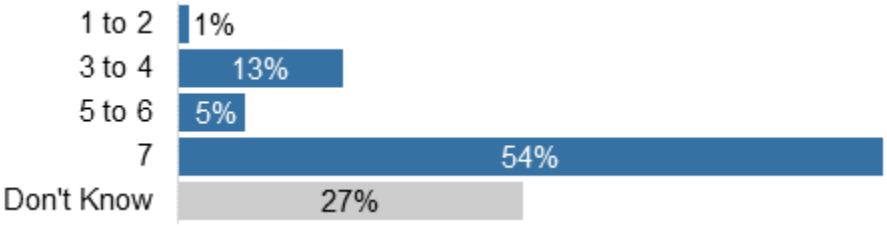
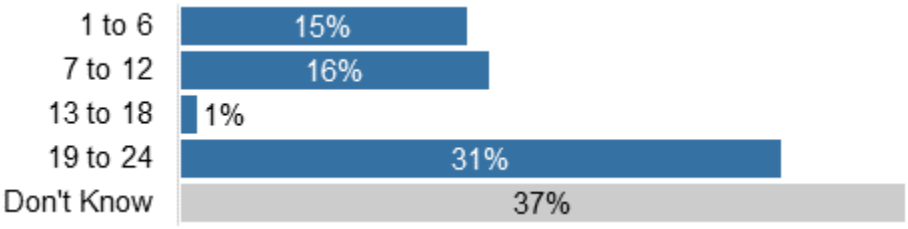
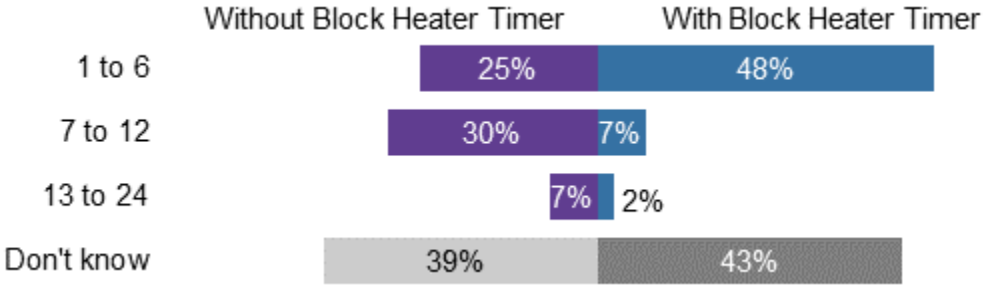


Figure 23: Hours per Day Dehumidifier in Use (n=94)



Before receiving the block heater timers provided by the program, respondents used their block heaters for 7.2 hours per day on average. After installing the block heater timers, respondents used their block heaters for an average of 4.5 hours per day. Figure 24 displays the distribution of hours per day that respondents used their block heaters before and after receiving the block heater timers.

Figure 24: Hours per Day Block Heater in Use (n=44)*



*May not sum to 100% due to rounding.

B.4 Detailed Net-to-Gross Results

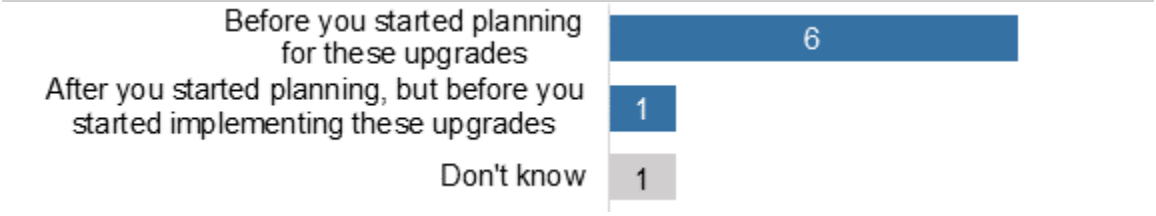
This appendix provides detailed FR and SO results associated with the NTGR for the Energy Saving Kit (Tier 2) participants. Higher-level results were provided in Section 3.2.

B.4.1 Free-ridership

The NMR team assessed the extent of FR within the program by surveying Energy Saving Kit (Tier 2) participants to understand their experiences and plans before learning about the program, what they would have done in the program's absence, and how influential the program was on their decision to implement the energy-efficient upgrades.

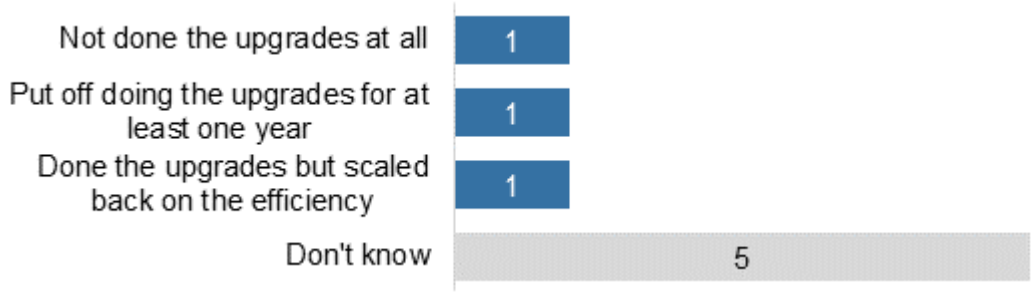
Six out of eight Energy Saving Kit (Tier 2) respondents first learned about EAP before they started planning for the upgrades (Figure 25). One out of eight respondents learned about EAP after they started planning, but before they started implementing the upgrades. While responses to this question did not directly impact the FR score, they provide additional context for understanding the point during the process when participants became aware of the program.

Figure 25: When Participants First Learned About the Program (n=8)



Respondents provided feedback about what they would have done in the program's absence (Figure 26). One out of eight respondents would not have done the upgrades at all and one would have put off the upgrades for at least a year. One respondent would have done the upgrades but scaled back on the efficiency by a moderate amount. Five out of eight respondents did not know what they would have done in the absence of the program. Responses from this participant intent question were factored into the FR analysis.

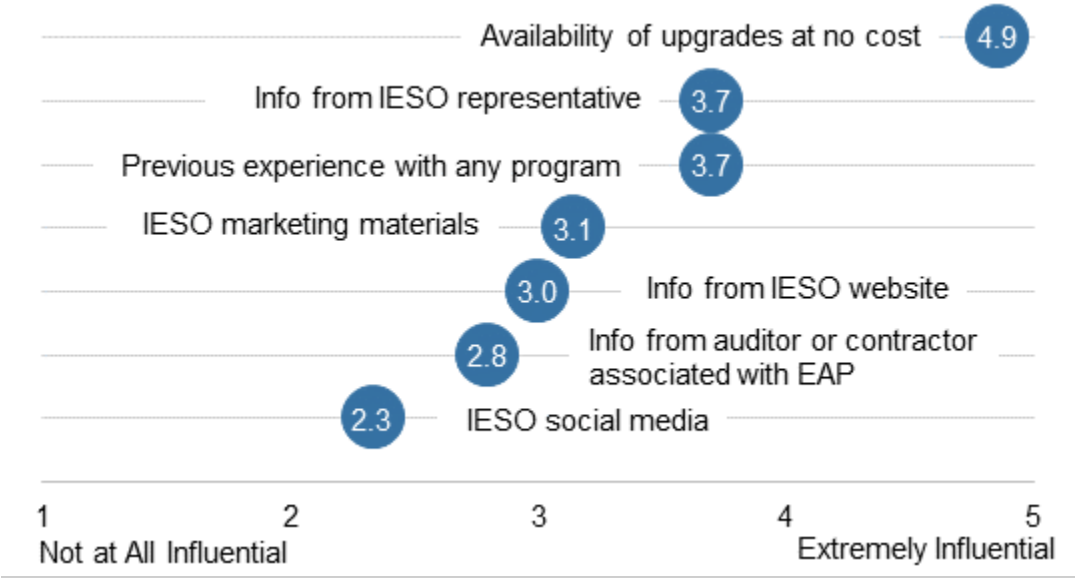
Figure 26: Actions in Absence of Program (n=8)



Respondents rated how influential various program features were on their decision to do the upgrades (Figure 27). They rated each feature's influence on a scale from 1 to 5, where 1 meant it was "not at all influential" and 5 meant it was "extremely influential". The highest-rated response was the availability of the upgrades at no cost, with an average rating of 4.9. The least influential feature was IESO social media, with an average rating of 2.3. The NMR team used this question,

which focuses on the program's influence, along with the prior questions about customer intentions, to estimate the FR score.

Figure 27: Influence of Program Features on Participation (n=8)



When asked if there was anything else that played a great role in influencing them to do the upgrades, three respondents said they did so to save money and two said they did so to help the environment.

B.4.2 Spillover

To estimate SO, Energy Saving Kit (Tier 2) participants provided feedback about whether they had installed any energy-efficient equipment for which they did not receive an incentive following their participation in EAP. Three out of eight respondents reported installing new equipment. Table 28 displays the types of non-incentivized equipment participants installed after participating in EAP. These respondents rated the level of influence their participation in EAP had on their decision to install additional energy-efficient equipment on a scale from one 1 to 5, where 1 meant the program was "not at all influential at all" and 5 meant the program was "extremely influential." The respondent who installed LEDs indicated that the program had a great influence on that decision.

Table 28: Program Influence on Efficient Equipment Installed Outside the Program (n=3, Multiple Response)*

Type of Equipment Installed	Count of Respondents	Influence Score
ENERGY STAR appliance	1	2.0
ENERGY STAR LED	1	5.0
Lighting controls (lighting timers, occupancy sensors)	1	3.0
High efficiency heating, cooling, or water heating equipment	1	2.0

Type of Equipment Installed	Count of Respondents	Influence Score
Weatherstripping around doors and windows	1	2.0
Window film	1	1.0
Low-flow showerhead	1	3.0

*Does not sum to 3 due to multiple responses.

Appendix C Additional Process Evaluation Results

This appendix provides additional process evaluation results.

C.1 Additional Auditor and Contractor Results

This appendix provides additional detail regarding the process evaluation results collected as part of the auditor and contractor survey. Higher-level results were provided in Section 5.2.

C.1.1 Program Experience

Figure 28 displays the year respondents began working with the Energy Affordability Program. Approximately one-fourth (26%) of respondents had been working with the program for ten or more years (i.e., since 2013 or earlier), whereas slightly more than one-half (52%) started with the program in the past five years.

Figure 28: Year Began Working with EAP (n=23)

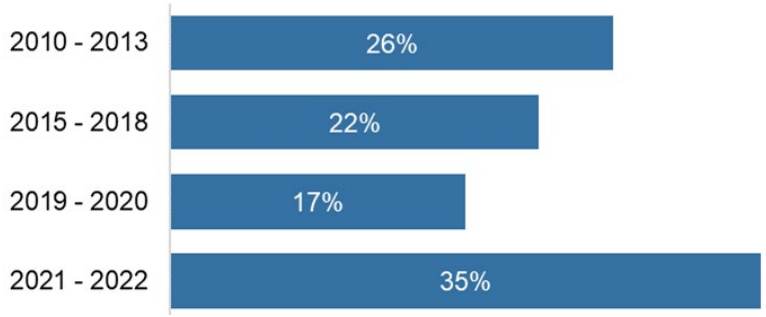
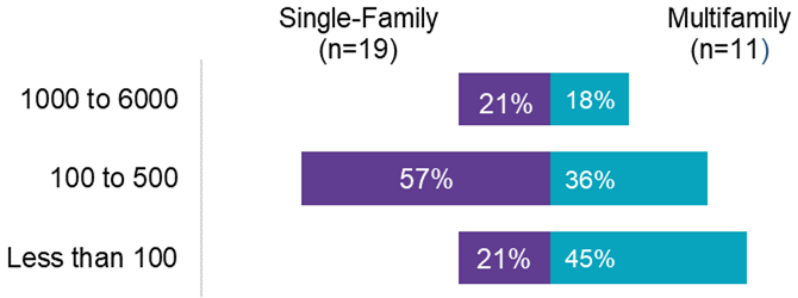


Figure 29 displays the number of projects respondents reported completing in PY2022 through the Energy Affordability Program. Most (83%) worked on single-family homes, while just under one-half (48%) worked on multifamily homes. Over one-half (57%) of those who worked on single-family homes completed between 100 and 500 single-family projects. Most who worked on multifamily homes (45%) completed less than 100 multifamily projects. Given that some respondents reported completing a large number of projects for both single family and multifamily homes, it is likely that these respondents were reporting on the number of projects their companies completed as a whole.

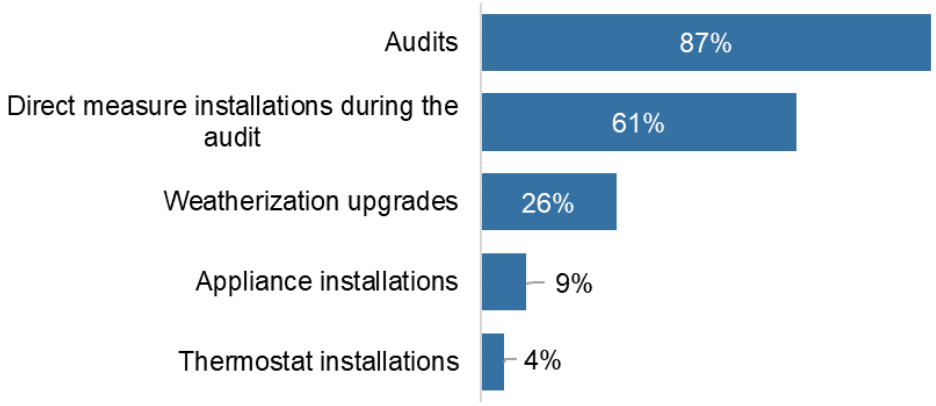
Figure 29: Number of EAP Projects



On average, auditors completed around 924 projects, contractors completed 2,110 projects, and respondents who served as both completed around 135 projects.

Figure 30 displays the type of work respondents performed for the program in PY2022. Most respondents (87%) conducted audits, close to three-fifths (61%) performed direct measure installations during the audit, and one-fourth (26%) performed weatherization upgrades. Very few respondents (9%) installed appliances. Even fewer respondents installed thermostats (4%).

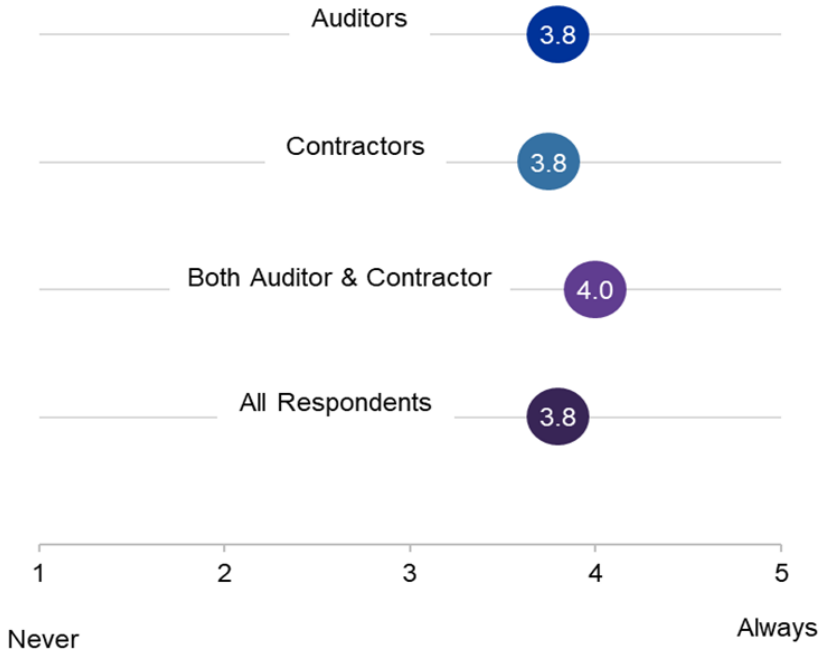
Figure 30: Type of Work Performed for EAP (n=23, Multiple Response)*



*Does not sum to 100% due to multiple responses.

Using a scale from 1 to 5, where 1 meant “never” and 5 meant “always,” respondents indicated how often they inform customers about the program. Figure 31 displays the average rating among respondents by their role. The average rating among all respondents was moderately high at 3.8. Both auditors and contractors indicated that they inform customers about the program at the same rate (average of 3.8). Respondents who rarely or never inform customers about the availability of the program said that they rely on the program to do the marketing and outreach (one respondent) and that customers are already aware of the program before they interact with them (one respondent).

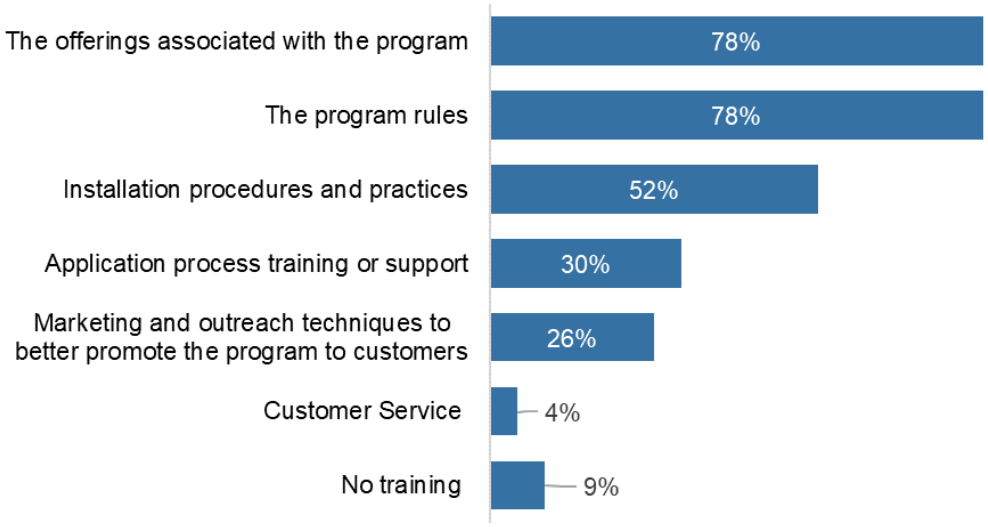
Figure 31: How Often Respondents Inform Customers about EAP (n=23)*



*Four respondents are excluded from this figure due to reporting that the question was not applicable to them.

Figure 32 displays the types of training respondents received from the program delivery vendor. Most respondents received training on the offerings associated with the program (78%) and program rules (78%), and around one-half of respondents received training on installation procedures and practices (52%). Less than one-third (30%) of respondents received training on the application process or support, about one-fourth (26%) received training on marketing and outreach techniques, and a small number (4%) received training on customer service.

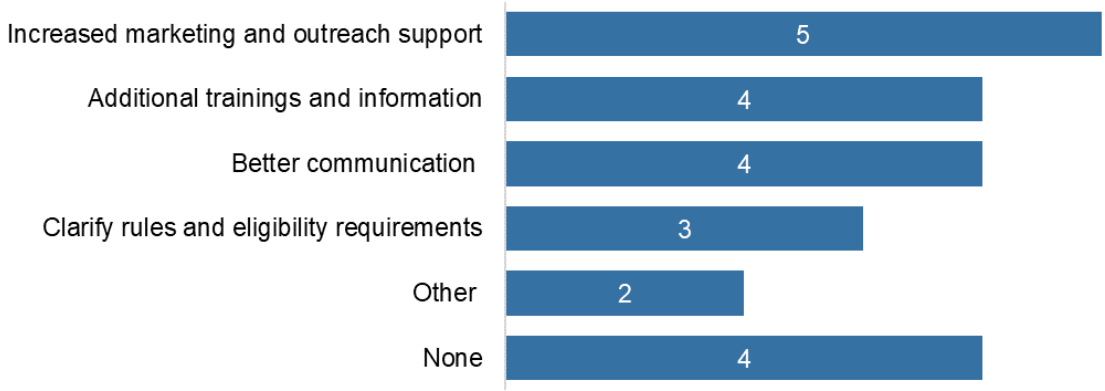
Figure 32: Types of Training Received by Auditors and Contractors (n=23, Multiple Response)*



*Does not sum to 100% due to multiple responses.

As shown in Figure 33, the most common requests for additional training or support from the program was to increase marketing and outreach support (mentioned by 29% of respondents). Additionally, about one-fourth (24%) requested to have additional training and information as well as better communication. About one-fifth (18%) requested to receive clarification on program rules and eligibility requirements.

Figure 33: Additional Training and Support (n=17, Multiple Response)*



*Does not sum to 17 due to multiple responses.

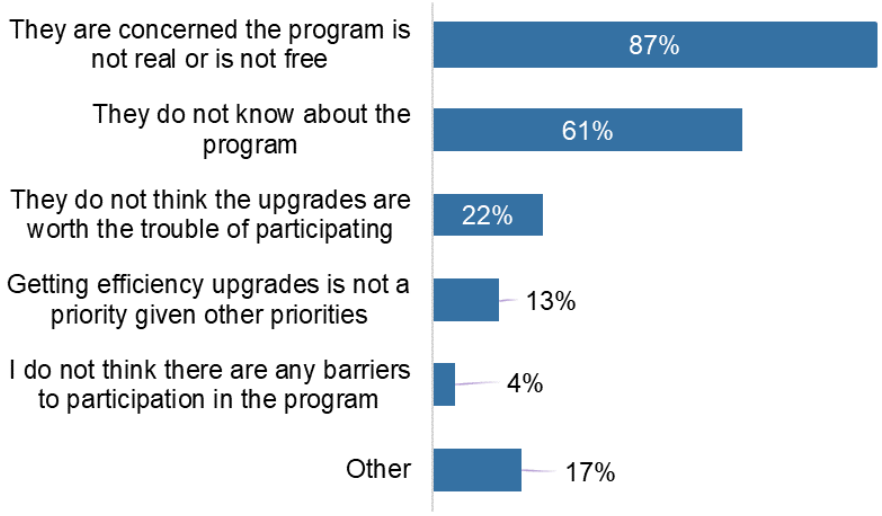
The “other” recommendations shown in Figure 33 include the following:

- Breakdown of what R values can be approved,
- Increased funding,
- Information on health and safety budgets, and
- More frequent feedback on program changes.

C.1.2 Program Barriers

Figure 34 displays the barriers respondents thought to be responsible for some households not participating in the Energy Affordability Program. The most commonly identified barrier was related to customer concerns that the program is not real or free (87%). Section 5.2.3 includes more discussion around barriers.

Figure 34: Barriers to EAP Participation (n=23, Multiple Response)*



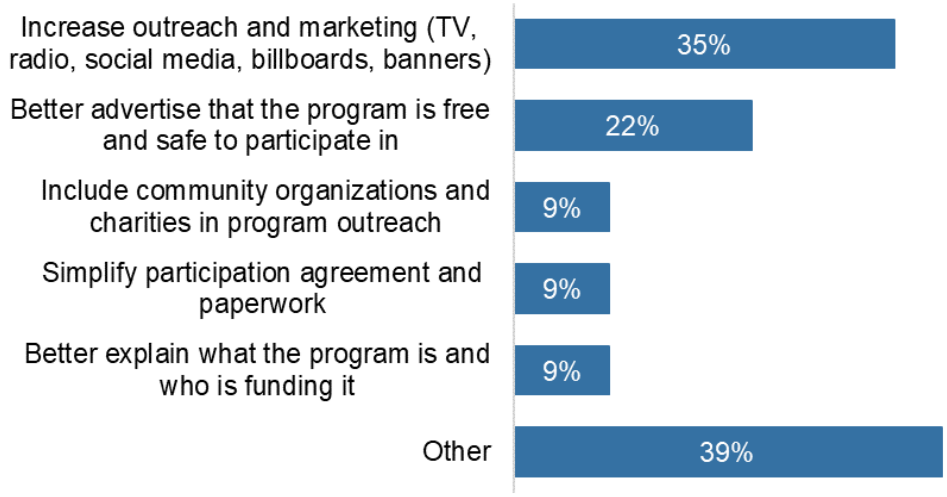
*Does not sum to 100% due to multiple responses.

The “other” recommendations shown in Figure 34 include the following:

- Eligible equipment does not meet the customer’s needs,
- There was not enough marketing and outreach,
- Remote communities can be difficult to service,
- Weather conditions,
- Social housing provider internal processes, and
- Customers who are not able-bodied have trouble moving belongings.

Figure 35 displays respondents’ recommendations for overcoming barriers to participation, the most common of which was to increase outreach and marketing (suggested by 35% of respondents). Section 5.2.3 includes more discussion around recommendations to address barriers.

Figure 35: Recommendations for Overcoming Barriers to Participation (n=23, Multiple Response)*



*Does not sum to 100% due to multiple responses.

The "other" recommendations shown in Figure 37 include the following:

- Provide funding for customers who are not able-bodied to help move belongings,
- Send customer paperwork in advance of site visit,
- Provide more information on energy and monetary savings,
- Cover travel costs and expenses for remote community site visits,
- Ensure income requirements are enforced,
- Offer the same color/size of appliance that customer already has,
- Create/share a list of IESO-approved auditors online,
- Ensure customer involvement in planning discussions,
- Provide more information about the program at the time of booking the assessment, and
- Inform contractors of marketing pushes so they can plan accordingly.

C.1.3 Measure Eligibility Criteria

Two-fifths of respondents (43%) indicated that, in their experience, the program's measure eligibility criteria affected the frequency with which some measure types are installed. Table 29 displays respondent perspectives on how the program's measure eligibility criteria affected program measures. Section 5.2.4 includes more discussion on how measure eligibility criteria are affecting measure installations.

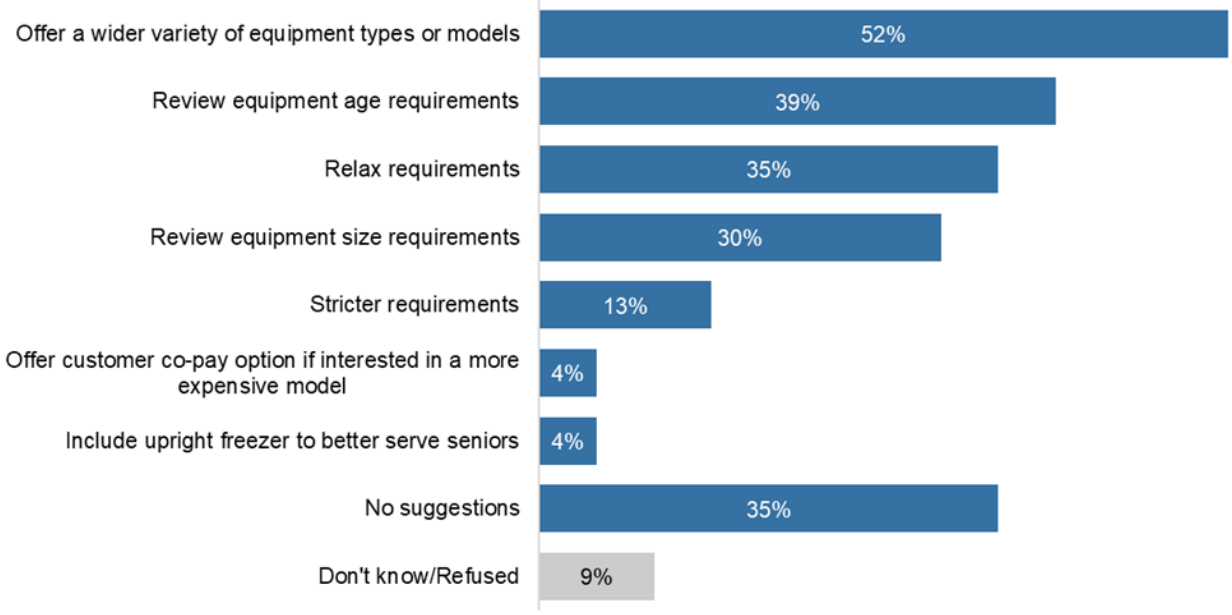
Table 29: How Measure Eligibility Criteria is Affecting Measures (n=7; Multiple Response)*

How Criteria is Affecting Measure Types	Respondents
Block heater timers are only offered to customers with cars but could be useful in other applications (e.g., small ponds, pools, garden lighting)	1
Kitchen aerators can only be replaced when client needs a showerhead	1
Low bag test requirement for showerheads and aerators is not necessary as advisors know if it is beneficial to replace	1
Smart power bar requirements make it difficult to replace many	1
Refrigerators that are too new are being replaced	1
Some clients prefer the illuminating “white light” of 8W and 15W LEDs and the measure criteria exclude them	1
The GPM threshold for replacing water measures means they are rarely installed anymore	1
The program allows bulbs to be installed in areas where they are infrequently used	1
Window AC requirements make it difficult to replace many	1

*Does not sum to seven due to multiple responses.

As shown in Figure 36, respondents suggested adjustments to measure eligibility criteria for the Energy Affordability Program to consider in future years. The most commonly suggested request was to offer a wider variety of equipment types or models (52%). Section 5.2.4 includes more discussion around recommended measure eligibility criteria adjustments.

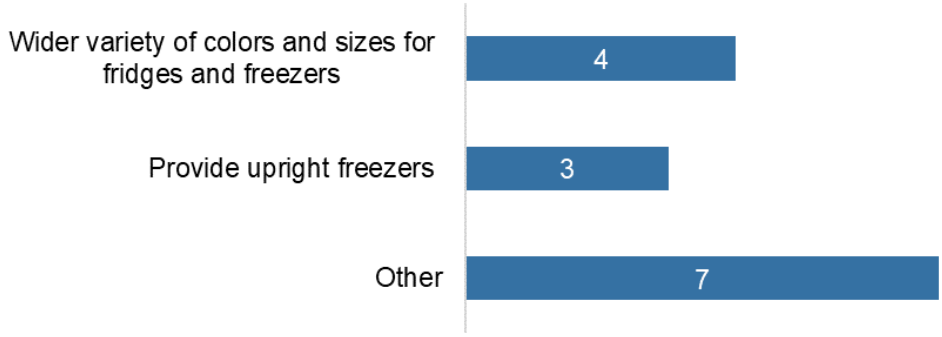
Figure 36: Recommended Adjustments to Measure Eligibility Criteria (n=23; Multiple Response)*



*Does not sum to 100% due to multiple responses.

As shown in Figure 37, respondents provided additional context about their recommended adjustments to measure eligibility criteria. Most commonly, respondents recommended offering a wider variety of colors and sizes for fridges and freezers (four respondents). Section 5.2.4 includes more discussion around recommended measure eligibility criteria adjustments.

Figure 37: Additional Context on Recommended Adjustments to Measure Eligibility Criteria (n=11; Multiple Response)*



*Does not sum to 11 due to multiple responses.

The "other" recommendations shown in Figure 37 include the following:

- Increase refrigerator age requirements,
- Eliminate low bag test for aerators/showerheads,
- Relax water measure GPM requirements,
- Provide 8W & 15W LEDs that radiate white light,
- Revise window A/Cs EER from 7.7 to 9.7,
- Insulate stone foundations,
- Increase attic insulation value up to R60 in northern/remote communities,
- Relax eligibility for insulation upgrades,
- Clarify fridge replacement criteria (age or consumption) to delivery agents,
- Allow wall insulation to be topped up if minimal pre-existing insulation,
- Allow fridge replacements for technical issues (e.g., icing up, leaking), and
- Better define criteria for freezers (set date for replacement or not metering for full hour).

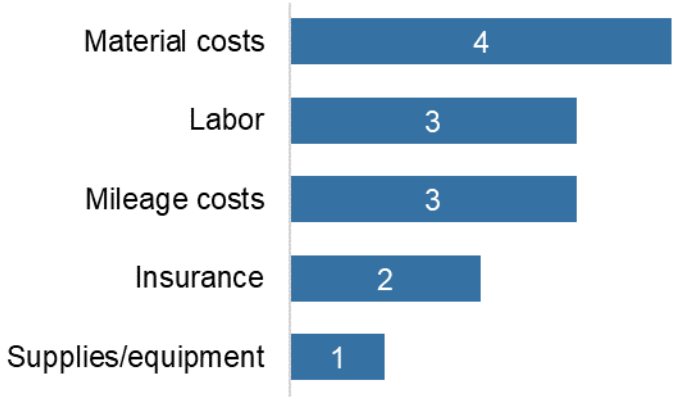
C.1.4 Measure-Related Costs and Cost Caps

Of the eight surveyed contractors, four said that costs of program-related measures have increased over the last year, and four others said they did not know.

The four contractors who indicated that costs of program-related measures have increased over the last year said that these costs have generally increased more quickly than the rate of inflation over the last year.

As shown in Figure 38, these same contractors most frequently said that material costs have increased (four respondents) followed by labor and mileage costs (three respondents). Section 5.2.5 includes more discussion around costs associated with program-related measures.

Figure 38: Increased Costs Associated with Program-Related Measures (n=4; Multiple Response)*

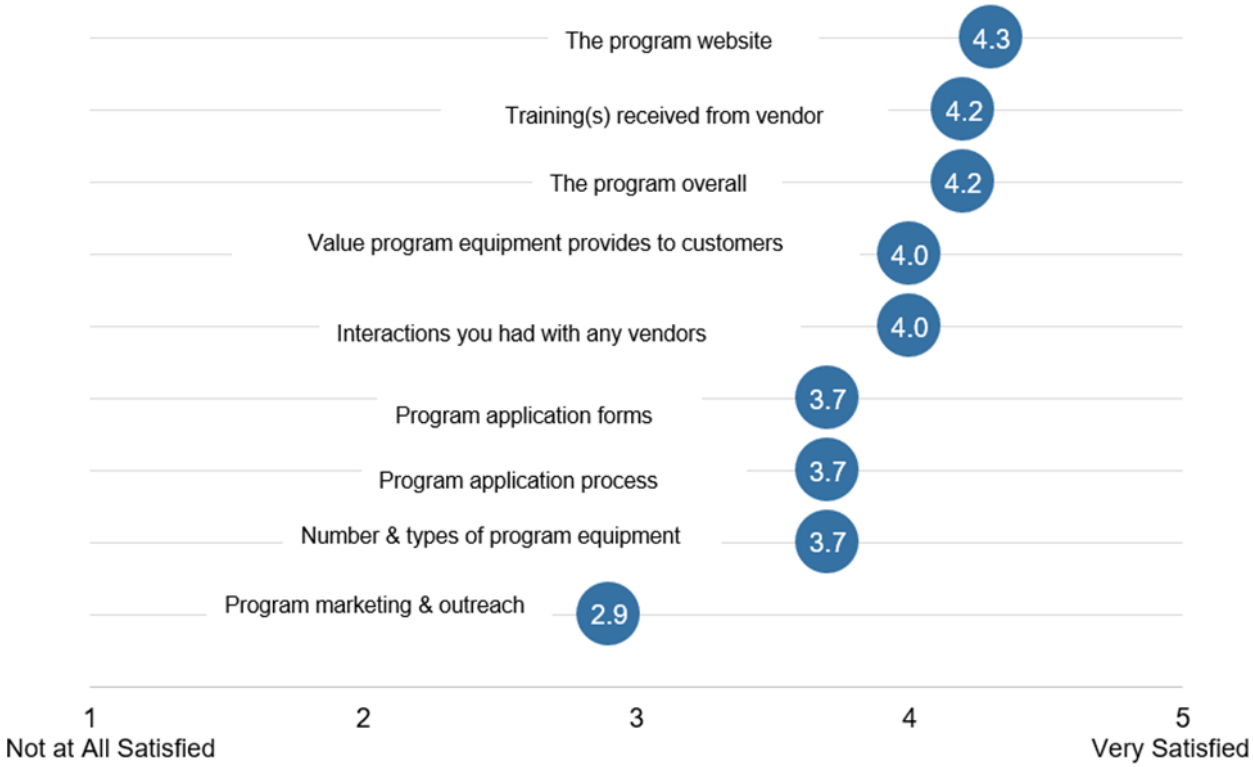


*Does not sum to 4 due to multiple responses.

C.1.5 Program Satisfaction

As shown in Figure 39, the aspect of the program that respondents were most satisfied with was the program website (average rating of 4.3 on a scale from 1 to 5, where 1 meant "not at all satisfied" and 5 meant "completely satisfied"). The average satisfaction rating with the program overall was 4.2. Section 5.2.6 includes more discussion around program satisfaction.

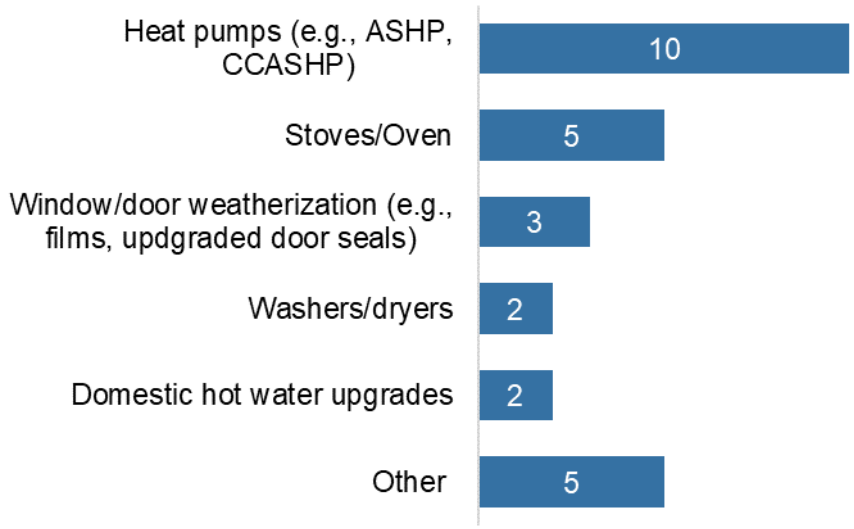
Figure 39: Satisfaction with Program Aspects (n=23)



C.1.6 Recommendations for Program Improvement

Figure 40 displays respondents' recommendations for energy-efficient equipment or services that they would like to see included in the program. The most frequently recommended equipment type was heat pumps (ten respondents). Section 5.2.7 includes more discussion around recommendations for equipment and services.

Figure 40: Recommendations for Additional Equipment or Services (n=19, Multiple Response)*



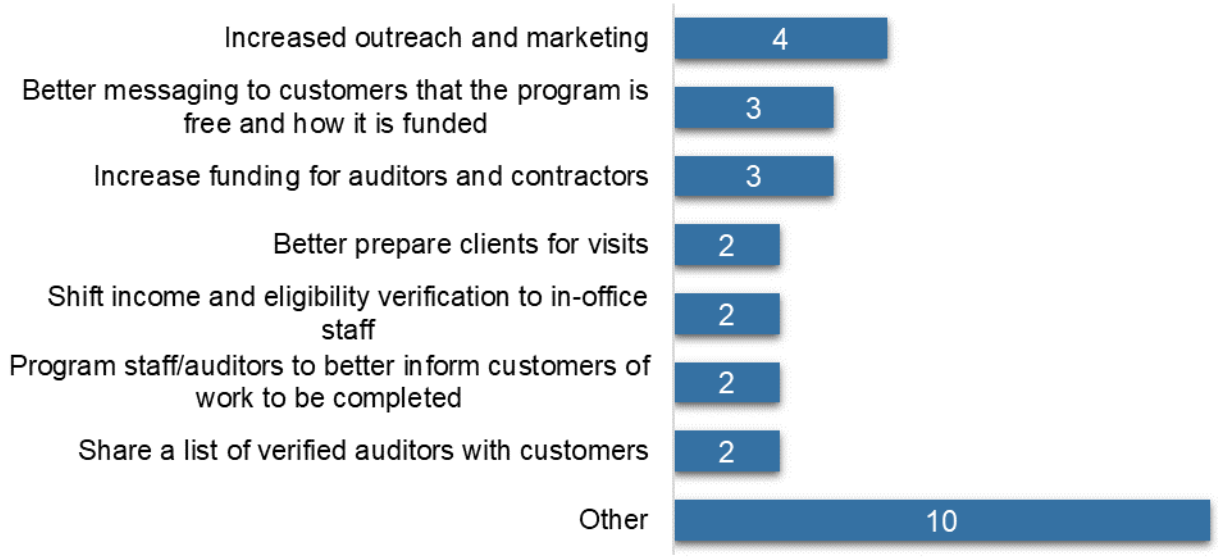
*Does not sum to 19 due to multiple responses.

The "other" recommendations shown in Figure 40 include the following:

- Upright freezers,
- A wider array of refrigerators,
- Dishwasher,
- Spray foam,
- Landscape products (e.g., electric mowers, leaf blowers),
- Solar attic fans,
- Heating equipment,
- Additional lighting types (e.g., 3000K, trilights),
- Wider variety of showerheads,
- Waste heat recovery, and
- Gaskets for exterior wall outlets and switches.

Figure 41 displays respondents' recommendations for improving the program. The most frequently mentioned recommendation was increased outreach and marketing (four respondents). Section 5.2.7 includes more discussion around recommendations for the program.

Figure 41: Recommendations for Program Improvement (n=13, Multiple Response)*



*Does not sum to 13 due to multiple responses.

The "other" recommendations shown in Figure 41 include the following:

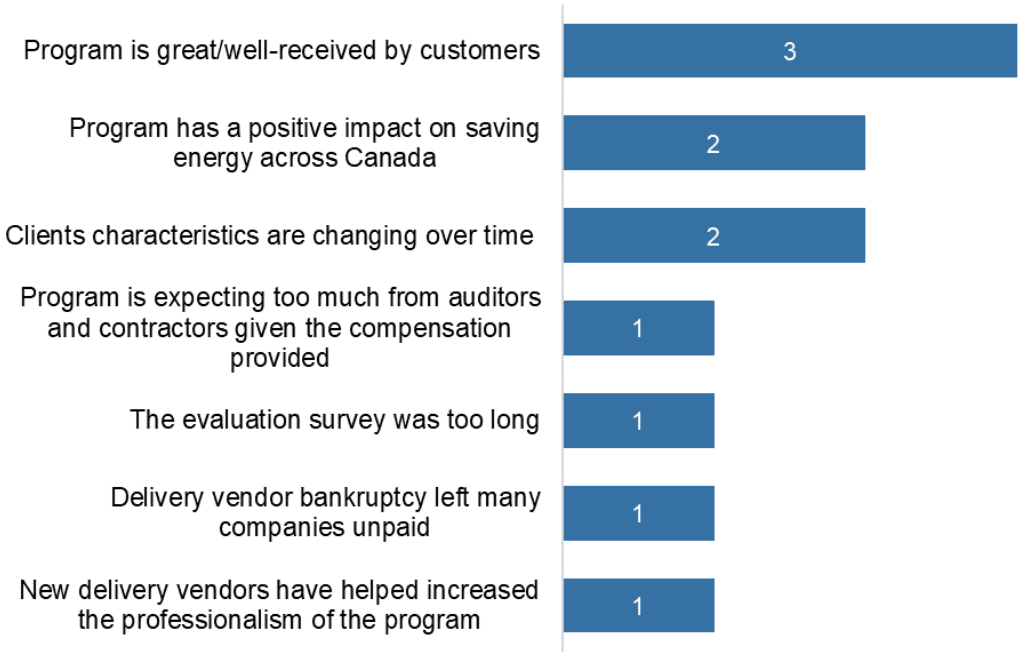
Better training for auditors,
Provide Save on Energy branded materials for site visits,
Provide compensation for canceled appointments,
Provide bulb disposal services,
Create one app where all elements of the application process can be completed and signed,
Ensure all forms can be submitted electronically,
Coordinate with local municipalities to promote the program to rural communities,
Shorten the application, data collection, and consent forms,
Remove flow bag test requirement for showerheads and aerators,
Remove redundancies in paperwork,
Simplify what needs to be recorded for appliances,
Allow auditors the opportunity to provide recommendations to delivery vendor on upgrade decisions,
Merge EAP and Enbridge Home Winterproofing Program (HWP) to allow for one audit and application,
Minimize the number of customer signatures needed,
Better sharing of information between auditor and contractor,
Allow application to be signed before audit,
Simplify weatherization modeling requirements,

Provide consistent information to delivery vendors on criteria for approving upgrades, and Tailored marketing based on regionality and seasons.

Section 5.2.7 includes more discussion around recommendations for equipment and services.

Figure 42 shows over one-half (12 of 23, or 52%) of respondents provided additional feedback regarding their experiences with the program. The most common response was that the program is great/well received by customers (three respondents). Section 5.2.8 includes more discussion around this additional feedback.

Figure 42: Additional Program Feedback (n=12, Multiple Response)*



*Does not sum to 12 due to multiple responses.

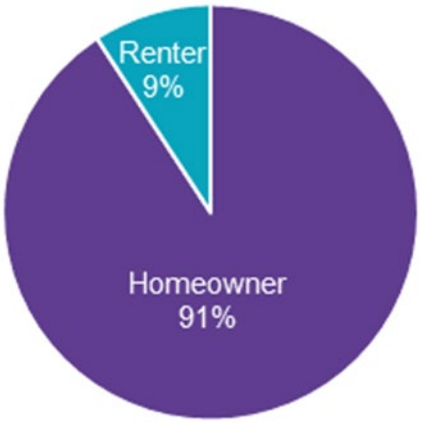
C.2 Additional Participant Results

This appendix provides additional detail regarding the process evaluation results collected as part of the participant survey. Higher-level results were provided in Section 5.3.

C.2.1 Participant Profile

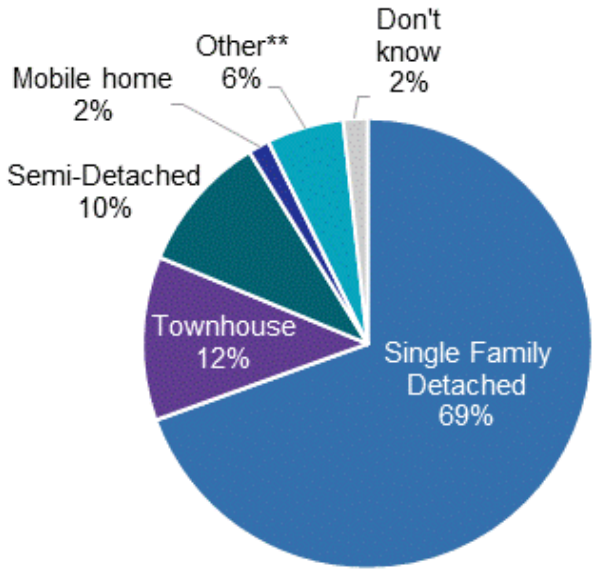
As shown in Figure 54, most respondents (91%) are homeowners, while 9% are renters.

Figure : Relationship to Home (n=1,108)



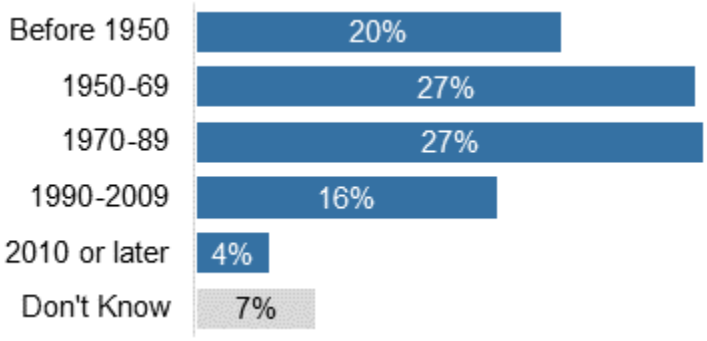
Respondents' homes are predominantly primary residences (99%) that are occupied year-round (95%). Figure 43 and Figure 44 display characteristics of respondents' homes, including the type of dwelling and the year it was built. Over two-thirds (69%) of respondents' homes are single-family detached houses. Around one-half of respondents' homes (46%) were built prior to 1970. On average, respondents' homes had 2.5 bedrooms and 2 bathrooms.

Figure 43: Type of Home (n=977)*



*Does not sum to 100% due to rounding.
**Other includes multi-unit low rise, multi-unit high rise, single family attached, duplexes, and triplexes.

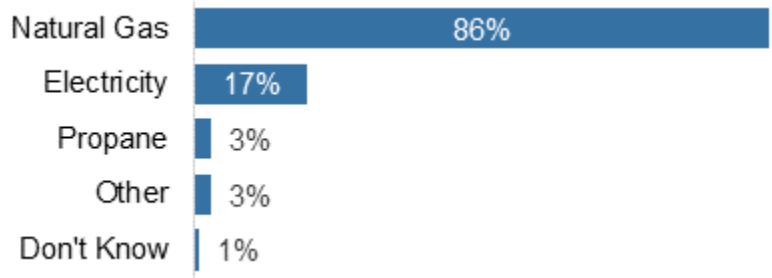
Figure 44: Year Home Built (n=982)*



*Does not sum to 100% due to rounding.

The majority (86%) of respondents' homes are heated with natural gas (Figure 45).

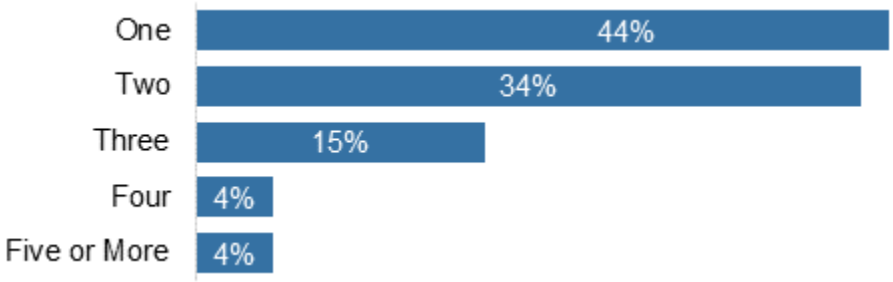
Figure 45: Home Heating Fuel (n=977)*



*Does not sum to 100% due to multiple responses.

Figure 46 displays the number of occupants in the respondents' households. Over two-fifths (44%) of respondents live alone. The average household size among respondents was 2.0.

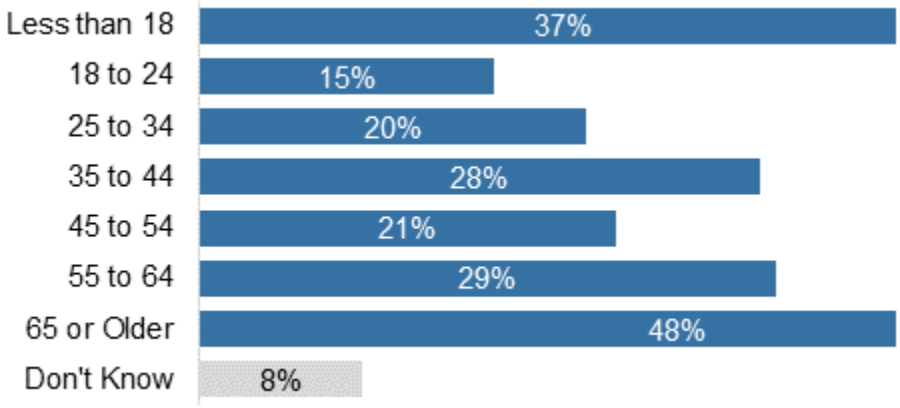
Figure 46: Number of Occupants (n=903)*



*Does not sum to 100% due to rounding.

Figure 47 displays the percent of households with occupants of each age group. Children under the age of 18 reside in more than one-third (37%) of households and seniors aged 65 or older reside in nearly one-half of households (48%).

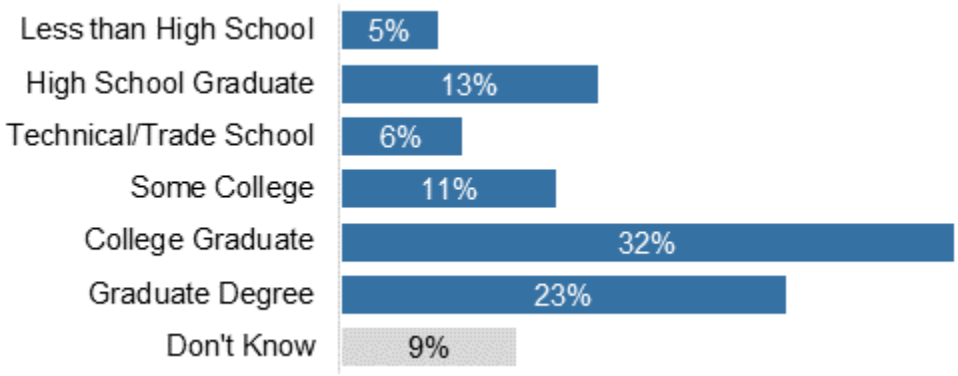
Figure 47: Households with Occupants of Each Age Group (n=903; Multiple Response)*



*Does not sum to 100% due to multiple responses.

Figure 48 displays respondents' highest education level. Over one-half (55%) of respondents have a college degree or higher.

Figure 48: Highest Education Level (n=977)*

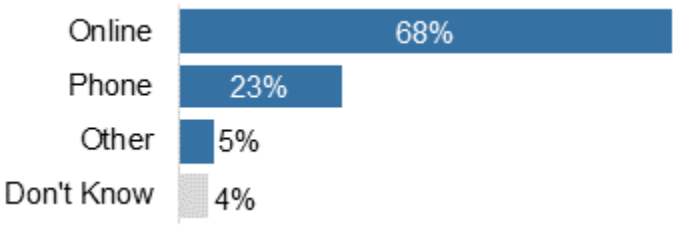


*Does not sum to 100% due to rounding.

C.2.2 Program Motivation and Application

Figure 49 shows how respondents applied to the program. Over two-thirds (68%) of respondents applied for the program online while around one-fourth (23%) applied over the phone.

Figure 49: How Participants Applied for Program (n=1,053)



Respondents rated their satisfaction with the length of time it took to complete the initial screening using a scale from 1 to 5, were 1 meant "not at all satisfied" and 5 meant "completely satisfied." Figure 50 shows that nearly three-fourths (74%) of respondents were very or completely satisfied with the time it took to complete the initial screening. The average rating was 4.0.

Figure 50: Satisfaction with Time to Complete Initial Screening (n=1,053)

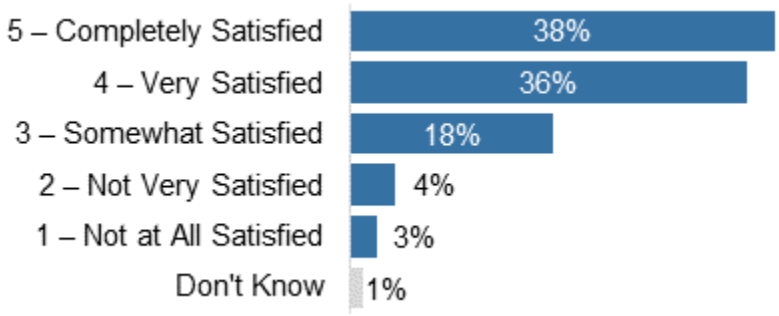
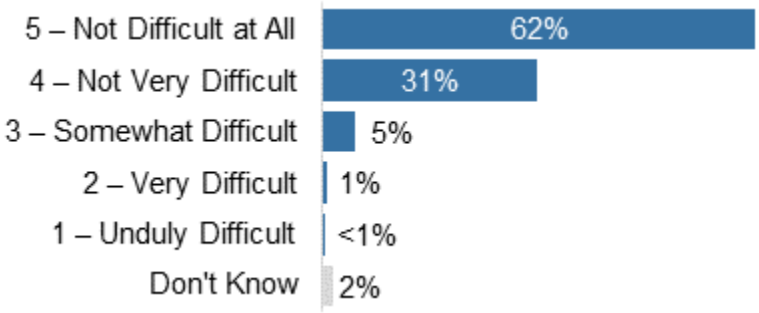


Figure 51 displays the distribution of respondents' ratings of how difficult it was to provide proof of income to participate in EAP using a scale of 1 to 5, where 1 meant it was "unduly difficult" and 5 meant it was "not difficult at all." The majority (93%) of respondents said the process was not very difficult or not difficult at all. The average rating was 4.6.

Figure 51: Ease of Providing Proof of Income (n=1,053)



*Does not sum to 100% due to rounding.

The small number (less than 2%) of respondents who found it difficult to provide proof of income mentioned a variety of reasons why it was difficult (mentioned by one respondent each) including the following:

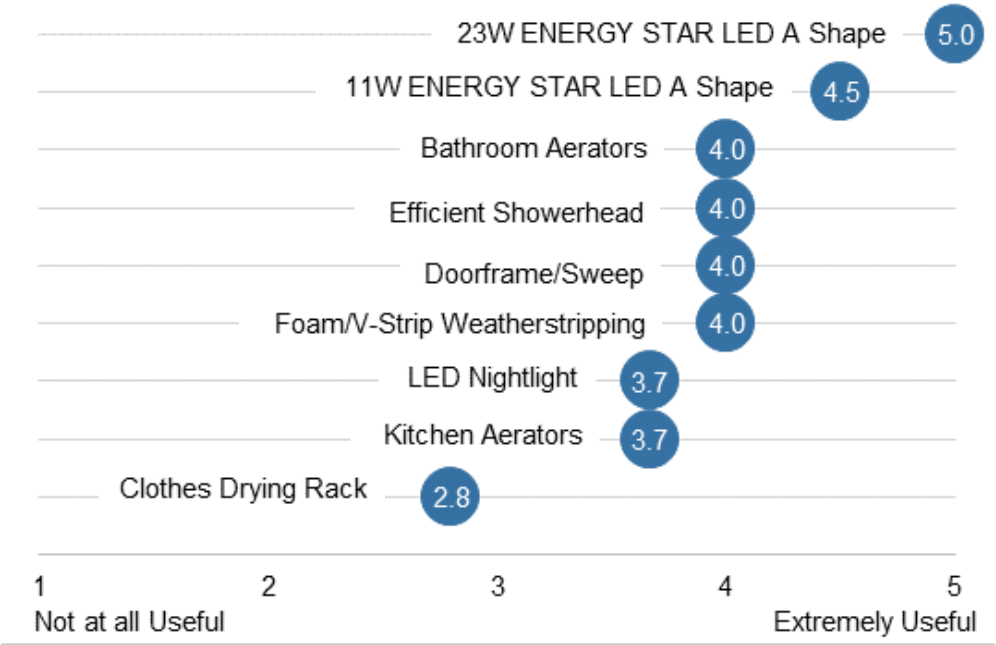
- Phone representative took down the wrong information during the initial call,
- Had to provide additional information,
- Had difficulty findings required paperwork,
- Computer issues,
- Self-employment made providing the right paperwork challenging, and
- COVID-19 financial impacts.

C.2.3 Program Experience

Figure 52 displays the average usefulness ratings for the various items in the Energy Saving Kits as reported by Energy Saving Kit (Tier 2) participants. Respondents provided their ratings on a

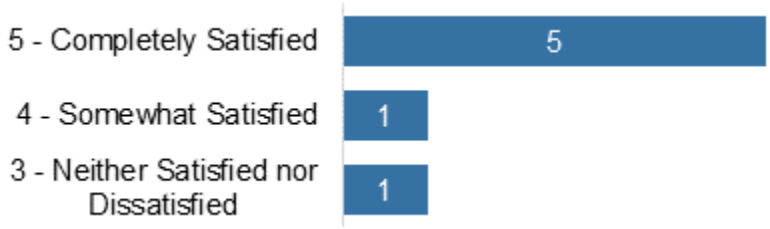
scale from 1 to 5, where 1 meant "not at all useful" and 5 meant "extremely useful." Energy Saving Kit (Tier 2) respondents found the LED bulbs to be the most useful, with average ratings of 5.0 for 23W LEDs and 4.5 for 11W LEDs. With an average rating of 2.8, respondents found the clothes drying rack to be the least useful item.

Figure 52: Usefulness of Products in Energy Saving Kit (n=7)



Energy Saving Kit (Tier 2) respondents rated their satisfaction with the process of applying for and receiving the Energy Saving Kit on a scale from 1 to 5, where 1 meant "not at all satisfied" and 5 meant "completely satisfied." As shown in Figure 53, five out of seven respondents were completely satisfied with the process.

Figure 53: Satisfaction with Applying for Energy Saving Kit (n=7)



A small number of Energy Saving Kit (Tier 2) respondents (three) suggested ways to improve the Energy Saving Kit including the following:

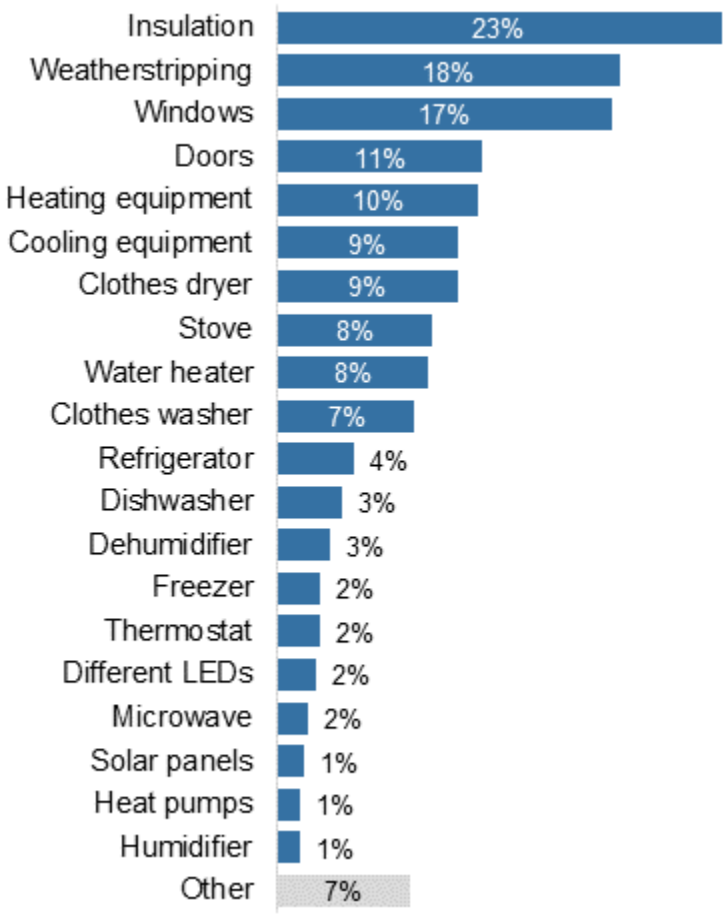
- Provide block heater timers to all participants (one respondent)
- Provide weather stripping to all participants (two respondents)
- Provide better dimmable light bulbs that do not flicker (one respondent)
- Provide door sweeps to all respondents (one respondent)

- Provide kits annually or semi-annually with a different mix of products each time (one respondent)

C.2.4 Recommendations for Program Improvement

Respondents were asked what, if any, additional energy-efficiency equipment, or services they had hoped would be included in EAP but were not. Figure 54 shows that the most commonly mentioned items were insulation (23%), weatherstripping (18%), and windows (17%).

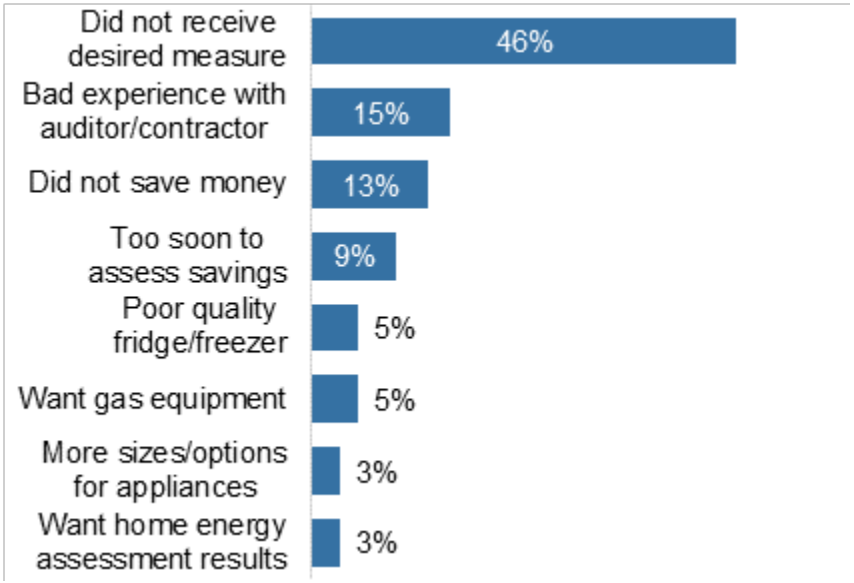
Figure 54: Additional Equipment or Services (n=455; Multiple Response)



*Does not sum to 100% due to multiple responses.

Finally, respondents were asked if there was any additional feedback they would like to provide regarding their participation in EAP. One-fifth (20%) of respondents took the opportunity to provide additional feedback, which is displayed in Figure 55. Much of the feedback respondents provided was a repetition of feedback they had provided earlier in the survey. Nearly one-half (46%) of the comments were complaints of not receiving specific measures respondents had hoped to receive. Other frequently mentioned comments related to the respondent indicating they had a bad experience with the auditor or contractor (15%), that they did not save money after participating (13%) or that it was too soon after participating to tell whether they had saved money (9%).

Figure 55: Additional Program Feedback (n=173)



Appendix D Additional Non-Energy Benefits Results

This appendix provides additional NEBs results. Higher level results were provided in Section 6.2.

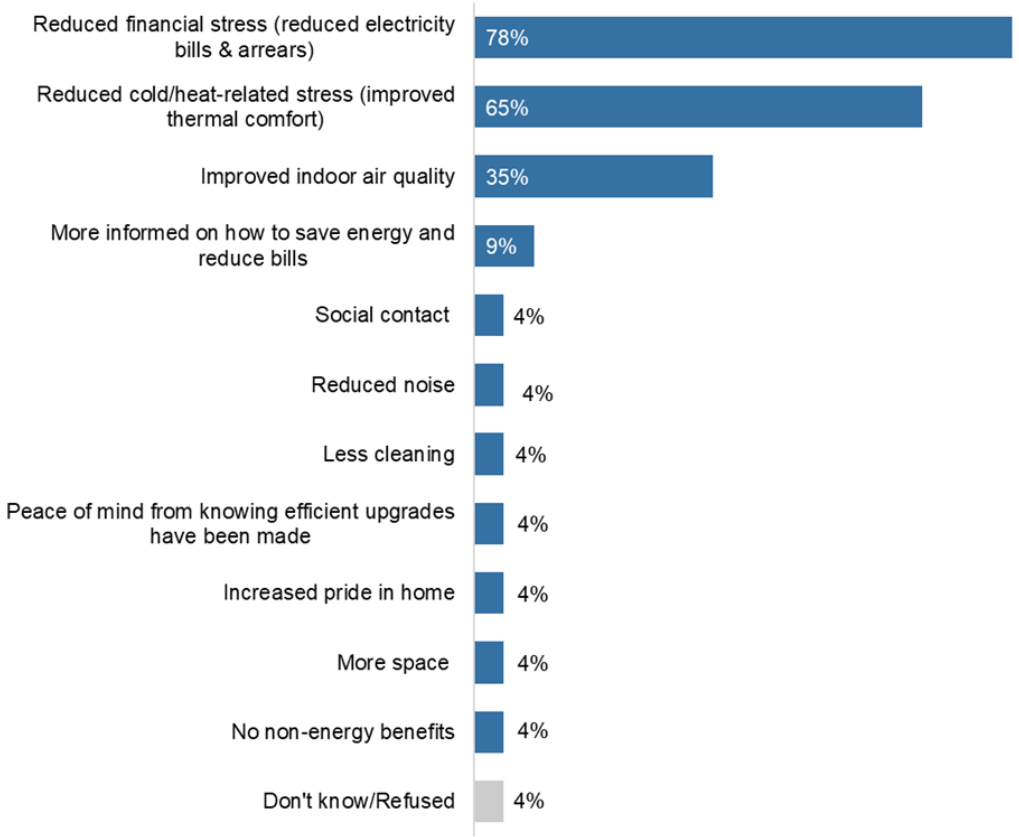
D.1 Auditor and Contractor Non-Energy Benefits Results

Approximately four-fifths (78%) of auditors and contractors reported that participants experienced NEBs from reduced financial stress, over three-fifths (65%) reported NEBs from reduced cold- and/or heat-related stress, and over one-third (35%) noted NEBs from improved indoor air quality as a result of customers' participation in EAP (Figure 56). One contractor mentioned that it brings a sense of "peace of mind knowing that the house attic/basement wall is now properly insulated or that the energy efficient appliances are now installed."

Auditors and contractors less frequently reported that they believe participants may have experienced NEBs related to being more informed on how to save energy and reduce bills. Respondents mentioned some psychological benefits (e.g., social contact, peace of mind, pride in home) that can be seen in Figure 56.

When asked to rank the importance of various NEBs to their customers, a majority (54%) of auditors and contractors ranked reduced financial stress as the most important NEB, followed by thermal comfort (45%).

Figure 56: Auditors and Contractors Observation of NEBs (n=23)



*Does not sum to 100% due to multiple responses.

Appendix E Additional Jobs Impact Results

This appendix provides additional results associated with the jobs impact evaluation activities. Higher-level results were provided in Section 6.3.

Input-Output models are informative for understanding the potential magnitudes and dynamics of economic shocks created by policies and programs. While useful, the StatCan IO Model is a simplified representation of the Canadian economy and thus has limitations. The model assumes fixed technological coefficients. It does not consider economies of scale, constraint capacities, technological change, externalities, or price changes. This makes analyses less accurate for long term and large impacts, where firms would adjust their production technology and the IO technological coefficients would become outdated. Assuming firms adjust their production technology over time to become more efficient implies that the impact of a change in final demand will tend to be overestimated. For household consumption, the model is based on the assumptions of constant consumption behavior and fixed expenditure shares relative to incomes.

E.1 Input Values

The model was used to estimate the impacts of two economic shocks: one representing the demand for energy-efficient products and services from EAP and the other from the increased household expenditures due to bill savings (and net of program funding). Table 30 shows the input values for the demand shock representing the products and services related to EAP. Each measure installed as part of EAP was categorized according to the StatCan IO Supply and Use Product Classifications (SUPCs).

The first seven rows of the table contain the categories corresponding to products, which were the measures installed in homes. The last two rows contain the services. Of the seven product measures, *Major appliances* had the highest total cost of approximately $7.1 million; *Electric light bulbs and tubes* was second largest product category with a total cost of over $1.8 million. Each measure's cost was divided into labor and non-labor. *Electric light bulbs and tubes*, *Plastic and Foam Building and Construction products* and *Other miscellaneous manufactured products* did not have any assumed labor costs for measure installation. For the remaining product categories, 16% of the total measure cost was used to pay for labor costs associated with measure installation. This is primarily due to the major appliances category, which had an assumed split of 88% non-labor and 12% labor costs.

For the two service categories in Table 30, *Office administrative services* included general overhead and administrative services associated with program delivery, such as program management and staffing, call center operations, measure administrative fees and IESO admin labor. The *Other professional, scientific, and technical services* included the audits as well as administrative costs associated with measurement and verification evaluations. The total demand shock represents the sum of the audit fees and all administrative costs associated with the program. The labor and non-labor amounts are not specified for these services, as the IO Model has assumptions incorporated for the relative proportions of each for these categories.

Table 30: Summary of Input Values for Demand Shock

Category Description	Non-Labor *($ Thousands)*	Labor *($ Thousands)*	Total Demand Shock *($ Thousands)*
Major appliances	6,275	797	7,072
Electric light bulbs and tubes	1,810	0	1,810
Small electric appliances	432	432	864
Other miscellaneous manufactured products	407	0	407
Switchgear, switchboards, relays and industrial control apparatus	99	67	166
Plastic and foam building and construction materials	132	0	132
Non-metallic mineral products, n.e.c.	7	15	22
Office administrative services	-	-	1,643
Other professional, scientific and technical services	-	-	4,917
Total			**17,034**

Table 31 shows the calculations and input value for the household expenditure shock.[33] This shock represents the net additional amount that households would inject back into the economy through spending. The model does not distinguish between participants and non-participants in the residential sector, so the net amount of additional money households (as a whole) would have available is the difference between the bill savings (Net Present Value (NPV) = $18.74 million) and the portion of all energy-efficiency programs funded by the residential sector (35%, or $5.96 million). The difference is $12.78 million and represents the additional money that households could either spend on goods and services or save, pay off debt, or otherwise not inject back into the economy. The surveys administered to participants as part of the EAP process evaluation included several questions about what households would do with the money that they saved on their electricity bills. From the survey responses, we estimated that 37% of household bill savings would be spent. Thus, the household expenditure shock would be $4.76 million.

[33] The model is actually run with a normalized value of $1 million in extra household expenditures and the job results can be scaled by the actual demand shock.

Table 31: Summary of Input Values for Household Expenditure Shock

Description	Demand Shock *($ Thousands)*
NPV of energy bill savings	18,742
Residential portion of program funding	(5,962)
Net bill savings to residential sector	**12,781**
Percent spent on consumption (vs. saved)	37%
Total Shock	**4,756**

E.2 Model Results

The StatCan IO Model generated results based on the input values detailed in Table 30. Table 32 shows the results of the model run for the demand shock for products and services. This shock represented the majority of the job impacts. As the two right columns show, the model estimated that the demand shock will result in the creation of 136 total jobs (measured in person-years) in Canada, of which 123 will be in Ontario. Of the 136 jobs, 46 were direct, 55 were indirect, and 34 were induced. In terms of Full-Time Equivalent jobs (FTEs), the numbers are slightly less, with 97 FTEs created in Ontario and 107 in total across the country. Of these 107 FTEs, 39 were direct, 44 indirect, and 25 induced. As Table 30 shows, the direct job impacts were realized exclusively in Ontario. As we move to indirect and induced jobs, impacts are dispersed outside of the province.

Table 32: Job Impacts from Demand Shock

Job Impact Type	FTE *(in person-years)* Ontario	FTE *(in person-years)* Total	Total Jobs *(in person-years)* Ontario	Total Jobs *(in person-years)* Total
Direct	39	39	46	46
Indirect	38	44	49	55
Induced	21	25	28	34
Total	**97**	**107**	**123**	**136**

Table 33 shows the results of the model run for the household expenditure shock. This shock is actually run off a normalized $1 million bundle of extra household spending, which can then be scaled by the actual household expenditure shock. The extra household spending of $4.8 million would yield 15 direct FTEs and 20 direct total jobs in Canada. Total jobs were 31 for Ontario and 36 in total for Canada.

Table 33: Job Impacts from Household Expenditure Shock

Job Impact Type	FTE *(in person-years)* Ontario	FTE *(in person-years)* Total	Total Jobs *(in person-years)* Ontario	Total Jobs *(in person-years)* Total
Direct	14	15	19	20
Indirect	6	7	7	9
Induced	4	5	5	6
Total	**23**	**26**	**31**	**36**

The other factors included in the research questions were the impact of program funding on the non-residential sector and the impact from reduced electricity consumption. Assuming that businesses absorb the increases in electricity costs to fund the program, there would be no impact on jobs. There would be an impact on direct GDP (value-added), equivalent to the profit loss resulting from the increase in electricity bills from program funding. The StatCan IO Model has production functions that cannot be adjusted, so electricity price changes would be modeled by making the assumption that surplus would be reduced by the extra amount spent on electricity.

The economic impact of the reduction of electricity production as a result of the increase in energy efficiency must be examined closely. Technically speaking, it can be estimated using StatCan Input-Output multipliers[34] without running the model. The multiplier is 5.0[35] (per $ million) and the NPV of decreased electricity bills (retail) was $18.7 million. Thus, the model would predict that the reduction in electricity production would cause a job loss of 94 person-years over the course of 20 years (the longest EUL in the portfolio of EAP measures). However, the IO model is linear, and not well suited to model small decreases in electricity production. Total electricity demand has been increasing over time and is projected to continue increasing.[36] EAP first year energy savings represented less than 0.01% of total demand in PY2022. This relatively small decrease in overall consumption may work to slow the rate of consumption growth over time but would likely not result in actual job losses in the utility industry or upstream suppliers. The linearity of the IO model means that it will provide estimates regardless of the size of the impact. Given the nature of electricity production, it is reasonable to conclude that the linear IO multiplier is not appropriate for estimating job impacts. This analysis assumes that job losses from decreased electricity production are negligible.

Table 34 shows the total estimated job impacts by type, combining Table 32 and Table 33. The majority (154 out of the 171 estimated total jobs) were in Ontario. Almost all the direct jobs created were created in Ontario (65 of 66). A slightly smaller share of the indirect and induced jobs was in Ontario, with 56 out of 65 indirect and 33 out of 40 induced total jobs within the province. The FTE estimates are slightly less, with a total of 120 FTEs (of all types) created in Ontario and 134 FTEs added throughout Canada. All but one direct FTEs were realized in Ontario, with this number representing 43% of the total FTEs added in Ontario and 39% of FTEs added in Canada.

[34] Table 36-10-0595-01. The relevant industry is Electric power generation, transmission and distribution [BS221100].
[35] Statistics Canada. Table 36-10-0595-01 Input-output multipliers, provincial and territorial, detail level
DOI: https://doi.org/10.25318/3610059501-eng
[36] Annual Planning Outlook – A view of Ontario's electricity system needs; 2021. IESO.

Table 34: Total Job Impacts by Type

Job Impact Type	FTE *(in person-years)* Ontario	FTE *(in person-years)* Total	Total Jobs *(in person-years)* Ontario	Total Jobs *(in person-years)* Total	Total Jobs per $1 million Investment *(in person-years)*
Direct	52	53	65	66	3.9
Indirect	44	51	56	65	3.8
Induced	24	30	33	40	2.4
Total	**120**	**134**	**154**	**171**	**10.1**

Calculating relative performance as a function of jobs created per $1 million of program budget is helpful in comparing the EAP program between years. This year, each $1 million investment resulted in the creation of 10.0 jobs, compared to 12.6 jobs created per $1 million of program spend in PY2021. Programs can increase in effectiveness – in terms of jobs created per $1 million of budget – when the incentives catalyze spending by participants on energy-efficient measures. Given that EAP covers 100% of measure costs, the relative proportion of participant spending is removed as a driver of variability, and as such the number of jobs per $1 million investment is expected to remain relatively consistent from year to year. The slight decrease observed from PY2021 to PY2022 is potentially due to differences in the underlying economic model, as it is updated by StatCan on an annual basis and cannot be held constant.

Table 35 shows the job impacts in more detail, with jobs added by type and by industry category. Industries are sorted from top to bottom by those with most impacts to least, with industries that showed no impacts not included in the table. The table shows that the industry with the largest impacts was *Administrative and support, waste management and remediation services*, which added 56 jobs across Canada and 55 jobs in Ontario. This category is large and non-specific, and reflects the need to hire individuals to fill a large range of roles based on program need (e.g., office administration, call center operations, program management, etc.). *Retail trade* added a total of 27 jobs, the second most of any industry - 25 of the 27 realized jobs were created in Ontario.

Table 35: Job Impacts by Industry*

Job Impact Type	FTE *(in person-years)* - Ontario	FTE *(in person-years)* - Total	Total Jobs *(in person-years)* - Ontario	Total Jobs *(in person-years)* - Total
Administrative and support, waste management and remediation services	44	45	55	56
Retail trade	18	19	25	27
Professional, scientific and technical services	8	9	11	13
Accommodation and food services	6	8	10	12
Wholesale trade	9	11	9	11
Finance, insurance, real estate, rental and leasing and holding companies	8	9	9	10
Manufacturing	5	7	6	8
Transportation and warehousing	4	6	6	7
Other services (except public administration)	3	4	5	6
Health care and social assistance	2	3	4	4
Information and cultural industries	2	2	2	3
Arts, entertainment and recreation	1	1	2	3
Repair construction	2	2	2	3
Non-profit institutions serving households	1	1	1	2
Government education services	1	1	1	2
Other municipal government services	1	1	1	1
Crop and animal production	0	1	1	1
Educational services	0	0	1	1
Utilities	1	1	1	1
Government health services	1	1	1	1
Total	**120**	**133**	**153**	**171**

*Columns may not add to totals due to rounding. Real values are rounded to nearest whole number and the whole numbers do not sum exactly to the whole number total in every column.

E.3 Survey Responses on Job Impact Questions

The EAP auditor and contractor survey contained job impact-related questions for auditors and contractors related to the impact of EAP on their firms and employment levels. Two questions in particular were informative to understand the nature of the impacts to respondents, which would be considered direct impacts. These two questions are below, with relevant illustrative verbatim survey responses included:

1. Did the 2022 Energy Affordability Program help or hinder the growth of your business in any way? If so, please explain how.

The program <u>helped</u> the growth of my business in the following ways:

- *"There was pent up demand of assessment to do because of the pandemic."*
- *"Providing a steady, predictable income for an REA, and allowing the company to invest in new electronic equipment."*
- *"Increased knowledge of household power."*
- *"Being associated with the IESO helped back us up as a licensed/certified Subcontractor. Allowed for leads that are already approved for projects. Helped us understand the limitations of certain aspects of the delivery of the services."*

The program <u>hindered</u> the growth of my business in the following ways:

- *"Since the reallocating of the contracts to new SO's [Service Organizations] in Jan 2022 milage reimbursement was eliminated for the advisor. This is a huge hinderance to my business and reduced the amount of assessments that I can do. I cannot afford to subsidize this program by driving for free. This is a huge problem and very short sighted."*
- *"The bankruptcy of GreenSaver was a huge financial hit that impacted our organization in many ways. This accompanying the lingering impacts of COVID was not good for our staff and organization."*
- *"We were pushed to do more for less. Income verification at door, calling customers to confirm appointment and way too many walkaways that we lost money on. Poor scheduling and the customer being able to cancel the day of the audit caused empty schedules and no revenue on days allocated for low income programs."*
- *"I reserve Mondays for this and I frequently seem to have Mondays off."*

2. Did the 2022 Energy Affordability Program have an impact on the number of people you hired in the last year? Yes, the program impacted the number of people hired in the last year in the following ways:

Positive Impacts:

- *"Additional advisors were brought on board to provide assessment services."*
- *"Yes, 3 people."*
- *"I am considering hiring an assistant. Without the program I could not even consider this, in fact my ability to earn a livelihood would be severely hampered."*

Negative Impacts:

- *"Due to transition to new vendors we had to let staff go, that along with the financial issues with GreenSaver caused unnecessary stress. We had to let people go and then when we were busy again we could not hire them back."*
- *"Yes, it was very inconsistent. We had to lay-off and re-hire, or simply hire temporary workers as needed."*
- *"The slow start in southwestern Ontario was brutal, the worst in 12 years. Reduce some of the red tape to make the process easier for Service Organizations and homeowners."*

Responding auditors and contractors indicated that the program generally had allowed them to add personnel to meet the demand for new work from EAP, as well as providing a steady revenue source and providing a level of confidence in subcontractors associated with the IESO which helped drive additional business opportunities. The direct job gains estimated by the model are

generally supported by the responses, which reveal the nature of the actual impact on firms. Customers who indicated that the program had hindered the growth of their business in 2022 – or that they had to reduce their workforce because of the program – primarily mentioned changes to program structure or a lack of consistency in workload that may have been relied upon to provide jobs as driving forces. External factors, such as the bankruptcy of GreenSaver, also contributed to these respondents' concerns. The negative issues could be examined further if there was a focus on redesigning certain aspects of the program to enhance job impacts.