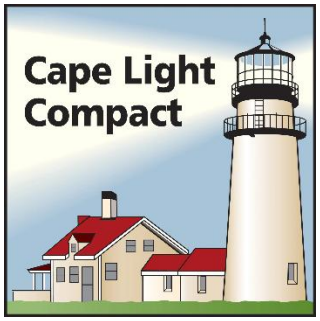
Cape Light Compact Cape and Vineyard Electrification Offering (CVEO) Evaluation Report

Prepared for:



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Executive Summary

Introduction

Cape Light Compact's Cape and Vineyard Electrification Offering Evaluation (CVEO) is an offering targeting low- and moderate-income customers with air source heat pumps, solar photovoltaic (PV), electric stoves, induction stoves, electric dryers, heat pump water heaters, electric water heaters, and battery storage. The objective of the CVEO is to serve low- and moderate-income customers with strategic electrification and active demand reduction to improve energy equity and lower the energy burden for these customers.

In order to be eligible, participants must be income eligible[1] and have oil, propane, or electric resistance as their primary heating fuel. In addition, the participant site must be suitable for air source heat pumps and solar PV, and participants must have completed a home energy assessment and implemented all subsequent recommendations in the previous two years. Lastly, participants must agree to the full removal of all existing fossil fuel systems upon completion of CVEO equipment installation.

Participants were offered various incentive levels based on their income and property status. Participants with deed-restricted properties received air source heat pumps, battery storage, and heat pump / electric water heaters at no cost. Participants with deed-restricted properties also received solar PV at no cost, with the exception of tree removal if necessary. For low-income participants with deed-restricted properties, CVEO also covered the cost of roof repairs to enable solar PV if necessary.

Low-income participants with non-deed restricted properties had the cost of heat pumps fully covered, as well as up to $15,000 for solar installations. For moderate income participants with non-deed-restricted properties, the CVEO program covered 80% of the cost for heat pump installation, with a maximum copay of $5,000 and up to $15,000 for solar installations. Participants had access to finance any portion of the remaining balance for CVEO installations with Mass Save HEAT Loan financing if applicable. For low-income participants with non-deed restricted properties, CVEO also covered the cost of roof repairs to enable solar if necessary.

For all participants, CVEO covered up to $1,000 of the cost for electric / induction stoves, with participants responsible for the remaining balance if applicable. Lastly, for all participants with fossil fuel dryers, CVEO covered up to $1,000 of the cost for electric dryers, with participants responsible for the remaining balance if applicable.

Evaluation Objectives

The evaluation consisted of interviews with Cape Light Compact (CLC) staff and program implementation partners, and surveys of participants to gather information regarding program processes, customer experiences, and non-energy benefits. In addition, the evaluation analyzed telemetry and billing data to quantify participant bill impacts. The specific research questions to be answered through this evaluation are included in the table below.

[1] Income eligible customers include low-income and moderate-income customers.

Table 1. CVEO Evaluation Objectives

Research Category	Research Questions	Evaluation Approach
Program Processes	• What was the intended program delivery process – what are the roles, who are the program actors, what are their interactions, over what time frame? • What actually happened? How was the program delivered? • What were the unanticipated challenges / barriers to program delivery? • How might these challenges / barriers be addressed? • What does the procurement of equipment and services and installation look like and are there any potential concerns with scalability of specific equipment or processes?	CLC Staff Interviews Program Implementation Partner Interviews Online Participant Enrollment Survey
Participant Experience & Non-Energy Benefits	• What were the primary motivations / barriers to participation? • What has been the experience with the installed technologies?	Online Participant Experience Survey
Telemetry and Billing Analysis	• What is the change in energy consumption before and after participation in the offering? • How have participant energy bills been impacted? • How much excess solar PV generation is exported to the distribution system? • What is the savings for the package of installed measures?	Participant Bill Analysis Telemetry Analysis

Source: Guidehouse

Evaluation Methods

This section outlines the evaluation methods utilized by Guidehouse to conduct the evaluation of CVEO.

CLC Staff & Program Implementation Partner Interviews

Guidehouse completed interviews with CLC staff at key program delivery milestones to gather information about program processes and opportunities for enhancement and scalability. In addition, Guidehouse completed interviews with organizations supporting the delivery of the program including the implementation contractor (IC), solar and storage installers, heat pump installers, and local appliance retailers.

Participant Surveys

Guidehouse administered two online surveys to participants to obtain feedback on the program. The first survey solicited feedback about motivation for participation, the enrollment process, and experience engaging with CVEO representatives throughout the program enrollment and

equipment installation process. The enrollment survey was fielded in two waves, with the first being administered in June 2024 and the second in December 2024.

Guidehouse administered a second survey to all participants in March 2025 to capture information on their experience with the installed equipment. These survey questions asked about experience relative to expectations, perceived impacts on bills, and probed on potential non-energy benefits the household may have experienced.

Telemetry and Billing Analysis

Guidehouse analyzed electricity and delivered fuel bills to assess the impact of the CVEO on participants' energy usage and bills. In the energy usage analysis, Guidehouse evaluated pre-installation and post-installation electric consumption, delivered fuel consumption, and solar generation for CVEO participants. In the billing data analysis, Guidehouse assessed changes in participants' expenditures on electricity and delivered fuels as well as excess solar generation credits received by CVEO participants. Average energy and bill impacts were weather-normalized.

Findings and Considerations

The principal EM&V findings and conclusions for the assessment of bill impacts and excess generation are as follows:

- **CVEO participants experienced large reductions in overall annual energy bills after installation of all CVEO equipment.** Overall annual energy bills, which include net electric bills and delivered fuel bills, decreased by an average of 59%, lowering the average annual bills from approximately $3,060 during the pre-installation period to $1,267 during the post-installation period. Reductions in overall annual energy bills are attributed to large reductions in net electric bills (32%) and the elimination of fossil fuel equipment and delivered fuel bills across CVEO participants.

- **CVEO participants showed reductions in average monthly electric consumption following the installation of all equipment by the CVEO Implementation Contractor.** During the post-installation period, CVEO participants experienced increases in weather-normalized gross electric consumption due to the electrification of home heating equipment. However, solar generation assisted in offsetting the increased consumption, resulting in a 59% reduction in weather-normalized net electric consumption. Additionally, participants discontinued the use of delivered fuel because all fossil fuel equipment was removed by the implementation contractor.

- **CVEO participants observed substantial decreases in average monthly electric bills during the post-installation period.** Despite the electrification of home heating leading to higher winter consumption, overall electric costs were significantly reduced due to solar generation offsets during other seasons. Post-installation, participants saw a 32% reduction in their average annual weather-normalized net electric bills. The largest reductions occurred during months with higher solar generation, such as the summer months where net electric bills were net negative due to excess solar generation. The average annual net electric bill decreased from approximately $1,858 to $1,267 per participant.

- **Solar generation benefited CVEO participants by offsetting home electric consumption and reducing net electric bills.** Installing solar generation equipment at customer homes led to considerable offsets in home energy consumption, particularly during periods with higher solar insolation. On average, each participant had excess solar generation of 476 kWh per month during the summer. For CVEO, each solar PV system was required to be interconnected as a qualifying facility rather than a net metering facility. As such, during the evaluation period, participants were compensated for their excess generation using the average monthly clearing price at ISO-NE, which typically ranges from $0.05 to $0.10 per kWh. This resulted in an average monthly excess generation credit of $32 per participant during the summer months in which customers' solar PV was generating more than the household was consuming. These credits were then applied to bills for subsequent months where household usage exceeded solar PV generation.

The principal EM&V findings and conclusions from the implementation and market actor interviews and from the analysis of participant surveys are as follows:

- **Overall, respondents reported high satisfaction with the program and with their installed equipment**. Most respondents are extremely likely to recommend the CVEO offering to a friend or colleague, reporting a net promoter score of 71%. The high net promoter score for the pilot indicates word-of-mouth could be an effective recruitment strategy if the offering were scaled.

- **Many respondents learned about CVEO from housing authorities or newspaper articles, indicating effective pathways for program awareness**. When asked to provide feedback on how they prefer to hear about programs like CVEO, most respondents indicated they preferred an email from the program. There was also interest amongst respondents in receiving a phone call from the program or hearing from a previous participant.

- **Environmental friendliness, money savings, and energy savings were ranked among the highest motivation for participating in the offering.**

- **Most survey respondents did not experience issues with their equipment after installation,** but the 7 respondents who did cited noise, leaks, improper installation, or the equipment not working as expected. All reported issues were associated with the heat pump equipment and were able to be resolved with a follow-up visit from a program contractor. As of June 2025, CLC and the Implementation Contractor staff have not been made aware of any subsequent active or unresolved issues with equipment among CVEO participants.

- **Due to installation timelines pushing installations to the second half of 2024, many participants who completed the participant experience survey have yet to realize the benefits of their installed equipment over a full year.**

- **During interviews with CLC and Implementation Contractor staff, it was noted that each project was custom with unanticipated issues, such as structural barriers to installation, permitting delays, and coordination challenges across multiple technologies, leading to a higher cost per house than was expected**. In addition, solar PV and battery projects faced delays due required review and approval of the

projects by Eversource. Despite the higher cost per house, the program was able to stay within budget by limiting the number of participants to 55, enabling use of Mass Save HEAT Loan financing for non-deed restricted properties, and streamlining implementation.

Based on the assessment of bill impacts and excess generation, Guidehouse provides CLC with the following considerations:

- **Consider allowing participants to enroll their homes as net metering sites.** While customers realized substantial reductions in their energy bills and received credit for their excess generation, for CVEO, each solar PV system was interconnected as a qualifying facility[2] rather than a net metering facility. As such, during the evaluation period, participants were compensated for their excess generation using the average monthly clearing price at ISO-NE, which typically ranges from $0.05 to $0.10 per kWh. Had participant sites been registered as net metered sites, participants would have been compensated $0.25 to $0.30 per kWh of excess generation. If allowed to register as net metered sites in the future, CVEO participants may realize more bill savings associated with excess generation.

Based on the process evaluation findings and conclusions, Guidehouse provides CLC with the following considerations:

- **Provide customers with a brochure outlining the key information after completion of the initial site assessment to reference when participating in CVEO.** Guidehouse recognizes that each participant site has unique characteristics dictating which types of CVEO equipment may be recommended or feasible for installation. Given the heterogeneity in projects completed in this offering, providing key information that could apply to all projects in the offering should help reduce the administrative burden associated with providing a brochure. Key information that may prove useful to provide includes participation expectations, incentives, typical installation timelines, stakeholders involved, and contact information. Providing this information may help improve participants' ability to recall the details of the offering and anticipate what their experience may be during the installation process.

- **Expand offering to additional participants, including non-governmental organizations (NGOs), other non-profit organizations, and previously ineligible participants.** During interviews with equipment installers, several installers recommended expanding eligibility to these populations who, without additional support provided by programs like CVEO, may have more difficulty acquiring the technologies and measures provided to CVEO participants.

- **Improve coordination amongst installers to reduce customer burden.** Installers requested additional transparency from the implementation contractor into the schedules of other installers to improve coordination between contractors and reduce the number of customer touchpoints.

[2] In the third, and approved, iteration of CVEO CLC made changes in part to address the requirements of Section 87A and concerns identified by the Department in D.P.U. 20-40 and D.P.U. 21-126. In accordance with Section 87A, the solar PV systems are registered as qualifying facilities (D.P.U. 22-137 Initial Filing at 13).

- **Continue collaborating with local housing authorities and the Implementation Contractor to generate program awareness, but also consider expanding additional marketing pathways.** Based on feedback received from survey respondents, CLC may consider expanding outreach through other channels such as email, phone calls, or social media. Additionally, since respondents were interested in learning about programs like CVEO from previous participants, CLC should consider utilizing respondents' high net promoter score and encourage participants to recommend the program to friends, family, or colleagues.

- **Survey participants on satisfaction after Fall 2025.** Most program installations were completed in Fall 2024, meaning survey respondents were only able to provide feedback on a partial year of their experience post-measure installation. Guidehouse recommends that CLC conducts another survey after Fall 2025 to determine if participant satisfaction has changed after utilizing their equipment for at least one year.

1. Introduction

Cape Light Compact's Cape and Vineyard Electrification Offering (CVEO) is an offering targeting low- and moderate-income customers with air source heat pumps, solar photovoltaic (PV), electric stoves, induction stoves, electric dryers, heat pump water heaters, electric water heaters, and battery storage. The objective of the CVEO is to serve low- and moderate-income customers with strategic electrification and active demand reduction to improve energy equity and lower the energy burden for these customers. Table 1-1 summarizes the characteristics of CVEO.

Table 1-1. CVEO Characteristics

Offering Attributes	Description
Target Number of Participants	100 in total - 80 deed restricted properties - 20 income eligible, non-deed restricted properties
Eligibility Requirements	Beyond income and deed requirements: - Heating fuel must be oil, propane, or electric resistance - Site must be suitable for air source heat pumps and solar PV - Completion of home energy assessment and implementation of all recommendations in previous two years
Technologies	- Air source heat pumps - Solar PV - Electric / induction stoves (if existing is fossil fuel-based) - Electric dryers - Heat pump / electric water heaters (if existing is fossil fuel-based) - Battery storage (goal of 25% of each group; automatically enrolled in ConnectedSolutions, which is a demand reduction offering)

Incentives	Deed-restricted properties:
	- Air source heat pumps; Battery storage; Heat pump / electric water heaters: 100% covered by CVEO at no cost to the customer
	- Solar PV: 100% covered by CVEO at no cost to the customer, with the exception of tree removal if necessary. For low-income customers, roof repairs 100% covered by CVEO to enable solar if necessary.
	- Electric / induction stoves and electric dryers: CVEO covered up to $1,000 per appliance, with participants responsible for the remaining balance if applicable
	
	Non-deed restricted properties:
	- Air source heat pumps:
	  o Income Eligible: 100% covered by CVEO at no cost to the customer
	  o Moderate-income: 80% of cost covered by CVEO, with customers paying a maximum of $5,000
	- Battery storage: Access to Mass Save HEAT Loan to finance battery install
	- Heat pump / electric water heaters: 100% covered by CVEO at no cost to the customer
	- Solar PV: CVEO covered up to $15,000, with participants responsible for remaining balance. For low-income customers, roof repairs 100% covered by CVEO to enable solar if necessary.
	- Electric / induction stoves and electric dryers: CVEO covered up to $1,000 per appliance, with participants responsible for the remaining balance if applicable

Source: Guidehouse

The evaluation consisted of interviews with Cape Light Compact (CLC) staff and program implementation partners, and surveys of participants to gather information regarding program processes, customer experiences, and non-energy benefits. In addition, the evaluation analyzed telemetry and billing data to quantify participant bill impacts. The specific research questions to be answered through this evaluation are included in Table 1-2.

Table 1-2. CVEO Evaluation Objectives

Research Category	Research Questions	Evaluation Approach
Program Processes	• What was the intended program delivery process – what are the roles, who are the program actors, what are their interactions, over what time frame? • What actually happened? How was the program delivered? • What were the unanticipated challenges / barriers to program delivery? • How might these challenges / barriers be addressed? • What does the procurement of equipment and services and installation look like and are there any potential concerns with scalability of specific equipment or processes?	CLC Staff Interviews Program Implementation Partner Interviews Online Participant Enrollment Survey
Participant Experience & Non-Energy Benefits	• What were the primary motivations / barriers to participation? • What has been the experience with the installed technologies?	Online Participant Experience Survey
Telemetry and Billing Analysis	• What is the change in energy consumption before and after participation in the offering? • How have participant energy bills been impacted? • How much excess solar PV generation is exported to the distribution system? • What is the savings for the package of installed measures?	Participant Bill Analysis Telemetry Analysis

Source: Guidehouse

2. Data Sources and Data Review

This section describes the data sources used for this evaluation and the steps taken to prepare the data for analysis.

2.1 Data from CLC and Implementation Contractor

This section describes the data collected from CLC and the CVEO implementation contractor for use in this evaluation.

- **Customer contact information:** Guidehouse required contact information of the complete group of CVEO participants to administer the enrollment and equipment experience surveys using a census approach. CLC provided this data on a regular basis throughout the enrollment period to facilitate timely implementation of the customer surveys, and again in April 2025.

- **Program data:** Accurately reported measure and installation details for each technology received through the CVEO were key to the impact analysis.

- **Home Energy Assessment data:** As an eligibility requirement, details around the timing and completion of the home energy assessment and the recommendations that followed are imperative to the impact analysis. The fields allowed Guidehouse to determine pre-installation period cutoffs for impact estimates, which are discussed in further detail in Section 3.3.1.

- **15-minute telemetry data:** Battery and solar telemetry data was used to evaluate the excess solar generation. Telemetry data during the analysis period was provided for each enrolled battery and solar array. A single data reading was provided for every 15-minute interval during the analysis period, starting on the date of installation and continuing through January 2025 for the final data transfer. If 15-minute interval data was unavailable, Guidehouse accepted more granular data (e.g., 5-minute interval) and aggregated to 15-minute intervals prior to analysis.

- **Delivered fuel bills:** The analysis used delivered fuel bills prior to customer enrollment in the program to estimate customer bill impacts. Guidehouse assumed the data transcription was reviewed for quality control prior to sending the data to Guidehouse. The following fields were needed to estimate bill impacts resulted from abated fuel costs: customer ID that links to program data, fuel delivery date, fuel type, fuel quantity (including units), and bill amount to customer ($).

- **Electric bills**: Customer billing data is key to conducting total kWh usage and customer bill impacts analysis. To estimate participation impacts of the program, Guidehouse required monthly electric bill information. Guidehouse assumed the data transcription was reviewed for quality control prior to sending the data to Guidehouse. The following data points were required for each customer bill: customer ID that links to program data, bill cycle end date, duration of bill cycle, bill cycle net usage (kWh), bill amount to customer ($), and rate code of bill.

- **Monthly electric rates:** Rate information was required to calculate counterfactual electric bills for participants. Guidehouse collected an average monthly rate ($ per kWh) for each rate class for the months of January 2022 through January 2025. Where electric rates were not available from CLC, Guidehouse used publicly available rate information for customers supplied by Eversource or CLC.

2.2 Data Collected from Other Sources

This section describes additional data collected by Guidehouse to support quantifying bill impacts and excess generation.

- **Weather data:** Information on observed weather conditions for participants was required to estimate how participant electric consumption and delivered fuel consumption changed as a function of cooling degree days and heating degree days (base 65 degrees Fahrenheit). Data was collected from the National Oceanic and Atmospheric Administration's Barnstable Municipal Airport weather station for January 2022 through February 2025.

- **Typical Meteorological Year data**: Information on typical meteorological conditions for participants was required to estimate weather-normalized electric consumption, delivered fuel consumption, excess generation, and energy bills. Guidehouse collected TMYx 2007-2021 data for Barnstable Municipal Airport from the Massachusetts eTRM database to calculate typical cooling degree days and heating degree days (base 65 degrees Fahrenheit) for use in weather-normalization.[3] Guidehouse provides additional information on the weather-normalization approach in Section 3.3 and Appendix A.

- **Excess generation credits:** Excess generation credit information ($ per kWh) was required to calculate total excess generation credits for participants. CVEO participants, for whom solar PV is interconnected as qualifying facilities, are compensated for their excess generation using the average monthly clearing price at ISO-NE, which typically ranged from $0.05 to $0.10 per kWh. Guidehouse collected average monthly excess generation credit information for the months of January 2022 through February 2025 using average monthly clearing price from ISO-NE for Southeastern Massachusetts.[4]

2.3 Data Review

Guidehouse reviewed and conducted validation of all data received. Guidehouse's review addressed the following points:

- **Data Completeness**: Guidehouse reviewed completeness and quality across the full suite of available data. The degree of review required differed by data set and use case. At a high level, the review process checked for data coverage, blank or invalid data points, duplicate entries, and the ability to connect data sets where necessary.

[3] Guidehouse utilized *MA_Barnstable_TMYx_2007-2021.xlsx* from the Massachusetts eTRM to calculate TMYx HDD and CDD (https://etrm.anbetrack.com, Accessed June 10, 2025).

[4] Average monthly clearing price data for 2022 through 2025 is publicly available on ISO-NE's website (https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/monthly-wholesale-load-cost-report, Accessed June 10, 2025).

  - For tracking data (i.e., enrollment, installation, event, and outage data), Guidehouse confirmed that the relevant data points were included, and that customer-level information is traceable across data sets.
  - For billing and telemetry data, Guidehouse reviewed the data to determine if data for each participant is available for the expected period (i.e., January 2022 through February 2025) based on their tracking data and the study period. Guidehouse also reviewed the billing and telemetry data for anomalous values (e.g., abnormally long bills, outlier bills) that may bias impact findings and ultimately removed 56 customer bills from the billing data received (approximately 3 percent of data).

- **Data Convention**: Guidehouse confirmed that all fields included across the full suite of data sets follow the agreed-upon conventions and were accurately and consistently reported. Key conventions include date format, time zone, usage units, power supply (AC vs. DC), duration of intervals and bill cycles, coverage period for date and time values, and sign conventions.

Guidehouse conducted an initial data review in mid-2024 to determine whether all data required for evaluation were being collected and would be available for use in an evaluation. Guidehouse presented findings from the initial data review in 2024 and identified several areas with missing or incomplete data. Guidehouse conducted a final data review during the first several months of 2025 and presented findings from the final data review in March 2025. Follow-up coordination with CLC and the implementation contractor to address flagged gaps in the data was completed by May 2025.

3. Evaluation Methods

3.1 Implementation and Market Actor Interviews

The evaluation included a series of interviews with Cape Light Compact (CLC) staff, the implementation contractor (IC), and participating appliance, solar, battery, and heat pump installers to gather information regarding program processes.

CLC utilized the implementation contractor (IC) to support and manage day-to-day program delivery, including informing participants about program details, managing the contractors, acting as the liaison between CLC and the field teams, and scheduling installations and site visits. Installation contractors were responsible for installing program equipment, providing participants with equipment instructions and training, and responding to post-installation equipment issues.

There were four participating solar contractors, who also installed battery storage where applicable, eight heat pump contractors, and one appliance contractor. This part of the evaluation focused on answering the questions listed below in Table 3-1.

Table 3-1. Program Implementation Research Questions

Research Questions	Evaluation Approach
• What was the intended program delivery process – what are the roles, who are the program actors, what are their interactions, over what time frame? • What actually happened? How was the program delivered? • What were the unanticipated challenges / barriers to program delivery? • How might these challenges / barriers be addressed? • What does the procurement of equipment and services and installation look like and are there any potential concerns with scalability of specific equipment or processes?	CLC Staff Interviews Program Implementation Partner Interviews

Source: Guidehouse

Guidehouse interviewed CLC and IC staff members once in January 2024 and again in February 2025. The primary goal of these interviews was to understand program delivery, program challenges, and scalability concerns.

Guidehouse also interviewed equipment installation contractors, including five heat pump installers in April 2024, four solar and/or battery installers in October 2024, and the participating appliance retailer/installer in October 2024, to learn about the program delivery process and identify program challenges.

3.2 Participant Surveys

Table 3-2 summarizes the participants enrolled in CVEO. Of 55 CVEO participants, the majority of CVEO participants (47 of 55) resided in deed restricted properties.

Table 3-2. CVEO Participant Property Characteristics

Property Type	Participants	
	#	%
Deed Restricted	47	85%
Non-Deed Restricted	8	15%

Source: Guidehouse analysis of CVEO tracking data

Guidehouse administered two online surveys to participants to obtain feedback on the program. The first survey solicited feedback about motivation for participation, the enrollment process, and experience engaging with CVEO representatives throughout the program enrollment and equipment installation process. The enrollment survey was fielded in two waves - once in June 2024 and again in December 2024. Respondents who completed the survey in its entirety received a $10 e-gift card.

Guidehouse administered a second survey to all participants in March 2025 to capture information on their experience with the installed equipment. These survey questions asked about experience relative to expectations, perceived impacts on bills, and probed on potential non-energy benefits the household may have experienced. Respondents who completed the survey in its entirety received a $20 e-gift card.

3.2.1 Enrollment Surveys

The enrollment survey was fielded online to two cohorts of customers:

1) Participants after they had passed eligibility screening, received a site visit and approval for installation, and signed a contract. Although the aim was to survey customers after they had all the equipment installed, some participants may have been surveyed before the equipment was completely installed, depending on how much time had passed since the enrollment and audit process.

2) Eligible near-participants (i.e., those who started but did not complete the enrollment process for reasons other than being determined to be ineligible).

The survey was fielded in two waves six months apart to capture additional participants who had not had their equipment installed during the first wave. The key research questions are outlined in Table 3-3.

Table 3-3. Participant Enrollment Survey Key Research Questions

	Description
Key Research Questions	• What were the primary motivations to participate in CVEO? • What were participant's experiences with the enrollment/onboarding processes? • What were participants' experiences with the installation of each technology that is part of the offering – air source heat pump, solar PV, energy storage and/or electric stove (as applicable depending on what has been installed to-date)? • Who did the participant interface with? How did these interactions go? • Do participants feel equipped with sufficient information about the offering and the installed technologies? • Were participants planning to replace their heating equipment if the new heat pump had not been installed? If so, what type and efficiency of heating system would the customer have purchased? • Did participants install and/or remove any household appliances or other energy-consuming equipment in the 12 months prior to the first CVEO offering installation (e.g., installed a window AC unit, got a new TV, etc.)?

Source: Guidehouse

Seventy-nine contacts, including 43 participants and 39 eligible near-participants, were invited to take the survey and 24 completed the survey (a response rate of 30%) for both waves combined. Most respondents (15 out of 24) resided in deed restricted properties as shown in Table 3-4, and three (13%) resided in non-deed restricted properties. The remaining six (24%) respondents were near-participants with unknown property characteristics.

Table 3-4. Enrollment Survey Respondent Property Characteristics

Property Type	Respondents	
	#	%
Deed Restricted	15	63%
Non-Deed Restricted	3	13%
Unknown*	6	24%

* Property characteristics of near-participants is unknown.
Source: Guidehouse analysis of CVEO tracking data

3.2.2 Participant Experience Survey

The participant experience survey aimed to capture post-participation feedback on the CVEO, including program satisfaction, equipment usage and operability, and equipment impact on the participant's home. The key research questions are outlined in Table 3-5.

Table 3-5. Participant Experience Survey Key Research Questions

	Description
Key Research Questions	• What has the participants' experiences been with the operation of each installed technology that is part of the offering – air source heat pump, solar PV, energy storage, induction/electric stove, electric dryer? • What are participants' perceptions of the impact of the installed technologies on their total energy bill? • What types of benefits, besides energy savings, are customers experiencing, if any? Did participation in the offering eliminate or reduce the duration of a power outage?

Source: Guidehouse

Forty-one participants[5] were invited to take the survey and 21 completed the survey (a response rate of 51%). Most respondents (17 out of 21) resided in deed restricted properties as shown in Table 3-6 and four (19%) resided in non-deed restricted properties.

Table 3-6. Participant Survey Respondent Property Characteristics

Property Type	Respondents	
	#	%
Deed Restricted	17	81%
Non-Deed Restricted	4	19%

Source: Guidehouse analysis of CVEO tracking data

3.3 Assessment of Bill Impacts and Excess Generation

This section provides a description of the approaches used to conduct the evaluation of bill impacts and excess generation for CVEO participants. Additional technical details related to the approaches may be found in Appendix A.

3.3.1 Pre-Installation and Post-Installation Periods

To identify bill impacts and excess generation for CVEO participants, Guidehouse first needed to identify the appropriate pre-installation and post-installation periods for each participant. There are several factors that were considered when defining the pre- and post-installation periods for each participant, including:

- **CVEO participants are required to have completed a Home Energy Assessment (HEA) within the past 2 years and installed all recommended measures.** HEA participation tracking data indicates that most HEAs and installations of recommended measures began in early 2023 and extended into 2024. All HEA measure installations were completed prior to installation of all CVEO equipment at participant homes. This indicates that data collected *after* a participant's HEA and *before* a participant's CVEO

[5] The original sample of participants included 55 contacts. Two participants resided at a multifamily site with one contact email, so one survey invitation was shared for the multifamily site. In addition, 12 participants resided at a multifamily site whose property manager was invited to complete the survey. After fielding, one participant survey invitation was not able to deliver, resulting in a final sample of 41 contacts.

installation completion is not appropriate to inform a pre-installation baseline. Guidehouse therefore requested billing data extending at least one year prior to HEAs to avoid capturing more efficient post-HEA conditions in a pre-installation period.

- **CVEO participants had multiple measures installed and the installation dates were staggered over a series of months throughout 2024.** Table 3-7 provides an overview of cumulative participant CVEO installations by measure. It shows that after a slow start, customers started receiving measures at a faster pace in the middle of 2024, with most measures installed by the beginning of 2025. Guidehouse considered CVEO installations to be complete when all selected equipment for each participant (e.g., heat pump, solar generation, and battery storage equipment) was installed and commissioned, denoted in the "All Measures Complete" column of Table 3-7.

Table 3-7. Cumulative CVEO Installations by Measure

Install Date	Heat Pump	Heat Pump / Electric Water Heater	Electric Dryer	Battery Storage	Electric / Induction Stove	Solar	All Measures Complete*
Jan. 2024	0	2	0	0	0	0	**0**
Feb. 2024	0	2	0	0	2	2	**0**
Mar. 2024	0	2	0	2	2	9	**1**
Apr. 2024	0	2	0	3	3	11	**1**
May 2024	0	7	0	3	3	15	**1**
Jun. 2024	11	15	1	7	6	16	**7**
Jul. 2024	20	16	2	9	9	16	**11**
Aug. 2024	25	21	3	10	9	23	**18**
Sep. 2024	27	24	3	10	10	30	**24**
Oct. 2024	30	27	3	12	10	35	**30**
Nov. 2024	31	29	3	12	11	37	**35**
Dec. 2024	44	41	3	12	12	52	**41**
Jan. 2025	45	41	3	12	12	53	**53**
Feb. 2025	45	41	3	12	12	54	**54**
Mar. 2025	45	41	3	12	12	54	**54**
Apr. 2025	45	41	3	12	12	54	**54**
May 2025	45	41	4	12	13	55	**55**

* Note: "All Measures Complete" denotes the number of participants that received all of their CVEO equipment (e.g., for a customer that received solar, battery storage, and a heat pump, the customer is only included in the "All Measures Complete" column following installation of all three equipment types).

Source: Guidehouse analysis

Based on the considerations outlined above, Guidehouse outlines the pre-installation period and post-installation period based on when each customer completed installation of all CVEO measures in Table 3-8 below. To avoid incorporating the period in which HEA and CVEO measures were being installed, data collected throughout 2023 and 2024 were excluded from the pre-installation period.

Table 3-8. Bill Impact and Excess Generation Analysis Pre- and Post-Installation Periods

Month All Measures Complete*	Number of Participants	Pre-Installation Period**	Post-Installation Period
Jan. 2024	0	Jan. 2022 – Dec. 2022	Jan. 2024 – Dec. 2024
Feb. 2024	0	Jan. 2022; Feb. 2022 – Dec. 2022	Feb. 2024 – Jan. 2025
Mar. 2024	1	Jan. 2022; Mar. 2022 – Dec. 2022	Mar. 2024 – Jan. 2025
Apr. 2024	1	Jan. 2022; Apr. 2022 – Dec. 2022	Apr. 2024 – Jan. 2025
May 2024	1	Jan. 2022; May 2022 – Dec. 2022	May 2024 – Jan. 2025
Jun. 2024	7	Jan. 2022; Jun. 2022 – Dec. 2022	Jun. 2024 – Jan. 2025
Jul. 2024	11	Jan. 2022; Jul. 2022 – Dec. 2022	Jul. 2024 – Jan. 2025
Aug. 2024	18	Jan. 2022; Aug. 2022 – Dec. 2022	Aug. 2024 – Jan. 2025
Sep. 2024	24	Jan. 2022; Sep. 2022 – Dec. 2022	Sep. 2024 – Jan. 2025
Oct. 2024	30	Jan. 2022; Oct. 2022 – Dec. 2022	Oct. 2024 – Jan. 2025
Nov. 2024	35	Jan. 2022; Nov. 2022 – Dec. 2022	Nov. 2024 – Jan. 2025
Dec. 2024	41	Jan. 2022; Dec. 2022	Dec. 2024 – Jan. 2025

* "Month All Measures Complete" denotes the month that a customer received all of their CVEO equipment for each month from January 2024 through December 2024 (e.g., for a customer that received solar, battery storage, and a heat pump, all measures are considered complete following installation of all three equipment types). 14 participants with all CVEO installations completed by Jan. 2025 through May 2025 were excluded due to insufficient post-installation data for use in the evaluation.

Source: Guidehouse analysis

3.3.2 Weather-Normalized Electric and Delivered Fuel Consumption Data

Guidehouse analyzed observed usage (i.e., usage sourced directly from billing data) and weather-normalized usage when estimating energy consumption impacts and excess generation. Guidehouse estimated weather-normalized gross electric usage and weather-normalized delivered fuel consumption during the pre-installation period and post-installation period using the approach outlined in Appendix A. Weather-normalization was conducted using TMYx 2007-2021 data for Barnstable County sourced from the Massachusetts eTRM.[6] Table 3-9 and Table 3-10 below compare observed pre-installation, observed post-installation, and

[6] Guidehouse utilized *MA_Barnstable_TMYx_2007-2021.xlsx* from the Massachusetts eTRM to calculate TMYx HDD and CDD (etrm.anbetrack.com, Accessed June 10, 2025).

TMYx average monthly heating degree days and cooling degree days (base 65 degrees Fahrenheit).

Table 3-9. Summary of Heating Degree Days (Base 65F)

	Spring Average Monthly	Summer Average Monthly	Fall Average Monthly	Winter Average Monthly	Annual Average Monthly
Pre-Installation	382	28	382	884	419
Post-Installation	439	28	439	940	462
TMYx	421	36	421	904	446

Note: Heating degree days for the spring and fall seasons are equivalent as Guidehouse extrapolated all fall season estimates to the spring season per the methodology outlined in Section 3.3.4.

Source: Guidehouse analysis

Table 3-10. Summary of Cooling Degree Days (Base 65F)

	Spring Average Monthly	Summer Average Monthly	Fall Average Monthly	Winter Average Monthly	Annual Average Monthly
Pre-Installation	23	247	23	0	73
Post-Installation	11	183	11	0	52
TMYx	20	193	20	0	58

Note: Cooling degree days for the spring and fall seasons are equivalent as Guidehouse extrapolated all fall season estimates to the spring season per the methodology outlined in Section 3.3.4.

Source: Guidehouse analysis

3.3.3 Weather-Normalized Electric and Delivered Fuel Bills

Guidehouse estimated weather-normalized electric and delivered fuel bills using weather-normalized electric and weather-normalized delivered fuel consumption data. To do so, Guidehouse gathered electric rates, excess generation credits, and delivered fuel costs for each CVEO participant for the period spanning 2022 through 2024. Since rates have changed over time, a simple comparison of pre-installation and post-installation bills may lead to misleading results. As such, Guidehouse calculated the average electric rate and average delivered fuel cost per unit for each calendar month across the 2022 through 2024 period and applied the calculated rates and costs to weather-normalized electric and delivered fuel bills. Table 3-11 presents a monthly summary of electric charges and excess generation credits used to calculate weather-normalized electric bills, and Table 3-12 presents a monthly summary of delivered fuel costs used to calculate weather-normalized delivered fuel bills.

Table 3-11. Average Electric Costs and Generation Credits by Calendar Month

Calendar Month	Average Base Distribution Charge ($)	Average Total Delivery & Supply Charge ($ per kWh)	Average Excess Generation Credit ($ per kWh)
Jan.	$5.78	$0.26	$0.08
Feb.	$6.28	$0.28	$0.08
Mar.	$5.99	$0.28	$0.05
Apr.	$6.46	$0.28	$0.05
May	$6.09	$0.28	$0.06
Jun.	$6.19	$0.29	$0.06
Jul.	$6.28	$0.28	$0.07
Aug.	$6.11	$0.26	$0.07
Sep.	$6.33	$0.26	$0.06
Oct.	$6.09	$0.26	$0.05
Nov.	$6.15	$0.26	$0.07
Dec.	$6.29	$0.26	$0.10

Source: Guidehouse analysis of participant electric usage data, electric rates, and excess generation credits

Table 3-12. Average Delivered Fuel Price per Gallon by Calendar Month

Calendar Month	Delivered Oil Price ($ per Gallon)	Delivered Propane Price ($ per Gallon)
Jan.	$4.20	$2.97
Feb.	$4.17	$2.91
Mar.	$4.46	$3.06
Apr.	$3.70	$2.92
May	$4.08	$3.07
Jun.	$4.18	$2.88
Jul.	$4.17	$3.48
Aug.	$4.20	$3.24
Sep.	$4.25	$2.75
Oct.	$4.30	$3.60
Nov.	$4.46	$2.95
Dec.	$3.65	$3.00

Note: Delivered fuel bill costs presented do not include tank or equipment rental fees, which were incurred by three customers with propane for a total of $225.75 per year, on average.

Source: Guidehouse analysis of participant delivered fuel consumption data

3.3.4 Estimation of Consumption and Bill Impacts

After weather normalizing consumption and billing data, Guidehouse estimated the average impact of CVEO equipment installation for each season of the post-installation period discussed in Section 3.3.1.

To estimate average monthly change in weather-normalized energy consumption for each season, Guidehouse calculated the difference between pre-installation and post-installation weather-normalized average monthly energy consumption following Equation 3-1 below. To estimate the average monthly change in weather-normalized energy consumption across a calendar year, Guidehouse calculated the average of each season's estimated change in monthly energy consumption. Guidehouse estimated the average change in total annual weather-normalized energy consumption by scaling the average monthly change estimated across a calendar year by 12.

Equation 3-1. Average Monthly Change in Weather-Normalized Energy Consumption or Excess Generation

$$Seasonal\ Consumption\ Impact = \bar{y}_{pre}^{season} - \bar{y}_{post}^{season}$$

where:

$\bar{y}_{pre}^{season}, \bar{y}_{post}^{season}$ = weather-normalized average gross or net electric consumption (kWh), delivered fuel consumption (gallons), or excess generation (kWh) during a specific season for the pre-installation period and post-installation period, respectively.

Guidehouse estimated the average monthly change in weather-normalized energy bills on a seasonal basis via a similar calculation approach highlighted in Equation 3-2 below. To estimate the average monthly change in weather-normalized energy bills across a calendar year, Guidehouse calculated the average of each season's estimated change in monthly energy bills. Guidehouse estimated the average change in total annual weather-normalized energy bills by scaling the average monthly change estimated across a calendar year by 12.

Equation 3-2. Average Monthly Change in Weather-Normalized Energy Bills

$$Seasonal\ Bill\ Impact\ (\$) = \left(\overline{ElecBill}_{pre}^{season} - \overline{ElecBill}_{post}^{season}\right) - \overline{FuelBill}_{pre}^{season}$$

where:

$\overline{ElecBill}_{pre}^{season}, \overline{ElecBill}_{post}^{season}$ = weather-normalized average monthly gross or net electric bill during a specific season for the pre-installation period and post-installation periods, respectively.

$\overline{FuelBill}_{pre}^{season}$ = weather-normalized average monthly delivered fuel bill during a specific season for the pre-installation period.

When estimating impacts per season, for each season, Guidehouse included only the participants who completed their installations before the beginning of the season in question (e.g., participants included in the estimation of fall season impacts for September through November 2024 must have completed all CVEO installations by the end of August 2024).

To provide impact estimates for the spring season of March through May 2024, Guidehouse extrapolated fall season estimates for September through November 2024 since there was an insufficient number of participants with installations completed by March 2024. This approach assumes that spring and fall season consumption and generation patterns are equivalent. Re-evaluating CVEO impacts after a full year of data collection for all participants will ensure a more holistic understanding of the impacts and benefits of CVEO across all four seasons of the year.

4. Analysis and Results

This section summarizes evaluation findings for each evaluation task. The discussion of evaluation findings is divided into the following sections:

1. **Key Findings.** This section provides key findings from the assessment of data collected during implementation and market actor interviews and participant surveys, and from the assessment of bill impacts and excess generation.

2. **Participant Surveys.** This section provides detailed findings from two Participant Enrollment Surveys and one Participant Experience Survey.

3. **Assessment of Bill Impacts and Excess Generation.** This section provides findings from an assessment of bill impacts and excess generation for CVEO participants.

4.1 Key Findings

The principal EM&V findings and conclusions from the implementation and market actor interviews and from the analysis of participant surveys are as follows:

- **Overall, respondents reported high satisfaction with the program and with their installed equipment**. Most respondents are extremely likely to recommend the CVEO offering to a friend or colleague, reporting a net promoter score of 71%. The high net promoter score for the pilot indicates word-of-mouth could be an effective recruitment strategy if the offering were scaled.

- **Many respondents learned about CVEO from housing authorities or newspaper articles, indicating effective pathways for program awareness**. When asked to provide feedback on how they prefer to hear about programs like CVEO, most respondents indicated they preferred an email from the program. There was also interest amongst respondents in receiving a phone call from the program or hearing from a previous participant.

- **Environmental friendliness, money savings, and energy savings were ranked among the highest motivation for participating in the offering.**

- **Most survey respondents did not experience issues with their equipment after installation,** but the 7 respondents who did cited noise, leaks, improper installation, or the equipment not working as expected. All reported issues were associated with the heat pump equipment and were able to be resolved with a follow-up visit from a program contractor. As of June 2025, CLC and the Implementation Contractor staff have not been made aware of any subsequent active or unresolved issues with equipment among CVEO participants.

- **Due to installation timelines pushing installations to the second half of 2024, many participants who completed the participant experience survey have yet to realize the benefits of their installed equipment over a full year.**

- **During interviews with CLC and Implementation Contractor staff, it was noted that each project was custom with unanticipated issues, such as structural barriers to installation, permitting delays, and coordination challenges across multiple technologies, leading to a higher cost per house than was expected**. In addition, solar PV and battery projects faced delays due required review and approval of the projects by Eversource. Despite the higher cost per house, the program was able to stay within budget by limiting the number of participants to 55, enabling use of Mass Save HEAT Loan financing for non-deed restricted properties, and streamlining implementation.

The principal EM&V findings and conclusions for the assessment of bill impacts and excess generation are as follows:

- **CVEO participants experienced large reductions in overall annual energy bills after installation of all CVEO equipment.** Overall annual energy bills, which include net electric bills and delivered fuel bills, decreased by an average of 59%, lowering the average annual bills from approximately $3,060 during the pre-installation period to $1,267 during the post-installation period. Reductions in overall annual energy bills are attributed to large reductions in net electric bills (32%) and the elimination of fossil fuel equipment and delivered fuel bills across CVEO participants.

- **CVEO participants showed reductions in average monthly electric consumption following the installation of all equipment by the CVEO Implementation Contractor.** During the post-installation period, CVEO participants experienced increases in weather-normalized gross electric consumption due to the electrification of home heating equipment. However, solar generation assisted in offsetting the increased consumption, resulting in a 59% reduction in weather-normalized net electric consumption. Additionally, participants discontinued the use of delivered fuel because all fossil fuel equipment was removed by the implementation contractor.

- **CVEO participants observed substantial decreases in average monthly electric bills during the post-installation period.** Despite the electrification of home heating leading to higher winter consumption, overall electric costs were significantly reduced due to solar generation offsets during other seasons. Post-installation, participants saw a 32% reduction in their average annual weather-normalized net electric bills. The largest reductions occurred during months with higher solar generation, such as the summer months where net electric bills were net negative due to excess solar generation. The average annual net electric bill decreased from approximately $1,858 to $1,267 per participant.

- **Solar generation benefited CVEO participants by offsetting home electric consumption and reducing net electric bills.** Installing solar generation equipment at customer homes led to considerable offsets in home energy consumption, particularly during periods with higher solar insolation. On average, each participant had excess solar generation of 476 kWh per month during the summer. For CVEO, each solar PV system was required to be interconnected as a qualifying facility rather than a net metering facility. As such, during the evaluation period, participants were compensated for their excess generation using the average monthly clearing price at ISO-NE, which typically ranges from $0.05 to $0.10 per kWh. This resulted in an average monthly excess generation credit of $32 per participant during the summer months in which

customers' solar PV was generating more than the household was consuming. These credits were then applied to bills for subsequent months where household usage exceeded solar PV generation.

4.2 Implementation and Market Actor Interviews

The evaluation included a series of interviews with Cape Light Compact (CLC) staff, the implementation contractor (IC), and participating appliance, solar, battery, and heat pump installers to gather information regarding program processes.

4.2.1 CLC and Implementation Contractor (IC) Staff Interviews

Overall, the feedback obtained through the two CLC and IC interviews was positive, and most issues were project specific. During both rounds of CLC and IC interviews, program staff indicated the interface between CLC, the IC, installers, and customers had been smooth. Challenges mentioned in the first interview included the program being behind on forecasted enrollment due to delays in onboarding solar installers, difficulty identifying deed-restricted properties using oil or propane heating sources in the area, and the high co-pay amount for moderate-income participants with non-deed restricted properties. Program staff indicated scalability barriers due to customer hesitancy about fully electrifying their home, and difficulty obtaining appropriate contractors for installation.

The IC managed all contractors, including appliance, solar, battery, and heat pump installers, to streamline communication and coordination between CLC and the various installation contractors. The IC was also responsible for providing information to customers after enrollment while being cautious of overwhelming program participants. Interviewees also noted that each project was custom with unanticipated issues, such as structural limitations, permitting delays, and coordination challenges across multiple technologies, and therefore led to a higher cost per house than was expected. Despite the higher cost per house, the program was able to stay within budget by limiting the number of participants to 55, enabling use of Mass Save HEAT loan financing for non-deed restricted properties, and streamlining implementation.

4.2.2 Heat Pump Installers

The heat pump installers reported positive feedback on working with the IC, with an emphasis on good communication. Heat pump installers reported challenges with long installation timelines due to equipment procurement, long design periods and waiting for other installers to finish their portion of the project. Most heat pump installers interviewed also noted that the CVEO program is too narrowly defined in terms of customer eligibility and system configurations, reporting that some customers want to install a subset of measures without completely electrifying their home. Installers suggest that loosening income and geographic restrictions would help with scalability.

4.2.3 Solar and Battery Installers

The four solar and battery installers reported a generally positive experience with the IC. Solar and battery installers noted that the IC was the main point of contact with customers and noted feeling supported by the offering. The installers also noted that there was a good level of

communication with the IC, and reported that the IC was very responsive when challenges were encountered. When asked to provide information on pain points, solar and battery installers noted that the IC did not use tracking software which created challenges with tracking purchase orders and change orders and confusion over paperwork ownership. Solar and battery installers also cited difficulty coordinating with heat pump installers. Solar and battery installers suggested increasing transparency from the IC around scheduling, expanding offerings to non-profit organizations, improving program advertising by utilizing local sustainability coordinators, and allowing customers to participate in net metering.

4.2.4 Appliance Installer

When interviewed by Guidehouse, the CVEO appliance installer reported generally positive feedback about the program, timelines, and interactions with the IC and other contractors. When asked for feedback on areas for improvement, the appliance installer noted difficulty communicating with customers about installations and suggested that CLC provide a list of approved appliances to make the decision-making process easier for customers. The appliance installer also suggested expanding access to near-participants and previously ineligible customers on Cape Cod, and advertising the program more widely to draw more participation.

4.3 Participant Surveys

Guidehouse administered online surveys to participants to solicit feedback about their motivations for participation and experience with various aspects of CVEO. As described in Appendix B, the majority of respondents reported living in single-family detached homes, with a significant portion having lived in their homes for over 10 years. Most homes were built after 1979, with many constructed in 2000 or later, and about half of the homes are relatively small in size (less than 1,499 square feet). Additionally, a high percentage of respondents have completed some amount of college education.

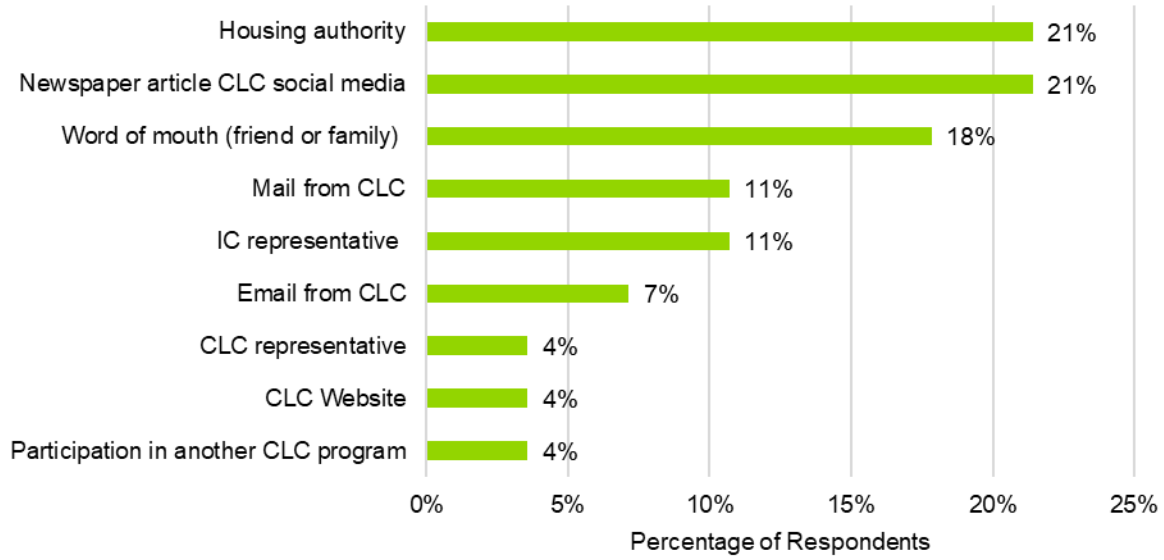
4.3.1 Participant Enrollment Survey

This section summarizes findings from Guidehouse's assessment of the participant enrollment survey, which aimed to research participant's primary motivations to participate in CVEO, enrollment experiences, installation experiences, and their interactions with program staff and representatives.

4.3.1.1 Program Awareness

Guidehouse asked participants and near-participants how they learned about CVEO, if they had an intake call with CLC, and how useful the information provided about CVEO was to understand the benefits of the offering. As shown in Figure 4-1, the relative majority of respondents heard about CVEO through local housing authorities, including Falmouth, Wellfleet, and Island Housing Trust, or from a newspaper article or social media.

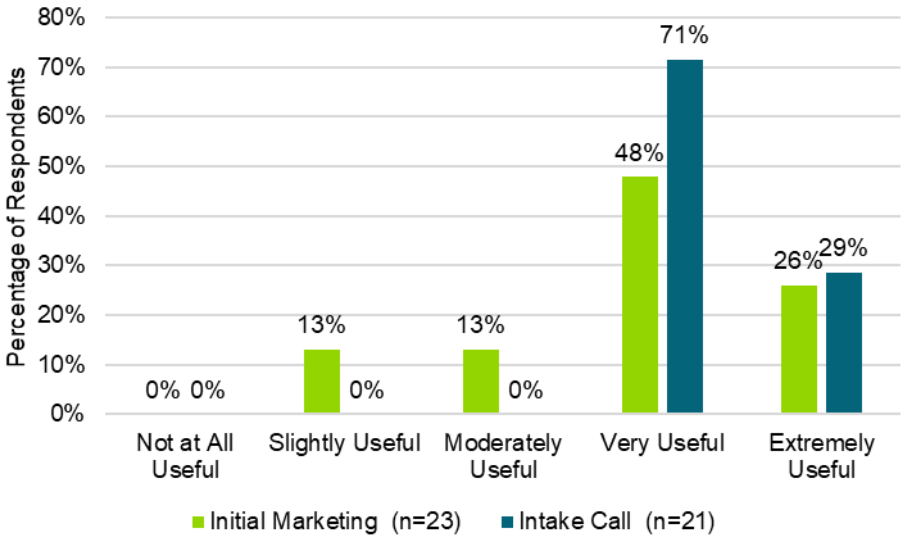
Figure 4-1. How did you hear about CVEO? (n=28)



Note: Percentages may sum to greater than 100% as respondents could select multiple responses.
Source: Guidehouse analysis of combined round one and two enrollment survey data

CLC program staff held intake calls with each prospective participant in the offering, where participants were given an overview of CVEO, including benefits of the offering, eligibility criteria, and a general timeline of when to anticipate the IC to reach out to schedule their initial assessment. Approximately 73% (19) of respondents recalled having an initial conversation with CLC staff to learn more about the program and to determine eligibility. All respondents who recalled having the intake call found the information provided during the call about the overall benefits of the offering to be very or extremely useful, as shown in Figure 4-2. Additionally, most respondents (74%, 17) found the marketing materials to be very or extremely useful in understanding the overall benefits of the offering.

Figure 4-2. How useful was the information provided to you about CVEO in understanding the overall benefits of the offering?



Source: Guidehouse analysis of combined round one and two enrollment survey data

The 26% (6) of respondents who reported the initial marketing or intake call to be moderately or slightly useful were asked what additional information they would have wanted to receive. Their responses included the following:

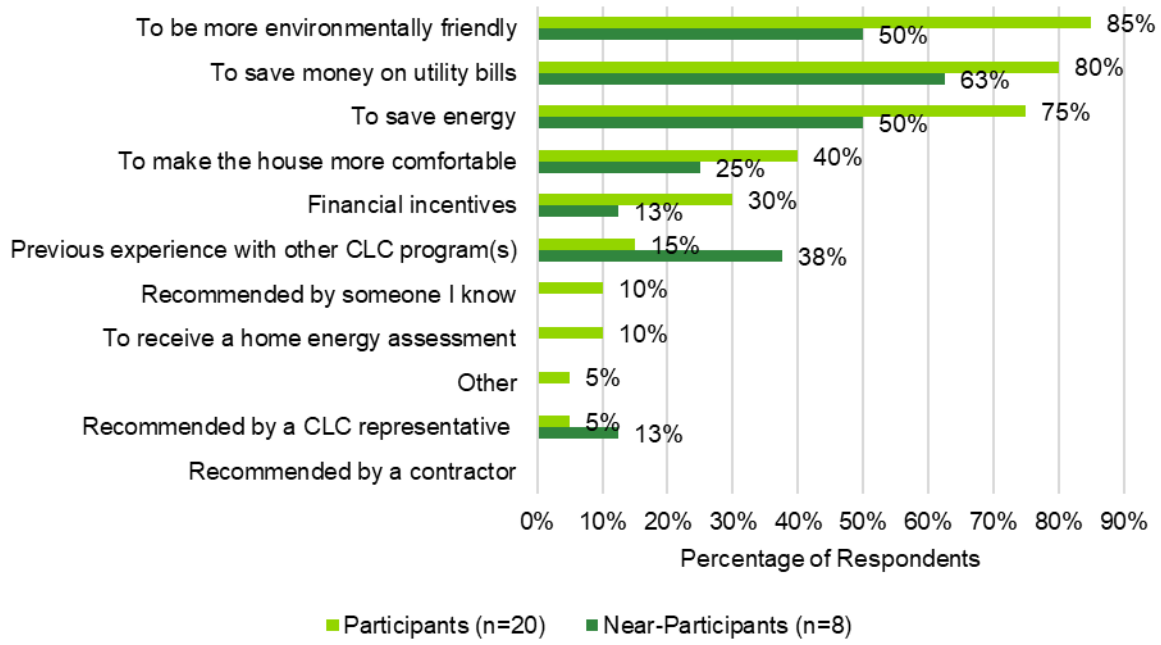
- "Time frame"
- "I never talked to a representative so I really didn't have a lot of information reasonably well explained"
- "That it was not a scam. I was a little weary."
- "I have wanted to know that part of the program was to remove my oil heat all together."
- "A complete plan about what will happen and a timeline."

Based on the feedback received from respondents who reported the initial marketing or intake call to be moderately or slightly useful, CLC may consider providing a brochure with more information on the participation process upon completion of the initial site assessment by the IC. Guidehouse recognizes that each participant site has unique characteristics dictating which types of CVEO equipment may be recommended or feasible for installation. Given the heterogeneity in projects completed in this offering, providing key information that could apply to all projects in the offering should help reduce the administrative burden associated with providing a brochure. Key information that may prove useful to provide includes participation expectations, incentives, typical installation timelines, stakeholders involved, and contact information. Providing this information may help improve participants' ability to recall the details of the offering and anticipate what their experience may be during the installation process.

4.3.1.2 Decision Making

Participants and near-participants were asked what motivated them to participate or consider participation in CVEO as shown in Figure 4-3.

Figure 4-3. What motivated you to participate, or consider participation, in CVEO?



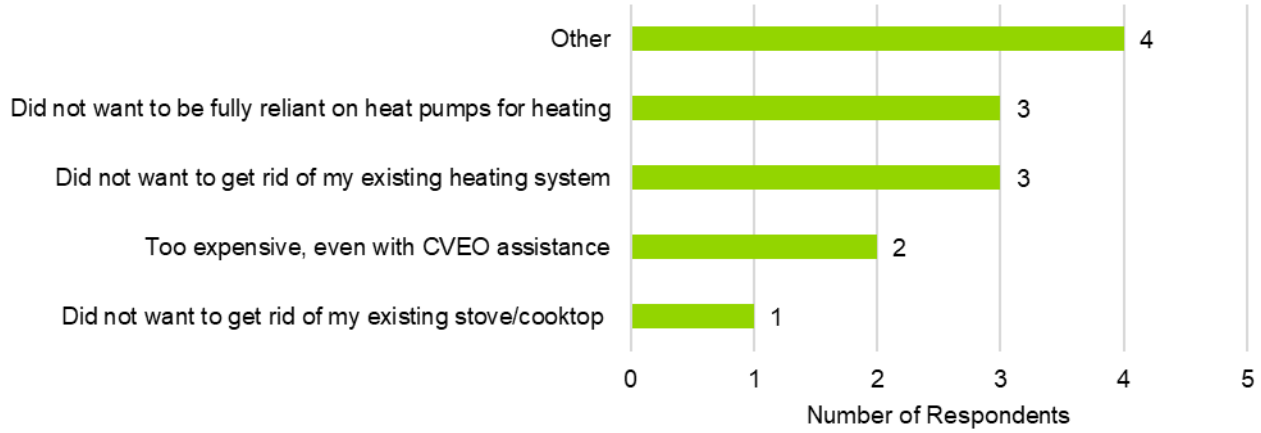
Note: Percentages may sum to greater than 100% as respondents could select multiple responses.
Source: Guidehouse analysis of combined round one and two enrollment survey data

Most participants (85%, 80%, and 75%, respectively) indicated they were motivated to enroll in the offering to be more environmentally friendly, to save money on energy utility bills, and to save energy. These results are consistent with near-participant results, though the primary motivation for near-participants was to save money on utility bills (63%).

Near-participants were then asked what factors contributed to them not continuing with participation, as shown in Figure 4-4, with respondents indicating that they did not want to get rid of their existing equipment, they did not want their home to be fully reliant on heat pumps for heating, and/or that their home characteristics were not appropriate for solar installation. The four "other" responses included the following verbatims:

- "Condo association would have probably not allowed it"
- "I would have had to remove 5 big trees from our yard for the solar to be effective'
- "After solar assessment, it was determined that solar would not cover enough of the energy draw, making my home almost entirely reliant on electric grid usage"
- "We understand that solar panels cannot be installed due to no attic on our post & beam house. We were hoping solar would offset the cost of our electric bill if we relied solely on heat pumps."

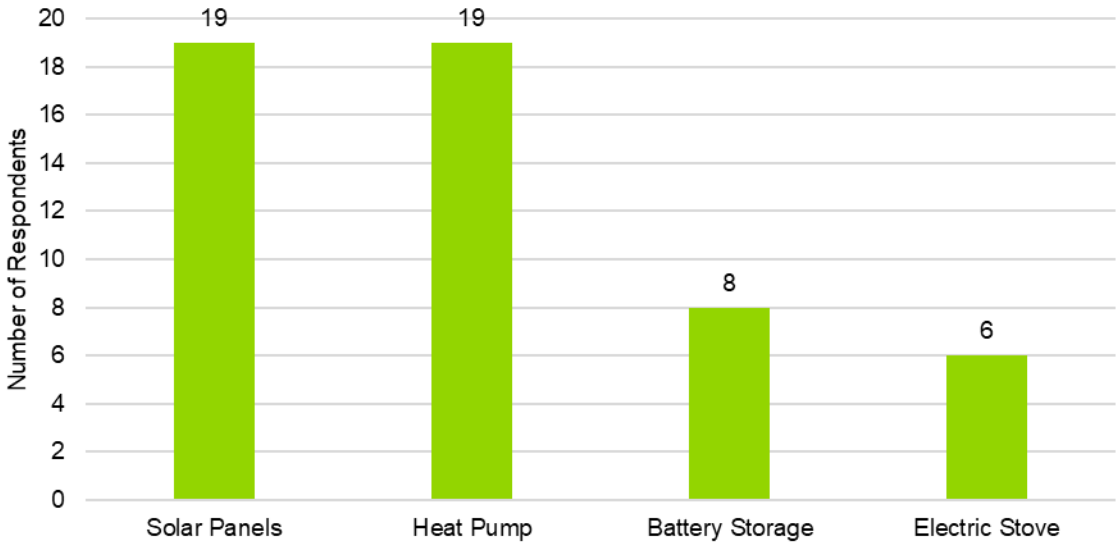
Figure 4-4. What factors contributed to you not continuing with participation in CVEO? (n=8)



Note: Counts may sum to greater than n-value as respondents could select multiple responses.
Source: Guidehouse analysis of combined round one and two enrollment survey data

Participants were asked to self-report which technologies they had installed or are planning to get installed through CVEO (Figure 4-5), with all respondents reporting getting solar panels and heat pumps, and less than half reporting getting battery storage (8) or an electric stove (6). The self-reported results vary slightly from CLC-provided tracking data of installed measures.

Figure 4-5. What technologies will you be getting through CVEO? (n=19)

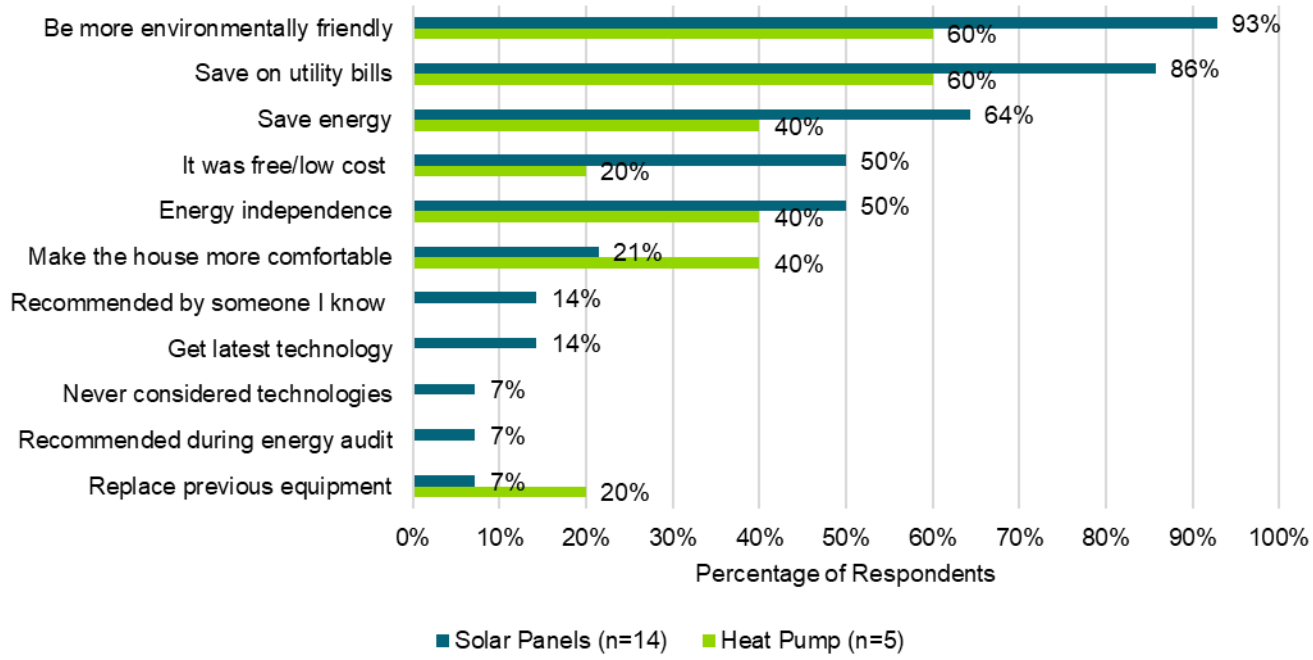


Note: Counts may sum to greater than n-value as respondents could select multiple responses.
Source: Guidehouse analysis of combined round one and two enrollment survey data

Participants were then asked to rank the technologies they had or will be having installed in order of importance. All respondents ranked either solar panels or heat pumps as being the most important technology, with most respondents (14) ranking solar panels first. Five

respondents ranked heat pumps as first. Respondents ranked electric stove followed by battery storage last. When asked why installing the technology was most important to them, most respondents reported a desire to be more environmentally friendly, to save on utility bills, and to save energy, as shown in Figure 4-6, which also aligns with the participation motivation shown in Figure 4-3.

Figure 4-6. Why is installing <equipment> most important to you?



Note: Percentages may sum to greater than 100% as respondents could select multiple responses.
Source: Guidehouse analysis of combined round one and two enrollment survey data

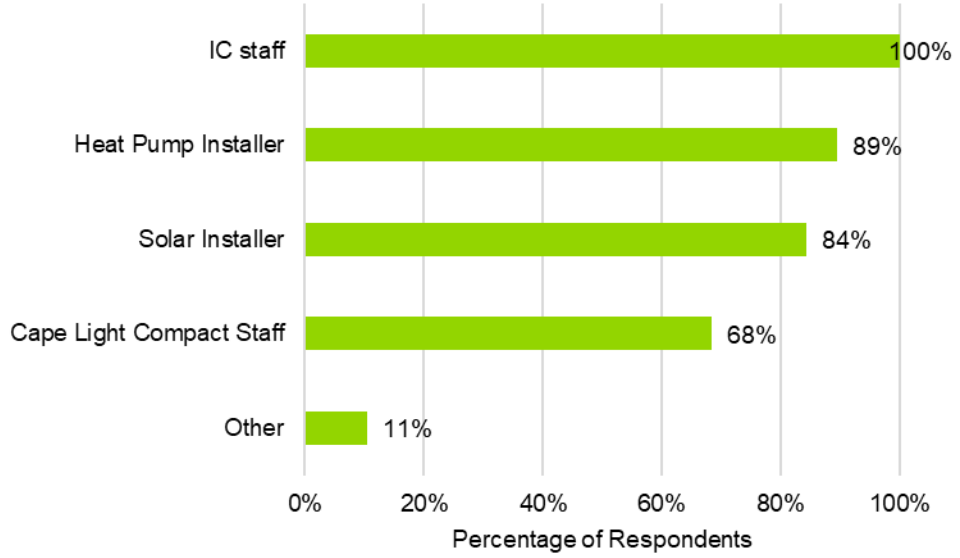
Of the 8 respondents who reported not receiving battery storage as part of CVEO, one respondent reported being informed about their home's feasibility for battery storage and three respondents indicated they were not informed about their home's feasibility and would have wanted to learn more about battery storage and its benefits. The remaining four respondents indicated they did not recall whether they were informed of their home's feasibility for battery storage.

Participants were next asked which of the offered technology upgrades, excluding heat pump installation, that they would have made to their home in the next five years if the CVEO were not available. All respondents either indicated that they did not know, or that they would not have installed any of the technologies offered in the next five years. Specifically regarding replacing their home's primary heating equipment, one respondent indicated that they were already planning on replacing their home's primary heating equipment in the next five years with a heat pump. Most respondents (63%, 12) indicated that they did not install or remove any household appliances or equipment within the 12 months prior to first engaging with CVEO. Those who did install or remove equipment reported installing smart thermostats, room air conditioners, electric dryers, and hot water tanks.

4.3.1.3 Program Experience

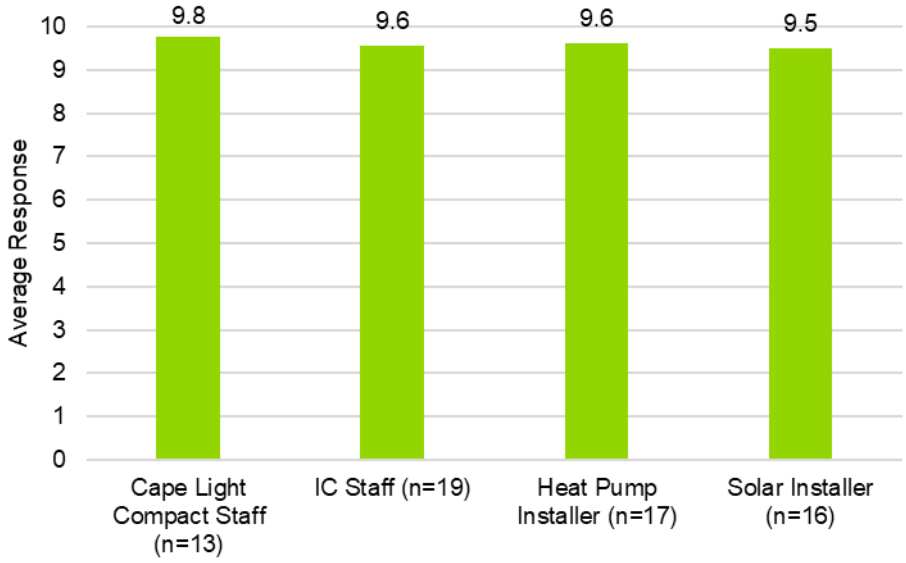
As shown in Figure 4-7, all respondents interacted with the IC staff, and most also interacted with a heat pump installer, solar installer, and CLC staff. Respondents reported an average response of 9.5 out of 10 or higher (Figure 4-8), with zero being extremely negative and 10 being extremely positive, for their experience interacting with CVEO representatives.

Figure 4-7. Which individuals have you interacted with? (n=19)



Note: Percentages may sum to greater than 100% as respondents could select multiple responses.
Source: Guidehouse analysis of combined round one and two enrollment survey data

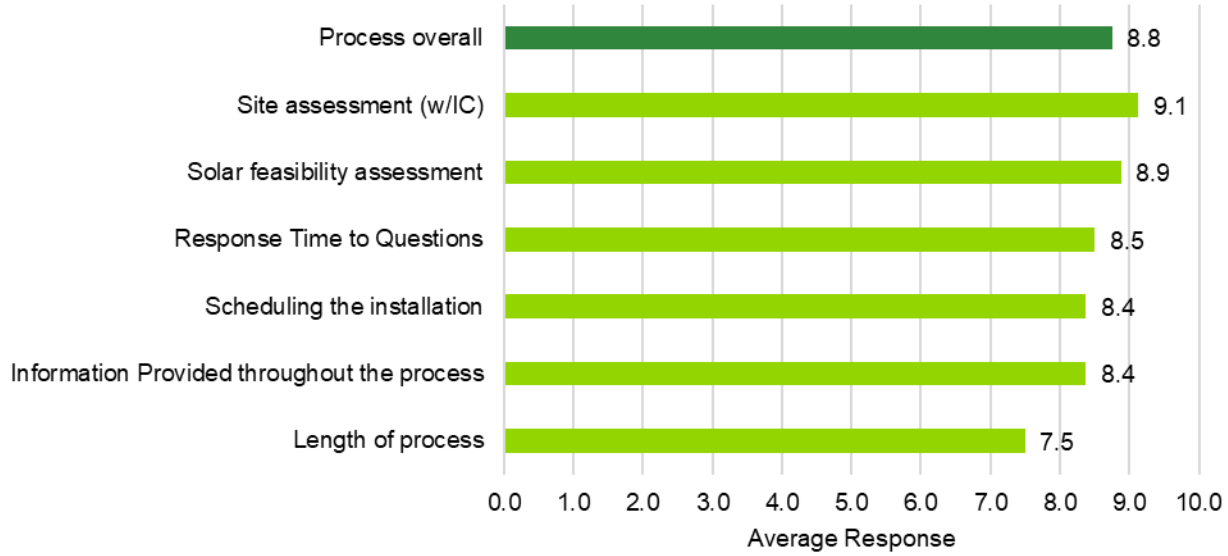
Figure 4-8. How would you rate your experience interacting with the CVEO representative?



Source: Guidehouse analysis of combined round one and two enrollment survey data

Respondents reported an average rating of 7.5 out of 10 or higher for their experience with aspects of the CVEO enrollment process, with 0 being extremely negative and 10 being extremely positive, as shown in Figure 4-9. The site assessment with the IC received the highest average rating of 9.1, and the length of the process received the lowest average rating of 7.5. Respondents cited issues with contractors rescheduling installations and the process being confusing contributing to the lower ratings.

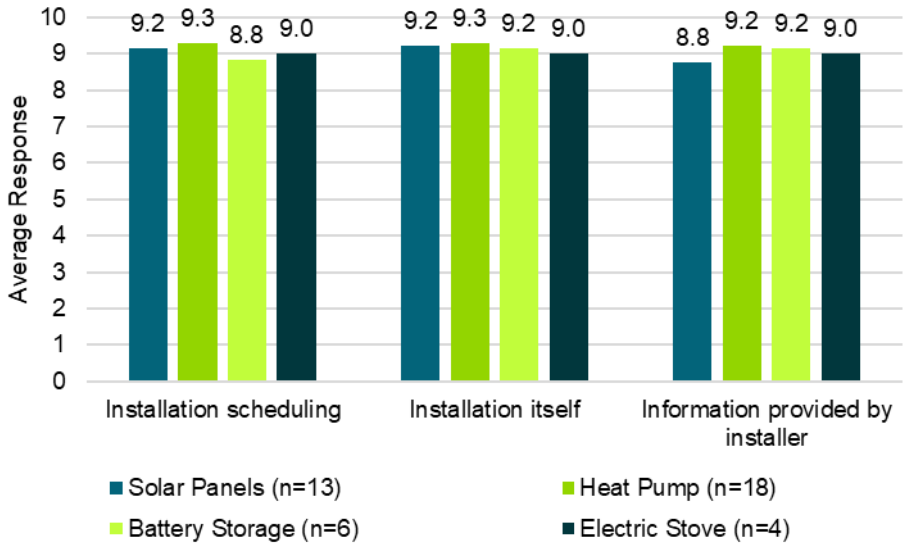
Figure 4-9. How would you rate your experience with various steps of the CVEO enrollment process? (n=16)



Source: Guidehouse analysis of combined round one and two enrollment survey data

Respondents also reported an average rating of their experience with the installation process as an 8.8 out of 10 or above (Figure 4-10), with the installation itself receiving the highest ratings for all installation types. Respondents who rated their experience as a 6 out of 10 or below (n=2) indicated that the contractors left a mess, did not leave behind instructions for newly installed thermostats, and that they were not informed on how to use their new system.

Figure 4-10. How would you rate your experience with the installation process?



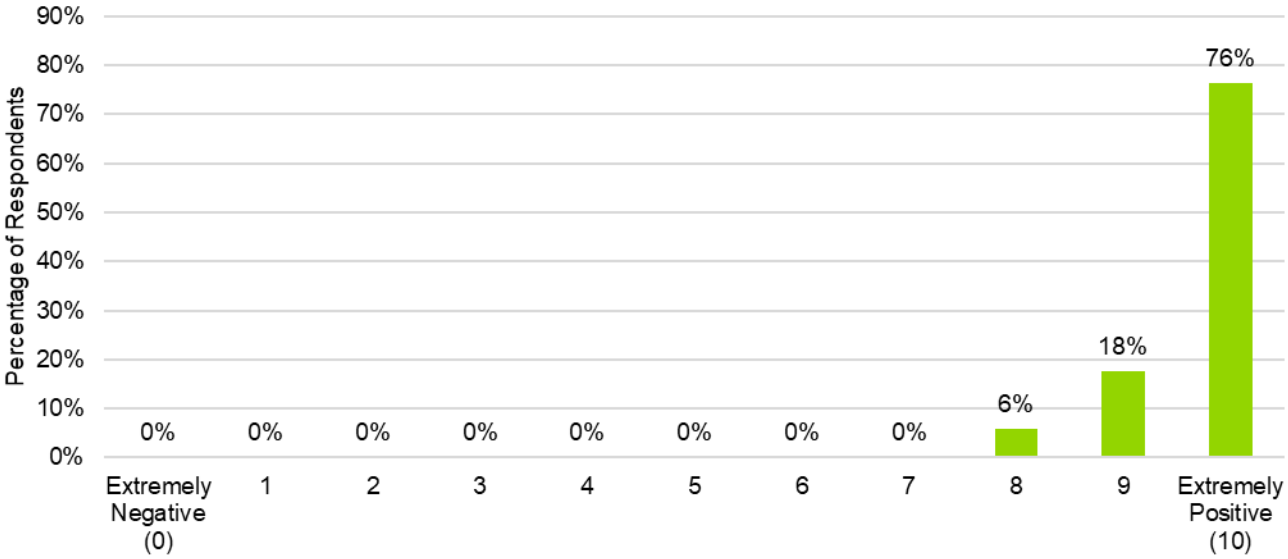
Source: Guidehouse analysis of combined round one and two enrollment survey data

Most respondents (67%, 12) reported that CVEO covered 100% of project costs, while 28% (5) did not know the approximate portion of total project costs the CVEO covered. All respondents reported being satisfied with the amount of the total project cost that was covered by the offering.

4.3.1.4 Program Improvements

All respondents rated their overall satisfaction with CVEO as an 8 out of 10 or higher (Figure 4-11), with 76% (13) of respondents rating their experience as extremely positive.

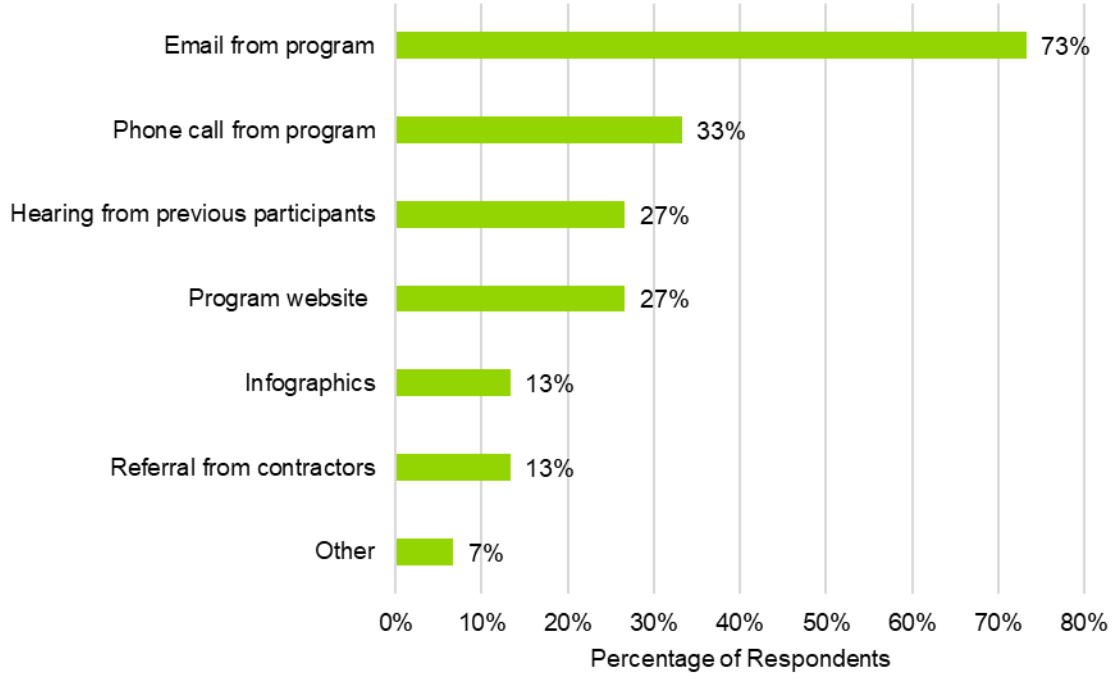
Figure 4-11. How would you rate your overall experience with CVEO to-date? (n=17)



Source: Guidehouse analysis of combined round one and two enrollment survey data

Respondents were asked how they preferred to learn about programs like CVEO, with most respondents (73%, 11) preferring to receive an email from the program as shown in Figure 4-12.

Figure 4-12. How do you prefer to learn about programs like CVEO? (n=15)



Note: Percentages may sum to greater than 100% as respondents could select multiple responses.
Source: Guidehouse analysis of combined round one and two enrollment survey data

Respondents offered the following suggestions for how CLC can more effectively communicate the financial and environmental benefits of CVEO:

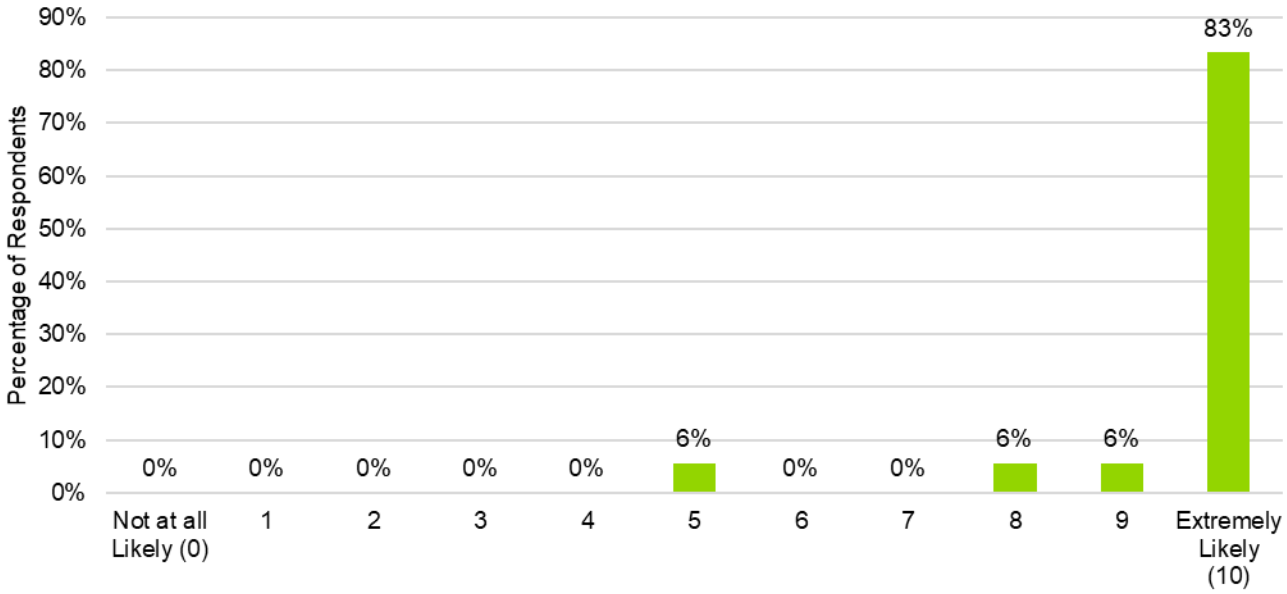
- "Make it very clear for customers"
- "More news articles, maybe with some testimonials from people that have participated"
- "Community informational sessions"

One additional respondent offered the following feedback on and recommendation to improve CVEO:

- "I think having an overall program manager to communicate regularly with the customer would be helpful. My propane was disconnected early on in the process. My panels were installed recently, but my meter has not been connected yet. I have sky high electric bills to pay. I understand that it was necessary to disconnect the propane, I filled out the extensive financial assurance paperwork through South Shore energy assistance and have heard nothing. Also, an electric heater was installed by High Efficiency in the downstairs bathroom. The inspector said it needed to be moved because it is behind the door. Do I call someone? Who? It is an amazing program, I hate to complain. These are minor blips in a fantastic opportunity!"

Most respondents (83%, 15) reported they were extremely likely to recommend the CVEO to a friend or colleague, with an overall net promoter score of 88% (Figure 4-13).

Figure 4-13. How likely is it that you would recommend the CVEO Program to a friend or colleague? (n=18)



Source: Guidehouse analysis of combined round one and two enrollment survey data

4.3.2 Participant Experience Survey

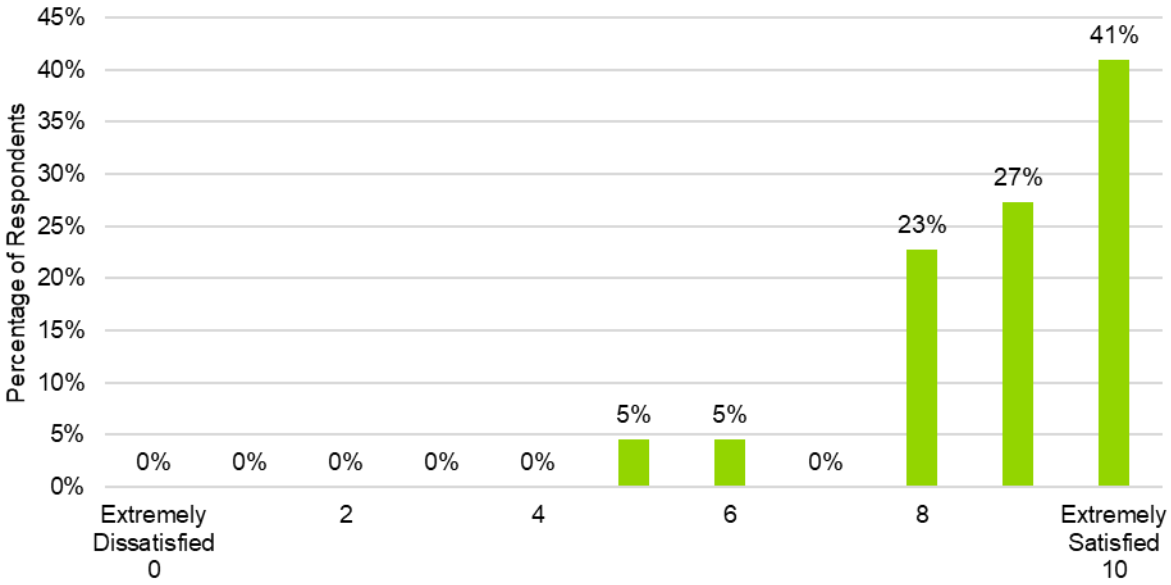
This section summarizes findings from Guidehouse's assessment of the participant experience survey, which aimed to capture information on experience with the installed equipment,

including participation experience relative to expectations, perceived impacts on bills, as well as explore potential non-energy benefits the household may have experienced.

4.3.2.1 Program Satisfaction

Respondents indicated high satisfaction with the CVEO offering overall, with 91% (20) of respondents reporting a satisfaction of 8 out of 10 or higher, as shown in Figure 4-14.

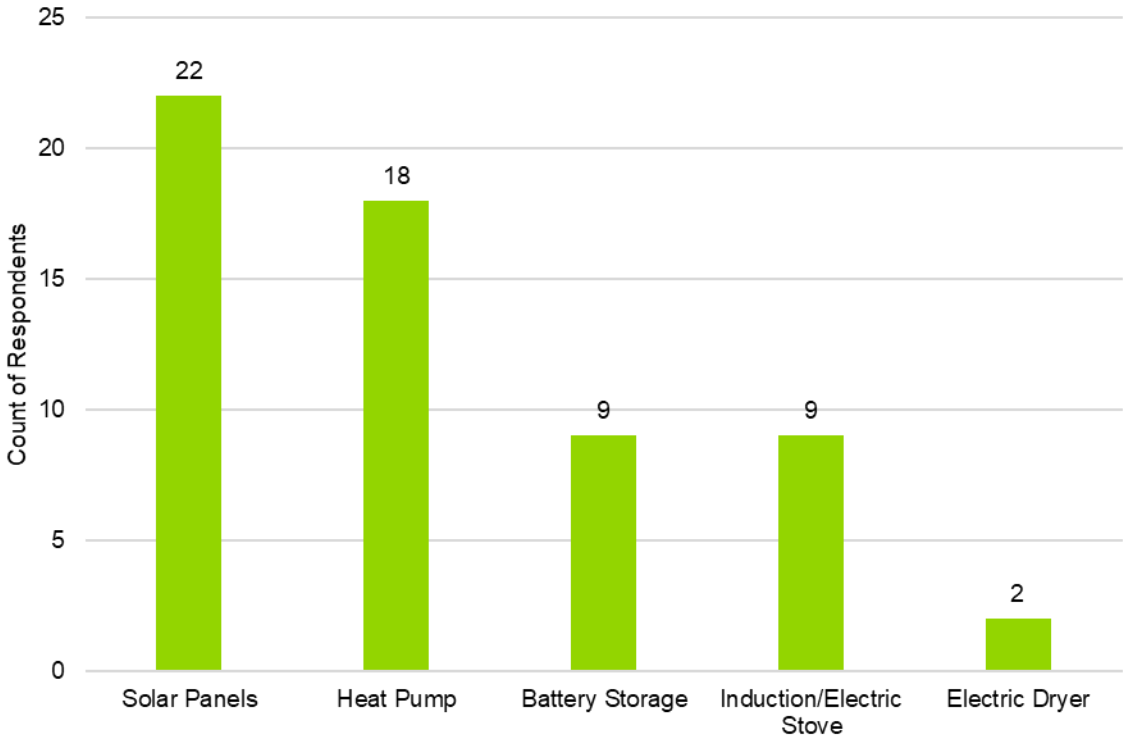
Figure 4-14. What is your satisfaction with Cape Light Compact's Cape and Vineyard Electrification Offering overall? (n=22)



Note: One participant partially completed the survey. Their results are included in this figure.
Source: Guidehouse analysis of survey data

Respondents were asked to self-report which technologies they had installed or are planning to get installed through CVEO (Figure 4-15), with all respondents reporting getting solar panels, most respondents getting heat pumps (18), and less than half reporting getting battery storage (9), an electric stove (9), or an electric dryer (2). The four respondents who did not receive a heat pump had this measure installed in their homes prior to CVEO. The self-reported results vary slightly from CLC-provided tracking data of installed measures.

Figure 4-15. Which equipment did you have installed as part of your participation in the Cape and Vineyard Electrification Offering? (n=22)

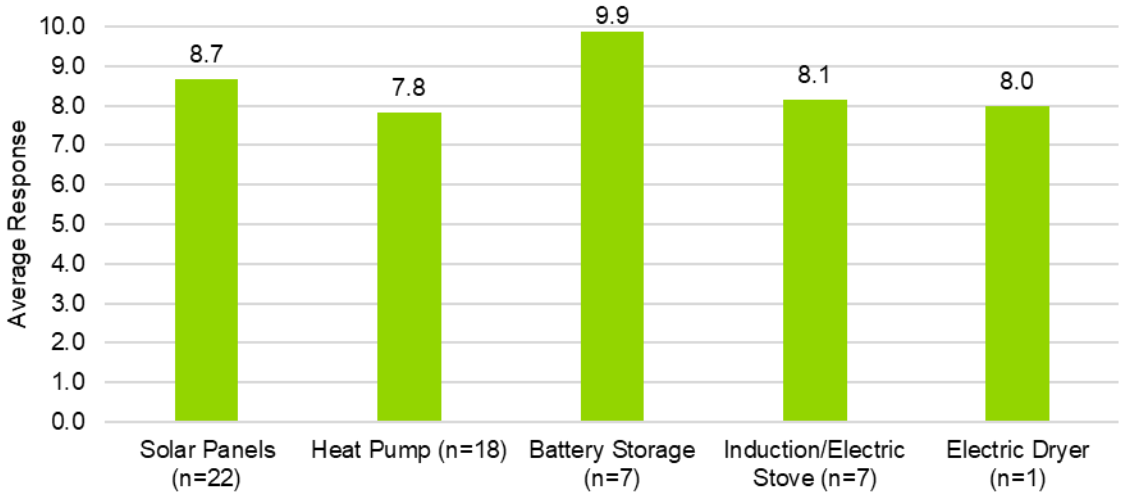


Note: One participant partially completed the survey. Their results are included in this figure. Counts may sum to greater than n-value as respondents could select multiple responses.

Source: Guidehouse analysis of survey data

Satisfaction with all equipment types installed through the CVEO offering is high, with respondents reporting an average satisfaction of 7.8 out of 10 or higher for all equipment (Figure 4-16). Respondents who installed battery storage reported the highest average satisfaction of 9.9 out of 10.

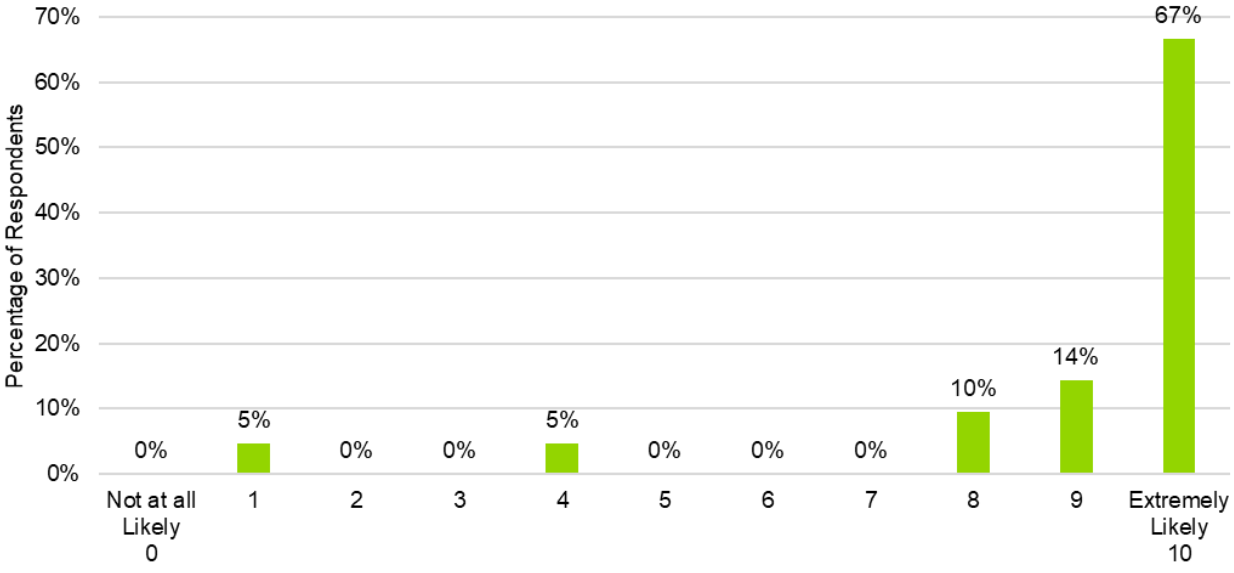
Figure 4-16. How would you rate your satisfaction with the following pieces of equipment installed through the Cape and Vineyard Electrification Offering overall?



Note: One participant partially completed the survey. Their results are included in this figure.
Source: Guidehouse analysis of survey data

Most respondents (67%, 14) are extremely likely to recommend the CVEO offering to a friend or colleague, with an overall net promotor score of 71%, as shown in Figure 4-17.

Figure 4-17. How likely are you to recommend the Cape and Vineyard Electrification Offering to a friend or colleague? (n=21)

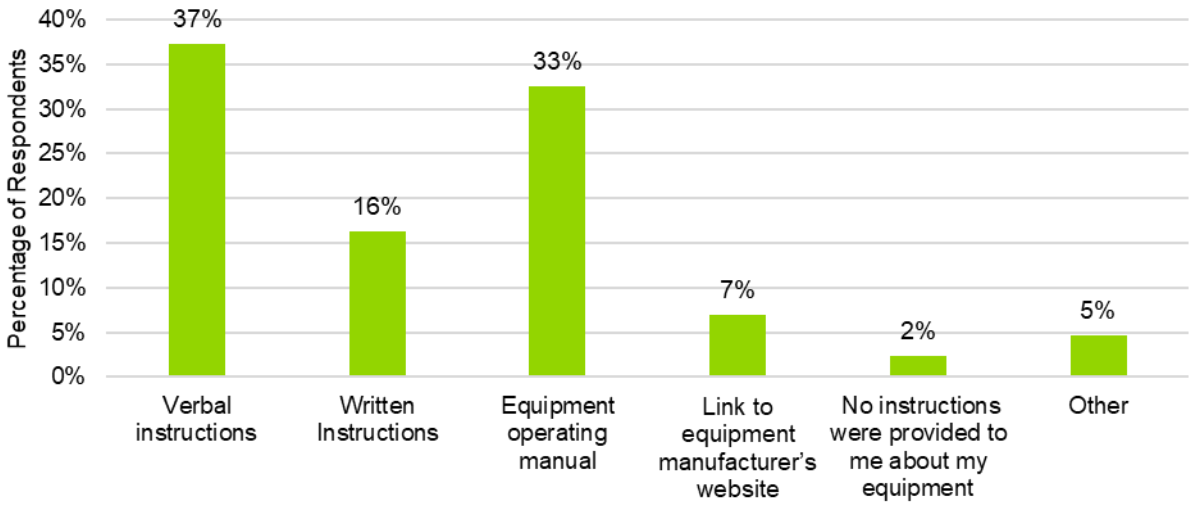


Source: Guidehouse analysis of survey data

4.3.2.2 Equipment and Background Operability

Most respondents (70%, 13) were given verbal instructions and/or an equipment operating manual by the contractors, as shown in Figure 4-18.

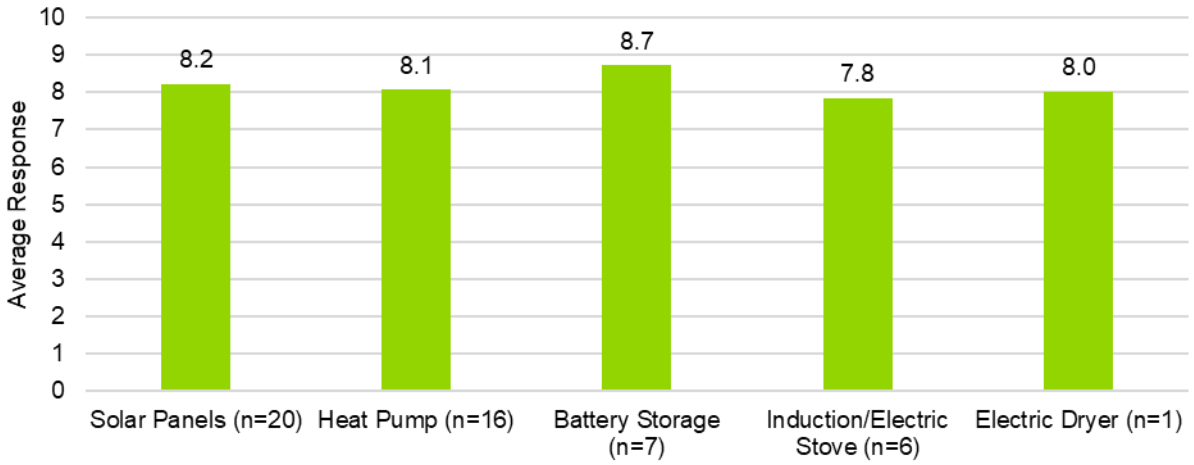
Figure 4-18. What types of instructions were given to you by the contractors on how to operate your newly installed equipment? (n=18)



Note: Percentages may sum to greater than 100% as respondents could select multiple responses.
Source: Guidehouse analysis of survey data

For all equipment types, respondents reported an average quality of instruction given by contractors as a 7.8 out of 10 or above (Figure 4-19). Of the four respondents who rated the quality of instruction given by the contractors below a 6 out of 10, most cited issues with the amount of detail or clarity of the verbal instructions given by the contractors.

Figure 4-19. How would you rate the quality of instruction given by the contractors on how to operate the installed equipment in your home?



Source: Guidehouse analysis of survey data

Most respondents (65%, 13) did not experience any issues with their installed equipment after the initial installation as shown in Figure 4-20. Of the seven respondents that did experience issues, all issues were related to the heat pump equipment and required additional contractor assistance at their home. All (7) respondents who required additional contractor assistance

were satisfied with the assistance they received from the contractors who visited their home to fix the issue.

Figure 4-20. After the initial installation, did you experience any issues with your installed equipment? (n=20)

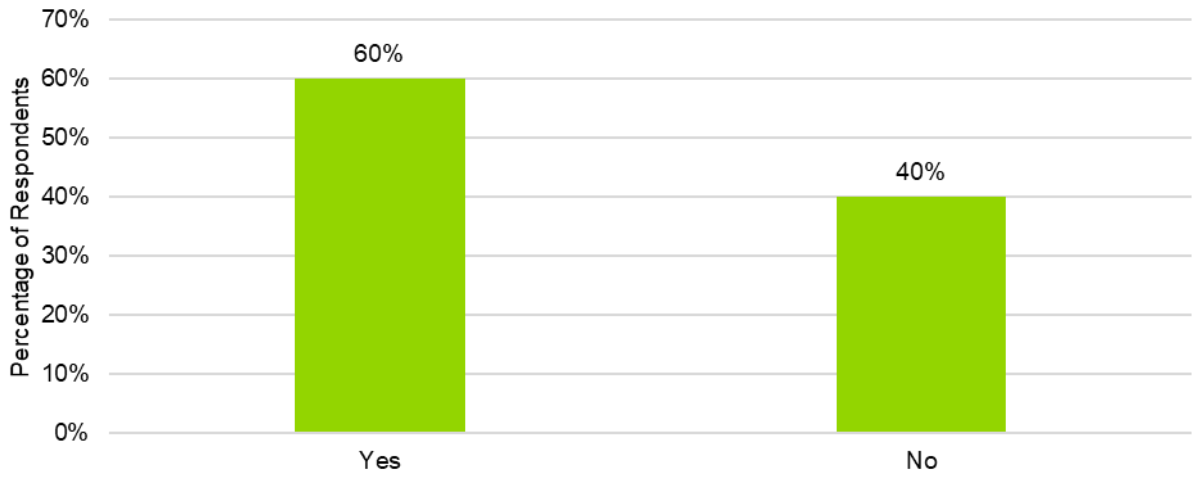
Source: Guidehouse analysis of survey data

Respondents provided the following feedback on issues they experienced:

- "When we turned on the heat in November there was no heat. I needed to call and they came right out to fix something in the attic. I don't remember what the problem was"
- "Noise and vibration"
- "There was water dripping onto the floor in our basement. We were told it was probably condensation from the pipes. Our contractor was going to come out to flush the pipes in a few weeks (before heating season started, he said) but then never came. The problem seems to have resolved, however, we will see once the air conditioning is turned backed on."
- "The water heater was not installed properly and someone had to come out and fix the pump."
- "Someone had to come fix the heating system already as well. I'm nervous this system will require expens[ive] maintenance."
- "It stopped working."
- "[It's not] working properly. When heating, it is not getting to the temperature I set."

While most respondents did not experience additional equipment issues after contractors visited their homes to address issues, two respondents (Figure 4-21) experienced persistent issues with their heat pump. One respondent reported that contractors and/or program staff were not able to get their installed equipment to work as advertised. As of June 2025, CLC and the Implementation Contractor staff have not been made aware of any subsequent active or unresolved issues with equipment among CVEO participants.

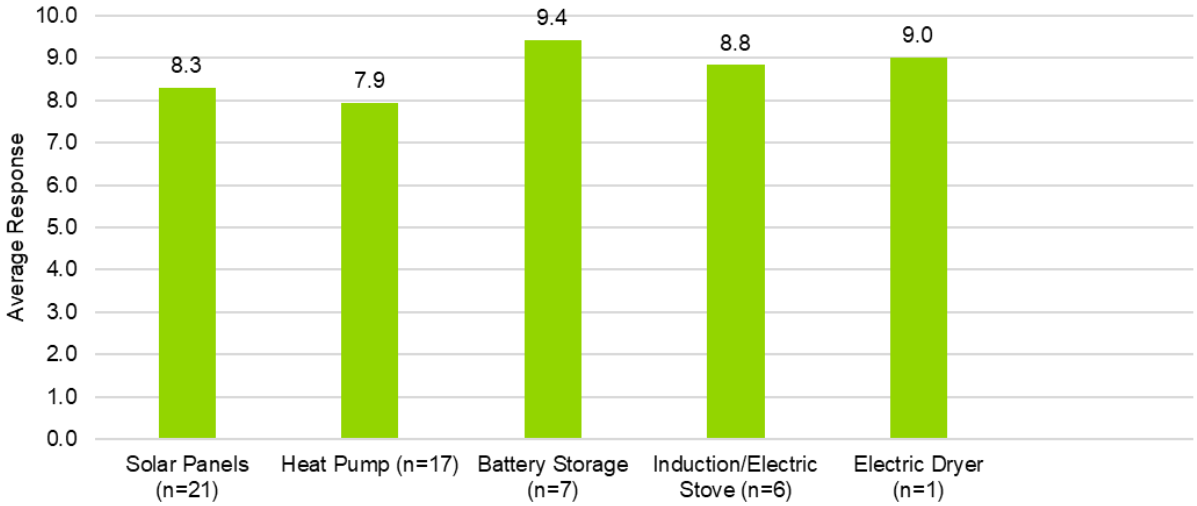
Figure 4-21. After installation and after any additional issues had been addressed by the contractors, did your equipment work as advertised? (n=5)



Source: Guidehouse analysis of survey data

Most respondents (17) for all equipment types reported an ability to operate the installed equipment with ease, with an average response of 7.9 out of 10 or higher, as shown in Figure 4-22. Of the 4 respondents who reported difficulty operating the installed equipment, 2 indicated that they received an adequate amount of support in resolving issues with operating the installed equipment, while another two indicated they did not receive an adequate amount of support from either program staff or the installation contractors in resolving their issues with operating installed equipment. Issues were related to the solar panels and heat pumps. Respondents cited not knowing how the solar panels or heat pumps work, or not understanding the equipment features, as reasons for why their household found it difficult to operate the equipment.

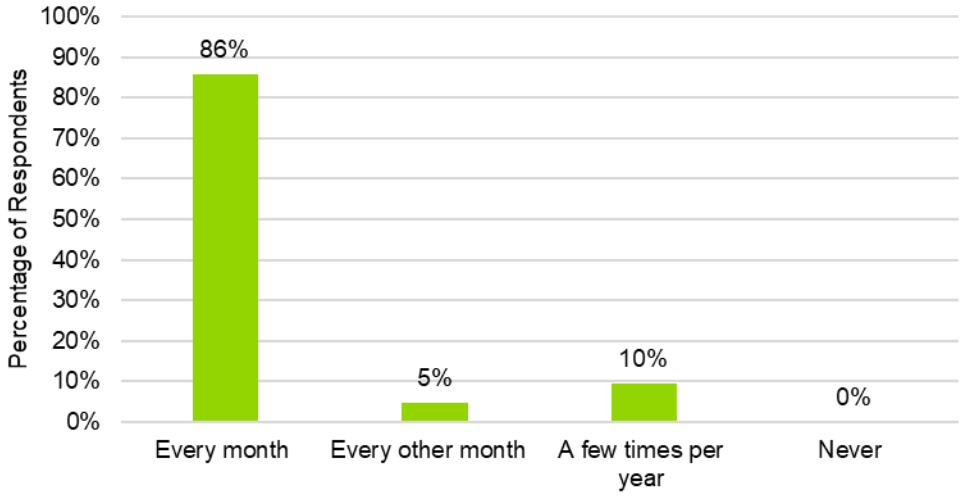
Figure 4-22. How would you rate your household's ability to operate the installed equipment?



Source: Guidehouse analysis of survey data

Respondents were asked to indicate how often they review their energy bills, which include bills for electricity and, prior to CVEO participation, delivered fuels. Most respondents (86%, 18) reported reviewing the details of their energy bill every month (Figure 4-23).

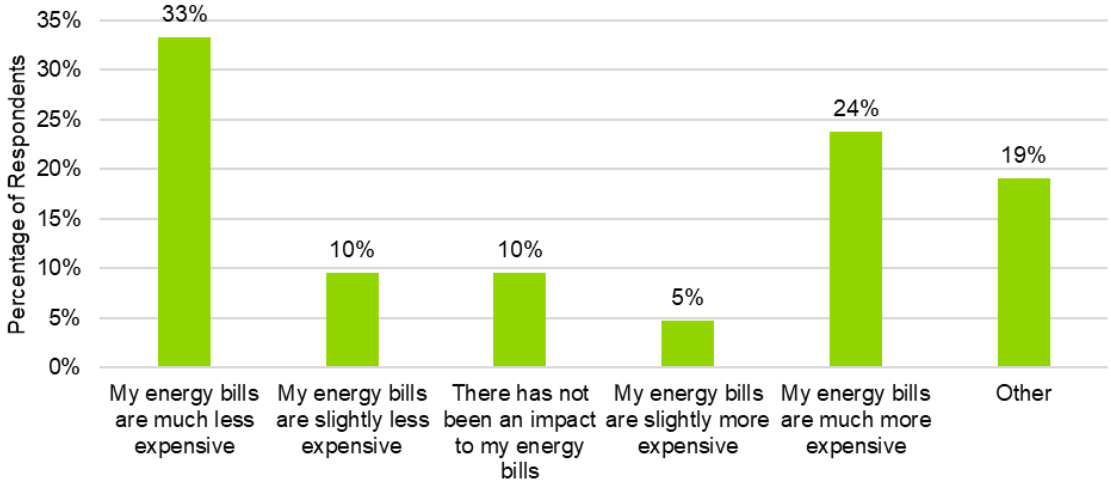
Figure 4-23. On average, how often do you review the details of your energy bills? (n=21)



Source: Guidehouse analysis of survey data

When asked whether their newly installed equipment had impacted their household energy bills, almost half (43%, 9) of respondents reported having lower energy bills, with 33% (7) reporting that their energy bills were substantially less expensive, as shown in Figure 4-24. Of the remaining respondents, 10% (2) reported no change in their energy bills, 5% (1) reported a slightly higher energy bill, and 24% (5) reported that their energy bills were much more expensive.

Figure 4-24. What impact, if any, has your newly installed equipment had on your household energy bills? (n=21)

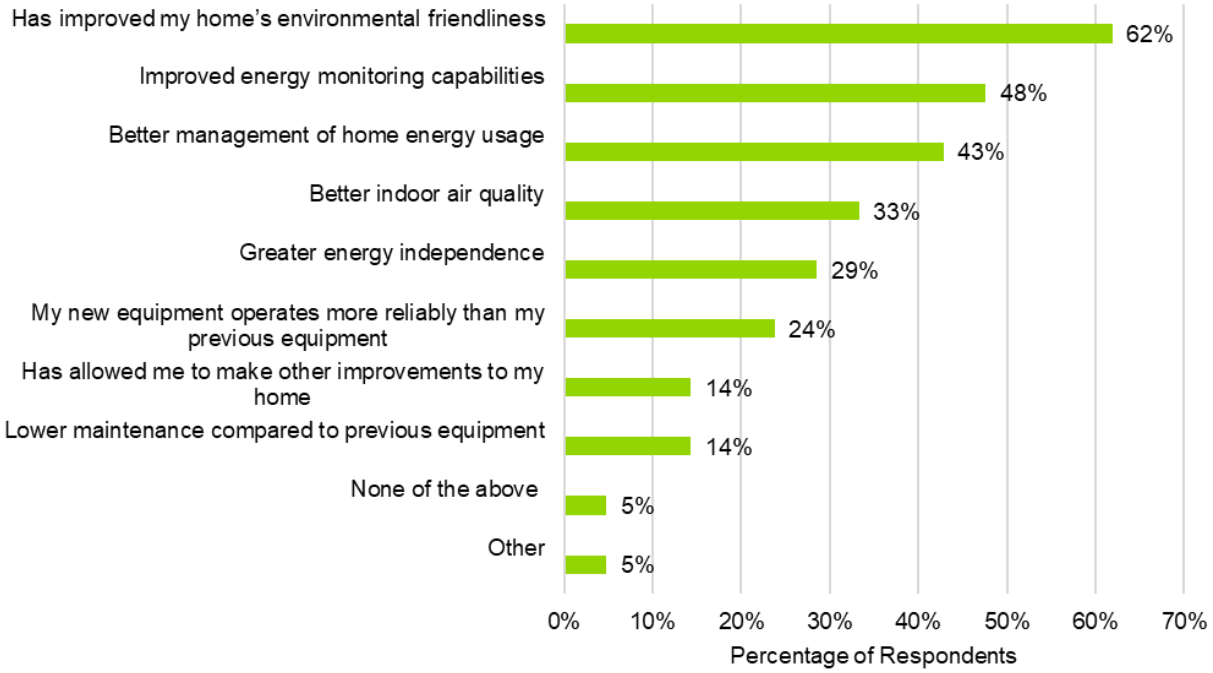


Source: Guidehouse analysis of survey data

Self-reported changes in energy bills may be impacted by the timing of CVEO equipment installation. Most solar PV installations were finalized in Fall 2024, which means that survey respondents could only provide feedback based on a partial year of experience with solar PV. Additionally, due to the timing of these installations, some survey respondents did not experience the benefits of solar generation from May through August when solar insolation is typically at its peak. Guidehouse recommends conducting another survey after Fall 2025 to determine if the participants' perception of energy bills has changed after utilizing their equipment for at least one year.

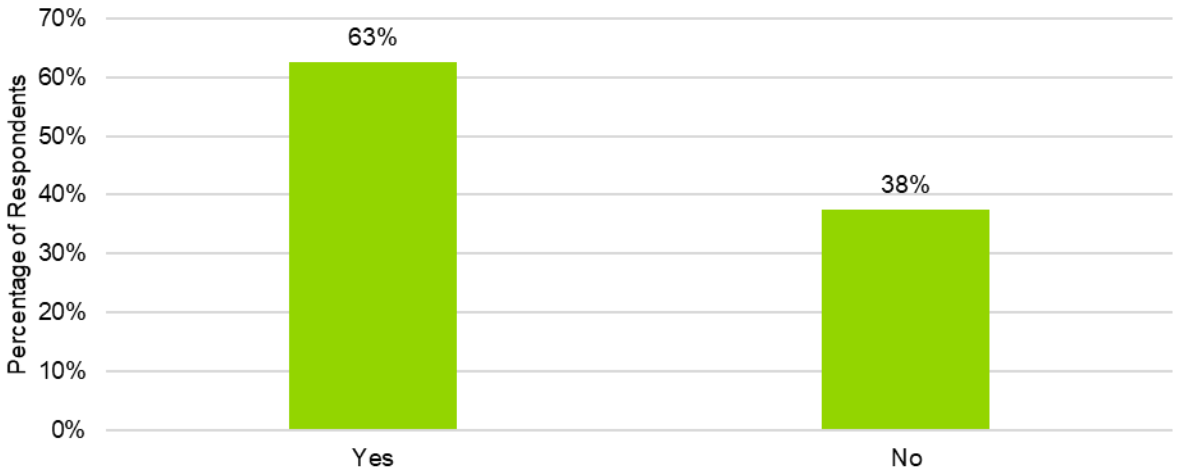
Most respondents (62%, 13) reported experiencing an improvement of their home's environmental friendliness since their new equipment was installed (Figure 4-25), but also thought they would receive additional benefits from the new equipment that they have not seen reflected yet (Figure 4-26), frequently citing lower electric bills.

Figure 4-25. Which of the additional below benefits, if any, have you experienced since your new equipment was installed? (n=21)



Note: Percentages may sum to greater than 100% as respondents could select multiple responses.
Source: Guidehouse analysis of survey data

Figure 4-26. Were there any benefits you thought you would receive from the new equipment that you have not seen reflected in either your energy bills or other home benefits? (n=16)



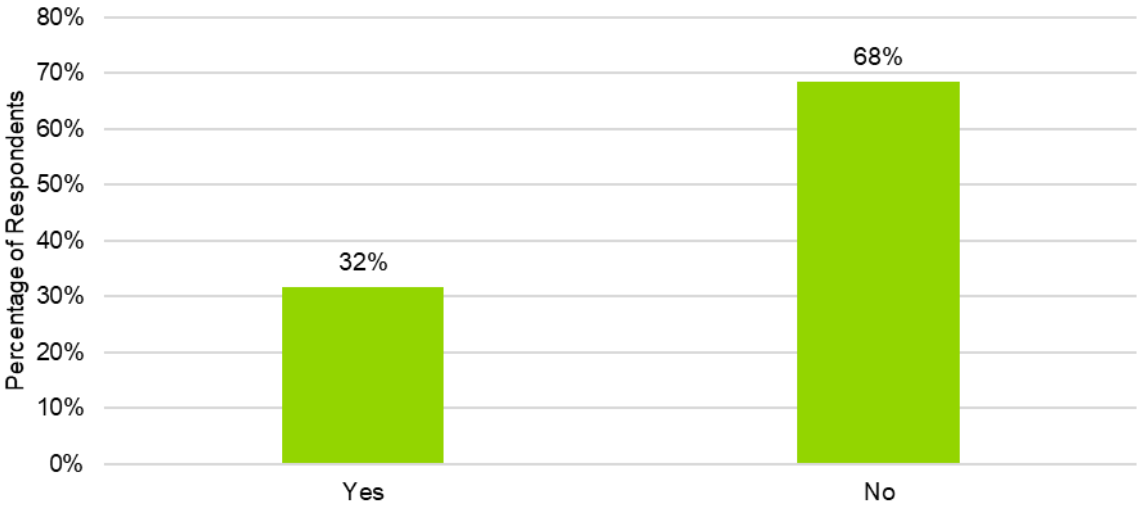
Source: Guidehouse analysis of survey data

Respondents provided the following feedback on additional expected benefits from CVEO:

- "New equipment [has] given my family greater sustainability, allowing 3 generations to live work and contribute to our community"
- "I thought we would be getting a better rate for extra kWh produced"
- "The heating is more efficient"
- "I've been surprised by my high electric bills. I thought that I'd be generating more solar energy."
- "Reduced energy bills"
- "A credit from solar panels, I got nothing"
- "I was under the impression my electric bill would go down not up"
- "I am still hoping to get battery backup system"
- "Have not seen any change in my electric bill yet, but realize there has been little sun."

Most (68%, 13) of respondents did not report any negative impacts of the new equipment (Figure 4-27).

Figure 4-27. Have there been any negative impacts that the new equipment has had on your home? (n=19)



Source: Guidehouse analysis of survey data

Respondents who indicated negative impacts commonly cited increased noise levels or discomfort:

- "I find the fan that is located outside my bedroom to be somewhat loud."
- "I feel as though the heat pumps on our first floor are too much for our small house. They are powerful, which is good, but there is a lot of hot air that is blown down where our couch is in the living room. Also, I don't believe the thermostat in the back room works as the heat pump back there will run continuously even though I have it set at 65 degrees."
- "Higher bills"
- "The hybrid water heater is loud, but I have gotten used to it"
- "My house is colder. There is some ceiling damage"

Respondents provided the following additional feedback about the program:

- "Our electric bill this year has gone way down. And the app that the solar panels came with is great to be able to see how much electricity you generate and use each hour of the day! I love seeing how much we use doing laundry, taking showers, etc."
- "Overall I am very happy with the process, and new equipment. I have recommended the program to friends"
- "I am extremely grateful for the program that I qualified for. In hindsight, I would have paid more attention to what I was signing, more attention to the process and been more verbal with my opinions of where the mini-splits were placed. I wish when I was signing the agreement someone had sat with me and explained what was happening. I am quite disappointed with that part. I feel that because the equipment and labor was at no cost to me, I wasn't fully informed on what I was agreeing to."
- "Good impact, but it was an adjustment to the "feel" of the heat pump air heating i.e. Dry, and drafty. We had forced hot water before."
- "I really appreciate the work was done on my home. Each of the workers was hardworking, efficient, and pleasant. I wish I was given some kind of an outline that

showed each of the steps that would be done. At times it was confusing to keep straight what was happening next, and who was responsible for that part of the project."
- "I really like the heat and the cooling that the air pumps provide."

4.4 Assessment of Bill Impacts and Excess Generation

This section provides findings from Guidehouse's assessment of customer bill impacts and excess generation attributable to participation in CVEO and is divided into the following sections:

1. **Consumption Data Analysis.** This section provides detailed findings from an assessment of gross and net electric consumption, delivered fuel consumption, and solar generation prior to and after receiving equipment through CVEO.

2. **Billing Data Analysis.** This section provides detailed findings from an assessment of gross and net bill impacts, delivered fuel bill impacts, and solar generation credits prior to and after receiving equipment through CVEO.

4.4.1 Consumption Data Analysis

This section summarizes findings from Guidehouse's assessment of consumption and solar generation data for CVEO participants. Pre-installation and post-installation consumption patterns are presented in separate subsections, followed by a discussion of consumption impacts post-installation of all CVEO equipment.

4.4.1.1 Pre-Installation Consumption Data Analysis

Table 4-1 shows pre-installation gross and net electric consumption and solar generation for CVEO participants. During the pre-installation period, gross electric and net electric consumption were equal, as customer sites did not yet include solar generation. Examining electric consumption patterns, average usage was highest during the winter months, followed by the spring and fall. On average, participants consumed 551 kWh per month, or 6,609 kWh of electricity per year, prior to CVEO participation.

Table 4-1. Pre-Installation Observed Electric Consumption and Generation

	Spring Average Monthly (kWh)	Summer Average Monthly (kWh)	Fall Average Monthly (kWh)	Winter Average Monthly (kWh)	Annual Average Monthly (kWh)	Annual Average Total (kWh)
Gross Electric Consumption	567	500	567	573	551	6,609
Total Solar Generation	0	0	0	0	0	0
Net Electric Consumption	**567**	**500**	**567**	**573**	**551**	**6,609**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-2 shows the weather-normalized pre-installation gross and net electric consumption and solar generation for CVEO participants. After weather-normalizing pre-installation consumption data using the methodology summarized in Appendix A, electric consumption changed minimally across the spring, fall, and winter seasons relative to observed electric consumption. Weather-normalized summer electric consumption was slightly higher (around 5%) relative to observed consumption. Across the pre-installation period, weather-normalization increased average annual electric consumption slightly (0.8%) from 6,609 to 6,664 kWh per participant.

Table 4-2. Pre-Installation Weather-Normalized Electric Consumption and Generation

	Spring Average Monthly (kWh)	Summer Average Monthly (kWh)	Fall Average Monthly (kWh)	Winter Average Monthly (kWh)	Annual Average Monthly (kWh)	Annual Average Total (kWh)
Gross Electric Consumption	561	526	561	578	555	6,664
Total Solar Generation	0	0	0	0	0	0
Net Electric Consumption	**561**	**526**	**561**	**578**	**555**	**6,664**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-3 and Table 4-4 present average observed and weather-normalized delivered fuel consumption (propane and oil, respectively) prior to participation in CVEO. Observed and weather-normalized delivered fuel consumption are similar, with weather-normalization increasing pre-installation propane consumption by 0.2% and pre-installation oil consumption by 1.4% relative to observed consumption. On average, delivered fuel consumption was greatest during the winter months, followed by the spring and fall shoulder months. This reflects the participants' use of delivered fuel for home heating energy consumption prior to electrifying their home heating.

Table 4-3. Pre-Installation Propane Consumption

	Spring Average Monthly	Summer Average Monthly	Fall Average Monthly	Winter Average Monthly	Annual Average Monthly	Annual Average Total
Observed Gallons	26	18	26	45	28	340
Weather-Normalized Gallons	26	18	26	44	28	341

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-4. Pre-Installation Oil Consumption

	Spring Average Monthly	Summer Average Monthly	Fall Average Monthly	Winter Average Monthly	Annual Average Monthly	Annual Average Total
Observed Gallons	40	21	40	40	35	423
Weather-Normalized Gallons	39	20	39	45	36	429

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

4.4.1.2 Post-Installation Consumption Data Analysis

Table 4-5 shows average observed post-installation gross and net electric consumption and solar generation for CVEO participants. Average monthly gross electric consumption during the winter months is more than double that of the spring, summer, and fall months, consistent with electrification of home heating through the offering. Total solar generation is highest during the summer and shoulder months, offsetting a substantial portion of home electric consumption. Participants realize the largest offset during the summer months, where average total solar generation of 1,030 kWh per participant per month yields excess solar generation of 379 kWh per participant per month.

Table 4-5. Post-Installation Observed Electric Consumption and Generation

	Spring Average Monthly (kWh)	Summer Average Monthly (kWh)	Fall Average Monthly (kWh)	Winter Average Monthly (kWh)	Annual Average Monthly (kWh)	Annual Average Total (kWh)
Gross Electric Consumption	703	651	703	1,423	868	10,420
Total Solar Generation	626	1,030	626	291	642	7,703
Net Electric Consumption	**78**	**-379**	**78**	**1,132**	**226**	**2,717**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-6 shows the weather-normalized post-installation gross and net electric consumption and solar generation for CVEO participants. Relative to observed gross electric consumption, weather-normalized consumption is lower during the summer and winter months and slightly higher during the spring and fall months. Corresponding to the reduction in gross electric consumption during the summer months, excess solar generation increased for the summer months from 379 kWh to 476 kWh per participant per month. Across the post-installation, weather-normalization decreased average annual electric consumption slightly (0.6%) from 2,717 kWh to 2,702 kWh per participant. Weather normalization had different impacts on average annual usage during the pre-installation (increased) and post-installation (decreased) periods because those were two different time frames (2022 and 2024, respectively).

Table 4-6. Post-Installation Weather-Normalized Electric Consumption and Generation

	Spring Average Monthly (kWh)	Summer Average Monthly (kWh)	Fall Average Monthly (kWh)	Winter Average Monthly (kWh)	Annual Average Monthly (kWh)	Annual Average Total (kWh)
Gross Electric Consumption	790	554	790	1,341	867	10,406
Total Solar Generation	626	1,030	626	291	642	7,703
Net Electric Consumption	**165**	**-476**	**165**	**1,050**	**225**	**2,702**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

CVEO fully electrified participating homes, as participants are required to have all fossil fuel equipment, including heating systems, stoves, dryers, and water heaters, removed from their homes as a part of participating in the offering. As such, after removal of existing applicable equipment and installation of all CVEO equipment, delivered fuel energy consumption falls to zero. Therefore, post-installation delivered fuel consumption (oil and propane) is not presented separately.

4.4.1.3 Consumption Impact Analysis

Table 4-7 below compares pre-installation and post-installation weather-normalized gross electric consumption after participants received all CVEO equipment. Average monthly gross electric consumption increased across all four seasons post-installation, with the largest increases in consumption observed during the winter months, reflecting the electrification of home heating across participating homes. Across the year, weather-normalized gross electric consumption increased by approximately 56% from a total of around 6,664 kWh to 10,406 kWh per participant per year.

Table 4-7. Change in Weather-Normalized Gross Electric Consumption

	Spring Average Monthly (kWh)	Summer Average Monthly (kWh)	Fall Average Monthly (kWh)	Winter Average Monthly (kWh)	Annual Average Monthly (kWh)	Annual Average Total (kWh)
Pre-Installation	561	526	561	578	555	6,664
Post-Installation	790	554	790	1,341	867	10,406
Change	**230**	**27**	**230**	**763**	**312**	**3,742**
Change (%)	**41%**	**5.2%**	**41%**	**132%**	**56%**	**56%**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.
Source: Guidehouse analysis

Table 4-8 presents the average change in net electric consumption across participant homes. While Table 4-7 indicates that there was an increase in gross electric consumption across all four seasons after CVEO equipment was installed, solar electric generation at participant homes was sufficient to offset a sizeable portion of this increase. Net electric consumption, on average, decreased across the spring, summer, and fall months while increasing across the winter months relative to the pre-installation period. The largest reductions in net electric consumption occurred in the summer months, reflecting high solar insolation and average excess generation of 476 kWh per participant per month. Across the entire summer period, average total excess generation totals to approximately 1,892 kWh per participating home. Across the year, weather-normalized total net electric consumption fell by 59% relative to the pre-installation period, dropping from approximately 6,664 kWh to 2,702 kWh per participant per year.

Table 4-8. Change in Weather-Normalized Net Electric Consumption

	Spring Average Monthly (kWh)	Summer Average Monthly (kWh)	Fall Average Monthly (kWh)	Winter Average Monthly (kWh)	Annual Average Monthly (kWh)	Annual Average Total (kWh)
Pre-Installation	561	526	561	578	555	6,664
Post-Installation	165	-476	165	1,050	225	2,702
Change	**-396**	**-1,003**	**-396**	**472**	**-330**	**-3,961**
Change (%)	**-71%**	**-191%**	**-71%**	**82%**	**-59%**	**-59%**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.
Source: Guidehouse analysis

Table 4-9 and Table 4-10 present the average change in weather-normalized propane and oil consumption for CVEO participants after receiving all CVEO equipment. As cited previously, CVEO fully electrified participating homes, with all fossil fuel equipment, including heating systems, stoves, dryers, and water heaters, removed from homes through the offering. As such, after removal of existing fossil fuel equipment and installation of all CVEO equipment, delivered fuel energy consumption falls to zero. Therefore, propane and oil consumption are presented as being removed entirely, dropping by 100% post-installation.

Table 4-9. Change in Weather-Normalized Propane Consumption

	Spring Average Monthly (Gallons)	Summer Average Monthly (Gallons)	Fall Average Monthly (Gallons)	Winter Average Monthly (Gallons)	Annual Average Monthly (Gallons)	Annual Average Total (Gallons)
Pre-Installation	26	18	26	44	28	341
Post-Installation	0	0	0	0	0	0
Change	**-26**	**-18**	**-26**	**-44**	**-28**	**-341**
Change (%)	**-100%**	**-100%**	**-100%**	**-100%**	**-100%**	**-100%**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.
Source: Guidehouse analysis

Table 4-10. Change in Weather-Normalized Oil Consumption

	Spring Average Monthly (Gallons)	Summer Average Monthly (Gallons)	Fall Average Monthly (Gallons)	Winter Average Monthly (Gallons)	Annual Average Monthly (Gallons)	Annual Average Total (Gallons)
Pre-Installation	39	20	39	45	36	429
Post-Installation	0	0	0	0	0	0
Change	**-39**	**-20**	**-39**	**-45**	**-36**	**-429**
Change (%)	**-100%**	**-100%**	**-100%**	**-100%**	**-100%**	**-100%**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

4.4.2 Billing Data Analysis

This section summarizes findings from the assessment of participant expenditures on home electric consumption and delivered fuel consumption, as well as participant compensation for excess solar generation. As outlined in Section 3.3.3, Guidehouse estimated bills using observed consumption data, electric rate data, and delivered fuel cost data. Information for the pre-installation and post-installation period are presented in separate subsections, followed comparison of the two periods and a discussion of bill impacts.

4.4.2.1 Pre-Installation Billing Data Analysis

Table 4-11 presents average observed gross and net electric bills and excess solar generation credits for CVEO participants during the pre-installation period. Similar to pre-installation gross and net electric consumption, pre-installation gross and net electric bills are equivalent, as no participants had solar generation at their homes. On average, customer electric bills were highest during the winter and shoulder months and lowest during the summer months, consistent with gross and net electric consumption trends observed during the pre-installation period. Across the year, CVEO participants paid an average of approximately $154 per month, or $1,844 per year, for electricity.

Table 4-11. Pre-Installation Observed Electric Bills by Season

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Gross Electric Bill	$156	$143	$156	$161	$154	$1,844
Excess Solar Generation Credit	$0	$0	$0	$0	$0	$0
Net Electric Bill	**$156**	**$143**	**$156**	**$161**	**$154**	**$1,844**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-12 presents average weather-normalized gross and net electric bills and excess solar generation credits for CVEO participants during the pre-installation period. There are minimal differences between observed and weather-normalized bills across all seasons, reflective of the minimal changes between observed and weather-normalized usage during the pre-installation period. Across the pre-installation period, CVEO participants had average weather-normalized electric bills totaling to approximately $155 per month, or $1,858 per year.

Table 4-12. Pre-Installation Weather-Normalized Electric Bills by Season

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Gross Electric Bill	$154	$150	$154	$162	$155	$1,858
Excess Solar Generation Credit	$0	$0	$0	$0	$0	$0
Net Electric Bill	**$154**	**$150**	**$154**	**$162**	**$155**	**$1,858**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-13 and Table 4-14 summarize average observed and weather-normalized delivered fuel bills for propane and oil. Weather-normalization of delivered fuel consumption had minimal impacts on delivered fuel bills. Bills were generally highest during the winter months, reflecting the delivered fuel consumption associated with fossil fuel heating equipment at participant homes during the pre-installation period. Participants with propane had a weather-normalized bill of approximately $1,020 per year per participant,[7] while those with oil had a weather-normalized bill of approximately $1,801 per year per participant.

[7] Delivered fuel bill amounts presented do not include tank or equipment rental fees, which were incurred by three customers with propane for a total of $225.75 per year, on average.

Table 4-13. Pre-Installation Propane Bills*

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Observed Bill	$83	$57	$83	$147	$92	$1,105
Weather-Normalized Bill	$79	$53	$79	$129	$85	$1,020

* Delivered fuel bill amounts presented do not include tank or equipment rental fees, which were incurred by three customers with propane for a total of $225.75 per year, on average.

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-14. Pre-Installation Oil Bills*

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Observed Bill	$168	$84	$168	$166	$146	$1,752
Weather-Normalized Bill	$165	$84	$165	$188	$150	$1,801

* Customers with delivered oil did not have tank or equipment rental fees, which were incurred by three customers with propane for a total of $225.75 per year, on average.

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-15 shows the average pre-installation weather-normalized overall energy bill, calculated as the summation of the average pre-installation weather-normalized net electric bill (Table 4-12) and the weighted average pre-installation weather-normalized delivered fuel bill (Table 4-13 and Table 4-14).[8] Prior to CVEO participation, participants paid an average of $255 per month on energy bills, totaling to $3,060 per year, with the highest amount paid during the winter months.

[8] Guidehouse calculated the weighted average fuel bills by weighting average propane and average oil bills according to the number of customers receiving each type of fuel.

Table 4-15. Pre-Installation Weather-Normalized Overall Energy Bill

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Net Electric Bill	$154	$150	$154	$162	$155	$1,858
Delivered Fuel Bill*	$99	$60	$99	$142	$100	$1,202
Total	**$253**	**$211**	**$253**	**$305**	**$255**	**$3,060**

* Pre-installation delivered fuel bill and delivered fuel bill reductions presented are the weighted average of propane and oil pre-installation bills. Guidehouse calculated the weighted average fuel bills by weighting average propane and average oil bills according to the number of customers receiving each type of fuel.

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

4.4.2.2 Post-Installation Billing Data Analysis

Table 4-16 shows the post-installation observed gross and net electric bills and excess generation credits for CVEO participants.[9] Average monthly gross electric bills during the winter months are more than double that of the spring, summer, and fall months, consistent with electrification of home heating through the offering. With solar generation across participant homes, some of this increased consumption is offset for the winter months and a more significant amount is offset by solar generation during the spring, summer, and fall months. Participants offset the most home electric consumption during the summer months, yielding a negative net electric bill of -$19 per participant per month, which includes an average excess generation credit of $25 received per participant per month.

[9] Gross electric bills were not received by participants and are instead illustrative of bills that would have been received in the absence of solar generation.

Table 4-16. Post-Installation Observed Electric Bills by Season

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Gross Electric Bill	$191	$184	$191	$391	$239	$2,865
Excess Solar Generation Credit	$0	-$25	$0	$0	-$6	-$76
Net Electric Bill*	**$61**	**-$19**	**$61**	**$314**	**$104**	**$1,249**

* Post-installation net electric bills include excess solar generation credits, which is why they are lower than gross electric bills.

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-17 shows the post-installation weather-normalized gross and net electric bills and excess generation credits for CVEO participants. Like observed bills presented in Table 4-16, average gross bills were highest during the winter months, though solar generation offset a portion of the gross energy consumption, reducing average monthly bill amounts from $369 to $290 per participant. Participants received greater benefits from solar generation in the spring, summer, and fall months, where generation offset a more sizable portion of electric consumption. Average weather-normalized spring and fall net electric bills were $79 per participant per month. Summer net electric bills were net negative at approximately -$26 per participant per month, which includes an average generation credit of $32 received per participant per month.[10] Across the year, the average annual weather-normalized net electric bill post-installation was $1,267, which included an average annual excess solar generation credit of $95.

[10] These credits were applied to bills for subsequent months where household usage exceeded solar PV generation.

Table 4-17. Post-Installation Weather-Normalized Electric Bills by Season

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Gross Electric Bill	$214	$158	$214	$369	$238	$2,857
Excess Solar Generation Credit	$0	-$32	$0	$0	-$8	-$95
Net Electric Bill*	**$79**	**-$26**	**$79**	**$290**	**$106**	**$1,267**

* Net electric bill amounts presented already take into account excess solar generation credits received by customers.

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-18 shows the average post-installation weather-normalized overall energy bill, calculated as the summation of the average post-installation weather-normalized net electric bill (Table 4-17) and the average post-installation delivered fuel bill, which is assumed to be zero.[11] Post-installation, CVEO participants paid an average of $106 per month for home energy consumption, with the highest average costs observed during the winter season when bills total to approximately $290 per month per participant. Across the year, the average annual weather-normalized energy bill post-installation is $1,267 per participant.

Table 4-18. Post-Installation Weather-Normalized Overall Energy Bill

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Net Electric Bill*	$79	-$26	$79	$290	$106	$1,267
Delivered Fuel Bill	$0	$0	$0	$0	$0	$0
Total Bill	**$79**	**-$26**	**$79**	**$290**	**$106**	**$1,267**

* Net electric bill amounts presented already take into account excess solar generation credits received by customers.

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

[11] CVEO fully electrified participating homes, as participants are required to have all fossil fuel equipment, including heating systems, stoves, dryers, and water heaters, removed from their homes as a part of participating in the offering. As such, after removal of existing applicable equipment installation of all CVEO equipment, delivered fuel energy consumption falls to zero.

4.4.2.3 Bill Impact Analysis

Table 4-19 compares the pre-installation and post-installation weather-normalized gross electric bills after participants received all CVEO equipment.[12] To support Average monthly gross electric bills increased across all four seasons post-installation, with the largest increases observed during the winter months consistent with the electrification of home heating. Across the year, weather-normalized gross electric bills increased by approximately 54% from a total of around $1,858 to $2,857 kWh per participant per year.

Table 4-19. Change in Weather-Normalized Gross Electric Bills

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Pre-Installation	$154	$150	$154	$162	$155	$1,858
Post-Installation	$214	$158	$214	$369	$238	$2,857
Change	**$60**	**$8**	**$60**	**$206**	**$83**	**$999**
Change (%)	**39%**	**5.1%**	**39%**	**127%**	**54%**	**54%**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-20 pre-installation and post-installation weather-normalized net electric bills after participants received all CVEO equipment. Weather-normalized net electric bills exhibit sharp drops post-installation across the spring, summer, and fall seasons, reflecting the solar generation offsetting large portions of electric consumption at participant homes. Excess solar generation benefited customers during the summer months, where average monthly solar generation credits totaled $32 per participant, dropping the average monthly customer net electric bill to -$26 per participant.[13] Weather-normalized net electric bills increased during the winter months, reflecting the electrification of home heating equipment and lower solar insolation and lower generation occurring during these months. On average across all seasons, weather-normalized net electric bills dropped by approximately 32% per participant, corresponding with average annual bill reductions of approximately $591 per participant.

[12] Gross electric bills were not received by participants and are instead illustrative of bills that would have been received in the absence of solar generation.

[13] Across the year, the average annual weather-normalized net electric bill post-installation is $1,267 per participant, which includes the average annual excess generation credit of approximately $95 per participant.

Table 4-20. Change in Weather-Normalized Net Electric Bills

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Pre-Installation	$154	$150	$154	$162	$155	$1,858
Post-Installation	$79	-$26	$79	$290	$106	$1,267
Change	**-$74**	**-$176**	**-$74**	**$128**	**-$49**	**-$591**
Change (%)	**-48%**	**-117%**	**-48%**	**79%**	**-32%**	**-32%**

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

Table 4-21 shows the estimated change in weather-normalized overall energy bills. Weather-normalized overall energy bill amounts for the pre-installation and post-installation periods were sourced from Table 4-15 and Table 4-18, respectively. Pre-installation home energy bills included costs incurred from delivered fuel consumption and electric consumption, and totaled to approximately $3,060 per participant per year. After receiving all CVEO equipment, customer bills dropped by 59% to $1,267, reflecting the removal of delivered fuel bills and the large reduction in net electric bills across participant homes.

Table 4-21. Change in Weather-Normalized Overall Energy Bill

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Pre-Installation*	$253	$211	$253	$305	$255	$3,060
Post-Installation	$79	-$26	$79	$290	$106	$1,267
Change	**-$174**	**-$237**	**-$174**	**-$14**	**-$149**	**-$1,793**
Change (%)	**-69%**	**-112%**	**-69%**	**-4.7%**	**-59%**	**-59%**

* Pre-installation weather-normalized bills include delivered fuel bills. Delivered fuel bill amounts included were calculated via calculating the weighted average of propane and oil bills.

Note: Estimates for the spring and fall seasons are equivalent as Guidehouse extrapolated fall season estimates to the spring season per the methodology outlined in Section 3.3.

Source: Guidehouse analysis

While customers realized substantial reductions in their energy bills and received credit for their excess generation, for CVEO, each solar PV system was interconnected as a qualifying facility[14] rather than a net metering facility. As such, during the evaluation period, participants were

[14] In the third, and approved, iteration of CVEO CLC made changes in part to address the requirements of Section 87A and concerns identified by the Department in D.P.U. 20-40 and D.P.U. 21-126. In accordance with Section 87A, the solar PV systems are registered as qualifying facilities (D.P.U. 22-137 Initial Filing at 13).

compensated for their excess generation using the average monthly clearing price at ISO-NE, which typically ranges from $0.05 to $0.10 per kWh. Had participant sites been registered as net metered sites, participants would have been compensated $0.25 to $0.30 per kWh of excess generation. If allowed to register as net metered sites in the future, CVEO participants may realize more bill savings associated with excess generation.

5. Findings and Considerations

The principal EM&V findings and conclusions for the assessment of bill impacts and excess generation are as follows:

- **CVEO participants experienced large reductions in overall annual energy bills after installation of all CVEO equipment.** Overall annual energy bills, which include net electric bills and delivered fuel bills, decreased by an average of 59%, lowering the average annual bills from approximately $3,060 during the pre-installation period to $1,267 during the post-installation period. Reductions in overall annual energy bills are attributed to large reductions in net electric bills (32%) and the elimination of fossil fuel equipment and delivered fuel bills across CVEO participants.

- **CVEO participants showed reductions in average monthly electric consumption following the installation of all equipment by the CVEO Implementation Contractor.** During the post-installation period, CVEO participants experienced increases in weather-normalized gross electric consumption due to the electrification of home heating equipment. However, solar generation assisted in offsetting the increased consumption, resulting in a 59% reduction in weather-normalized net electric consumption. Additionally, participants discontinued the use of delivered fuel because all fossil fuel equipment was removed by the implementation contractor.

- **CVEO participants observed substantial decreases in average monthly electric bills during the post-installation period.** Despite the electrification of home heating leading to higher winter consumption, overall electric costs were significantly reduced due to solar generation offsets during other seasons. Post-installation, participants saw a 32% reduction in their average annual weather-normalized net electric bills. The largest reductions occurred during months with higher solar generation, such as the summer months where net electric bills were net negative due to excess solar generation. The average annual net electric bill decreased from approximately $1,858 to $1,267 per participant.

- **Solar generation benefited CVEO participants by offsetting home electric consumption and reducing net electric bills.** Installing solar generation equipment at customer homes led to considerable offsets in home energy consumption, particularly during periods with higher solar insolation. On average, each participant had excess solar generation of 476 kWh per month during the summer. For CVEO, each solar PV system was required to be interconnected as a qualifying facility rather than a net metering facility. As such, during the evaluation period, participants were compensated for their excess generation using the average monthly clearing price at ISO-NE, which typically ranges from $0.05 to $0.10 per kWh. This resulted in an average monthly excess generation credit of $32 per participant during the summer months in which customers' solar PV was generating more than the household was consuming. These credits were then applied to bills for subsequent months where household usage exceeded solar PV generation.

The principal EM&V findings and conclusions from the implementation and market actor interviews and from the analysis of participant surveys are as follows:

- **Overall, respondents reported high satisfaction with the program and with their installed equipment**. Most respondents are extremely likely to recommend the CVEO offering to a friend or colleague, reporting a net promoter score of 71%. The high net promoter score for the pilot indicates word-of-mouth could be an effective recruitment strategy if the offering were scaled.

- **Many respondents learned about CVEO from housing authorities or newspaper articles, indicating effective pathways for program awareness**. When asked to provide feedback on how they prefer to hear about programs like CVEO, most respondents indicated they preferred an email from the program. There was also interest amongst respondents in receiving a phone call from the program or hearing from a previous participant.

- **Environmental friendliness, money savings, and energy savings were ranked among the highest motivation for participating in the offering.**

- **Most survey respondents did not experience issues with their equipment after installation,** but the 7 respondents who did cited noise, leaks, improper installation, or the equipment not working as expected. All reported issues were associated with the heat pump equipment and were able to be resolved with a follow-up visit from a program contractor. As of June 2025, CLC and the Implementation Contractor staff have not been made aware of any subsequent active or unresolved issues with equipment among CVEO participants.

- **Due to installation timelines pushing installations to the second half of 2024, many participants who completed the participant experience survey have yet to realize the benefits of their installed equipment over a full year.**

- **During interviews with CLC and Implementation Contractor staff, it was noted that each project was custom with unanticipated issues, such as structural barriers to installation, permitting delays, and coordination challenges across multiple technologies, leading to a higher cost per house than was expected**. In addition, solar PV and battery projects faced delays due required review and approval of the projects by Eversource. Despite the higher cost per house, the program was able to stay within budget by limiting the number of participants to 55, enabling use of Mass Save HEAT Loan financing for non-deed restricted properties, and streamlining implementation.

Based on the assessment of bill impacts and excess generation, Guidehouse provides CLC with the following considerations:

- **Consider allowing participants to enroll their homes as net metering sites.** While customers realized substantial reductions in their energy bills and received credit for their excess generation, for CVEO, each solar PV system was interconnected as a qualifying facility[15] rather than a net metering facility. As such, during the evaluation period, participants were compensated for their excess generation using the average

[15] In the third, and approved, iteration of CVEO CLC made changes in part to address the requirements of Section 87A and concerns identified by the Department in D.P.U. 20-40 and D.P.U. 21-126. In accordance with Section 87A, the solar PV systems are registered as qualifying facilities (D.P.U. 22-137 Initial Filing at 13).

monthly clearing price at ISO-NE, which typically ranges from $0.05 to $0.10 per kWh. Had participant sites been registered as net metered sites, participants would have been compensated $0.25 to $0.30 per kWh of excess generation. If allowed to register as net metered sites in the future, CVEO participants may realize more bill savings associated with excess generation.

Based on the process evaluation findings and conclusions, Guidehouse provides CLC with the following considerations:

- **Provide customers with a brochure outlining the key information after completion of the initial site assessment to reference when participating in CVEO.** Guidehouse recognizes that each participant site has unique characteristics dictating which types of CVEO equipment may be recommended or feasible for installation. Given the heterogeneity in projects completed in this offering, providing key information that could apply to all projects in the offering should help reduce the administrative burden associated with providing a brochure. Key information that may prove useful to provide includes participation expectations, incentives, typical installation timelines, stakeholders involved, and contact information. Providing this information may help improve participants' ability to recall the details of the offering and anticipate what their experience may be during the installation process.

- **Expand offering to additional participants, including non-governmental organizations (NGOs), other non-profit organizations, and previously ineligible participants.** During interviews with equipment installers, several installers recommended expanding eligibility to these populations who, without additional support provided by programs like CVEO, may have more difficulty acquiring the technologies and measures provided to CVEO participants.

- **Improve coordination amongst installers to reduce customer burden.** Installers requested additional transparency from the implementation contractor into the schedules of other installers to improve coordination between contractors and reduce the number of customer touchpoints.

- **Continue collaborating with local housing authorities and the Implementation Contractor to generate program awareness, but also consider expanding additional marketing pathways.** Based on feedback received from survey respondents, CLC may consider expanding outreach through other channels such as email, phone calls, or social media. Additionally, since respondents were interested in learning about programs like CVEO from previous participants, CLC should consider utilizing respondents' high net promoter score and encourage participants to recommend the program to friends, family, or colleagues.

- **Survey participants on satisfaction after Fall 2025.** Most program installations were completed in Fall 2024, meaning survey respondents were only able to provide feedback on a partial year of their experience post-measure installation. Guidehouse recommends that CLC conducts another survey after Fall 2025 to determine if participant satisfaction has changed after utilizing their equipment for at least one year.

Appendix A. Weather-Normalization Methodology

This appendix provides additional technical details regarding the model specifications used by Guidehouse to estimate weather-normalized monthly gross electric and delivered fuel consumption. For each fuel type, two estimation sets were employed, one for the pre-installation period and one for the post-installation period, to estimate weather-normalized consumption for each respective period. In each case, the relevant pre-installation and post-installation periods were identified for each customer following the methodology summarized in Section 3.3.1, then the regression models were estimated for each period.

Equation A-1 shows the regression specification used to estimate weather-normalized gross electric consumption (measured in kWh) for each customer *i* for each month *t.*

Equation A-1. Regression Specification for Weather Normalization of Gross Electric Consumption Data

$$y_{it} = \alpha_i + \beta_1 Season_{it} + \beta_2 HDD_{it} + \beta_3 CDD_{it} + \beta_4 Season_{it} HDD_{it} + \beta_5 Season_{it} CDD_{it} + \epsilon_{it}$$

where:

y_{it} = average daily gross electric consumption (kWh) customer *i* during month *t.*
$Season_{it}$ = a factor variable denoting the season (Spring, Summer, Fall, or Winter) for customer *i* during month *t.*
HDD_{it}, CDD_{it} = heating degree days or cooling degree days (base 65 degrees Fahrenheit) for customer *i* during month *t.*
α_i = a customer-specific fixed effect.
β = regression parameter estimates. These values are the estimated relationship between average daily gross electric consumption (kWh) and the variable for which the parameter represents (e.g., HDD).
ϵ_{it} = cluster-robust error for customer *i* during month *t.* Standard errors are estimated from the model residuals and are cluster-robust to account for any heteroskedasticity or serial correlation at the customer-level.

After Equation A-1 was estimated, Guidehouse predicted average daily gross electric consumption using the TMYx conditions that would have applied to each customer *i* during month *t* using Equation A-2 below:

Equation A-2. Predicted Weather-Normalized Gross Electric Consumption (kWh)

$$\hat{y}_{it}^{season} = \hat{\alpha}_i + \hat{\beta}_1^{season} + (\hat{\beta}_2 + \hat{\beta}_4)\overline{HDD}_{it} + (\hat{\beta}_3 + \hat{\beta}_5)\overline{CDD}_{it}$$

where:

$\hat{y}^{season}{}_{it}$ = weather-normalized average daily gross electric consumption (kWh) customer *i* during month *t* during a specific season.
$\hat{\alpha}_i$ = a customer-specific fixed effect.
$\hat{\beta}_1^{season}$ = a season-specific intercept term indicating the overall average daily gross electric consumption during the season for customer *i* during month *t* independent of observed HDD and CDD.
$\overline{HDD}_{it}$, $\overline{CDD}_{it}$ = TMYx heating degree days or cooling degree days (base 65 degrees Fahrenheit) for Barnstable County for customer *i* during month *t.*

$\hat{\beta}_2, \hat{\beta}_4$ = the overall estimated and season-specific estimated impact, respectively, of heating degree days (base 65 degrees Fahrenheit) on average daily gross electric consumption (kWh).

$\hat{\beta}_3, \hat{\beta}_5$ = the overall estimated and season-specific estimated impact, respectively, of cooling degree days (base 65 degrees Fahrenheit) on average daily gross electric consumption (kWh).

Guidehouse estimated weather-normalized delivered fuel consumption (measured in gallons) for each customer *i* for each month *t* by estimating Equation A-3 below:

Equation A-3. Regression Specification for Weather Normalization of Delivered Fuel Consumption Data

$$y_{it} = \alpha_i + \beta_1 Season_{it} + \beta_2 HDD_{it} + \beta_3 CDD_{it} + \beta_4 Season_{it} HDD_{it} + \beta_5 Season_{it} CDD_{it} + \beta_6^{fuel} fuel_i + \beta_7 fuel_i HDD_{it} + \beta_8 fuel_i CDD_{it} + \epsilon_{it}$$

where:

y_{it} = monthly delivered fuel consumption customer *i* during month *t.*

$Season_{it}$ = a factor variable denoting the season (Spring, Summer, Fall, or Winter) for customer *i* during month *t.*

HDD_{it}, CDD_{it} = heating degree days or cooling degree days (base 65 degrees Fahrenheit) for customer *i* during month *t.*

$fuel_i$ = a factor variable denoting whether customer *i* uses propane or oil for fossil fuel-fired end uses.

α_i = a customer-specific fixed effect.

β = regression parameter estimates. These values are the estimated relationship between monthly delivered fuel consumption and the variable for which the parameter represents (e.g., HDD).

ϵ_{it} = cluster-robust error for customer *i* during month *t.* Standard errors are estimated from the model residuals and are cluster-robust to account for any heteroskedasticity or serial correlation at the customer-level.

After estimating the regression model above, Guidehouse predicted monthly delivered fuel consumption using the TMYx conditions that would have applied to each customer *i* during month *t* using Equation A-4 below:

Equation A-4. Predicted Weather-Normalized Delivered Fuel Consumption

$$\hat{y}_{it}^{season} = \hat{\alpha}_i + \hat{\beta}_1^{season} + \hat{\beta}_6^{fuel} + (\hat{\beta}_2 + \hat{\beta}_4 + \hat{\beta}_7)\overline{HDD}_{it} + (\hat{\beta}_3 + \hat{\beta}_5 + \hat{\beta}_8)\overline{CDD}_{it}$$

where:

$\hat{y}^{season}_{\ it}$ = weather-normalized monthly delivered fuel consumption for customer *i* during month *t* during a specific season.

$\hat{\alpha}_i$ = a customer-specific fixed effect intercept term for customer *i.*

$\hat{\beta}_1^{season}$ = a season-specific intercept term indicating the overall average monthly delivered fuel consumption during the season for customer *i* during month *t* independent of observed HDD and CDD.

$\hat{\beta}_6^{fuel}$ = a fuel-specific intercept term indicating the overall average monthly delivered fuel consumption for delivered propane or oil independent of observed HDD and CDD.

$\overline{HDD}_{it}$, $\overline{CDD}_{it}$ = TMYx heating degree days or cooling degree days (base 65 degrees Fahrenheit) for Barnstable County customer *i* during month *t.*

$\hat{\beta}_2, \hat{\beta}_4, \hat{\beta}_7$ = the overall, season-specific, and fuel type-specific estimated impact, respectively, of heating degree days (base 65 degrees Fahrenheit) on monthly delivered fuel consumption.

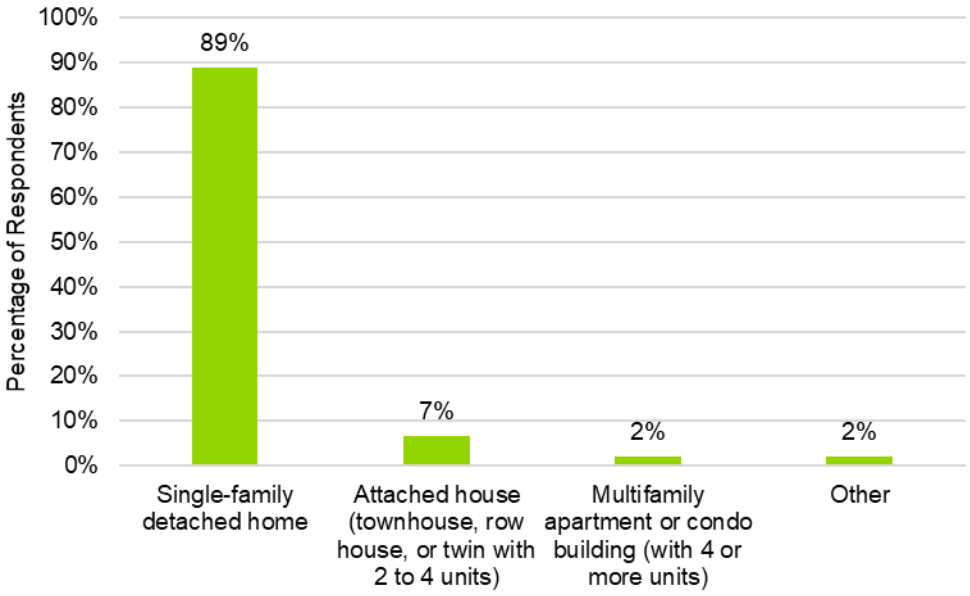
$\hat{\beta}_3, \hat{\beta}_5, \hat{\beta}_8$ = the overall, season-specific, and fuel type-specific estimated impact, respectively, of cooling degree days (base 65 degrees Fahrenheit) on monthly delivered fuel consumption.

Appendix B. Participant Survey Demographics

The following appendix section provides an overview of demographic data collected across the three surveys summarized in Section 3.

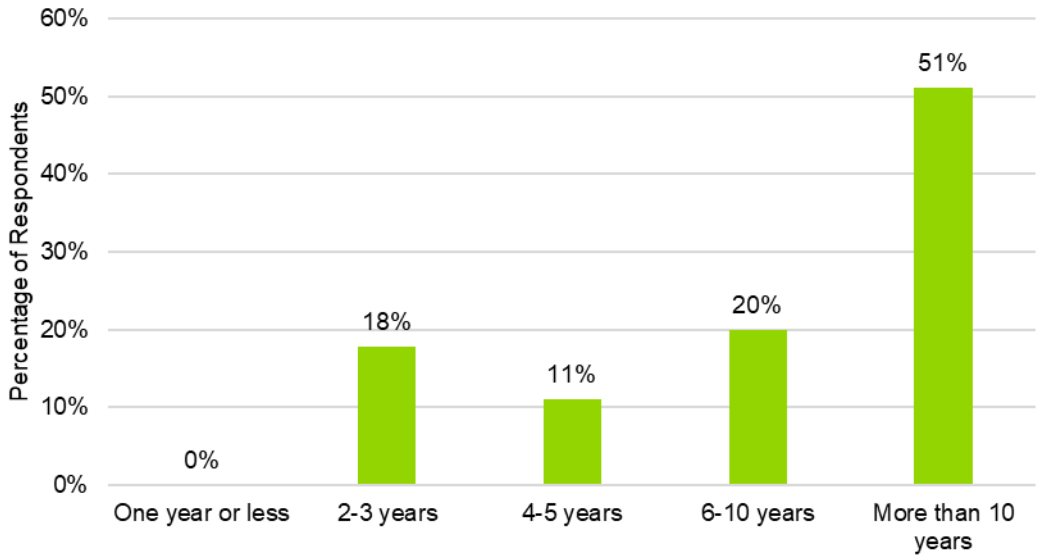
Most (89%, 40) respondents reported living in a single-family detached home (Figure B-1), and all reported that they own their home. About half of respondents (51%, 23) (Figure B-2) reported having lived in their home for more than 10 years.

Figure B-1. What type of residence do you live in? (n=45)



Source: Guidehouse analysis of combined survey data

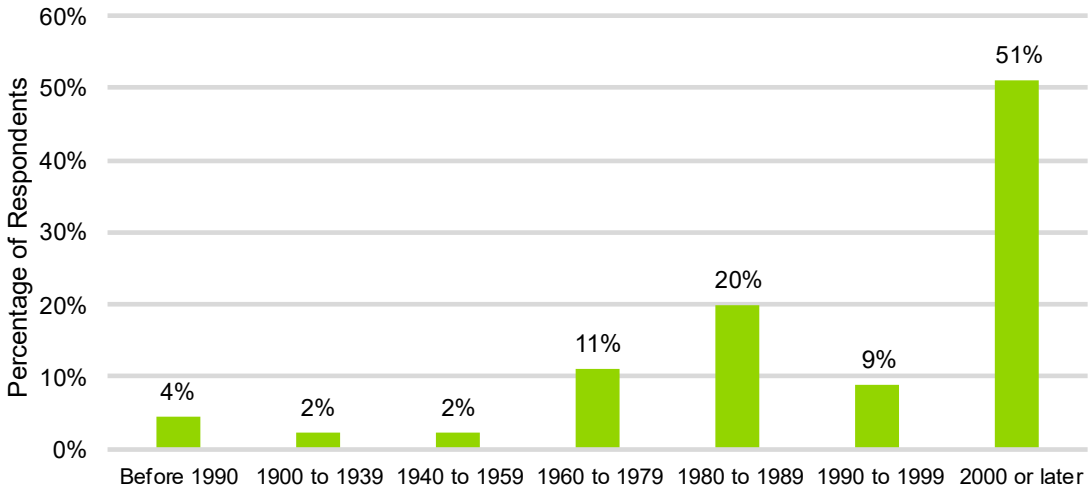
Figure B-2. How many years have you lived in your current home? (n=45)



Source: Guidehouse analysis of combined survey data

Most (80%, 36) of respondents reported that they lived in homes that were built after 1979, with a relative majority reporting their home being built in 2000 or later as shown in Figure B-3.

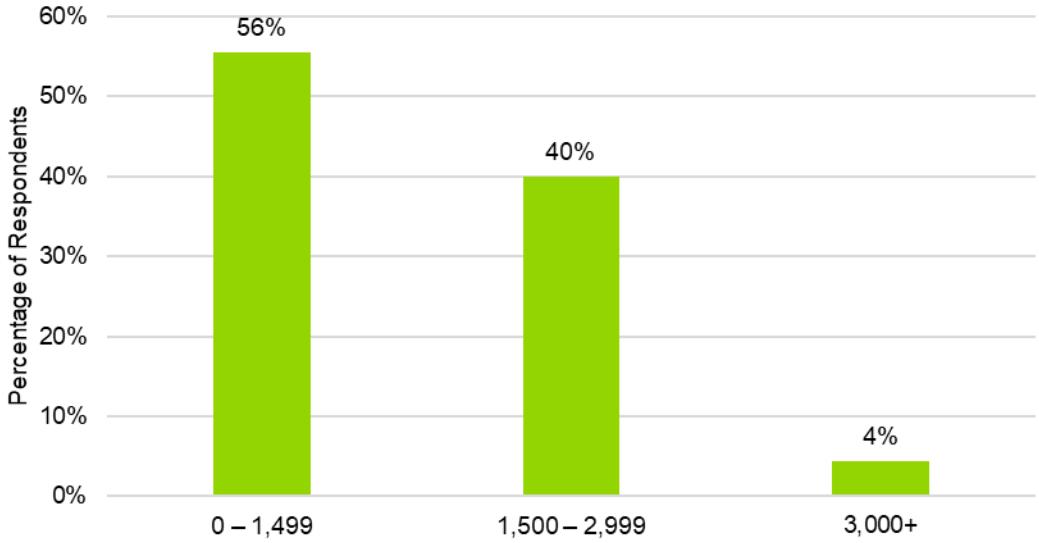
Figure B-3. When was your home built? (n=45)



Source: Guidehouse analysis of combined survey data

About half (56%, 25) of respondents reported their home being less than 1,499 square feet (Figure B-4).

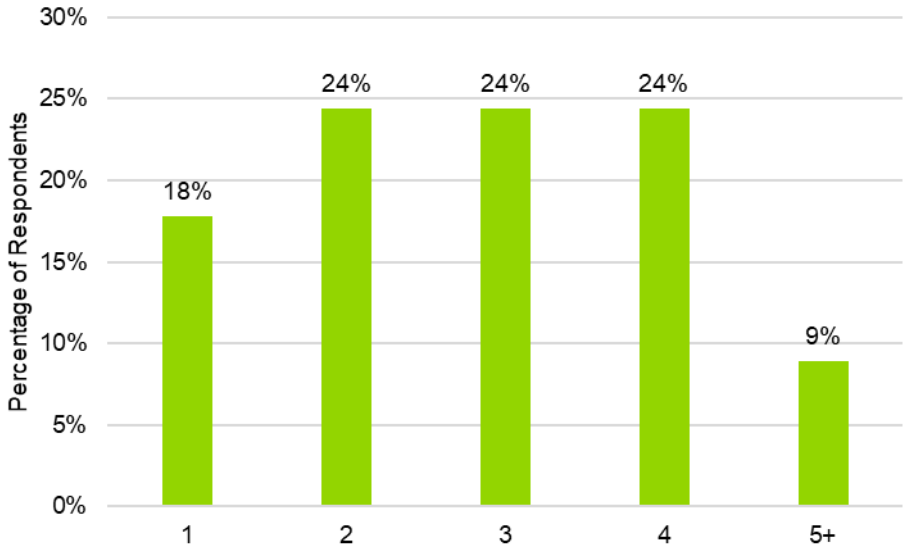
Figure B-4. About how many square feet is your home? (n=45)



Source: Guidehouse analysis of combined survey data

Most respondents (72%) reported having between 2-4 people occupying their home in 2024 (Figure B-5).

Figure B-5. How many people occupied your home in 2024? (n=45)

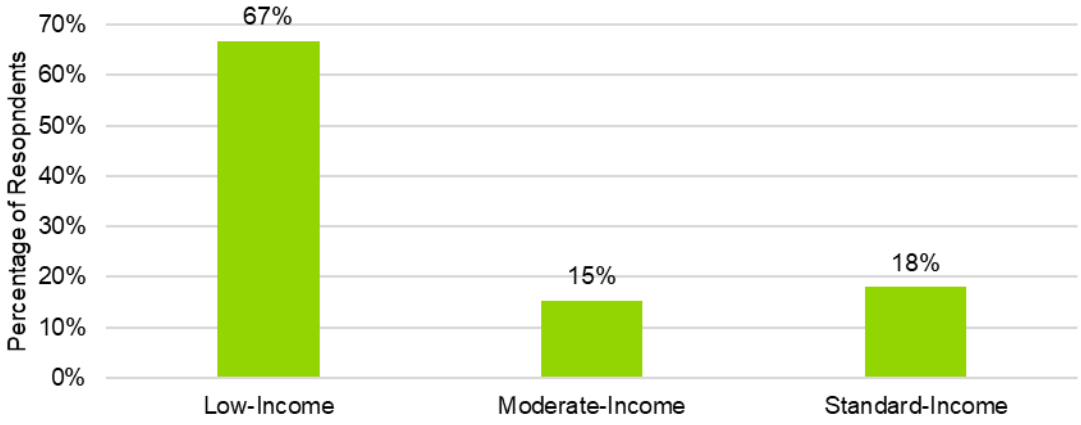


Source: Guidehouse analysis of combined survey data

Respondents were asked to estimate their total annual household income in 2023 before taxes using pre-defined income brackets. The income brackets were adjusted for each respondent based on how many people they reported occupying their home, with increased brackets correlating with more people in the home. Guidehouse then categorized the income brackets into low-income, moderate-income, and standard income using the state median income based on household size.

Over half (67%, 26) of respondents reported their income as 60% or below the state median income, which Guidehouse classified as low-income (Figure B-6).

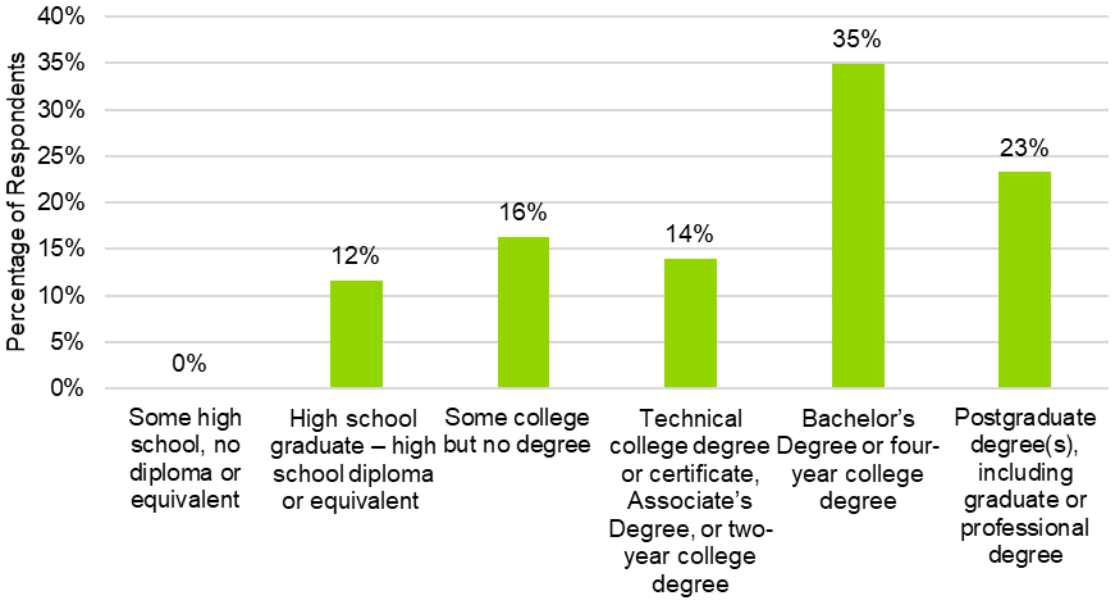
Figure B-6. What was your estimated total annual household income in 2023? (n=18)



Note: Income level is based on self-reporting. Standard-income denotes 80%+ of state median income.
Source: Guidehouse analysis of combined survey data

88% (38) of respondents reported completing some amount of college, including some college but no degree, an associate's degree, a bachelor's degree, or a postgraduate degree (Figure B-7).

Figure B-7. What is the highest level of education you have completed? (n=21)



Source: Guidehouse analysis of combined survey data

Appendix C. CVEO Measure Costs and Savings

The following table was produced by the Cape Light Compact. It has the average costs and savings for each of the CVEO measures.

Table C-1. Average CVEO Measure Costs and Savings

Measure	Number of Participants	Average Incentives per Installation	Average STAT per Installation	Annual Savings per Installation	Units	GHG (2030 Total Avoided CO2e in Metric Tons)
Air Source Heat Pumps	45	$45,564	6,955	-4,334	kWh	121.4
Solar PV	55	$29,107	4,651	7,741	kWh	45.3
Battery Storage	12	$33,146	4,940	3.3	kW	
Non-Induction Stove	8	$1,110	-			
Total	**55**	**$73,780**	**11,419**			**166.7**

Source: Cape Light Compact

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