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C1901 Commercial and Industrial Energy Efficiency Programs (non-SBEA) Process Evaluation

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1. Abstract

This report presents results from the C1901: Commercial and Industrial (C&I) Sector-Wide (non-SBEA) Process Evaluation. It examines program processes and performance for three Energize Connecticut C&I programs including the Energy Opportunities (EO), the Energy Conscious Blueprint (ECB), and the Business Energy Sustainability (BES) Programs based on program participation in 2019. It also includes a separate process evaluation for the Upstream Lighting Program (a sub-program under the EO Program), which is the first process evaluation conducted for this offering. To benchmark and provide information to assess best practices, the Energize Connecticut programs were compared to similar programs from other jurisdictions.

The process evaluation relied on in-depth interviews and web-based surveys with program and implementer staff, program participants, trade allies, and for Upstream Lighting, distributors. A non-participant survey was also conducted to understand the views, opinions, and barriers of those who have not participated in Energize Connecticut programs. Extensive secondary research, including review of program documentation, evaluation reports, data, and other sources of relevant information was conducted.

This study consists of the individual program evaluations and was also designed and implemented in a manner that provides insights *across the* entire C&I sector. The objectives of this research were to examine key process-related issues associated with each program and to look across the C&I sector to understanding how the programs work together to deliver savings and uncover opportunities for coordination to deliver deeper and more comprehensive savings.

To bolster the sector-wide perspective, this study also included a large-scale C&I Customer Profile (CIPC) activity that relied on customer population, consumption, and program tracking data, from both utilities, to describe and explore the Connecticut C&I customer population in terms of metrics such as program participation, savings achieved, and potential.

An abundance of individual research objectives are addressed within this report; however, six overarching themes pervaded all this research.

- **Program Satisfaction.** The portfolio of Connecticut C&I programs is mature and long running. Overall, all market actors—including participants, trade allies, and distributors—are quite satisfied with their experiences. Though respondents did provide some small recommendations for improvements to program implementation, nothing rose to the level of being a systematic issue or concern.
- **Market Penetration.** Increasing market penetration is going to be a function of increasing program participation, which should be focused on two strategies: (1) increasing general customer awareness of available rebates and programs, and (2) more deeply engaging existing participants to facilitate repeat participation. In general, programs have wisely targeted large customer accounts but moving ahead the potential from the smaller accounts representing 99% of the C&I population (and roughly half of energy consumption) should be considered.
- **Depth and Comprehensiveness of Savings.** In Connecticut, depth and comprehensiveness of savings are a big focus. A tiered incentive structure was put in place to better incentivize customers to conduct projects targeting more than one end use. While the tiered system does seem to be stimulating some comprehensiveness, the evaluation team argues that a project-level view of comprehensiveness is limiting. If the goal is to drive deeper and more comprehensive savings in the C&I sector, comprehensiveness might better be viewed and incentivized at the *customer* level (i.e., over time), particularly among larger customers who are most suited to repeat participation.

- **Customer Equity.** Customer equity has arisen as a dominant theme in the energy efficiency industry in the past few years. The evaluation team found that customers in both distressed and non-distressed and urban and rural communities appear to be being served (i.e., receiving program incentives and savings) in proportion to their contribution to consumption. These results provide partial information toward assessing equity; additional metrics may be developed over time as commercial customer research evolves.
- **Optimizing Program Expenditures.** Lighting dominates the Connecticut C&I portfolio throughout the period studied in this evaluation. The evaluation team estimates that almost three-quarters of 2019 C&I population savings (73%) were associated with lighting. Further, the high percentage of LED products carried by distributors that meet DLC/ENERGY STAR specifications and the high levels of free ridership for Upstream Lighting suggest this market is transforming. Two additional Connecticut studies are exploring the remaining potential for lighting and can provide insight into measures to target and incentive levels.
- **Data Review and Management.** Acquiring and processing utility data to facilitate the process evaluations and participation and equity analyses was perhaps the largest undertaking associated with this study. Through that process, the evaluation team identified specific changes the utilities and contractors should make in data tracking that will make the assessment of program performance and targeting by the utilities and other parties more comprehensive and efficient. In particular, the evaluation team highlighted specific data fields that should be added to utility tracking systems, as well as areas where data quality issues should be addressed (e.g., account tracking and infographic information).

Key findings and a wide array of detailed recommendations arising from this work are provided in the first chapter.



Chapter 2



2. Study Summary

This report presents results from the C1901: Commercial and Industrial (C&I) Sector-Wide Non-Small Business Energy Advantage (non-SBEA) Process Evaluation conducted by Opinion Dynamics for the Connecticut Energy Efficiency Board (EEB) under the guidance of the EEB Evaluation Administration team (EA Team). Given the wide range of topics and programs explored through this study, the evaluation team developed this chapter in lieu of an executive summary to give readers a full picture of the study scope, findings, and recommendations. Throughout this chapter we provide abbreviated background and high-level findings, as well as recommendations. Each section of this chapter also points to the full report chapter or appendix where additional details can be found.

2.1 Overview

This study involved process evaluations of the three main Energize Connecticut non-SBEA C&I programs. It also includes the first ever process evaluation of the Upstream Lighting Program—a sub-program under the Energy Opportunities Program. More specifically, this report covers the following programs:¹

- The Energy Opportunities (EO) Program
 - Upstream Lighting Program
- The Energy Conscious Blueprint (ECB) Program
- The Business Energy Sustainability (BES) Program

For study purposes, the evaluation team separated the ECB Program into two components: (1) ECB New Construction (includes major renovations), and (2) ECB Existing Equipment (includes everything not captured under new construction).² After separating the New Construction projects, the remaining ECB projects—in terms of factors such as market actors, project scale, program processes, and customer trade ally experiences—are quite similar to EO projects, so these were combined for data collection and reporting purposes.

This study is unique in that it not only involved the individual program process evaluations covering programs targeted to medium and large customers, but also includes a more holistic examination of the Connecticut C&I sector as a whole. This broader perspective was attained in two main ways:

- By planning and conducting the research in a manner that facilitated synthesizing and presenting findings *across the individual evaluations* to draw out themes relevant to the entire sector.
- By including a large-scale Commercial and Industrial Customer Profile (CICP) activity that involved compiling a wide range of utility program, population, and consumption data to describe and analyze the Connecticut C&I sector over the three-year period 2017-2019.

Utility data played a central and critical role throughout this project. Program tracking data and C&I population data provided the sample frames for our primary data collection efforts (i.e., surveys and interviews); customer

¹ The programs are described in greater detail within Section 3.1.

² This decision was made because the New Construction pathway is rather distinct and can involve different market actors, scale and type of projects, program processes, timing considerations and constraints, and customer and trade ally experiences. Separating New Construction projects from the remainder of ECB projects allowed the evaluation team to develop surveys and interview guides specific to the unique audiences.

consumption data was added to these to develop the database needed to conduct the profiling analyses. The latter was a major endeavor that demanded an undue proportion of project time, resources, and funds. It was also clearly burdensome to the utilities as well. As such, the evaluation team also includes a chapter and appendix discussing the data, its processing, and recommendations centered on improving utility data. Importantly, many of the data recommendations will not only benefit evaluators, but should also be of tremendous benefit to program managers, implementers, and others that might rely on utility customer and energy efficiency program participation data.

As such, after a brief discussion of methods and study objectives, the remainder of this chapter includes the following sections:

- 2.4.1: Data Review and Management (Chapter 4)
- 2.4.2: C&I Customer Profile (CICP) (Chapter 5)
- 2.4.4: Looking Across the Connecticut Non-SBEA C&I Programs (Chapter 6)
- 2.4.5: Energy Opportunities (EO) – Upstream Lighting (Chapter 7)
- 2.4.6: EO/ECB – Existing Equipment (Chapter 8)
- 2.4.7: Energy Conscious Blueprint (ECB) New Construction and Major Renovation (Chapter 9)
- 2.4.2: Business and Energy Sustainability (BES) (Chapter 10)

2.2 Methods

Each of the individual process evaluations involved both secondary research (documentation and data reviews), as well as primary research (surveys and/or interviews). We also conducted a customer non-participant survey that, by its nature, spans all the programs (results incorporated into Chapter 6 and throughout the report).

Table 1 summarizes the research activities making up each of the individual evaluations (see Section 3.3 and Appendix A for more detail on methods and sampling).

Table 1. Evaluation Activities

Target Audience/ Activity	Energy Opportunities (EO)		Energy Conscious Blueprint (ECB)	Business and Energy Sustainability (BES)
	EO Program	UL Program		
Review of Program Materials/Data	✓	✓	✓	✓
Review of Secondary Data	✓	✓	✓	✓
Utility Staff	Interviews	Interviews	Interviews	Interviews
Implementer	n/a	Interviews	n/a	Interviews
Trade Allies	Survey	n/a	Interviews	Interviews
Distributors	n/a	Interviews	n/a	n/a
Participants	Survey	Survey	Interviews	Interviews
Non-Participants	Survey			

The profiling research included in this report was the first time this activity has been conducted in Connecticut. Massachusetts has a long-running profiling study that provided the framework for our analyses.^{3,4,5} Aligning the approach across the Connecticut and Massachusetts studies was advantageous as it supported useful and insightful cross-state comparisons, and because Eversource and United Illuminating (UI) are the primary service providers in both states.

2.3 Objectives

The exploration of several key topical areas provided the overarching framework for the study, including:

- Market penetration
- Depth and comprehensiveness of savings
- Customer equity
- Factors informing program cost effectiveness and optimization of program expenditures

The evaluation team developed and examined a wide range of research objectives that spanned across these topics and programs to facilitate cross-program comparison. These topics generally covered:

- The pathways and time frames of customer energy efficiency adoption
- Customer decision-making around adoption of energy efficiency and program participation
- Customer satisfaction and recommendations for potential program improvements
- Utility and trade ally interactions with customers
- Trade ally and distributors business and sales practices

³ DNV GL (2020). *Commercial and Industrial Small Business Nonparticipant Customer Profile Study*. MA18X11-B-SBNONPART. Prepared for the Massachusetts Program Administrators and EEAC Consultants. Dated: April 15, 2020.

⁴ DNV GL (2018). *Commercial and Industrial 2011-2016 Mid-size Customer Assessment*. Prepared for the Massachusetts Program Administrators and EEAC Consultants. March 7, 2018.

⁵ DNV GL (2019). *2017 Commercial and Industrial Customer Profile Study Report*. Prepared for the Massachusetts Program Administrators and EEAC Consultants. Dated: April 18, 2019.

- Comparison of Energize Connecticut programs to similar programs in other jurisdictions
- Review of utility data collection and tracking

In addition, program-specific research objectives were developed and probed to address issues or topics of interest to each of the particular Energize Connecticut offerings (see Appendix A for a comprehensive list of all the study research objectives).

The remainder of this chapter summarizes key findings and recommendations presented throughout the study. The presentation is by chapter and the summaries are kept brief. Please see the associated report chapters for additional details.

2.4 Key Findings and Recommendations

The following sections summarize the key findings and recommendations by study chapter.

2.4.1 Data Review and Management (Chapter 4)

In many ways, the largest task associated with this project was the acquisition and the processing of the utility data required to facilitate the process evaluations and profiling. Because the data played such a central role to the project—and because obtaining and processing it proved to be quite challenging—we present our discussion of the data and its processing before the rest of the results to ensure that the recommendations we provide do not get lost among the vast amount of information garnered through this study.

Overall, the data for this study served two main purposes:

- Provided the sample frames for the array of primary data collection efforts (i.e., participant, non-participant, trade ally, and distributor surveys and interviews)
- Provided the detailed information needed to conduct the profiling task

The study required the following data—all at the customer account level, for the three years 2017-2019, and from both utilities:

- Program tracking data
- C&I population data
- Consumption data for the entire population

Initial data requests covered the program and population data; consumption data was brought into the project later as part of the profiling task (this had sampling implications discussed in Section 3.3.1). Each utility has a separate data system, they track different information, use different naming conventions, use different file structures, etc. Overall, the processing of the data needed to conduct this study was a massive undertaking that involved *dozens* of different data files, multiple meetings with utility staff and the EA Team, and a multitude of email exchanges between the evaluation team and utility staff to work out the numerous issues that arose. The entire process, from initial data request to working through as many of the issues as possible to receipt of the last requested data, took over a year.

The evaluation team wants to emphasize that the utility staff we communicated with were always responsive, friendly, and helpful. However, the sheer number of questions and issues we needed to work through to compile the data sometimes stacked up and resulted in delays. In the end, the evaluation team was able to

resolve most, but not all the data issues and we try to call these issues out when they arise throughout this report, predominantly in the profiling chapter (Chapter 4).

Importantly, the data issues we discuss should not be looked at just as an evaluation issue. In many instances we expect our recommendations will be of great value and benefit to program managers and implementers as well. For example, adding key information to a data tracking system that can be used to target customers more effectively will be valuable. Simplifying the structure and content of data files to make them more accessible and usable to a wider range of users will be helpful. Standardizing data both within and across programs and utilities will make for much easier assessment of program performance and help emphasize areas of focus. This is just a few examples—there are certainly more.

A more detailed discussion of the data processing is provided in Chapter 4; Appendix B presents details of the specific processing issues we faced.

Recommendations

- **A common reporting framework should be developed to ensure comparable and consistent data is available to the utilities and other parties year after year.** While acknowledging that the utilities will continue to have their own data systems, effort should be allocated to developing database queries which the utilities could use to extract, manipulate, and structure data in a consistent manner. Among other things, the output should focus on ensuring consistent:
 - **Data file structure:** Decide whether single-tab Excel flat files or multi-tabbed, relational data files are best.
 - **Content:** Ensure the files contain the same fields. No more; no less.
 - **Naming conventions:** Impose consistent field naming across utilities. Also, ensure field values are consistent (e.g., use the same program names, segment names, end-uses, measure names, etc.)
 - **Formatting:** Ensure quantitative data is formatted as numeric (and is represented in the same units), string data is formatted as string, dates are formatted appropriately and consistently, etc.
 - **Reporting at the measure level:** None of the utility data that was provided to the evaluation team provided enough granularity to fully inform us about measures. While we could usually tell that certain end-uses were installed as part of a project (e.g., lighting or HVAC), we did not have insights into measure details like what type of lighting equipment or even how many units. These are insights that are key for impact evaluations as well as profiling.

We understand that the coordination and development of harmonized queries is a sizable recommendation that would require coordination across multiple parties including utility staff, the EA Team, and an evaluation consultant. Nevertheless, investment in the effort would prove valuable for all parties and have the potential to reduce evaluation costs in the future.

- **There are a number of data fields that should be included in the program tracking/C&I population data that are critical to program delivery, and potentially target marketing that are either not currently being collected or being collected inconsistently.** Effort should be allocated to populate as much missing information as possible. These fields include:
 - Email addresses
 - Industry segment

- For ECB and BES, the pathway or initiative
- Prescriptive or custom measure
- Comprehensive project (yes/no)
- Did the project use financing (yes/no, type of financing)
- Ownership status (tenant vs owner)
- **Develop and provide data dictionaries** (with code lists). These should be developed in conjunction with the development of the above queries to ensure alignment.
- **Improve account tracking.** The ability to compute performance metrics and profile customers requires linking consumption and program tracking data. The utilities should continue to improve their ability to identify the appropriate account numbers for tracking records. This is a particular challenge for upstream program measures.
- **Improve coverage of firmographic information.** Improved coverage of firmographic information such as square footage, employee size, NAICS codes, building ownership, and ownership structure, though not necessary, will improve the ability to characterize customers and isolate their program needs.
- **Improve tracking of micro-business consumption and savings.** The smallest accounts may consist of a variety of entities who may not require much consumption on specific accounts but may indeed require consumption on some other account for the same customer. The ability for performance metrics to accurately depict the savings achieved at the account level requires assigning the savings to the appropriate account. For micro-business, incorrectly assigning savings to accounts can greatly obscure savings achieved metrics as the savings per unit of consumption accounts for a much larger share.
- **Collect, consolidate, and report lighting measures by sector and customer type.** Use the information to identify under/over served customer groups.

United Illuminating-Specific Recommendations

- **Incorporate BES data into other program tracking data.** At present, this data is tracked separately from the remainder of the C&I portfolio, which presents challenges in holistically viewing participation and comprehensiveness as well as matching across customer accounts.
- **Incorporate the tracking of trade allies into the overall program tracking system.** Including information on trade allies associated with projects completed through the program will allow program staff to better determine those allies driving program participation, as well as identify those who may need additional assistance or outreach given low levels of participation.
- **Parse out the “qualifier” field into separate fields.** This is currently an odd field that can contain a very wide range of largely unrelated information using three-letter codes. Much of this information is potentially useful as it helps to delineate things like upstream projects. However, the information in this field is difficult to work with as it can consist of long lists of three-letter codes.

Eversource-Specific Recommendations

- **Upstream Lighting data needs to be tracked more consistently and if Upstream Lighting savings are to be included in the main program tracking data files, the entries need to be coded in a manner that**

makes them easier to find (e.g., a unique subprogram or initiative name) and the entries in the program tracking data should reconcile with any other tracking files.

2.4.2 C&I Customer Profile (CICP) (Chapter 5)

Structure of the Database

The evaluation team developed the CICP based on the population of billing and program tracking data provided by Eversource and UI and analyzed the information to construct the following performance metrics.

Table 2. Performance Metrics used in Customer Profile

Metric	Definition	Purpose
Population Savings Achieved	Total savings for a segment / Total consumption for a segment	Overall metric of performance measuring level of service
Participant Savings Achieved	Total savings for a segment / Total consumption for participants in that segment	Measure of depth of savings for participating accounts in a segment
Unweighted Participation Rate	Total participants in a segment / Total number of accounts in a segment	Measure of penetration into a population or segment of accounts (saturation)
Consumption Weighted Participation Rate	Consumption associated with participating accounts in a segment / Total consumption in segment	Measure of penetration that accounts for the size of participants
Total savings	Sum of savings in a year: Measured in kWh for electric, CCF for gas	Measure of overall impact of program savings
Total Incentives	Sum of incentive cost in a year: Measured in nominal dollars	Allocation of program resources

The evaluation team then defined a series of profiling factors to explore how performance metrics varied across subpopulations of the C&I Population. The factors we used in this CICP include the following:

- **Account Size:** Defined based on annual consumption for an account as outlined in Table 3. These Massachusetts definitions were used in absence of Connecticut specific definitions.^{6 7 8 9}

Table 3. MA Customer Size Definitions used in Customer Profile

Account Size	Electric (kWh / year)	Gas (therm / year)	MMBTU / year
Micro	<= 110,000	= < 8,000	<=374
Small	110,000 to 1.5 million	8,000 to 40,000	375 to 5,118
Medium	1.5 million to 4.5 million	40,000 to 250,000	5,119 to 15,354
Large	=> 4.5 million	=> 250,000	=>15,355

*Note: The evaluation team converted the MA definition for gas size from annual therms to CCF.

⁶ Mid-size Customer Needs Assessment. Prepared by DNV KEMA for the Massachusetts Program Administrators and EEAC Consultants. January 20, 2014. 2013 Plan-Year Report Appendix 4D, Study 13-5 Page 1 of 276.

⁷ Commercial and Industrial Small Business Nonparticipant Customer Profile Study. MA18X11-B-SBNONPART. Prepared by DNV GL for the Massachusetts Program Administrators and EEAC Consultants. April 15, 2020.

⁸ Commercial and Industrial 2011-2016 Mid-size Customer Assessment. Prepared by DNV GL for the Massachusetts Program Administrators and EEAC Consultants. March 7, 2018.

⁹ 2017 Commercial and Industrial Customer Profile Study Report. Prepared by DNV GL for the Massachusetts Program Administrators and EEAC Consultants. April 18, 2019.

- **Timeseries:** The evaluation team designed the CICP to present performance metrics over time for each of the three years (2017-2019) of consumption and program tracking data provided by the utilities.¹⁰ There are a number of limitations to viewing account level performance across years:
 - Annual account level analysis did not consider the cumulative effects of repeat participation over time on multi-year participation rates, nor does it consider the actual “addressable market” (i.e., the share of the total market that replacement was both technically and economically feasible, which would exclude measures that had recently been replaced already) for measures in a year, given recent past participation.
 - It does not consider the cumulative savings over time, which would require more thorough analysis of measure life and possible depreciation in savings over time.
 - Account level analysis does not reflect change to building occupancy that occur year over year. These changes will impact industry segmentation, consumption behavior and size, measure needs, financial resources, tastes and preferences, preferred program and delivery method, available resources, and many other factors impacting, past participation and other factors impacting the addressability of accounts for programmatic activity. Account level analysis did not reflect activity across accounts owned by the same customer (customer level analysis). As was discussed in the 2020 Massachusetts Small Business Terms Sheet Report, defining and standardizing definitions of “what is a customer” required a substantial effort that was outside the directive of this evaluation.
- **Industry Segment (Segment):** The evaluation team classified accounts according to the corresponding industry defined by Eversource. UI did not provide segment information. Consequently, industry segment analysis only reflected Eversource accounts. Where no industry segment was provided by the utility, the evaluation team listed the segment as “N/A”.
- **Program:** Participants, savings and measures were tracked according to the program through which incentives were allocated.
- **Delivery Path:** Identified program activity delivered through “Prescriptive” or “Custom” delivery paths.
- **Measure:** Program metrics were tracked according to end use.
 - Electric accounts
 - HVAC
 - Lighting
 - Motors
 - Process
 - Refrigeration
 - Gas accounts
 - HVAC
 - Process

¹⁰ Annual account level analysis was consistent with the level of analysis used in the MA C&I Customer Profile and the 2020 Small Business Term Non-Participant Study. Both studies cited limitation of this level of analysis and document the additional research to provide true time-series analysis at either the location or customer level.

- **Community Type:** The evaluation team identified “distressed” and non-distressed” communities based on zip codes as provided by the Connecticut Department of Economic and Community Development.¹¹
- **Population Density:** Identified accounts located in towns as “Rural” or “Urban” based on population density.¹²

Electric C&I Customer Profile

Population of C&I Accounts

As seen in Table 4 and Table 5, the population of 2019 electric and gas C&I accounts was dominated by micro businesses. On the electric side, micro business made up 89% of accounts, but only 19% of total consumption.^{13,14} For the gas population, micro business had roughly six times the number of small business accounts, but roughly 67% of the consumption of small businesses.

Table 4. Population of 2019 Electric Accounts and Consumption by Size

Size	Accounts		Consumption		
	Number	Percent	kWh	MMBTU ^A	Percent
Micro	133,063	89.1%	2,448,321,765	8,354,023	18.8%
Small	14,583	9.8%	5,004,488,738	17,076,028	38.4%
Medium	1,110	0.7%	2,635,459,211	8,992,562	20.2%
Large	281	0.2%	2,956,554,594	10,088,185	22.7%
N/A	300	0.2%	N/A	N/A	N/A
Total	149,337	100.0%	13,044,824,308	44,510,798	100.0%

^A MMBtu calculation assumes 293.071 kWh/MMBtu.

The distribution of gas consumption by size group suggests the importance of identifying the consumption level of the remaining 153 gas accounts to provide an accurate picture of gas key performance metrics, participant savings achieved, population savings achieved, and consumption weighted participation.¹⁵

Table 5. Population of 2019 Gas Accounts and Consumption by Size

Size Category	Accounts		Consumption		
	Number	Percent	CCF	MMBTU	Percent

¹¹ The Evaluation Team does not make an assessment regarding what constitutes “equity” as this is a policy question yet to be determined. However, we present performance metric across geographic regions of interest to the EA team.

¹² See footnote 47. An account is defined by having a zip code with population density higher (“Urban”) or lower (“Rural”) than 1,000 people per square mile. (Definition from US Census Bureau. <https://www2.census.gov/geo/pdfs/reference/GARM/Ch12GARM.pdf>).

¹³ It is important to note that there are 300 accounts in the CT database for which no size could be determined due to lack of consumption data. If these are “large accounts, the share of consumption could shift dramatically.

¹⁴ By comparison, the MA Commercial and Industrial Small Business Nonparticipant Customer Profile Study found MA micro-business make up 92% accounts and 32% of consumption, while small business made up 7% of accounts and 17% of consumption; non-small business made up 0.8% of accounts and 50% of consumption

¹⁵ It is important to note that there are 153 accounts for which no size could be determined due to lack of consumption data. If these are “large accounts, the share of consumption could shift dramatically.

Micro	48,966	82.5%	90,401,442	9,220,949	12.8%
Small	8,087	13.6%	134,418,946	13,710,735	19.1%
Medium	1,851	3.1%	151,409,864	15,443,809	21.5%
Large	306	0.5%	328,696,541	33,527,053	46.6%
N/A	153	0.3%	N/A	N/A	N/A
Total	59,363	100.0%	704,926,793	71,902,546	100.0%

^A MMBtu calculation assumes 9.804 CCF/MMBtu.

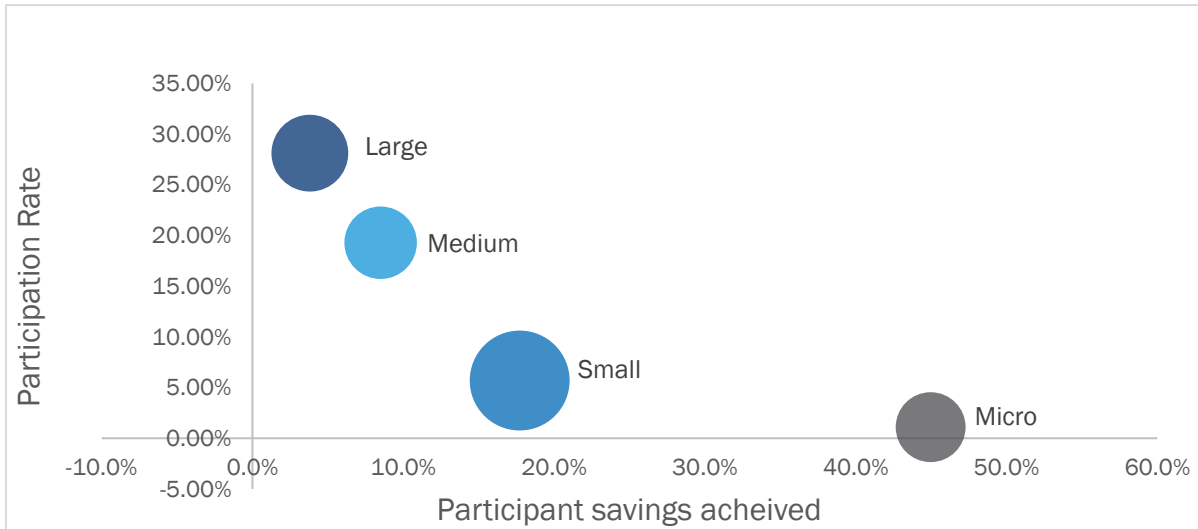
Profile by Customer Size

A primary characteristic the evaluation team considered for this CICP was account level performance in terms of participation and savings by customer size. As such, this section presents differences in performance metrics across customer size groups (see Table 3). Key findings include:

Overall, small and medium businesses offer opportunities for increased electric and gas participation and/or depth of savings (Figure 1 and Figure 2).

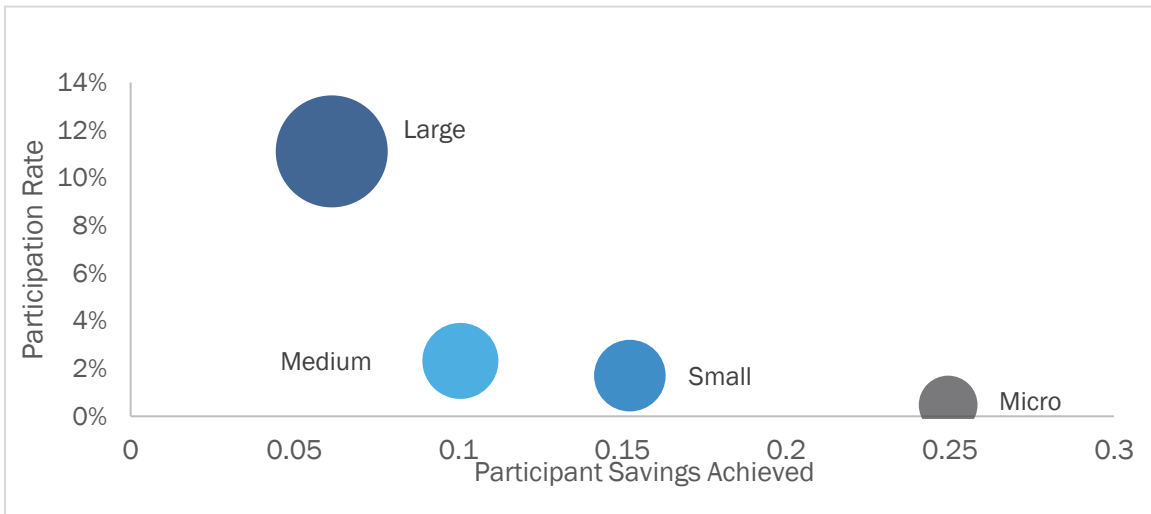
- Large business had relatively high participation rates, but low depth of savings. This is expected as large businesses are more likely to participate over multiple years to address potentially more diverse, larger, and costly energy needs.
- Small business had high depth of savings but low participation rates. The overall size of the small business segment suggests there are considerable additional savings opportunity through increased participation.
- Medium business had moderate depth of savings, and moderate participation rate. Medium business shows relatively higher participation rates than small business and higher participant savings achieved than large business.
- Micro business shows opportunities for increased participation, as only a small share of consumption was from participating accounts.

Figure 1. 2019 Electric Participation Rate by Participant Savings Achieved



Note: Bubble size represents 2019 kWh consumption.

Figure 2. 2019 Gas Participation Rate by Participant Savings Achieved



Specific to gas accounts, programs would benefit from program and marketing strategies that target gas customers by size. The data illustrate that for two years participation rates increase dramatically from medium to large business. Given the relatively larger savings opportunity and lower number of medium gas accounts relative to small accounts, this suggests that there is substantial savings opportunity possible by increasing participation of medium business.

Engaging medium gas businesses could provide a substantial boost to gas savings. Further, the overwhelming number of small and micro gas accounts suggests targeted strategies for addressing their somewhat limited needs could provide a substantial boost to participation rate and participant savings achieved. Possible

avenues for expanding service to small and micro accounts include engaging dedicated gas direct install vendors and offering expanded upstream measures such as hot water, and kitchen appliances.

In addition to large businesses having relatively high participation rates, **contrasting consumption weighted and unweighted participation shows that in all years, the utilities targeted the largest of each size group.** This is particularly true for gas accounts as seen in Figure 3 and Figure 4 below. Both figures show decreasing participation from large to micro accounts. Further, within each size segment, the consumption weighted participation is higher than the unweighted participation indicating that program participants consisted of larger accounts than non-participants.

Figure 3. Gas Consumption Weighted Participation Rate by Size and Year

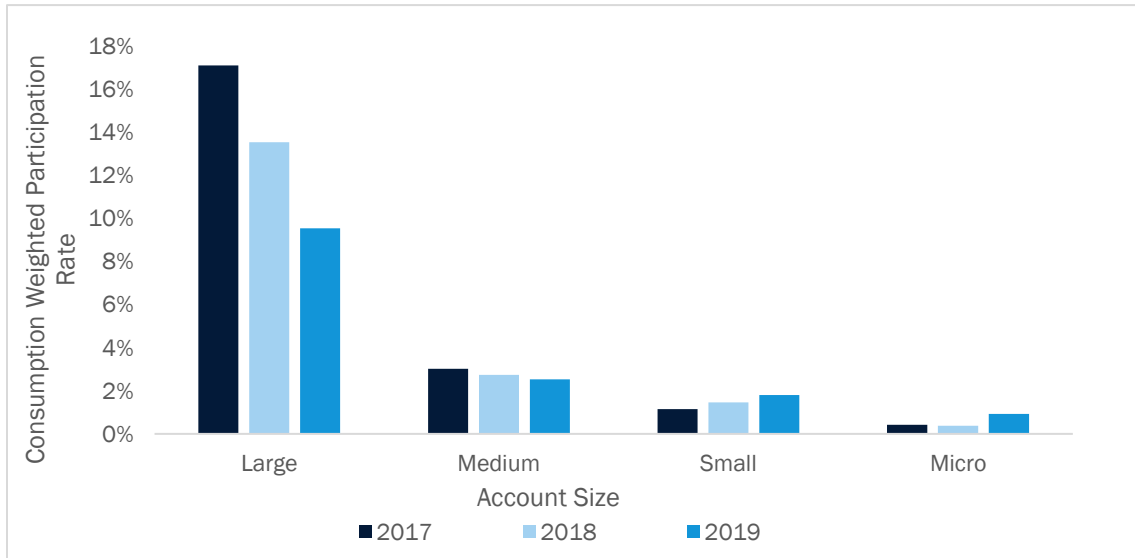
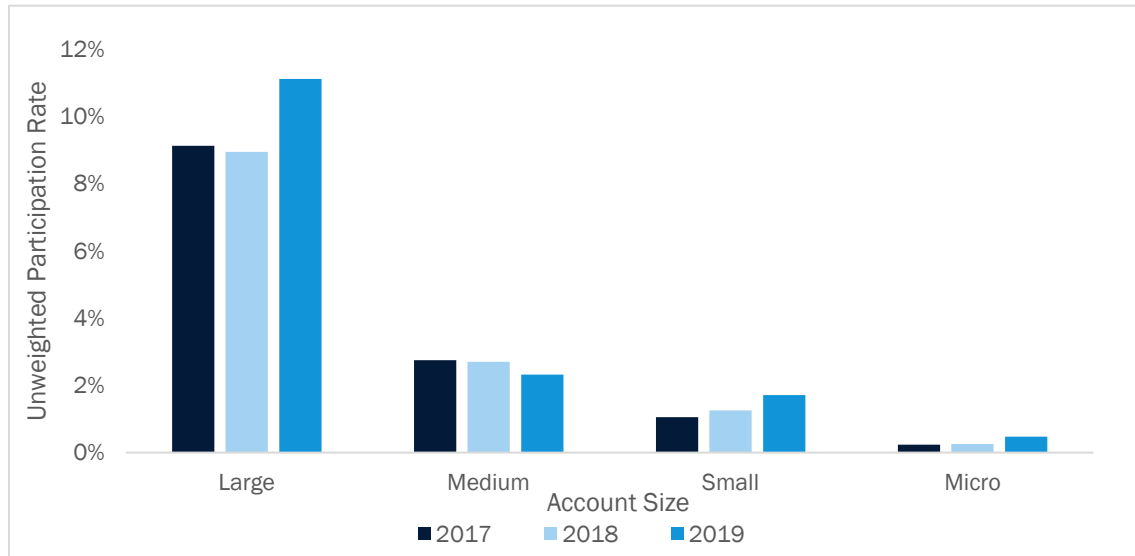


Figure 4. Gas Unweighted Participation Rate by Size and Year



While participation rates tended to favor large business and participant savings achieved favored micro and small business, the combined impact of these metrics is captured by the population savings achieved metric, which is considered the single best overall indicator of level of service identified through recent customer profile work to date. **Examining population savings achieved by size group, shows that the overall level of service was relatively flat across size bins and years, except for a spike in 2018 for micro business.**

Electric micro business accounts showed much higher depth of savings for participants, but lower participation rates. This resulted in comparable population savings achieved to other size segments. For gas accounts, the population savings achieved for micro and small accounts was somewhat lower than medium and large accounts suggesting a possible need for increased focus on smaller business offerings.

Small and micro gas accounts provide opportunities for increased population savings achieved through increased participation, while small, medium, and large business offer opportunities through increased depth of savings.¹⁶ Medium gas accounts had higher population savings achieved in 2018 relative to large business, while large business had higher population savings achieved than medium business in both 2017 and 2019. However, both small business and micro business had consistently lower population savings achieved than the larger segments. Considering the relatively high participant saving achieved of particularly micro business suggests that participant savings achieved was relatively high for existing participants, so efforts to increase participation among small and micro business should lead to increased population savings achieved.

Small, medium and large business all showed increases in the share of non-lighting savings from 2017 to 2019, but overall savings has declined. For small and micro-business, the decline in overall savings in 2019 appeared to be directly proportional to the decline in lighting savings. However, we should note that the share of lighting savings from accounts for which no consumption data was available increased in 2019 as well, which could partially offset the overall savings decrease in one or more of the four size groups.

¹⁶ The population savings achieved provide an indication of the overall level of service to a sub-population of accounts as it reflects the combined impact of the participation rate (account level penetration) with participant savings achieved (depth of savings among participating accounts).

Figure 5. 2017 Electric Savings by Measure and Size

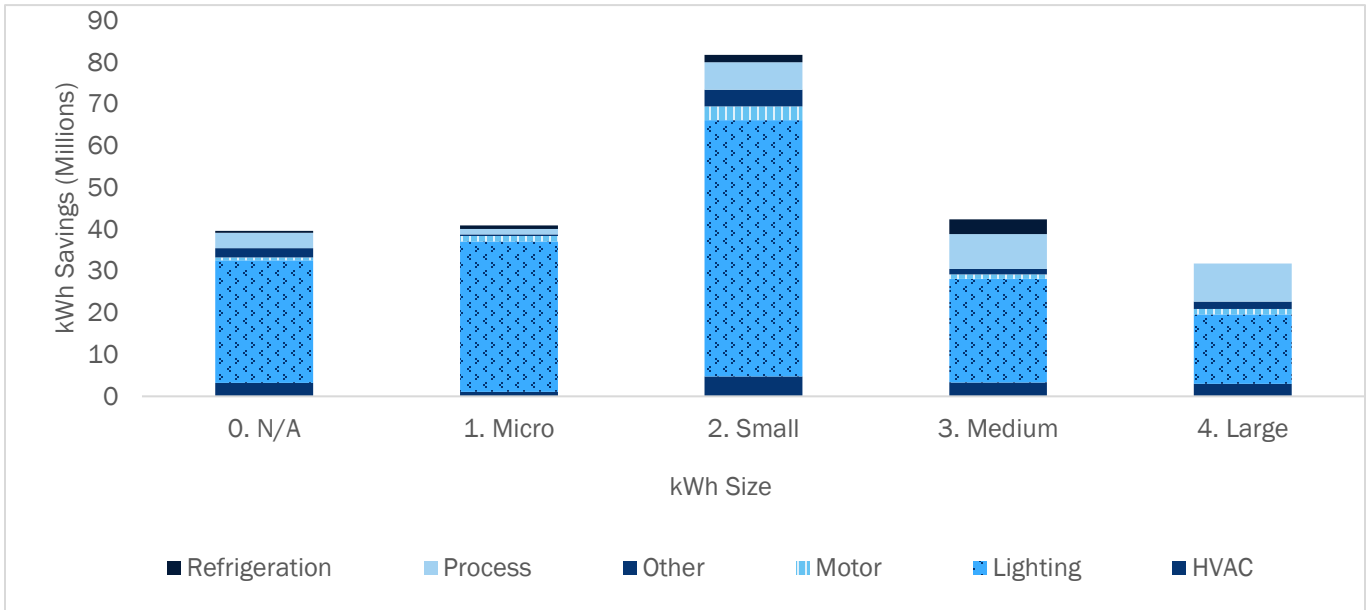
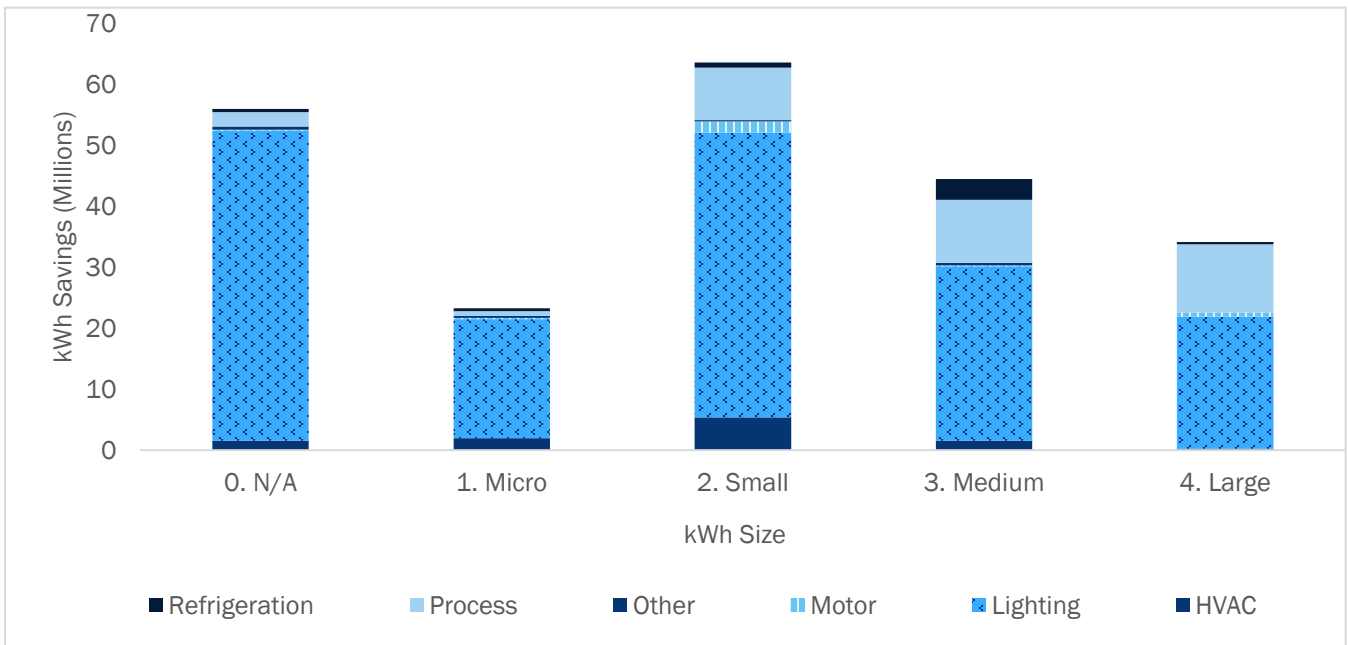


Figure 6. 2019 Electric Savings by Measure and Size

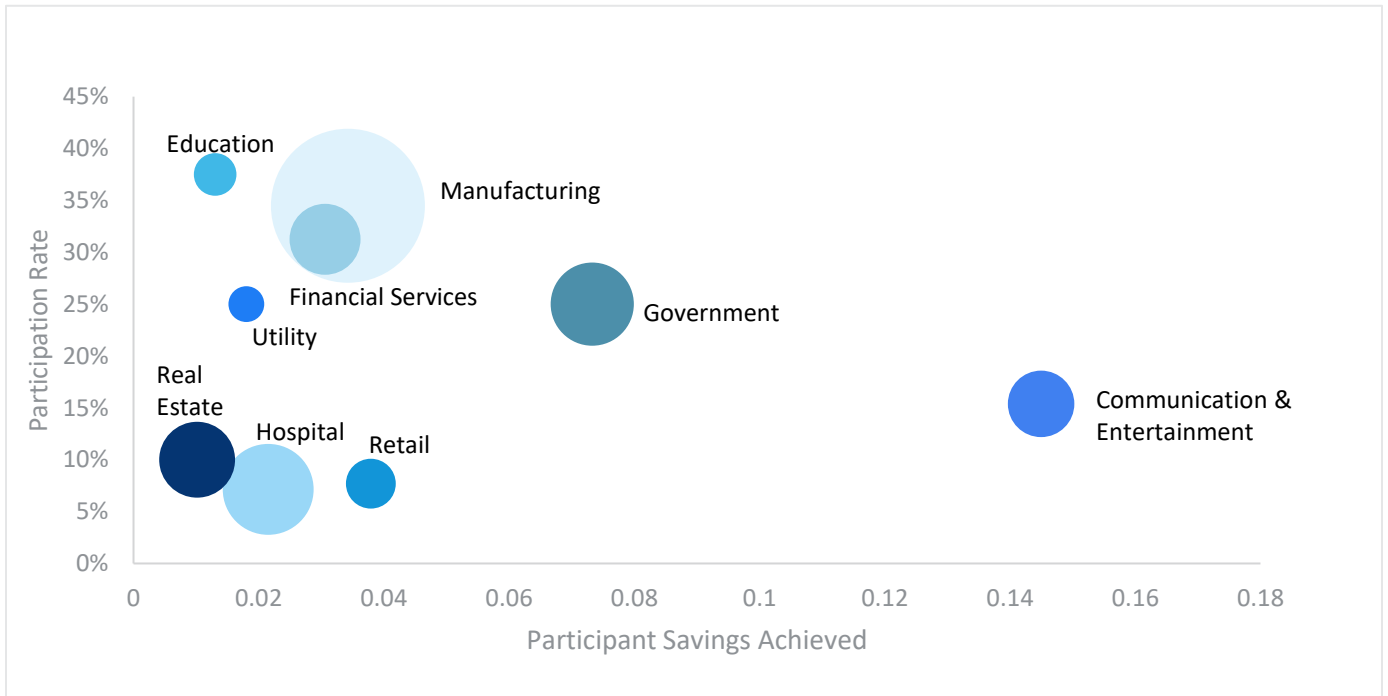


Profile by Segment

The distribution of firms and consumption by industry segment, as well as performance metrics varies considerably by account size. Consequently, when considering performance metrics by segment, it is important to view the performance metrics as the intersection of industry and size.

Overall, we see large differences in performance metrics by segment for large and medium electric accounts (Figure 7 and Figure 8).^{17 18} These differences are even more striking for gas accounts (Figure 9 and Figure 10).¹⁹ These data further suggest that the intersection of company size and segment were important determinants of program performance.

Figure 7. 2019 Electric Participant Savings Achieved by Industry Segment: Large Accounts



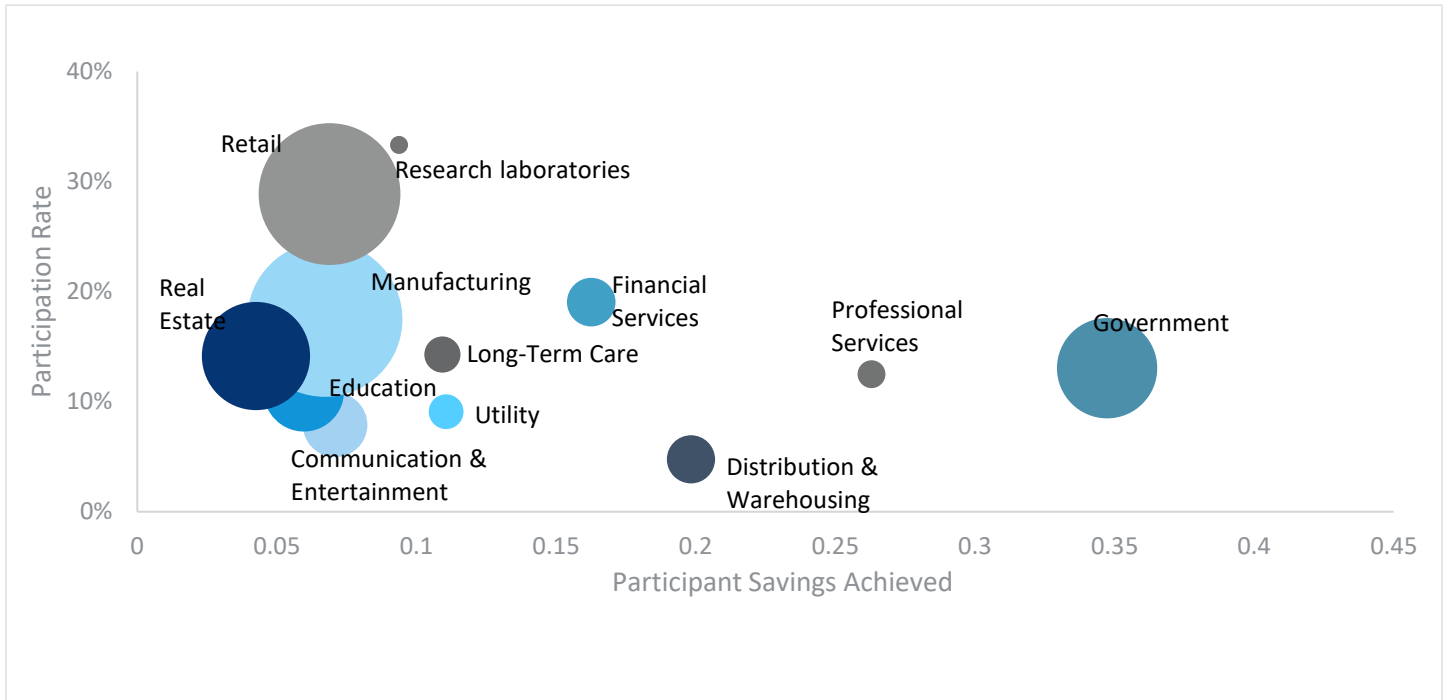
Note: Bubble size represents 2019 kWh consumption. Industry segment analysis only reflects Eversource accounts.

¹⁷ Small and medium business are not shown due to the relatively high concentration of “unknown” cases.

¹⁸ Industry segment analysis only reflects Eversource accounts.

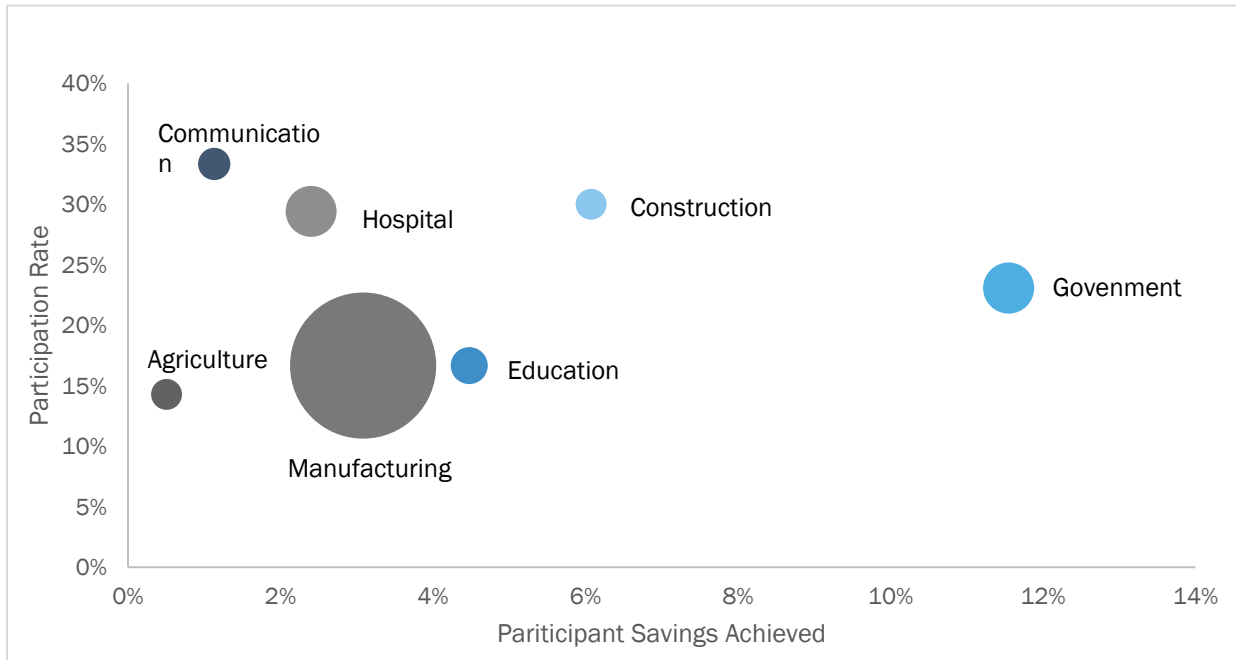
¹⁹ Small and medium business are not shown Due to the relatively high concentration of “unknown” segments within the small and

Figure 8. 2019 Electric Participant Savings Achieved by Industry Segment: Medium Accounts



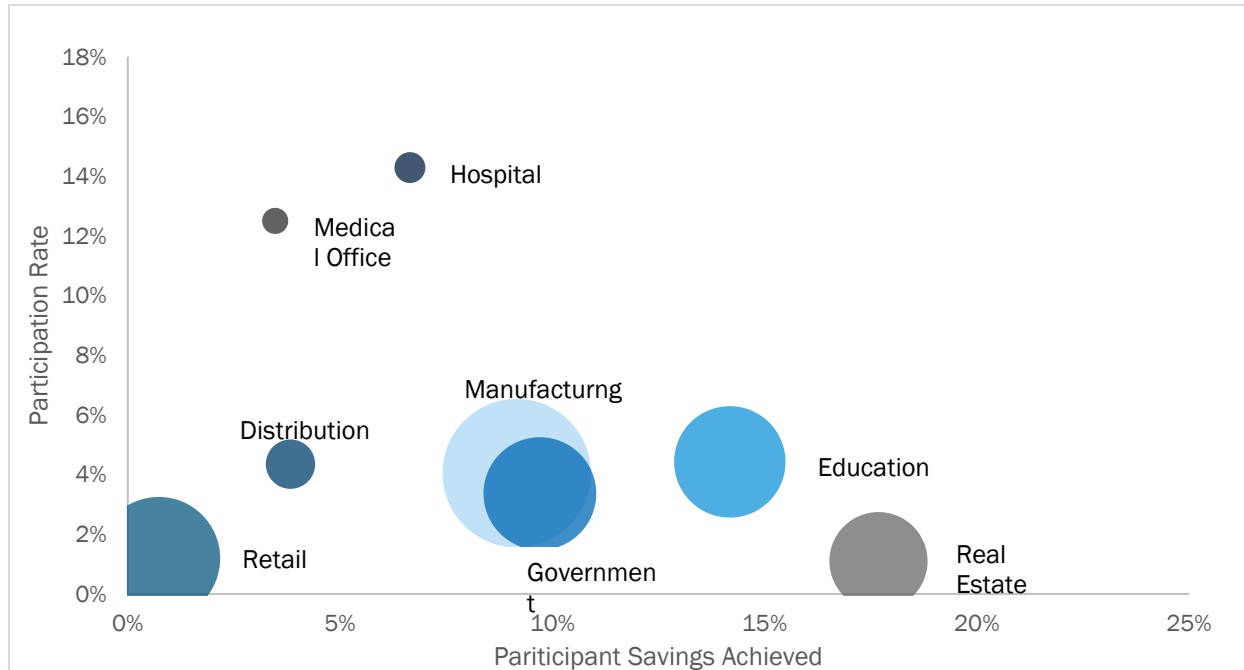
Note: Bubble size represents 2019 kWh consumption. Industry segment analysis only reflects Eversource accounts.

Figure 9. 2019 Gas Participation Rate and Participant Savings Achieved by Industry: Large Accounts



Note: Bubble size represents 2019 CCF consumption. Industry segment only available for Eversource accounts

Figure 10. 2019 Gas Participation Rate and Participant Savings Achieved by Industry: Medium Accounts



Note: Bubble size represents 2019 CCF consumption. Industry segment only available for Eversource accounts.

Profile by Program

The evaluation team examined the total energy savings by initiative in each program year and saw **minor fluctuations in savings by program over the timeframe provided with only marginal shifts to overall savings.** Specific changes over time include:

- Electric savings increased for the EO Program from 2017 to 2018, but in 2019 declined, resulting in lowest overall savings of the 3-year period;
- The share of overall savings from SBEA declined in each analysis year; and
- Upstream Lighting Program savings has increased steadily over time.

Profile by Delivery Pathway

The custom delivery pathway experienced large declines in savings in 2019, while prescriptive delivery accounted for an increasing share of electric savings.

- In 2017, prescriptive delivery accounted for 54% of savings across all size segments except micro business but increased to 78% in 2019. The corresponding increase in prescriptive savings for the N/A size segment may suggest a shift to the programs delivering more savings and measures through an upstream model rather than through custom projects, but the structure of the program data prevents us from knowing for sure. The micro, small, and medium segments all experienced sharp declines in custom savings with corresponding increased savings from prescriptive the delivery path.

- **Custom delivery was the dominant delivery pathway for gas across all customer sizes throughout the analysis period, particularly for medium and large businesses.** The relative complexity of C&I gas solutions often necessitates custom, rather than prescriptive solutions. Therefore, it was unsurprising that custom delivery constituted the majority of savings for all sizes within each of year of the profile analysis.

2.4.3 Looking Across the Connecticut Non-SBEA C&I Programs (Chapter 6)

Effectiveness in Meeting Customer Needs

Participant satisfaction is high across all programs indicating, that for those who participate, the programs are meeting customer expectations.

- Overall program satisfaction was slightly higher for the EO/ECB Existing Equipment programs (average score of 8.1 out of 10) than for ECB New Construction (average score of 7.7).
- Seven of 10 BES participants indicated they were “highly satisfied” with the program while the other three were “moderately satisfied.”

Distributors and trade allies are also generally satisfied with their respective program experiences. In general, the satisfaction results seen among participants in the Connecticut programs mirror those seen in other jurisdictions.

Overall, the Energize Connecticut programs are generally a well-running, mature set of offerings and only a few recommendations for improvement were provided.

- EO/ECB – Existing Equipment participants revealed concerns about the application process, including the length and clarity of the application and the turnaround time for approving projects.
- ECB – New Construction trade allies asked for more utility outreach and more regular updates on program information, changes, requirements, and processes.

Program participants and trade allies did not identify any notable differences in utility implementation across any of the programs.

Customer Decision-Making

Only about half of the surveyed non-participants reported that someone at their organization had the authority to make equipment decisions, which will limit comprehensive projects and participation in general.

- When they had authority, non-participants generally reported being able to make decisions about three main equipment types including HVAC, lighting, and water heating.
- For all other equipment types, less than half of non-participants reported that someone in their organization has decision-making authority.

Decision-making authority is partly a function of facility ownership, but not entirely.

- Non-participant owners make up 64% of those with the authority to make decisions versus being 53% of non-participant population.

Barriers to Making Energy Efficiency Upgrades and Barriers to Program Participation

In general, regardless of whether they were a program participant or a non-participant, the main barriers to making energy-efficient upgrades at customer facilities are:

- Uncertainty around monetary bill savings
- Higher cost of energy efficient equipment
- Lack of awareness of energy efficient options

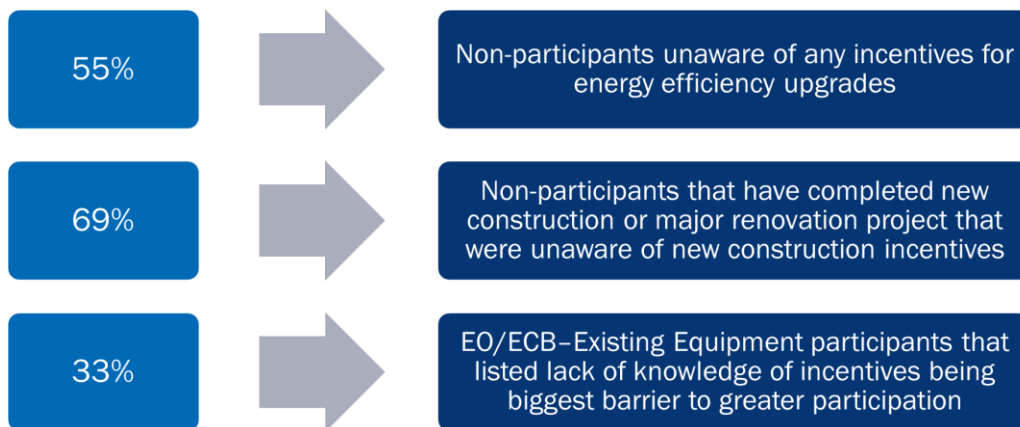
It is important to note that two of the biggest barriers—namely uncertainty about bill savings and lack of awareness—are both *informational gaps*, and thus, something the programs should be able to directly address.

A diverse set of market actors are affecting projects and market actors other than contractors may pose an opportunity for new construction projects.

- Contractors play key roles in making customers aware of energy efficiency programs and opportunities, and typically have significant influence on the equipment customers ultimately select, regardless of whether it is a retrofit or new construction project.
- While contractors still play a big role with ECB – New Construction, “other design professionals” (e.g., architects, mechanical engineers, etc.) were the most influential.

While customers identified a range of barriers to making energy efficient upgrades, the main barrier to program participation is lack of awareness (Figure 11).

Figure 11. Awareness of Program Incentives



Regardless of size, information needs generally center on the barriers.

Financing

For some programs, access to financing may also be a barrier to participation, especially for smaller customers.

- About a quarter of EO/ECB Existing Equipment participants utilized financing, with uptake more common among small and medium sized businesses.

- This is similar to ECB New Construction, where about a fifth of participants indicated they used financing.
- Trade allies indicated that additional financing options may appeal to smaller customers.
- Given the suite of offerings, the evaluation team found that financing was not generally needed to encourage BES Program participation.

Financing energy efficiency upgrades is a bit more common for non-participants that completed a new construction project, but not necessarily rare for existing equipment projects either, making it a potential barrier for at least a certain portion of customers.

When using financing, most non-participants chose to do so either through a conventional loan at their bank (36%) or through on-bill financing through their utility (45%).

- None reported using financing through the Commercial Property Assessed Clean Energy (C-PACE) Green Bank; only about a quarter were aware that C-PACE was even an option for financing energy efficiency improvements.

Depth and Comprehensiveness of Savings

Evidence suggests the tiered incentive structure is supporting some comprehensiveness, but impacts are likely limited at the project level.

- Energize Connecticut programs encourage customers to complete more comprehensive projects using a tiered incentive structure that provides increased per kWh or per KW, and per CCF incentives based on the number and types of end-uses installed through a project.
- Between 2017 and 2019, the evaluation team estimates that 16-18% of projects were considered comprehensive.
- The C&I portfolio's tiered incentive approach is likely limited in its ability to drive comprehensiveness for C&I customers and projects because many of the projects conducted amongst the C&I population are large, pre-planned, and pre-budgeted endeavors. Interviewed trade allies suggest that while the tiered incentive likely does influence some smaller projects, for larger projects, consideration of multiple end uses is something that would typically need to occur in the design and planning stages.

If deep and comprehensive savings are the goal, repeat participation trends suggest a view of comprehensiveness over time may be better than focusing on comprehensiveness at the project level. Many customers are participating across multiple years across multiple end-uses.

Program Measures

Lighting dominates the C&I portfolio, with no close second.

- 2019 was much like 2017 and 2018 with *more than three-quarters* of the non-SBEA portfolio kWh savings being associated with lighting.

Significant changes will be coming to lighting, which are likely to have huge impacts to the Energize Connecticut portfolio of C&I programs, especially comprehensive projects.

- The lighting market is quickly transforming as LEDs are rapidly replacing less efficient lighting products.

- Lighting savings are going to be much harder to come by as baselines shift to represent the current market and/or net-to-gross ratios decrease due to limited alternative options in the marketplace.
- Given the dominant role of lighting, the Connecticut utilities need to consider what the portfolio might look like with dramatically less lighting.
- Also, since 81% of comprehensive projects included lighting in 2019, this also suggests obtaining comprehensiveness and deep savings will become increasingly challenging.

Short term opportunities for Energize Connecticut exist primarily with lighting, HVAC, hot water, and appliance equipment projects.

Where Do Customers Hear About the Programs?

Customers tend to learn about programs from the Energize Connecticut website or contractors, but most surveyed non-participants would prefer to hear via email or printed materials.²⁰

Conclusions & Recommendations

Given that customers are largely satisfied with the programs, it appears the biggest challenge moving ahead is going to be sustaining or increasing program participation. The results show that lack of awareness of rebates and programs is the biggest barrier to participation, so this needs to be addressed.

- **The vast majority of the C&I customer base is small accounts. While each of these accounts individually might not offer huge savings potential, the number of these accounts is tremendous (roughly 99% of the C&I population) so overall savings potential is substantial. Increase overall awareness of incentives and programs by leveraging low-cost means of reaching large numbers of small customers and steering them to the Energize Connecticut website.** Currently, participants most often become aware of program incentives through trade allies, with very few mentioning utility marketing materials. However, participating trade allies are asking for greater marketing support from the programs to engage with customers. To help support trade allies and potential participants, and increase program uptake the utilities should:
 - Leverage, low-cost, large-scale print and/or digital channels like email and bill inserts to increase awareness. Both are the most preferred methods of communication mentioned by customers.
 - Eversource has a large proportion of email address for their business accounts (but not all), while UI does not.
 - In the short-term, UI will be limited to print promotions as their customer database lacks email addresses.
 - UI needs to begin populating customer email addresses into their database. Digital marketing and communications are not just the future but the present, and not having email addresses is a big disadvantage.
 - Each time either utility has contact with a customer, an email address should be obtained (or verified) and entered in the data system.

²⁰ It is important to emphasize that due to sampling limitations, the non-participant survey results effectively represent small and micro accounts, and as such, these results should be interpreted to mean that the 99% of the C&I population that is made up of small and micro accounts might best be targeted via low-cost, far-reaching digital or print promotions.

- For larger customers, it is likely account representatives already have email addresses; they need to be entered into the database.
- At a larger scale, email addresses can also be purchased from sources such as Hoovers, Hunter.io, FindThatLead, or VoilaNorbert.
- Entice customers to learn more about the programs by honing messages and emphasizing **potential energy savings** and **incentives to offset project costs**.
 - Importantly, customers tend to think in terms of dollars, so translating energy savings into dollars they can potentially save will be key for piquing customer interest.
- All large-scale digital or print promotion efforts to increase awareness should aim to steer customers to the Energize CT website or a utility representative for more information and help navigating the participation process, which can be complicated for some offerings.
- **Continue fine-tuning the Energize Connecticut website.** The Energize Connecticut website is revised on an annual basis to update incentive levels and make adjustments associated with changes to program offerings. The utilities should continue these efforts as the Energize Connecticut website plays a critical role in helping facilitate the customer's journey from awareness to participation.
- Leverage what has been learned about the barriers to making energy-efficient upgrades to consistently harmonize and inform marketing, messaging, website content, and promotional strategies. In particular, materials need to continually address:
 - **Uncertainty about energy savings:** Work to overcome this barrier by striving to present this information in terms of dollars instead of kWh, KW, or Mcf.
 - **Higher costs of energy-efficient equipment:** Consider developing materials or web content that compares efficient and inefficient equipment in terms of total lifetime costs (including first costs and operating costs). This can help show customers that in many instances, the efficient path is actually the cheaper path.
 - **Lack of awareness of available options:** This is an opportunity the utilities can take to better educate the customer base in general. Measures such as lighting and HVAC are likely obvious to most customers. Use marketing and the website to promote and inform customers about other less-obvious measures such as motors, compressors, insulation, appliances, etc.
- Provide more examples of energy savings and project costs. The website currently has a small number of case studies, but there are only a few and many customers will not be able to relate to the projects covered. Develop more case studies and examples so that almost any customer can find something they can relate to. The best way of doing so is likely by segment and size.
- For BES, emphasize the program's ability to meet unique customer needs and specialization.
- **Study the customer experience more deeply to further refine processes and materials.**
 - Conduct a web usability assessment to determine how customers are using the Energize Connecticut website, what information resonates, what is confusing, what they trying to find but cannot, etc.

- Conduct customer journey mapping²¹ to better understand the customer experience, their needs, responses, actions, and challenges at different steps in the process; respond accordingly.
- **Assess the programs' abilities to achieve comprehensiveness over a longer timeframe.** A customer- or account-level view of comprehensiveness across time is likely more useful than a project-level view if deep savings truly is the goal of Energize Connecticut programs. While a small handful of customers are under multi-year Customized Solutions Partnership (CSP) agreements and some larger C&I and municipal customers have a utility engineer assigned to promote continued participation, these efforts seem limited to just larger customers. Taking a longer-term view across *all* C&I customers recognizes and leverages the nature of participation over time. Focusing on comprehensiveness over time can help to better serve customers that may not have the flexibility to expand the scope of their projects to include multiple end-uses within a given program year. In support of this change in timeframe, the utilities should consider developing an additional tiered incentive structure aligned with customer or account number that places value on incenting multiple end-uses *over time*.
- **Continue to stimulate repeat participation over time for deeper and more comprehensive savings.** Regardless of size, past participants are going to be more likely than the average customer to participate again. We know that they are already open to energy efficiency, have benefited from incentives and energy savings, and overcome the first-cost barrier. Especially advantageous is that they are also easy to identify and, thus, are easily targetable. Evidence suggests that repeat participation, both in the same program as well as in other programs, is occurring. The utilities should continue to leverage existing customer relationships and incentivize the development of new relationships that support a healthy utility, customer, and trade ally ecosystem.
- **Continue to implement a segmented and strategic delivery strategy but refine by adding other customer attributes.** Recent attention in the state has been allocated to focusing on specific industry segments as denoted in the *2019-2021 Conservation & Load Management Plan*. This is certainly useful and prudent as it acknowledges the C&I customer base is not a single population. But the C&I population varies by more than just segment. In addition to industry segments, other factors should be brought into segmentation efforts such as business sizes and ownership patterns.
 - Though the issue of tenants not having the authority to make the decision on equipment upgrades is always going to be a challenge, there still seems to be some opportunity for certain measures like lighting, HVAC, and water heating among renters.
 - A program tailored to C&I renters offering a streamlined set of measures such as these (and other low-involvement measures like faucet aerators and power strips) could be valuable for better saturating this hard-to-reach group.
 - Effective segmentation and strategic marketing rely on good data. To maximize the potential for segmentation as a strategy and tool moving forward, both utilities need to consistently collect key data points for each of their C&I customer accounts such as email addresses for energy efficiency decision-makers, industry segment, facility type, past program participation, and whether a customer is an owner or a renter. Additional factors can be considered when it comes to segmenting; these are just a few that played a part in this study.

²¹ *Customer journey mapping* is a research technique that involves working with a customer through a process (such as program participation) from beginning to end to ensure a robust understanding of the process *from the customer's perspective*. Every step in the process and each touchpoint with the utility and program is assessed to understand how it works, how it is perceived, what challenges might exist, and what opportunities for improvement might be. Customer journey mapping is a powerful technique for helping to ensure processes are tuned to meet their desired expectations.

- **Make use of other market partners besides contractors and designers; capitalize on retailers/distributors.** While much of the activity around the Energize Connecticut C&I programs centers on contractors and/or designers, other partners such as retailers and distributors can be assets. These market partners can also have significant influence on non-participants' decisions to make energy-efficient equipment upgrades. The evaluation team recommends that the utilities target more end uses with midstream strategies/programs. Well-designed and implemented midstream programs also offer significant opportunity to have larger scale market effects than downstream programs.

2.4.4 Energy Opportunities (EO) – Upstream Lighting (Chapter 7)

The Energize Connecticut Upstream Lighting Program—also known as the Instant Rebate Program—provides instant discounts to customers who purchase qualified lighting products from participating distributors.²² C&I customers of Eversource and UI are eligible for the discounts and the rebated lighting must be installed in the service territory of the participating utility. Business customers, and contractors working with these customers, may purchase eligible lighting at a reduced cost without a rebate form. Each lighting purchase requires the business name, address, and contact information for the location where the lamps will be installed.

The evaluation team spoke with lighting distributors that participated in the Energize Connecticut Upstream Lighting Program in 2020. All 10 of the distributors we spoke with are long-time participants, none having participated for less than 3 years.

Distributor Satisfaction and Recommendations for Improvement

Distributors are quite satisfied with the Energize Connecticut Upstream Lighting Program and processes.

- Together, the 10 distributors provided a rating of 8.6 to their overall experience with the Energize Connecticut Upstream Lighting Program; none of the interviewed distributors scored any of their individual program experiences lower than a 7 out of 10.

When asked to compare the Connecticut program to programs in other jurisdictions, about one-third indicated the Energize Connecticut Upstream Lighting Program is the best or close to best program; another third said it was on par with the other programs.

The Upstream Lighting Program and the Connecticut C&I Lighting Market

The Upstream Lighting Program has become a key element of distributor sales practices.

- All 10 distributors indicated they always mention the rebates to customers and contractors when applicable.
- The program has become so embedded in the market that some distributors indicated that they feel they **need to participate** in the program to remain competitive.

²² Energy efficiency programs that target distributors are typically referred to as midstream programs; upstream programs typically target manufacturers. Nevertheless, the evaluation team continues to carry forward the Upstream Lighting title to align with how this program is referred to in Connecticut, and similar programs are referred to throughout the region.

Distributors claim the program is still influencing sales, but by how much is hard to say. Quantifying Energize Connecticut Upstream Lighting Program influence on stocking or sales is challenging.

- This is a rapidly changing market. None of the 10 distributors we spoke with had participated for less than 3 years. As such, asking about sales or stocking practices before and after participation is not meaningful.
- 4 of 7 (representing about 17% of 2019 program activity) said 99% or more of their LED products currently meet DLC®/ENERGY STAR® specifications.
- 4 of 6 rated the influence of the program on efficient lighting sales 8 or higher (on a 10-point scale); 2 rated it 2 or lower.
 - Both that rated it low were national distributors.

Distributors mention cost, timing, and education as customer barriers; but cost is more complex.

- Costs were often mentioned in the context of needing to show customers adequate return on investment or payback period, suggesting enough economic benefit exists to overcome the cost barrier.
- This aligns with the most recent net-to-gross study that suggested 95% of customers would still have done LEDs without program support.²³

In addition to costs, participating distributors also mentioned the following perceived customer barriers:

- The 60-day installation period for the program (2 of 10).
- Education about LED technology—both customers and contractors (2 of 10).

Distributors did not identify any systematic distributor barriers to selling energy-efficient lighting.

Upstream Lighting Program Measures

While distributors indicate measures covered by the program are current and advanced, lighting controls will likely play a dominant program role in the future.

- 9 of 10 distributors stated there are no notable gaps in the products covered by the program.
- When asked specifically about lighting controls, 8 of 10 distributors emphasized the importance of lighting controls moving forward:
 - *“The move to controls has exploded over past 24 months or so.”*
 - *“Two to three years ago, everyone was in re-lamp mode; now people are interested in controls.”*
 - *“Controls are a big emphasis from our manufacturing partners. There is definitely a market demand for it.”*

Market Factors to Consider Moving Ahead

²³ EMI Consulting. (2019) “Connecticut Energy Efficiency Board C1644 EO Net-to-Gross Study.” Prepared for the Connecticut Energy Efficiency Board. Dated September 25, 2019.

The global lighting market is dynamic and rapidly changing.

- Both the residential and non-residential lighting markets are quickly transforming (though the non-residential market is generally a couple years behind the residential market).
- LEDs are not just becoming more common, but they are beginning to dominate the lighting market. As mentioned previously, 4 of 7 distributors said more than 99% of their inventory is already efficient LEDs.

Free ridership is sure to increase.

- *C1644 EO Net-to-Gross Study* presented a free-ridership rate of 40% for Upstream Lighting—the highest of the entire EO Program measure mix.²⁴ Also, a soon-to-be-released Massachusetts study shows a free-ridership rate of nearly 50% for LEDs. High free ridership is not always bad—it can actually be a strong indicator of a program’s success in transforming a market, but the program needs to respond accordingly.

Baselines will be shifting, greatly reducing savings.

The utilities should also consider lost potential associated with installing sub-optimal solutions today.

- The installation of non-controlled efficient lighting is lost potential and the program should do what it can to push customers to the most advanced solutions (e.g., integrated lighting controls) now as opposed to taking a more incremental approach.

Potential impacts on distributors and contractors of significant program changes—or even a full market exit by the utilities—should be considered.

- The Connecticut utilities have implemented the Upstream Lighting Program for many years and have come to rely on sizable lighting savings, but supply chain actors (i.e., distributors and contractors) have also come to rely on the program and its incentives, which are now a fundamental part of sales practices and the Connecticut nonresidential lighting market.

Conclusions & Recommendations

- **Focus resources on continually fine-tuning current measure mix and rebate levels.** Though there is a lag between the residential and non-residential lighting markets, the evaluation team recommends the utilities heed the early warnings from *R1963a: Short-Term Residential Lighting Study*, which stated that while there is still some short-term savings potential for lighting, the incentive and measure mix need to be refined, and an exit strategy should be planned. The incremental savings for lighting are diminishing quickly. The challenge for the utilities will be defining rebate levels that are just large enough to affect consumer decision-making but maximize cost-effectiveness, while accounting for the fact that the lighting market is dynamic and constantly changing. There is a need is for timely and accurate incremental cost, and net-to-gross data.
 - Develop an ongoing system for collecting and tracking incremental costs and sales to support ongoing optimization of rebate levels.
 - More frequent net-to-gross studies are likely needed. Net-to-gross results from several years ago are of limited value for a market that is transforming so rapidly. In general, net-to-gross

²⁴ EMI Consulting. (2019) “*Connecticut Energy Efficiency Board C1644 EO Net-to-Gross Study.*” Prepared for the Connecticut Energy Efficiency Board. Dated September 25, 2019.

ratios are steadily declining for lighting. Dated net-to-gross results prevent the utilities from optimizing incentive levels.

- **With up-to-date and accurate data, implement a staged approach to adjusting or eliminating rebates for individual measures.** The evaluation team is not recommending an instantaneous exit from the market; there are certainly still some savings to be had with lighting. Instead, the recommendation is that the utilities develop a plan and an approach for optimizing incentive levels, while assessing the right time to transition specific measures out of the program.
 - The upcoming *C2014 C&I Lighting Saturation and Lighting Potential Study* should inform transition efforts, providing insights into measures to target, incentive levels, and the best timing of such activities.
- **Consider adding wireless non-integrated lighting controls to the program.** Distributors and others see lighting controls as the next evolution of the market. While the program currently rebates fixtures with integrated controls—and should certainly put more focus on these measures moving ahead—it does not offer rebates for non-integrated controls.²⁵ The ideal scenario is to get all business customers to upgrade to LEDs with integrated controls and any installations without controls should be viewed as lost opportunity. Incorporating independent wireless controls may provide the ability to help reduce the lost opportunity by giving customers a reasonable-cost future option to improve their facility lighting efficiency that would not require replacing lighting they have already upgraded. In the same way, incorporating non-integrated wireless controls could also provide additional energy savings potential to the large number of Connecticut businesses that have already borne the cost of upgrading to LED bulbs, but did not elect controls at the time of installation.
- **Develop program materials (e.g., one- or two-page flyers, case studies) for customers and training for contractors to educate them on the benefits of LEDs, including non-energy benefits.** Even with all the transformation occurring in the market, there are still contractors not favoring LED technology who could benefit from education and training. Hands-on training with advanced technologies like lighting controls would also be advantageous to ensure contractors are prepared to work with and sell controlled lighting. At the same time, many customers are still unclear of the advantages of efficient LED lighting. Here the utilities might benefit from acknowledging that not all benefits are energy related. Participant non-energy benefits (NEBs) for C&I customers can include factors such as reduced maintenance, fewer tenant complaints, improved productivity. Societal NEBs can include a range of factors including, but not limited to, economic impacts or job creation benefits, reduced emissions, and health impacts.²⁶ NEBs such as these should be incorporated into educational and promotional materials for LED lighting so the market can be better informed, and the technology can more fully represent its true value.
- **Extend the amount of time customers have to install the new lighting equipment.** The timing of the installation in alignment with inspections arose as a customer barrier. Currently, the program requires that customers install their rebated lighting within 60 days of delivery.²⁷ While this was not a very commonly mentioned barrier, it warrants consideration because it can potentially have large impacts. Multiple distributors indicated that the installation timeframe requirement was a limitation and may

²⁵ Occupancy sensors are rebated through the Express Service Lighting Rebate program, but not the Instant Discounts program.

²⁶ Skumatz, Lisa & Bement, Dawn. (2007). *New Non-Energy Benefits (NEBs) Results in the Commercial/Industrial Sectors: Findings from Incentive, Retrofit, and Technical Assistance/New Construction Programs*. European Council for an Energy Efficient Economy Summer Study Proceedings: 2007.

²⁷ Maybe adding to this issue is that while the Participating Distributor Agreements stipulate purchased products must be installed within 60 days of delivery. However, it also states that any site can be inspected at any time after 30 days of the Qualified Product Invoice Date.

have prevented some larger projects from participating in the program. With large construction or major retrofit projects, it is common that the builder or contractor will obtain all the materials at one time, but the installation of the units may occur over time (often much more than 30 or 60 days), or even over multiple project phases that can last months.

- The utilities should consider offering the ability to extend the time to install in unique circumstances. Though rules and criteria to ensure consistency need to be developed, this can likely be addressed programmatically on as-needed basis. Distributors will know when a large project is at risk because of the installation time requirement. If this happens, they should have the ability to reach out to the utility to get approval for an extended installation/inspection period; given that these large projects are also likely to require pre-approval, it could also be worked directly into that process.
- **Collect, consolidate, and report lighting measures by sector and customer type.** As noted in the Data Review and Management section, use this information to identify under/over served customer groups.

2.4.5 EO/ECB – Existing Equipment (Chapter 8)

Energize Connecticut’s EO Program is a retrofit program that provides incentives and technical services to encourage existing C&I building owners to replace functioning, but outdated and inefficient equipment with premium-efficiency units. The EO program targets all non-residential electric and gas customers. Three different approaches to energy efficiency projects, utilizing both prescriptive and custom incentives, comprise the core elements of the EO Program.

Energize Connecticut’s ECB Equipment Replacement program provides incentives for new or end of useful life equipment for C&I and municipal customers.²⁸ Typically, ECB customers making equipment upgrades undergo a similar process to EO customers with major building renovations. Both customer groups can either take a prescriptive approach, with pre-determined equipment types and incentive amounts, or a hybrid prescriptive/custom approach while focusing on one or two components of a building’s energy system during an addition project. The only major difference between the two programs is that the EO program is used for upgrading old, but still functioning equipment, while ECB Existing Equipment is used for brand new equipment additions or replacing old non-functioning equipment. Due to the similarities in types of equipment installed and program delivery, EO and ECB Existing Equipment are covered together in this report.

To assess EO and ECB programs, the evaluation team conducted quantitative web surveys with 41 EO and 28 ECB Existing Equipment participants and 34 trade allies.

Participant Sources of Awareness and Trade Ally Program Promotion

The Energize Connecticut website and trade allies play the dominant role in making customers aware, but wider-scale mass promotion should be considered for small customers making up the bulk (99%) of the C&I customer base.

Trade allies carry significant responsibility for promoting the programs and additional marketing support is desired.

- Several mentioned they would like to see co-branded materials.

²⁸ For the purposes of our evaluation, ECB New Equipment and ECB Equipment Replacement are combined and referred to as “ECB Existing Equipment.”

- A couple said they have received no marketing support at all beyond periodic trainings.

Barriers to Equipment Upgrades and Program Participation

The primary *barriers to making energy efficiency upgrades* are uncertainty around monetary bill savings and upfront costs of the upgrades.

The primary *barrier to program participation* is lack of program awareness, though trade allies also mentioned the application process.

EO and ECB Existing Equipment Project Financing

The use of financing is relatively common with EO and ECB Existing Equipment projects.

- One-quarter of EO/ECB Existing Equipment participants reported that they utilized financing on their project.

Financing is key for some projects and more could be done by the programs and trade allies to promote the availability of project financing.

- Over one-quarter of non-participants reported that a lack of access to financing or capital for energy efficiency improvements was a barrier to making upgrades to their facilities.
- About three-quarters of non-participants, however, were not aware of financing options through the Connecticut Green Bank or their utility.

Comprehensive Projects and Repeat Participation

Comprehensive projects achieve greater savings but are uncommon for the EO and ECB Existing Equipment Programs, as lighting continues to dominate upgrades.

- On average, comprehensive projects achieved a 0.29 savings to consumption ratio in 2019 compared to 0.11 for non-comprehensive projects.
- 84% of 2019 EO and ECB Existing Equipment projects were not comprehensive.

Though lighting dominates comprehensive (and non-comprehensive) projects, potential exists for other end uses.

- Participants who only completed one upgrade most often installed lighting (71%), refrigeration equipment (4%), or HVAC equipment (3%).
- Participants who completed comprehensive projects were most likely to include lighting (93%), refrigeration (45%), or motor (24%) upgrades in their projects.
- Notably, few EO and ECB Existing Equipment participants chose to upgrade other equipment options besides lighting, whether as part of comprehensive or non-comprehensive projects (only 4% refrigeration, 3% HVAC, 2% motors, 2% process equipment, and <1% hot water equipment), suggesting program potential exists across these other end uses.

Trade allies and utility representatives play an integral role in encouraging comprehensive projects.

- About 80% of EO and ECB Existing Equipment participants (74% Eversource; 100% UI) reported that they consulted with either a trade ally or utility representative before deciding on the scope of their project. Among the 20% of participants who did not, none completed a project that consisted of multiple end uses.

Existing Equipment Program participation often leads to additional energy efficiency improvements; comprehensive *projects* versus comprehensive *customers* may warrant consideration.

- While only 16% of 2019 EO/ECB Existing Equipment *projects* were comprehensive, nearly three-quarters (73%) of participants reported making additional energy efficiency upgrades following their participation in the EO/ECB Existing Equipment Programs (within or outside the program).
- Repeat participation is efficient and offers notable benefits (e.g., past participants are more likely to participate than those who have not, past participants are easy to identify and target, previous participation suggests the barriers to making upgrades or participating are less of an issue than with the general population).
- Focusing solely on project level comprehensiveness overlooks the critical fact that customers can also be comprehensive *over time*.

EO and ECB Existing Equipment Program Satisfaction

Participants were generally quite satisfied with the EO and ECB Existing Equipment Programs.

- Overall, participants were highly satisfied with the program (providing an average rating of 8.1 (on a 10-point scale).

Trade allies reported relatively lower levels of satisfaction with the EO/ECB Existing Equipment Programs, specifically with paperwork and program marketing.

- Trade allies reported being least satisfied with the amount of time needed to complete program paperwork (5.7 on 10-point scale)
- Trade allies also reported lower levels of satisfaction with the amount (6.5) and quality (6.6) of program marketing.

Overall, participation satisfaction with the EO/ECB Existing Equipment Programs is in line with programs throughout the country offering a combination of prescriptive and custom project incentives.

Conclusions & Recommendations

- **Leverage relatively low-cost, large-scale digital channels like email to inform a larger number of customers about the available incentives and programs to increase participation.**
 - Given limited email coverage within utility customer databases (20% Eversource, <1% UI), consider purchasing email addresses for customers within utility service territory zip codes.
 - Messaging should emphasize the primary barriers, including potential energy bill savings and costs.
 - The Energize Connecticut website currently contains a few case studies, but most are for rather large projects. Develop additional case studies that cover more market segments and more

measures and share via email, targeting specific customer types with content most relevant to them.

- Marketing and promotions could also focus on the availability of financing and the additional rebates available for comprehensive projects to help steer customers to these opportunities.
- **Develop, co-brand, and share marketing, promotional, and educational materials that can be used by trade allies to promote the program to their customers.**
 - Regularly solicit input from trade allies on their marketing needs.
 - Develop a library of electronic resources based on those needs that can be accessed by participating trade allies.
 - Also consider conducting events (webinars, annual informational meetings, trainings) with trade allies to make them aware of the program and available resources.
- **Ensure trade allies are aware of utility and Connecticut Green Bank financing options and are promoting these options to customers** (see marketing, promotional and educational tactics above).
- **Work to streamline the application process for EO and ECB Existing Equipment projects.**
 - Consider reducing length of the application and improving clarity of the application process, providing faster turnaround times for approving projects, and more prompt communications in general throughout the process.

2.4.6 Energy Conscious Blueprint (ECB) New Construction and Major Renovation (Chapter 9)

Energize Connecticut’s ECB program provides incentives for new construction, major renovation, and new (or end of useful life) equipment for commercial, industrial, and municipal customers. The ECB Program currently offers customers multiple “paths” to program participation to provide customers with a variety of ways to participate in the ECB program based on their unique needs. For this evaluation, the evaluation team conducted in-depth telephone interviews with 21 ECB New Construction participants and 11 trade allies.

Drivers of Program Participation

Lowering project and utility energy costs are the key drivers of program participation.

Familiarity with program benefits, as a result of past participation may also play a role in program participation.

- Over half (12 of 21) of interviewed ECB New Construction participants reported they had previously participated in an Energize Connecticut program prior to undertaking an ECB project.

Customer Barriers to Energy Efficient Upgrades and ECB Program Participation

Lack of adequate information on energy-efficient options and associated savings are the primary *barriers to making energy efficiency improvements* for non-participants.

Lack of ECB program awareness appears to be the primary *barrier to program participation*.

- Over two-thirds (11 of 16) of non-participants who completed a new construction or major renovation project in the past two years reported being unaware that ECB New Construction incentives were available.

Trade Ally Barriers to Delivering the Program Most Effectively

Trade allies report needing additional information regarding ECB program processes and changes to program rules and requirements.

- About half of trade allies (6 of 11) reported that having additional information would improve how they deliver the program. Among those trade allies, all but one mentioned needing additional program related information such as timely information on program changes, requirements, and processes.
- Additional types of information requested by trade allies included information on energy modeling and Zero Net Energy (ZNE) building techniques, specific vertical markets including healthcare and educational customers, and emerging energy-efficient products (one mention each).

Trade allies also felt more utility support in terms of customer outreach would benefit the program and help increase program participation.

- About one-third (4 of 11) of trade allies indicated there is a need for more utility outreach to potential customers. Suggested program outreach included,
 - Utility-provided print advertising and direct outreach to municipalities;
 - Utility-provided webinars;
 - Utility presence at events where architects and engineers attend, including American Institute of Architects (AIA) events; and
 - Utility engagement in sector-specific conferences and events (e.g., municipal water and wastewater treatment, affordable and multifamily housing, and industrial sectors; one mention each).

These findings are consistent with best practices identified for other new construction programs, specifically conducting outreach to trade allies to inform and keep them up to date about program offerings.

Project Financing

Although C-PACE financing is available through the Connecticut Green Bank, it was not used by interviewed ECB New Construction participants.

- No interviewed ECB New Construction participants reported using C-PACE financing for their project even though half (12 of 21) reported being aware that it was available. Instead, participants reported using capital budget (11 mentions) or traditional bank financing (4 mentions) to pay for ECB New Construction projects.

Interview findings suggest that C-PACE financing may be of interest to smaller customers.

- Two ECB New Construction participants who completed smaller projects (in terms of square footage) indicated they might be interested in using financing for future projects if rates and terms were competitive with other lenders.

- Additionally, about half (5 of 11) of trade allies believe additional financing options may appeal to smaller customers, particularly on-bill financing like what is offered through the Energize Connecticut Small Business Energy Advantage (SBEA) program.
- Further, among the 16 non-participants who reported completing a new construction or major renovation project, about one-third (5 of 16) mentioned that having access to financing or capital was a barrier to making energy efficiency improvements.
- Studies of comparable new construction programs also identified access to financing as a barrier to participation and suggested making a wider range of financing options available to utility customers.

Early Project Involvement

All but one interviewed trade ally indicated that their own early involvement in an ECB project is imperative to increasing project savings and comprehensiveness.

- They noted that early involvement:
 - Increases their ability to make recommendations to customers (2 mentions)
 - Impacts their ability to provide energy modeling (1 mention)
 - Allows them to influence building massing and shape decisions (1 mention)
 - Decreases the amount of time needed for projects (1 mention)

Although trade allies do generally get involved in projects early in the design phase, some are not getting involved early enough, which limits eligibility for the most comprehensive ECB program paths.

Figure 12. Phases When Trade Allies Typically Get Involved in ECB New Construction Projects (Trade Allies n=11)



Comprehensiveness and Tiered Incentives

The Energize Connecticut ECB initiative offerings and incentive structures are generally similar to C&I new construction programs in Massachusetts and Rhode Island, though there are some notable differences.

- One notable difference is that the Connecticut program has considerably higher incentives amounts for Paths 1, 2, and 3 than the Massachusetts and Rhode Island offerings.²⁹
- Another difference worth noting is that Massachusetts and Rhode Island do not offer tiered incentives for Paths 3 and 4, nor design incentives for Path 4.

²⁹ The evaluation team probed this issue with the utilities, and they reported that this is due to several reasons including differing baselines, different code cycles, and differing rates of available savings. Overall, the result is the cost per kWh of savings tends to be higher in Massachusetts and therefore the ability to pay more incentives decreases in Massachusetts as compared to Connecticut.

Trade allies had mixed opinions about the effectiveness of the multi-end use or tiered incentive structure in motivating customers to complete more comprehensive projects.

- Only about half (6 of 11) of interviewed trade allies reported that the tiered incentive structure encourages their customers to do more than they otherwise would have as part of their projects.

Limited promotion of energy modeling by trade allies affects the program's ability to achieve the most comprehensive projects.

- ECB program Paths 1 and 2 both require that energy modeling be completed for a project to qualify for incentives. While energy modeling is required for these program paths, only half of interviewed trade allies (5 of 11) reported regularly promoting these services to their ECB customers.
- Trade allies who indicated they do not promote energy modeling reported having the capacity to do modeling but not regularly promoting it (two mentions) or not promoting modeling for unspecified reasons (three mentions).

ECB New Construction Program Participant and Trade Ally Satisfaction

ECB New Construction participants and trade allies are satisfied with the program elements and experience.

- None of the interviewed participants scored any of the program elements or their overall experience less than a 7 out of 10.
- Participants reported being most satisfied with Energize Connecticut program representatives and the equipment and services associated with the project and least satisfied with the project incentive amount and application process.
- Trade allies were also generally satisfied with their program experience, noting they were particularly satisfied with the paperwork process (three mentions), communication and responsiveness of program staff (two mentions), program staff level of knowledge, energy modeling guidelines, and the inspection process (one mention each).

Free Ridership

The Energize Connecticut ECB New Construction Program is attracting some participants that appear to be free riders, but it may be more complicated than it seems at first glance.

- About two-thirds (14 of 21) of interviewed participants reported that their participation in the ECB New Construction Program did not affect their project design or equipment choices. At first glance, these would appear to be complete free riders. And high free ridership is not uncommon for new construction programs; recent evaluations of comparable programs have found net-to-gross ratios ranging from 50% to 70%. This issue is currently under exploration as part of a NTG and baseline study for the ECB Program, which should provide additional information on this issue.
- When probed further, however, most of these respondents indicated nothing really changed because they were *working with trade allies that were already planning to use energy-efficient equipment and design practices*. Thus, the free ridership question might need to center on what influenced *the trade allies* to participate?

Conclusions & Recommendations

- **Focus program messaging on how the ECB Program can reduce project costs in addition to annual and life cycle energy costs.** Economic considerations are the top motivators for customers to participate in the ECB New Construction program. The utilities should ensure any marketing and educational materials emphasize rebates and potential cost savings. Messaging should be targeted to customers who are undertaking new construction or major renovation projects but have not previously participated.
- **Program should consider additional outreach specifically to architect and design professionals to locate projects in early planning and design stages and connect with project leads.** To do this, consider reviewing industry publications and databases to identify project leads, attend events where architects and designers attend, including AIA events to connect with design teams, and use public records to locate project in their early phases to engage with owners.
- **Provide educational and workforce training opportunities to increase customer and trade ally understanding of energy efficient building construction and design practices.** Opportunities could include webinars and roundtables focusing on energy-efficient design principles (i.e., ZNE, LEED, etc.) and energy-efficient technologies. Education and training should communicate the specific benefits of pursuing ZNE buildings and setting EUI targets.
- **Target C-PACE financing towards small and medium sized businesses.** Highlighting the benefits to property owners (longer lending terms, no upfront costs, off-balance-sheet) through case studies that include financial benefits of C-PACE. Alternatives to C-PACE financing could include on-bill type financing that is used by the SBEA program.
- **New construction incentive levels in CT are much higher than neighboring states.** Review incentive levels to ensure they are cost effectively driving adequate participation.
- **Improve program evaluability.** This can be achieved by tracking additional project information in program tracking data, including types of incentives received (ECB path, tiered incentives, design team incentives, etc.).

2.4.7 Business and Energy Sustainability (BES) (Chapter 10)

The BES Program is designed to encourage customers to make *continuous* improvements in their business and facility operations that lead to sustainability and competitive business advantages. BES offerings include Operations and Maintenance Services (O&M), Process Reengineering for Increased Manufacturing Efficiency (PRIME), Energy Utilization Assessments (EUA), Retro-Commissioning/Continuous Commissioning (RCx/CCx), and Strategic Energy Management (SEM).³⁰ The evaluation team conducted in-depth interviews with 10 of 32 trade allies serving the BES Program and 15 of 109 participants in the BES Program.

BES Program Ecosystem

Overall, there is a well-developed, mature BES ecosystem in Connecticut consisting of participants, trade allies, utilities, and the market.

- BES participants have long-standing and ongoing relationships with utility staff. Among the participants interviewed, all (15 of 15) had been working with the utilities on energy efficiency projects for multiple years. Six reported at least 10 years of activity with the utilities while four reported at least four years,

³⁰ Although SEM is part of the BES program, it is not included in this study as no projects were completed as of December 2019.

two reported between two and three years and one did not specify exactly how many years but referred to a very long history of engagement.

Almost all participants (13 of 15) and trade allies (8 of 10) reported *regular* interactions with utility staff.

- Among the 13 participants reporting regular interactions with utility staff, several mentioned utility staff by name, one reported monthly meetings with utility staff, and another reported partnering with the utility on a lighting study.

All BES trade allies rely on repeat business and referrals to develop BES projects.

Barriers to and Drivers of Program Participation

The different BES offerings are needed to address the broad range of customer barriers and needs.

- Trade allies report a diversity of barriers to customers taking energy-efficient actions. The barriers generally pertain to the specific circumstances of a client as opposed to systemic or overarching issues.

While energy savings is important, there are a mix of reasons for participation.

- Trade allies reported that customers participate in the BES initiatives for many reasons: energy savings (eight mentions), operations and maintenance improvements (six mentions), recovering systems benefit charge money (four mentions), improving productivity (three mentions), and safety (one mention).
- Both trade allies that worked with the PRIME initiative noted that improving productivity was a key reason to participate.

Customer Decision-Making

Decision-making for BES projects is complex and information needs vary.

- Decision-making at BES participant sites often involves multiple people and can even involve people located outside Connecticut. In addition to the respondents, decision makers include facility/maintenance managers (eight mentions), senior management like CEOs/Vice Presidents (six mentions), financial staff like comptrollers or CFOs (three mentions), and technical staff like engineers and operations directors (two mentions).

BES participants tend to take a long-term view when considering building and process improvements.

- The respondents representing the seven largest sites and three respondents representing smaller manufacturers reported prioritizing long-term savings over upfront cost when considering energy-efficient equipment.
- Of the 10 respondents that reported some type of payback requirement when considering projects, half indicated they would consider projects with five-year or longer payback periods.
- This commitment to relatively long payback periods and long-term savings suggests that this group is different from other business participants who often report upfront cost as their primary concern and payback requirements are often just one to two years.

That said, while longer term energy savings is generally a bigger concern than upfront cost, customer size matters.

- Larger participants are more concerned with long-term savings, while smaller customers are equally likely to be concerned with upfront costs indicating that payback needs vary.

Participants report they and their colleagues also need information about equipment reliability and how a project comports with facility plans and productivity.

Those customers successfully engaging in BES tend to have at least one business practice aimed at managing energy use, which aids in the decision-making process.

Given the suite of BES offerings, financing is not typically needed to encourage participation.

Comprehensiveness and Deep Savings

The BES Program supports comprehensive and deep savings *by design*.

- The Operations and Maintenance (O&M) initiative, the most used of the BES initiatives, builds equipment recommendations and repairs into the process and incentive structure. Participants in this initiative often use the initiative annually to ensure steam and compressed air systems are operating as efficiently as possible.
- The retro-commissioning (RCx) initiative supports customers by helping them find no- and low-cost measures to ensure savings over time.
- The Process Reengineering for Increased Manufacturing Efficiency (PRIME) initiative and the Energy Utilization Assessments (EUA) initiatives assist the manufacturing customer segment by identifying ways to increase production while using the same or less energy as they did before they participated in the initiative.

BES participants tend to be comprehensive customers, but over time.

- BES participants have extensive experience using Energize Connecticut programs and services with most indicating they installed multiple end uses in recent years with support from the program.
- All participants reported doing a lighting project with support from Energize Connecticut, and the majority of participants reported doing steam, HVAC, and motors projects in recent years.

Trade Ally Satisfaction and Recommendations for Improvement

Trade allies are quite satisfied but offer some recommendations for improvement.

- TAs are largely satisfied with the program (7 of 10 expressed high levels of satisfaction while 3 of expressed moderate levels of satisfaction) and none expressed dissatisfaction.
- Nine of 10 TAs also mentioned a recommendation for improvement, but none characterized these recommendations vital to the success of the program. The recommendations covered:
 - **Program processes** by making the program experience uniform across Eversource (EV) and United Illuminating (UI) territories, paying incentives faster, and streamlining the participation process.

- **Outreach** by increasing the frequency of outreach to customers about Energize Connecticut and BES opportunities, improving communication to trade allies about program changes, and improving communication about the program during the COVID-19 pandemic.
- **Program rules** by providing a waiver for larger projects,³¹ supporting infrared drone surveys of large buildings to detect heat loss, requiring customers to analyze savings six and 12 months after a retro-commissioning project, and not requiring steam specialists to submit projects by the end of the calendar year which is often the busiest time of year for steam projects.

Differences in Program Experiences across Utilities and Jurisdictions

While trade ally respondents generally completed more BES Program work in the Eversource territory than UI simply because of the utility's relative sizes, several trade allies reported different experiences with Eversource and UI.

- While 4 of 5 allies expressed some frustration with the UI experience, nothing was systematic.
- One installer trade ally reported preferring UI's application process over the Eversource process. According to this respondent, UI was more flexible with deadlines and had a more "traditional" Excel-based approach that was easy to use compared to Eversource's "very engineer" focused application process.

Trade allies reported that the Energize Connecticut programs generally compare favorably to the programs in Massachusetts and Rhode Island.

Conclusions & Recommendations

- **Expand outreach to new customers.** the utilities should conduct targeted outreach to manufacturing, educational, and hospital facilities that have not participated to date. These business sectors serve as the foundation for current participation and a compelling case can likely be made that they would get value out of the program, particularly using the experiences of similar customers. This strategy should involve leveraging existing utility staff and/or trade ally relationships where possible and creating incentives such as contests or rewards for those that bring in *new* customers.
- **Collaborate across utilities to better understand differences between UI and Eversource implementation and make changes where feasible to make participation more consistent.** Trade allies alluded to some differences between the utility programs that could affect performance. While the differences did not appear systematic, it is clear some things are being done differently across the utilities. Ensure these differences are understood and use them as an opportunity for improvement. The utilities should meet to collaborate on the participation process and identify places they could better align the process or requirements. Ideally, the utilities should work together to derive a single method for project submission, documentation, data collection, and tracking, which would make evaluation and assessment much easier.
- **Both Utilities need to track BES Program participation as well as detail on which sub-initiative the customer participated in.** The Eversource program tracking data provided a field indicating if a project was a BES project along with the associated sub-initiative. For UI, it was much more complicated. The evaluation team was first told that UI had not done any BES work in the 2017–2019 timeframe. With

³¹ According to one respondent, large steam trap surveys can exceed the cap for incentives for the BES program. In these instances, the ally must break the project into multiple steam trap assessments and submit multiple applications instead of just one.

further probing they acknowledged that they did but said they did not track them as BES projects. In the end, UI did provide the evaluation team with two separate files: (1) O&M projects, and (2) RCx projects.

2.4.8 Assessment of Equity in Program Delivery

Program Treatment of Distressed Communities

The Connecticut Department of Economic and Community Development issues a list of distressed municipalities annually to help target funds to those communities most financially and economically in need.³² The evaluation team used this list to assess the degree to which Energize Connecticut dollars and services are flowing to distressed and non-distressed communities throughout the state and identify any equity concerns related to energy efficiency program delivery.

Distressed communities received program benefits proportional to population and electric and gas consumption. Data across program years show that the share of incentives going to distressed communities increased from 2017 to 2018, but then declined slightly in 2019. Further, distressed communities received a slightly higher percent of the total share of savings relative to non-distressed communities than incentives for both electric and gas.

Program Treatment of Rural versus Urban Communities

The evaluation also found that **rural communities received program benefits proportional to population and consumption.** The proportions of incentives going to rural areas tracked closely with the proportion of accounts, consumption, and savings. Electric participation rates were generally higher than gas participation rates, but there was little difference in rural versus urban participation rates.

Conclusions & Recommendations

- **Differentiate program offerings and marketing strategies by customer size.** Micro and small accounts could realize relatively high participant savings achieved with measures that offer limited savings per measure, typically prescriptive solutions. Medium accounts have somewhat more complex energy needs, but often do not have sufficient energy needs to have dedicated energy managers within the business. Large accounts are typically managed directly due to the size of their energy needs and savings opportunities. Developing program and marketing strategies that address differences in needs by size can improve performance metrics of customers within each size class.
- The overwhelming number of small and micro gas accounts suggest targeted strategies for addressing their somewhat limited needs could provide a substantial boost to participation rate and participant savings achieved. Possible avenues for expanding service to small and micro accounts include engaging dedicated gas direct install vendors and offering expanded upstream measures such as hot water, kitchen equipment, and HVAC solutions, which have been successful among this customer group in Massachusetts.
- Based on experiences in Massachusetts, the Connecticut utilities could consider utilizing a differentiated marketing strategy by both segment and customer size. In Massachusetts,

³² The Connecticut Department of Economic and Community Development defines Distressed Communities in terms of its tax base, personal income of residents, and residents' need for public services. Details on Distressed Communities can be found here: https://portal.ct.gov/DECD/Content/About_DECD/Research-and-Publications/O2_Review_Publications/Distressed-Municipalities

Eversource has used a strategy that separates accounts into quartiles based on annual kWh or therm consumption. Accounts are then assigned to teams based on industry segment and quartile. The smallest accounts are considered small business and handled by the DI vendors. All other accounts are managed by teams based on industry segment and customer size. Medium businesses are handled by separate teams than large business. This approach led to relatively high population savings achieved for medium and large business.



Chapter 3



3. Evaluation Objectives and Methods

This report presents the results of *C1901: Commercial and Industrial (C&I) Sector-Wide (non-SBEA) Process Evaluation* conducted by Opinion Dynamics on behalf of the Connecticut Energy Efficiency Board (EEB). This evaluation was designed to take a holistic look at the Energize Connecticut programs offered to the state’s C&I sector (with the exception of the Small Business Energy Advantage (SBEA) Program),³³ to understand how the programs work together to serve this group of utility customers, what gaps might exist, and what improvements could be made to optimize program performance including ways to harmonize programs and enhance coverage and equity.

The project also includes a data-driven C&I Customer Profile (CICP) task that provides an overview of the C&I landscape of accounts across Connecticut. The CICP analyses include all C&I accounts (including small businesses) across both utilities and explores patterns of consumption, participation, savings, and incentives over three years: 2017, 2018, and 2019.

This chapter provides an overview of the Energize Connecticut C&I sector programs covered by the process evaluation, as well as an overview of the research approach including key objectives and evaluation activities. The final section of this chapter describes the organization of the report.

3.1 C&I Sector Overview

This evaluation covers the three main non-SBEA Energize Connecticut programs designed to serve C&I customers of all sizes throughout the state. The programs include:

- Energy Opportunities (EO) (including Upstream Lighting)
- Energy Conscious Blueprint (ECB)
- Business and Energy Sustainability (BES)

Table 6 provides a high-level description of each program.

Table 6. Energize Connecticut C&I (non-SBEA) Programs

Program	Overview
Energy Opportunities (EO)	<p>Retrofit program that provides incentives and technical services to encourage existing C&I building owners to replace functioning, but outdated and inefficient equipment with premium-efficiency units for C&I electric and gas customers of any size.</p> <p>The program also includes the Upstream Lighting Program, which provides instant discounts to customers who purchase qualified lighting products from participating distributors.</p>
Energy Conscious Blueprint (ECB)	<p>Program offerings incentives for new construction; major renovation; tenant fit-out measures; and new (or end of useful life) equipment measures for commercial, industrial, or municipal customers throughout Connecticut.</p>

³³ The SBEA program targets smaller non-residential customers and is evaluated separately from the C&I programs discussed herein. It is worth noting that the small customers can also participate in the programs covered under this evaluation, so they remain part of the general population of interest.

Program	Overview
	<p>It is worth noting that to better align our research and data collection instruments with the nature of the offerings, we explored the ECB-New Construction (including new construction and major renovation projects) and ECB-Existing Equipment (including retrofit measures and new measures not captured under new construction) portions of the program separately. The ECB-New Construction pathway is a very different offering involving different market actors, program processes, and customer experiences than the ECB-Existing Equipment pathway. Since ECB-Existing Equipment is rather like EO, we combined data collection and reporting for these (see Chapter 8); ECB-New Construction is covered separately (Chapter 9).</p>
Business and Energy Sustainability (BES)	<p>The BES Program is designed to encourage customers to make continuous improvements in their business and facility operations that lead to sustainability and competitive business advantages. BES consists of five specialized initiatives, four of which are included in this evaluation: Retro-commissioning (RCx), Process Reengineering for Increased Manufacturing Efficiency (PRIME), Energy Utilization Assessment (EUA), Operations and Maintenance (O&M), and Strategic Energy Management (SEM).³⁴</p>

3.2 Research Objectives and Activities

The overarching objective of the evaluation was to explore key questions that cut across the non-SBEA C&I energy efficiency programs in the Energize Connecticut portfolio and provide key findings and actionable recommendations in areas including:

- Information to inform program cost effectiveness
- Optimization of program expenditures
- Market penetration
- Depth and comprehensiveness of savings
- Customer equity

Additional topics explored through the process evaluation included:

- The pathways and time frames of customer energy efficiency adoption
- Customer decision-making around adoption of energy efficiency and program participation
- Customer satisfaction and recommendations for potential program improvements
- Utility and trade ally interactions with customers
- Trade ally and distributors business and sales practices
- Comparison of Energize Connecticut programs to similar programs in other jurisdictions
- Review of utility data collection and tracking.

³⁴ The SEM initiative is being evaluated as part of a separate study.

In close collaboration with the Evaluation Administrator Team (EA Team), the evaluation team developed a wide range of detailed research objectives for each program, as well as for the cross-cutting analysis. The full list of research objectives that guided this evaluation are provided in Appendix A.

3.3 Evaluation Approach

To conduct this evaluation, the evaluation team collected data from a variety of sources (program administrators, implementers, trade allies, distributors, program participants, non-participants, and various secondary sources) using a range of methods (interviews, surveys, and review of databases and literature) to investigate the topics of interest and meet the research objectives (Table 7).

Table 7. Data Sources Used to Inform Key Areas of Interest

Data Source	Key Areas of Interest				
	Cost-Effectiveness	Optimization of Program Expenditures	Market Penetration	Depth of Savings	Customer Equity
Utility staff	✓	✓	✓	✓	✓
Program Implementers	✓	✓	✓	✓	✓
Trade Allies/Distributors			✓	✓	✓
Participants			✓	✓	✓
Non-Participants			✓	✓	✓
Program Material/Data	✓		✓	✓	✓
Secondary Data	✓		✓	✓	✓

In terms of secondary data, the evaluation team conducted comparative program analyses to understand how the Connecticut program offerings aligned with other similar programs in other jurisdictions. While the emphasis was placed on drawing comparisons to similar programs in Massachusetts, in many cases, the evaluation team had to look further afield to find publicly available evaluation reports for key metrics such as participant satisfaction. For each Connecticut program, the evaluation team gathered and reviewed reports on the most comparable program offerings. As such, the comparison programs differ depending on the Connecticut program under study.

Table 8 shows the data collection activities conducted by program. Detailed information on target populations, sampling, and completed interviews is provided in Appendix A.

Table 8. Evaluation Activities

Target Audience/ Activity	Energy Opportunities (EO)		Energy Conscious Blueprint (ECB)	Business and Energy Sustainability (BES)
	EO Program	UL Program		
Review of Program Materials/Data	✓	✓	✓	✓
Review of Secondary Data	✓	✓	✓	✓
Utility Staff	Interviews	Interviews	Interviews	Interviews
Implementer	n/a	Interviews	n/a	Interviews
Trade Allies	Survey	n/a	Interviews	Interviews
Distributors	n/a	Interviews	n/a	n/a
Participants	Survey	Survey	Interviews	Interviews
Non-Participants	Survey			

Note: Interviews refer to in-depth interviews conducted by a trained consultant. Surveys refer to quantitative surveys fielded online or by phone.

3.3.1 Comments on Business Account Size

It is important to clarify that the evaluation team uses two different account size schemas in this report. The distinction is between the profiling analyses provided in Chapter 4 and the discussion of the non-participant survey results peppered throughout the report.

A significant component of this study was the profiling (CICP) analyses aimed at characterizing various aspects of the entire C&I population of customer accounts in Connecticut. The framework and foundation for the profiling task was prior work conducted in Massachusetts.^{35,36,37} Because this was the first time conducting the profiling task for Connecticut, the evaluation team strove to ensure, to the extent possible, that the profiling analyses were aligned across Connecticut and Massachusetts to support robust comparative analyses. To do so, we needed to rely on the business account size classes used in the prior Massachusetts work. Table 9 shows the distribution of business account sizes, by size class, for the most recent Massachusetts study alongside with the Connecticut C&I population distribution from 2019. Notably, the distributions of business account sizes are quite similar across both states.

Table 9. Business Customer Account Distributions Across Massachusetts, Connecticut, and the Connecticut Non-Participant Sample

Size Bin	Consumption Level	Massachusetts Population		Connecticut Population		Connecticut Non-Participant Sample	
		Count	%	Count	%	Count	%
Micro	<0.11 GWh/yr.	342,500	91.3%	133,063	89.3%	82	88.2%
Small	>=0.11 GWh/yr. and <1.50 GWh/yr.	27,659	7.4%	14,583	9.8%	10	10.8%
Medium	>=1.50 GWh/yr. and <4.50 GWh/yr.	3,689	1.0%	1,110	0.7%	1	1.1%

³⁵ DNV GL (2020). *Commercial and Industrial Small Business Nonparticipant Customer Profile Study*. MA18X11-B-SBNONPART. Prepared for the Massachusetts Program Administrators and EEAC Consultants. Dated: April 15, 2020.

³⁶ DNV GL (2018). *Commercial and Industrial 2011-2016 Mid-size Customer Assessment*. Prepared for the Massachusetts Program Administrators and EEAC Consultants. March 7, 2018.

³⁷ DNV GL (2019). *2017 Commercial and Industrial Customer Profile Study Report*. Prepared for the Massachusetts Program Administrators and EEAC Consultants. Dated: April 18, 2019.

Size Bin	Consumption Level	Massachusetts Population		Connecticut Population		Connecticut Non-Participant Sample	
		Count	%	Count	%	Count	%
Large	>=4.50 GWh/yr.	1,287	0.3%	281	0.2%	0	0.0%
Total		375,135	100.0%	149,037	100.0%	93	100.0%

Table 9 also shows the distribution of the non-participant survey respondents the evaluation team collected through this study.³⁸ Here too we see the proportional distribution across size classes looking quite like the overall C&I population proportions. However, because the large and medium size bins contain such small proportions of total accounts (0.2% and 0.7%, respectively), and we only completed 93 total non-participant surveys, we have virtually no non-participant representation in the larger size classes. Thus, while these size classes are particularly useful for the interstate comparisons, they are not very helpful for discriminating account size among the non-participant respondents.

While this may initially seem problematic for drawing inferences from the important non-participant sample, it is worth emphasizing that the *small and micro customer accounts comprise over 99% of all C&I accounts in Connecticut* (as well as Massachusetts). That is, while our non-participant sampling failed to capture any large and only one medium account, the respondent sample is still representative of the vast majority of C&I customer accounts.

When conducting the non-participant survey analyses, the evaluation team still wanted to assess whether any size variability existed among the non-participants we did survey. Since the profiling size bin framework would not work for non-participants, we decided to divide the C&I population into three equally sized bins (i.e., terciles) based on 2019 annual kWh energy consumption.³⁹ We took this approach as we felt it would be the easiest manner of assessing size differences in an objective way that is easily duplicable.

Overall, while using this approach does provide the ability to ascertain some interesting size class differences when assessing the non-participant survey results, it is important to emphasize that *when interpreting non-participant size differences, we are effectively comparing three separate bins of small and micro customers* and cannot extrapolate these findings to the medium and large customers as we did not capture any in our survey.

3.4 Report Organization

The following chapters present evaluation results—both findings and recommendations—beginning with a discussion of the data that was needed for this study and with the processes and protocols the evaluation team used to manage and process the data (Chapter 4), C&I customer profiling analyses (Chapter 5) and a broad assessment across all the non-SBEA programs in the Energize Connecticut C&I portfolio (Chapter 6). This is followed by the program-specific evaluations (Chapters 7-10). Within the appendices, we provide

³⁸ The evaluation team developed the sample frame for the non-participant survey prior to knowing that consumption data would be part of the study (the profiling task as presented herein—along with the need for consumption data—was not finalized until after the primary data collection began). As such, at the time of developing the non-participant sample frame, we did not have consumption data and, thus, could not stratify by account size. Rather, we sampled randomly from the overall C&I account population, which is why the distribution of cases by size class in the final sample generally aligns with the distribution of cases in the overall population.

³⁹ That is, each bin contains the same number of customer accounts (i.e., the bottom-third bin contains 33.3% of customer accounts, the middle-third bin contains 33.3% of C&I customer accounts, and the top-third bin contains 33.3% of the C&I customer accounts).

research objectives, the non-participant respondents' profile, detailed methodology information, additional detail on data review, and data collection instruments.



Chapter 4



4. Data Review and Management

In many ways, the largest task associated with this project was the acquisition and the processing of the utility data required to facilitate this evaluation and the profiling. This brief chapter provides an overview of the data management processes. At the end we make some recommendations based on our experiences and observations. Additional details regarding data processing are included in Appendix B.

Overall, the data for this study served two main purposes:

- Provided the sample frames for the array of primary data collection efforts (i.e., participant, non-participant, trade ally, and distributor surveys and interviews, by program)⁴⁰
- Provided the detailed information needed to conduct the profiling task

In the simplest sense, the study required the following data:

- Program tracking data
- C&I population data
- Consumption data for the entire population

All the data needed to simplify down to the account number level, and it needed to cover the three years 2017-2019. Of course, we needed this data from both utilities.

The evaluation team obtained data from the utilities through a series of formal data requests that the utilities attentively addressed. The initial request covered the three years of program tracking data and a C&I population file so we could develop our sample frames for our surveys and interviews. A final decision on what the profiling activity was to entail was not made until later in the project, when we learned we needed consumption data. Thus, the request for consumption data was made later.⁴¹

Notably, for the purposes of developing sample frames, the various data files did not need to be merged or brought together. We only sampled 2019 cases and we sampled from within programs, which was supported by the structure of the data files we were provided (i.e., generally, project by end-use by customer by year). However, to conduct the profiling, all the data needed to be brought together and merged into an account number-level file for analytic purposes. This was a massive undertaking.

In the end, the data processing for the profiling task consisted of the evaluation team receiving and processing *dozens* of data files. Across utilities (and sometimes even within a utility across various files for the same program), the evaluation needed to address inconsistent:

⁴⁰ We had also initially also planned to conduct a partial participant survey. We defined *partial participants* as customers that in some way started pursuing an Energize Connecticut project, but ultimately did not complete it. The utilities generally track projects once approved to begin, or after they are completed, depending on the program. One of the partial participant subgroups we were very interested in interviewing were customers that showed interest in a program but did not even make it through the application process. Unfortunately, these customers are not present in the program tracking data. The other partial participant subgroup we were interested in talking with were customers that started a project—and thus appear in the data—but had not completed it (i.e., had a project start date more than six months in the past and no project complete date). However, there were very few of these customers present in the 2019 data and the ones we reached out to indicated they either had completed the project (possible because we conducted the research in 2020 based on program data from 2019) or were still planning to complete it.

⁴¹ We also had a request covering the partial participant lists, but as noted above, this research did not come to fruition. There was also a final formal data request memo that wrapped up some pending data questions and issues but did not ask for the delivery of an actual data.

- Content
- Naming conventions
- Formats
- Data structures

The entire process from initial data request to receipt of the last requested data took well over a year. The evaluation team met several times with the utilities and EA Team to discuss the data and we communicated with utility staff extensively via email throughout the process to work through issues, discrepancies, and questions as they arose. **The evaluation team wants to emphasize that the utility staff we communicated with were always responsive, friendly, and helpful.** However, the sheer number of questions and issues we needed to work through to compile the data sometimes stacked up and resulted in delays.

In the end, the evaluation team was unable to resolve all the data issues with which we were confronted when trying to merge the myriad of data files for this project. We know there are still some issues with the data and try to call these out when they arise throughout this report. There are also other issues we cannot begin to address, such as when either or both utilities do not yet track a key piece of information or data point.

The remainder of this chapter presents the array of issues we faced, along with recommendations for making both general and specific changes to utility data and processes based on our experience working with these data files. Strides could certainly be made to improve the utility data to both support typical process and impact evaluations, as well as lay the foundation for consistent and systematic profiling efforts into the future.

Importantly, the data issues we discuss should not be looked at just as an evaluation issue. In many instances we expect our recommendations will be of great value and benefit to program managers and implementers as well. For example, adding key information to a data tracking system that can be used to target customers more effectively will be valuable. Simplifying the structure and content of data files to make them more accessible and usable to a wider range of users will be helpful. Standardizing data both within and across programs and utilities will make for much easier assessment of program performance and help emphasize areas of focus. This is just a few examples—there are certainly more.

In these recommendations, we focus mostly on issues and challenges we had in getting the data into the shape needed for both sampling and profiling. Appendix B lists the detailed issues we faced when processing the data; the recommendations here are generalizations from the items mentioned in the appendix.

4.1 Recommendations

A common reporting framework should be developed to ensure evaluators are provided with comparable and consistent data year after year. Ideally, the utilities would entirely harmonize the content and structure of their databases, but we also acknowledge this is unlikely to occur for several reasons. Nevertheless, worthwhile effort could be allocated to developing database queries which the utilities could use to extract, manipulate, and structure data in a consistent manner. The output should focus on ensuring consistent:

- **Data file structure:** Decide whether single-tab Excel flat files or multi-tabbed, relational data files are best.
 - The former wastes space but are easier to manage and process; the latter provide more detail, are more efficient, but harder to use.

- If the latter path is chosen, ensure all cases in each tab correspond with entries in the other tabs (i.e., there should be no orphan entries).
- **Content:** Ensure the files contain the same fields. No more; no less.
- **Naming conventions:** Impose consistent field naming across utilities. Also, ensure field values are consistent (e.g., use the same program names, segment names, end-uses, measure names, etc.)
- **Formatting:** Ensure quantitative data is formatted as numeric (and is represented in the same units), string data is formatted as string, dates are formatted appropriately and consistently, etc.
- **Reporting at the measure level:** None of the utility data that was provided to the evaluation team provided enough granularity to fully inform us about measures. While we could usually tell that certain end-uses were installed as part of a project (e.g., lighting or HVAC), we did not have insights into measure details like what type of lighting equipment or even how many units. These are insights that are key for impact evaluations as well as profiling.

We understand that the coordination and development of harmonized queries is a sizable recommendation that would require coordination across multiple parties including utility staff, the EA Team, and an evaluation consultant. Nevertheless, investment in the effort would prove valuable for all parties and have the potential to reduce evaluation costs in the future.

There are a number of data fields that should be included in the program tracking/C&I population data that are critical to evaluation, program delivery, and/or potentially target marketing that are either not currently being collected or being collected inconsistently. Effort should be allocated to populate as much missing information as possible. These fields include:

- Email addresses
- Industry segment
- For ECB and BES, the pathway or initiative
- Prescriptive or custom measure
- Comprehensive project (yes/no)
- Did the project use financing (yes/no, type of financing)
- Ownership status (tenant vs owner)

Data dictionaries (with code lists) should be developed in conjunction with the development of the above queries to minimize the need to communicate extensively with the utilities to decipher their data.

Improve account tracking. The ability to compute performance metrics and profile customers requires linking consumption and program tracking data. The utilities should continue to improve their ability to identify the appropriate account numbers for tracking records. This is a particular challenge for upstream program measures.

Improve coverage of demographic information. Improved coverage of firmographic information such as square footage, employee size, NAICS codes, building ownership, and ownership structure, though not necessary, will improve the ability to characterize customers and isolate their program needs. Both utilities should seek to improve coverage of firmographic information to characterize customers.

Improve tracking of micro-business consumption and savings. The smallest accounts may consist of a variety of entities who may not require much consumption on specific accounts but may indeed require consumption on some other account for the same customer. The ability for performance metrics to accurately depict the savings achieved at the account level requires assigning the savings to the appropriate account. For micro-business, incorrectly assigning savings to accounts can greatly obscure savings achieved metrics as the savings per unit of consumption accounts for a much larger share.

Collect, consolidate, and report lighting measures by sector and customer type. Use the information to identify under/over served customer groups.

4.1.1 United Illuminating'

UI should incorporate their BES data into the other program tracking data. We were initially told there were no BES projects in 2017-2019 but were later provided a BES file that was “found” separate from the other program data.

UI should incorporate the tracking of trade allies into the overall program tracking system. A trade ally should be tied to each project, as appropriate. If a trade ally was used, the file should state such.

UI should parse out the “qualifier” field into separate fields. This is currently an odd field that can contain a very wide range of largely unrelated information using three-letter codes. Much of this information is potentially useful as it helps to delineate things like upstream projects. However, the information in this field is difficult to work with as it can consist of long lists of three-letter codes.

4.1.2 Eversource

Upstream Lighting data needs to be tracked more consistently and if Upstream Lighting savings are to be included in the main program tracking data files, the entries need to be coded in a manner that makes them easier to find (e.g., a unique subprogram or initiative name) and the entries in the program tracking data should reconcile with any other tracking files.



Chapter 5



5. C&I Customer Profile (CICP)

This section presents results of the C&I CICP task the evaluation team completed as part of the overall process evaluation. The CICP provides an overview of the C&I landscape of accounts consumption, participation, savings, and incentives over three years: 2017, 2018, and 2019. The evaluation team structured this CICP into three main sections:

- Customer Profile of Electric Accounts
- Customer Profile of Gas Accounts
- Customer Profile of Electric and Gas Accounts by Geography

The evaluation team developed the CICP based on the population of billing and program tracking data (the CICP Database) provided by Eversource and UI. The evaluation team cleaned, analyzed, and, where possible, linked together consumption and tracking data by Account Number. The evaluation team analyzed information in the CICP Database to construct the following performance metrics.

Table 10: Performance Metrics used in Customer Profile

Metric	Definition	Purpose
Population Savings Achieved	Total savings for a segment / Total consumption for a segment	Overall metric of performance, combined participation rate and depth of savings per participant
Participant Savings Achieved	Total savings for a segment / Total consumption for a participants in that segment	Measure of depth of savings for participating accounts in a segment (how much of the participant's consumption does savings account for in a year)
Unweighted Participation Rate	Total participants in a segment / Total number of accounts in a segment	Measure of penetration into a population or segment of accounts (saturation)
Consumption Weighted Participation Rate	Consumption associated with participating accounts in a segment / Total consumption in segment	Measure of penetration that accounts for the size of participants (i.e. focusing participation on larger accounts increases metric)
Total savings	Sum of savings in a year: Measured in kWh for electric, Measured in CCF for gas	Measure of overall impact of program savings to a sub-population, or segment from program, initiative, measure, or delivery path
Total Incentives	Sum of incentive cost in a year: Measured in nominal dollars	Allocation of program resources to a sub-population or segment

The evaluation team then defined a series of profiling variables (or factors) used to explore how performance metrics varied across subpopulations of the C&I Population. The factors we used in this CICP include the following:

- **Account Size:** Defined based on annual consumption for an account as outlined in Table 11. These Massachusetts definitions were used in absence of Connecticut specific definitions.^{42 43 44 45}

Table 11: MA Customer Size Definitions used in Customer Profile

Account Size	Electric (kWh / year)	Gas (therm / year)	MMBTU / year
Micro	<= 110,000	= < 8,000	<=374
Small	110,000 to 1.5 million	8,000 to 40,000	375 to 5,118
Medium	1.5 million to 4.5 million	40,000 to 250,000	5,119 to 15,354
Large	=> 4.5 million	=> 250,000	=>15,355

*Note: The evaluation team converted the MA definition for gas size from annual therms to CCF.

- **Timeseries:** The evaluation team designed the CICP to present performance metrics over time for each of the three years (2017-2019) of consumption and program tracking data provided by the utilities.⁴⁶ It is important to note a number of limitations to viewing account level performance across years. First, annual account level analysis did not consider the cumulative effects of repeat participation over time on multi-year participation rates, nor does it consider the actual “addressable market” (i.e., the share of the total market that replacement was both technically and economically feasible, which would exclude measures that had recently been replaced already) for measures in a year, given recent past participation. Second, it does not consider the cumulative savings over time, which would require more thorough analysis of measure life and possible depreciation in savings over time. Third, account level analysis does not reflect change to building occupancy that occur year over year. These changes will impact industry segmentation, consumption behavior and size, measure needs, financial resources, tastes and preferences, preferred program and delivery method, available resources, and many other factors impacting, past participation and other factors impacting the addressability of accounts for programmatic activity. Account level analysis did not reflect activity across accounts owned by the same customer (customer level analysis). As was discussed in the 2020 Massachusetts Small Business Terms Sheet Report, defining and standardizing definitions of “what is a customer” required a substantial effort that was outside the directive of this evaluation.
- **Industry Segment (Segment):** The evaluation team classified accounts according to the corresponding industry defined by Eversource. UI did not provide segment information. Consequently, industry segment analysis only reflected Eversource accounts. Where no industry segment was provided by the utility, the evaluation team listed the segment as “N/A”.
- **Program:** Participants, savings and measures were tracked according to the program through which incentives were allocated.
- **Delivery Path:** Identified program activity delivered through “Prescriptive” or “Custom” delivery paths.

⁴² Mid-size Customer Needs Assessment. Prepared by DNV KEMA for the Massachusetts Program Administrators and EEAC Consultants. January 20, 2014. 2013 Plan-Year Report Appendix 4D, Study 13-5 Page 1 of 276.

⁴³ Commercial and Industrial Small Business Nonparticipant Customer Profile Study. MA18X11-B-SBNONPART. Prepared by DNV GL for the Massachusetts Program Administrators and EEAC Consultants. April 15, 2020.

⁴⁴ Commercial and Industrial 2011-2016 Mid-size Customer Assessment. Prepared by DNV GL for the Massachusetts Program Administrators and EEAC Consultants. March 7, 2018.

⁴⁵ 2017 Commercial and Industrial Customer Profile Study Report. Prepared by DNV GL for the Massachusetts Program Administrators and EEAC Consultants. April 18, 2019.

⁴⁶ Annual account level analysis was consistent with the level of analysis used in the MA C&I Customer Profile and the 2020 Small Business Term Non-Participant Study. Both studies cited limitation of this level of analysis and document the additional research to provide true time-series analysis at either the location or customer level.

- **Measure:** Program metrics were tracked according to end use. For electric accounts, measures included HVAC, Lighting, Motors, Process, and Refrigeration. For gas accounts, measures included HVAC and Process.
- **Community Type:** The evaluation team identified “distressed” and non-distressed” communities based on zip codes as provided by the Connecticut Department of Economic and Community Development. This metric was used to explore whether distressed communities receive an “equitable share” or program resources.⁴⁷
- **Population Density:** Identified accounts located in towns as “Rural” or “Urban” based on population density.⁴⁸

5.1 Electric C&I Customer Profile

This section presents the C&I of electric accounts. First, we provide summary statistics of the population of C&I electric accounts and consumption. Next, we examine the account level activity by segment and size. Third, we explore overall patterns in performance metrics by key program. Finally, we review how savings were allocated across prescriptive and custom deliver paths.

5.1.1 Population of Electric C&I Accounts

As seen in Table 12, the population of 2019 electric C&I accounts was dominated by micro businesses. Micro business made up 89% of accounts and only 19% of total consumption.^{49,50}

Table 12. Population of electric accounts and consumption by size and segment

Size	Accounts		Consumption		
	Number	Percent	kWh	MMBTU ^A	Percent
Micro	133,063	89.1%	2,448,321,765	8,354,023	18.8%
Small	14,583	9.8%	5,004,488,738	17,076,028	38.4%
Medium	1,110	0.7%	2,635,459,211	8,992,562	20.2%
Large	281	0.2%	2,956,554,594	10,088,185	22.7%
N/A	300	0.2%	N/A	N/A	N/A
Total	149,337	100.0%	13,044,824,308	44,510,798	100.0%

^A MMBtu calculation assumes 293.071 kWh/MMBtu.

⁴⁷ The Evaluation Team does not make an assessment regarding what constitutes “equity” as this is a policy question yet to be determined. However, we present performance metric across geographic regions of interest to the EA team.

⁴⁸ See footnote 47. An account is defined by having a zip code with population density higher (“Urban”) or lower (“Rural”) than 1,000 people per square mile. (Definition from US Census Bureau. <https://www2.census.gov/geo/pdfs/reference/GARM/Ch12GARM.pdf>).

⁴⁹ It is important to note that there are 300 accounts in the CT database for which no size could be determined due to lack of consumption data. If these are “large accounts, the share of consumption could shift dramatically.

⁵⁰ By comparison, the MA Commercial and Industrial Small Business Nonparticipant Customer Profile Study found MA micro-business make up 92% accounts and 32% of consumption, while small business made up 7% of accounts and 17% of consumption; non-small business made up 0.8% of accounts and 50% of consumption

Three segments dominated the distribution of electric accounts: Retail, Professional Services, and Real Estate Management, while roughly one third of all consumption was derived from the Retail and Manufacturing segments (Table 13). Equally important, however, industry segment was missing for roughly 20% of accounts that contribute approximately 23% of consumption.

Table 13. Distribution of Electric Accounts and Consumption by Segment

Segment	Electric Accounts	Electric Consumption
RETAIL	20.6%	16.2%
PROFESSIONAL SERVICE	16.8%	3.3%
REALESTATE MANAGEMENT	10.0%	8.5%
GOVERNMENT AGENCY	6.5%	7.6%
COMMUNICATION & ENTERTAINMENT	6.4%	5.2%
OTHER INSTITUTION	3.7%	1.3%
MEDICAL OFFICE	3.6%	1.6%
MANUFACTURING	3.4%	15.9%
FINANCIAL	2.0%	2.9%
EDUCATIONAL	1.6%	4.6%
DISTRIBUTION & WAREHOUSING	1.5%	1.5%
CONSTRUCTION	1.2%	0.4%
UTILITY	0.8%	1.1%
HOSPITAL	0.5%	3.2%
LONG TERM CARE FACILITIES	0.5%	1.5%
AGRICULTURE	0.4%	0.2%
LODGING	0.4%	1.3%
DATA CENTER	0.2%	0.4%
PUBLIC ASSEMBLY	0.2%	0.1%
COMPUTERS & ELECTRONICS	0.1%	0.2%
RESEARCH LABORATORY	0.1%	0.2%
SOFTWARE & INTERNET	0.1%	0.1%
Missing	19.5%	22.7%

Note: Industry segment analysis only reflects Eversource accounts.

5.1.2 Electric Profile by Customer Size

A primary characteristic the evaluation team considered for this CICP was account level performance by customer size. As such, this section presents differences in performance metrics across customer size groups. The CICP data provided by the utilities did not have designated size definitions. Consequently, the evaluation team leveraged size definitions specified in the 2020 Massachusetts Small Business Non-Participant Terms Sheet report for both electric and gas sizes to construct the profile by size.

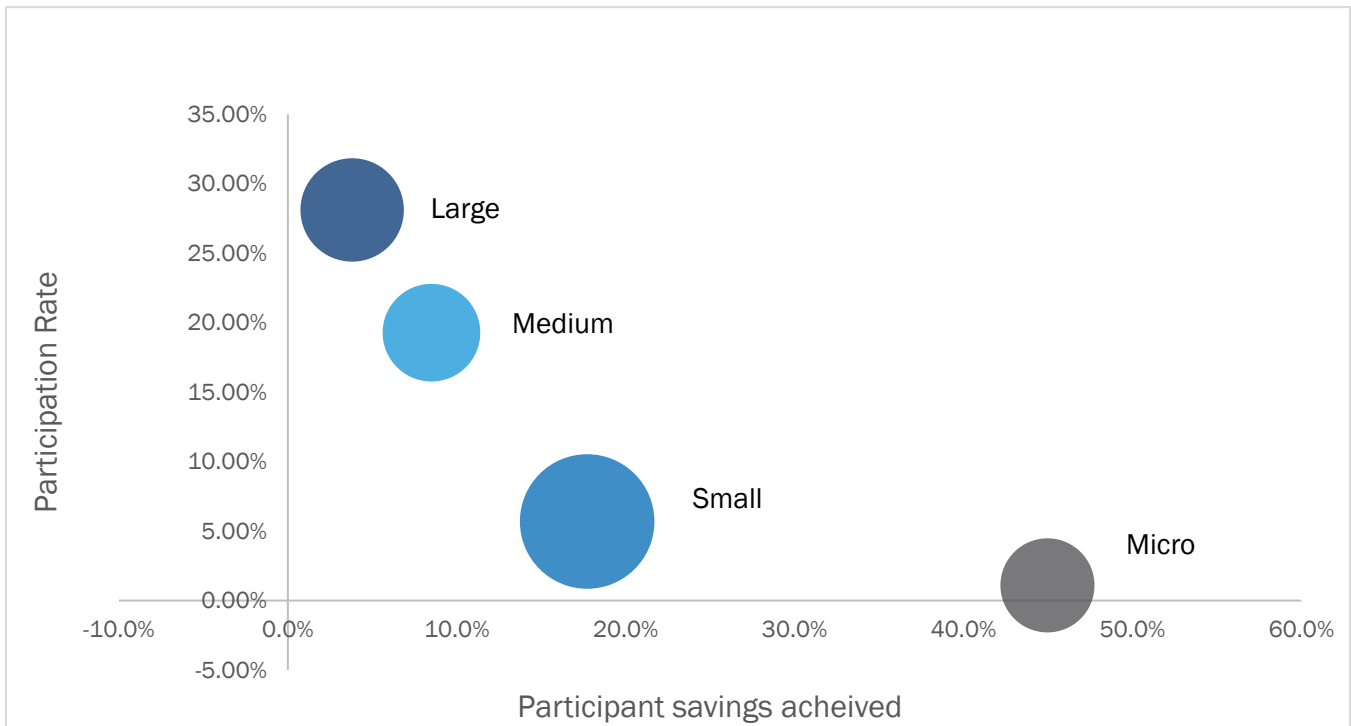
Previous Massachusetts studies revealed that account size was a primary factor influencing the level of service to accounts impacting participation rates and depth of savings.⁵¹ To explore whether Connecticut accounts experience similar trends in the need for targeted services as in Massachusetts, we completed the detailed analysis of performance metrics by customer size that follows.

Small and medium businesses offer opportunities for increased electric participation and/or depth of savings (Figure 13).

- Large business had relatively high participation rates but low depth of savings. This is expected as large businesses are more likely to participate over multiple years to address potentially more diverse, larger, and costly energy needs.
- Small business had high depth of savings but low participation rates. The overall size of the small business segment suggested there were considerable additional savings opportunity through increased participation. However, the 2020 Small Business Non-participant study found that micro-business was largely responsible for the relatively low participation rate of small business. The PAs efforts to address small businesses using a combination of direct install vendors and upstream measures had proven successful at increasing participation rates for larger small business.
- Medium business had moderate depth of savings, and moderate participation rate. Medium business shows relatively higher participation rates than small business and higher participant savings achieved than large business. This finding differs from the 2014 MA Mid-Size Needs Assessment study that showed medium business had both low participation rate and depth of savings. The 2018 mid-size needs assessment found that the PAs efforts to improve participation and depth of savings had resulted in improved population savings achieved by 2016, the year for which data were available,
- Micro business shows opportunities for increased participation, as only a small share of consumption was from participating accounts. This trend is consistent with the findings of the Massachusetts 2020 Small Business Non-Participant Term Sheet report.

⁵¹ The evaluation team explored this issue in depth given relatively recent findings from Massachusetts. The 2021 Small Business Non-Participant study found that micro-businesses had lower population savings achieved than small business. Further, the 2014 mid-sized needs assessment found that medium businesses often require more complex solutions that warrant the added expense of engineering studies, making them less profitable for trade allies to pursue than custom projects for large businesses or prescriptive measures offered through direct install programs. However, the 2018 follow-up study found the PAs had made recommended changes to marketing strategies for medium business resulting in improved performance metrics. These finding suggest importance of considering customer size when examining differences in performance metrics among customer segments.

Figure 13. 2019 Electric Participation Rate and Participant Savings Achieved by Size



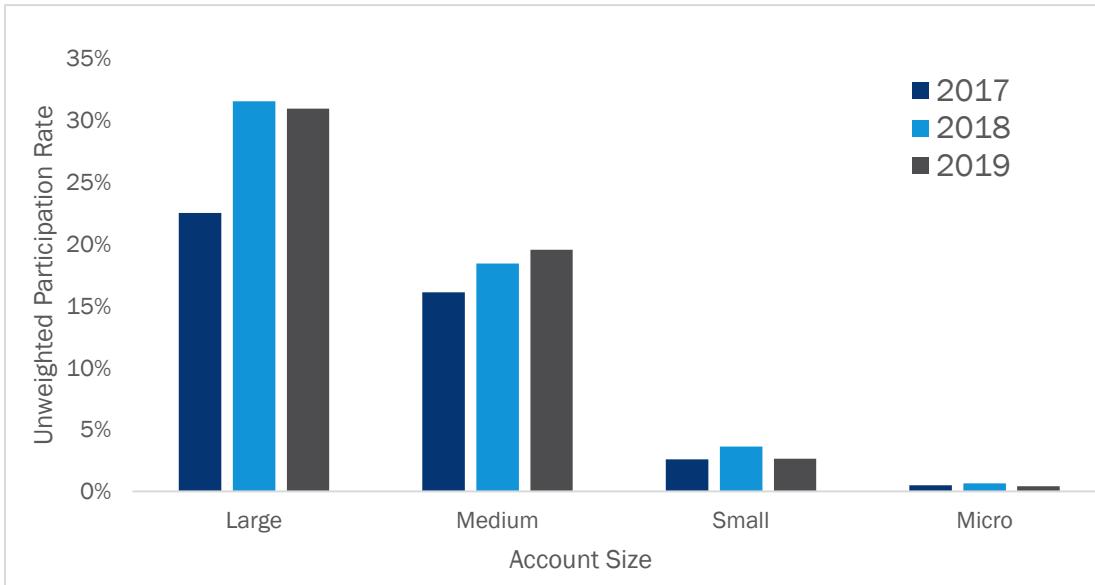
Note: Bubble size represents 2019 kWh consumption.

Consumption weighted participation shows that the programs target the largest customers. Participation rates increase steadily by account size, which differs from findings in the previously mentioned Massachusetts studies. The MA studies found medium business did not show a proportionate increase to participation rate with the relative decrease in number of firms when compared to small business. Examining the unweighted participation rates shows the utilities clearly addressed an increasing share of accounts as account size increases. As was identified in Table 12, the overwhelming number of electric accounts are micro and small business accounts compared to medium and large business accounts. While the unweighted participation rate among medium businesses did remain lower than large business for all program years, medium business unweighted participation rate did increase substantially relative to small business.⁵² The conclusion here was that participation rates among medium business accounts in Connecticut improved relative to small business.⁵³

⁵² In contrast, the 2014 Massachusetts study found relatively little change in participation rate from small to medium business.

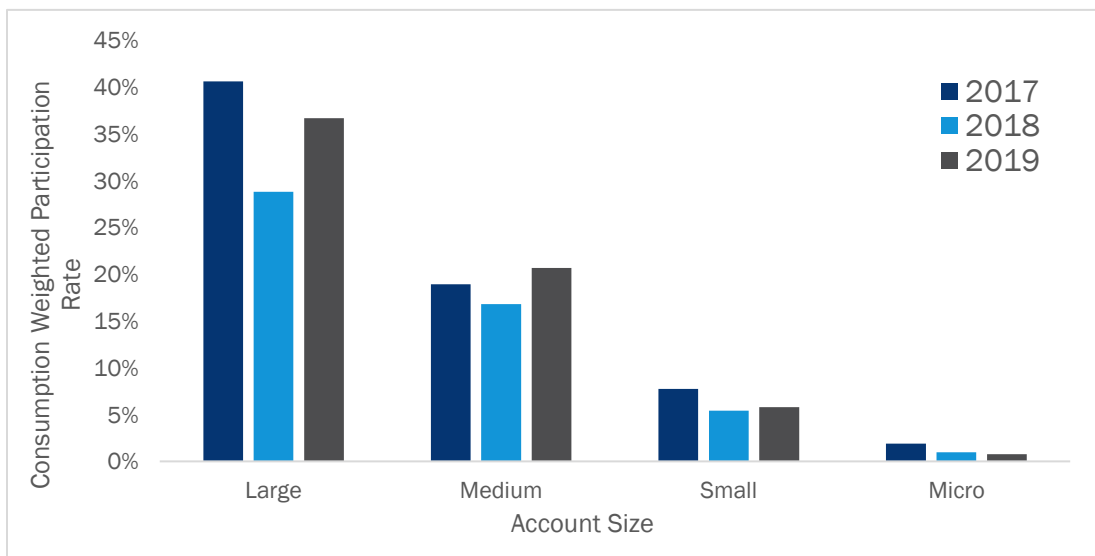
⁵³ This finding is more consistent with the 2018 Massachusetts mid-sized needs assessment study (after implementing changes recommended by the 2014 study) than prior to those changes.

Figure 14. Electric Unweighted Participation Rate by Size and Year



Contrasting the consumption weighted (Figure 15) and unweighted participation (Figure 14) rates provided insight into the size of accounts targeted by the utilities within each size bin (i.e., higher consumption weighted participation than unweighted participation would indicate that participating accounts made up a larger share of overall consumption within each size-group). Higher consumption weighted participation than unweighted participation would indicate the PAs targeted the largest of the large or the largest of medium, etc. The data suggest that in all years, the utilities targeted the largest of each size group.

Figure 15. Electric Consumption Weighted Participation Rate by Size and Year



Population savings achieved is considered the single best overall indicator of level of service identified through recent customer profile work to date. First, population savings achieved provides some basis to assess the

overall benefits that flow to a customer class compared to what they are likely to be contributing financial (i.e., assuming energy savings is a decent proxy for dollar savings, and consumption a decent proxy for the dollar contribution). Second, the metric incorporates the effects of two variables that we know to be strongly size related in opposite directions, participation rate and participant savings. This metric reflects the combined impact of the participation rate (account level penetration) with participant savings achieved (depth of savings among participating accounts).

Figure 16 presents the population savings achieved by company size for each year in the CICP. The data shows that population savings achieved was relatively flat across size bins, except for a spike in 2018 for micro business. The relatively consistent population savings achieved across account sizes is a key difference from the findings of previous Massachusetts studies. The Commercial and Industrial Small Business Nonparticipant Customer Profile Study found micro business had relatively low population savings achieved, and the 2014 Mid-Size Customer Needs Assessment found medium businesses had relatively low population savings achieved.⁵⁴ Population savings achieved for medium business in Connecticut for all size segments was more comparable than Massachusetts. It is particularly notable that population savings achieved for medium business was actually higher than large business for two of the three years. Micro-business had roughly equal population savings achieved to small business in 2017, but somewhat lower subsequent years. These findings differ substantially from the Massachusetts studies.

Micro business showed much higher depth of savings for participants but, overall, lower participation rates. This resulted in comparable population savings achieved to other size segments. Due to the limited overall consumption of micro and small businesses, relatively lower saving measures, such as lighting measures or other prescriptive measures provided for substantial savings relative to consumption for participating accounts. As seen in Figure 16, this provided for relatively high depth of savings for micro business and small business compared to medium and large business.⁵⁵

Figure 18 presents the participant savings achieved by size, excluding micro to adjust the scale of the figure so differences between small, medium and large business can be observed. The figure clearly shows an inverse relationship between customer size and participant savings achieved. Small business participants saved roughly 18% to 22% of consumption, while medium business participants save between 8% and 9% of consumption. Large business participating accounts saved between 3% and 6% of annual consumption in a single year.

⁵⁴ Note: the 2018 Mid-size needs assessment found the PAs had addressed low population savings achieved for medium business through actions taken since the 2014 study.

⁵⁵ It is important to note that participant savings achieved for micro business is skewed to some extent by accounts with greater savings than consumption. This is particularly true for the smallest accounts (i.e. < 18,000 kWh / year). Our analysis found that many micro business projects for the smallest accounts produce greater savings than the consumption of the accounts they are assigned. One possible explanation for this is that micro businesses were actually part of a larger business with multiple accounts. At the account level, the consumption was limited resulting in classifying the account as a micro-business. Other accounts for this same customer can have consumption that meets the definition of small, medium, or large business. It is possible that program measures were installed for a larger account customer with multiple accounts and incorrectly applied to the micro-business account. While correcting these discrepancies required an extensive data cleaning and verification process that was beyond the scope of the current study, the Evaluation Team identified this as limitation of the study and provides a recommendation that the PAs correct these discrepancies for future analysis.

Figure 16. 2017-2019 Electric Population Savings Achieved by Size

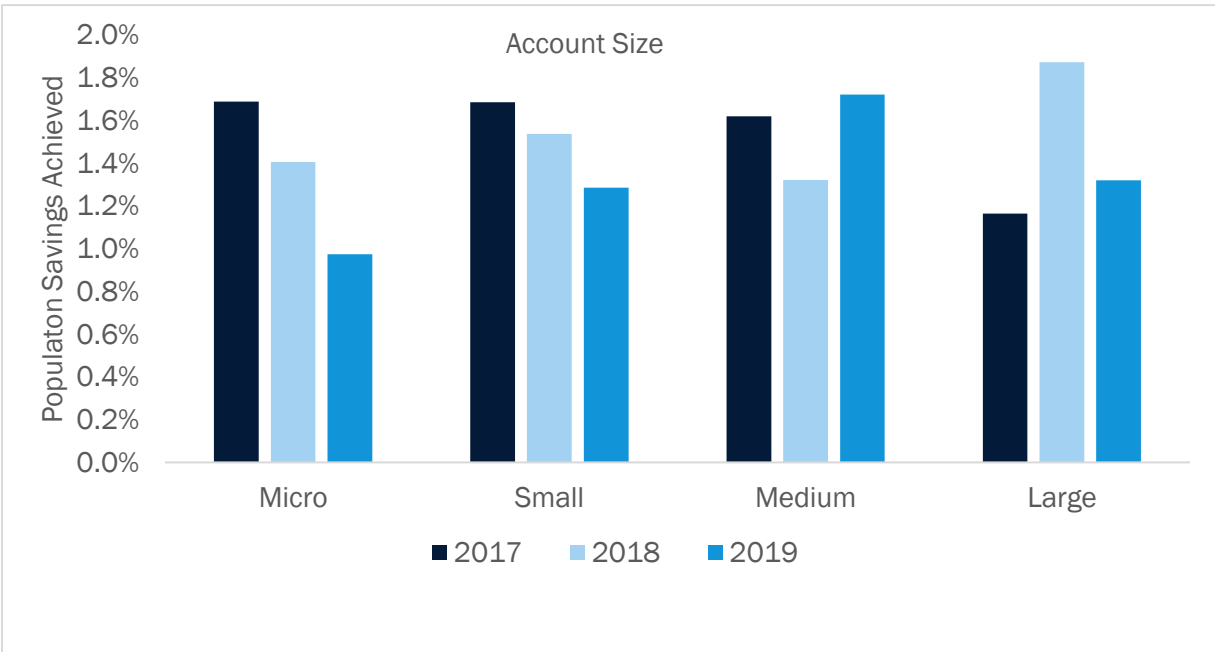


Figure 17. 2017-2019 Electric Participant Savings Achieved by Size

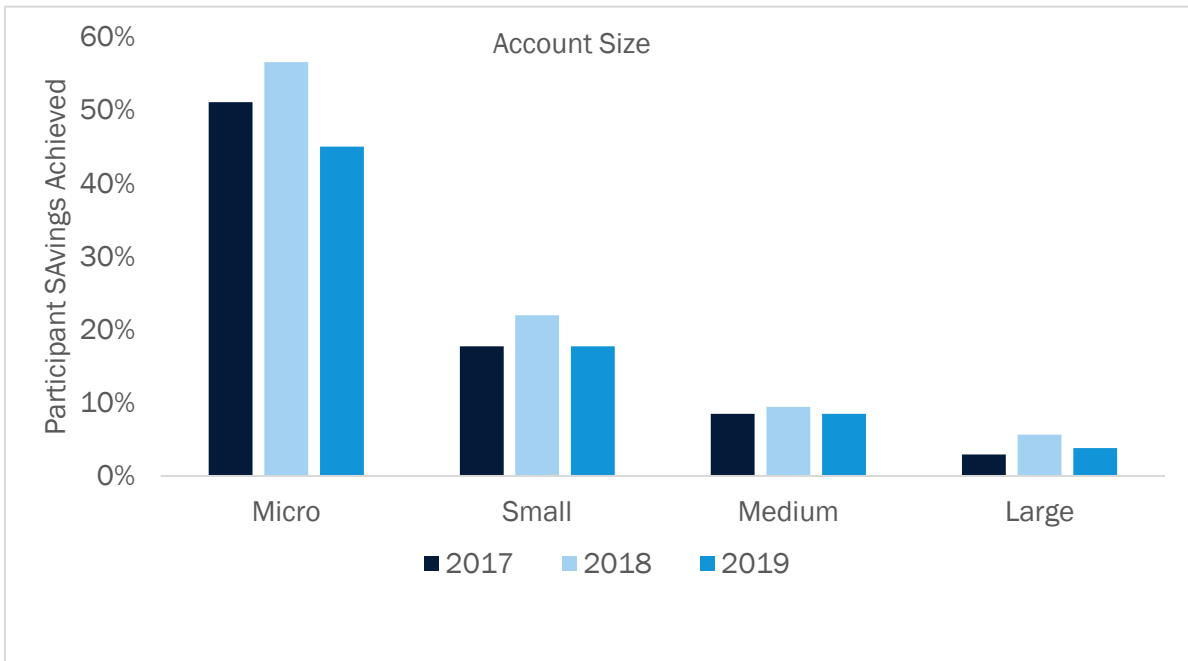
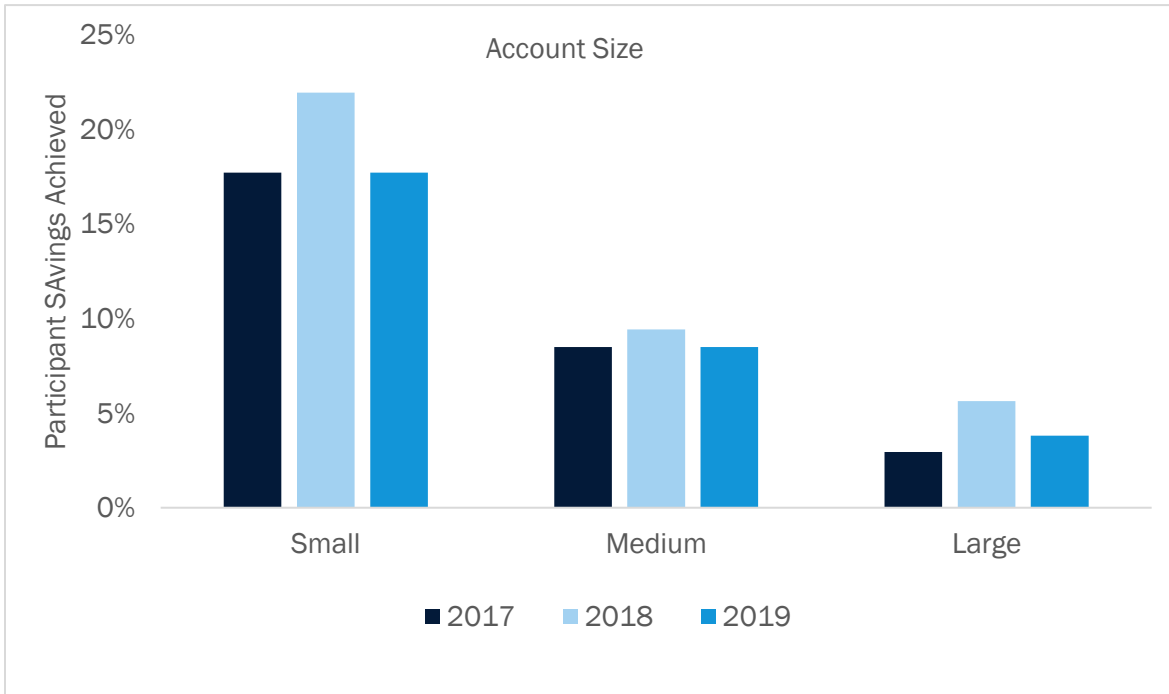


Figure 18. 2017–2019 Electric Participant Savings Achieved by Size (Excluding Micro)



Company size impacts the measure level needs of businesses within a given segment (or industry). For example, given the limit of 1.5 million kWh/year, a small hospital might not require the same HVAC solutions and process equipment integral to a medium or large hospital. Similarly, a small educational account may be a daycare center or small school while a large educational account is part of a university campus or large high school. These larger accounts were likely to have more diverse energy needs.

Small, Medium and Large business all showed increases in the share of non-lighting savings from 2017 to 2019, but overall savings has declined. For small and micro-business, the decline in overall savings in 2019 appeared to be directly proportional to the decline in lighting savings. However, we should note that the share of lighting savings from accounts for which no consumption data was available increased in 2019 as well, which could partially offset the overall savings decrease in one or more of the three size groups. For small and medium business, the PAs could look to expanding upstream measures to include upstream hot water and HVAC measures, which provided a substantial boost in savings for small and medium businesses in Massachusetts, as reported by the 2017 Massachusetts Customer Profile report.^{56, 57}

⁵⁶ DNV GL (2017). *Commercial and Industrial Customer Profile Study Report*. Prepared for the Massachusetts Program Administrators and EEAC Consultants. Dated: April 18, 2019

⁵⁷ A cautionary note is warranted as a reviewer indicated that Massachusetts now has two net-to-gross studies suggesting that there is a rather low net-to-gross ratio for this program.

Figure 19: 2017 Electric Savings by Measure and Size

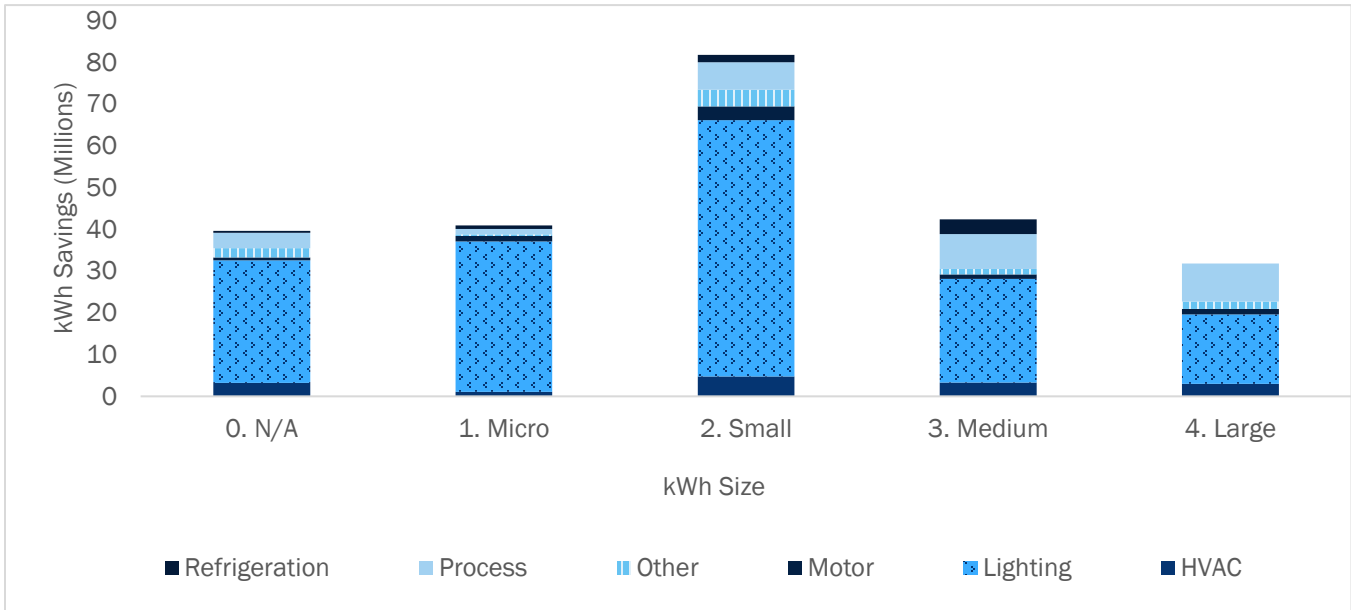
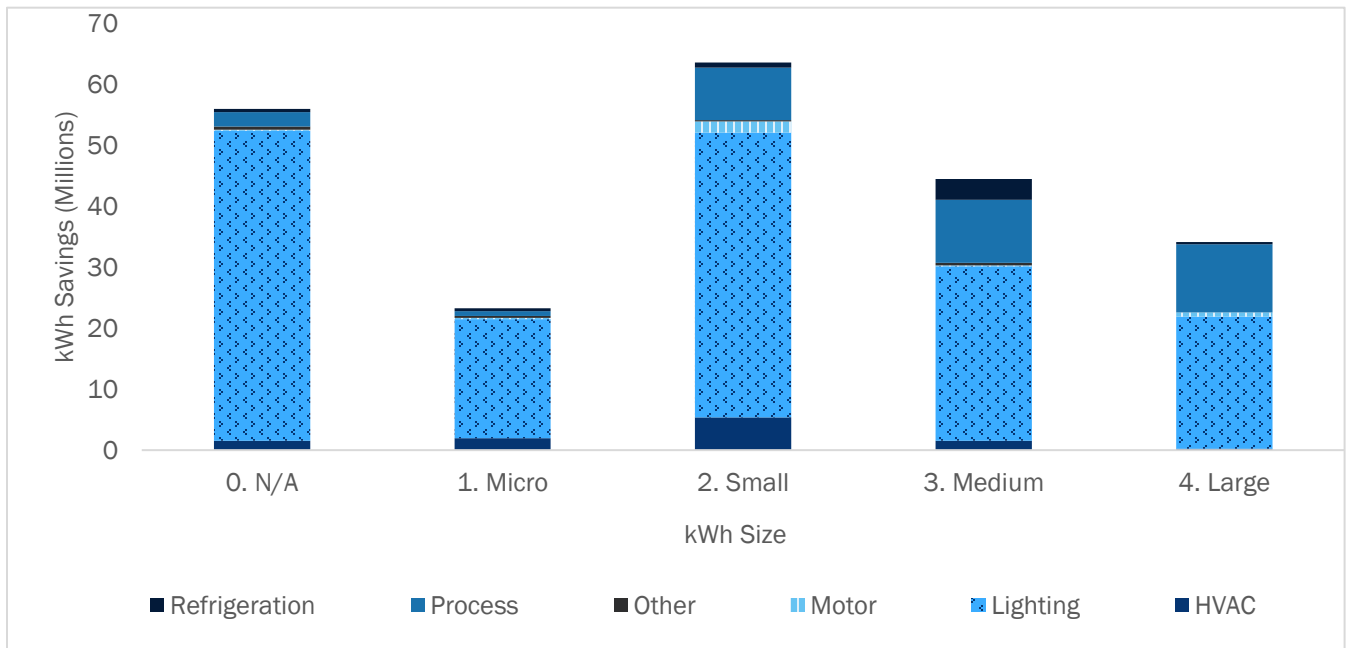


Figure 20: 2019 Electric Savings by Measure and Size



5.1.3 Electric Profile by Segment

In this section we explore differences in performance metrics by industry segment for the roughly 80% of accounts for which segment information were available.

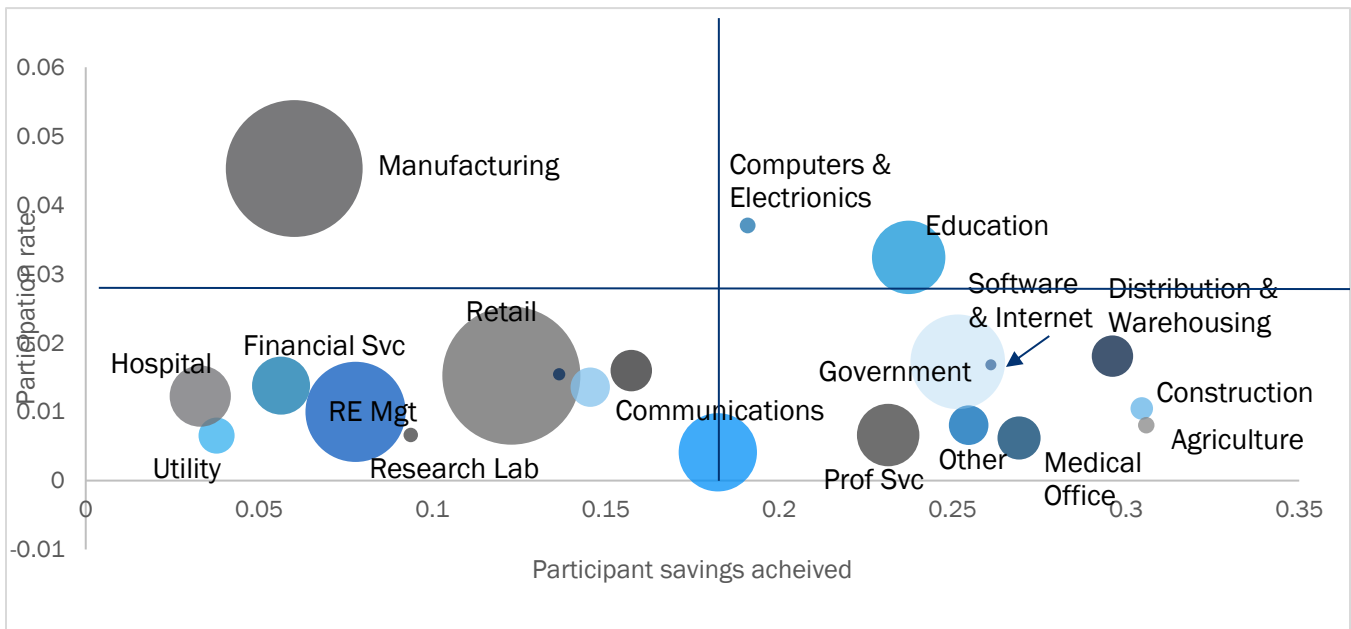
Figure 21 presents a multi-dimensional view of performance by industry segment in 2019. The vertical axis shows the participation rate for accounts in each segment (a measure of penetration), while the horizontal axis shows the participant savings achieved (a measure of depth of savings). These two metrics combined make up population savings achieved, which is valuable for understanding the overall level of service to a segment. Viewing the metrics separately allowed us to isolate whether high or low population savings achieved was attributable to the penetration, depth of savings, or both penetration and depth of savings. In terms of quadrants, segments in the upper right-hand quadrant represent the best performing segments. Segments in this quadrant were both highly penetrated and had high depth of savings. The lower left-hand quadrant represents the lowest performing segment with neither high penetration, nor high depth of savings. The bubble size depicts the third dimension on the graph, the segment size as measured by total kWh consumption of all accounts in a segment and provided an indication of the opportunity for savings.

Industry segments offer differing opportunities for increased depth of electric savings and participation. The following segments provide notable opportunities for the utilities based on 2019 data (Figure 21):

- Manufacturing – Second largest segment with a relatively high participation rate;
- Retail – Largest segment with a relatively low participation rate and low depth of savings;
- Educational Services – Moderately sized segment with both a relatively high participation rate and high depth of savings; and
- Government – Moderately sized segment with a relatively low participation rate and modest depth of savings.

Finally, while the Construction, Distribution, Medical office, and Agriculture segments all had relatively high depth of savings in 2019, each of these industries provides only limited opportunity due to the overall relatively small size of each segment.

Figure 21: 2019 Electric Participant Savings Achieved by Industry Segment

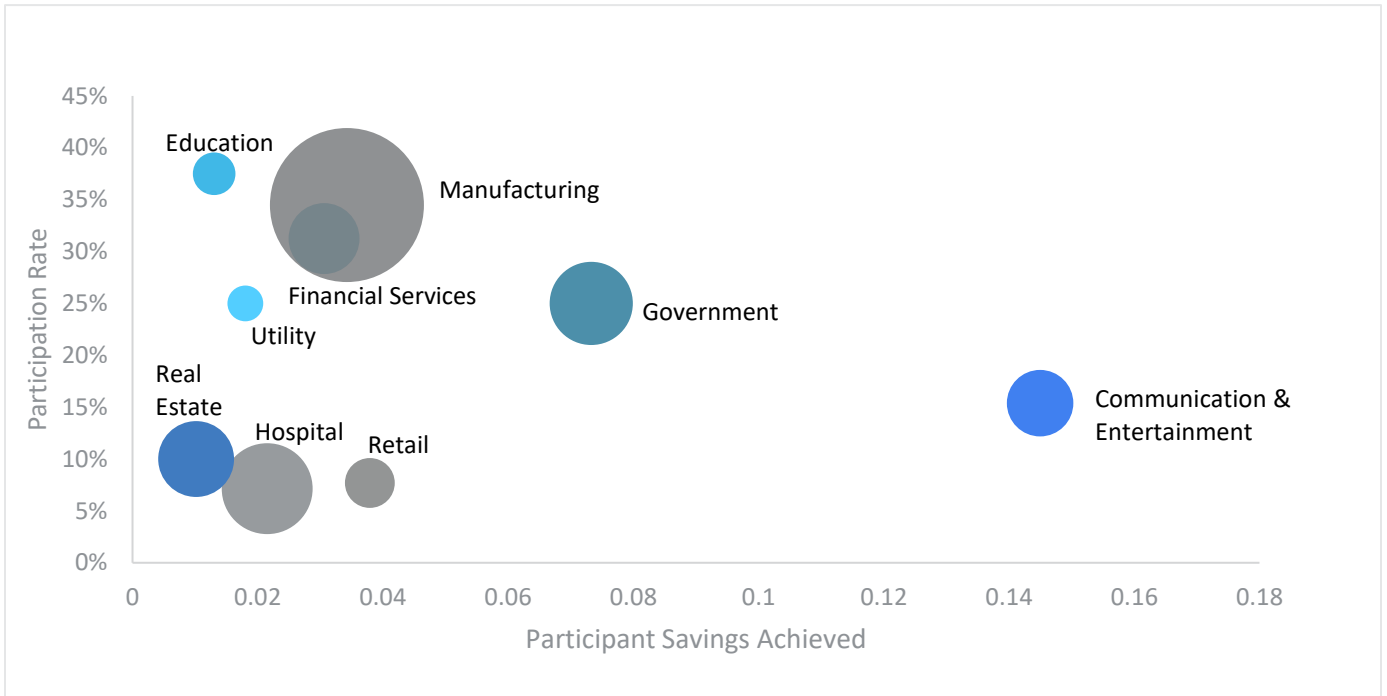


Note: Industry segment analysis only reflects Eversource accounts.

Overall, we see large differences in performance metrics by segment for large and medium accounts (see Figure 22 and Figure 23).⁵⁸ The retail segment provided one striking difference relative to large retail businesses. Medium retailers were much larger relative to other medium businesses, and also had one of the highest participation rates, whereas large retailers had relatively low consumption compared to other large businesses and also had a relatively low participation rate. For large accounts, retail was one of the relatively smaller segments with a low participation rate and low participant savings achieved. In contrast, retail was one of the biggest segments for medium size accounts and had a relatively high participation rate. Medium government accounts and large Communications & Entertainment accounts had the highest participant savings achieved. Manufacturing was the largest segment for both large and medium size accounts, but the participation rate for large manufacturers was roughly 15% higher than medium size accounts.

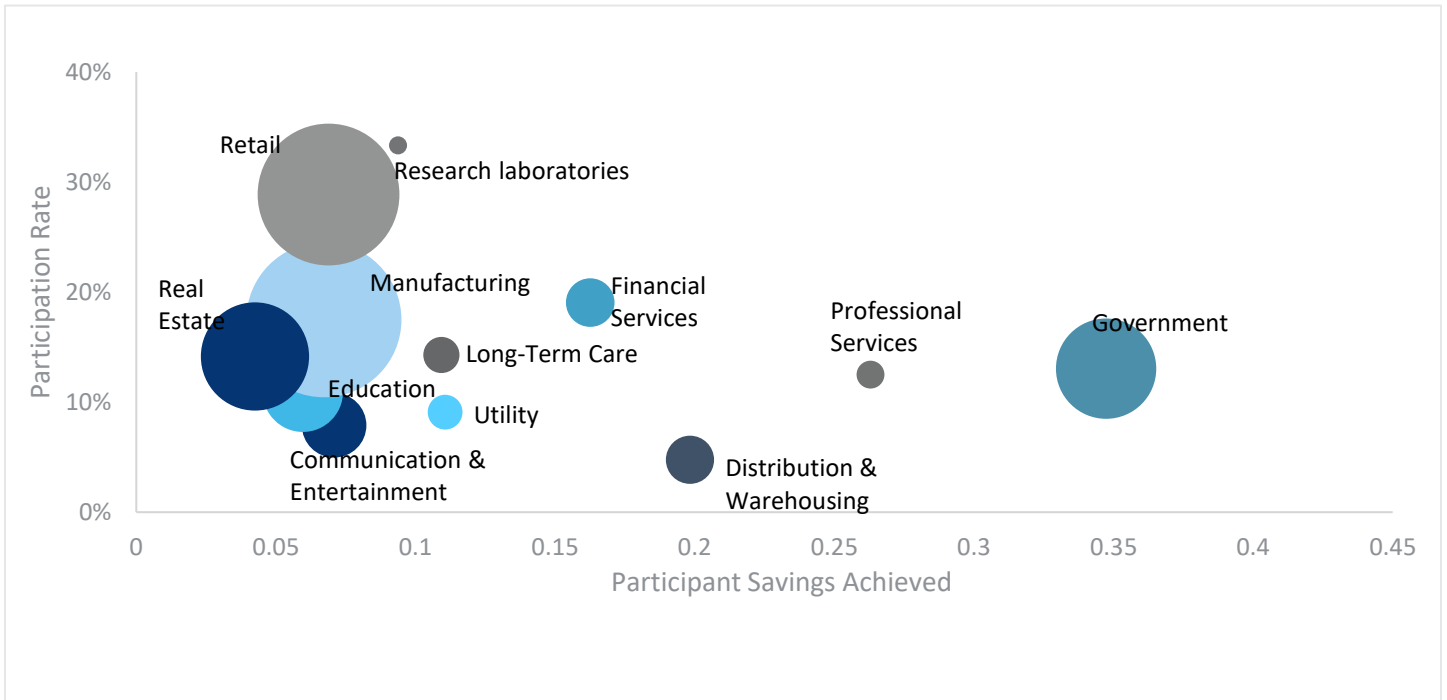
⁵⁸ Small and medium business are not shown due to the relatively high concentration of “unknown” cases.

Figure 22. 2019 Electric Participant Savings Achieved by Industry Segment: Large Business



Note: Bubble size represents 2019 kWh consumption. Industry segment analysis only reflects Eversource accounts.

Figure 23. 2019 Electric Participant Savings Achieved by Industry Segment: Medium Business



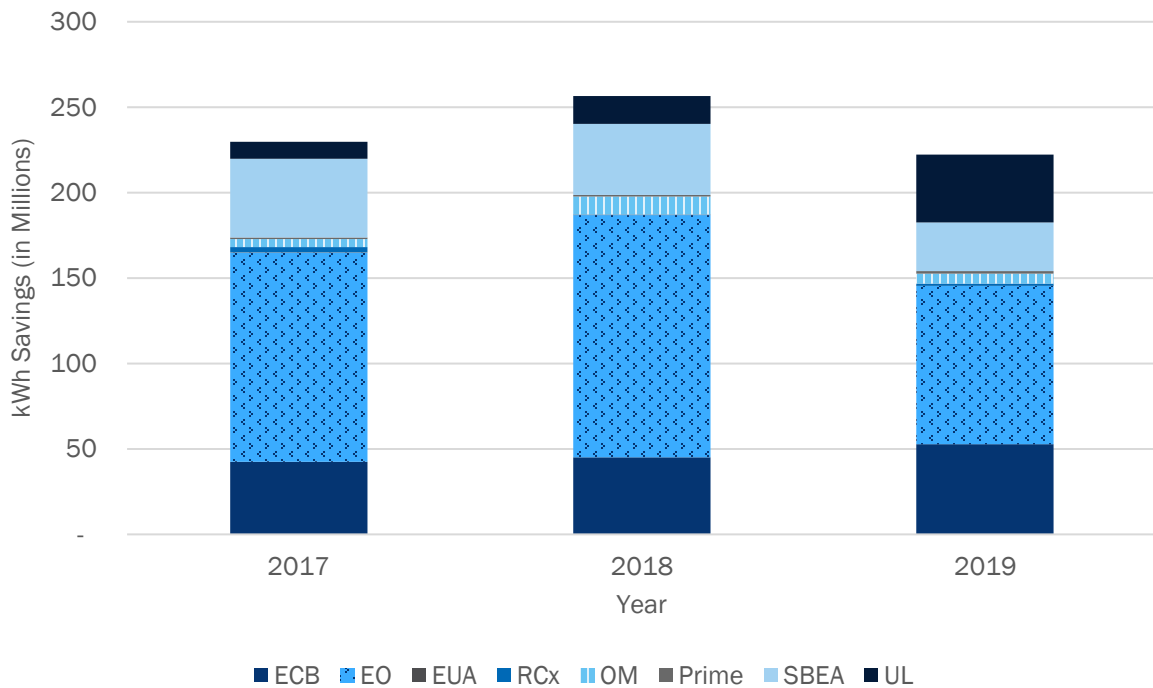
Note: Bubble size represents 2019 kWh consumption. Industry segment analysis only reflects Eversource accounts.

5.1.4 Electric Profile by Program

The evaluation team examined the total energy savings by initiative in each program year. Figure 24 shows **minor fluctuations in savings by program over the timeframe provided with only marginal shifts to overall savings**. Specific changes over time include:

- Savings increased for the EO Program from 2017 to 2018, but in 2019 declined, resulting in lowest overall savings of the 3-year period;
- The share of overall savings from SBEA declined in each analysis year; and
- Upstream Lighting Program savings has increased steadily over time.

Figure 24. 2017 – 2019 Electric Savings by Program and Year



To demonstrate the impact of lighting on annual savings, we split savings into three groups: (1) Accounts without lighting measures installed in a year; (2) Accounts with only lighting measures installed; and (3) Accounts with lighting measures and other end-uses (see Figure 25). Overall, we see that:

- The share of savings from non-lighting projects has not increased from 2017 to 2019;
- The share of accounts that have completed non-lighting projects has *decreased* for the EO Program most noticeably; and
- Small Business Energy Assessment (SBEA) savings consist overwhelmingly of lighting end uses in all three years.

Figure 25. 2017 - 2019 Electric Savings by Program: Lighting Measures

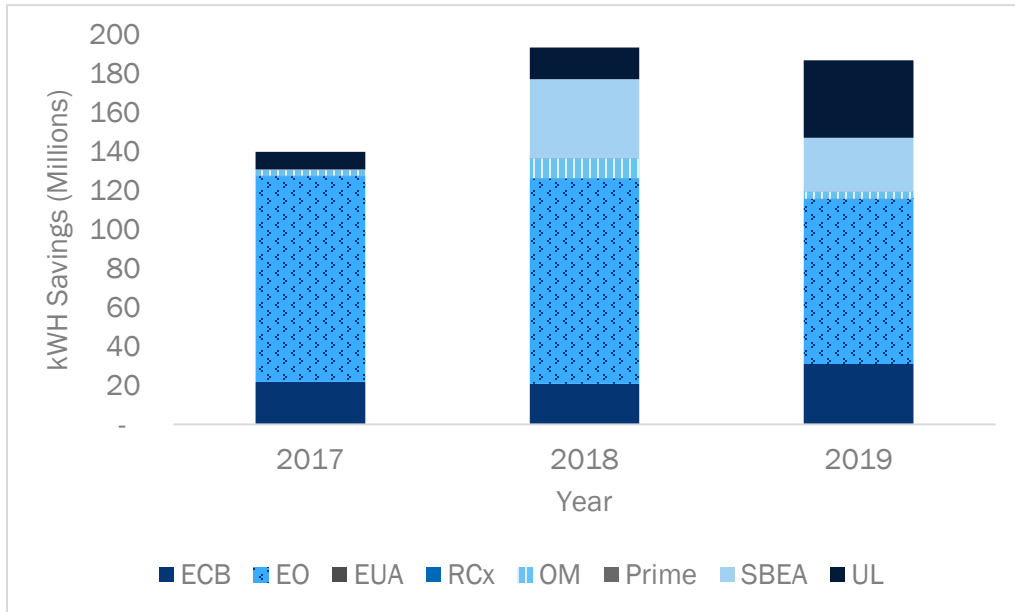


Figure 26. 2017 - 2019 Electric Savings by Program: Non-Lighting Measures

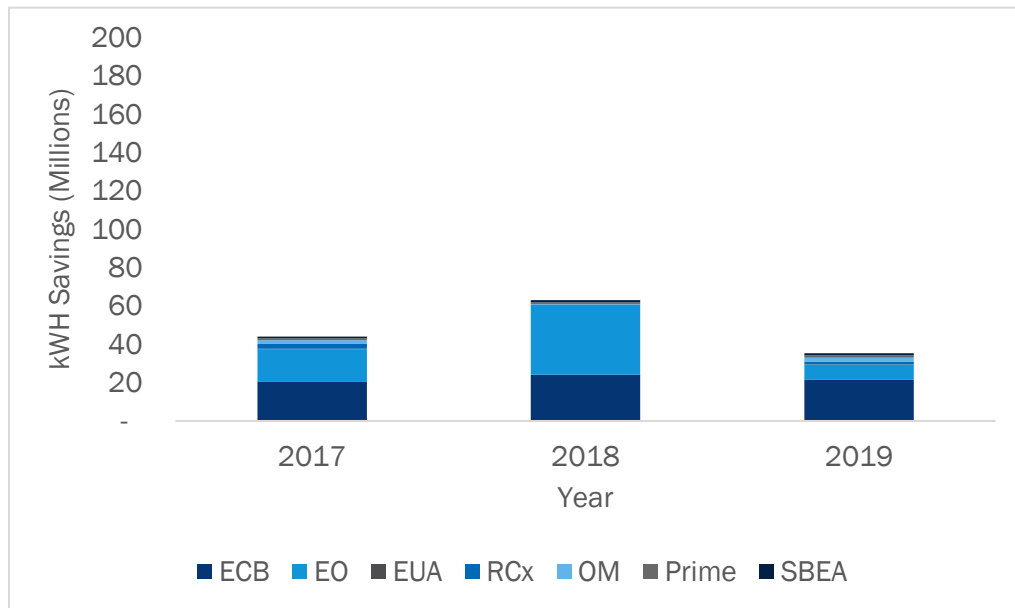
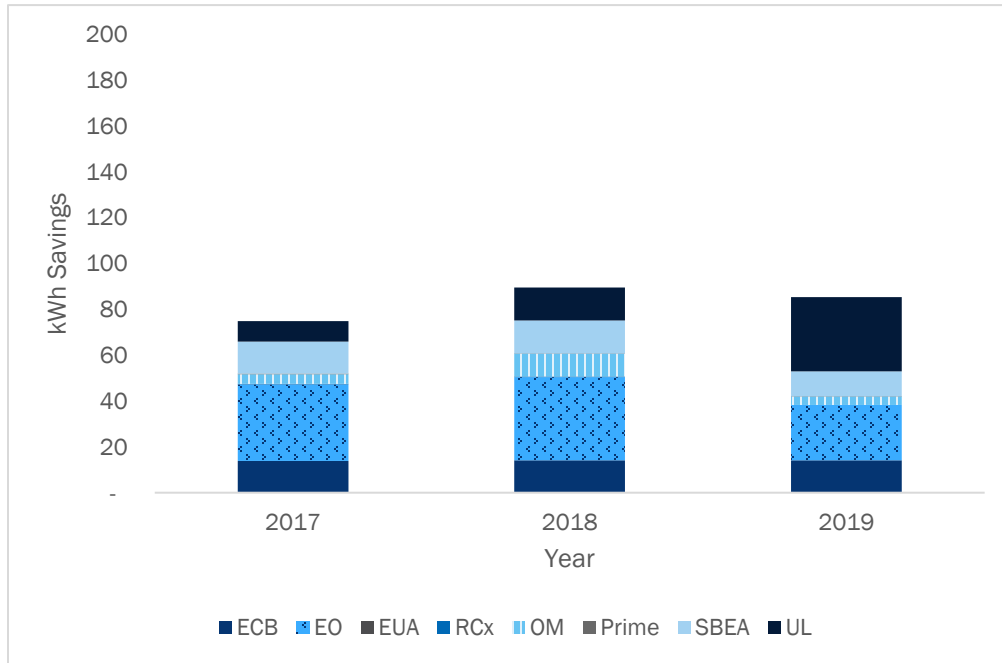


Figure 27. 2017 – 2019 Electric Savings by Program: Multiple endues with Lighting measures



5.1.5 Electric Profile by Delivery Pathway

The custom delivery pathway experienced large declines in savings in 2019, while prescriptive delivery accounted for an increasing share of electric savings. In 2017, prescriptive delivery accounted for 54% of savings across all size segments except micro business but increased to 78% in 2019 (see Table 14). The corresponding increase in prescriptive savings for the N/A size segment may suggest a shift to the programs delivering more savings and measures through an upstream model rather than through custom projects, but the structure of the program data prevents us from knowing for sure. The micro, small, and medium segments all experienced sharp declines in custom savings with corresponding increased savings from prescriptive the delivery path.

Table 14. Electric kWh Savings by Delivery Pathway and Account Size (2017-2019)

Pathway	Custom Savings			Prescriptive Savings		
	2017	2018	2019	2017	2018	2019
Micro	11,396,387	15,284,053	3,106,673	13,953,863	13,780,239	20,189,005
Small	34,791,642	23,678,388	13,073,632	27,627,069	36,432,341	51,028,082
Medium	21,891,707	15,935,729	11,869,946	19,743,887	18,884,060	33,491,159
Large	16,594,532	19,184,013	13,372,754	15,187,547	34,841,240	16,843,318
N/A	22,011,701	18,730,991	6,693,770	15,758,469	34,462,755	49,948,349
Total	106,685,969	92,813,174	48,116,775	92,270,834	138,400,634	171,499,913

Table 15. Percent of Electric Savings by Delivery Pathway and Account Size (2017-2019)

Pathway	Customer Savings			Prescriptive Savings		
	2017	2018	2019	2017	2018	2019
Micro	45%	53%	13%	55%	47%	87%
Small	56%	39%	20%	44%	61%	80%
Medium	53%	46%	26%	47%	54%	74%
Large	52%	36%	44%	48%	64%	56%
N/A	58%	35%	12%	42%	65%	88%
Total	54%	40%	22%	46%	60%	78%

5.2 Gas C&I Customer Profile

The evaluation team presents the CICP of gas accounts in the following sub-sections. First, we provide summary statistics of the population of C&I gas accounts and consumption by size and segment. Next, we examine the account level activity by size and segment. Third, we explore overall patterns in performance metrics by key program. Finally, we review how savings were allocated across prescriptive and custom deliver paths.

5.2.1 Population of Gas C&I Accounts

The population of 2019 C&I gas accounts were dominated by micro businesses, which had roughly six times the number of small business accounts, but roughly 67% of the consumption of small businesses (Table 16). In addition, the number of medium business gas accounts was just 25% that of small business gas accounts while contributing slightly more consumption than the small business accounts. Finally, with just 306 gas accounts, large business contributed 87% of all consumption.

The distribution of gas consumption by size group suggests the importance of identifying the consumption level of the remaining 153 gas accounts to provide an accurate picture of gas key performance metrics, participant savings achieved, population savings achieved, and consumption weighted participation.⁵⁹

Table 16. Distribution of 2019 Gas Accounts by Size Bin

Size Category	Accounts		Consumption		
	Number	Percent	CCF	MMBTU	Percent
Micro	48,966	82.5%	90,401,442	9,220,949	12.8%
Small	8,087	13.6%	134,418,946	13,710,735	19.1%
Medium	1,851	3.1%	151,409,864	15,443,809	21.5%
Large	306	0.5%	328,696,541	33,527,053	46.6%
N/A	153	0.3%	N/A	N/A	N/A
Total	59,363	100.0%	704,926,793	71,902,546	100.0%

^A MMBtu calculation assumes 9.804 CCF/MMBtu.

⁵⁹ It is important to note that there are 153 accounts for which no size could be determined due to lack of consumption data. If these are "large accounts, the share of consumption could shift dramatically.

Overall, manufacturing contributed roughly 20% of total 2019 gas consumption for which segment could be identified,⁶⁰ but only 2% of the total number of accounts (Table 17). Manufacturing made up 43% of all consumption for which customer segment was available (i.e., excluding the 46.1% of consumption with missing segment). In contrast, Retail and Professional Services reflect 12% and 21% of accounts, respectively or 33% of accounts between the two segments. However, their combined consumption was just roughly 12% of total across all segments. This suggests that consumption-based case metrics (savings achieved and consumption weighted participation) better reflect programmatic impacts on savings opportunity than unweighted participation.

Table 17. Distribution of 2019 Gas Accounts by Segment

Segment	Electric Accounts	Electric Consumption
RETAIL	11.8%	6.3%
PROFESSIONAL SERVICE	21.0%	5.3%
REALESTATE MANAGEMENT	4.3%	2.3%
GOVERNMENT AGENCY	2.3%	4.7%
COMMUNICATION & ENTERTAINMENT	0.9%	1.6%
OTHER INSTITUTION	1.7%	0.6%
MEDICAL OFFICE	1.6%	0.3%
MANUFACTURING	2.0%	19.6%
FINANCIAL	1.2%	0.3%
EDUCATIONAL	1.2%	3.1%
DISTRIBUTION & WAREHOUSING	0.7%	0.7%
CONSTRUCTION	0.6%	0.9%
UTILITY	0.2%	3.7%
HOSPITAL	0.4%	2.2%
LONG TERM CARE FACILITIES	0.3%	0.6%
AGRICULTURE	0.1%	0.8%
LODGING	0.2%	0.4%
DATA CENTER	0.3%	0.1%
PUBLIC ASSEMBLY	0.1%	0.1%
COMPUTERS & ELECTRONICS	0.1%	0.1%
RESEARCH LABORATORY	0.1%	0.1%
SOFTWARE & INTERNET	0.0%	0.1%
Missing	48.9%	46.1%

Note: Industry segment analysis only reflects Eversource accounts.

5.2.2 Gas Profile by Customer Size

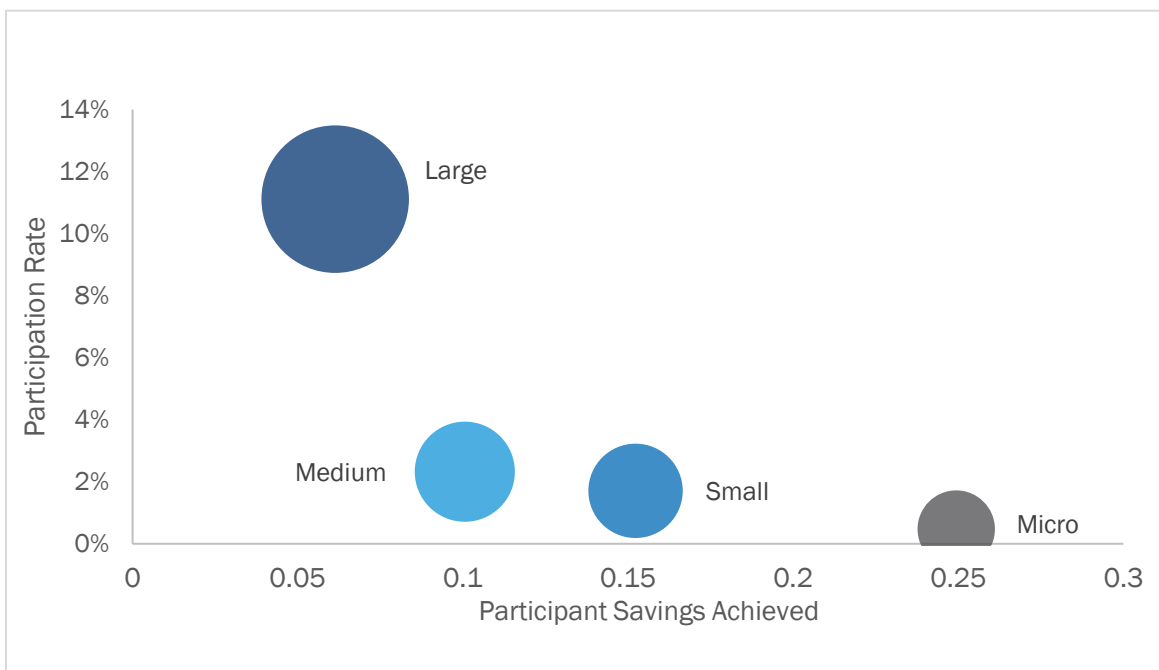
The findings from previous Massachusetts studies suggested that size was a primary determinant of key performance metrics. Consequently, this section presents differences in gas performance metrics across customer size groups. It is important to note that one limitation associated with this analysis is that data

⁶⁰ Segment was not available for 48.8% of gas accounts that represented 46.1% of all consumption.

provided by the utilities did not have designated size definitions. Consequently, the evaluation team leveraged the Massachusetts size definitions for gas sizes to construct the profile by size.

Consistent with findings from the electric profile, small and medium businesses offer possible opportunities for increased gas participation and/or depth of savings. Large business had relatively high participation rates but low depth of savings. As with electric, this is expected as large businesses have extensive and diverse energy needs and often participate over multiple years. Additionally, medium business had moderate depth of savings, and moderate participation rates while small business had high depth of savings but low participation rates. Micro business shows opportunity for increased participation as participation rates were the lowest of all groups.

Figure 28. Gas 2019 Participation Rate and Participant Savings Achieved by Size



Consumption weighted participation shows programs target the largest customers. Programs would benefit from program and marketing strategies that target gas customers by size. The data illustrate that for two years participation rates increase dramatically from medium to large business. Given the relatively larger savings opportunity and lower number of medium gas accounts relative to small accounts, this suggests that there is substantial savings opportunity possible by increasing participation of medium business. As was seen in Table 16, there were under 2,000 medium business accounts in 2019. Those accounts contributed 151 million CCF in consumption. In contrast, there were 8,000 small business gas accounts that contributed just 134 million CCF in consumption. This suggested the limited number of medium business accounts may represent a valuable group for targeted services.

Engaging medium gas businesses could provide a substantial boost to gas savings. Further, the overwhelming number of small and micro gas accounts suggests targeted strategies for addressing their somewhat limited needs could provide a substantial boost to participation rate and participant savings achieved. Possible avenues for expanding service to small and micro accounts include engaging dedicated gas direct install venders and offering expanded upstream measures such as hot water, and kitchen appliances.

Figure 29. Gas Consumption Weighted Participation Rate by Size and Year

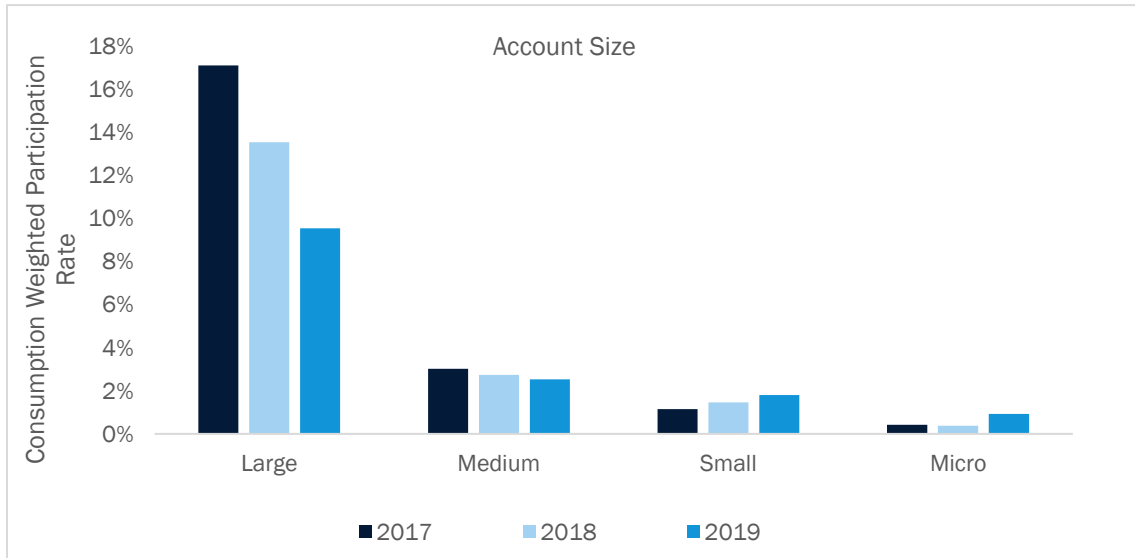
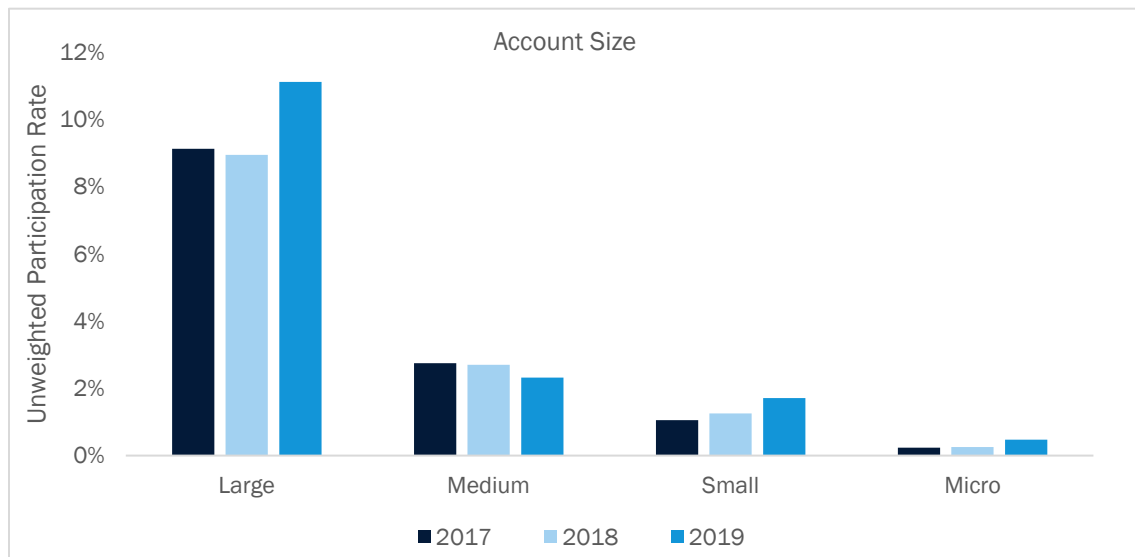


Figure 30. Gas Unweighted Participation Rate by Size and Year



Small and micro business provide opportunities for increased population savings achieved through increased participation, while small, medium, and large business offer opportunity through increased depth of savings.⁶¹ Medium business had higher population savings achieved in 2018 relative to large business, while large business had higher population savings achieved than medium business in both 2017 and 2019 (Figure 31 and Figure 32). This suggests that medium business did not necessarily require targeted services to the extent that were required in Massachusetts in 2014. However, both small business and micro business had

⁶¹ The population savings achieved provide an indication of the overall level of service to a sub-population of accounts as it reflects the combined impact of the participation rate (account level penetration) with participant savings achieved (depth of savings among participating accounts).

consistently lower population savings achieved than the larger segments. Considering the relatively high participant saving achieved of particularly micro business suggests that participant savings achieved was relatively high for existing participants, so efforts to increase participation among small and micro business should lead to increased population savings achieved. The Massachusetts PAs have looked to expansion of the upstream initiative to increase participation among small and micro business.

These findings reinforce the conclusion that more targeted strategies by size could improve population savings achieved for micro and small gas accounts. While medium gas accounts offer opportunities for increased savings, there does not appear to be a similar equity concern to that seen in Massachusetts in 2014.

Figure 31. Gas Population Savings Achieved by Size

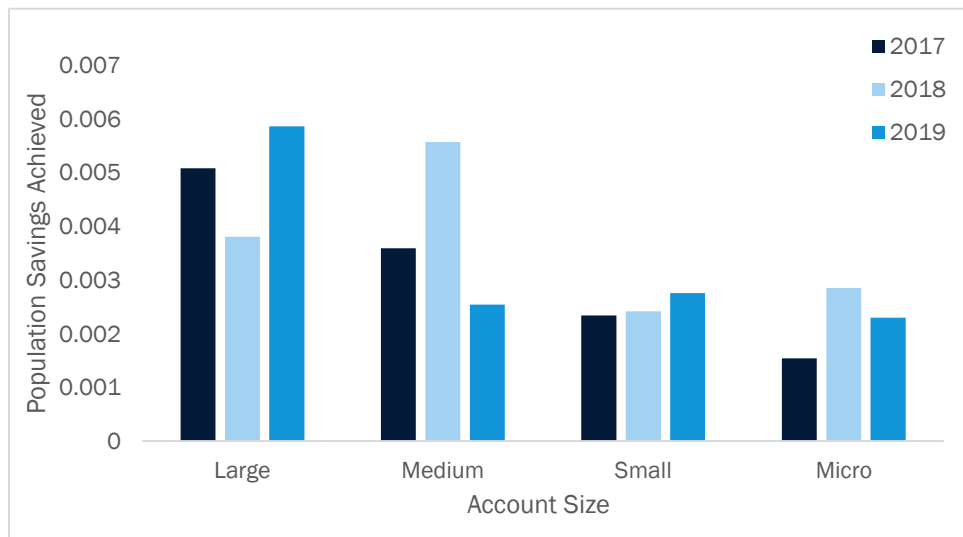
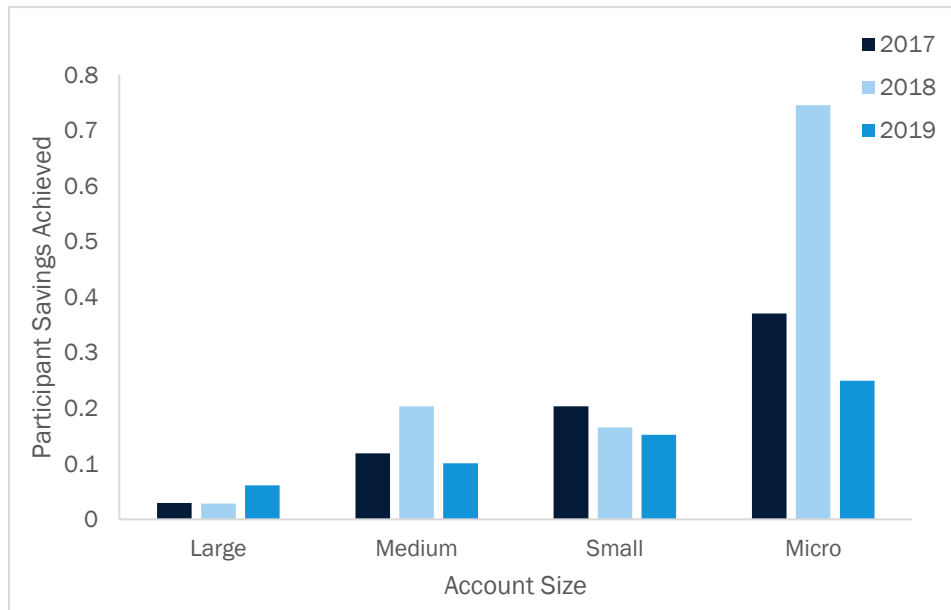


Figure 32. Gas Participant Savings Achieved by Size



5.2.3 Gas Profile by Segment

In this section we explore differences in performance metrics by industry segment for the roughly 51% of accounts for which segment information was available. This section is divided into four sub-sections. First, we considered the performance metrics for 16 separate industry segments. Next, we examine how the intersection of industry segment and size impacted performance metrics. Third, we introduced the time dimension to explore whether patterns in population savings achieved or participant savings achieved vary over the three-year analysis period. For a deeper dive into measure level savings for four key segments, manufacturing, retail, government, and education, both in total and by size, see Appendix C.

In Figure 33, we present a multi-dimensional view of performance by industry segment in 2019. The vertical axis reports the participation rate for accounts in each segment (a measure of penetration), while the horizontal axis indicates the participant savings achieved (a measure of depth of savings). These two metrics combined make up population savings achieved, which is valuable for understanding the overall level of service to a segment. Viewing the metrics separately allowed us to isolate whether high or low population savings achieved was attributable to the penetration, depth of savings, or both penetration and depth of savings. In terms of quadrants, segments in the upper right-hand quadrant represent the best performing segments that were both highly penetrated and had high depth of savings. The lower left-hand quadrant represents the least desirable segment with neither high penetration, nor high depth of savings. The bubble size depicts the third dimension on the graph, the segment size, provided total kWh consumption of all accounts in a segment and provided an indication of the opportunity for savings.

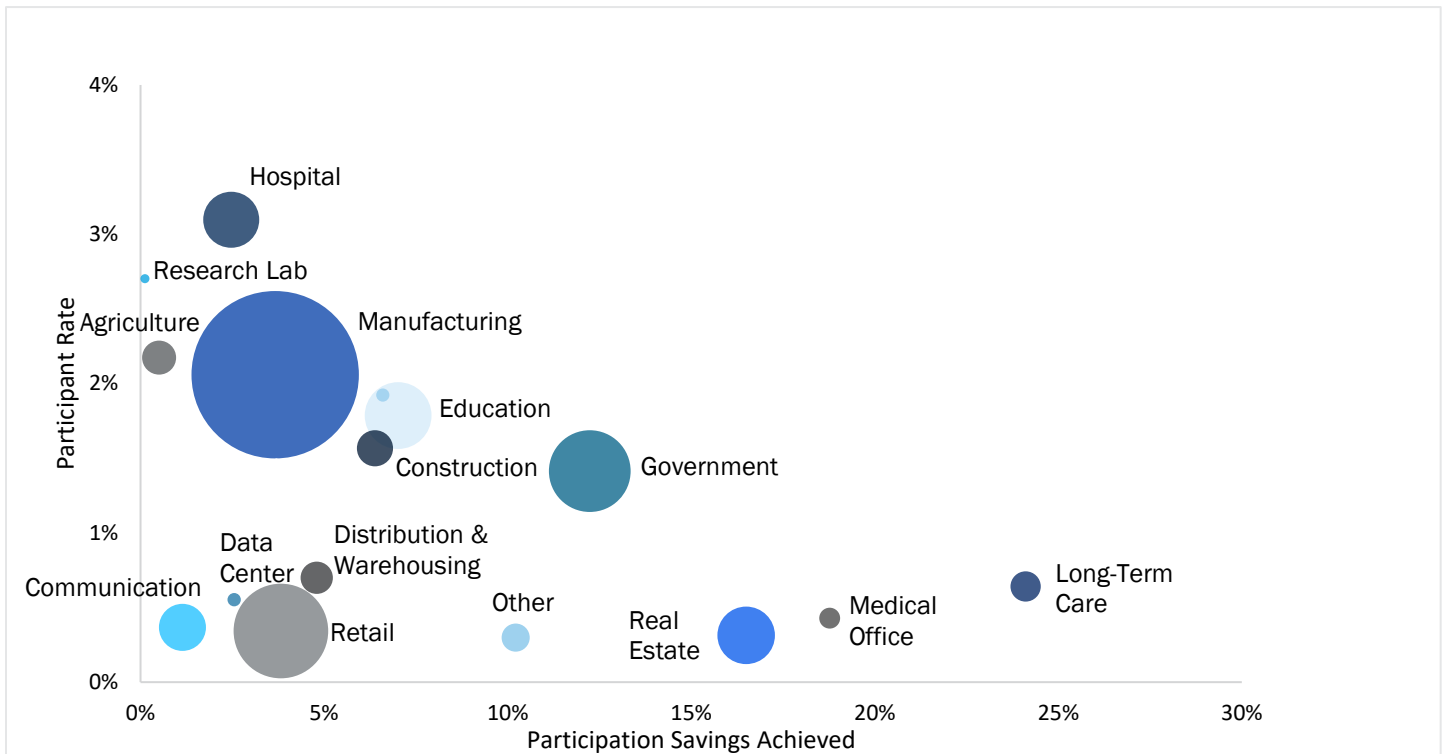
Industry segments offer differing opportunities for increased depth of gas savings and participation in 2019. The evaluation team identified the following segments as providing notable opportunities in 2019 (Figure 33):

- Manufacturing: Required roughly 20% of total 2019 gas consumption and 43% of the share of total consumption associated with accounts for which customer segment was available (i.e., excluding the

46.1% of consumption with missing segment). Manufacturing had the third highest participation rate (2%), but relatively low depth of savings.

- Retail: The second largest segment with relatively low participation rates and participant savings achieved.
- Educational Services: Showed relatively high participation rates, but moderate to low depth of savings.
- Government: The third largest segment with moderate performance in terms of both participation rate and depth of savings.
- Hospitals: Moderately sized industry with the highest participation rates, but relatively low depth of savings.

Figure 33. Gas 2019 Participation Rate vs Participant Savings Achieved by Industry

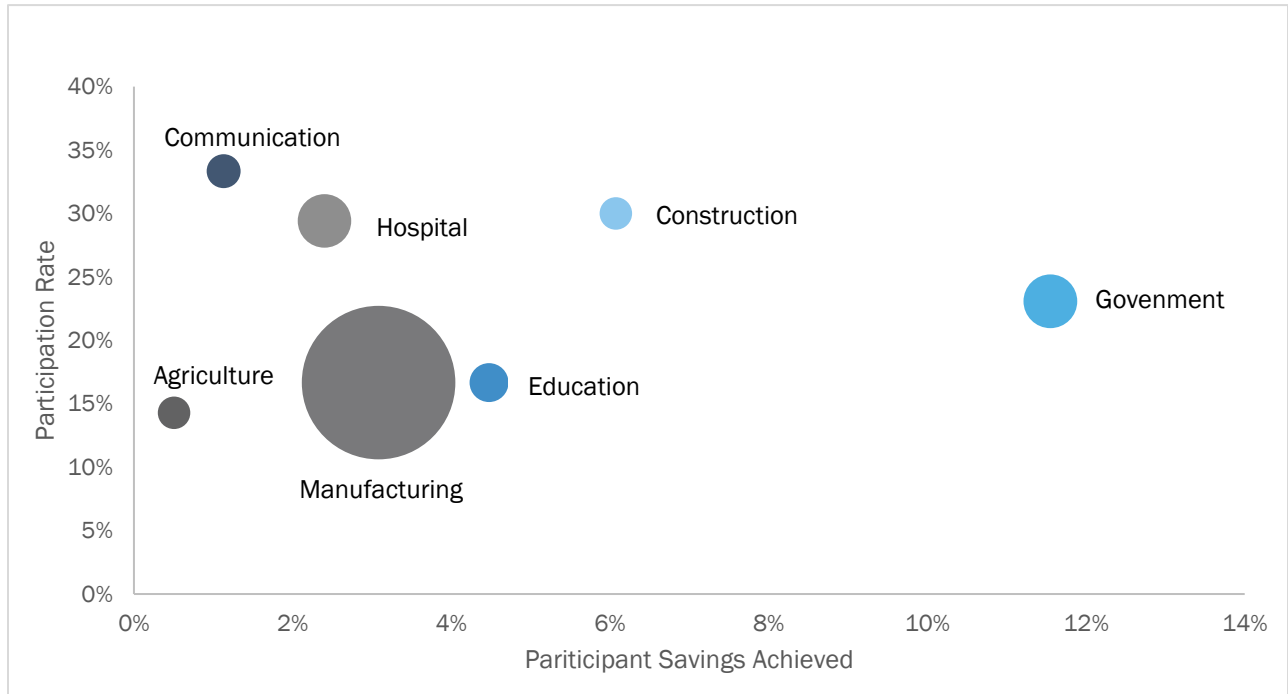


Note: Bubble size represents 2019 CCF consumption. Industry segment only available for Eversource accounts.

There are large differences in performance metrics by segment for large and medium accounts (Figure 34 and Figure 35).⁶² For large accounts, government had relatively high participant savings achieved (12.5%) and a high participation rate (23%). In contrast, medium government accounts had just a 9% participant savings achieved and a 3% participation rate. Both medium and large hospitals had some of the highest participation rates, but relatively low participant savings achieved. **These data further suggest that the intersection of company size and segment were important determinants of program performance.**

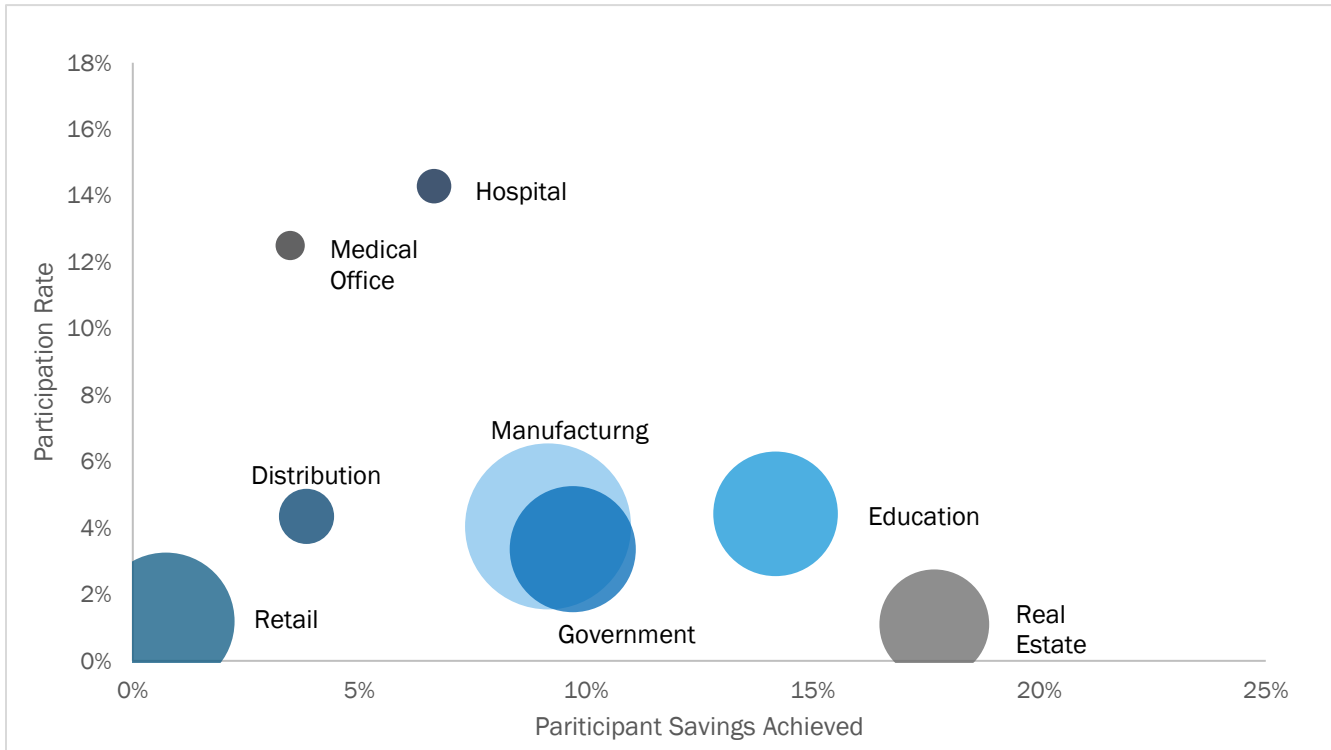
⁶² Small and medium business are not shown Due to the relatively high concentration of “unknown” segments within the small and

Figure 34. Gas 2019 Participation Rate and Participant Savings Achieved by Industry: Large Businesses



Note: Bubble size represents 2019 CCF consumption. Industry segment only available for Eversource accounts.

Figure 35: Gas 2019 Participation Rate and Participant Savings Achieved by Industry: Medium Businesses

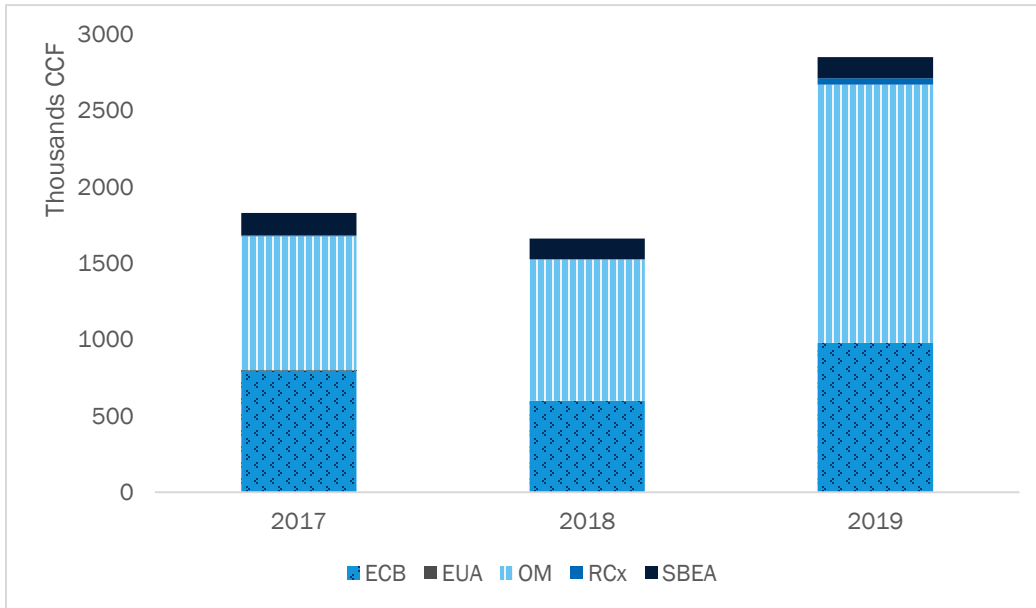


Note: Bubble size represents 2019 CCF consumption. Industry segment only available for Eversource accounts.

5.2.4 Gas Profile by Program

The evaluation team examined the total gas savings by program in each program year. Three initiatives, ECB, EO, and O&M (a component of the BES Program) provided roughly 95% of all gas savings in each of the three analysis years, while the relative contribution of each of these three programs varied year to year. In 2019, O&M became the largest contributor, providing 48% of total gas savings, while EO and ECB provided 25% and 26% of 2019 savings, respectively.

Figure 36. Gas Savings by Program and Year



5.2.5 Gas Savings by Delivery Pathway

Custom delivery was the dominant delivery pathway for gas across all customer sizes throughout the analysis period, particularly for medium and large businesses. The relative complexity of C&I gas solutions often necessitates custom, rather than prescriptive solutions. Therefore, it was unsurprising that custom delivery constituted the majority of savings for all sizes within each of year of the profile analysis. Even micro business received between 65% (in 2019) and 96% (in 2018) of savings from custom delivery. Large business gas accounts received between 90% of in 2019 to 98% of savings in 2018 through custom delivery.

Table 18. Gas Savings by Delivery Pathway and Account Size (2017-2019)

Size	Custom Savings			Prescriptive Savings		
	2017	2018	2019	2017	2018	2019
Micro	80,526	479,890	137,118	21,228	20,223	73,092
Small	212,777	204,286	243,678	47,944	55,416	122,163
Medium	370,179	598,387	308,496	143,097	189,102	76,216
Large	1,425,039	1,301,003	2,143,721	96,715	30,635	239,258
N/A	591,557	372,295	975,056	9,785	90,182	60,627
Total	2,680,078	2,955,861	3,808,069	318,769	385,558	571,356

Table 19. Gas Percent Savings by Delivery Path and Account Size (2017-2019)

Size	Custom Savings			Prescriptive Savings		
	2017	2018	2019	2017	2018	2019
Micro	79%	96%	65%	21%	4%	35%
Small	82%	79%	67%	18%	21%	33%

Size	Custom Savings			Prescriptive Savings		
Medium	72%	76%	80%	28%	24%	20%
Large	94%	98%	90%	6%	2%	10%
N/A	98%	81%	94%	2%	19%	6%
Total	89%	88%	87%	11%	12%	13%

5.3 Assessment of Equity in Program Delivery

The evaluation team examined concerns regarding equitable distribution of program services to communities through two analyses. First, we divided communities into distressed and non-distressed communities based on definitions provided by the Connecticut Department of Economic and Community Development. Next, we considered the distribution of program resources by the population density of the community, which allowed us to separate communities into rural and urban communities.

5.3.1 Program Treatment of Distressed Communities

The Connecticut Department of Economic and Community Development issues a list of distressed municipalities annually to help target funds to those communities most financially and economically in need.⁶³ The evaluation team used this list to assess the degree to which Energize Connecticut dollars and services are flowing to distressed and non-distressed communities throughout the state and identify any equity concerns related to energy efficiency program delivery.

Distressed communities received program benefits generally proportional to population and electric and gas consumption.⁶⁴ Data across program years show that the share of incentives going to distressed communities increased from 2017 to 2018, but then declined slightly in 2019. Further, distressed communities received a slightly higher percent of the total share of savings relative to non-distressed communities than incentives for both electric and gas.

Table 20. Distribution of Electric and Gas Accounts and Consumption by Community Type

Community Type	Electric		Gas	
	Accounts (2019)	Consumption (2019)	Accounts (2019)	Consumption (2019)
Non-distressed	75%	70%	70%	69%
Distressed	25%	30%	30%	31%

Table 21. Distribution of Electric and Gas Incentives by Community Type

Year	Electric Incentives			Gas Incentives		
	Non-distressed	Distressed	Percent Distressed	Non-distressed	Distressed	Percent Distressed
2017	\$53,408,994	\$18,629,107	26%	\$6,061,654	\$1,617,145	21%

⁶³ The Connecticut Department of Economic and Community Development defines Distressed Communities in terms of its tax base, personal income of residents, and residents' need for public services. Details on Distressed Communities can be found here: https://portal.ct.gov/DECD/Content/About_DECD/Research-and-Publications/02_Review_Publications/Distressed-Municipalities

⁶⁴ While the percentage of incentives going to distressed communities is generally a little lower than the percentage of consumption, there is alignment in terms of accounts. Additionally, given the quality of the data, the evaluation team is not confident that a statistically significant difference of 5% can be detected.

Year	Electric Incentives			Gas Incentives		
	Non-distressed	Distressed	Percent Distressed	Non-distressed	Distressed	Percent Distressed
2018	\$52,539,384	\$20,997,323	29%	\$5,449,592	\$2,459,710	31%
2019	\$45,369,048	\$12,836,124	22%	\$5,625,269	\$1,971,424	26%

Table 22. Distribution of Electric and Gas Savings by Community Type

Delivery Pathway	Year	Electric Savings			Gas Savings		
		Non-distressed	Distressed	Percent of Savings to Distressed	Non-distressed	Distressed	Percent of Savings to Distressed
Custom	2017	74,567,506	32,625,726	30.4%	2,155,158	525,555	19.6%
	2018	66,616,270	26,476,440	28.4%	1,900,947	1,054,914	35.7%
	2019	31,816,038	16,303,985	33.9%	2,111,401	1,696,750	44.6%
Prescriptive	2017	2,111,472	1,774,782	45.7%	16,373	86,856	84.1%
	2018	3,133,404	3,344,572	51.6%	24,365	-	0.0%
	2019	54,174,897	42,170,420	21.5%	427,616	245,343	36.5%
Total	2017	76,678,978	34,400,508	31.0%	2,171,531	612,411	22.0%
	2018	69,749,674	29,821,012	29.9%	1,925,312	1,054,914	35.4%
	2019	185,990,935	58,474,405	23.9%	2,539,017	1,942,093	43.3%

5.3.2 Program Treatment of Rural versus Urban Communities

The evaluation also found that **rural communities received program benefits proportional to population and consumption**. As shown in the tables below, the proportions of incentives going to rural areas tracked closely with the proportion of accounts, consumption, and savings. Electric participation rates were generally higher than gas participation rates, but there was little difference in rural versus urban participation rates.

Table 23. Distribution of Electric and Gas Accounts and Consumption by Location Type (Rural/Urban)

Location Type	Electric		Gas	
	Accounts (2019)	Consumption (2019)	Accounts (2019)	Consumption (2019)
Unknown	1%	1%	1%	2%
Rural	40%	32%	25%	27%
Urban	59%	67%	73%	71%

Table 24. Distribution of Electric and Gas Incentives by Location Type (Rural/Urban)

Location Type	Electric Incentives			Gas Incentives		
	2017	2018	2019	2017	2018	2019
Rural	\$26,601,508	\$25,802,710	\$18,248,882	\$2,897,105	\$1,436,689	\$1,685,496
Urban	\$41,265,002	\$42,029,225	\$29,850,153	\$3,186,014	\$5,704,865	\$4,357,458
Percent Rural	39%	38%	38%	48%	20%	28%

Table 25. Electric and Gas Participation Rate by Location Type (Rural/Urban)

Location Type	Electric Participation Rate			Gas Participation Rate		
	2017	2018	2019	2017	2018	2019
Rural	2.0%	1.6%	1.4%	NA	0.6%	0.7%
Urban	2.4%	1.9%	2.0%	NA	0.5%	0.8%

Table 26. Distribution of Electric and Gas Savings by Location Type (Rural/Urban)

Location Type	Electric Savings (kWh)			Gas Savings (CCF)		
	2017	2018	2019	2017	2018	2019
Rural	76,241,022	84,463,844	57,689,567	2,897,105	1,436,689	1,685,496
Urban	130,987,415	133,948,475	120,147,319	3,186,014	5,704,865	4,357,458
Percent Rural	37%	39%	32%	48%	20%	28%

5.4 Conclusions & Recommendations

Opinion Dynamics made the following recommendations to improve the ability to profile customers and performance.

- **Differentiate program offerings and marketing strategies by customer size.** Micro and small accounts could realize relatively high participant savings achieved with measures that offer limited savings per measure, typically prescriptive solutions. Medium accounts have somewhat more complex energy needs, but often do not have sufficient energy needs to have dedicated energy managers within the business. Large accounts are typically managed directly due to the size of their energy needs and savings opportunities. Developing program and marketing strategies that address differences in needs by size can improve performance metrics of customers within each size class.
- The overwhelming number of small and micro gas accounts suggest targeted strategies for addressing their somewhat limited needs could provide a substantial boost to participation rate and participant savings achieved. Possible avenues for expanding service to small and micro accounts include engaging dedicated gas direct install vendors and offering expanded upstream measures such as hot water, kitchen equipment, and HVAC solutions, which have been successful among this customer group in Massachusetts.
- Based on experiences in Massachusetts, the Connecticut utilities could consider utilizing a differentiated marketing strategy by both segment and customer size. In Massachusetts, Eversource has used a strategy that separates accounts into quartiles based on annual kWh or therm consumption. Accounts are then assigned to teams based on industry segment and quartile. The smallest accounts are considered small business and handled by the DI vendors. All other accounts are managed by teams based on industry segment and customer size. Medium businesses are handled by separate teams than large business. This approach led to relatively high population savings achieved for medium and large business.



Chapter 6



6. Looking Across the Connecticut Non-SBEA C&I Programs

The Energize Connecticut C&I portfolio is designed to provide a wide selection of energy saving solutions to business customers that encompass a diverse set of industry segments, business sizes, facility types—each with varied needs. Collectively, the non-SBEA C&I program offerings range from prescriptive and custom offerings to retro-commissioning and operations and maintenance (O&M)-type interventions. As previously noted, the goal of this process evaluation is to look both *across* and *within* each of the program offerings.

This chapter presents the broad look across the programs at the C&I market holistically. It incorporates the learnings from each of the individual program process evaluations (which are presented as later chapters in this report), but also weaves in the results of the non-participant survey conducted as part of this study (as by their nature of being non-participants are not specific to any of the individual offerings).

As discussed earlier,⁶⁵ the evaluation team uses two different size class definitions for this study, both of which appear in this chapter:

- **Profiling Results:** To ensure cross-state comparability, the evaluation team relies on four size bins that were originally developed for the Massachusetts work that guided our profiling activities. These size bins include: (1) large (≥ 4.50 GWh/yr.), (2) medium (≥ 1.50 GWh/yr.), and < 4.50 GWh/yr.), (3) small (≥ 0.11 GWh/yr. and < 1.50 GWh/yr.), and (4) micro (< 0.11 GWh/yr.).
- **Non-Participant Survey Results:** Because we were unable to stratify our survey samples frames by business size, the respondent pool reflects the distribution of business accounts across the unstratified business account population—that is, the pool of non-participant respondents included in our analyses is 99% small business accounts (see Table 9). Nevertheless, we still suspected account size—even among the relatively smaller accounts—would likely matter. As such, we separated the non-participant population into three bins where each bin contains an equal number of accounts (i.e., terciles). To avoid confusion with the large, medium, small, and micro size bins used for the profiling analyses, we refer to the bins used with the survey data as: (1) the bottom third, (2) middle third, and top third. Non-participant results in this chapter are weighted by proportional representation across the three size bins.

6.1 Key Findings

6.1.1 Effectiveness in Meeting Customer Needs

Understanding how well the current Energize Connecticut portfolio is meeting customer needs is foundational to developing strategies to optimize program design and expenditures going forward. This section provides key study findings around satisfaction and recommendations for potential program improvement (additional details are included in each of the individual program chapters of this report).

Participant satisfaction is high across all programs indicating, that for those who participate, the programs are meeting customer expectations. Overall program satisfaction was highest for the EO/ECB Existing Equipment programs (average score of 8.1 out of 10) followed by ECB New Construction (average score of 7.7 out of 10). Among those who participated in BES, seven of 10 were highly satisfied with the program while the other three

⁶⁵ The evaluation team was unable to stratify the non-participant population at the time of sampling because consumption data was not available at the time of sample frame development. Additional detail on this issue is found in Section 3.3.1: *Comments on Business Account Size*.

were moderately satisfied.⁶⁶ When asked to rate various aspects of the programs and their participation experiences, generally no participants scored any of their experiences below a 7.0.⁶⁷

Distributors and trade allies are also generally satisfied with their respective program experiences. Within the Upstream Lighting Program, all 10 distributors we spoke with were long-time participants and none scored any of their program experiences below a 7.0 (on a 0-10 scale). In general, trade allies were also satisfied across all programs. EO/ECB Existing Equipment trade allies were mostly satisfied with the program (average score of 7.0 out of 10) and the various program elements except for utility marketing efforts (6.5) and the paperwork involved (5.7). Trade allies involved with ECB New Construction were also satisfied with the program, in particular mentioning that they were satisfied with the paperwork process and the responsiveness of program staff:

"I think you guys have perfected the program over the past 5 or 10 years. Goes smoothly. Paperwork has been easy to read of late."

Among trade allies involved with BES, respondents were generally satisfied, but experiences were a bit more varied:

"Overall, I love the relationship and I think they are good partners. I love the work I do. When we are done with a project, people are happy. They are getting this stuff. The only thing I would say is [they are] way too slow in paying and they have too much minutiae. It took 9 months to get paid for a project."

"I would say I am satisfied - not very but satisfied. It is one of the best programs in the country as far as incentive levels. It is also one of the most intricate - the details needed. You get more money, so it is more work. There are areas of improvement. The messages and interpretation of rules change across utility and staff. They have a big tech upgrade push to support projects. They don't have the best tools to work with."

In general, the satisfaction results seen among participants in the Connecticut programs mirror those seen elsewhere. As part of this study, the evaluation team conducted a benchmarking analysis to compare the Energize Connecticut C&I programs' performance to other similar programs throughout the country. Where data were available, we collected information on program satisfaction among participating customers and trade allies. As illustrated in Table 27 (participants) and Table 28 (trade allies), most of the available data came from programs most comparable to the EO and ECB Existing Equipment programs.

Table 27. Participant Satisfaction Benchmarking

Program Component	Connecticut: EO/ECB Program (n=69)	Dominion South Carolina: Prescriptive, Custom & NC Programs (n=53)	Ameren Illinois: Standard (n=140) & Custom/NC Programs (n=34)	Duke: Non-Residential Prescriptive Program (n=108)
Program Overall	8.1		8.9	8.8

⁶⁶ Note that though the BES participants were asked to rate their levels of satisfaction using a 0-10 scale, most answered with richer, open-ended responses. However, while these responses provided deeper insights than scale responses, they prevented the evaluation team from scoring BES participant satisfaction the same way as EO and ECB participants.

⁶⁷ Note that the one exception was among EO/ECB Existing Equipment participants, where the average satisfaction score for financing assistance was 6.0. However, this particular result was based on a very small sample size (n=5) with one rather unsatisfied outlier dramatically skewing the final average score. As such, we do not think it is representative of overall program feedback.

Program Component	Connecticut: EO/ECB Program (n=69)	Dominion South Carolina: Prescriptive, Custom & NC Programs (n=53)	Ameren Illinois: Standard (n=140) & Custom/NC Programs (n=34)	Duke: Non-Residential Prescriptive Program (n=108)
Contractor	8.5	9.1		9.2
Equipment/Services	8.4	9.5	9.4	--
Incentives	8.0	8.3	8.5	8.3
Amount of Time	8.0	8.2	8.9	--
Range of Equipment	7.9	8.8	8.5	7.7
Application Process	7.7	8.3	8.1	8.3
Technical Assistance	7.5	--	8.7	--

Table 28. Trade Ally Satisfaction Benchmarking

Program Component	Connecticut: EO/ECB Program (n=34)	Duke: Non-Residential Prescriptive Program (n=62)
Range of products	7.6	6.9
Program staff ability to address questions	7.4	8.3
Information about incentives available to customers on Energize Connecticut website	7.1	--
Amount of incentives	6.9	6.8

Overall, the Energize Connecticut programs are a mature set of offerings and only a few recommendations for improvement were provided. The Energize Connecticut offerings are an established, long-running set of programs and initiatives and it appears that any systematic or large-scale implementation challenges or issues have largely been addressed in earlier years. Participants—be they customers, trade allies, or distributors—provided few recommendations for improvement. The only notable areas of feedback are shown in Table 29.

Table 29. Participant and Trade Ally Recommendations for Program Improvement

Areas of Improvement	Number of Respondents		
	EO/ECB Existing Equipment Participants (n=21)	ECB NC Trade Allies (n=11)	BES Trade Allies (n=10)
Application process	5		
Length and clarify of the application	5		
Turnaround time for approving projects	4		
Regular information about program changes, requirements, and processes		5	
More utility outreach		4	4
More consistent experience across utilities			5

Program participants and trade allies did not identify any notable differences in utility implementation across any of the programs. No differences at all were noted for the EO, ECB, or Upstream Lighting programs. A few one-off differences were noted for BES:

“UI is more flexible on deadlines than Eversource.” (EE Installer)

“UI uses traditional Excel sheet to submit projects. Eversource uses [a] very engineer-driven approach which is harder to work with.” (EE Installer)

“[We] only work with Eversource because UI has paused the PRIME Initiative for 2 years.” (Operations)

“UI does not have money to support BES work like Eversource does.” (Operations)

“UI pays 50% of steam assessments whereas Eversource pays 100%.” (Distributor/Operations)

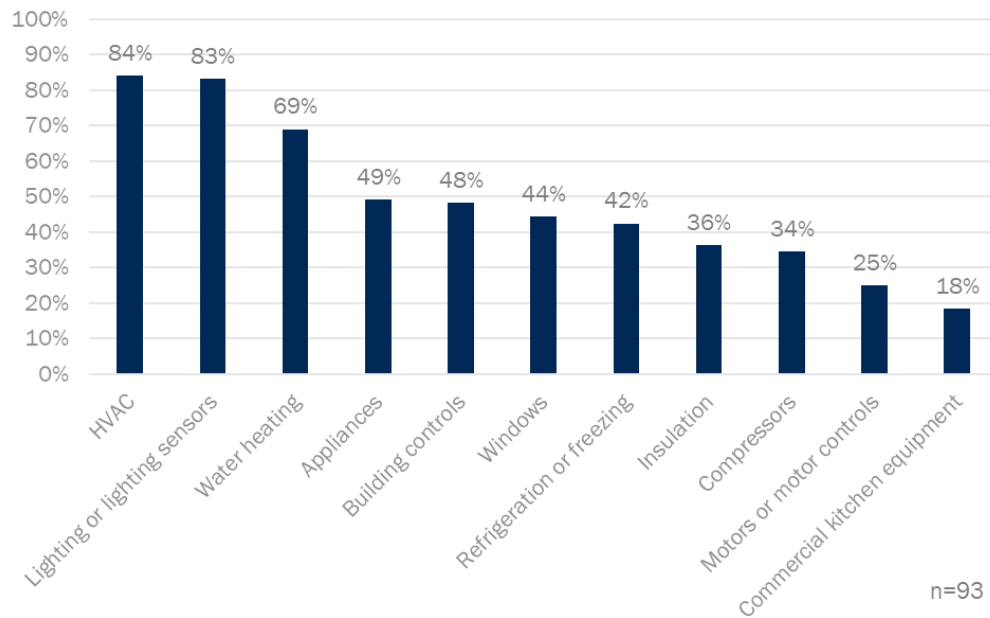
6.1.2 Customer Decision-Making

Understanding how C&I customers make energy efficiency upgrade decisions is key to informing program design and implementation including program marketing and associated customer targeting. The following presents key findings around customer decision-making.

Only about half of the surveyed non-participants reported that someone at their organization had the authority to make equipment decisions; this will limit comprehensive projects and participation in general.⁶⁸ A majority of non-participants reported having the authority to make decisions about the three most common equipment types including HVAC, lighting, and water heating (see Figure 37). For all other equipment types, less than half of non-participants reported that someone in their organization has authority to make equipment maintenance or replacement decisions at their facility, which will limit the ability to achieve comprehensive savings.

⁶⁸ Here it is important to emphasize that while the non-participant sample is representative of 99% of C&I business accounts, it excludes the largest customers.

Figure 37. Decision-Making Authority by Equipment Type Among Non-Participants



Decision-making authority is partly a function of facility ownership, but not entirely. When considering all but the first three end uses from Figure 37, it turns out that non-participant owners make up 64% of those with the authority to make decisions versus being 53% of non-participant population.⁶⁹ As one might expect, decision-making authority is also associated with size, as non-participants in the bottom third size bin were less likely (42%) to have the authority to make decisions than those in the middle third (48%) or top third (56%). There are also some differences among industry segments with retail/personal services (21%) and office/professional service facilities (17%) being the *least* likely to have decision-making authority on equipment types outside of lighting, HVAC, and water heating—not surprising given retail and office customers are often renters.

6.1.3 Barriers

Fundamentally, all energy efficiency programs are designed to overcome market barriers preventing customers from implementing more energy-efficient measures and/or practices. The evaluation team differentiates between *barriers to making energy-efficient upgrades at their facilities*, and *barriers to program participation*.

Barriers to Making Energy efficiency Upgrades at Their Facilities

In general, regardless of whether they were a program participant or a non-participant, the main barriers to making energy-efficient upgrades are uncertainty around bill savings,⁷⁰ the higher cost of energy efficient equipment, and a lack of awareness of energy efficient options. Figure 38 shows that uncertainty about utility

⁶⁹ This contrasts with non-owners, where only 36% have decision-making authority yet representing 47% of the non-participants.

⁷⁰ The evaluation team asked this question in terms of “uncertainty about utility bill savings from energy efficiency improvements.” Throughout this report we take this to mean dollar cost savings on their bill. While one could take the position that the statement is ambiguous regarding whether it is dollar or energy savings, it is our experience that customers rarely think of “bill savings” in terms of energy savings and almost always think in terms of dollar savings.

bill savings is the most common barrier followed by lack of knowledge of energy-efficient options, and then the higher costs of energy-efficient equipment. Some notable differences also arose between the size classes:

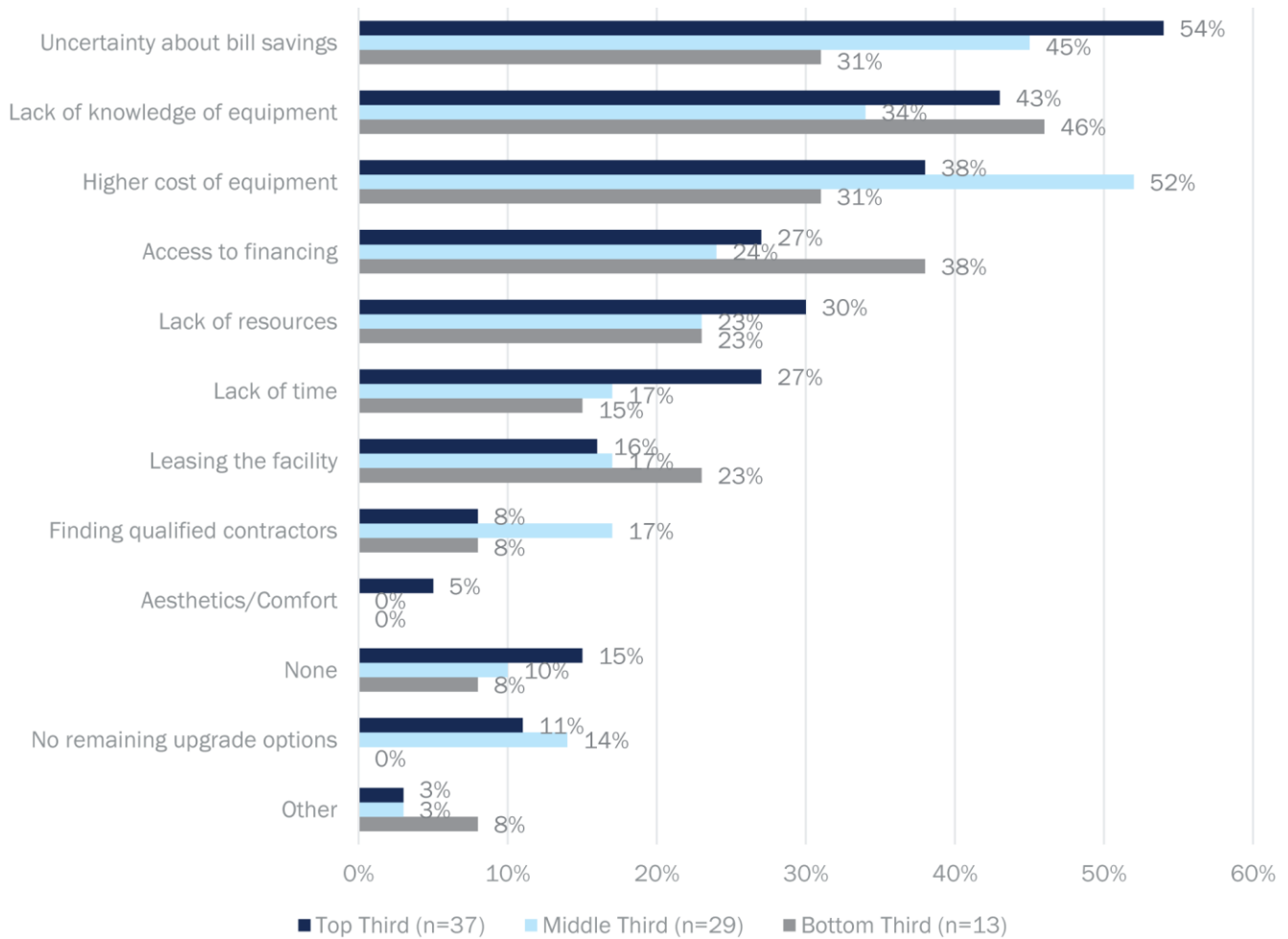
- Larger non-participants (in the top third size bin) are significantly more likely than smaller accounts (in the middle or bottom third bins) to mention uncertainty about bill savings as a barrier.
- Smaller non-participants are significantly more likely than larger accounts to mention access to financing their leasing of the facility as barriers.
- Larger non-participants are more likely than smaller accounts to indicate a lack of time was an issue.

When looking at barriers to making energy-efficient upgrades by industry segment, costs tended to be a bigger barrier for health service facilities (57%) and manufacturing facilities (46%). These results are also associated with size as healthcare and manufacturing facilities tend to be larger business accounts which generally implement higher-cost projects. In contrast, restaurants (60%) and retail/personal service facilities (33%) were most likely to mention access to financing, which also makes sense as these are generally smaller business that often have limited capital resources to allocate to equipment upgrades.

However, as we illustrate later in the BES chapter, the barriers to making energy efficient upgrades for that offering vary greatly and are generally specific to the circumstances of each customer, which aligns with the program's design.

One thing that stands out is that the two biggest barriers—namely uncertainty about bill savings and lack of knowledge of equipment—are both informational gaps, and thus, something the programs should be able to directly address.

Figure 38. Barriers to Making Energy Efficient Improvements among Non-Participants



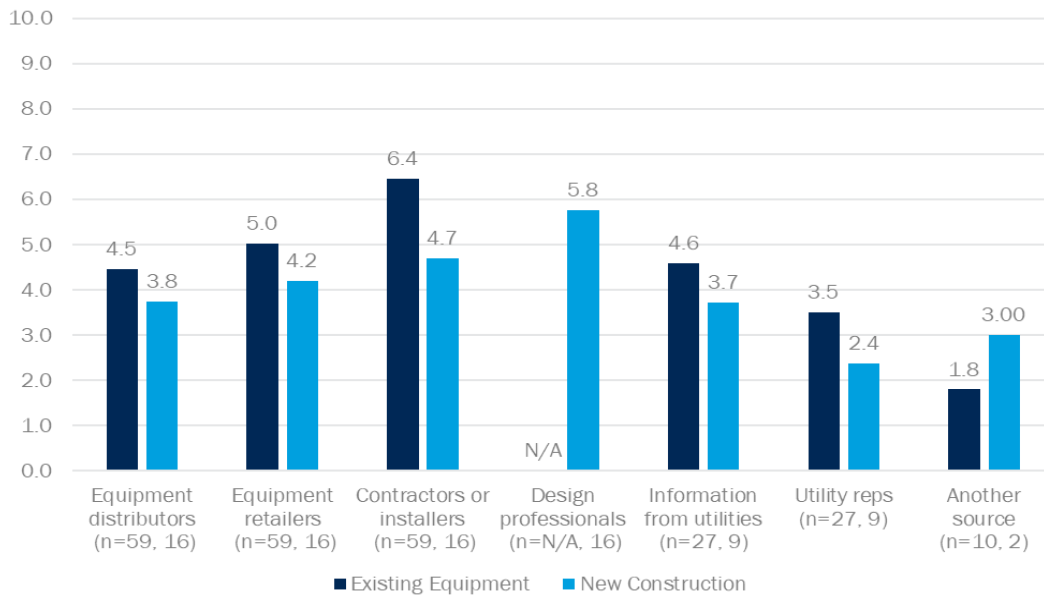
When comparing these results to another C&I portfolio for which results are publicly available (Ameren Illinois), the higher cost of energy efficient equipment is a consistent theme. According to that study, non-participants cited the higher cost of energy efficient equipment (30%), limited resources to plan and implement efficiency projects (29%), access to financing or capital (29%), and limitations of building characteristics (29%) as major barriers to taking energy efficient actions.⁷¹

A diverse set of market actors are affecting projects; market actors other than just contractors may pose an opportunity for new construction projects. Contractors play key roles in making customers aware of energy efficiency programs and opportunities, and typically have significant influence on the equipment customers ultimately select, regardless of whether it is a retrofit or new construction project (Figure 39). For non-participants that reported conducting a retrofit or upgrade of existing equipment in the last two years, contractors were the most influential source among market partners. But while contractors still play a big role

⁷¹ Opinion Dynamics. NTG Research Memo: Ameren Illinois Business Program Cross-Cutting Evaluation Activities – Non-Participant Survey Results. Accessed: https://ilsag.s3.amazonaws.com/AIC_Business_Non-Participant_Research_Results_FINAL_2019-06-24.pdf

with new construction, other design professionals were the most influential, and as discussed in the ECB New Construction chapter (Section 0), should be strategically leveraged moving forward.

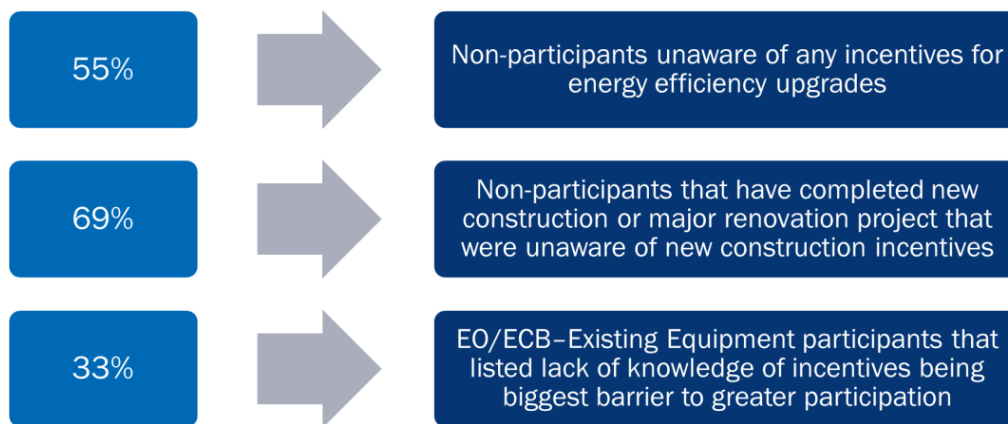
Figure 39. Influence on Decision-Making by Market Actor



Barriers to Program Participation

While customers identified a range of barriers to making energy efficient upgrades, **the main barrier to program participation is lack of awareness**. More than half of the surveyed non-participants were unaware of any incentives available for energy efficiency upgrades (see Figure 40). Also, more than two-thirds of non-participants that completed new construction or major renovation projects on their own were unaware of new construction incentives. Finally, a third of EO or ECB Existing Equipment participants mentioned that lack of awareness of incentives was the biggest barrier to participation in additional energy efficiency projects.

Figure 40. Awareness of Program Incentives



Size is associated with awareness, with larger customers generally being more aware. Non-participants in the bottom third size bin were much less likely to be aware of existing equipment incentives when compared to non-participants in the middle or top-third (Table 30). A similar but less severe pattern emerges with new construction incentives: less than one-quarter of the bottom third of non-participants reported being aware compared to over a third of the middle third and then almost half for the top third.

Table 30. Awareness of Existing Equipment and New Construction Utility Incentives by Customer Size

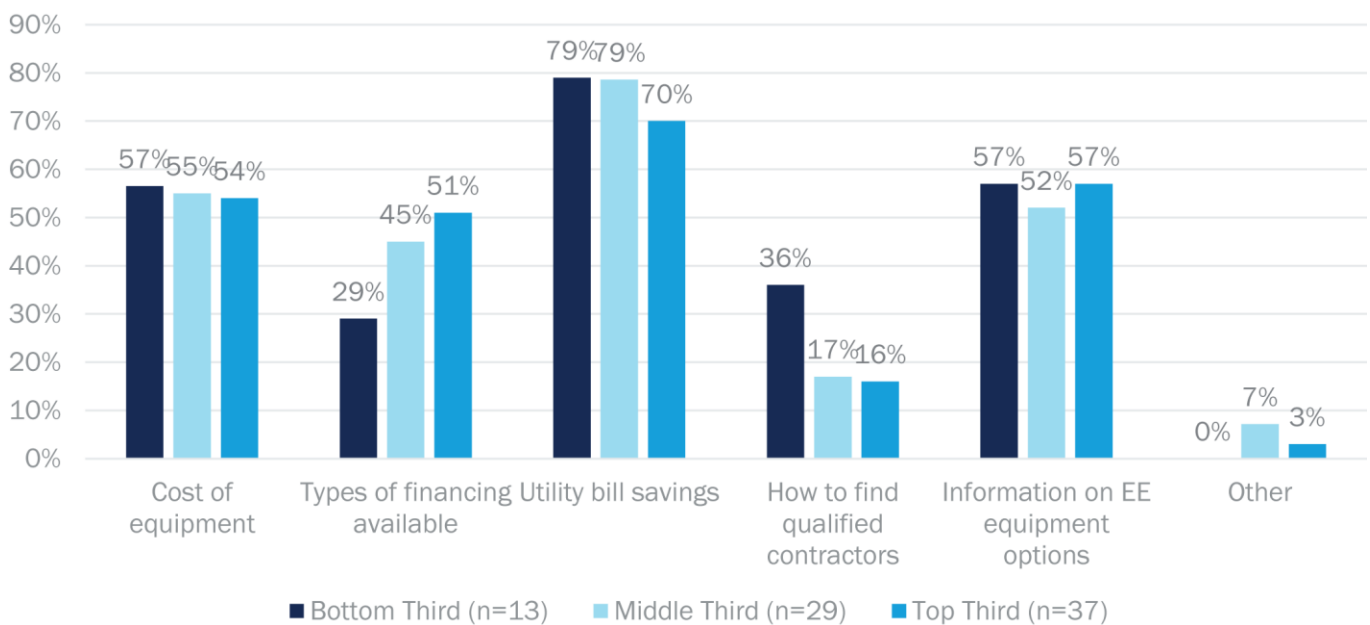
Customer Size Bins	Existing Equipment Awareness	New Construction Awareness
Bottom Third (n=13)	23%	23%
Middle Third (n=29)	52%	38%
Top Third (n=37)	59%	46%

Interestingly, while there was no significant difference in awareness between the utilities for existing equipment (Eversource 44%; UI 46%), there was a notable difference when it came to new construction (Eversource 32%; UI 62%). This could be due to the UI service territory having a population density around three times higher than Eversource territory—and as such, likely having much greater development and new construction—but we cannot be certain from our results.

It is also worth noting that the group of non-participants that had completed a non-incentivized project in the last two years *and* were aware that their utility offered energy efficiency incentives were asked why they did not apply for incentives for their projects. The most common answer was not being aware of specific incentives available for the equipment that they were upgrading/replacing (28%).

Regardless of size, information needs generally center on the barriers. Better insights into potential energy bill savings leads customer information needs (see Figure 41). This is followed by information on the cost of equipment and then information on energy-efficient equipment options applicable to their facility.

Figure 41. Information Needed by Organization Size



6.1.4 Financing

For some programs, access to financing may also be a barrier to participation, especially for smaller customers. About a quarter of EO/ECB Existing Equipment participants utilized financing, with uptake more common among small and medium sized businesses (23% and 25%, respectively compared to 13% for large customers). This theme is also evident within the ECB New Construction program where about a fifth of participants indicated they used financing (mostly traditional bank financing), and trade allies indicated that additional financing options may appeal to smaller customers. Given the suite of offerings, the evaluation team found that financing was not generally needed to encourage BES Program participation.

Financing energy efficiency upgrades is a bit more common for non-participants that completed a new construction project, but not necessarily rare for existing equipment projects either, making it a potential barrier for at least a certain portion of customers. As shown earlier, in terms of barriers to making energy-efficient upgrades, access to financing came in fourth (Figure 38). Of the non-participants who reported that they made some energy efficiency upgrades within the past two years, 16% reported using financing (compared to 22% of program participants). More specifically, the non-participants reported that 23% of new construction projects and 15% of retrofit projects were financed.

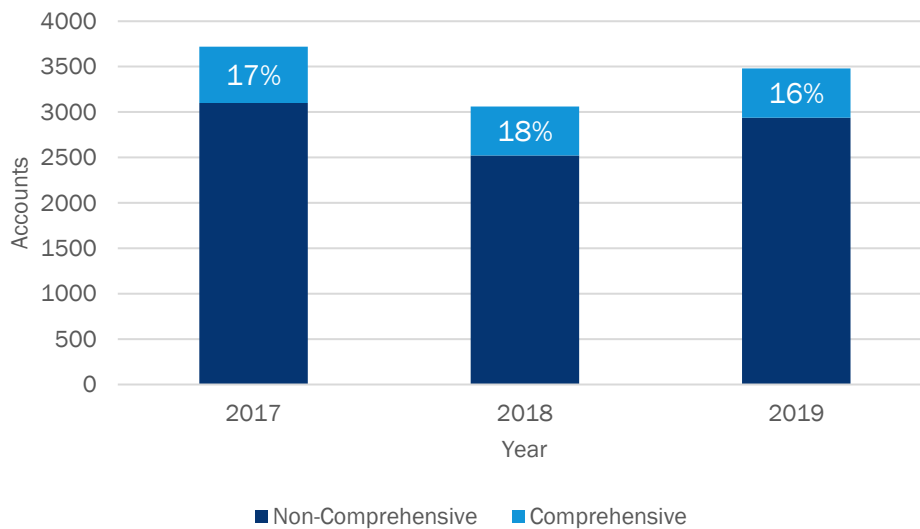
When using financing, most non-participants chose to do so either through a conventional loan at their bank (36%) or through on-bill financing through their utility (45%). None reported using financing through the Commercial Property Assessed Clean Energy (C-PACE) Green Bank. Additionally, only about a quarter (23%) were aware that C-PACE was even an option for financing energy efficiency improvements. For those that were aware, most had learned about C-PACE either through the Energize Connecticut website or through their contractors.

6.1.5 Depth and Comprehensiveness of Savings

A central goal of Energize Connecticut programming is to encourage more comprehensive projects with deeper savings than traditional single end-use projects. Energize Connecticut programs encourage customers to complete more comprehensive projects using a tiered incentive structure that provides increased per kWh or per KW, and per CCF incentives based on the number and types of end-uses installed through a project. To be deemed a comprehensive project, more than one end use needs to be installed.

Evidence suggests the tiered incentive structure is supporting some comprehensiveness, but impacts are likely limited at the project level. In any given year, between 2017 and 2019, 16-18% of projects were considered comprehensive (Figure 42). Notably, however, the tiered approach is likely limited in its ability to drive comprehensiveness for C&I customers and projects. Many of the projects conducted amongst the C&I population are large, pre-planned, and pre-budgeted endeavors. The interviewed trade allies suggest that while the tiered incentive likely does influence some smaller projects, for larger projects, consideration of multiple end uses is something that would typically need to occur in the design and planning stages. Thus, if the overall goal is to drive greater comprehensiveness and deeper savings across the Energize Connecticut C&I programs, offering a tiered incentive structure based on comprehensiveness at the *project level* may be of limited influence and potential.

Figure 42. Percent of Comprehensive Projects by Year



Notable repeat participation is occurring suggesting a customer-level view of comprehensiveness over time might also be warranted. While some C&I projects do have the flexibility to be changed, and thus, the tiered incentive structure may be of some value in driving comprehensiveness, this is unlikely the case for most projects. Nevertheless, the fact is that many customers are participating across multiple years across multiple end-uses. Table 31 shows the proportion of 2017 and 2018 participants from each program that participated again in the subsequent year. In general, though customers appear somewhat more likely to participate in the same program again the next year, there is also a lot of movement from one program to another. If deep and comprehensive savings are the goal, these patterns suggest a view of comprehensiveness over time may be better than focusing on comprehensiveness at the project level.

Table 31. Year-Over-Year Program Participation

2017 Participation	2018 Participation			Total
	EO	ECB	BES	
EO (n=1,050)	8%	3%	1%	11%
ECB (n=664)	6%	6%	2%	11%
BES (n=99)	13%	15%	11%	29%
2018 Participation	2019 Participation			Total
	EO	ECB	BES	
EO (n=899)	7%	4%	2%	10%
ECB (n=489)	4%	6%	1%	9%
BES (n=88)	10%	10%	13%	22%

6.1.6 Program Measures

Energy efficiency program measure mixes are always changing as the newest and most efficient technologies come to market and become targeted. The Energize Connecticut measure mix is no different, and like other programs around the nation, a deeper consideration of the markets in which they operate is key.

Lighting dominates the C&I portfolio, with no close second, Table 32 shows the number of participant accounts, electricity, and gas savings by end use for 2019. What immediately stands out is that *more than three-quarters of the non-SBEA portfolio kWh savings was associated with lighting*. The results, though not shown, are quite similar for 2018 and 2017. The next most common end use is process equipment, but only representing about 15% of kWh savings. On the gas side, HVAC dominates, representing roughly two-thirds of Mcf savings.

Table 32. Number of Accounts, Electricity and Gas Savings by End Use (2019)

End Use	# of Electric Accounts	kWh Savings	% of Total kWh	# of Gas Accounts	Mcf Savings	% of Total Mcf
Lighting	2,602	167,604,211	75.5%	0	0	0.0%
Process	181	33,294,614	15.0%	37	77,504	24.3%
HVAC	185	10,654,006	4.8%	289	210,535	65.9%
Refrigeration	220	5,657,451	2.5%	0	0	0.0%
Motor	79	3,038,874	1.4%	0	0	0.0%
Hot Water	137	363,949	0.2%	151	10,522	3.3%
Other	37	1,471,554	0.7%	203	20,676	6.5%
Total	2,880	222,084,659	100.0%	600	319,236	100.0%

Significant changes will be coming to lighting, which are likely to have huge impacts to the Energize Connecticut portfolio of C&I programs, especially comprehensive projects. The lighting market is quickly transforming as LEDs are rapidly replacing less efficient lighting products. Lighting savings are going to be much harder to come by as baselines shift to represent the current market and/or net-to-gross ratios decrease due to limited alternative options in the marketplace. Given lightings dominant role, the Connecticut utilities need to consider what the portfolio might look like with dramatically less lighting. Also, since 81% of comprehensive projects included lighting in 2019, this also suggests obtaining comprehensiveness and deep savings will become increasingly challenging.

Short term opportunities for Energize Connecticut exist primarily with lighting, HVAC, hot water, and appliance equipment projects. Almost one-third of non-participants reported not upgrading or replacing *any* equipment in the last two years (see Table 33), suggesting there is likely substantial energy savings potential in the market (notably, only 15% of those who own their facility did not make any upgrades versus 50% for non-owners). Looking ahead to the next two years, the most common planned upgrades are lighting, HVAC, and appliance replacements. Interestingly, plans to replace hot water equipment do not map well with what has been replaced over the past couple years. This may be the nature of hot water equipment, however, as there is not a lot of early replacement with this equipment. In general, clear opportunities exist for Energize Connecticut programs to capitalize on in the future, with over half of non-participants either already planning on making some kind of equipment upgrade or replacement in the next two years or still considering the possibility.

Table 33. Non-Participant Equipment Replacement Decisions

Measure	Replaced in the last two years (n=93)	Planning to replace in the next two years (n=93)
Lighting	35%	13%
HVAC	28%	11%
Water heating	12%	2%
Appliances	11%	10%

Measure	Replaced in the last two years (n=93)	Planning to replace in the next two years (n=93)
Windows	9%	5%
Refrigeration or freezing	7%	1%
Building controls	7%	4%
Compressors	4%	2%
Commercial kitchen equipment	4%	2%
Insulation	4%	3%
Motors	3%	1%
Other	4%	2%
Don't know	4%	33%
None	31%	44%

6.1.7 Coverage of the C&I Sector⁷²

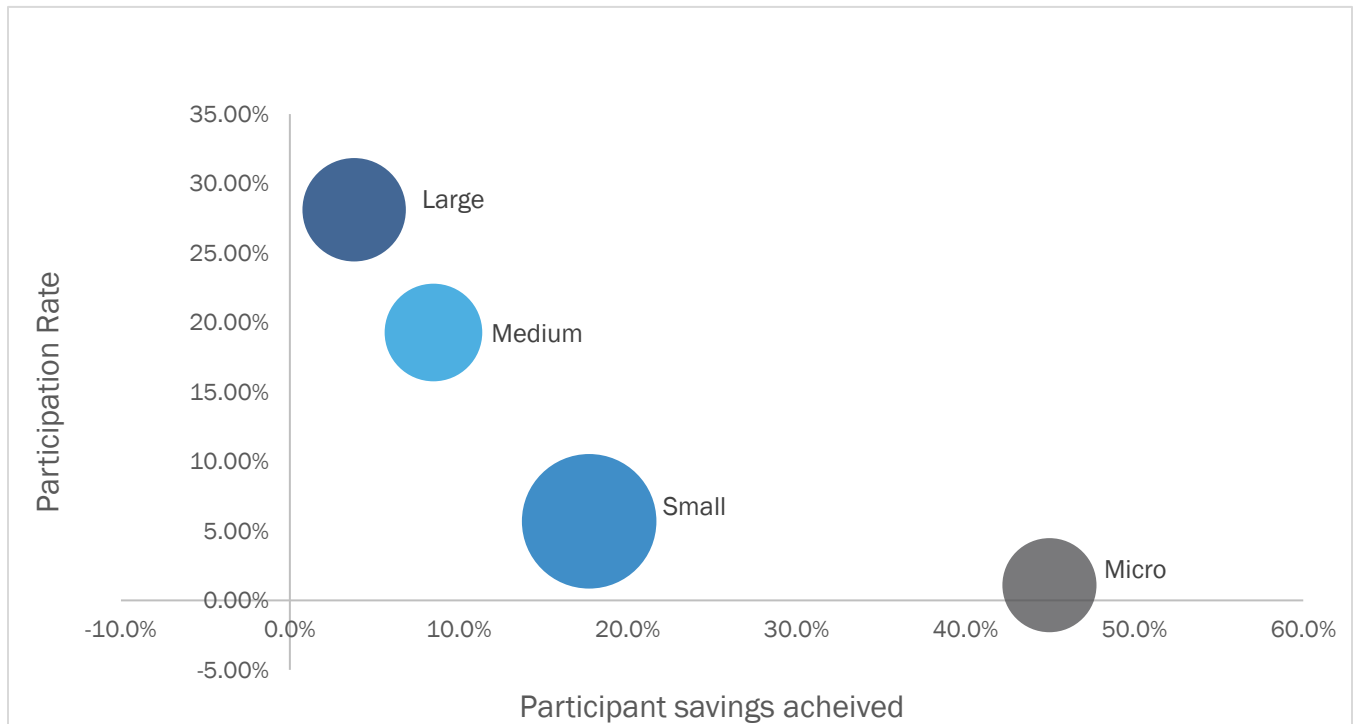
This section summarizes key findings regarding the Energize Connecticut coverage of the C&I sector. There are many ways to look at “coverage.” Here we explore coverage as it relates to customer size, industry segments, distressed versus non-distressed communities, and urban versus rural locations.

Customer size matters in terms of energy savings potential and participation rates. As shown in Figure 43, large customers have relatively high participation rates in the Energize Connecticut programs, but relatively low depth of savings achieved (i.e., comprehensiveness). In contrast, small and micro customers have lower participation rates but much higher depth of savings. Medium customers are situated in the middle with moderate participation rates and moderate depth of savings achieved. Re-targeting large and medium customers for additional participation can help increase depth of savings for these size classes. Also, given this trend and the sheer number of small customers in Connecticut (roughly 99% of the C&I population), there is likely considerable savings opportunity available by more strongly targeting increased participation by small and micro customers.⁷³

⁷² Note that the results presented in this section of this chapter are derived from the profiling research presented in Chapter 4. As such, when referring to size in this section, we are referring to the micro, small, medium, and large size classes used for the profiling task.

⁷³ These trends are consistent with the findings of the 2013 and 2016 Massachusetts Mid-Size Needs Assessment and the 2020 Small Business Term Sheet Report.

Figure 43. Electric Participation Rate by Participant Savings Achieved



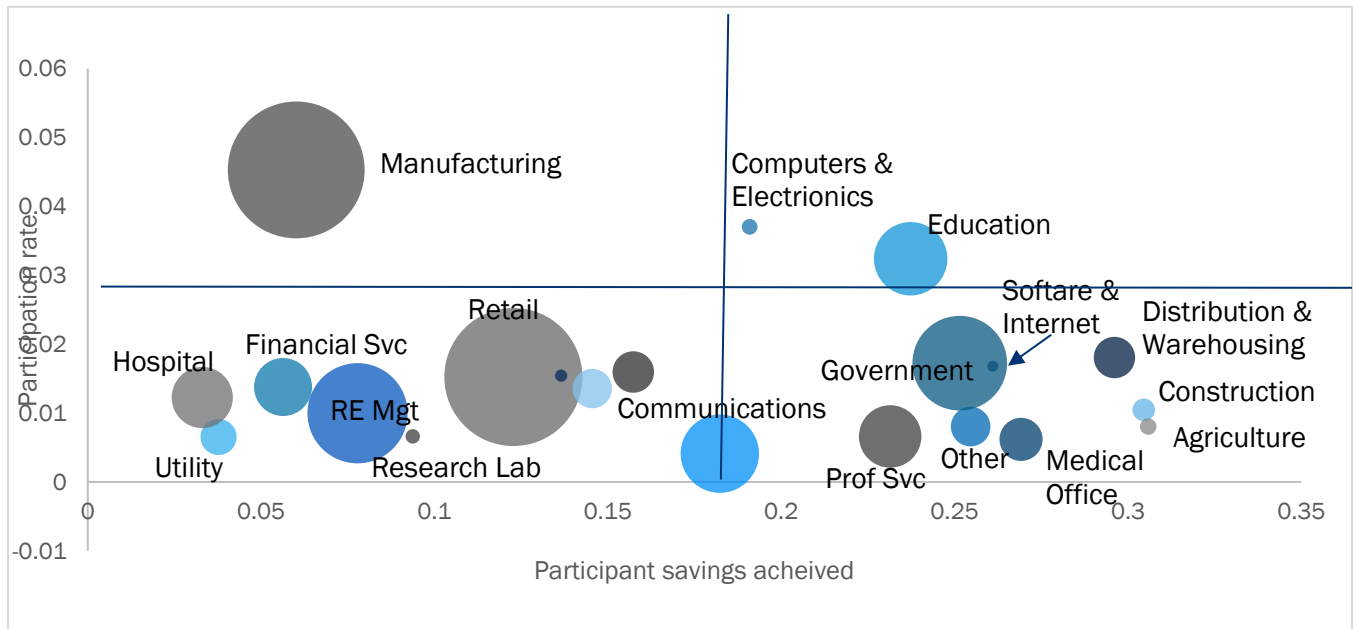
Note: Bubble size represents 2019 kWh consumption.

Opportunities for increased depth of savings and participation vary across industry segments. In 2019, customers from the Manufacturing and Educational Services segments generally had some of the highest rates of participation (see Figure 44). However, at the same time, both industry segments presented differing opportunities from a depth of savings perspective. Manufacturing achieved a relatively low depth of savings while Education achieved a relatively high depth of savings. Including these segments, the evaluation team identified the following as notable opportunities based on 2019 data:

- **Manufacturing** (upper left quadrant): Large segment with relatively high participation rates and low depth of savings.
- **Retail** (bottom left quadrant): Large segment with a relatively low participation rates and low depth of savings.
- **Educational Services** (upper right quadrant): Medium segment with a relatively high participation rates and high depth of savings.
- **Government** (bottom right quadrant): Moderate segment with relatively low participation rates and modest depth of savings.

Additionally, while each has a high depth of savings, the Construction, Distribution, Medical Office, and Agriculture segments all represent limited opportunities based on the overall size of each segment in 2019.

Figure 44. 2019 Electric Participation Rate and Savings Achieved by Industry Segment



Note: Bubble size represents 2019 kWh consumption. Segment analysis only reflects Eversource data; segment not present in UI data.

Both distressed and rural communities are receiving program benefits (incentives and savings) generally proportional to population and consumption. As shown in Figure 45, in 2019, distressed communities made up about a quarter to a third of all C&I electric accounts, consumption, incentives, and electric savings. At the same time, in terms of gas, distressed communities represented between a quarter and third of C&I accounts, consumption, and incentives, but slightly higher than expected (between a third and half) of gas savings.^{74,75}

Figure 46 looks at the same metrics, but from a rural versus urban distinction. For electricity, we see the proportion of C&I accounts and incentives are quite similar (between a third and half), while consumption is slightly lower but aligning closely with electric savings (just under a third). For gas, the proportion of accounts, consumption, incentives, and savings are all rather similar at around a quarter of all C&I accounts.

⁷⁴ The evaluation team used the definition of *Distressed Communities* as defined by the Connecticut Department of Economic and Community Development. More details can be found here: https://portal.ct.gov/DECD/Content/About_DECD/Research-and-Publications/02_Review_Publications/Distressed-Municipalities

⁷⁵ As discussed elsewhere in this report, compiling the data to conduct the profiling analysis was a substantial endeavor. While the evaluation team feels the quality of the underlying data is good enough to draw broad conclusions, we are not confident that the data quality is good enough to statistically test relatively small differences. As such, we speak here in relatively broad statements, not focusing on specific percentage values.

Figure 45. Distressed Communities Representation of Accounts, Consumption, and Savings: Electric and Gas - 2019

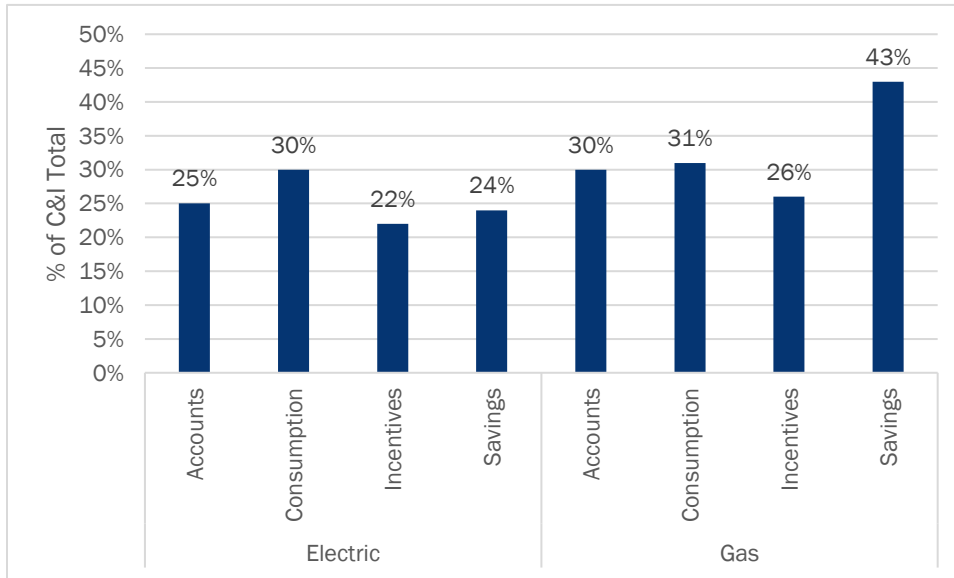
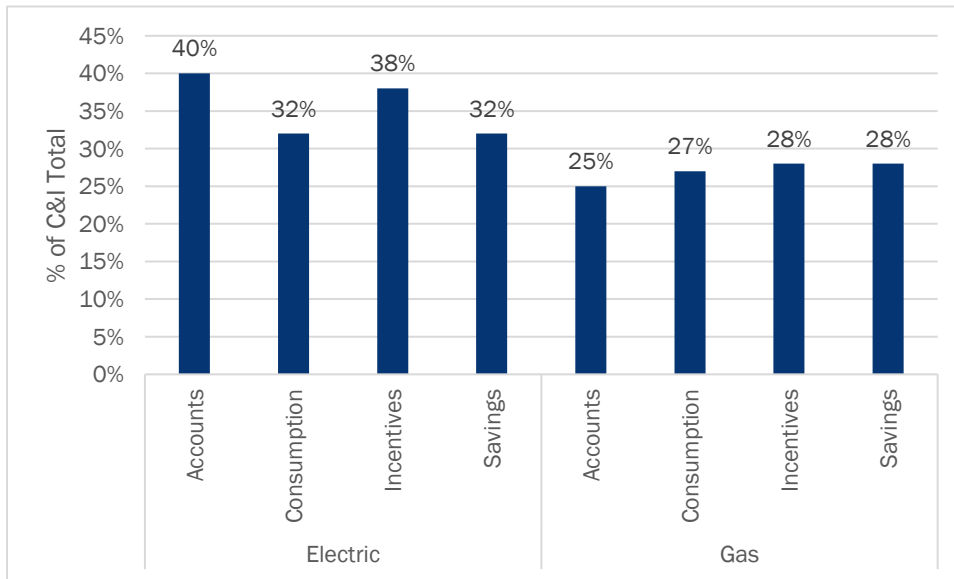


Figure 46. Rural Communities Representation of Accounts, Consumption, and Saving: Electric and Gas - 2019

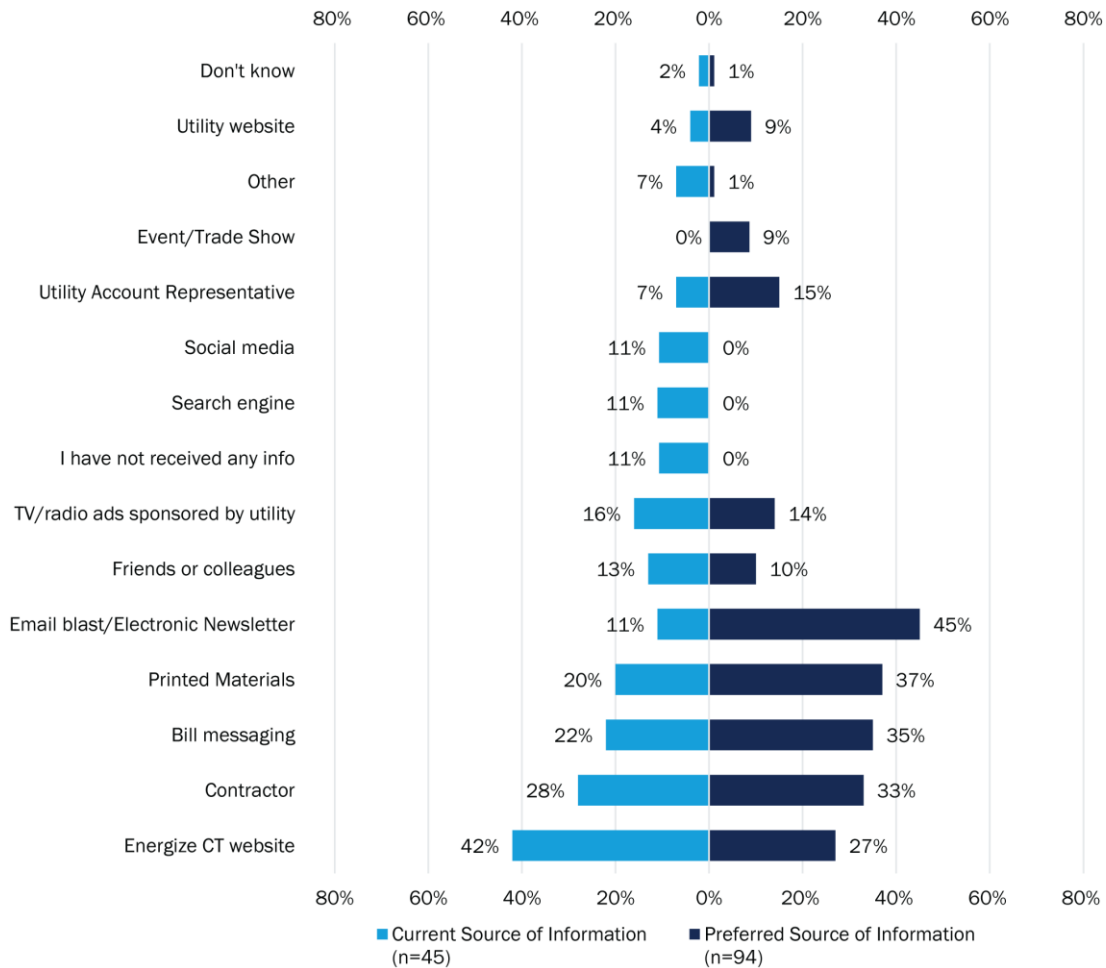


6.1.8 Where Do Customers Hear About the Programs?

Customers tend to learn about programs from the Energize Connecticut website or contractors, but most surveyed non-participants would prefer to hear via email or printed materials. Among the non-participants aware of utility incentives, the most common sources of information were the Energize Connecticut website or a contractor (see Figure 47). In contrast, customers most often reported that email blasts, printed materials, and bill messaging were their most preferred ways of hearing about energy efficiency opportunities. Now it is worth re-emphasizing that the non-participant survey results effectively represent small and micro accounts, and as such, these results should be interpreted to mean that the 99% of the C&I population that is made up

of small and micro accounts might best be targeted via low-cost digital promotions.⁷⁶ Overall, the utilities currently have limited email coverage for their C&I customer base suggesting that some investment in acquiring this type of contact information would be valuable for ongoing program success.

Figure 47. Current vs Preferred Sources of Information among Non-Participants



6.2 Conclusions & Recommendations

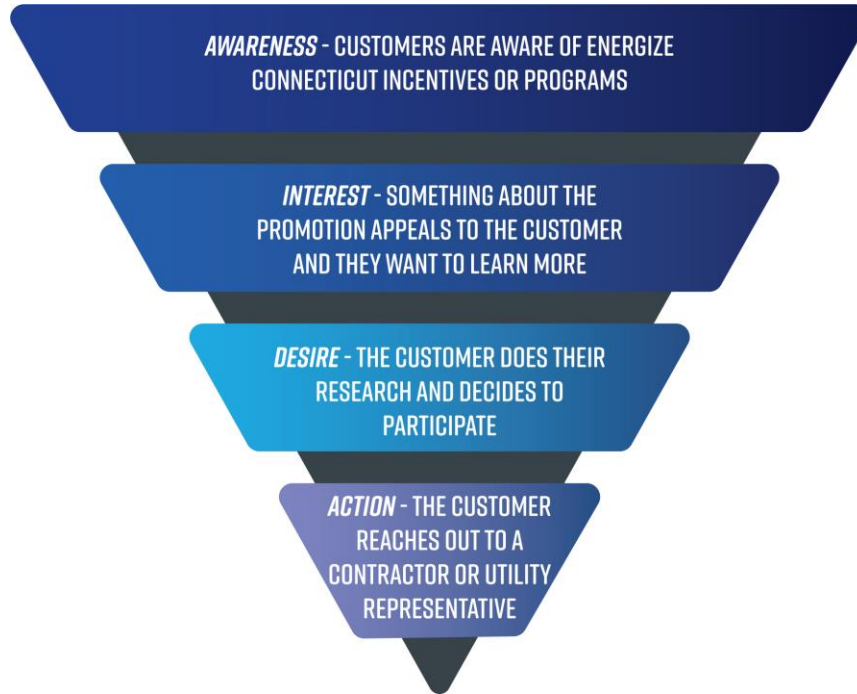
Given that customers are largely satisfied with the programs, it appears the biggest challenge moving ahead is going to be sustaining or increasing program participation. The results show that lack of awareness of rebates and programs is the biggest barrier to participation, so this needs to be addressed.

Conceptually, it is useful to view the recruitment-to-participation process in terms of the well-known marketing funnel (see Figure 48). Ensuring customers are aware of energy efficiency rebates and programs is the first task. Data suggests this has traditionally happened most through contractors and account representatives,

⁷⁶ Though we were unable to survey larger C&I customers and cannot be certain, we do not expect that a digital marketing approach will be as effective for larger customers. Most larger customer accounts are managed by account representatives and existing relationships will almost certainly continue to be the most effective tool for approaching these customers.

but this limits overall reach. Results suggest promotions could likely be expanded to digital marketing to cast a much wider net at the 99% of the C&I population consisting of smaller accounts.

Figure 48. Marketing Funnel



In the process of making them aware, the promotions should be developed to ensure they appeal to customers and pique their interests (the second stage of the funnel). The objective of the promotions should be to steer customers to the Energize Connecticut website where they can go to get information and do their initial research (third stage of the funnel). The website contains a wealth of information and is the best way of providing critical information to a large number of customers. The website already does some of this but should be updated to emphasize key information needs like potential energy bill savings, types of equipment available in the market, and the lifetime operating costs of energy-efficient equipment.⁷⁷ Ultimately, the goal of these efforts should be to get the customer to reach out to a contractor or utility representative where all their specific needs can be addressed (final stage of the funnel).

Based on the findings presented in this chapter, the evaluation team offers the following recommendations for the non-SBEA Energize Connecticut C&I portfolio going forward:

- **The vast majority of the C&I customer base is small accounts. While each of these accounts individually might not offer huge savings potential, the number of these accounts is tremendous (roughly 99% of the C&I population) so overall savings potential is substantial. Increase overall awareness of incentives and programs by leveraging low-cost means of reaching large numbers of small customers and steering them to the Energize Connecticut website.** Currently, participants most often become aware of program incentives through trade allies, with very few mentioning utility marketing materials. However, participating trade allies are asking for greater marketing support from

⁷⁷ The cost of efficient equipment was one of the greatest barriers to installing more efficient upgrades. Data and information that helps overcome this barrier—e.g., discussing lifetime operating costs, added capital value, etc.—could be used to help address this barrier.

the programs to engage with customers. To help support trade allies and potential participants, and increase program uptake the utilities should:

- Leverage, low-cost, large-scale print and/or digital channels like email and bill inserts to increase awareness. Both are the most preferred methods of communication mentioned by customers.
 - Eversource has a large proportion of email address for their business accounts (but not all), while UI does not.
 - In the short-term, UI will be limited to print promotions as their customer database lacks email addresses.
 - UI needs to begin populating customer email addresses into their database. Digital marketing and communications are not just the future but the present, and not having email addresses is a big disadvantage.
 - Each time either utility has contact with a customer, an email address should be obtained (or verified) and entered in the data system.
 - For larger customers, it is likely account representatives already have email addresses; they need to be entered into the database.
 - At a larger scale, email addresses can also be purchased from sources such as Hoovers, Hunter.io, FindThatLead, or VoilaNorbert.
- Entice customers to learn more about the programs by honing messages and emphasizing **potential energy savings** and **incentives to offset project costs**.
 - Importantly, customers tend to think in terms of dollars, so translating energy savings into dollars they can potentially save will be key for piquing customer interest.
- All large-scale digital or print promotion efforts to increase awareness should aim to steer customers to the Energize CT website or a utility representative for more information and help navigating the participation process, which can be complicated for some offerings.
- **Continue fine-tuning the Energize Connecticut website.** The Energize Connecticut website is revised on an annual basis to update incentive levels and make adjustments associated with changes to program offerings. The utilities should continue these efforts as the Energize Connecticut website plays a critical role in helping facilitate the customer's journey from awareness to participation.
- Leverage what has been learned about the barriers to making energy-efficient upgrades to consistently harmonize and inform marketing, messaging, website content, and promotional strategies. In particular, materials need to continually address:
 - **Uncertainty about energy savings:** Work to overcome this barrier by striving to present this information in terms of dollars instead of kWh, KW, or Mcf.
 - **Higher costs of energy-efficient equipment:** Consider developing materials or web content that compares efficient and inefficient equipment in terms of total lifetime costs (including first costs and operating costs). This can help show customers that in many instances, the efficient path is actually the cheaper path.
 - **Lack of awareness of available options:** This is an opportunity the utilities can take to better educate the customer base in general. Measures such as lighting and HVAC are likely obvious to most customers. Use marketing and the website to promote and inform customers about other less-obvious measures such as motors, compressors, insulation, appliances, etc.

- Provide more examples of energy savings and project costs. The website currently has a small number of case studies, but there are only a few and many customers will not be able to relate to the projects covered. Develop more case studies and examples so that almost any customer can find something they can relate to. The best way of doing so is likely by segment and size.
- For BES, emphasize the program's ability to meet unique customer needs and specialization.
- **Study the customer experience more deeply to further refine processes and materials.**
 - Conduct a web usability assessment to determine how customers are using the Energize Connecticut website, what information resonates, what is confusing, what they trying to find but cannot, etc.
 - Conduct customer journey mapping⁷⁸ to better understand the customer experience, their needs, responses, actions, and challenges at different steps in the process; respond accordingly.
- **Assess the programs' abilities to achieve comprehensiveness over a longer timeframe.** A customer- or account-level view of comprehensiveness across time is likely more useful than a project-level view if deep savings truly is the goal of Energize Connecticut programs. While a small handful of customers are under multi-year Customized Solutions Partnership (CSP) agreements and some larger C&I and municipal customers have a utility engineer assigned to promote continued participation, these efforts seem limited to just larger customers. Taking a longer-term view across *all* C&I customers recognizes and leverages the nature of participation over time. Focusing on comprehensiveness over time can help to better serve customers that may not have the flexibility to expand the scope of their projects to include multiple end-uses within a given program year. In support of this change in timeframe, the utilities should consider developing an additional tiered incentive structure aligned with customer or account number that places value on incenting multiple end-uses *over time*.
- **Continue to stimulate repeat participation over time for deeper and more comprehensive savings.** Regardless of size, past participants are going to be more likely than the average customer to participate again. We know that they are already open to energy efficiency, have benefited from incentives and energy savings, and overcome the first-cost barrier. Especially advantageous is that they are also easy to identify and, thus, are easily targetable. Evidence suggests that repeat participation, both in the same program as well as in other programs, is occurring. The utilities should continue to leverage existing customer relationships and incentivize the development of new relationships that support a healthy utility, customer, and trade ally ecosystem.
- **Continue to implement a segmented and strategic delivery strategy but refine by adding other customer attributes.** Recent attention in the state has been allocated to focusing on specific industry segments as denoted in the *2019-2021 Conservation & Load Management Plan*. This is certainly useful and prudent as it acknowledges the C&I customer base is not a single population. But the C&I population varies by more than just segment. In addition to industry segments, other factors should be brought into segmentation efforts such as business sizes and ownership patterns.
 - Though the issue of tenants not having the authority to make the decision on equipment upgrades is always going to be a challenge, there still seems to be some opportunity for certain measures like lighting, HVAC, and water heating among renters.

⁷⁸ *Customer journey mapping* is a research technique that involves working with a customer through a process (such as program participation) from beginning to end to ensure a robust understanding of the process *from the customer's perspective*. Every step in the process and each touchpoint with the utility and program is assessed to understand how it works, how it is perceived, what challenges might exist, and what opportunities for improvement might be. Customer journey mapping is a powerful technique for helping to ensure processes are tuned to meet their desired expectations.

- A program tailored to C&I renters offering a streamlined set of measures such as these (and other low-involvement measures like faucet aerators and power strips) could be valuable for better saturating this hard-to-reach group. Such an offering might also include an alternative incentive structure to help stimulate participation.
- Effective segmentation and strategic marketing rely on good data. To maximize the potential for segmentation as a strategy and tool moving forward, both utilities need to consistently collect key data points for each of their C&I customer accounts such as email addresses for energy efficiency decision-makers, industry segment, facility type, past program participation, and whether a customer is an owner or a renter. Additional factors can be considered when it comes to segmenting; these are just a few that played a part in this study.
- **Make use of other market partners besides contractors and designers; capitalize on retailers/distributors.** While much of the activity around the Energize Connecticut C&I programs centers on contractors and/or designers, other partners such as retailers and distributors can be assets. These market partners can also have significant influence on non-participants' decisions to make energy-efficient equipment upgrades. The evaluation team recommends that the utilities target more end uses with midstream strategies/programs. Well-designed and implemented midstream programs also offer significant opportunity to have larger scale market effects than downstream programs.



Chapter 7



7. Energy Opportunities (EO) - Upstream Lighting

This chapter summarizes key findings from the research conducted with lighting distributors that participated in the Energize Connecticut Upstream Lighting Program in 2020.^{79,80}

7.1.1 The Energize Connecticut Upstream Lighting Program

The Energize Connecticut Upstream Lighting Program—also known as the Instant Rebate Program—provides instant discounts to customers who purchase qualified lighting products from participating distributors.⁸¹ C&I customers of Eversource and UI are eligible for the discounts and the rebated lighting must be installed in the service territory of the participating utility. Business customers, and contractors working with these customers, may purchase eligible lighting at a reduced cost without a rebate form. Each lighting purchase requires the business name, address, and contact information for the location where the lamps will be installed.

7.2 Comparison to Other Jurisdictions

The evaluation team identified three programs that were comparable to the Upstream Lighting Program in Connecticut (see Table 34). Overall, the programs were consistent in their implementation with the main differentiator being incentive levels for specific lighting products (see Section 7.4.1 for additional detail).

Table 34. Upstream Lighting Program Comparisons

Comparison Program	Market Partners	Measures	Incentives
CT EEB (CT)	Distributors	LED lamps, LED stairwell fixtures and sensors, LED downlights, linear replacement lamps	Lower than MA/RI for approximately 40% of measures
MassSave (MA)	Distributors	LED lamps, LED stairwell fixtures and sensors, LED downlights, linear replacement lamps	Higher than CT for majority of measures
National Grid (RI)	Distributors	LED lamps, LED stairwell fixtures and sensors, LED downlights, linear replacement lamps	
ComEd (IL)	Distributors	Standard and specialty LEDs (lamps and fixtures), LED exit signs, linear fluorescent lamps, tubular LEDs	

⁷⁹ The Upstream Lighting Program is a sub-offering under the Energy Opportunities (EO) Program. However, given its unique nature, it was evaluated entirely separate from the EO Program.

⁸⁰ The population file used for selecting distributors was the list of participating distributors that were participating in the Upstream Lighting as of October 20, 2020.

⁸¹ Energy efficiency programs that target distributors are typically referred to as midstream programs; upstream programs typically target manufacturers. Nevertheless, the evaluation team continues to carry forward the Upstream Lighting title to align with how this program is referred to in Connecticut, and similar programs are referred to throughout the region.

7.3 Respondent Characteristics

The evaluation team conducted telephone-based in-depth interviews with a total of 10 participating lighting distributors that represented roughly 40% of total 2019 Upstream Lighting program activity.^{82,83} Table 35 provides an overview of the participating distributors interviewed for this study. Some of the highlights include:

- All but one interviewed distributor (9 of 10) works with both small and medium-large C&I customers; the exception is the one distributor that indicated they do not work with small commercial customers.
- Overall half of interviewed distributors (6 of 10) also work with residential customers, but the residential sector is only a small part of their businesses total sales.
- All but one of the distributors (9 of 10) reported they sell to both contractors and end use customers and two reported having a special focus on energy service companies (ESCOs).
- Two of the distributors reported having no physical presence in Connecticut, and four stated they only have an office, or a sales representative located in the state. Four of the 10 interviewed distributors indicated they did have a physical presence in Connecticut; only two of 10 said they have more than one location in the state.

⁸² Details regarding the sample design and methods are provided in Appendix A.

⁸³ The evaluation team also attempted to do some non-participating distributor interviews as part of this study. To locate non-participants, we conducted web searches for lighting distributors and suppliers in Connecticut and developed a list of lighting distributors using Hoovers. We compared the results to the participating distributor list. We were ultimately unable to find any C&I lighting suppliers in Connecticut that were not participating in the program; however, so there are no non-participating distributor results.

Table 35. Interviewed Distributor Characteristics

Title	Proportion of Sales from...			Proportion of Sales from...		Presence in CT	Areas of Operations	% of Company Sales in CT	Number of Employees	Other EE Programs	% of 2019 Gross kWh Savings
	Res	Small Comm	Medium to Large Comm	Contractors	End Use Customers						
Program Manager	0%	60%	40%	0%	100%	Office	Nationwide and Canada	Proportional to state size	32k	Many	2.6%
President and Operations Supervisor	<1%	65%	34%	40%	60%	None	CT, NH, MA, RI, NY	40%	11	MA, NH, NY, RI	11.2%
Director of Operations	40% - Only MF	30%	30%	30%	70%	1 Location	CT, MA, RI, FL, PA, NY	65%	18	MA, NY, RI	9.2%
Utility Program Manager	0%	50%	50%	20%	80%	Warehouse	CT, NY, NJ	40%	16	Many	1.8%
President	25%	50%	25%	75%	25%	4 Locations	CT, NY	99%	46	No	2.6%
Office Manager	10%	60%	40%	10%	90%	None	CT, MA, RI		10	MA, RI	0%
Company Founder	0%	50%	50%	50% - ESCOs	50%	1 Sales Rep	Northeast	Very small % ("Wouldn't show up on a chart")	12	MA, NY, RI	0%
Program Manager - Utility & Incentives	0%	20%	80%	10%	90%	2 Locations	Nationwide and International	Proportional to state size	About 20k	Many	5.5%
Utility Program Manager	<1%	49%	50%	85% - Specializes in ESCOs	15%	1 Sales Rep	National but concentrated in Northeast	2-5%	1,130	Many	6.3%
Energy Project Manager	30%	0%	70%	90%	10%	Many	CT and Western MA	90%	28	MA	0%

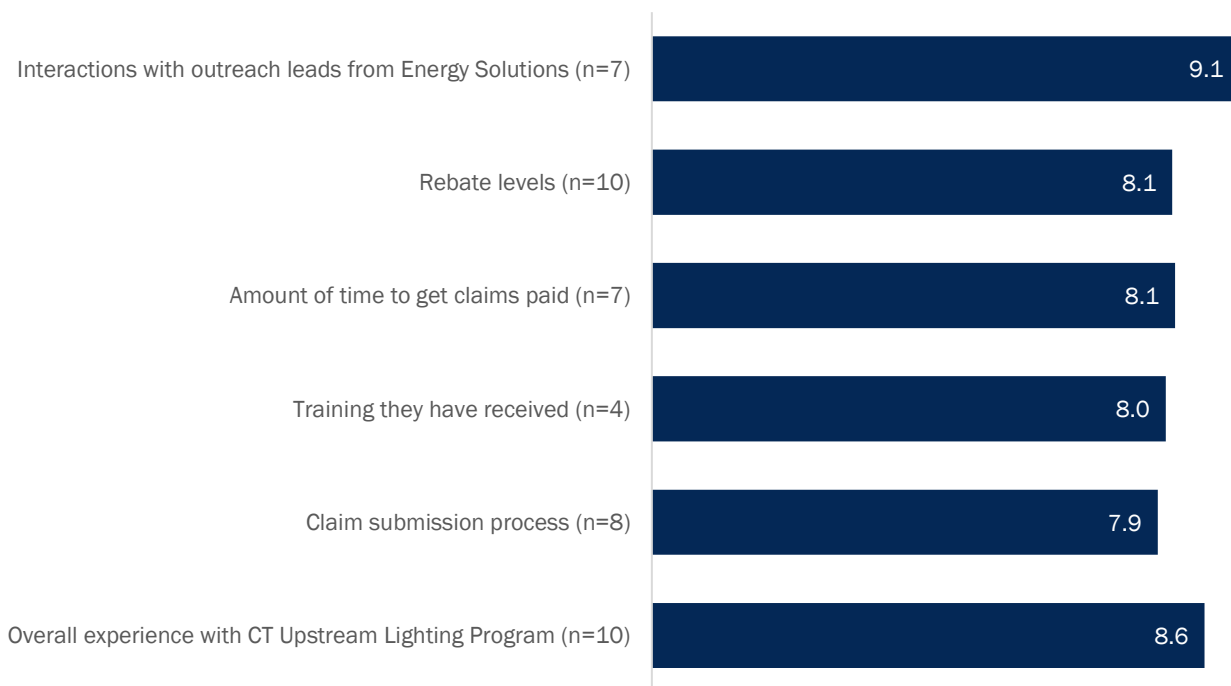
7.4 Key Findings

7.4.1 Distributor Satisfaction and Recommendations for Program Improvement

Participating distributors are central to the Energize Connecticut Upstream Lighting Program. They obtain the efficient lighting and add it to their product assortments, they interact with customers and contractors, they promote and sell the efficient lighting, and they deal with the administrative side of submitting sales data to the program via a portal.

Distributors are quite satisfied with the Energize Connecticut Upstream Lighting Program and processes. When asked to rate their satisfaction with various program elements (on a 0 to 10 scale), the highest rated element was “interactions with outreach leads from Energy Solutions” (the program implementer) ; the lowest was with the “claims submission process” (Figure 49). Together, the 10 distributors provided a rating of 8.6 to their overall experience with the Energize Connecticut Upstream Lighting Program. None of the interviewed distributors scored any of their individual program experiences lower than a 7 out of 10 (not shown).

Figure 49. Participating Distributor Satisfaction with Upstream Lighting Program Elements



Notably, all 10 of the distributors we spoke with are long-time participants. The program launched in 2014 and has been operated by the same implementer since mid-2017. Most of the distributors we spoke with have participated since the inception of the Upstream Lighting Program, and none have participated for less than three years. All but one interviewed distributor reported that they take part in other utility energy efficiency programs. When asked to compare the Connecticut program to programs in other jurisdictions, about one-third indicated the Energize Connecticut Upstream Lighting Program is the best or close to best program; another third said it was on par with the other programs. There were no notable performance distinctions between the Connecticut utilities.

Distributors provided only a couple recommendations for program improvement. When asked, in an open-ended format, what could be done to improve the Energize Connecticut Upstream Lighting Program, only a couple of recommendations were provided:

- Issues around the data portal were mentioned by 2 of the 10 distributors.
 - One raised concern over portal updates, noting that some have had retroactive impacts. They described how they once had to go back to a customer and tell them the incentive amount for a large project needed to be revised downward, which made for an uncomfortable situation.
 - Another distributor mentioned that the portal is not really designed for large companies with multiple simultaneous users.
- The incentive levels were mentioned by one distributor, who stated that they felt the incentives are higher in neighboring states.

The evaluation team examined this last issue in more depth by comparing Energize Connecticut incentives (and minimum contributions) to the Massachusetts/Rhode Island Bright Opportunities Program as well as other comparable programs. Specific to the Massachusetts/Rhode Island Program, we found that of the 51 measures in common, about half (49%) have a lower incentive in Connecticut and 16% have a higher minimum contribution. On average, when Bright Opportunities incentives are larger, they are about 95% larger; when Energize Connecticut incentives are larger, they are about 34% larger. In general, Bright Opportunities incentives are higher for A-Line LEDs, PAR LEDs, T5 LEDs, T8 LEDs, and LED troffers; Energize Connecticut incentives are higher for parking garage LEDs and exterior LEDs. Note that while incentive information was available for the Massachusetts and Rhode Island programs, the evaluation team was not able to gather similar information for Illinois.

7.4.2 The Upstream Lighting Program and the Connecticut C&I Lighting Market

The Energize Connecticut Upstream Lighting Program has been around since 2014. Distributors and contractors are well-aware of the program, and it appears rather embedded in the Connecticut C&I lighting market.

The Upstream Lighting Program has become a key element of distributor sales practices. All 10 distributors indicated they always mention the rebates to customers and contractors when applicable.⁸⁴ Given the nature of the program—i.e., offering instant discounts on lighting—there is little reason for distributors not to participate in the program:

“I don’t think there’s any reason that we would not participate. It’s a win-win for everyone!”

The program has become so embedded in the market, however, that some distributors also indicated that they feel they **need to participate** in the program to remain competitive:

“We’re a lighting distributor—we have to do it.”

“We do a lot of regional and national accounts. If we are servicing them in states that have a program, we like to offer them incentives and savings because if we don’t, someone else will.”

⁸⁴ All 10 distributors also emphasized that 100% of their customers are aware they are participating in a utility sponsored, Energize Connecticut energy efficiency program when buying discounted lighting.

Notably, while all 10 distributors stated that energy efficiency is a big focus of their business, only half mentioned having any marketing efforts targeting energy-efficient lighting. Some distributors emphasized how, especially when selling to contractors, little promotion is needed:

"It's Connecticut—everyone is aware!"

Distributors claim the program is still influencing sales, but by how much is hard to say.

"We are selling a higher amount of LEDs in areas that have programs versus areas without programs. These programs absolutely are contributing."

Quantifying Energize Connecticut Upstream Lighting Program influence on things like stocking or sales is challenging. None of the distributors we spoke with have been participating in the program for less than three years. As such, asking about changes in stocking or sales *before* they participated and *after* they started participating is not very meaningful as the lighting market—and especially the LED lighting market—has been changing so rapidly. When asked about the overall efficiency level of their current lighting assortment, however, 7 of the 10 distributors provided a response. Four of the 7 (representing about 17% of 2019 program activity) said 99% or more of their LED products currently meet DLC®/ENERGY STAR® specifications.⁸⁵ Two of the distributors who responded (representing about 7% of 2019 program activity) stated about half of their assortment was DLC/ENERGY STAR; the other was not sure.

- When asked to estimate how influential the program has been on their efficient lighting sales (on a 10-point scale), 6 of the 10 distributors provided responses: 4 of the 6 rated it an 8 or higher
- Two of the 6 rated it 2 or lower

Thus, while it appears that the program is having significant influence on some distributors' sales of efficient LED lighting, it is not really affecting others. Both distributors who rated it not very influential were national distributors who emphasized that their product assortment is driven more by national trends than individual state trends; however, suggesting there still may be differences between Connecticut and elsewhere.

Distributors mention cost, timing, and education as customer barriers; but cost is more complex. When asked to identify what they perceived to be *customers' biggest barriers* to obtaining more energy-efficient lighting, costs were rated near the top (6 of 10). Costs were often mentioned in the context of needing to show customers adequate return on investment or payback period (4 of the 6), however, suggesting enough economic benefit to adequately address the cost-related barrier. This latter finding also aligns with the most recent net-to-gross study conducted for this program that suggested that 95% of customers would still have done LEDs without program support.⁸⁶

In addition to costs, participating distributors also mentioned the following perceived customer barriers:

- The narrow installation period for the program (2 of 10):⁸⁷

"Sometimes there is fear that there is a job, and they have to buy all of the fixtures at once but won't get them installed in time."
- Education about LED technology—both customers and contractors (2 of 10):

⁸⁵ All product or company names that may be mentioned in this publication are tradenames, trademarks, or registered trademarks of their respective owners.

⁸⁶ EMI Consulting. (2019) "Connecticut Energy Efficiency Board C1644 EO Net-to-Gross Study." Prepared for the Connecticut Energy Efficiency Board. Dated September 25, 2019.

⁸⁷ The program currently gives customers 60 days from the date of delivery to have their new lighting installed.

“A lot of the contractors don’t know enough about the LEDs and EE lighting and when we try to explain it, they’re not interested.”

There is a lack of systematic distributor barriers to selling energy-efficient lighting. When asked about *their* barriers to *selling* energy-efficient lighting, 4 of the 10 distributors stated there are no barriers at all. Six of the 10 distributors did indicate that there are barriers to selling more energy-efficient lighting, but none of the barriers mentioned were stated by more than one distributor. The barriers noted included the following:

- Competition with online manufacturers— “It’s all about price” (1 of 10).
- The minimum contribution was sometimes too high (1 of 10).
- Incentive levels quoted today may not be the same 30 to 90 days from now (1 of 10).
- Lack of incentives for controls (1 of 10).
- A large, national distributor noted that lighting is only a small part of their company’s overall focus (1 of 10).

7.4.3 Upstream Lighting Program Measures

While measures covered are current and advanced, lighting controls will likely play a dominant program role in the future. When asked if the products rebated through the program are the most current and advanced models, most distributors (8 of 10) agreed. However, one astute distributor noted:

“They almost have to be the most advanced. If they fall off the ENERGY STAR or DLC list, they don’t qualify.”

When asked in general, all but one distributor (9 of 10) stated there are no notable gaps in the products covered by the program. The one distributor that did mention a gap emphasized that there are some instances where DLC or ENERGY STAR do not have certified products for certain applications, and as such, they are sometimes forced to go with a sub-optimal solution (the specific example they provided was cove lighting).

When asked specifically about lighting controls, most distributors (8 of 10) emphasized the importance of lighting controls moving forward:

“The move to controls has exploded over past 24 months or so.”

“Two to three years ago, everyone was in re-lamp mode; now people are interested in controls.”

“Controls are a big emphasis from our manufacturing partners. There is definitely a market demand for it.”

The program currently rebates fixtures with integrated lighting controls, but non-integrated controls/sensors may be an opportunity as well.⁸⁸

7.4.4 Leakage and/or Stockpiling

⁸⁸ Lighting sensors are included in the Eversource Connecticut Express Lighting Rebates but not the Eversource/UI Instant Rebates.

Because of the proximity and relatively small size of states in New England, leakage and stockpiling have been concerns with upstream lighting programs in the region in the past.^{89,90,91} If a customer or contractor knows they can get a better deal on lighting in a neighboring state, they may try to obtain lighting products there. When this occurs, the savings do not accrue to the utility paying the incentives. Also, there has been concern that customers or contractors may try to stockpile bulbs, buying more than they need for a particular project and keeping the additional bulbs in storage until they are needed. This would also be an issue when it comes to estimating program savings.

Leakage and stockpiling are not an issue in Connecticut—or in neighboring states anymore either. None of the distributors reported any sense of leakage or stockpiling. When probed, the distributors universally attributed this to the strict Energize Connecticut Participating Distributor Agreement. The agreement specifies that all purchasers of rebated lighting need to be clearly informed that:

- All the rebated lighting needs to be installed at the specified site (which must be within Eversource or UI service territory).
- The lighting product needs to be installed within 60 days of delivery.
- All projects are subject to inspection; if they fail inspection, the rebates will be invalidated.

In the view of the distributors, though leakage and stockpiling have been issues in the past (in Connecticut, Massachusetts, and Rhode Island), this has been resolved across-the-board by using similar agreements across the neighboring states.

7.4.5 Market Factors to Consider Moving Ahead

This section presents key market factors identified by the evaluation team as considerations for the Upstream Lighting Program moves forward.

The global lighting market is dynamic and rapidly changing. The evidence is irrefutable: both the residential and non-residential lighting markets are quickly transforming (though the non-residential market is generally a couple years behind the residential market). In general, LEDs are not just becoming more common, but they are beginning to dominate the lighting market. As mentioned previously, 4 of 7 distributors said more than 99% of their inventory is already efficient LEDs. Also, LED market activity is thriving, even in areas without programs.

Free ridership is sure to increase. In 2019, the *C1644 EO Net-to-Gross Study* presented a free-ridership rate of 40% for Upstream Lighting—the highest of the entire EO Program measure mix.⁹² A soon-to-be-released Massachusetts study shows a free-ridership rate of nearly 50%. High free ridership is not always bad—it can actually be a strong indicator of a program’s success in transforming a market, but the program needs to respond accordingly.

⁸⁹ DNV GL. (2017). “*FINAL REPORT Impact Evaluation of PY2015 Massachusetts Commercial and Industrial Upstream Lighting Initiative.*” Prepared for: Massachusetts Program Administrators and Energy Efficiency Advisory Council. Dated: November 22, 2017.

⁹⁰ KEMA. (2013). “*Process Evaluation of the 2012 Bright Opportunities Program: Final Report.*” Prepared for: Massachusetts Program Administrators and Energy Efficiency Advisory Council. Dated: June 14, 2013.

⁹¹ DNV GL. (2018). “*Impact Evaluation of PY2015 Rhode Island Commercial and Industrial Upstream Lighting Initiative.*” Prepared for: National Grid. Dated September 5, 2018.

⁹² EMI Consulting. (2019) “*Connecticut Energy Efficiency Board C1644 EO Net-to-Gross Study.*” Prepared for the Connecticut Energy Efficiency Board. Dated September 25, 2019.

Baselines will be shifting, greatly reducing savings. Baselines need to reflect the options available to customers in the market. As less costly and less-efficient options continue to disappear, the market will move more towards an LED baseline.

The utilities should also consider lost potential associated with installing sub-optimal solutions today. Convincing a customer to upgrade from incandescent, fluorescent, or halogen to LED is relatively easy because the energy savings are sizable enough that customers are willing to bear the upgrade costs. Based on the current market and available technology, the energy efficiency lighting upgrade from LED lighting is to controlled LED lighting. Convincing a customer to upgrade from LEDs to controlled LEDs may present a challenge. The potential energy savings associated with going from LEDs to controlled LEDs are rather small and the costs are large. As such the program should do what it can to push customers to the most advanced solutions (e.g., integrated lighting controls) now as opposed to taking a more incremental approach.

Potential impacts on distributors and contractors of significant program changes—or even a full market exit by the utilities—should be considered. The Connecticut utilities have implemented the Upstream Lighting Program for many years and have come to rely on sizable lighting savings. Supply chain actors (i.e., distributors and contractors) have also come to rely on the program and its incentives, which are now a fundamental part of sales practices and the Connecticut nonresidential lighting market. In 2019, incentives paid to distributors ranged from \$87–\$2,229,085 (mean=\$257,238; median=\$97,208). As such, it is also worth considering how any potential shift in program delivery or exit strategies might affect these market actors.

7.5 Conclusions & Recommendations

Based on the findings presented above, the evaluation team offers the following recommendations for the Energize Connecticut Upstream Lighting Program going forward.

- **Focus resources on continually fine-tuning current measure mix and rebate levels.** Though there is a lag between the residential and non-residential lighting markets, the evaluation team recommends the utilities heed the early warnings from *R1963a: Short-Term Residential Lighting Study*, which stated that while there is still some short-term savings potential for lighting, the incentive and measure mix need to be refined, and an exit strategy should be planned. The incremental savings for lighting are diminishing quickly. The challenge for the utilities will be defining rebate levels that are just large enough to affect consumer decision-making but maximize cost-effectiveness, while accounting for the fact that the lighting market is dynamic and constantly changing. There is a need is for timely and accurate incremental cost, and net-to-gross data.
 - Develop an ongoing system for collecting and tracking incremental costs and sales to support ongoing optimization of rebate levels.
 - More frequent net-to-gross studies are likely needed. Net-to-gross results from several years ago are of limited value for a market that is transforming so rapidly. In general, net-to-gross ratios are steadily declining for lighting. Dated net-to-gross results prevent the utilities from optimizing incentive levels.
- **With up-to-date and accurate data, implement a staged approach to adjusting or eliminating rebates for individual measures.** The evaluation team is not recommending an instantaneous exit from the market; there are certainly still some savings to be had with lighting. Instead, the recommendation is that the utilities develop a plan and an approach for optimizing incentive levels, while assessing the right time to transition specific measures out of the program.

- The upcoming *C2014 C&I Lighting Saturation and Lighting Potential Study* should inform transition efforts, providing insights into measures to target, incentive levels, and the best timing of such activities.
- **Consider adding wireless non-integrated lighting controls to the program.** Distributors and others see lighting controls as the next evolution of the market. While the program currently rebates fixtures with integrated controls—and should certainly put more focus on these measures moving ahead—it does not offer rebates for non-integrated controls.⁹³ The ideal scenario is to get all business customers to upgrade to LEDs with integrated controls and any installations without controls should be viewed as lost opportunity. Incorporating independent wireless controls may provide the ability to help reduce the lost opportunity by giving customers a reasonable-cost future option to improve their facility lighting efficiency that would not require replacing lighting they have already upgraded. In the same way, incorporating non-integrated wireless controls could also provide additional energy savings potential to the large number of Connecticut businesses that have already borne the cost of upgrading to LED bulbs, but did not elect controls at the time of installation.
- **Develop program materials (e.g., one- or two-page flyers, case studies) for customers and training for contractors to educate them on the benefits of LEDs, including non-energy benefits.** Even with all the transformation occurring in the market, there are still contractors not favoring LED technology who could benefit from education and training. Hands-on training with advanced technologies like lighting controls would also be advantageous to ensure contractors are prepared to work with and sell controlled lighting. At the same time, many customers are still unclear of the advantages of efficient LED lighting. Here the utilities might benefit from acknowledging that not all benefits are energy related. Participant non-energy benefits (NEBs) for C&I customers can include factors such as reduced maintenance, fewer tenant complaints, improved productivity. Societal NEBs can include a range of factors including, but not limited to, economic impacts or job creation benefits, reduced emissions, and health impacts.⁹⁴ NEBs such as these should be incorporated into educational and promotional materials for LED lighting so the market can be better informed, and the technology can more fully represent its true value.
- **Extend the amount of time customers have to install the new lighting equipment.** The timing of the installation in alignment with inspections arose as a customer barrier. Currently, the program requires that customers install their rebated lighting within 60 days of delivery.⁹⁵ While this was not a very commonly mentioned barrier, it warrants consideration because it can potentially have large impacts. Multiple distributors indicated that the installation timeframe requirement was a limitation and may have prevented some larger projects from participating in the program. With large construction or major retrofit projects, it is common that the builder or contractor will obtain all the materials at one time, but the installation of the units may occur over time (often much more than 30 or 60 days), or even over multiple project phases that can last months.
 - The utilities should consider offering the ability to extend the time to install in unique circumstances. Though rules and criteria to ensure consistency need to be developed, this can likely be addressed programmatically on as-needed basis. Distributors will know when a large project is at risk because of the installation time requirement. If this happens, they should have

⁹³ Occupancy sensors are rebated through the Express Service Lighting Rebate program, but not the Instant Discounts program.

⁹⁴ Skumatz, Lisa & Bement, Dawn. (2007). *New Non-Energy Benefits (NEBs) Results in the Commercial/Industrial Sectors: Findings from Incentive, Retrofit, and Technical Assistance/New Construction Programs*. European Council for an Energy Efficient Economy Summer Study Proceedings: 2007.

⁹⁵ Maybe adding to this issue is that while the Participating Distributor Agreements stipulate purchased products must be installed within 60 days of delivery. However, it also states that any site can be inspected at any time after 30 days of the Qualified Product Invoice Date.

the ability to reach out to the utility to get approval for an extended installation/inspection period; given that these large projects are also likely to require pre-approval, it could also be worked directly into that process.

- **Collect, consolidate, and report lighting measures by sector and customer type.** As noted in the Data Review and Management Chapter, use this information to identify under/over served customer groups.



Chapter 8



8. Energy Opportunities (EO)/Energy Conscious Blueprint (ECB) Existing Equipment

This chapter summarizes key findings from the research conducted on Energize Connecticut's Energy Opportunities (EO) and Energy Conscious Blueprint (ECB) Existing Equipment⁹⁶ Programs in PY2019.⁹⁷ Note that because of their uniqueness and generally higher level of involvement, the findings regarding ECB New Construction and Major Renovation projects are covered in a separate chapter (see Chapter 9).

8.1 EO and ECB Existing Equipment Program Structure

Energize Connecticut's EO Program is a retrofit program that provides incentives and technical services to encourage existing C&I building owners to replace functioning, but outdated and inefficient equipment with premium-efficiency units. The EO program targets all non-residential electric and gas customers. Three different approaches to energy efficiency projects, utilizing both prescriptive and custom incentives, comprise the core elements of the EO Program.

Most participating customers choose a prescriptive approach, in which they follow a standardized, streamlined incentive delivery path through which a variety of equipment types (lighting, HVAC, refrigeration, water-heating, and process-related) are available for selection. In these cases, customers work with their own contractors and staff to install the equipment. Incentives are processed and sent once the energy-efficient equipment has been inspected and verified. Customers can also choose a custom approach for energy-efficient equipment upgrades that requires engineering calculations to calculate energy savings. Utility staff work more closely with customers under this path to develop a tailored and customized approach for each customer that is site-specific. A final hybrid approach involves focusing in one or two aspects of a C&I building's energy systems while offering a blend of prescriptive and custom incentives for the project.

Energize Connecticut's ECB New Construction and Equipment Replacement Programs provide incentives for new or end of useful life equipment for C&I and municipal customers.⁹⁸ Typically, ECB customers making equipment upgrades undergo a similar process to EO customers with major building renovations or new building construction. Both customer groups can either take a prescriptive approach, with pre-determined equipment types and incentive amounts, or a hybrid prescriptive/custom approach while focusing on one or two components of a building's energy system during an addition project. The only major difference between the two programs is that the EO program is used for upgrading old, but still functioning equipment, while ECB Existing Equipment is used for brand new equipment additions or replacing old non-functioning equipment. Due to the similarities in types of equipment installed and program delivery, EO and ECB Existing Equipment are covered together in this report.

⁹⁶ We use the term "Existing Equipment" to distinguish from ECB New Construction. We evaluate ECB Existing Equipment separately from ECB New Construction because the notable differences in program delivery associated with new construction projects. ECB Existing Equipment is more like the EO Program, thus we grouped them together. Note that though we use the term "Existing Equipment," this could include projects that had new equipment installed, it just would not have been part of a new construction or major renovation project.

⁹⁷ Details regarding the sample design and methods are provided in Appendix A.

⁹⁸ For the purposes of our evaluation, ECB New Equipment and ECB Equipment Replacement are combined and referred to as "ECB Existing Equipment."

8.2 Comparison to Other Jurisdictions

The evaluation team identified three programs that were comparable to the EO/ECB Equipment Replacement programs in Connecticut (see Table 36). The evaluation team found that the comparison programs generally had consistent implementation models and offered similar types of energy efficiency measures to participating customers. Additionally, trade allies and account managers served as key drivers of customer outreach for these programs. The main difference identified was that the Connecticut programs offer tiered incentives to encourage more comprehensive projects whereas none of the other programs do so (see Section 8.4.4).

Table 36. EO/ECB Equipment Replacement Program Comparisons

Comparison Program	Measures	Tiered Incentives	Financing
CT EEB (CT)	Lighting, HVAC, refrigeration, water-heating, process equipment, custom measures	Yes	Yes
Efficiency Maine Trust (ME)	Lighting, HVAC, VFDs, refrigeration, compressed air, agricultural equipment	No	Yes, but specific to small businesses conducting high-performance heat pump retrofits and variable refrigerant flow system retrofits
NH Electric and Gas Utilities (NH)	HVAC, lighting, motors/VFDs, process, refrigeration	No	Yes
National Grid (NY)	Process improvements, pipe insulation, envelope measures, steam traps, heat exchangers, boiler controls, HVAC, water heating, lighting, compressed air, motors, VFD	No	No

8.3 Respondent Characteristics

To assess EO and ECB programs, the evaluation team conducted quantitative web surveys with 41 EO and 28 ECB Existing Equipment participants and 34 trade allies. The following summarizes the composition of those we surveyed.

8.3.1 Participant Characteristics

The 69 surveyed EO and ECB Existing Equipment participants represented a variety of roles at their organizations, dominated by facility managers of some kind. The remaining participants were relatively evenly distributed across owners/CEOs, financial/administrative positions, and energy managers (Table 37).

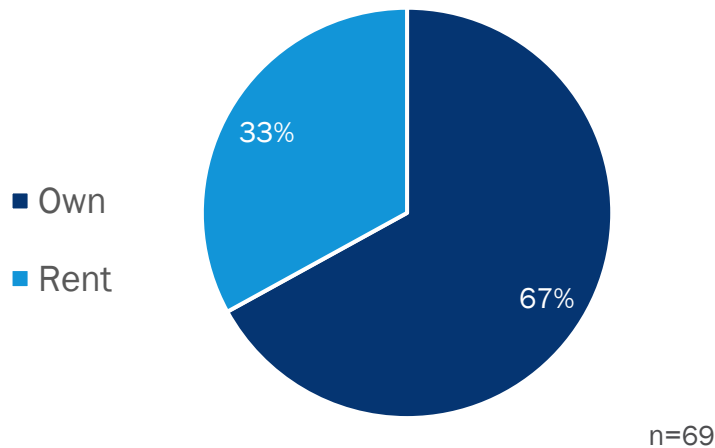
Table 37. Distribution of Participants by Role

Role	% of Respondents
Facilities/Maintenance Manager	61%
President/CEO	10%
Proprietor/Owner	9%
Energy Manager	8%
Analyst	4%
Chief Financial Officer	6%

Role	% of Respondents
Administrative Position	2%

About two-thirds of participants reported their company owned the facility where the EO or ECB Existing Equipment project was completed; one-third rented their facility. (Figure 50).

Figure 50. Distribution of Participants by Ownership



In alignment with the utilities’ relative sizes in the state, more than three-quarters of EO/ECB Existing Equipment participants were Eversource customers while the rest were United Illuminating customers,. The respondents captured a wide range of industry segments (Table 38), with the most common being manufacturing followed by education and retail/personal services. While it is not entirely clear why manufacturing facilities are so highly represented, the evaluation team suspects these facilities have been targeted due to their relatively high savings potential.

Table 38. Distribution of Participants by Facility Type⁹⁹

Industry Segment	% of Respondents
Manufacturing	46%
Education	14%
Retail/Personal Service	14%
Offices/Professional Service	10%
Government	6%
Health Services	5%

⁹⁹ Eversource was able to provide segment information for all their C&I customer accounts, but UI was not. As such, the evaluation team was unable to assess the distribution by segment across the entire Connecticut C&I population. We did, however, compare the distribution of Eversource segments in the population to the distribution of Eversource sample cases, and only a couple notable differences were found. If we consider just Eversource, our sample over-represents manufacturing (46% in respondents, 15% in all participants) and education (14% in respondents, and 5% in all participants); our sample under-represents retail/personal services (14% in respondents, 29% in all participants).

Industry Segment	% of Respondents
Warehousing	2%
Lodging	2%

Participants also represented a range of building sizes, ranging from 1,400 to 1.8 million square feet (average of 200,000 square feet). Primarily, respondents had a role in completing the application for incentives (70%), although a high number had contractors (59%), equipment vendors (34%), or utility account representatives (30%) involved as well.

The participant population was diverse. Many things can differentiate participants, but in addition to industry segment and facility ownership, size is probably the next most important in the context of energy efficiency programs. As mentioned earlier, we took the entire C&I population and divided it into three equally sized bins representing the bottom, middle, and top third, in terms of 2019 kWh consumption.

8.3.2 Trade Ally Characteristics

The 34 trade allies surveyed primarily represented firms that provided lighting, engineering, and HVAC services as their principal services (Table 39).

Table 39. Principal Services of Surveyed EO/ECB Trade Allies

Principal Services	% of TAs
Lighting	58%
Engineering	40%
HVAC	32%
Architecture/Design	8%
Plumbing	3%

The trade allies tended to work primarily with medium to large customers (60%) and across Energize Connecticut programs. Only a small percentage of their work was with residential customers (4%).

8.4 Key Findings

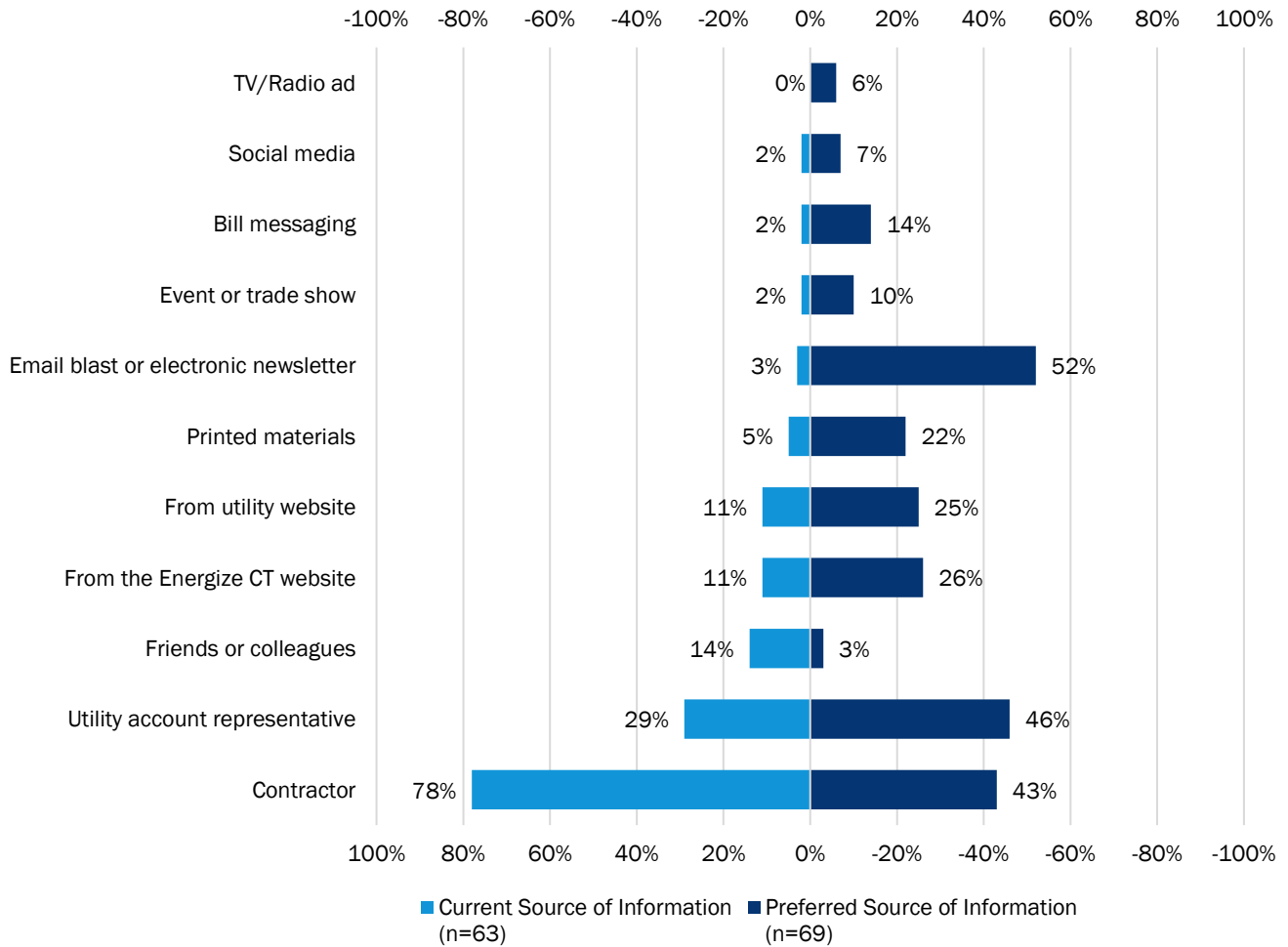
8.4.1 Participant Sources of Awareness and Trade Ally Program Promotion

The Energize Connecticut EO and ECB Existing Equipment Programs are mature, long-running programs. The biggest implementation challenge for mature programs typically is sustaining or increasing participation. For any energy efficiency program, participation is inherently preceded by awareness, but some form of engagement also needs to occur to spur participation. Activities to increase customers’ awareness and effectively engage them by providing the information they want and need to make the participation decision is key.

Trade allies and utility representatives play the dominant role in making customers aware, but wider-scale mass promotion should be considered for the small customers making up the bulk of the C&I customer base. The left side of Figure 51 shows that participants reported learning about Energize Connecticut incentives primarily from contractors and utility account representatives. Few participants mentioned email blasts or an electronic newsletter—although this is participants’ most preferred form of communication about energy efficiency opportunities. This is not to say that contractors and utility representatives should not play a

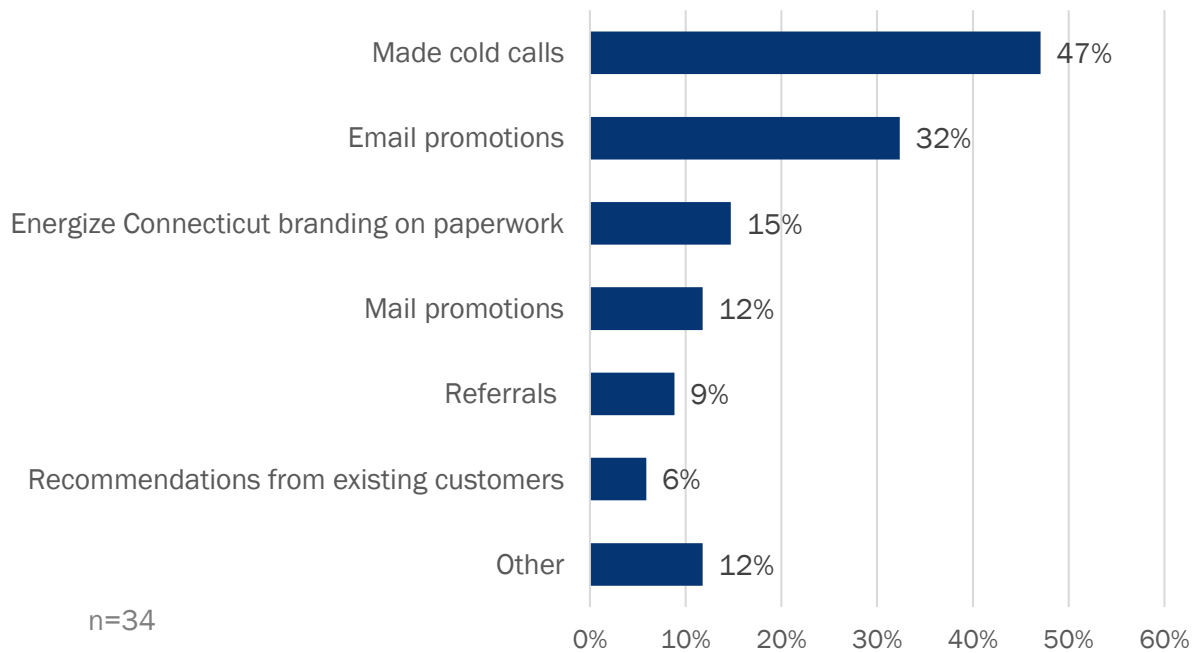
significant role moving ahead—they are also quite preferred sources—but this does suggest that lower-cost, wider-reaching forms of communication such as email and print materials may be under-utilized. This would be the case especially for the very large number of smaller customer accounts.

Figure 51. EO/ECB Participants’ Current and Preferred Sources of Program Information



Trade allies carry significant responsibility for promoting the programs; additional marketing support is desired. While expanding outreach efforts will be key for sustaining and increasing participation moving ahead, trade allies will always play the critical role of being the dominant actor that communicates with the customer and ultimately convinces them to participate. About three-quarters (72%) of trade allies reported promoting Energize Connecticut programs or services in 2019. The primary marketing channels used by trade allies included cold-calling customers, and email promotions (Figure 52). Of the trade allies who reported promoting Energize Connecticut programs, about two-fifths (40%) reported working with either Eversource or UI on promotional activities, but less than one-fifth (15%) indicated using any co-branded marketing materials. A quarter of trade allies indicated they would like marketing materials from the utilities that they can share with customers.

Figure 52. EO/ECB Trade Ally Promotional Activities



Note: Does not include “Don’t know” (26%) or “None” (3%). A trade ally can have done multiple promotional activities, but if they responded: “Don’t know” or “None”, that was the only option that they could select.

Trade allies indicated additional marketing support is desired. Several mentioned they would like to see co-branded materials. Another subset said they have received no marketing support at all beyond periodic trainings. In comparison to some other utilities, it appears there are opportunities for the Connecticut utilities to provide addition marketing materials to better support trade ally’s promotional efforts. Strategies used in jurisdictions with high levels of trade ally satisfaction include:

- Co-branded marketing materials for trade ally use (MO, IL)
- Case studies of successful projects (MO, IL)
- Collateral highlighting specific project opportunities (MO, IL)
- Annual Business Symposium to educate and keep trade allies up to date on program opportunities (IL)

8.4.2 Barriers to Equipment Upgrades and Program Participation

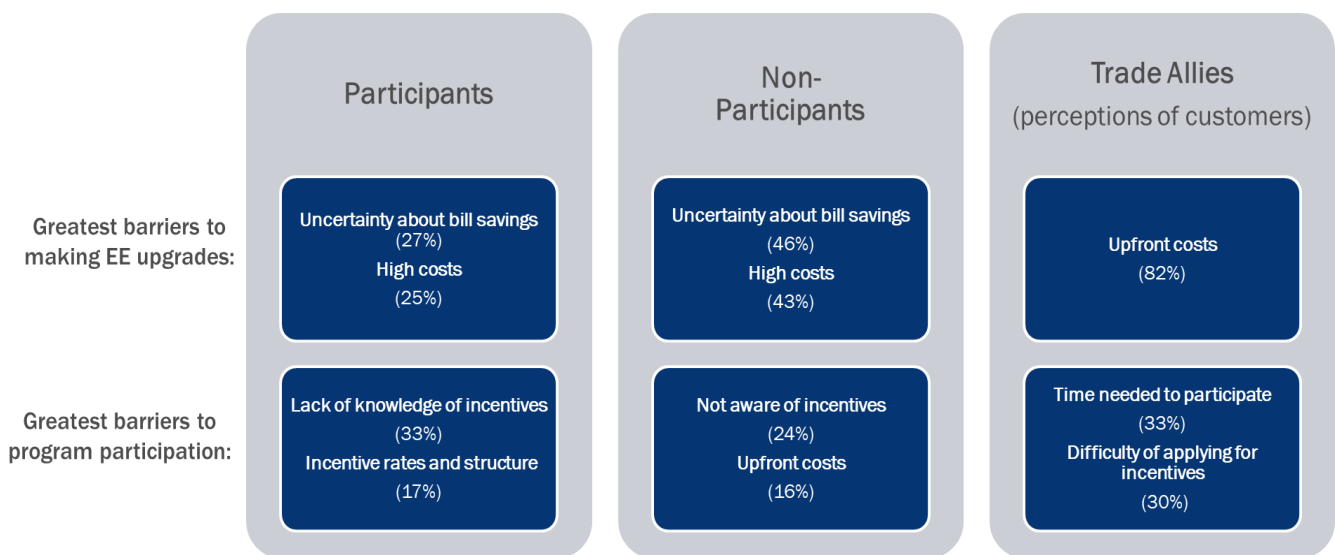
Making customers aware of the available rebates and program offerings is the first step to overcoming barriers to equipment upgrades and program participation. The next step is ensuring the materials and information provided to the customers directly addresses their primary barriers to making energy efficiency upgrades and barriers to participation.

The primary barriers to making energy efficiency upgrades are uncertainty around monetary bill savings (i.e., dollars) and the upfront costs of the upgrades. According to both surveyed EO and ECB Existing Equipment participants and non-participants (see Section □), uncertainty about bill savings (27% and 46%, respectively) and higher costs of energy efficient equipment (25% and 43%, respectively) are the biggest barriers to making

energy efficiency upgrades (Figure 53).¹⁰⁰ Similarly, nearly all trade allies (82%) reported that customers perceive the higher upfront costs of energy-efficient equipment (when compared to less-efficient equipment) as barriers to upgrades, followed by some with concerns about reliability of efficient equipment (13%), and disrupting business operations (13%).

The primary barrier to EO/ECB Existing Equipment Program participation is lack of program awareness, though trade allies also mentioned the application process. Lack of knowledge about available incentives and the incentive rates and structure were the dominant barriers to program participation mentioned by participants; non-participants also mentioned lack of awareness as well as the upfront costs (Figure 53). Trade allies tended to see the main barriers to customer participation being more programmatic; however, where the time required to participate and difficulties with applying for incentives rose to the top.

Figure 53. Top Barriers to Energy-Efficient Upgrades and Program Participation by EO/ECB Respondent Group



8.4.3 EO and ECB Existing Equipment Project Financing

Given the significance of upfront costs, financing options may appeal to some customers and overcome the barriers associated with upfront cost. Financing options that do not decrease overall costs may still provide opportunities for customers who are unable to afford to energy-efficient equipment otherwise, by spreading the costs out over time.

Use of financing is relatively common with EO and ECB Existing Equipment projects. One-quarter (25%) of EO/ECB Existing Equipment participants reported that they utilized financing on their project. A plurality of participants that reported using financing did so through a conventional loan from a bank (44%). Others reported doing so through on-bill financing with their utility (31%) or the CT Green Bank (13%), with the remaining 12% reporting that they did not remember. Financing was used most often by educational (45%), retail (33%), and manufacturing and industrial (24%) facilities. Smaller customers were slightly more likely to

¹⁰⁰ These differences may seem rather large, but they also make sense. The significance of a barrier is lower for someone who has already participated in a program than for those who have not participated. If the barrier had been too high, they would have been unlikely to participate—Nevertheless, the fact that these two barriers were clearly the dominant barrier across participants and non-participants is the important point.

use financing than other customers (bottom third 26%, middle third 20%, and top third 23%). The evaluation team found no noticeable difference in the use of financing across utilities.

Financing is key for some projects and more could be done by the programs and trade allies to promote the availability of project financing. Over one-quarter (28%) of non-participants reported that a lack of access to financing or capital for energy efficiency improvements was a barrier to making upgrades to their facilities. About three-quarters (74%) of non-participants, however, were not aware of financing options through the Connecticut Green Bank or their utility. Oddly, although most trade allies (82%) cited upfront costs as the top barrier to customers making energy-efficient upgrades at their facilities, less than half of the trade allies (48%) reported they consistently discuss financing options with customers and almost one-quarter (23%) reported they *never* discuss financing to customers.

8.4.4 Comprehensive Projects and Repeat Participation

Comprehensive and deep savings are a big focus in Connecticut and Energize Connecticut offers a tiered incentive structure aimed at stimulating projects with multiple end uses. However, comprehensiveness is complex.

Comprehensive projects achieve greater savings but are uncommon for the EO and ECB Existing Equipment Programs, as lighting continues to dominate upgrades. On average, comprehensive projects achieved a 0.29 savings to consumption ratio in 2019 compared to 0.11 for non-comprehensive projects. The evaluation team found, however, that the vast majority (84%) of 2019 EO and ECB Existing Equipment projects were not comprehensive.¹⁰¹ Sample sizes were too small to determine whether a specific business sector or facility type would be more likely to complete a comprehensive project; however, the team found larger businesses were more likely to have completed a comprehensive project than smaller businesses (13% of participants in the middle-third or top-third in customer size compared to 0% for those in the bottom third of customer size).

Though lighting dominates comprehensive (and non-comprehensive) projects, significant potential exists for other end uses. Participants who only completed one upgrade most often installed lighting (71%), refrigeration equipment (4%), or HVAC equipment (3%). Participants who completed comprehensive projects were most likely to include lighting (93%), refrigeration (45%), or motor (24%) upgrades in their projects. Notably, few EO and ECB Existing Equipment participants chose to upgrade other equipment options besides lighting, whether as part of comprehensive or non-comprehensive projects (only 4% refrigeration, 3% HVAC, 2% motors, 2% process equipment, and <1% hot water equipment), suggesting program potential exists across these other end uses.

Trade allies and utility representatives play an integral role in encouraging comprehensive projects. About 80% of EO and ECB Existing Equipment participants (74% Eversource; 100% UI) reported that they consulted with either a trade ally or utility representative before deciding on the scope of their project. Among the 20% of participants who did not, none completed a project that consisted of multiple end uses. About two-thirds (63%) of surveyed participants reported being aware of tiered incentives, and nearly all (90%) learned about the incentives from a trade ally or a utility account representative. All participants (100%) who were aware of tiered incentives and completed a comprehensive project reported learning about the incentives from a trade ally or utility representative.

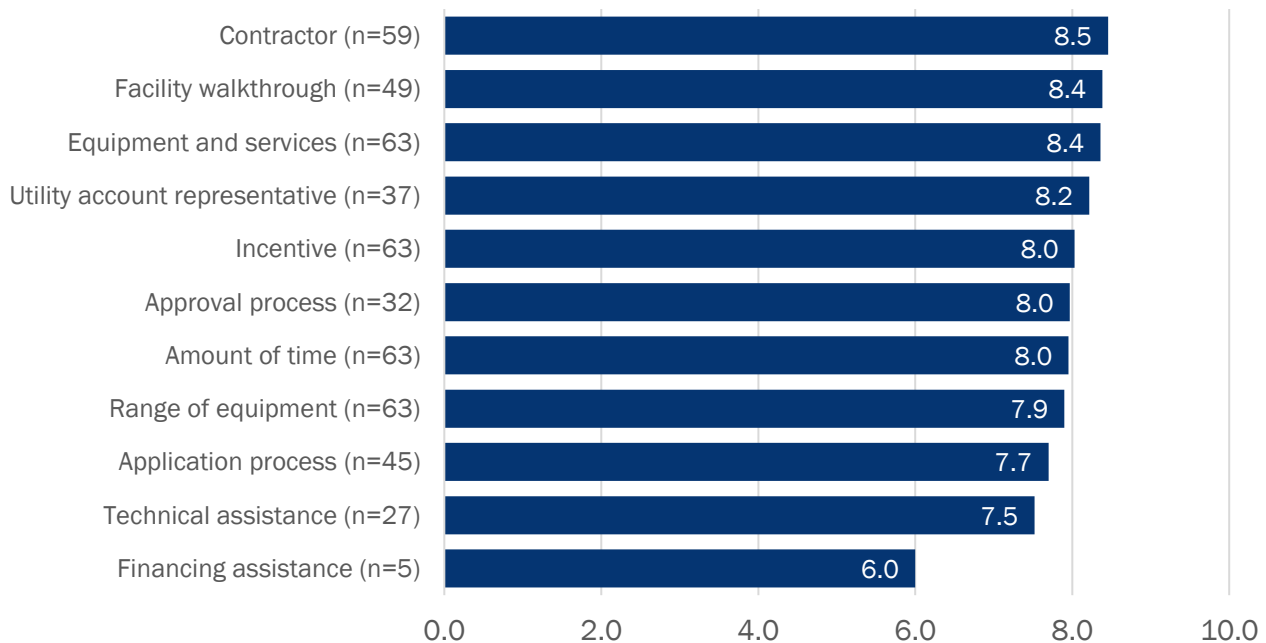
¹⁰¹ The UI program data provided a field indicating if a project was comprehensive or not, but the Eversource data did not. To assess comprehensiveness, the evaluation team coded projects as comprehensive if they consisted of more than one end use. Though the official qualifications for the tiered incentives are a bit more complex (e.g., requiring a proportion of savings to come from the different end uses), our simplified definition serves its purpose for these high-level analyses.

EO/ECB Existing Equipment Program participation often leads to additional energy efficiency improvements; comprehensive projects versus comprehensive customers may warrant consideration. While only 16% of 2019 EO/ECB Existing Equipment *projects* were comprehensive, nearly three-quarters (73%) of participants reported making additional energy efficiency upgrades following their participation in the EO/ECB Existing Equipment Programs (within or outside the program). Repeat participation is efficient and offers notable benefits (e.g., past participants are more likely to participate than those who have not, past participants are easy to identify and target, previous participation suggests the barriers to making upgrades or participating are less of an issue than with the general population). Focusing solely on project level comprehensiveness overlooks the critical fact that customers can also be comprehensive *over time*.

8.4.5 EO and ECB Existing Equipment Program Satisfaction

Participants were generally quite satisfied with the EO and ECB Existing Equipment Programs, but there are opportunities for improving program processes. Overall, participants were highly satisfied with the program (providing an average rating of 8.1 on a 10-point scale) (Figure 54). Participants reported high levels of satisfaction with almost all aspects of the EO and ECB Existing Equipment Programs, with financing assistance being the only category scoring lower than 7.5.¹⁰² Participants in the top-third size bin were slightly more satisfied (8.9) than the middle-third (8.6). Participants in the bottom-third size bin were least satisfied (6.7), suggesting more should be done to address smaller customer needs.

Figure 54. Average Participant Satisfaction Level with EO and ECB Existing Equipment Program Elements



Note: Analysis excludes “don’t know” and “not applicable” responses.

¹⁰² Only five participants scored the financing assistance category and a single respondent who said utility bill savings did not meet expectations greatly influenced this score. Without the single respondent (0 out of 10), the financing assistance average score would be 7.5 and comparable to other program elements.

Overall, participation satisfaction with the EO/ECB Existing Equipment Programs is in line with programs throughout the country offering a combination of prescriptive and custom project incentives (Table 40). The evaluation team selected the programs highlighted below based on the availability of publicly accessible evaluation results.

Table 40. EO/ECB Program Participant Satisfaction Benchmarking

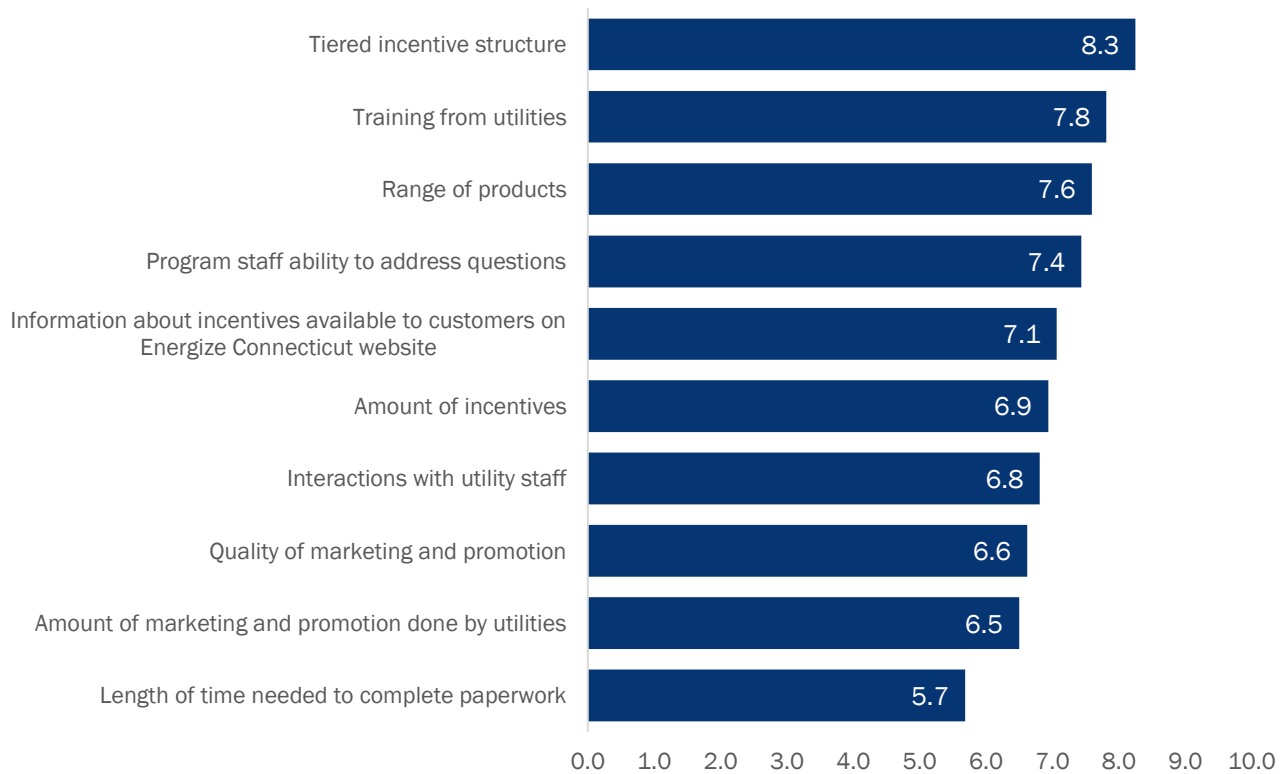
Program Component	Connecticut: EO/ECB Program (n=69)	Dominion South Carolina: Prescriptive & Custom Programs (n=53)	Ameren Illinois: Standard (n=140) & Custom (n=34) Programs	Duke: Non-Residential Prescriptive Program (n=108)
Contractor	8.5	--	--	9.2
Equipment/Services	8.4	9.5	9.4	--
Incentives	8.0	8.3	8.5	8.3
Amount of Time	8.0	8.2	8.9	--
Range of Equipment	7.9	8.8	8.5	7.7
Application Process	7.7	8.3	8.1	8.3
Technical Assistance	7.5	--	8.7	--

Note: While all questions were asked based on a 0 to 10 scale, the end points were labeled differently across studies.

About one-third (29% or 20 participants) provided recommendations to improve the program. The most common recommendations included reducing length and improving clarity of the application process (five mentions), more prompt communication from utility staff or trade allies (five mentions each), and faster turnaround on approving projects (four mentions). Other recommendations include single mentions of adjusting incentive timing for municipal projects to match their budget year and suggesting contractors be approved by the utility.

Trade allies reported relatively lower levels of satisfaction with the EO/ECB Existing Equipment Programs, specifically with paperwork and program marketing. Trade allies reported being most satisfied with the tiered incentive structure (providing an average rating of 8.3 on a 10-point scale) and least satisfied with the amount of time needed to complete program paperwork (5.7) (Figure 55). Trade allies also reported lower levels of satisfaction with the amount (6.5) and quality (6.6) of program marketing. In line with earlier results, the trade allies who reported some level of dissatisfaction with marketing (score below 6 out of 10; n=9), primarily indicated that they have not received any marketing materials that they could provide to their customers.

Figure 55. Average Trade Ally Satisfaction Level with EO and ECB Existing Equipment Program Elements



Note: Analysis excludes “don’t know” and “not applicable” responses.

While not a perfect comparison given differences in questions asked of respondent populations, the low level of satisfaction with time needed to complete program paperwork appears significantly lower than at least one other comparable program (see Table 41). That said, calls to streamline program application processes are fairly common in trade ally feedback across a range of energy efficiency programs.

Table 41. EO/ECB Program Trade Ally Satisfaction Benchmarking

Program Component	Connecticut: EO/ECB Program (n=34)	Duke: Non-Residential Prescriptive Program (n=62)
Range of products	7.6	6.9
Program staff ability to address questions/program staff	7.4	8.3
Information about incentives available to customers on Energize Connecticut website	7.1	--
Amount of incentives	6.9	6.8
Length on time needed to complete paperwork/application process	5.7	7.7

8.5 Conclusions & Recommendations

Based on the findings presented above, the evaluation team offers the following recommendations for the EO and ECB Existing Equipment Programs going forward:

- **Leverage relatively low-cost, large-scale digital channels like email to inform a larger number of customers about the available incentives and programs to increase participation.**
 - Given limited email coverage within utility customer databases (20% Eversource, <1% UI), consider purchasing email addresses for customers within utility service territory zip codes.
 - Messaging should emphasize the primary barriers, including potential energy bill savings and costs.
 - The Energize Connecticut website currently contains a few case studies, but most are for rather large projects. Develop additional case studies that cover more market segments and more measures and share via email, targeting specific customer types with content most relevant to them.
 - Marketing and promotions could also focus on the availability of financing and the additional rebates available for comprehensive projects to help steer customers to these opportunities.
- **Develop, co-brand, and share marketing, promotional, and educational materials that can be used by trade allies to promote the program to their customers.**
 - Regularly solicit input from trade allies on their marketing needs.
 - Develop a library of electronic resources based on those needs that can be accessed by participating trade allies.
 - Also consider conducting events (webinars, annual informational meetings, trainings) with trade allies to make them aware of the program and available resources.
- **Ensure trade allies are aware of utility and Connecticut Green Bank financing options and are promoting these options to customers** (see marketing, promotional and educational tactics above).
- **Work to streamline the application process for EO and ECB Existing Equipment projects.**
 - Consider reducing length of the application and improving clarity of the application process, providing faster turnaround times for approving projects, and more prompt communications in general throughout the process.



Chapter 9



9. Energy Conscious Blueprint (ECB) New Construction and Major Renovation

This chapter summarizes key findings from the research conducted on Energize Connecticut's Energy Conscious Blueprint (ECB) new construction and major renovation projects conducted in PY2019. Note that because of their uniqueness and generally higher level of involvement, the findings covered in this section focus only new construction and major renovation aspects of the ECB program; see Chapter 8 for findings related to ECB existing equipment.

9.1 ECB Program Structure

Energize Connecticut’s ECB program provides incentives for new construction, major renovation, and new (or end of useful life) equipment for commercial, industrial, and municipal customers. As shown in Table 42, the ECB Program currently offers customers multiple “paths” to program participation to provide customers with a variety of ways to participate in the ECB program based on their unique needs.¹⁰³ Paths 1 and 2 (ZNE/DEEP Energy Savings and Whole Building EUI Reduction, respectively) are designed to encourage the most comprehensive projects, which include energy modeling requirements.

To encourage comprehensive projects, Paths 3 and 4 (Whole Building Streamlined and Systems, respectively) provide both prescriptive and custom incentives to customers, as well as a multi-end-use incentive or “tiered incentive.” The evaluation team estimates that almost two-thirds (60%) of 2019 ECB New Construction projects (and 57% of surveyed participants’ projects) were comprehensive and likely eligible for at least tiered incentives.¹⁰⁴ However, the evaluation team could not definitively determine comprehensiveness because the Eversource tracking data did not contain a field indicating whether a project was comprehensive. As we will show later, however, **early utility engagement (typically before the end of the design development phase) is required for Paths 1, 2, and 3 to ensure comprehensive energy savings.**

Table 42. ECB Program Paths

Aspect of Participation	Path 1 – ZNE / Deep Energy Savings	Path 2 – Whole Building EUI Reduction	Path 3 – Whole Building Streamlined	Path 4 - Systems
Building size	20k+ SF buildings	30k+ SF buildings	20k+ SF buildings	Smaller projects
When utility engagement must occur	Must engage with utilities early in design phase (before 50% schematic design).	Must engage with utilities before end of design development.	Must engage with utilities before end of design development.	No engagement requirements.
Available incentives	Construction, post-occupancy, certification, tech assistance, verification, and design team.	EUI reduction (25%+ vs 10-24.9%), tech assistance, verification, and design team.	Prescriptive, custom, design, and tiered	Prescriptive, custom, sustainable office design, lighting design, and tiered

¹⁰³ The period covered by this evaluation is 2017-2019. The structure of the program presented herein was different then than it is now with the various pathways. The program was revised because of findings that arose in Massachusetts, suggesting the existing program design was failing to deliver savings and was not holding up to standard practices. Connecticut adapted their program to align with the new Massachusetts design.

¹⁰⁴ While UI included a field indicating whether project was comprehensive or not and qualified for the tiered incentive, the Eversource did not have a similar field.

Aspect of Participation	Path 1 – ZNE / Deep Energy Savings	Path 2 – Whole Building EUI Reduction	Path 3 – Whole Building Streamlined	Path 4 - Systems
Energy modeling requirement	✓	✓		

Comparison to Other Jurisdictions

As part of this study, the evaluation team also identified four programs that were comparable to the ECB New Construction program in Connecticut (see Table 43). Overall, each of the programs reviewed was comprehensive in nature. The programs included similar program paths and offered technical assistance and whole building approaches to participating customers consistent with the Connecticut ECB New Construction program. However, key differences included incentive levels (those in Connecticut were higher), the use of tiered incentives (offered in Connecticut only) and the inclusions of a Sustainable Office and Lighting Design offering (offered in Connecticut only). These differences suggest the Connecticut program is taking additional steps compared to other programs in pushing the comprehensiveness of completed projects (see Section 9.3.6 for additional details).

Table 43. ECB New Construction Program Comparisons

Comparison Program	Participation Paths	Measures	Tiered Incentive	Financing
CT EEB (CT)	ZNE/Deep Energy Savings Whole Building EUI Reduction Whole Building Streamlined Systems	Whole-building, prescriptive, and custom measures including, but not limited to lighting, HVAC, chillers, motors, VFDs, refrigeration and process/systems updates; modeling for the ZNE/Deep Energy Savings path	Yes	Yes
Mass Save (MA)	ZNE/Deep Energy Savings Whole Building EUI Reduction Whole Building Streamlined Systems	Energy modeling, prescriptive and custom measures	No	No
NHSaves (NH)	ZNE/Deep Energy Savings Whole Building EUI Reduction Whole Building Streamlined	Lighting, HVAC, chillers, VFDs, motors, compressed air, heating equipment, water heating equipment, and commercial kitchen equipment	No	No
Energy Trust of Oregon (OR)	Whole Building and Path to Net Zero Market Solutions Individual Incentives	Prescriptive and custom measures including lighting, HVAC, and motors, along with LEED code compliance	No	No
NYSERDA (NY)	Technical assistance Green building assistance LEED compliance support	LEED certification, lighting, HVAC, controls, whole building and green building designs.	No	No

9.2 Respondent Characteristics

For this study, the evaluation team conducted in-depth telephone interviews with 21 ECB New Construction participants and 11 trade allies. The following section summarizes the composition of the two groups we interviewed.

9.2.1 Participant Characteristics

The 21 ECB New Construction participants we interviewed represented a variety of roles at their organizations, including facilities or construction manager (six mentions), owner or president (four mentions), property manager (four mentions), financial manager (three mentions), administrative (two mentions), and general counsel (one mention). Other important attributes include:

- Most participants indicated being in their position for over five years (14 of 21).
- All interviewed participants reported their company owned the facility where the ECB project was completed.
- The majority of interviewed participants indicated the project involved a major renovation (15 of 21), with the remaining participants completing a new construction (four mentions) or facility expansion (two mentions) project.
- Participants represented a range of building sizes, ranging from 1,400 to 1.8 million square feet, or an average of 200,000 square feet.

Table 44 presents the interviewed participants by industry segment. Interviewed participants were generally representative of the 2019 ECB New Construction project end use mix, except for retail, multifamily, and warehouse end-uses, which are underrepresented. Given their timeframe for participation, it is important to note that these customers participated in an earlier version of the ECB New Construction Program. Additionally, the evaluation team conducted a census, reaching out to all the 142 unique participants and 21 agreed to conduct an interview. Thus, any differences between the distribution of industries in the population and the distribution in our final sample is unavoidable.

Table 44. Building End Use by Interviewed ECB New Construction Participants

Industry Segment	Count of Interviewed Participants	Count of 2019 Projects
Education	4	27
Manufacturing	4	23
Office	6	22
Retail	0	18
Municipal	1	13
Health Care	1	9
Multifamily	0	6
Agriculture	1	4
Restaurants	2	4
Industrial	1	3
Warehouse	0	3
Other	1	10
Total	21	142

9.2.2 Trade Ally Characteristics

The 11 ECB New Construction trade allies we interviewed reported having a variety of roles at companies that offered a diverse selection of services to customers (Table 45). Trade allies tended to primarily work with medium to large customers and across Energize Connecticut programs. For this set of trade allies, about half of their Energize Connecticut work occurs under the ECB New Construction or Major Renovation Program on average, with about one-third falling under the Energy Opportunities program.

Table 45. ECB Trade Ally Roles, Services Provided, and Type of Work

Title / Role	Services	Proportion of 2019 work with...			Proportion of 2019 Energize CT Projects under...			
		Res	Small C&I	Med/Lg C&I	SBEA	EO	ECB - NC	ECB - ER
Project Manager	Comprehensive energy solutions	0%	0%	100%	0%	95%	5%	0%
Associate Principle	Engineering, energy assessments, modeling	0%	0%	100%	0%	0%	100%	0%
Senior Energy Engineer	HVAC equipment sales, general contracting	0%	10%	90%	0%	67%	34%	0%
Director of Project Development	Comprehensive solutions including lighting, rooftop unit replacements, and optimization	0%	70%	30%	50%	40%	5%	5%
Principal Consultant	Owners' representative	5%	60%	35%	20%	50%	5%	25%
President	Engineering, energy assessments, energy modeling	0%	0%	100%	0%	25%	60%	15%
Principal	NCx, RCx, building commissioning, LEED consulting, energy modeling, audits	0%	5%	95%	0%	0%	100%	0%
Associate Engineer	Engineering, energy assessments, energy modeling	0%	1%	99%	0%	0%	80%	20%
Analyst	Rebate management	0%	80%	20%	DK	DK	DK	DK
Pre-Construction Manager	General contracting	0%	5%	95%	0%	0%	100%	0%
Project Manager	Mechanical and electrical engineering, plumbing, fire protection	40%	20%	40%	25%	25%	25%	25%
Average		4%	23%	73%	10%	30%	51%	9%

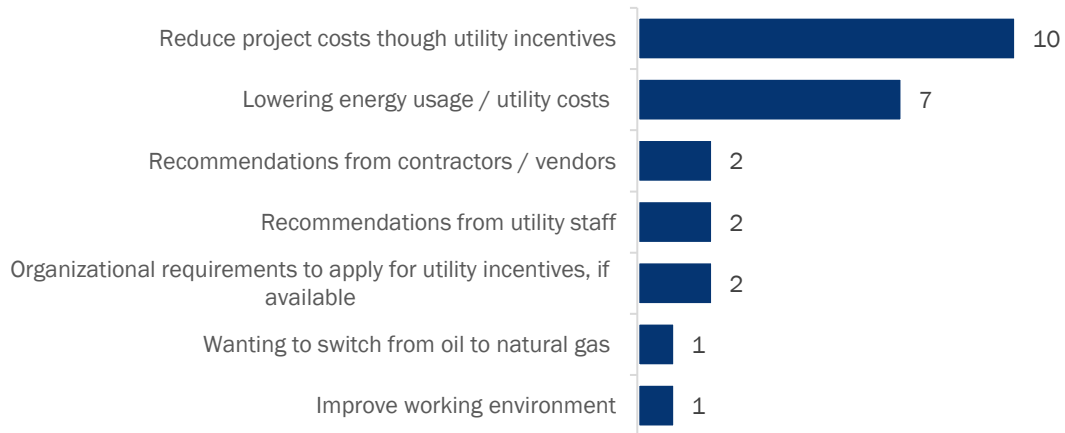
9.3 Key Findings

9.3.1 Drivers of Program Participation

Understanding why customers are participating in a program is central to ensuring the program is designed to meet customer needs and points to specific areas of emphasis for marketing and promotion. In the case of ECB New Construction, however, learning why they participate also led to an interesting portfolio-level finding, namely that repeat participation matters.

Lowering project and utility energy costs are the key drivers of program participation. About half of ECB participants indicated that the project incentive was a primary motivator for participating in the ECB program as it reduced project costs, followed by lowering energy usage and resulting utility costs (seven mentions) (Figure 56). The evaluation team found that motivations for participation were consistent across participants, regardless of facility size.

Figure 56. Reasons for Participating in ECB New Construction Program (Participants n=21; Multiple Responses Allowed)



Familiarity with program benefits as a result of past participation may also play a role in program participation. Over half (12 of 21) of interviewed ECB New Construction participants reported they had previously participated in an Energize Connecticut program prior to undertaking an ECB project. One municipal participant summarized their motivation for participating in the program, saying:

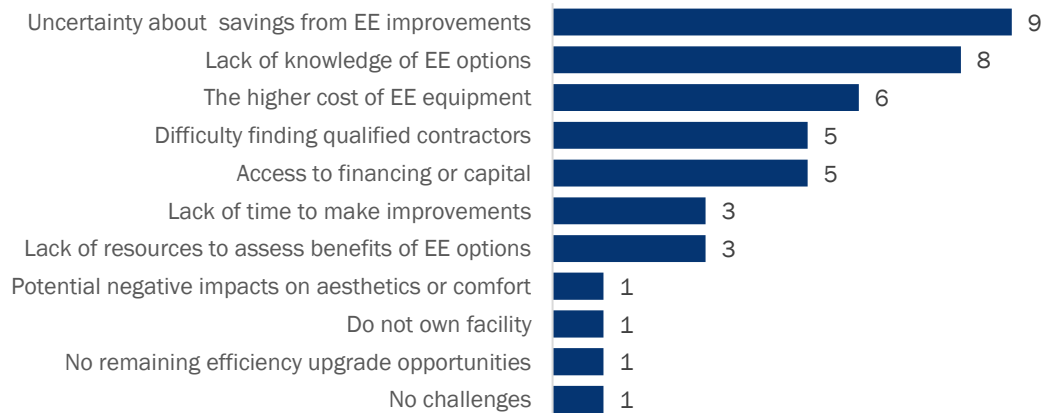
“I am always looking for ways to save money. I have been doing this for 35 years and just know these incentives exist. The town received incentives back in 2009 when the previous plant upgrade happened as well, so we knew about them because of that.”

9.3.2 Customer Barriers to Energy Efficient Upgrades and ECB Program Participation

All energy efficiency programs are designed to address market imperfections, or barriers, hindering greater uptake of energy-efficient equipment or behaviors. Understanding the different barriers customers face is critical for ensuring programs are appropriately designed, implemented, and marketed. It is also important to distinguish between *barriers to making energy-efficient improvements* from *barriers to program participation*—these are often not the same, but both provide useful process insights.

Lack of adequate information on energy-efficient options and associated savings are the primary barriers to making energy efficiency improvements for non-participants. Among non-participants who reported undertaking a new construction or major renovation project in the past two years, over two-thirds reported a lack of information prevented them from making energy efficiency improvements, including uncertainty about savings, lack of knowledge of efficient equipment, and difficulty finding qualified contractors ((Figure 57). Non-participants also cited the higher costs associated with energy efficient equipment and access to financing or capital as challenges to making energy-efficient improvements.

Figure 57. Challenges to Making Energy Efficiency Improvements (Non-Participants Who Had Undertaken a New Construction or Major Renovation Project in Past Two Years n=16; Multiple Responses Allowed)



Lack of ECB program awareness appears to be the primary barrier to program participation. Over two-thirds (11 of 16) of non-participants who completed a new construction or major renovation project in the past two years reported being unaware that ECB New Construction incentives were available. Non-participants who were unaware of ECB New Construction incentives tended to be smaller customers in terms of average facility square footage (75,312 versus 143,440 square feet, on average). Limited staff and experience with utility programs may at least partially explain why smaller customers are less aware of utility incentive offerings.

9.3.3 Trade Ally Barriers to Delivering the Program Most Effectively

Trade allies play key roles in the delivery of most Energize Connecticut programs. Not only are they the people installing the energy-efficient equipment, but they also fulfill important administrative roles and often carry the responsibility of promoting the programs to customers. Ensuring trade allies needs are met is as important as meeting customer needs.

Trade allies report needing additional information regarding ECB program processes and changes to program rules and requirements. About half of trade allies (6 of 11) reported that having additional information would improve how they deliver the program. Among those trade allies, all but one mentioned needing additional program related information such as timely information on program changes, requirements, and processes. One trade ally who provided engineering services commented:

“Any time the program is having an update, it should be widely publicized. A webinar to show us the changes. We just get these PDFs and figure out changes ourselves. During COVID-19, there were a few new programs that we were not aware of. It becomes a big problem if the owners catch wind about something we did not know about. Even the website is not very good. I think communication could definitely be better.”

Additional types of information requested by trade allies included information on energy modeling and ZNE building techniques, specific vertical markets including healthcare and educational customers, and emerging energy-efficient products (one mention each).

Trade allies also felt more utility support in terms of customer outreach would benefit the program and help increase program participation. About one-third (4 of 11) of trade allies indicated there is a need for more utility outreach to potential customers. Suggested program outreach included,

- Utility-provided print advertising and direct outreach to municipalities;
- Utility-provided webinars;
- Utility presence at events where architects and engineers attend, including American Institute of Architects (AIA) events; and
- Utility engagement in sector-specific conferences and events (e.g., municipal water and wastewater treatment, affordable and multifamily housing, and industrial sectors; one mention each).

These findings are consistent with best practices identified for other new construction programs, specifically conducting outreach to trade allies to inform and keep them up to date about program offerings.

9.3.4 Project Financing

The nature of new construction and major renovation projects is that funding is largely decided before a project begins and any financing that is secured for projects tends to have short payback terms (7 to 10 years), but often at a higher cost than traditional financing.¹⁰⁵ This puts pressure on building owners to fast-track design and construction. The fast-tracking of project design and construction can limit the incorporation of energy-efficient equipment and design elements. The Connecticut Green Bank offers commercial and industrial building owners Commercial Property Assessed Clean Energy (C-PACE) financing for new construction and major renovation projects. The C-PACE financing allows building owners to pay for energy efficiency investments over a longer period of time (20 to 30 years) through an assessment on their property tax bill, making it easier for owners to secure low-interest capital to fund improvements while incorporating energy efficient equipment and design elements.

Although C-PACE financing is available through the Connecticut Green Bank, it was not used by interviewed ECB New Construction participants. No interviewed ECB New Construction participants reported using C-PACE financing for their project even though half (12 of 21) reported being aware that it was available. Instead, participants reported using capital budget (11 mentions) or traditional bank financing (4 mentions) to pay for ECB New Construction projects. The remaining six participants indicated that they were not involved in project funding decisions and were unaware of the type of funding used for the ECB New Construction project. Similarly, most trade allies (7 of 11) reported that their ECB customers generally do not use financing for ECB New Construction projects.

Interview findings suggest that C-PACE financing may be of interest to smaller customers. Two ECB New Construction participants who completed smaller projects (in terms of square footage) indicated they might be interested in using financing for future projects if rates and terms were competitive with other lenders. Additionally, about half (5 of 11) of trade allies believe additional financing options may appeal to smaller customers, particularly on-bill financing like what is offered through the Energize Connecticut Small Business Energy Advantage (SBEA) program. One participant representing the education segment echoed interest in on-bill financing and indicated a desire for additional information on available financing:

“We did use [financing] with other projects. It appears we are using on-bill financing for other upgrades we completed. I think we have been interested and cannot see why [we

¹⁰⁵ Construction loans are different from a conventional loan in few ways. They tend to be shorter-term and based on construction phases. Later phase loans are dependent on successful completion of earlier phases. Construction loans also typically have higher interest rates due to the uncertainties associated with the completion of a new construction project. Construction loans also often require larger down payments, though if the business already owns the land, it can often be used as collateral for the first phase.

would not be interested in using financing for future projects], but I'm new and do not know what financing is out there. Having a webinar or something might be helpful."

Further, among the 16 non-participants who reported completing a new construction or major renovation project, about one-third (5 of 16) mentioned that having access to financing or capital was a barrier to making energy efficiency improvements. Studies of comparable new construction programs also identified access to financing as a barrier to participation and suggested making a wider range of financing options available to utility customers.

9.3.5 Early Project Involvement

Early project involvement is critical in incorporating energy-efficient equipment and design elements into new construction and major renovation projects. A 2020 study conducted on the behalf of the Massachusetts Energy Efficiency Advisory Council concluded that a best practice for utility new construction programs was to encourage utility involvement in projects before or no later than the early design phase.¹⁰⁶ Early involvement provides programs with more opportunities to encourage the incorporation of efficient equipment and design elements into project design plans and budgets, which are often not considered until later stages of design, when there is less opportunity to adjust plans and budgets.

All but one interviewed trade ally indicated that their own early involvement in an ECB project is imperative to increasing project savings and comprehensiveness. They noted that early involvement:

- Increases their ability to make recommendations to customers (2 mentions);
- Impacts their ability to provide energy modeling (1 mention);
- Allows them to influence building massing and shape decisions (1 mention); and
- Decreases the amount of time needed for projects (one mention).

One trade ally who is an owner's representative summarized how timing can impact their ability to incorporate energy-efficient equipment and design elements:

"Timing is everything – If it's too late I can get them what I can get them...On the next projects, they typically see the amount of incentive per square footage increase because we can have that conversation during the planning phase."

Although trade allies do generally get involved in projects early in the design phase, some are not getting involved early enough, which limits eligibility for the most comprehensive ECB program paths. According to trade allies, about one-third (32%) of the time they are getting involved in ECB projects during the construction documents or construction phase of a project (Figure 58). As discussed above, involvement in a project after the design phase limits opportunities for trade allies and program representatives to recommend energy-efficient equipment and design elements, and prevents the use of ECB program Paths 1, 2, and 3.

¹⁰⁶ NMR Group, Inc. and EMI Consulting, *C&I New Construction Program Planning & Market Effects/Spillover, MA19CX01-B-NCPLANME*, April 2020, <https://ma-eeac.org/wp-content/uploads/MA19CX01-B-PLANME-Report-FINAL-2020-04-15.pdf>.

Figure 58. Phases When Trade Allies Typically Get Involved in ECB New Construction Projects (Trade Allies n=11)



9.3.6 Comprehensiveness and Tiered Incentives

The Energize Connecticut ECB New Construction—like other business programs—includes an incentive structure aimed at stimulating deeper and more comprehensive savings. Table 44 shows the elements of the ECB incentive structure, comparing Connecticut’s ECB Program with C&I new construction programs in Massachusetts and Rhode Island. It is important to note that Path 1 (ZNE/Deep Energy Savings) and Path 2 (Whole Building EUI Reduction) are both inherently focused on comprehensiveness by the nature of their program designs—i.e., they are about incorporating building wide energy efficiency at the planning and design levels. Path 3 (Whole Building Streamlined) and Path 4 (Systems) are *not* inherently comprehensive; however, for these latter two paths, Energize Connecticut offers a tiered incentive structure, offering higher incentive levels for projects that include multiple end uses to drive deeper and more comprehensive savings.

Table 46. Comparison of New Construction Program Incentives for Connecticut, Massachusetts, and Rhode Island

Program Path	Incentive Type	Incentive Amount	
		Energize Connecticut’s ECB Program	Massachusetts and Rhode Island
Path 1 – ZNE / Deep Energy Savings	Construction	\$3.50/sf	\$1.25/sf
	Post-Occupancy	\$1.00/sf	\$1.00/sf
	Certification	\$10k	\$3k
	Tech Assistance	Same across utilities	Same across utilities
	Verification	Same across utilities	Same across utilities
	Design team	Same across utilities	Same across utilities
Path 2 – Whole Building EUI Reduction	> 25% EUI reduction	\$2.50/sf	\$1.25/sf
	10–25% EUI reduction	\$1.00–\$2.00/sf	\$0.35–\$0.75/sf
	Tech Assistance	Same across utilities	Same across utilities
	Verification	Same across utilities	Same across utilities
	Design team	Same across utilities	Same across utilities
Path 3 – Whole Building Streamlined	Prescriptive	Program rate	Program rate
	Custom	\$0.40/kWh	\$0.35/kWh
	Tiered incentive	Yes	No
	Design team	Same across utilities	Same across utilities
Path 4 – Systems	Prescriptive	Program rate	Program rate
	Custom	Program rate	Program rate
	Tiered incentive	Yes	No
	Sustainable office design	Yes	No
	Lighting design	Yes	No

The Energize Connecticut ECB initiative offerings and incentive structures are generally similar to C&I new construction programs in Massachusetts and Rhode Island, though there are some notable differences. The new construction offerings are quite similar in terms of the program elements, services, and types of incentives provided. One notable difference, however, is that the Connecticut program has considerably higher incentive amounts for Paths 1, 2, and 3 than the Massachusetts and Rhode Island offerings.¹⁰⁷ Another difference worth noting is that Massachusetts and Rhode Island do not offer tiered incentives for Paths 3 and 4, nor design incentives for Path 4.

Trade allies had mixed opinions about the effectiveness of the multi-end use or tiered incentive structure in motivating customers to complete more comprehensive projects. Only about half (6 of 11) of interviewed trade allies reported that the tiered incentive structure encourages their customers to do more than they otherwise would have as part of their projects. One trade ally who provides engineering services did mention, however, how the tiered incentive structure provides a more equitable incentive structuring, saying:

“The tiers encourage customers to go net zero. [...] I think it's more equitable to have a variety of incentive levels because some projects don't have enough budget for a ZNE building. They may not be able to achieve the top tier, but they have the budget for a lower tier.”

Another trade ally who provided HVAC services highlighted how the incentive structure is useful to customers in showing the financial benefits of pursuing comprehensive projects, saying:

“I think [the tiered incentive structure] is a very powerful tool to show customers the benefit of having comprehensive improvement in their projects. The tiered system also helps upsell rooftop units that fit a certain tier.”

Among the five trade allies who reported that the incentive structure encourages customers to go further, two (one who provided engineering services and one who provided comprehensive energy solutions) specifically noted cost effectiveness challenges for some projects, saying:

“The tiered structure is not very encouraging. To even get a 5% improvement, you're getting \$0.50 to \$0.75 more per square foot. But sometimes it's a lot more work because the things you're installing. If Connecticut is trying to get projects to do deep incentives, there's really nothing there. Tons of work for no payoff. \$10,000 is a drop in the bucket for large projects.”

“Sometimes yes, it is effective. When it is very ineffective, is when there is Tier II and Tier III - lighting is always a part of a project- 80% of our projects have lighting - and not every customer is set up to have lighting controls. Schools for example, don't operate 24/7 and the cost of lighting controls in not always [offset by the savings] ... We end up having to add costs just to get a little more incentive. Not really cost effective.”

Limited promotion of energy modeling by trade allies affects the program's ability to achieve the most comprehensive projects. ECB program Paths 1 and 2 both require that energy modeling be completed for a project to qualify for incentives. While energy modeling is required for these program paths, only half of interviewed trade allies (5 of 11) reported regularly promoting these services to their ECB customers. The trade allies that indicated they promote energy modeling services, reported doing so because incentives are

¹⁰⁷ The evaluation team probed this issue with the utilities, and they reported that this is due to several reasons including differing baselines, different code cycles, and differing rates of available savings. Overall, the result is the cost per kWh of savings tends to be higher in Massachusetts and therefore the ability to pay more incentives decreases in Massachusetts as compared to Connecticut.

available (two mentions), energy modeling improves project cost effectiveness (two mentions), and that modeling is helpful in making decisions about building and equipment optimization (one mention).

Trade allies who indicated they do not promote energy modeling reported having the capacity to do modeling but not regularly promoting it (two mentions) or not promoting modeling for unspecified reasons (three mentions). One trade ally who provided comprehensive energy solutions reported a lack of knowledge of the practice and mentioned that modeling is seen as something only architects are involved with:

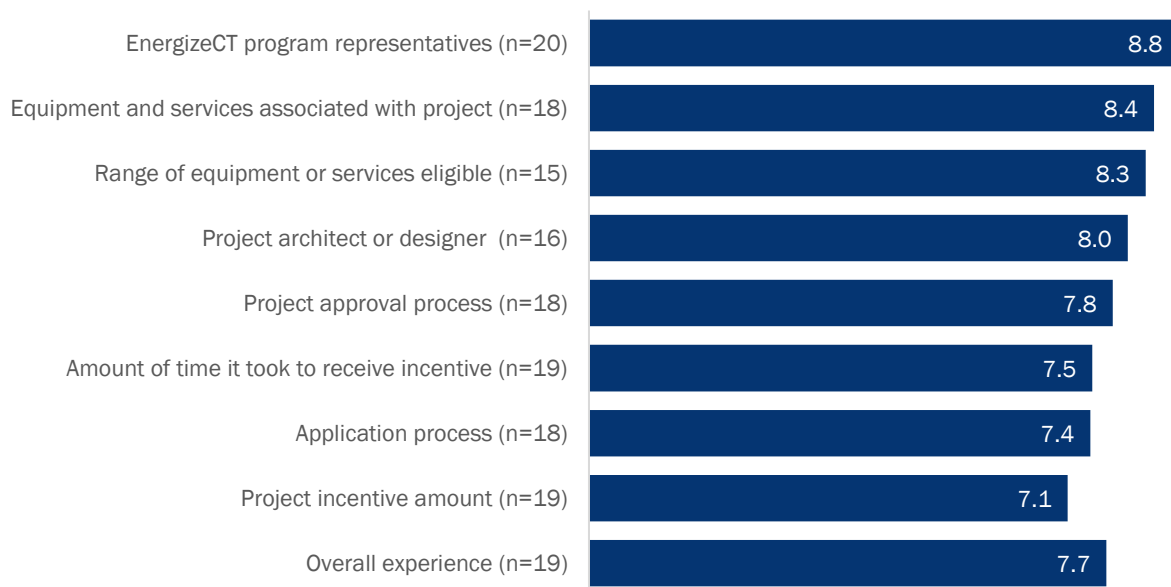
“We do not [promote energy modeling], and that is definitely because of a lack of knowledge... I know there is money out there for energy modeling, but it is viewed as an architect issue.”

9.3.7 ECB New Construction Program Participant and Trade Ally Satisfaction

Consistent monitoring of customer and trade ally satisfaction are necessary, even for mature, long-running programs like the Energize Connecticut programs, to ensure programs are operating effectively.

ECB New Construction participants and trade allies are satisfied with the program elements and experience. None of the interviewed participants scored any of the program elements or their overall experience less than a 7 out of 10. Participants reported being most satisfied with Energize Connecticut program representatives and the equipment and services associated with the project and lease satisfied with the project incentive amount and application process (Figure 59).

Figure 59. Average Participant Satisfaction Level with ECB New Construction Program Elements *



* Note: Analysis excludes “don’t know” and “not applicable” responses.

Trade allies were also generally satisfied with their program experience, noting they were particularly satisfied with the paperwork process (three mentions), communication and responsiveness of program staff (two mentions), program staff level of knowledge, energy modeling guidelines, and the inspection process (one mention each). The contrast between ECB New Construction and EO/ECB Existing Equipment programs in terms of satisfaction with the paperwork process may be the result of the differing forms and documentation

needed for eligible projects. While the latter requires participants to populate an extensive Excel based file, no similar format is required for the ECB New Construction Program.

9.3.8 Free Ridership

The Energize Connecticut ECB New Construction Program is attracting some participants that appear to be free riders, but it may be more complicated than it seems at first glance. About two-thirds (14 of 21) of interviewed participants reported that their participation in the ECB New Construction Program did not affect their project design or equipment choices. At first glance, these would appear to be complete free riders. And high free ridership is not uncommon for new construction programs; recent evaluations of comparable programs have found net-to-gross ratios ranging from 50% to 70%.^{108,109} This issue is currently under exploration as part of a NTG and baseline study for the ECB Program, which should provide additional information on this issue.

When probed further, however, most of these respondents indicated nothing really changed because they were *working with trade allies that were already planning to use energy-efficient equipment and design practices*. Thus, the question really needs to be: *What ultimately influenced their decision to participate?*

When participants did note program influence, it was mostly around equipment choices rather than building design, including

- Different lighting choices (two mentions),
- Upgraded HVAC rooftop units (one mention),
- Program encouraged them to get LEED certified as costs were offset by incentives (one mention), and
- Would not have purchased newest models of equipment (one mention).

9.4 Conclusions & Recommendations

Based on the findings presented above, the evaluation team offers the following recommendations for the ECB New Construction Program going forward:

- **Focus program messaging on how the ECB Program can reduce project costs in addition to annual and life cycle energy costs.** Economic considerations are the top motivators for customers to participate in the ECB New Construction program. The utilities should ensure any marketing and educational materials emphasize rebates and potential cost savings. Messaging should be targeted to customers who are undertaking new construction or major renovation projects but have not previously participated.
- **Program should consider additional outreach specifically to architect and design professionals to locate projects in early planning and design stages and connect with project leads.** To do this, consider reviewing industry publications and databases to identify project leads, attend events where architects and designers attend, including AIA events to connect with design teams, and use public records to locate project in their early phases to engage with owners.
- **Provide educational and workforce training opportunities to increase customer and trade ally understanding of energy efficient building construction and design practices.** Opportunities could

¹⁰⁸ ComEd Programs NTG Approach for CY2020, September 2020, <https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.pdf>.

¹⁰⁹ Opinion Dynamics, Ameren Missouri Program Year 2019 Annual EM&V Report, Vol. 3: Business Portfolio Report, June 2020, <https://efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=936298057>.

include webinars and roundtables focusing on energy-efficient design principles (i.e., ZNE, LEED, etc.) and energy-efficient technologies. Education and training should communicate the specific benefits of pursuing ZNE buildings and setting EUI targets.

- **Target C-PACE financing towards small and medium sized businesses.** Highlighting the benefits to property owners (longer lending terms, no upfront costs, off-balance-sheet) through case studies that include financial benefits of C-PACE. Alternatives to C-PACE financing could include on-bill type financing that is used by the SBEA program.
- **New construction incentive levels in CT are much higher than neighboring states.** Review incentive levels to ensure they are cost effectively driving adequate participation.
- **Improve program evaluability.** This can be achieved by tracking additional project information in program tracking data, including types of incentives received (ECB path, tiered incentives, design team incentives, etc.).



Chapter 10



10. Business and Energy Sustainability (BES)

This chapter summarizes key findings from the research conducted on Energize Connecticut's Business Energy Sustainability (BES) Program in 2019.¹¹⁰

10.1 BES Structure and Initiatives

The BES Program is designed to encourage customers to make *continuous* improvements in their business and facility operations that lead to sustainability and competitive business advantages. BES consists of five specialized initiatives:

- **Operations and Maintenance Services (O&M):** Under O&M, a utility energy expert works with the customer and associated trade allies to identify opportunities for operational and maintenance improvements at facilities. The objective is to improve facility electrical and thermal efficiency through operational changes and repairs rather than capital investments.
- **Process Reengineering for Increased Manufacturing Efficiency (PRIME):** The PRIME initiative is aimed at getting manufacturers to embrace “lean manufacturing.” By providing training, the program aims to streamline product flows, eliminate or reduce waste, improve production efficiency, minimize environmental impacts, and reduce energy costs.
- **Energy Utilization Assessments (EUA):** EUAs are a tool for the BES portfolio to help ensure the delivery of a standardized approach to facility audits. The objective of an EUA is to find “holistic” energy efficiency solutions for customers that focus on low- and no-cost equipment upgrades that can deliver energy savings with quick payback periods.
- **Retro-Commissioning/Continuous Commissioning (RCx/CCx):** Under the RCx/CCx initiative, a pre-qualified retro-commissioning engineer conducts a comprehensive assessment, including diagnostic monitoring, of a customer’s facility. The assessment involves examining how the facility’s mechanical equipment, lighting, and related controls operate and function together. Recommendations are made for fine-tuning existing systems/controls, O&M improvements, and potentially new low-cost improvements that can be made to enhance overall building performance.
- **Strategic Energy Management (SEM):**¹¹¹ SEM is a long-term approach that focuses on setting goals, tracking progress, and reporting results. SEM is offered under the Business Sustainability Challenge umbrella, which assists customers with SEM and Strategic Energy plans, as well as facilitates peer roundtables. The goal of this approach is to establish long-term relationships with customers and target persistent energy savings.

Comparison to Other Jurisdictions

Given the suite of offerings included under the BES umbrella, it was challenging for the evaluation team to find comparable programs that aligned with all the BES subprograms. In general, the comparison programs identified focused on RCx and O&M offerings, although some included features similar to the PRIME and EUA subprograms. Overall, the evaluation team identified six programs that we felt were comparable to the BES Program in Connecticut on some level (see Table 47).

¹¹⁰ Details regarding the sample design and methods are provided in Appendix A.

¹¹¹ Although SEM is part of the BES program, it is not included in this study as no projects were completed as of December 2019.

While many utilities offer retro-commissioning and O&M-type programs, as in Connecticut, they are tailored to the specific needs of customers within their service territories. As such, while there are broad similarities in program designs and delivery channels overall, the specifics of targeted customers, pathways to participation and incentive designs are quite varied and, in some cases, not documented in the evaluation literature at the level of detail needed to draw out applicable best practices. That said, Table 47 includes a snapshot of comparative information across these programs. Additionally, the evaluation team explored the experiences of trade allies active in both the Connecticut, Massachusetts and Rhode Island programs (see Section 10.3.7).

Table 47. BES Program Comparisons

Comparison Program	Services/Focus Areas	Measures/Offerings	Incentives
CT EEB (CT)	RCx, Monitoring-Based Commissioning (MBCx), O&M, Audits, Manufacturing		
Massachusetts Program Administrators (MA)	RCx	Low-Cost tuning solutions, targeted systems, whole building and process tuning, monitoring-based commissioning	
Efficiency Maine Trust (ME)	RCx	Focus on optimization of existing building management systems and/or automated lighting controls	50% of the RCx study and measure implementation costs
Ameren Illinois (IL)	RCx	Compressed air, industrial refrigeration, large facilities, retro-commissioning lite, and grocery store	70-100% of study cost and implementation incentives of \$0.02/kWh and \$0.3-0.4/therm
ComEd, Peoples Gas, Northshore Gas and Nicor Gas (IL)	RCx	Systematic evaluation of building systems	100% of the RCx study cost contingent upon customer commitment to spend a defined amount of their own money implementing recommendations
ComEd (IL)	Operational Efficiency Industrial Systems Optimization	Lighting, HVAC, chillers, VFDs, motors, compressed air, heating equipment, water heating equipment, commercial kitchen equipment, HVAC controls systems Air leak repair, no-loss drain, optimization, engineered nozzle, compressor, controls, dryer	
Xcel (CO)	Process Efficiency	Code compliant technologies, LEED certification, lighting, HVAC, controls	
NEEA (OR)	Lean Manufacturing (single project case study)	Process upgrades	N/A

10.2 Respondent Characteristics

For this study, the evaluation team conducted in-depth interviews with 10 of 32 trade allies serving the BES Program and 15 of 109 participants in the BES Program. The following section summarizes the composition of the two groups we interviewed.

10.2.1 Participant Characteristics

Participants in the BES initiatives represent two distinct groups: (1) very large sites across a variety of industries or (2) smaller manufacturing facilities, mostly machines and machine parts. Eight (of 15) participant respondents represented sites that were over one million square feet and the remaining seven represented smaller manufacturers responsible for making food, machine parts, and semiconductors. Six of the respondents representing the largest sites indicated their site is a campus setting and three reported having multiple sites in Connecticut, all of which have taken part in Energize Connecticut programs in the past (Table 48).

Table 48. Interviewed BES Participant Characteristics

Title/Role	Years in Role	Building and Industry	Size or Sq. Ft.	Multiple Sites in CT	Other Sites do ECT	Campus
Director of Physical Plant	35	College	300 Bldgs.			✓
Architect	4	College	30+ Bldgs.	✓	✓	✓
Plumbing Team Lead	25	Manufac. Mining Eq.	200 Bldgs.			✓
Electrical Maintenance Manager	11	Entertainment	10,000,000			✓
Facilities Energy Manager	4	Manufac. Aerospace	2,750,000	✓	✓	✓
Dir. of Engineering and Plant Ops.	3	Hospital	2,250,000	✓	✓	
Director of Facilities	11	Offices - Insurance	1,500,000			✓
Facilities Operation Manager	4	Hospital	1,000,000			
Facilities Engineer	40	Manufac. Semicond.	350,000			
Technical Manager	22	Manufac. Cables	290,000			
Plant Manager	12	Manufac. Food	150,000			
Mgr. of Environ. Health and Safety	3	Manufac. Metals	70,000			
Mgr. of Continuous Improvement	22	Manufac. Mach. Parts	65,000			
Vice President	16	Manufac. Ind. Equip.	35,000			
Director of Facilities	12	Manufac. Mach. Parts	20,000			

10.2.2 Trade Ally Characteristics

A diverse group of trade allies support the BES initiatives by providing a range of services to BES participants that tend to represent large facilities and manufacturing sites.

Trade ally respondents were senior staff, represented a diversity of services, served a mix of commercial and industrial customers, and they mostly served medium and large customers. Trade allies tended to serve industrial customers more than commercial customers and they heavily served medium and larger businesses as opposed to smaller businesses during the evaluation period (Table 49).

Table 49. BES Trade Ally Experience among Interviewed Participants

Title/Role	Principal Service	Percentage of Work		Percentage of Customers	
		Comm.	Ind.	Small Business	Med./Large Business
Director of Sales	Building controls	35%	65%	0%	100%
Senior Sales Engineer	Steam specialists	<50%	>50%	0%	100%
Steam Division Manager	Steam specialists	75%	25%	0%	100%
Technical Director (Former VP)	Engineering assessments	<50%	>50%	0%	100%
Project Development Manager	EE installations	75%	25%	20%	80%
President	Operational improvements	0%	100%	0%	100%
Sales and Rental Manager	Compressed air surveys	20%	80%	0%	100%
Managing Member	Operational improvements	0%	100%	100%	0%
Dir. of Cx and Energy Services	Retro-commissioning	80%	20%	0%	100%
Product Manager	Operational improvements	15%	85%	0%	100%

10.3 Key Findings

10.3.1 BES Program Ecosystem

The BES Program is best viewed as an ecosystem consisting of a wide range of market actors, including participants, contractors and other trade allies, and utility representatives. Most of these actors have well-established relationships and have been working together for a number of years across numerous projects.

Overall, there is a well-developed, mature BES ecosystem in Connecticut consisting of participants, trade allies, utilities, and the market. BES participants have long-standing and ongoing relationships with utility staff. Among the participants interviewed, all (15 of 15) had been working with the utilities on energy efficiency projects for multiple years. Six reported at least 10 years of activity with the utilities while four reported at least four years, two reported between two and three years and one did not specify exactly how many years but referred to a very long history of engagement.

Almost all participants (13 of 15) and trade allies (8 of 10) reported regular interactions with utility staff. Among the 13 participants reporting regular interactions with utility staff, several mentioned utility staff by name, one reported monthly meetings with utility staff, and another reported partnering with the utility on a lighting study. One respondent also mentioned how utility staff would sometimes provide project incentive checks in-person (prior to COVID-19). Four trade allies mentioned some type of coordination like email and phone calls with utility staff to discuss projects. Five trade allies noted working with utility staff on a customer site.

All BES trade allies rely on repeat business and referrals to develop BES projects. While trade allies also use other outreach means (cold calls, utility leads, mass marketing, etc.), they tend to rely most on repeat business, referrals, and the long-established Energize Connecticut services in the state.

“We go back year after year [to the same site] for energy savings” – Steam specialist

“[The commercial and industrial market] knows that that's the way the game is played. You involve the utility and you try to maximize their involvement to minimize your costs. Nothing gets done energy wise in Connecticut...without the utilities involvement. Nothing.” – Engineer

10.3.2 Barriers to and Drivers of Program Participation

All energy efficiency programs are designed to overcome customer barriers to implementing more energy-efficient measures or behaviors in their facilities. The BES Program is not different in purpose. The wide range of specialized services offered under the different BES initiatives, however, enables BES to help customers overcome a greater diversity of barriers than similar energy efficiency programs in other jurisdictions.

The different BES offerings are needed to address the broad range of customer barriers and needs. Trade allies report a diversity of barriers to customers taking energy-efficient actions. Those barriers generally pertain to the specific circumstances of a client as opposed to systemic or overarching issues. Six of the trade allies reported the following nine barriers to completing energy efficiency projects:

- Customers leasing their property (one Building Controls Specialist)
- Accessing a site, especially if a customer needs to cease production to accommodate a project (one distributor/operations improvement)
- Finding qualified people to complete installation of some projects (one maintenance specialist)
- Overcoming customer reluctance to believe adequate savings will result from a project (one steam specialist)
- Accessing the right decision makers at a site (one equipment installer)
- Having inadequate space to complete a project such as when needing to move a large air compressor (one compressed air specialist)
- Inadequate financing available to the customer (one compressed air specialist)
- Inadequate power supply on-site to support new replacement equipment (one compressed air specialist)
- Inadequate building management system for RCx (one commissioning agent)

While energy savings is important, there are a mix of reasons for participation. Trade allies reported that customers participate in the BES initiatives for many reasons: energy savings (eight mentions), operations and maintenance improvements (six mentions), recovering systems benefit charge money (four mentions), improving productivity (three mentions), and safety (one mention). Both trade allies that worked with the PRIME initiative noted that improving productivity was a key reason to participate.

10.3.3 Customer Decision-Making

The decision-making process around participating in energy efficiency programs is almost always complex. Potential benefits need to be weighed against the expected costs and the most cost-effective path forward

needs to be determined.¹¹² This becomes even more complicated when dealing with non-residential customers—especially larger customers—as the number of people involved in the decisions and the different types of information they may need can quickly grow. However, non-residential customers are generally wiser to long-term financial implications than residential customers.

Decision-making for BES projects is complex and information needs vary. Decision-making at BES participant sites often involves multiple people and can even involve people located outside Connecticut. In addition to the respondents, decision makers include facility/maintenance managers (eight mentions), senior management like CEOs/Vice Presidents (six mentions), financial staff like comptrollers or CFOs (three mentions), and technical staff like engineers and operations directors (two mentions).

BES participants tend to take a long-term view when considering building and process improvements. The respondents representing the seven largest sites and three respondents representing smaller manufacturers reported prioritizing long-term savings over upfront cost when considering energy-efficient equipment. Of the 10 respondents that reported some type of payback requirement when considering projects, half indicated they would consider projects with five-year or longer payback periods. This commitment to relatively long payback periods and long-term savings suggests that this group is different from other business participants who often report upfront cost as their primary concern and payback requirements are often just one to two years.

That said, while longer term energy savings is generally a bigger concern than upfront cost, customer size matters. Larger participants are more concerned with long-term savings, while smaller customers are equally likely to be concerned with upfront costs indicating that payback needs vary. Further, as shown in Table 50, payback requirements vary widely across participating customers from no payback requirements (5 of 15) to more than five years (5 of 15).

Table 50. Key Factors in BES Participant Decision-Making

Customer Size	Building Type	Size/Sq. Ft.	Upfront Cost	Long-Term Savings	Payback Requirements
Large	College	300 Bldgs		✓	4 to 10 years
	College	30+ Bldgs		✓	5 years
	Manufac. Mining/Explosives	200 Bldgs		✓	1 year
	Entertainment	10,000,000		✓	None
	Manufac. Aerospace	2,750,000		✓	5 years
	Hospital	2,250,000		✓	5 years
	Offices - Insurance	1,500,000		✓	2.5 years
Small	Hospital	1,000,000	✓		None
	Manufac. Semiconductors	350,000		✓	None
	Manufac. Cables	290,000	✓		2.5 years
	Manufac. Food	150,000	✓		3 years

¹¹² This is an oversimplification. “Cost-effective” has a very specific meaning in the energy industry, and there are rules about what costs and benefits should be included and how they should be measured. There are often benefits (and costs) that are not typically or easily measured that factor into customers’ decisions of whether or not to go with energy efficient-equipment upgrades (e.g., equipment reliability, minimization or elimination of down-time, comfort, productivity, product quality, emissions or environmental impacts, etc.). This is especially true of non-residential customers. The evaluation team thinks these non-energy benefits are often overlooked and should be incorporated into the discussions with customers as well as marketing and promotional materials designed to entice customers to participate.

Customer Size	Building Type	Size/Sq. Ft.	Upfront Cost	Long-Term Savings	Payback Requirements
	Manufac. Metals	70,000		✓	< 10 years
	Manufac. Machine Parts	65,000		✓	None
	Manufac. Industrial Equipment	35,000	✓		None
	Manufac. Machine Parts	20,000	✓		1 year

Participant respondents and their colleagues also need information about equipment reliability and how a project comports with facility plans and productivity. Five of the 15 BES participants reported needing information about equipment reliability, quality, and support provided by the installer or manufacturer. Four of the participant respondents need to know how a potential project would affect other site plans. For example, one university respondent needs to know if he should make an upgrade based on the campus master plan. If the master plan calls for selling or repurposing a building in three to five years, it would not make sense to complete a project with a five-year payback period. Two other participants reported needing to know how an energy efficiency project would affect occupancy or productivity. One large manufacturer noted that pausing production or changing occupancy of a building to accommodate a project can be expensive, stating “downtime costs a lot of money.”

Those customers successfully engaging in BES tend to have at least one business practice aimed at managing energy use, which aids in the decision-making process. Most BES participants have a dedicated staff person responsible for managing energy use (11 of 15) and over half (8 of 15) also have policies in place to purchase energy-efficient equipment, regardless of size (square footage) or whether they have energy savings goals. However, large participants were more likely to have defined goals related to saving energy or reducing carbon emissions. These findings speak to the relative sophistication of current BES participants, which aligns with earlier findings related to long-term participation and engagement with utility staff.

Table 51. Energy Efficient Business Practices among BES Participants

Building and Industry	Size or Sq. Ft.	Person Resp. For Energy Use	Defined Energy Saving Goals	Defined Carbon Goals	Policy to Purchase EE Equip.
College	300 Bldgs.	✓	✓	✓	✓
College	30+ Bldgs.				
Manufac. Mining/Explosives	200 Bldgs.				
Entertainment	10,000,000	✓			
Manufac. Aerospace	2,750,000	✓	✓	✓	✓
Hospital	2,250,000	✓			
Offices – Insurance	1,500,000	✓	✓	✓	✓
Hospital	1,000,000	✓	✓	✓	✓
Manufac. Semiconductors	350,000	✓	✓	✓	✓
Manufac. Cables	290,000				
Manufac. Food	150,000	✓			
Manufac. Metals	70,000	✓			✓

Building and Industry		Size or Sq. Ft.	Person Resp. For Energy Use	Defined Energy Saving Goals	Defined Carbon Goals	Policy to Purchase EE Equip.
Manufac. Parts	Machine	65,000	✓			✓
Manufac. Equipment	Industrial	35,000	✓	✓	✓	✓
Manufac. Parts	Machine	20,000				

Given the suite of BES offerings, financing is not typically needed to encourage participation. As noted, most BES initiatives focus on identifying low- and no-cost measures or upgrades through site-surveys; the utilities cover part or all of the cost of these studies and provide additional incentives through other programs or on a custom basis. As such, only 2 of 15 participants (both small manufacturers) reported any use of financing. One used conventional financing with better rates than the Connecticut Green Bank and one reported using on-bill financing.

As such, there do not appear to be any systematic barriers to participants using financing to fund energy-efficient investments through the BES Program. Instead, the decision to use financing appears driven by the specific needs of customers participating in this diverse program.

“...like I said, the payback is so good that they don't have to finance it.” (Steam specialist)

Industrial customers “want to just finance the project themselves. We don't have to deal with those alternative financing mechanisms.” (Engineering Assessment Professional)

“If they say they don't have money, I would offer financing, but that has not really happened yet.” (Equipment Distributor/Assessor)

10.3.4 Comprehensiveness and Deep Savings

The BES Program and its initiatives tend to support comprehensiveness *by design*. That is, the initiatives are designed and implemented in a way that focuses on making continuous energy efficiency improvements within the participants facilities. However, a key consideration is that *comprehensiveness tends to arise over time, and not always within a project*.

The BES Program supports comprehensive and deep savings by design. Each initiative aims to help customers identify energy savings over time through regular interactions with the initiatives or via training and support that enables customers to identify savings opportunities over time.

- The Operations and Maintenance (O&M) initiative, the most used of the BES initiatives, builds equipment recommendations and repairs into the process and incentive structure. Participants in this initiative often use the initiative annually to ensure steam and compressed air systems are operating as efficiently as possible.
- The retro-commissioning (RCx) initiative supports customers by helping them find no- and low-cost measures to ensure savings over time.
- The Process Reengineering for Increased Manufacturing Efficiency (PRIME) initiative and the Energy Utilization Assessments (EUA) initiatives assist the manufacturing customer segment by identifying

ways to increase production while using the same or less energy as they did before they participated in the initiative.

BES participants tend to be comprehensive customers, but over time. BES participants have extensive experience using Energize Connecticut programs and services with most indicating they installed multiple end uses in recent years with support from the program. All participants reported doing a lighting project with support from Energize Connecticut, and the majority of participants reported doing steam, HVAC, and motors projects in recent years (Table 52).

Table 52. BES Participant Experience Installing Measures with Energize Connecticut

Building and Industry	Lighting	Steam	HVAC	Motors	Compressed Air	Sum of Measures
College	✓	✓	✓	✓		4
Manufac. Metals	✓	✓	✓	✓		4
Manufac. Food	✓	✓	✓	✓	✓	4
Entertainment	✓	✓	✓	✓		4
Manufac. Aerospace	✓	✓	✓	✓	✓	4
Hospital	✓	✓	✓	✓		4
Manufac. Cables	✓		✓	✓	✓	3
Manufac. Machine Parts	✓		✓	✓	✓	3
College	✓	✓	✓			3
Offices – Insurance	✓	✓	✓			3
Manufac. Semiconductors	✓	✓		✓		3
Manufac. Machine Parts	✓		✓		✓	2
Manufac. Mining/Explosives	✓	✓			✓	2
Hospital	✓		✓			2
Manufac. Industrial Equipment	✓					1
Total	15	10	12	9	6	

10.3.5 Trade Ally Satisfaction and Recommendations for Improvement

Trade allies are quite satisfied but offer some recommendations for improvement. TAs are largely satisfied with the program (7 of 10 expressed high levels of satisfaction while 3 of expressed moderate levels of satisfaction) and none expressed dissatisfaction. Nine of 10 TAs also mentioned a recommendation for improvement, but none seemed to characterize these recommendations vital to the success if the program. The recommendations related to improving:

- **Program processes** by making the program experience uniform across Eversource (EV) and United Illuminating (UI) territories, paying incentives faster, and streamlining the participation process.

- **Outreach** by increasing the frequency of outreach to customers about Energize Connecticut and BES opportunities, improving communication to trade allies about program changes, and improving communication about the program during the COVID-19 pandemic.
- **Program rules** by providing a waiver for larger projects,¹¹³ supporting infrared drone surveys of large buildings to detect heat loss, requiring customers to analyze savings six and 12 months after a retro-commissioning project, and not requiring steam specialists to submit projects by the end of the calendar year which is often the busiest time of year for steam projects.

Table 53 summarizes trade allies’ recommendations for improvement.

Table 53. BES Trade Ally Satisfaction and Recommendations for Improvement

Recommendation for Improvement	Number of Respondents (n=10)
Make UI and EV experiences more consistent	5
Increase outreach of BES and Energize CT	4
Improve communication about the program	3
Pay incentives faster	2
Streamline the participation process	2
Improve outreach during the pandemic	2
Provide a waiver for large projects	1
Support drone surveys	1
Analyze savings for RCx 6–12 months after project completion	1
Align program rules with weather	1

10.3.6 Differences in Program Experiences across Utilities

The BES initiatives are very customer-specific, and the utilities often have a greater role in many of these projects, with customer interactions with utility representatives being the norm. Understanding any notable differences between the utility delivery processes can point to areas for potential improvement.

While trade ally respondents generally completed more BES Program work in the Eversource territory than UI simply because of the utility’s relative sizes, several trade allies reported different experiences with Eversource and UI. Four of these five allies expressed some frustration with the UI experience, but nothing systematic. Specifically:

- Two trade allies working in operational improvement reported that UI does not support the PRIME initiative while Eversource does.
- Another operational improvement trade ally reported that UI pays 50% for steam trap surveys whereas Eversource pays 100%. Unsurprisingly, this trade ally prefers the 100% incentive and reported that the higher incentive encourages customers to participate more.
- An engineering trade ally reported that UI takes longer to process applications even though, according to this respondent, UI has more staff per customer than Eversource.

¹¹³ According to one respondent, large steam trap surveys can exceed the cap for incentives for the BES program. In these instances, the ally must break the project into multiple steam trap assessments and submit multiple applications instead of just one.

- One installer trade ally reported preferring UI’s application process over the Eversource process. According to this respondent, UI was more flexible with deadlines and had a more “traditional” Excel-based approach that was easy to use compared to Eversource’s “very engineer” focused application process.

Table 54. Trade Allies Work Experience with United Illuminating and Eversource

Principal Service of Respondent	Percentage of Work in Territory	
	Eversource	United Illuminating
Engineering assessments	50%	50%
EE installations	80%	20%
Operational improvements	100%	0%
Operational improvements	95%	5%
Distributor/Op. improve.	80%	20%
Building controls	Don't know	Don't know
Steam and EE specialists	70%	30%
Steam and EE specialists	33%	66%
Compressed air	60%	40%
Commissioning	75%	25%

10.3.7 Experiences Across Other Jurisdictions

Understanding how the Energize Connecticut BES initiatives compare to similar offering in other jurisdictions can help point to potential areas for improvement.

Trade allies reported that the Energize Connecticut programs generally compare favorably to the programs in Massachusetts and Rhode Island. Eight of the 10 trade allies had enough experience with programs in Massachusetts or Rhode Island to compare with the Energize Connecticut services for commercial and industrial customers.

- **Four allies were indifferent about their experiences in the two regions.** One steam specialist stated, “the programs are very similar” and an installer stating that overall, the programs “are about the same.”
- **Two trade allies specified attributes they liked about non-Connecticut programs.** These two trade allies, a compressed air provider and an energy management system provider, preferred the quicker turnaround time to receive incentives in Massachusetts and Rhode Island. The energy management system provider also liked the ability to negotiate incentives in Massachusetts, something not allowed in Connecticut.
- **Two trade allies specified attributes they preferred about the Energize Connecticut programs compared to programs in Massachusetts/Rhode Island.** A steam specialist reported that incentives are higher in Connecticut and the commissioning agent reported that the RCx initiative is better in Connecticut because it does not rely on ESCOs and performance contracting to do RCx work.

10.4 Conclusions & Recommendations

Overall, BES can be viewed as a well-developed, mature, and diverse ecosystem of participants, trade allies, utilities, and the market. This ecosystem has fostered ongoing relationships with a relatively small group of

customers (107 associated accounts numbers in 2019). Savings delivered through pathways such as O&M and RCx, since they are whole facility, inherently result in comprehensive and deep savings. Given that these types of offerings are very specific and intended to apply to a small set of customers, the level of participation in BES is generally in line with expectations and what the evaluation team sees for similar programs in other jurisdictions. That said, there may be potential equity concerns related to the BES Program given that the same large customers tend to participate year-after-year. While this is good for comprehensive savings, it is likely not very equitable.

Based on the findings presented above, the evaluation team offers the following recommendations for the BES Program going forward:

- **Expand outreach to new customers.** the utilities should conduct targeted outreach to manufacturing, educational, and hospital facilities that have not participated to date. These business sectors serve as the foundation for current participation and a compelling case can likely be made that they would get value out of the program, particularly using the experiences of similar customers. This strategy should involve leveraging existing utility staff and/or trade ally relationships where possible and creating incentives such as contests or rewards for those that bring in *new* customers.
- **Collaborate across utilities to better understand differences between UI and Eversource implementation and make changes where feasible to make participation more consistent.** Trade allies alluded to some differences between the utility programs that could affect performance. While the differences did not appear systematic, it is clear some things are being done differently across the utilities. Ensure these differences are understood and use them as an opportunity for improvement. The utilities should meet to collaborate on the participation process and identify places they could better align the process or requirements. Ideally, the utilities should work together to derive a single method for project submission, documentation, data collection, and tracking, which would make evaluation and assessment much easier.
- **Both Utilities need to track BES Program participation as well as detail on which sub-initiative the customer participated in.** The Eversource program tracking data provided a field indicating if a project was a BES project along with the associated sub-initiative. For UI, it was much more complicated. The evaluation team was first told that UI had not done any BES work in the 2017–2019 timeframe. With further probing they acknowledged that they did but said they did not track them as BES projects. In the end, UI did provide the evaluation team with two separate files: (1) O&M projects, and (2) RCx projects.



Appendices



Appendix A. Detailed Evaluation Methods

Research Objectives

In alignment with the cross-program framework guiding this research, we developed a set of research objectives common to all programs, as well as program-specific research objectives.

Cross-Cutting Research Objectives

- Assess the paths and time frames of energy efficiency (EE) adoption
- Understand customer decision-making around adoption of EE and program participation
- Determine if the CT EE programs are meeting customers' needs and identify where gaps might exist
- Examine how the programs currently attempt to obtain deep savings, comprehensive projects, and maximum adoption and what alternatives might be more effective
- Assess the capability of the market to deliver program projects
- Identify how utilities are ensuring quality and continuity in savings across custom measures/projects. Determine if there are feedback loops
- Describe and assess utility and contractor outreach efforts offering technical assistance, financing options, and other solutions to customers
- Understand programs' coverage of the C&I sector
- Identify the roles tenants play in affecting EE upgrades
- Identify differences between UI and Eversource in terms of account management
- Determine how the program compares to similar programs in other jurisdictions (especially RI and MA programs)
- Assess program data collection and tracking

Energy Opportunities (EO) Research Objectives

- Assess how contractors interact with customers and operate in the field
- Assess the role played by national accounts
- Assess the role and performance of "remote audits"
- Identify how, if at all, the end use of the building affects participation in EO
- Understand nuances of program

Upstream Lighting (EO-UL) Research Objectives

- Determine how utilities account for and manage leakage
- Assess distributor satisfaction with the program and its processes
- Determine how the program is affecting distributor stocking and sales practices
- Determine reasons for differing performance compared to similar programs and jurisdictions

Energy Conscious Blueprint (ECB) Research Objectives

- Assess the degree requirements by national accounts to follow established national design templates limit program influence on new construction project design
- Assess the awareness of the ECB program among market actors (building and business owners; architects, designers and contractors) and differences in rules and requirements from those of the EO program
- Assess how utility engineers and contractors interact to provide comprehensive non-lighting projects
- Identify how, if at all, the end use of the building affects participation in ECB
- Assess participation of design community
- Assess barriers to taking a whole-building approach

Business and Energy Sustainability (BES) Research Objectives

- Assess how utility engineers and contractors interact to provide comprehensive non-lighting projects
- Assess how each BES initiative drives deeper and comprehensive savings
- Assess interaction of each BES initiative with other BES initiatives as well as other EE programs

EUA

- Understand how participants are chosen
- Assess diffusion of energy management practices across sites
- Assess the degree to which the EUA cost-sharing spurs audit recipients to act
- Assess the timeline for carrying out EUA audit-recommended upgrades

PRIME

- Understand how participants are chosen
- Assess diffusion of energy management practices across sites
- Assess the value of the PRIME-funded assessments and vendor training

Retro-Commissioning

- Assess how well RCx/CCx vendors explain the purpose of commissioning, including the long-term maintenance activities

O&M

- Assess how well utility staff explain the benefit to making O&M changes to save energy
- Assess the adoption and persistence of the recommended O&M changes

Research Activities

EO and ECB Existing Equipment Participant Survey

Between December 2020 and January 2021, the evaluation team conducted a quantitative online survey with customers who participated in the EO or ECB Existing Equipment programs. A total of 1,380 EO and ECB existing equipment projects were completed in 2019 among 667 unique participants (Table 55). The team invited all 667 participants to complete an online survey to better understand their program experience. Of the 667 participants, 61 screened out of the survey. A total of 69 EO and ECB existing equipment participants completed the survey resulting in a 11% overall response rate.

Table 55. EO and ECB Existing Equipment Participant Sample Frame and Completed Surveys, by Utility

Program	Eversource			United Illuminating			Total Completion Surveys
	Projects	Sample Frame	Completed Surveys	Projects	Sample Frame	Completed Surveys	
EO	548	177	37	215	113	4	41
ECB EE*	142	107	17	475	270	11	28
Total	690	284	54	690	383	15	69

*UI data does not differentiate between ECB existing equipment and ECB New Construction programs. We determined UI ECB new construction participants through screening questions in the EO/ECB – ER participant survey.

EO and ECB Existing Equipment Trade Ally Survey

Between October and December 2020, the evaluation team conducted a quantitative online survey with trade allies who were involved completing projects that received incentives through the EO and ECB existing equipment programs. The team identified 118 unique trade allies involved in the 1,380 EO and ECB existing equipment projects completed in 2019 (Table 56). The team invited all 118 trade allies to complete an online survey to better understand their program experience. Of the 118 participants, 11 screened out of the survey. A total of 34 EO and ECB existing equipment trade allies completed the survey resulting in a 29% overall response rate.

Table 56. EO and ECB Existing Equipment Participant Sample Frame and Completed Surveys, by Utility

Program	Eversource			United Illuminating			Total Completion Surveys
	Projects	Sample Frame	Completed Surveys	Projects	Sample Frame	Completed Surveys	
EO	548	69	22	215	116	3	25
ECB EE*	142	26	9	475	7	0	9
Total	690	95	33	690	23	3	34

Upstream Lighting Participating Distributor In-Depth Interviews

The evaluation team conducted telephone-based in-depth interviews with Upstream Lighting participating distributors serving Connecticut.¹¹⁴ The program implementer, Energy Solutions, provided the team with a list of all current participating distributors as of 7/13/2020, including contact information and rankings of level

¹¹⁴ The initial research plan also included interviews with non-participating distributors. However, the evaluation team was unable to find any non-participating distributors after extensive Internet searches and an assessment of Hoovers database using the search criteria of "Connecticut" with a "5063" SIC code (Electrical Apparatus and Equipment Wiring Supplies, and Construction Materials).

of program participation. The list included a total of 36 unique participating distributors throughout the state of which we completed 10 participating distributor interviews, who represent roughly 40% of total 2019 Upstream Lighting Program activity.¹¹⁵ Table 57 shows the sample design for the Upstream Lighting participating distributors.

Table 57. EO Upstream Lighting Distributors Sample Frame and Completed Interviews

Distributor Type	Estimated Population	Completed Interviews	
		Eversource	UI
Participating	36	7	3

ECB New Construction and Major Renovation Participant In-Depth Interviews

Between November 2020 and January 2021, the evaluation team conducted qualitative in-depth interviews with customers who participated in the ECB New Construction and Major Renovation programs. A total of 189 Eversource ECB projects were completed in 2019 among 143 unique participants (Table 58). Note that the number of United Illuminating ECB New Construction projects is unknown because United Illuminating does not track this distinction; the evaluation team attempted to determine if United Illuminating ECB projects were new construction or major renovation via screening questions in the EO and ECB existing equipment participant survey. Of the 270 United Illuminating ECB participants invited to take the EO and ECB existing equipment participant survey, five indicated they had completed a new construction or major renovation project and were asked to complete an in-depth interview about their experience. Ultimately, no United Illuminating ECB New Construction and Major Renovation participants complete an interview. The team completed interviews with 21 ECB New Construction and Major Renovation participants resulting in a 15% overall response rate.

Table 58. ECB New Construction and Major Renovation Participant Sample Frame and Completed Interviews, by Utility

Program	Eversource			United Illuminating			Total Completed Interviews
	Projects	Sample Frame	Completed Interviews	Projects	Sample Frame	Completed Interviews	
ECB - Major Renovation	73	49	15	Unknown	5	0	15
ECB - New Construction	86	70	4				4
ECB - New Equipment	30	24	2				2
Total	189	143	21	Unknown	5	0	21

ECB New Construction and Major Renovation Trade Ally In-Depth Interviews

Between November 2020 and January 2021, the evaluation team conducted qualitative in-depth interviews with trade allies who were involved in projects that received ECB New Construction and major renovation incentives. A total of 57 trade allies were involved with ECB New Construction and Major Renovation projects in 2019 (Table 59). As mentioned above, the number of United Illuminating ECB New Construction and Major Renovation projects is unknown, thus the team was unable to determine which trade allies were involved in these projects. Only one trade ally who was initially invited to complete the EO and ECB existing equipment trade ally survey reported being involved in a United Illuminating ECB New Construction project completed and

¹¹⁵ Note that many of the unique distributors operate more than one location in the state.

interview. The team completed interviews with 11 ECB New Construction and major renovation participants resulting in a 19% overall response rate.

Table 59. ECB New Construction and Major Renovation Trade Ally Sample Frame and Completed Interviews, by Utility

Program	Eversource			United Illuminating			Total Completed Interviews
	Projects	Sample Frame	Completed Interviews	Projects	Sample Frame	Completed Interviews	
ECB – Major Renovation	73	22	0	Unknown	Unknown	0	0
ECB – New Construction	86	39	7			1	8
ECB – New Equipment	30	7	3			0	3
Total	189	57	10	Unknown	Unknown	1	11

*Note that this includes one United Illuminating TA.

BES Participant In-Depth Interviews

Between November and December 2020, the evaluation team conducted in-depth interviews with participants who completed projects that received incentives through the BES program. A total of 197 BES projects were completed in 2019 among 109 unique participants (Table 60). The team invited all 109 participants to complete an in-depth interview to better understand their program experience. A total of 15 BES participants completed an interview resulting in a 14% overall response rate.

Table 60. BES Participant Sample Frame and Completed Interviews, by Utility

Program	Eversource			United Illuminating			Total Completed Interviews
	Projects	Sample Frame	Completed Interviews	Projects	Sample Frame	Completed Interviews	
BES – EUA	2	2	0	3	2	0	0
BES – RCx	14	12	0	4	1	0	0
BES – OM	67	46	11	58	20	2	13
BES – PRIME	49	26	2	0	0	0	2
Total	132	86	13	65	23	2	15

BES Trade Ally In-Depth Interviews

Between October and November 2020, the evaluation team conducted in-depth interviews with trade allies who were involved in projects that received incentives through the BES program. A total of 32 trade allies were involved with BES projects in 2019 (Table 61). The team invited all 32 trade allies to complete an in-depth interview to better understand their program experience. A total of 10 BES trade allies completed an interview resulting in a 31% overall response rate.

Table 61. BES Trade Ally Sample Frame and Completed Interviews, by Utility

Program	Eversource			United Illuminating			Total Completed Interviews
	Projects	Sample Frame	Completed Interviews	Projects	Sample Frame	Completed Interviews	
BES - EUA	2	2	1	3	0	0	1
BES - RCx	14	1	1	4	1	0	1
BES - OM	67	20	7	58	3	0	7
BES - PRIME	49	5	1	0	0	0	1
Total	132	28	10	65	4	0	10

Non-Participant Survey

Between November and December 2020, the evaluation team conducted surveys with customers in the utility data system who did not participate in any Energize Connecticut programs from 2017 to 2019. Since these non-participants did not participate in a program, the team did not have appropriate contact information (i.e., email address and contact names). We provided Infogroup, a marketing services provider, with the complete de-duped list of non-participant companies and directed them to append contact names and email addresses for contacts who had a role or title that would likely be qualified to complete the survey (e.g., facilities manager, operations manager, owner, or other executive staff). Contact information was appended to a random selection of non-participant companies. The final sample frame consisted of 5,101 unique contacts from Eversource and 1,701 from United Illuminating (Table 62). The team invited all 6,802 participants to complete a survey to better understand barriers they may face to completing energy efficiency upgrades and what may prevent them from participating in utility programs. Of the 6,802 non-participants, 63 screened out of the survey. A total of 93 non-participants completed a survey resulting in a 1.4% overall response rate.

Table 62. Non-Participant Survey Sample Frame and Completed Surveys, by Utility

Utility	Number of Unique Companies (Population)	Sample Frame	Total Completed Surveys
Eversource	96,578	5,101	80
United Illuminating	31,776	1,701	13
Total	128,354	6,802	93

Appendix B. Detailed Project Data Issues

Chapter X discussed the data needed to conduct the evaluation and profiling tasks and provided some recommendations on how data might be improved to better support evaluation, profiling analyses, program management, and customer targeting. This appendix lists some of the specific challenges the evaluation team faced when processing the data. These are often detailed descriptions, but all are captured in the recommendations included in Chapter X. We summarize by data type (program tracking data, C&I population data, and the consumption data). We also distinguish issues specific to each utility.

Program Tracking Data

The following three sections presents issues the evaluation team found with the program tracking data. Note that addressing the varying structures and content of the program tracking data was the most complicated aspect of this project. The first section presents some general observations relevant to both utility's datasets; the subsequent sections highlight issues specific to each utility's data.

Eversource and UI

The following findings apply to both the Eversource and UI program tracking data.

- The Eversource and UI program tracking data files exist at different levels of summarization (Eversource: project-by-phase-by-program; UI: project-by-end-use-by-program).
- Neither utility's program data file provided information on the actual measures installed; the end use level was all we could see (e.g., we could see lighting was done, but no insights into what kind of lighting, or how many, etc.).
- The Eversource and UI program data files do not contain the same field names, formats, structures, naming conventions, or even the same information.
- There are a number of data fields that should be included in the program tracking data that are critical to evaluation, program delivery, and/or potentially target marketing. These include:
 - Email address
 - Industry segment
 - Comprehensive project (yes/no)
 - Project used financing (yes/no, type of financing)
 - Ownership status (tenant/owner)
 - Program pathway/initiative for ECB and BES projects
 - Prescriptive or custom measure
- Coding conventions vary significantly from utility-to-utility. For example, with Eversource data we were able to tell which BES initiative a project was associated with; we could not do this with the UI data. And the program names were not the same between utilities.

Eversource

The following findings apply to the Eversource program tracking data.

- Eversource’s program tracking data files contained three tabs: (1) “Generic Data Extract” (project-level information), (2) “Measures” (end use information), and (3) “Contact Details” (project-level contacts for various actors associated with the project, e.g., applicant, contractor, architect, engineer) (they provided separate files for 2017, 2018, and 2019). Both the projects and contacts tabs were provided at the project-by-phase-by-program level whereas the end use info was only provided at the project-by-phase level.
 - When merging the “Measure” and “Generic Data Extract” tabs within each Eversource program tracking data file (2017-2019), we were unable to match which end uses were associated with which program in instances where a project was associated with multiple programs and multiple measures. This was an issue in about ~3% of cases.
 - Several projects in the “Generic Data Extract” tab in each year did not have any corresponding measures in the “Measure” tab. This was an issue in about ~2% of cases.
- Upstream Lighting data was included as single, bulk, monthly entries in the program data files. However, we were also provided separate Upstream Lighting data files (with inconsistent file structures and incomplete data, e.g., sometimes only covering part of a month). Eversource confirmed that the bulk monthly entries were duplicative of the separate Upstream Lighting data files, but the evaluation team was unable to reconcile these amounts.
- Rate code and billing code variables in the “Generic Data Extract” tab were not populated. This could potentially be of value for segmenting.
- There was no measure-level quantity field in the data. The “UnitQuantity” variable was unpopulated.
- ~2% of program tracking data had erroneous billing account numbers outside the regular Eversource 11-Number formatting. Eversource was able to fix ~64% of these, but this still leaves ~1% of program tracking data with missing/erroneous billing account numbers.

United Illuminating

The following findings and recommendations apply to the UI program tracking data.

- In contrast to the Eversource data where each year’s program tracking data file was presented as three tabs, the UI program tracking data was a single file (for all three years) with one tab; the data was organized at the project-by-end-use level. This presentation made it very difficult to see project-level attributes versus end use attributes. Eversource’s presentation, though more complex, provides more information in a simpler manner; consider providing data in the Eversource manner.
- Program names in the “Program” field did not provide enough granularity to correctly ascertain the programs. For example, for ECB projects, there is no way of distinguishing between a new construction or major renovation project and a retrofit project.
- All BES initiatives were initially missing from the program tracking data. UI later provided BES – RCx and BES – O&M data in separate files.
- Initial program data did not include trade ally and contractor contact information; when it was provided, it was rather sparse. While a separate file was provided at a later date, about 50% of the cases had no useful data (i.e., “vencode” variable was populated with “AAA”, which was explained to us to mean “not assigned”). We were also informed that some of these cases were upstream projects that were not tracked (~80%) and others were downstream projects that simply did not have any contract information. This greatly limited our ability to develop a comprehensive sample frame of trade allies for UI.

- The SBEA program tracking data we were initially provided did not contain account numbers. UI later provided this information in a separate file.
- Upstream Lighting data was included in the downstream program data file; in the future they should be in a separate file.

C&I Population Data

In addition to the program tracking data, the evaluation team also needed non-residential population files from both utilities—that is, all non-residential accounts that were open at any time during the three-year period. The structure of these files was rather simple compared to the program tracking data: the files needed to contain the account number, business name and location, industry segment, and rate class data. The following summarizes issues found with the utility population files.

Eversource

- Email field was not fully populated (~80% were unpopulated).
- Industry segment field was not fully populated (~20% were unpopulated).

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- The UI population data email field was virtually unpopulated (~99.9% unpopulated).
- Industry segment was represented by NAICS codes but was not fully populated (~50% unpopulated).
- Since the data is at the account number level, each account should have the customer's industry segment (ideally, as well as the facility type, as these can differ). Both of these provide critical—but different—information. Also, the industry segments should align between utilities; Eversource seems to be using a schema that syncs with other materials in the state (e.g., the C&LM Plan).
- The initial data pull did not include customer service start dates (and end dates, when appropriate).

Consumption Data

This section summarizes issues we encountered when working with the consumption data. It is worth noting that the process of resolving missing account numbers, while not the most complicated part of the project (that goes to the program tracking data), was quite tedious and time consuming, requiring substantial back-and-forth with the utilities and numerous re-compilations of the data files.

Eversource

- Ultimately, we were unable to match about 4% of program tracking data accounts to corresponding Eversource consumption data.
- The consumption data we were provided did not contain some cases that appeared in the program tracking data:
 - ~1% of program tracking data accounts included UI number format for an unknown reason; issue was not fixed.

- ~8% of program tracking data accounts were either mistakenly assigned as residential accounts or were on “large power billing” with SERVICE_ACCOUNT_IDs values listed as “DUM”, and therefore not pulled in. Eversource fixed this issue with a separate data file.
- There were also cases (<1%) where the consumption data was lost; issue was not fixed.

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- Ultimately, we were unable to match about 7% of program tracking data accounts to corresponding UI consumption data.
- The consumption data we were provided did not contain some cases that appeared in the program tracking data:
 - Initially, about 18% of accounts in the program tracking data had no associated consumption data.
 - UI was able to find and provide consumption data for 63% of these cases, leaving 7% of UI program tracking data with no associated consumption data.

Appendix C. Additional Customer Profiling Results

Additional Electric Segment-Level Analyses

Most segments had declining population savings achieved over time, but depth of savings (participant savings achieved) was variable over time by segment. The following two figures present population and participant savings achieved by segment over time (2017–2019). Figure 62 and Figure 63. present the population and participant savings achieved, respectively, for all accounts by segment and year. The data show that:

- Software and utilities had an unusually high spike in population savings achieved in 2018.
- Population savings achieved for Financial Services, Agriculture, Data Centers, and Government increased over the three-year period; all other sectors experienced declines.
- Participant savings achieved increased for Financial Services, Agriculture, Data Centers, and Government, with large spikes in 2018 for Hospitals, Utilities, and Software companies.
- Professional services and Other Institutions showed declines in 2018.

(Note: Year over year changes can be misleading due to timing of project data and multi-year participation)

Figure 60. Electric Population Savings Achieved by Segment and Year

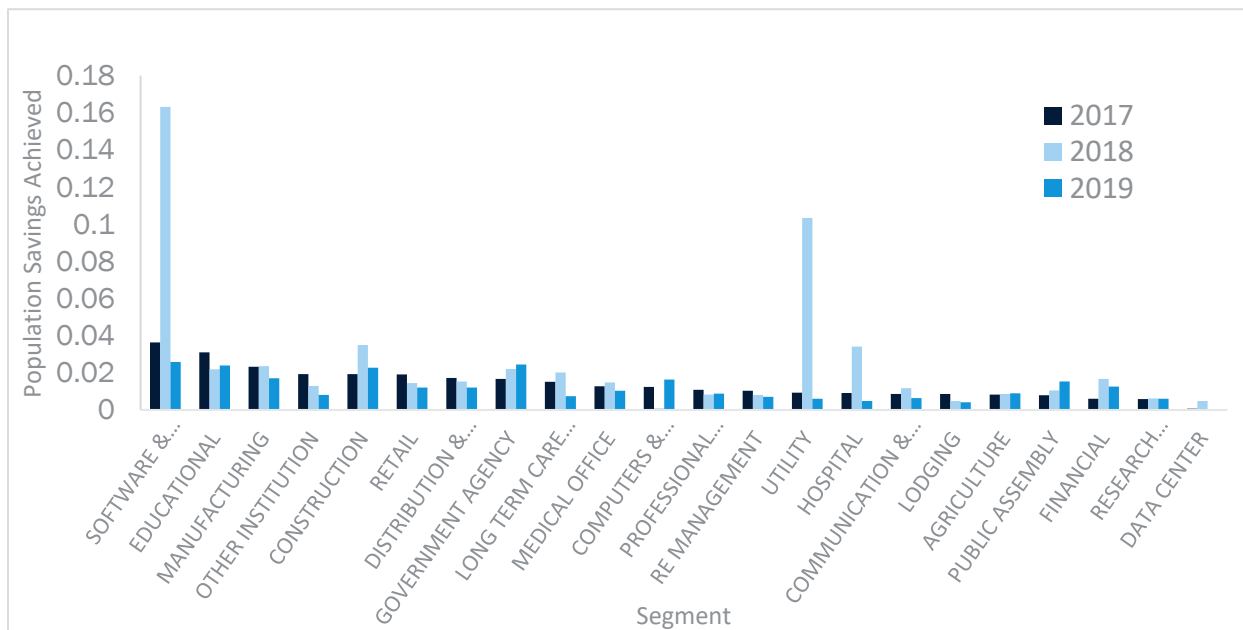
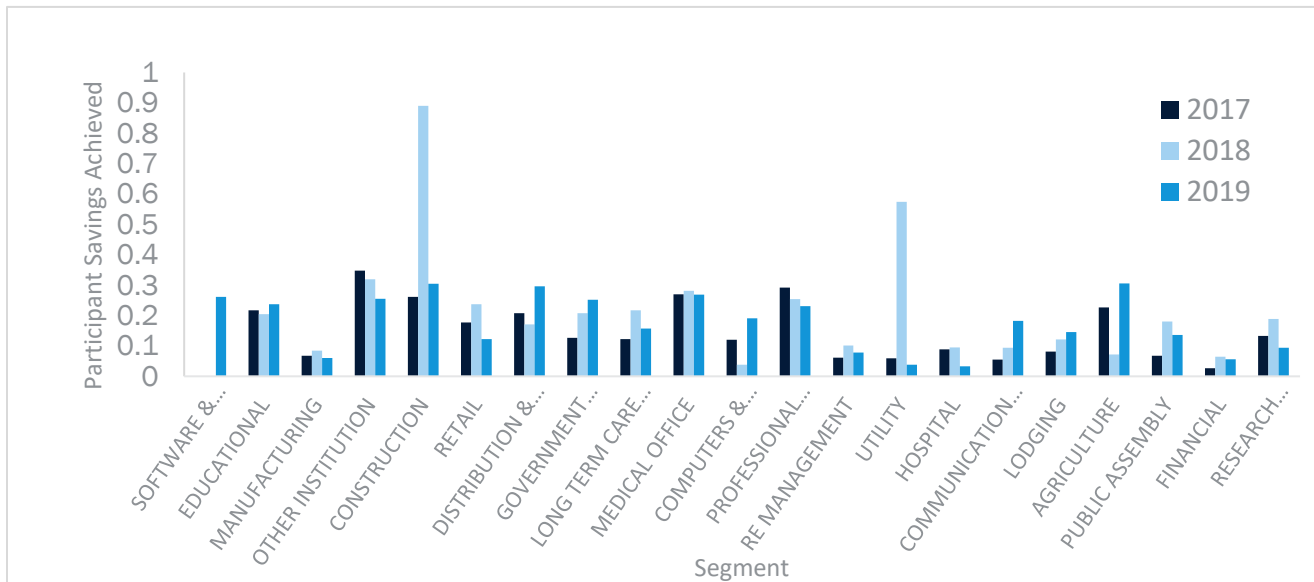


Figure 61. Electric Participant Savings Achieved by Segment and Year



The following five figures (Figure 62, Figure 63., Figure 64, Figure 65, and Figure 66) present a deeper dive into the key segments for electric savings. The evaluation team selected these segments for the following reasons:

- Manufacturing and Retail were both very large segments.
- Education and Government both had relatively high performance-metrics.

Figure 62 shows that lighting accounted for the majority (nearly all) of savings in Retail, Government, and Education segments, while over 50% of electric savings in Manufacturing was from process equipment upgrades. Education received a noticeable share of savings from refrigeration, HVAC, and motor measures, but lighting still dominates savings.

Figure 62. 2019 Electric Savings by Measure and Key Segment

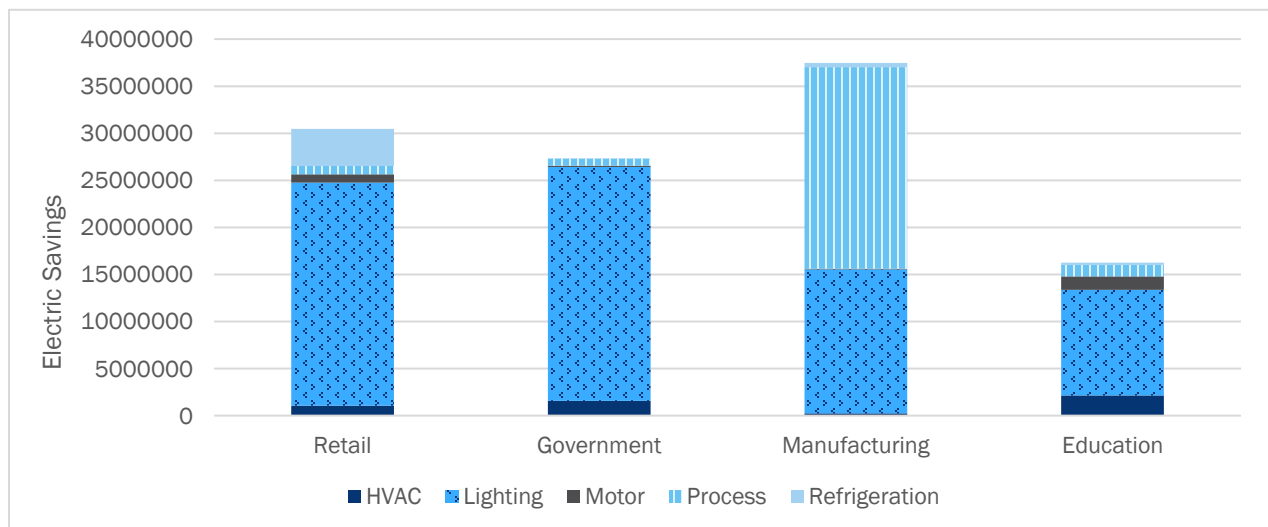


Figure 63., Figure 65, Figure 65, and Figure 66 present 2019 measure level savings for key segments, for large medium, small, and micro businesses, respectively. Micro-business savings across the four segments was almost exclusively derived from lighting measures, suggesting possible opportunities for increased depth of savings through HVAC (heat pump) or building shell measures. The most notable non-lighting savings came from process equipment for large, medium, and small manufacturers, refrigeration for medium and small retailers, and HVAC and motors in medium educational accounts.

Figure 63. 2019 Electric Savings by Measure in Key Segments among Large Business

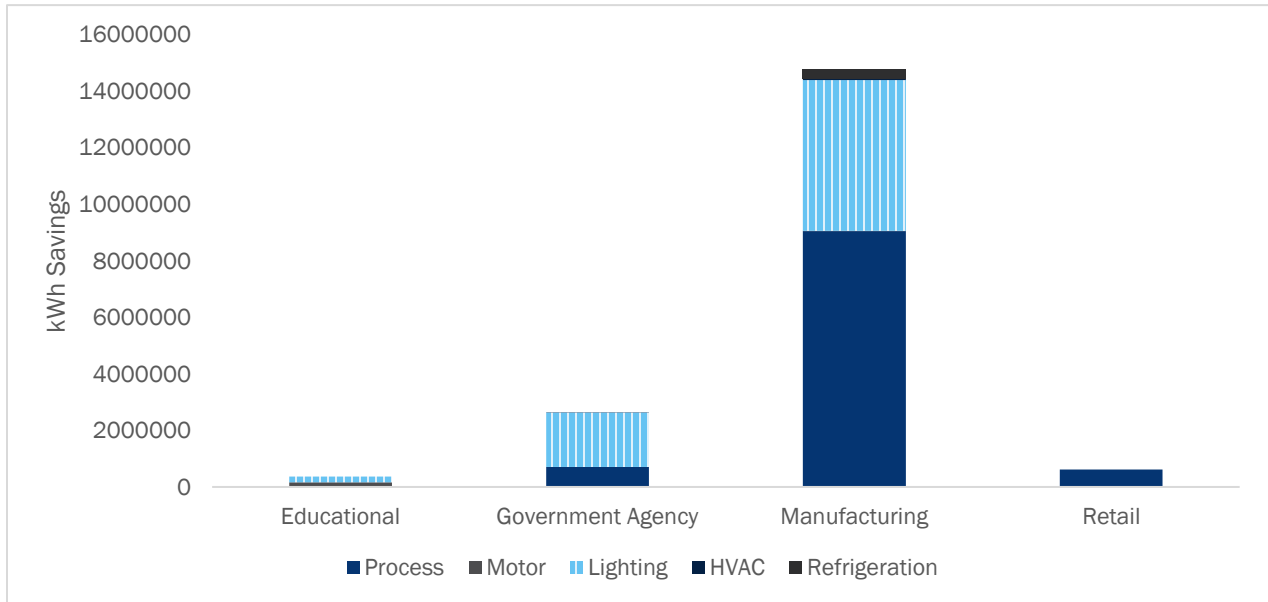


Figure 64. 2019 Electric Savings by Measure in Key Segments among Medium Business

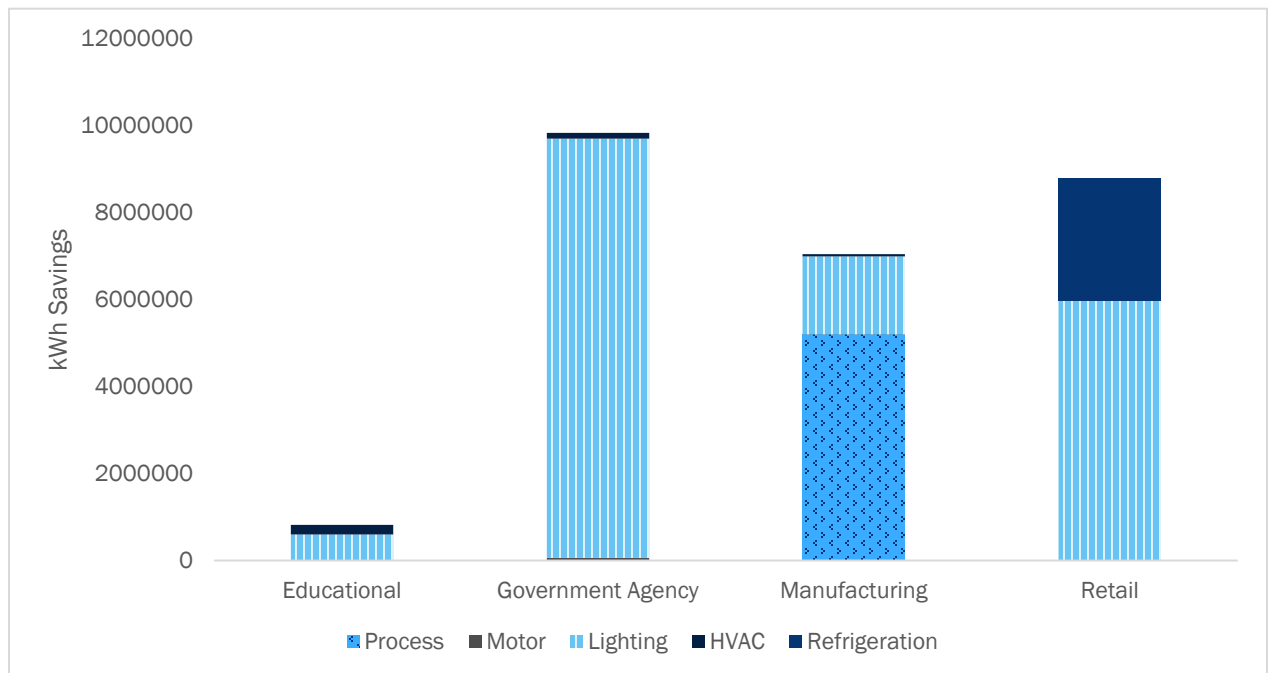


Figure 65. 2019 Electric Savings by Measure in Key Segments among Small Business

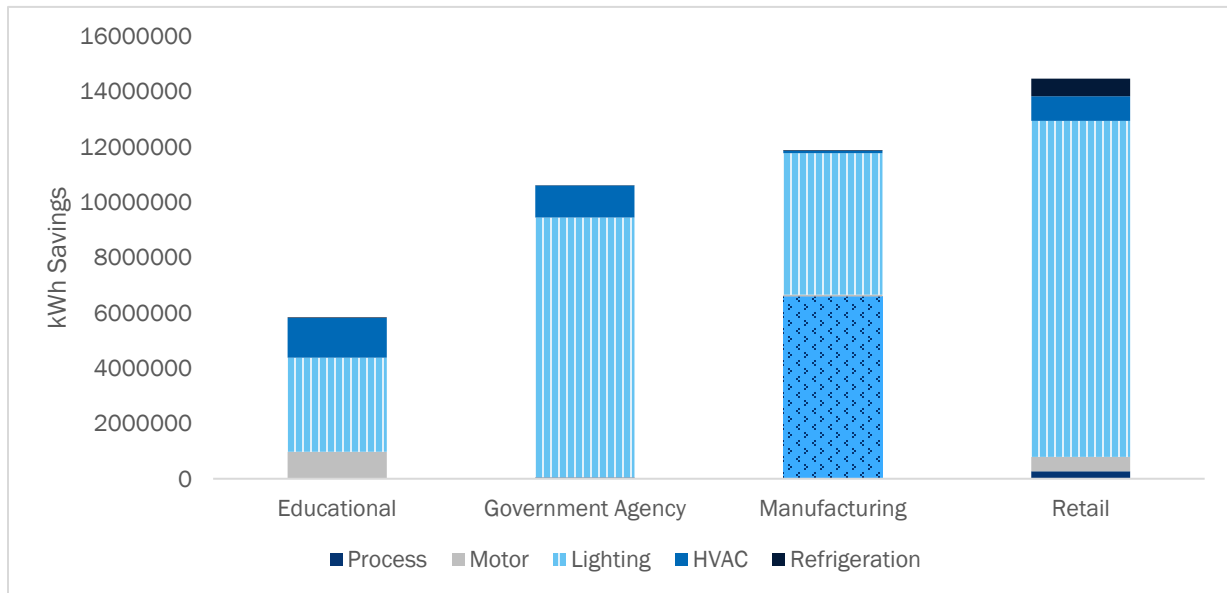
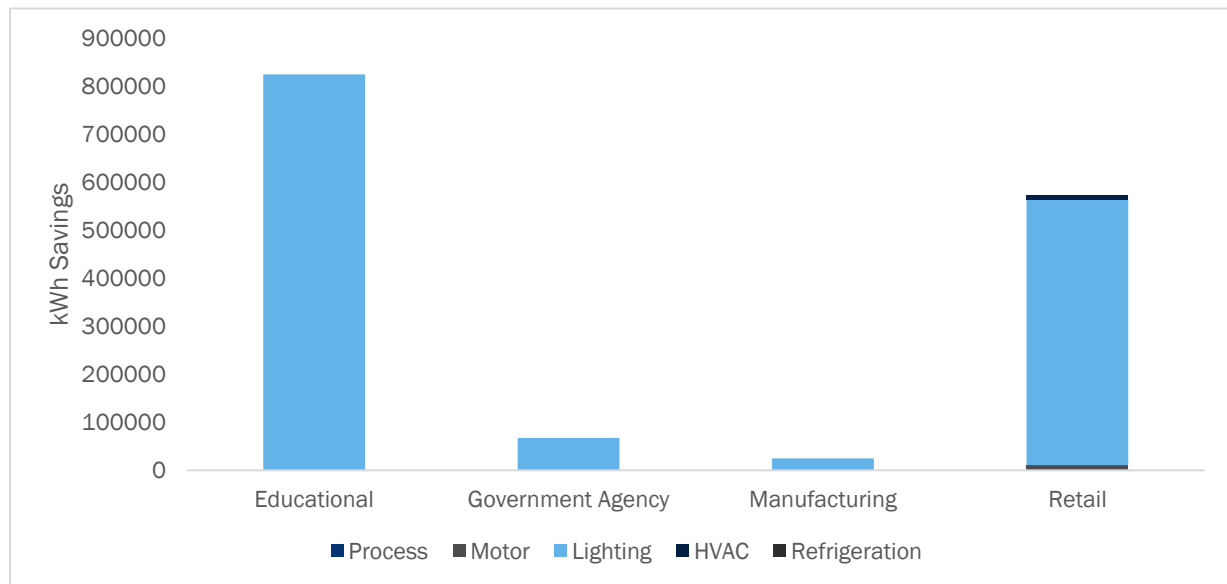


Figure 66. 2019 Electric Savings by Measure in Key Segments among Micro Business



Additional Gas Segment-Level Analyses

The data did not reveal any discernable trends in population and participant savings achieved by industry over time (Figure 67 and Figure 68).¹¹⁶

¹¹⁶ Year over year changes can be misleading due to timing of project data and multi-year participation.

Figure 67. 2017-2019 Gas Population Savings Achieved by Segment

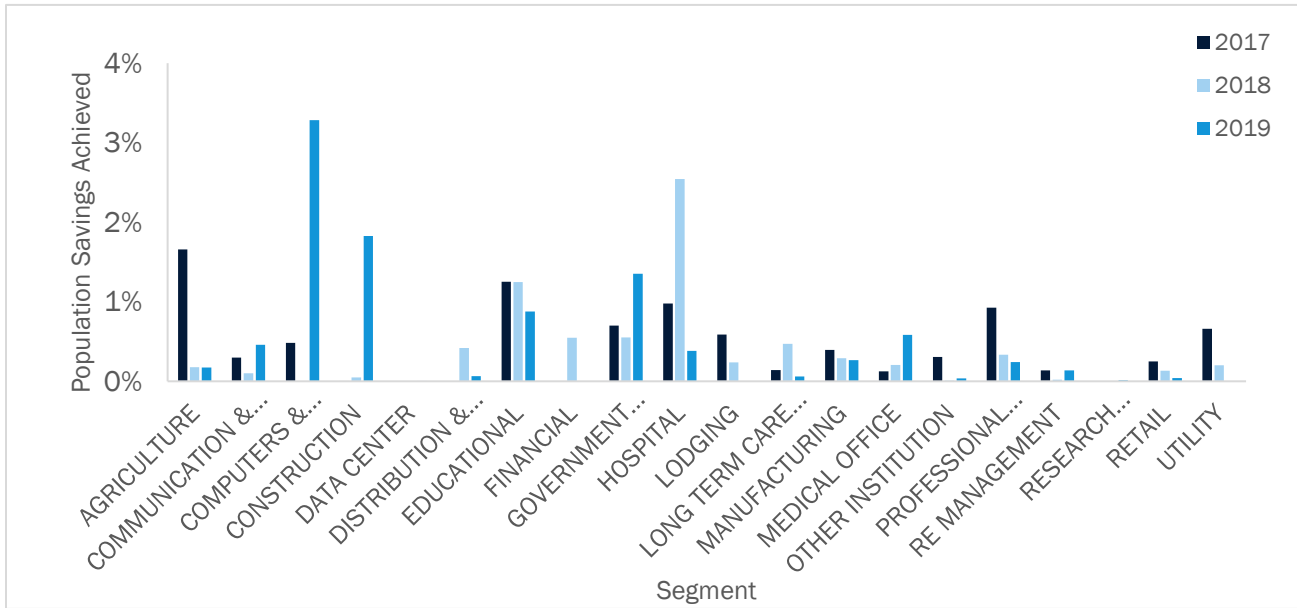
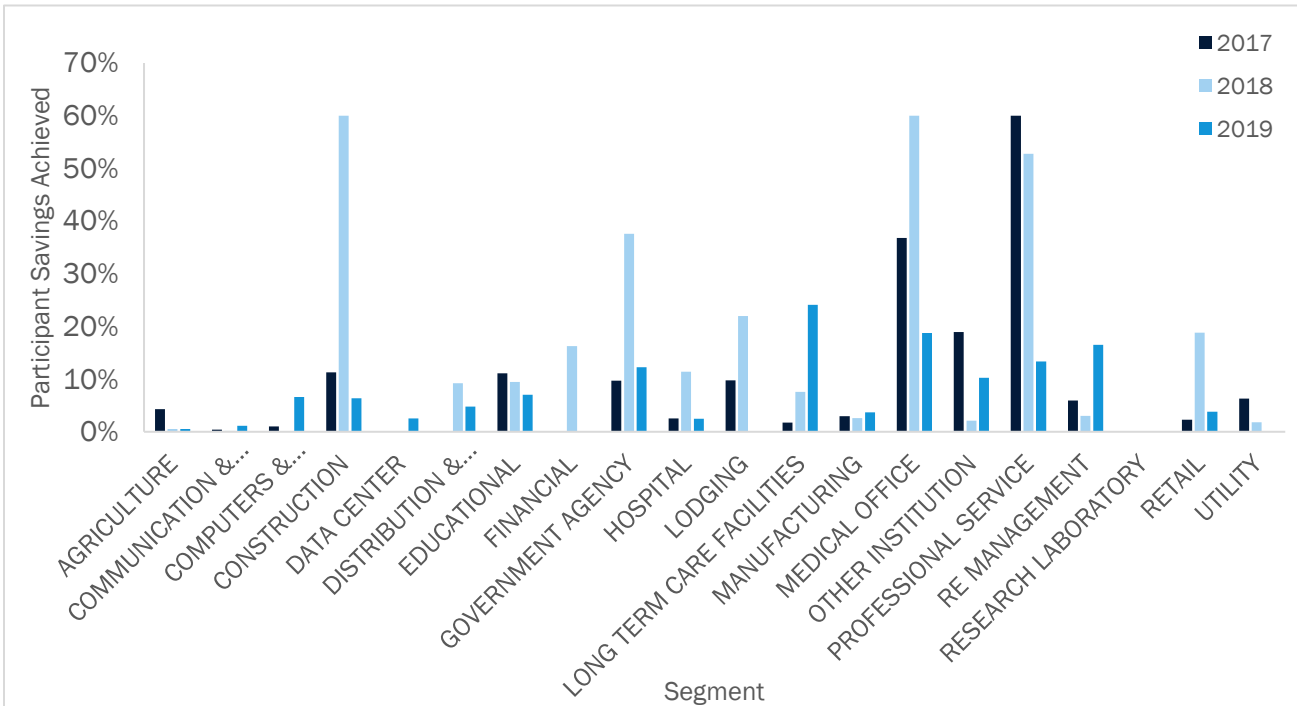


Figure 68. 2017-2019 Gas Participant Savings Achieved by Industry



Note: Professional services and other institution restricted to 0.6 for scaling as both segments' metric > 1.0.

The following five figures present a deeper dive into the key segments for gas savings. The data show that savings across all segments, except manufacturing, was exclusively HVAC measures. Manufacturing had considerable savings resulting from process measures. **As previously noted, the PAs could expand offerings**

to small and medium businesses by offering more upstream hot water and kitchen equipment similar to the Massachusetts upstream programs.

Figure 69. 2019 Gas Savings by Measure and Key Segment

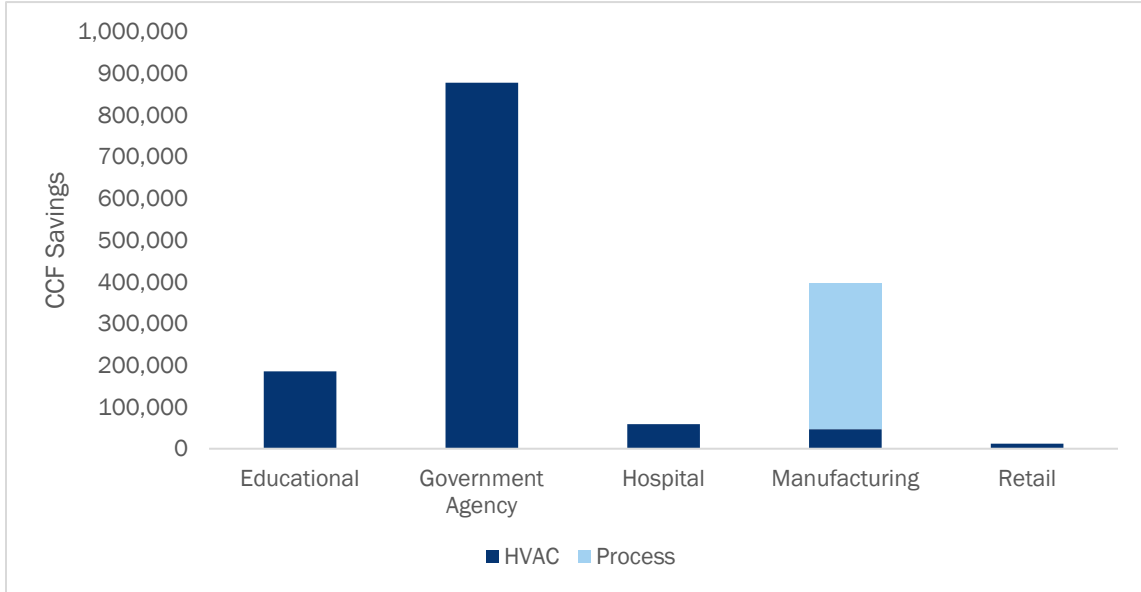


Figure 70. 2019 Gas Savings by Measure and Key Segment: Large Business

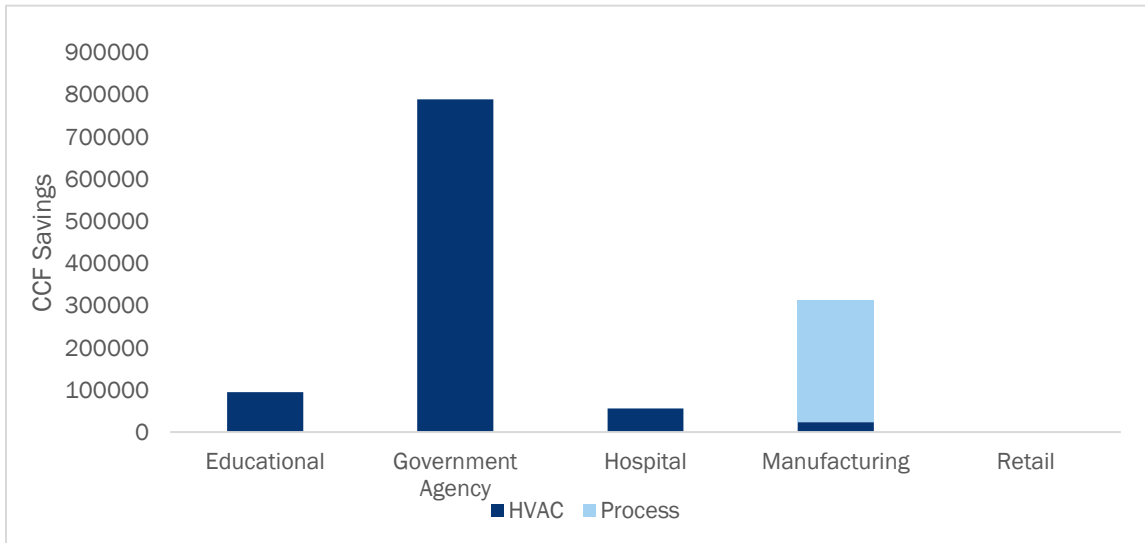


Figure 71. 2019 Gas Savings by Measure and Key Segment: Medium Business

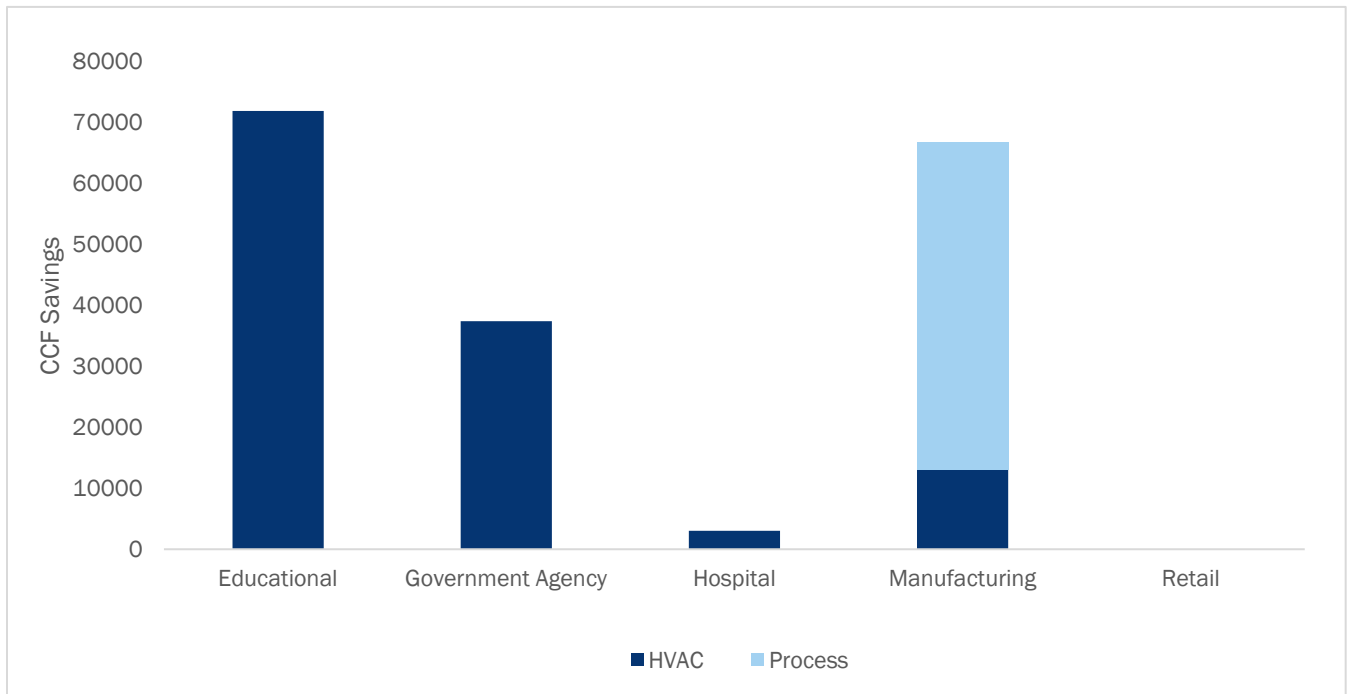


Figure 72. 2019 Gas Savings by Measure and Key Segment: Small Business

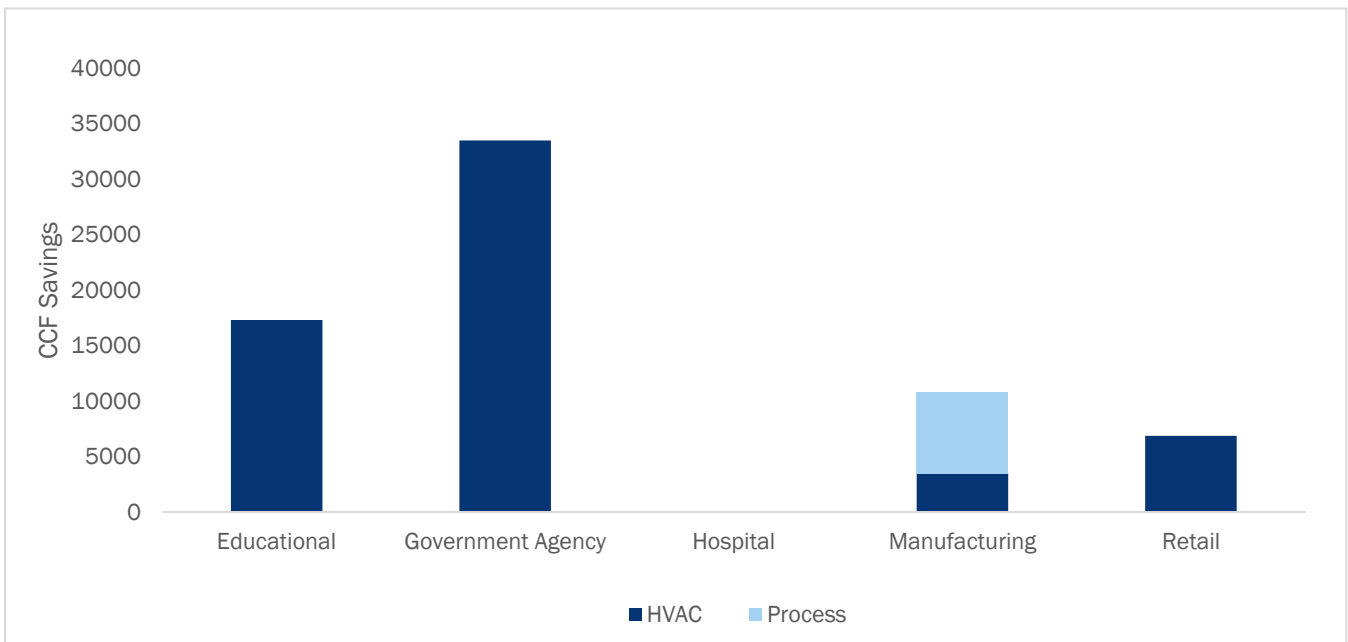
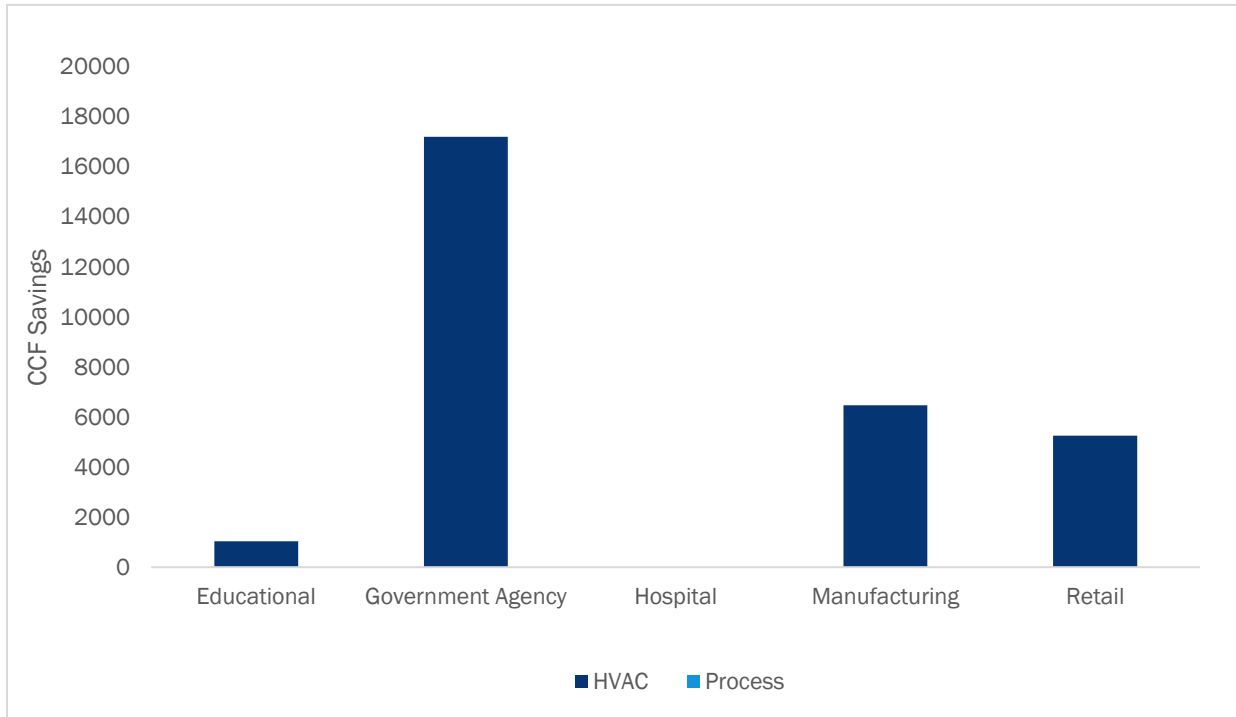


Figure 73. 2019 Gas Savings by Measure and Key Segment: Micro-Business



Appendix D. Data Collection Instruments

Forthcoming.

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