CADMUS

New Hampshire Non-Lighting Commercial and Industrial Programs

2016 AND 2017 EVALUATION REPORT

July 14, 2019

Prepared for:

New Hampshire Evaluation Measurement & Verification Working Group

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Acronyms and Abbreviations

Acronym	Definition
C&I	Commercial and industrial
EC motors	Electronically commutated motors
ECM	Energy conservation measure
EM&V Working Group	Evaluation Measurement & Verification Working Group
EMS	Energy management system
LP	Liquid propane
NHEC	New Hampshire Electric Cooperative
RGGI	Regional Greenhouse Gas Initiative
TRM	Technical reference manual
VFD	Variable frequency drive

Executive Summary

NHSaves' demand-side management nonresidential portfolio contains three programs that contributed electric and natural gas savings and demand reduction to the portfolio, two of which (Retail & Large Business; Municipal) also contributed savings to nonregulated fuels (oil and propane) during the 2016 and 2017 program years through the Regional Greenhouse Gas Initiative (RGGI). Eversource Energy (Eversource), Liberty Utilities (Liberty), New Hampshire Electric Cooperative (NHEC), and Unitil Energy Systems, Inc. (Unitil) administer these programs to serve commercial, industrial, and municipal customers.

Through its 2016 and 2017 commercial and industrial (C&I) programs, including Small Business Energy Solutions, Large Business Energy Solutions, Retail and Large Business, and Municipal programs, NHSaves offers incentives for electric, natural gas, and nonregulated fuel energy-efficient installations. The electric and nonregulated fuel initiatives are administered by the four electric program administrators and the natural gas initiative is administered by the two natural gas program administrators (Liberty and Unitil). Individual utilities oversee program management and delivery. With support from program partners and, in some cases, third-party energy audit and direct install subcontractors, utilities promote the offerings to customers.

This report provides the results of Cadmus' assessment of the non-lighting components of NHSaves' 2016 and 2017 nonresidential programs, excluding Large Business Energy Solutions. The Large Business Energy Solutions program was evaluated separately. This report presents the key evaluation findings related to programs' operations, performance, and energy savings and demand reduction impacts.

Evaluation Objectives

Cadmus had several evaluation, measurement, and verification objectives:

- Assess the accuracy of claimed energy savings during the 2016-2017 program years for the Municipal, Small Business Energy Solutions, and Retail and Large Business programs
- Compare actual savings against claimed savings and make recommendations to improve the accuracy of claimed savings
- Assess the effectiveness of program design, delivery, and performance of and coordination with vendors and contractors
- Assess utility, participant, and vendor, contractor, and technical service provider satisfaction with the program
- Identify opportunities to improve program penetration and savings
- Assess baseline efficiencies offered in the marketplace

Key Findings

Key Impact Evaluation Findings

For the impact evaluation, the Cadmus team evaluated 99 projects through site visits and engineering desk reviews that contributed 17.8% of average summer on-peak demand reduction, 44.8% of electric energy savings, and 35.8% of fossil fuel savings within the 2016 and 2017 non-lighting measures within the Municipal, Small Business Energy Solutions, and Retail and Large Business programs offered by NHSaves. Table 1 summarizes the evaluation findings, including evaluated units, gross savings, and net savings.

Overall, the two program years had a gross realization rate of 113.5% for average summer on-peak demand reduction, 93.7% for electric consumption savings, and 98.8% for fossil fuel savings, though variability occurred between measure categories. Overall, with 90% confidence, the impact evaluation achieved ±32.7% precision for average summer on-peak demand reduction, ±5.6% precision for electric consumption savings, and ±10.9% precision for fossil fuel savings. Specific details and findings per strata are described in the report's *Evaluated Gross Savings Results by Program and Strata* section.

Table 1. 2016 and 2017 NHSaves Non-Lighting Program Savings

Program	Total Measures	Gross Demand		Gross Electric Consumption		Gross Fossil Fuel	
		Reported Savings (kW)	Realization Rate	Reported Savings (kWh)	Realization Rate	Evaluated Savings (MMBtu)	Realization Rate
Municipal	147	182.4	107%	1,544,143	105%	14,596	112%
Small Business	1,189	1,061.0	115%	2,394,822	86%	56,785	87%
Retail and Large Business	247	0.0	N/A	19,199	100%	18,855	123%
Total	**1,648**	**1,243.4**	**113.5%**	**3,958,165**	**93.7%**	**90,236**	**98.8%**

Key Process Evaluation Findings

For the process evaluation, Cadmus interviewed 71 participants, program partners, and program staff about the performance of NHSaves' Small Business Energy Solutions, Retail and Large Business, and Municipal programs. The key process evaluation findings, which span the programs and their respective utilities, follow. More nuanced descriptions of these key findings can be found in this report's *Process Evaluation* section.

Marketing and Outreach

- Some program partners, in particular customer-selected contractors and contractors who complete a minimal number of program-funded projects per year, do not understand the nuances of the different NHSaves C&I programs. Three of the interviewed program partners completed fewer than 10 NHSaves projects per year. Overall, these program partners appeared to be less engaged with the programs. Two were unaware of any available marketing materials for the programs and the third did not answer. In a follow-up question, all three said more

marketing could improve their ability to promote the programs and programs' benefits. When asked what benefits of the programs they promote, two did not answer and the third said they only promote the rebates.

- Program partners and participants suggested more marketing to improve the program experience and increase participation. Program partners advocated for general marketing that can be pushed out at the state level or that is focused on the customer's journey. Participants also said marketing should be more detailed to reflect all program offerings, as some were unaware of opportunities that may be offered through the program, such as the opportunity to receive a loan through the program. Customer-focused marketing can engage a wider range of customers and set accurate expectations about the program experience.

Market Baselines

- NHSaves supports most of the project types that nonresidential customers are interested in pursuing. Most customers could not identify equipment or services that the programs do not support. Similarly, program partners said the custom incentives within the NHSaves programs cover most customers' project applications and that most measures are eligible for incentives if the project is deemed cost-effective.
- Most program participants explored and were offered options of varying degrees of efficiency. Contractors reported promoting high-efficiency equipment both inside and outside the program and to cite NHSaves as an important factor in their equipment stocking practices. Twelve of 13 participants said they performed their own research or talked to contractors about equipment or service options of varying levels of energy efficiency. On average, direct install contractors (when not working on retrofit, direct install projects) noted that 25% of their new construction customers with eligible projects do not participate, while 70% of customer-selected contractors' new construction customers do not participate. For equipment replaced on failure, direct install contractors noted that 51% of their customers do not participate, while 80% of customer-selected contractors' customers do not participate. Because direct install contractors are generally contracted with the utilities to perform these services, they appear to be more engaged and to be proactively encouraging their customers to participate in the NHSaves programs beyond the direct installation measures.
- Regardless of project type, most program partners (seven of 10) said they still offer good/better/best options or promote efficiency to nonparticipants. The six of 12 participants who could recall how many other equipment options they explored most commonly considered at least two other pieces of equipment (while six respondents could not recall). Most participants could not remember the efficiency level of the other options they considered (seven of 12 respondents, one respondent did not provide a response). Of those who could recall, all four said the options they explored were of the same efficiency level or were less efficient than the equipment selected.

Data Management

- Although the utilities were very responsive to requests for participant application data and supporting documentation, the documentation did not contain some details needed to support the evaluation activities. Cadmus obtained all the data and documentation recorded, but we found that the names of each field varied across the datasets and that there were a few critical details missing, which made it difficult to gather samples for the participant surveys and program partner interviews and to substantiate savings assumptions. Missing fields or data included participant phone and contact name, measure quantity, measure descriptions, and installing contractor details like business name, contact name, address, phone, and email address. Within the supporting documentation, measure savings calculations and energy models were in some cases not available or were only provided as images without the formulas or calculation workbooks. The utilities would benefit from a unified approach to collecting participant data and documenting energy savings assumptions.

Participant and Partner Experience

- Most participants are satisfied with the programs overall (40 of 53 customers provided a rating of 5 out of 5 and the mean rating for all participants was 4.6) and most are very likely to recommend the program (46 of 52 customers provided a rating of 5, with a mean rating of 4.8). The 2016 and 2017 participant Small Business Energy Solutions program overall satisfaction mean rating (4.7, n=47) was significantly higher than the mean satisfaction rating found during the 2010 program evaluation (4.3, n=103).
- Participants were most satisfied with their contractor (45 of 52 provided a rating of 5, with a mean rating of 4.9) and with the equipment installed (43 of 53 provided a rating of 5, with a mean rating of 4.8) and believe that saving money is one of the main benefits they receive from the program, which was also noted by program partners.
- Participants reported the lowest satisfaction ratings with the application paperwork and the rebate levels. Similarly, most program partners are satisfied with the program overall (seven of 14 provided a rating of 5, with a mean rating of 4.4) and do not perceive barriers to their own participation. For those who did perceive barriers, the application process and inconsistent communication were the main drivers of dissatisfaction. However, program partners felt generally uninformed during the beginning stages of a project, especially in the application process. They said the response time from one utility to the next can be variable. Program partners also felt uncertain about the amount of funding available at any given time, which poses challenges with program marketing.
- The most common barrier to participation identified by program partners was the time or effort required to participate, particularly with the program application process. Within the customer survey, those who cited a program barrier or challenge most commonly said it took too much time or effort to participate. Most participants who reported that it took too much time and effort to participate were also less satisfied with the rebate amount, suggesting that the level of effort for participating is not worth the benefit collected.

- Through Retail and Large Business grant funding, NHSaves provided organizations with energy audits to identify opportunities specific to their buildings and to help customers achieve energy savings. All participants who received an audit (78% of survey respondents) rated the site assessment, its clarity, and its content as a 4 or 5 out of 5. In addition, participants who received direct install measures through the audit process rated the measures as a 4 or 5.

Recommendations

Based on the impact and process evaluation interviews, surveys, site visits, and other analyses, the Cadmus team complied the following recommendations for measures offered in each of the three programs.

Savings Considerations

Recommendations:

- For aerator incentives offered through the Small Business Energy Solutions program, reduce the reported fossil fuel savings per unit from 1.7 MMBtu to 1.2 MMBtu to account for the difference in estimated distribution of aerators between bathroom faucets and kitchen faucets. The recommended 1.2 MMBtu is based on six projects sampled by Cadmus within the Small Business Energy Solutions program.
- For programmable thermostats within the Small Business Energy Solutions program, increase contractor installation requirements to include requirements for setback temperature programming and customer training on how to use the energy saving features of programmable thermostats. Cadmus sampled four projects within the Small Business Energy Solutions program that involved programmable thermostat purchases.
- For steam traps, increase the reported fossil fuel savings per unit from 25.70 MMBtu to 40.1 MMBtu to account for the higher average steam pressure and trap size found in the seven sampled projects by Cadmus.

Marketing and Outreach

Recommendations:

- Encourage new program partners, or program partners that submit fewer than 10 applications per year, to participate in NHSaves programs more regularly. To reduce confusion and better enable these partners to market the programs, provide additional educational materials that summarize the details of each program. Support program partners through periodic outreach campaigns, such as quarterly emails or phone calls to formally introduce program staff, check on project leads, and discuss program changes.
- Coordinate under the NHSaves umbrella to develop marketing materials that every utility and program partner can use with customers. Use real examples of previous projects to help potential participants understand the process and set accurate expectations.

Market Baselines

Recommendation:

- Foster a closer relationship with customer-selected contractors to help decrease the rate of nonparticipation, particularly because these contractors are still promoting and selling program-eligible equipment. Offer more support and educational resources to help empower customer-selected contractors. For example, reach out to these contractors the first time they submit an application with or on behalf of a participant to connect that contractor with a staff member, familiarize them with the programs, provide marketing materials, and offer one-on-one training as needed.

Data Management

Recommendation:

- In addition to developing application forms that are the same across utilities (recommended above), create a coordinated data library that identifies each field name, defines what each field captures, and documents savings assumptions or algorithms and energy savings sources. Within that data library, consider creating measure reference IDs or categorized measure names and descriptions.
- Consistently capture these data in program databases and supporting documentation: participant phone number and contact name, measure quantity, measure reference ID or categorized measure descriptions, energy models, savings calculations, savings source. The following are also useful for tracking contractor performance and for conducting the evaluation: contractor business name, contractor contact name, contractor address, contractor phone, contractor email.

Participant and Partner Experience

Recommendations:

- Ensure that program partners are supported. Keep open lines of communication, particularly with direct install contractors. Consider hosting conference calls or webinars that program partners can join to ask questions or explore alternative methods of communication to ensure consistent feedback.
- Prioritize transparency during the application and funding process by setting accurate estimates of how long an application will take to process and by providing a customer or contractor portal to check the application status. Provide program partners and customers with updates as applications go through each step of the process. Utilities should also be transparent and update program partners as soon as possible if funding runs out for a particular program. Two utilities said they already track participants' application status online, so it may be possible to use existing infrastructure to update program partners and participants.
- To encourage participation even for a small financial reward, consider ways to streamline the application process for participants and for contractors who fill out an application on the customer's behalf. For example, consider creating application forms that are the same across

the utilities so that contractors working within multiple utility territories can familiarize themselves with the form layout and become comfortable with compiling the same supporting documentation for every project.

- For utilities where program audits and direct installations are no longer available once Retail and Large Business grant funding is exhausted, consider allocating a portion of the NHSaves budget to delivering energy audits and direct installation measures through program partners or implementation contractors.

Introduction

This section summarizes the evaluation background, research objectives, activities, and data collection methods.

Background

On January 2, 2018, the New Hampshire Public Utilities Commission issued Order Number 26,095 approving the *2018–2020 New Hampshire Statewide Energy Efficiency Plan* as part of a settlement agreement for implementing an Energy Efficiency Resource Standard in New Hampshire.[1] The *2018–2020 Plan* established an Evaluation Measurement & Verification (EM&V) Working Group, responsible for planning, contracting, and overseeing independent third-party evaluations of the NHSaves programs. The parties comprising the EM&V Working Group are shown in Table 2.

Table 2. EM&V Working Group Organizations and Individuals

EM&V Working Group	Associated Organizations and Individuals
New Hampshire Public Utilities Commission	New Hampshire Public Utilities Commission Staff Members
New Hampshire Public Utilities Commission–Hired Independent Consultant	Skumatz Economic Research Associates
NHSaves Utilities	Eversource Energy Liberty Utilities New Hampshire Electric Cooperative Unitil Energy Systems, Inc.
Representative from the New Hampshire Energy Efficiency and Sustainable Energy Board	Brian Buckley from the New Hampshire Office of Consumer Advocate

As approved by the New Hampshire Public Utilities Commission, the EM&V Working Group directs, oversees, and sponsors the annual evaluations of New Hampshire's energy efficiency programs.

In June 2018, Cadmus was hired to evaluate the 2016-2017 non-lighting components of the Small Business Energy Solutions, Retail and Large Business, and Municipal programs, for which NHSaves offers incentives for electric, natural gas, and nonregulated fuel energy-efficient installations.[2] The results of the 2016-2017 Large Business Energy Solutions program were omitted from this evaluation, as that program was evaluated independently from this effort. The electric and nonregulated fuels energy efficiency programs are administered by all four NHSaves electric utilities and the natural gas initiative is administered by the two natural gas utilities, Liberty and Unitil.

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1 For links to previous evaluations of New Hampshire's energy efficiency programs, see New Hampshire Public Utilities Commission. "Completed Monitoring & Evaluation Studies." http://www.puc.state.nh.us/Electric/Monitoring_Evaluation_Report_List.htm.

2 The Retail and Large Business program is also known as the Energy Reduction Partners program, which offers funding and services to reduce the use of nonregulated fuels (oil and propane).

Evaluation Research Objectives, Activities, and Data Collection

This section outlines Cadmus' objectives, activities, and data collection methods for the 2016 and 2017 evaluation.

Research Objectives

Cadmus sought to address several research objectives:

- Assess the accuracy of claimed energy savings during the 2016 and 2017 program years for the Municipal, Small Business Energy Solutions, and Retail and Large Business programs
- Compare actual savings against claimed savings and make recommendations to improve the accuracy of claimed savings
- Assess the effectiveness of program design, delivery, and performance of and coordination with vendors and contractors
- Assess utility, participant, and vendor, contractor, and technical service provider satisfaction with the program
- Identify opportunities to improve program penetration and savings
- Assess baseline efficiencies offered in the marketplace

Evaluation Activities

Cadmus used a combination of the research activities described below to evaluate the non-lighting component of the C&I programs. Detailed findings are provided in the *Impact Evaluation* and *Process Evaluation* sections below.

Program Records Review

To inform the *ex ante* impact evaluation, Cadmus reviewed the benefit/cost models used by the utilities to ensure that the applicable algorithms and inputs stipulated by the EM&V Working Group were used for *ex ante* savings. We also cross-checked the utility benefit/cost models against the year-end savings reports filed with the New Hampshire Public Utilities Commission. Cadmus verified reported energy savings and average summer on-peak demand reduction during the 2016 program year for all fuel types, as applicable (electricity, natural gas, liquid propane, and fuel oil) and for water savings. We also reviewed program documentation to ensure that *ex ante* savings in the utility benefit/cost models matched the final report each utility submitted to the New Hampshire Public Utilities Commission.

Engineering Desk Review

Cadmus reviewed 33 project files out of 1,332 incentivized non-lighting projects within the Municipal and Small Business Energy Solutions programs. The desk review process involved examining project files and pertinent documentation including measure details such as model numbers, baseline equipment, hours of operation, and equipment size. We reviewed the savings methodology and code baseline requirements, simulation model files, and building construction and operation to identify any algorithms, engineering models, or calculation spreadsheets with assumptions and formulas to ensure they were applied appropriately.

Site Visits

In addition to engineering desk reviews, Cadmus performed 66 site visits out of 1,579 incentivized non-lighting projects within the Municipal, Small Business Energy Solutions, and Retail and Large Business programs. Using a data collection form at each site, we performed several tasks:

- Verified the installation and operation of equipment that received incentives, confirming that installed equipment met program eligibility requirements and verifying that the quantity of installed measures matched program documentation.
- Collected additional data to inform savings analyses and performed a detailed review of site project files to collect additional data at each site. Where applicable, Cadmus interviewed facility personnel involved with the project to gather information (such as equipment types replaced and hours of use) that could not be verified on the site or through documentation reviews or metering.
- Where program equipment performance was expected to be consistent throughout the year, installed power metering equipment (to measure electric consumption and demand) and associated temperature sensors (to measure space or airflow temperature and verify operational schedules) over a minimum of six weeks.

Engineering Analysis

Cadmus performed several activities when reviewing sampled project documentation and developing evaluation, measurement, and verification plans: we summarized the measure description, identified the reported savings methodology, reviewed other jurisdictions' technical reference manuals (TRMs) for established energy savings methodologies, and identified all potential data collection variables for metering or site data collection.

NHSaves uses three types of savings methodologies to determine reported energy savings:

1. For deemed measures, reported savings are applied on a per-unit basis. For example, NHSaves reports 7.7 MMBtu of fossil fuel savings per unit for each rebated programmable thermostat during the 2016 and 2017 program years.
2. For prescriptive measures, reported savings use a calculation formula with more than one data input to calculate savings. For example, NHSaves reports fossil fuel savings between 9.0 MMBtu and 345.1 MMBtu for each rebated condensing boiler. The reported value depends on the boiler quantity, heating capacity, and fuel type.
3. For custom measures, the reported savings use spreadsheet calculations or energy simulation models.

Cadmus reviewed several TRMs and associated documentation to identify approved and established energy savings methodologies:

- Massachusetts TRM – 2016-2018 Program Years – Plan Version[3]
- Massachusetts TRM – 2019-2021 Plan Version[4]
- Connecticut Program Savings Document – 15th Edition for 2019 Program Year[5]
- 2018 Mid-Atlantic TRM Version 8[6]
- Wisconsin Focus on Energy 2017 TRM[7]

Where rebated measures were identified in multiple TRMs, Cadmus prioritized the closest geographically TRM available. In cases where the closest geographically TRM used deemed savings for rebated measures, we reviewed the source material and developed savings calculations methodologies if appropriate. Where possible, Cadmus used New Hampshire weather data to calculate evaluated energy savings.

For custom calculated measures or measures where meter data or site collected data precluded the use of a prescriptive calculation methodology, Cadmus used custom calculation spreadsheets and energy models to evaluate energy savings.

Utility Staff Interviews

Cadmus interviewed NHSaves utility program managers to understand how each program was designed and delivered, what worked well, and what could be improved. The interviews covered a wide range of topics, such as program design and administration, communication and data tracking processes, marketing strategies, trade ally and participant interactions, and challenges and successes.

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[3] Massachusetts Electric and Gas Energy Efficiency Program Administrators. 2015. *Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures.* http://ma-eeac.org/wordpress/wp-content/uploads/2016-2018-Plan-1.pdf

[4] Massachusetts Electric and Gas Energy Efficiency Program Administrators. 2018. *Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures.* https://www.masssavedata.com/TRL/Introduction%20to%20TRM%202019-2021%20Plan%20Version.pdf

[5] Energize Connecticut. March 1, 2019. *Connecticut's 2019 Program Savings Document.* 15th Edition. https://www.energizect.com/sites/default/files/2019%20PSD%20%283-1-19%29.pdf

[6] Northeast Energy Efficiency Partnership. 2018. *Mid-Atlantic Technical Reference Manual Version 8.* https://neep.org/sites/default/files/resources/Mid_Atlantic_TRM_V8_0.pdf

[7] Public Service Commission of Wisconsin. 2017. *Wisconsin Focus on Energy 2017 Technical Reference Manual.* https://focusonenergy.com/sites/default/files/Focus%20on%20Energy%20TRM%20-%20PY2017_1%28Archive%29.pdf

Participant Surveys

Cadmus surveyed 53 participants from the 2016-2017 Small Business Energy Solutions program (n=47), Retail and Large Business program (n=3), and Municipal program (n=3) over the phone to collect data about their market awareness of NHSaves' energy saving programs, behavior and equipment purchase practices, satisfaction with the program components, barriers to participation, and to verify installations. These surveys primarily informed the research objectives of the process evaluation.

Program Partner Interviews

Cadmus interviewed a mix of program partners (both customer-selected contractors and utility-contracted direct install contractors) to collect data about their awareness of NHSaves' energy saving programs, market baselines and sales practices inside and outside the program, communication with program staff, satisfaction with program components, and barriers to participation.

Impact Evaluation Data Collection

The following section describes the activities, sample design, and evaluated gross savings estimation process.

Impact Activities

Cadmus performed on-site visits and engineering analyses for 99 projects. Cadmus' impact activities by program and strata are shown in Table 3.

Table 3. Impact Evaluation Activities by Program

Evaluation Activity	Municipal	Small Business	Energy Reduction Partners Program
Database and Tracking Review	✓	✓	✓
Desk Reviews	31 projects	44 projects	24 projects
Site Visits	19 projects	23 projects	24 projects
Metering	8 projects	5 projects	2 projects
Engineering Analysis and Calculations	✓	✓	✓
Estimate Greenhouse Gas Emission Reductions			✓
Realization Rate Estimation	✓	✓	✓

Impact Sampling Design and Data Collection Methods

Cadmus developed a sample design consistent with the *Uniform Methods Project*.[8] We used standard sample design calculations to determine sample sizes for the reported energy savings variable in each program. We based our proposed sample sizes on achieving a 90% confidence level with a ±10% level of

[8] National Renewable Energy Laboratory. 2017. "Chapter 11: Sample Design Cross-Cutting Protocol." *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* https://www.nrel.gov/docs/fy17osti/68567.pdf

precision at the state level. For each combination of program and utility, we targeted 90%/±20% confidence and precision.

Because the majority of energy savings for non-lighting projects in the Municipal and Small Business Energy Solutions programs are related to fossil fuels, Cadmus sampled the Municipal and Small Business programs by fuel type. Projects reporting electricity savings exclusively were sampled for desk reviews. Projects reporting fossil fuel savings were sampled for site visits and desk reviews. All projects within the Retail and Large Business program were sampled for site visits and desk reviews.

Cadmus divided the sampled projects into two categories: Random and Selected. Random projects were chosen randomly and the evaluated results were extrapolated to the rest of the population within the strata. Selected projects were chosen due to having the highest claimed energy savings per strata and were evaluated individually, with the results included within each stratum but those realization rates not extrapolated to the population.

Table 4 shows the total quantity of projects sampled, the associated reported energy savings, and the percentage that this sample represents out of the population.

Table 4. 2016-2017 NHSaves Municipal, Small Business Energy Solutions, and Retail and Large Business Programs Impact Sampling Summary

Program	Strata	Sample Type	Unique Projects Sampled	Percentage Sampled		
				kW	kWh	MMBtu
Municipal	HVAC and Motors	Selected	6	71%	82%	61%
		Random	15			
	Other	Selected	2	35%	35%	30%
		Random	8			
Small Business Energy Solutions	HVAC	Selected	0	54%	8%	19%
		Random	12			
	Refrigeration and Motors	Selected	1	44%	45%	-
		Random	6			
	Other	Selected	1	7%	32%	20%
		Random	24			
Retail and Large Business	HVAC	Selected	3	-	-	78%
		Random	15			
	Other	Selected	2	-	19%	48%
		Random	4			
Total			**99**	**18%**	**45%**	**36%**

Municipal Program

Through the Municipal program, NHSaves provides incentives for the 20 measure types shown in Table 5 along with the total project counts and energy savings reported in the tracking database, total reported energy savings, and sampled projects. Cadmus organized these 20 measure types into two strata: (1) HVAC and Motors, and (2) Other. We designed the sampling plan for 2016-2017 participation combined to achieve approximately ±20% precision at 90% confidence per strata and to exceed ±10%

precision at 90% confidence at the program level. To account for the wide range of project sizes, we hand selected any projects reporting 10% or more energy savings for the associated strata and year, then selected the remaining projects randomly.

Table 5. 2016 and 2017 Municipal Program Impact Sampling

Strata	Measure Type	Number of Incentivized Projects	Reported Energy Savings			Unique Sampled Projects
			kW	kWh	MMBtu	
HVAC and Motors	Boiler	2	109.2	866,179	11,784	21
	Boiler Reset Controls	1				
	Cooling	7				
	Custom - Energy Management System (EMS)	5				
	Custom - Heating System	2				
	EMS	1				
	HVAC	27				
	Motors	7				
	Motors/Drives	5				
Other	Custom	15	73.3	677,964	2,812	10
	Custom - Weatherization	6				
	Domestic Hot Water	24				
	Heating	2				
	Indirect Water Heating	1				
	Insulation	2				
	Process	19				
	Refrigeration	11				
	Spray Foam	1				
	Water Heater	1				
	Weatherization	4				
Total		**143**	**182.4**	**1,544,143**	**14,596**	**31**

Small Business Energy Solutions

Through the Small Business Energy Solutions program, NHSaves provides incentives for the 24 measure types shown in Table 6 along with the total project counts and energy savings reported in the tracking database, total reported energy savings, and sampled projects. Cadmus organized these 24 measure types into three strata: HVAC, Refrigeration and Motors, and Other. We designed the sampling plan for 2016 and 2017 participation combined to achieve approximately ±20% precision at 80% confidence per strata and to exceed ±10% precision at 90% confidence at the program level. To account for the wide range of project sizes, we hand selected any projects reporting 10% or more energy savings for the associated strata and year, then selected the remaining projects randomly.

Table 6. 2016 and 2017 Small Business Energy Solutions Program Impact Sampling

Strata	Measure Type	Number of Incentivized Projects	Reported Energy Savings			Unique Sampled Projects
			kW	kWh	MMBtu	
HVAC	Heating	1	27.4	142,077	23,213	12
	Heating and Cooling	147				
	HVAC	94				
	(SCI) HVAC Air-Source Heat Pump New	1				
	SCI HVAC Unitary/Split New	16				
	Space Heating	75				
Other	Appliance	126	935.9	1,506,445	33,571	25
	Compressed Air	7				
	Cooking	16				
	Cooling	32				
	Custom	20				
	Domestic Water Heating	313				
	Envelope	7				
	Hot Water	100				
	Other	142				
	Process	56				
Refrigeration and Motors	Motors	18	97.7	746,300	-	7
	Motors/Drives	1				
	Refrigeration	15				
	SCI Motor Retrofit	1				
	SCI Variable Frequency Drive (VFD) Retrofit	1				
Total		**1,189**	**1,061.0**	**2,394,822**	**56,785**	**44**

Retail and Large Business Program

Through the Retail and Large Business program, NHSaves provides incentives for the 24 measure types shown in Table 7 along with the total project counts and energy savings reported in the tracking database, total reported energy savings, and sampled projects.[9] Cadmus organized these 24 measure types into two strata: HVAC and Other. We designed the sampling plan for 2016 and 2017 participation combined to achieve approximately ±20% precision at 80% confidence per strata and to exceed ±10% precision at 90% confidence at the program level. To account for the wide range of project sizes, Cadmus hand selected any projects reporting 10% or more energy savings for the associated strata and year, then selected the remaining projects randomly.

[9] This RGGI-funded program was intended to supplement the existing electric programs with oil and propane savings and is expected to close in 2019. The Large Business Energy Solutions program remains within the NHSaves portfolio but was omitted from this evaluation since it was evaluated independently from this effort.

Table 7. 2016 and 2017 Retail and Large Business Program Impact Sampling

Strata	Measure Type	Number of Incentivized Projects	Reported Energy Savings			Unique Sampled Projects
			kW	kWh	MMBtu	
HVAC	Boiler	8	-	7,295	13,382	18
	Custom - EMS	1				
	Custom - Heating	2				
	EMS	5				
	Heating and Cooling	15				
	HVAC	82				
Other	Aerator Liquid Propane (LP)	6	-	11,904	5,473	6
	Aerator Oil	4				
	Custom	79				
	Custom - Weatherization	18				
	Domestic Hot Water	3				
	Dryer	1				
	Indirect Water Heater	2				
	Insulation	3				
	Low-Flow Showerhead LP	2				
	Low-Flow Showerhead Oil	1				
	Pipe Insulation LP	7				
	Pipe Insulation Oil	2				
	Pre-Rinse Spray Valve LP	1				
	Pre-Rinse Spray Valve Oil	1				
	Spray Foam	1				
	Water Heater	1				
	Weatherization	2				
Total		**247**		**19,199**	**18,855**	**24**

Evaluated Gross Savings Estimation

To determine gross savings, Cadmus applied Step 1 through Step 4, shown in Table 8.

Table 8. Impact Steps to Determine Evaluated Gross Savings

Savings Estimate	Step	Action
Evaluated Gross Savings	1	Tracking Database Review: Validated the accuracy of data in the participant database and verified that savings matched annual reports.
	2	Verification: Adjusted gross savings based on actual installation rates.
	3	Unit Energy Savings: Validated saving calculations through engineering review, data analysis, and by metering.
	4	Realization Rates: Extrapolated realization rates to programs' population.

Step 1: To validate data accuracy, Cadmus reviewed the program participant tracking database from each utility to ensure that participants and reported savings matched annual reports.

Step 2: Cadmus selected a sample of projects from the databases provided from each of the four utilities offering incentives through the NHSaves program, stratified by program (Municipal, Small Business Energy Solutions, and Retail and Large Business) and by measure end-use type within each program:

- Municipal HVAC and Motors
- Municipal Other
- Small Business Energy Solutions HVAC
- Small Business Energy Solutions Other
- Small Business Energy Solutions Refrigeration and Motors
- Retail and Large Business HVAC
- Retail and Large Business Other

As part of the 2016-2017 program evaluation, Cadmus completed 99 site visits and desk reviews described in Table 3, using those site visits to verify measure installation and equipment performance.

Step 3: Next, Cadmus reviewed all project documentation; developed an evaluation, measurement, and verification plan; and performed site visits to verify the installation, specification, and operation of incented measures. We installed power metering equipment and temperature sensors at 15 sites within the sample. Where possible, we collected equipment performance trend data on the sites from the customer's monitoring or control system.

Step 4: Last, Cadmus reviewed measure savings' assumptions, equations, and inputs. For complicated or custom measures, we conducted an engineering analysis using the appropriate measurement and verification option within the *International Performance Measurement and Verification Protocol*.[10] For sites where power metering equipment was installed, we used logger data to determine power consumption for the metered equipment types. In some instances, the customer provided trend data from their building management systems, which Cadmus used to determine equipment load profiles and performance characteristics

Process Evaluation Data Collection

For the process evaluation, Cadmus performed utility staff interviews, program partner interviews, and participant surveys to assess the 2016 and 2017 NHSaves programs.

Process Activities

Cadmus conducted the activities shown in Table 9 to address the process evaluation research objectives.

[10] International Performance Measurement & Verification Protocol. 2002. *Concepts and Options for Determining Energy and Water Savings Volume I.* https://www.nrel.gov/docs/fy02osti/31505.pdf

Table 9. Process Evaluation Objectives and Data Collection Activities

Process Evaluation Objective	Utility Staff Interviews	Participant Surveys	Program Partner Interviews
Assess the effectiveness of program design and delivery and determine the performance of and coordination with vendors and contractors	✓	✓	✓
Assess satisfaction with the programs	✓	✓	✓
Identify opportunities to improve programs' non-lighting market penetration and savings	✓	✓	✓
Verify equipment installation	-	✓	-
Assess baseline efficiencies offered in the marketplace	-	✓	✓

Table 10 summarizes sampling and participation for each process evaluation activity.

Table 10. Process Evaluation Data Collection Efforts

Activity	Planned Sample Size	Sample Frame	Achieved Completes
Utility Staff Interviews	4 (one per utility)	4	4 (one per utility)
Participant Surveys	180	Census	53
Program Partner Interviews	12 (at least 2 per utility)	Prioritized sample of customers selected and direct install contractors	14 (2 or more per utility)

Process Sampling Design and Data Collection Methods

The following outlines the sampling design and data collection methods Cadmus used to assess the 2016 and 2017 Small Business Energy Solutions, Retail and Large Business, and Municipal programs.

Utility Staff Interviews

In November 2018, Cadmus interviewed Eversource, Liberty, NHEC, and Unitil staff responsible for program design and day-to-day implementation to discuss program delivery and performance, determine satisfaction with the programs and their operations, and identify opportunities for improvement.

Participant Surveys

Cadmus contracted with Vupoint Research to conduct telephone surveys with 2016 and 2017 program participants. In January 2019, Vupoint Research contacted 710 Small Business Energy Solutions, Retail and Large Business, and Municipal programs' participants. During calls, VuPoint offered each participant a $50 Visa gift card for completing the survey to encourage a strong response rate. As shown in Table 11, the survey firm received responses from 53 participants, for an overall 7% response rate.

Table 11. Participant Survey Target and Achieved Sample

Program	Electric			Natural Gas			Nonregulated Fuels			Total Targeted Sample	Total Achieved Sample
	P	T	A	P	T	A	P	T	A		
Small Business Energy Solutions	89	38	16	518	65	31	--	--	--	103	47
Retail and Large Business	--	--	--	--	--	--	68	33	3	33	3
Municipal	18	15	2	--	--	--	17	13	1	28	3
Total	**108**	**53**	**18**	**518**	**65**	**31**	**85**	**46**	**4**	**164**	**53**

Note: P = population, T = target, A = actual

Cadmus designed the participant survey sample size to achieve a relative precision of ±10% or better at 90% confidence. Despite the lower-than-anticipated response rates, we achieved ±10% or better at 90% confidence for the Small Business Energy Solutions program sample (n=47). However, we were not able to achieve these confidence and precision levels for the Retail and Large Business and Municipal programs: we reached ±44% precision at 90% confidence (n=3) for the Retail and Large Business program and ±43% precision at 90% confidence for the Municipal program (n=3). Because of these levels, results for these programs should be considered anecdotal.

We attribute low response rates across the programs to several factors. Project activity occurred in 2016-2017, which made it difficult to connect with respondents who were involved with or could recall the projects. Also, only 21% of the Small Business Energy Solutions program participant data contained contact names, making it difficult to connect with the decision maker (42% of Small Business Energy Solutions participants who responded to the survey had a contact name in the sample). The Retail and Large Business and Municipal programs' participant nonresponse (refusal/no answer/not available) rates were high compared to other C&I surveys conducted by Vupoint Research during the same timeframe (January 2019).

Shown in Table 12, the Retail and Large Business program's disposition report for the last survey day reflected nonresponse rates of 9% refusal, 64% no answer/answering machine, and 13% not available, and the Municipal program nonresponse rates were 10% refusal, 69% no answer/answering machine, and 4% not available. These rates were generally higher than for other nonresidential surveys conducted at the same time for two Midwestern utilities, particularly those for no answer/answering machine. Dispositions noted as "Other" in Table 12 were items such as busy signals, wrong or disconnected numbers, and fax machines.

Table 12. Comparison of Commercial and Industrial Survey Dispositions

Program	Population	Completed Surveys	Response Rate	Refused	No Answer/ Answering Machine	Not Available	Other
NHSaves							
Small Business Energy Solutions	607	47	8%	9%	56%	16%	11%
Retail and Large Business	68	3	4%	9%	64%	13%	9%
Municipal	36	3	8%	10%	69%	4%	8%
Midwestern Utility							
Utility 1: all C&I programs	991	170	17%	10%	40%	4%	28%
Utility 2: Small Business Direct Install	77	24	31%	8%	42%	6%	12%
Utility 2: Prescriptive	237	70	30%	8%	42%	8%	10%

Program Partner Interviews

To gather insights specific to the non-lighting and direct installation components of the NHSaves C&I programs, Cadmus interviewed program partners. Using contractor lists from each utility, we identified 34 customer-selected contractors and 12 direct installation firms that installed non-lighting equipment. Cadmus prioritized the 34 customer-selected contractors from a total sample of 138 contacts with telephone numbers; this prioritization included contractors on more than one utility's contractor list, those shown to participate in the 2016 and 2017 programs through participant tracking data (only available in NHEC data), and, to assist with interviewing non-lighting contractors, those utility staff identified as providing therm and electric saving services.

In January 2019, Cadmus contacted these 46 program partners with a target to conduct 12 telephone interviews, and as shown in Table 13 We received responses from 14 program partners—eight customer-selected contractors and six utility hired direct install contractors. Cadmus designed the interview guide to collect data about awareness of NHSaves' C&I energy saving programs, market baselines and sales practices inside and outside the program, communication with program staff, satisfaction with program components, and barriers to participation.

Table 13. Program Partner Interview Target Sample and Total Completes

Utility	Contractors Sample Frame		Total Targeted Sample	Total Completes[a]
	Direct Installation	Customer Selected		
Eversource Energy	12	34	12	13
Liberty Utilities				10
New Hampshire Electric Cooperative				7
Unitil Energy Systems, Inc.				7
Total	**12**	**34**	**12**	**14**

[a] The completes by utility do not sum to 14 because 11 contractors participated in the NHSaves programs through more than one utility.

Impact Evaluation

This section presents the non-lighting overall gross reported savings values and non-lighting overall gross evaluated saving values. NHSaves reported lighting and non-lighting summer on-peak demand reduction, electricity savings, and fossil fuel savings in the 2016 and 2017 annual reports.[11] This evaluation focuses on non-lighting savings.

Overall Evaluated Gross Savings Results by Program

Table 14 presents non-lighting overall reported and evaluated annual gross summer on-peak demand reduction for each program over the 2016 and 2017 program years, while Table 15 presents evaluated annual gross electric savings and Table 16 presents evaluated gross fossil fuel savings. The reported and evaluated gross demand reduction represent the average kilowatt reduction coincident with the summer on-peak period as defined by the ISO New England for the Forward Capacity Market.

Table 14. Reported and Evaluated Gross Annual Demand Reduction by Program

Program	Annual Program Savings (kW)		Realization Rate	Precision
	Reported	Evaluated Gross		
Municipal	182.4	194.6	107%	±16.8%
Small Business Energy Solutions	1,061.0	1,216.8	115%	±39.0%
Retail and Large Business	N/A	N/A	N/A	N/A
Total	**1,243.4**	**1,411.3**	**113.5%**	**±32.7%**

Table 15. Reported and Evaluated Gross Electric Savings by Program

Program	Program Savings (kWh)		Realization Rate	Precision
	Reported	Evaluated Gross		
Municipal	1,544,143	1,622,306	105%	±5.0%
Small Business Energy Solutions	2,394,822	2,067,615	86%	±9.4%
Retail and Large Business	19,199	19,199	100%	0.0%
Total	**3,958,165**	**3,709,120**	**93.7%**	**±5.6%**

Note: Totals may not sum due to rounding.

[11] NHEC is not required to file an annual report. For RGGI programs, expenditures but not savings are reported; savings for this program were calculated in the same manner as savings for the other programs or deemed as outlined in the utilities' proposal. Electric report: https://www.puc.nh.gov/Electric/AnnualReports.html; natural gas report: https://www.puc.nh.gov/Gas-Steam/gas-steam.htm

Table 16. Reported and Evaluated Gross Fossil Fuel Savings by Program

Program	Program Savings (MMBtu)		Realization Rate	Precision
	Reported	Evaluated Gross		
Municipal	14,596	16,390	112%	±16.8%
Small Business Energy Solutions	56,785	49,548	87%	±16.0%
Retail and Large Business	18,855	23,243	123%	±23.2%
Total	**90,236**	**89,181**	**98.8%**	**±10.9%**

Evaluated Gross Savings Results by Program and Strata

The following sections provide a description of the measures and reported savings by program as well as detailed findings by sampled measure type within each program.

Municipal Program

NHSaves provided incentives for 143 measures in 2016 and 2017, accounting for 182.4 kW of summer on-peak demand reduction, 1,544,143 kWh of energy savings, and 14,596 MMBtu of fossil fuel savings. These incentives encompassed 15 types of measures, which Cadmus organized into two strata: HVAC and Motors and Other (shown in Table 17).

Table 17. Municipal Program Reported Savings

Strata	Measure Type	Measures	Reported kW	Reported kWh	Reported MMBtu
HVAC and Motors	Boiler	2	-	-	858.65
	Boiler Reset Controls	1	-	-	91.70
	Cooling	7	17.49	44,980.00	-
	Custom - EMS	5	7.94	64,536.00	1,702.00
	Custom - Heating System	2	11.71	37,952.00	1,794.34
	EMS	1	-	24,385.00	1,331.54
	HVAC	27	19.76	41,114.50	6,006.22
	Motors	7	44.61	389,916.00	-
	Motors/Drives	5	7.65	263,295.96	-
Other	Custom	15	15.00	75,968.00	415.04
	Custom - Weatherization	6	1.80	6,820.00	1,816.17
	Domestic Hot Water	24	-	42,600.00	-
	Heating	2	8.96	7,998.00	-
	Indirect Water Heating	1	-	-	20.70
	Insulation	2	-	-	153.30
	Process	19	23.24	332,125.00	-
	Refrigeration	11	24.27	212,280.00	-
	Spray Foam	1	-	-	47.40
	Water Heater	1	-	-	50.00
	Weatherization	4	-	173.00	309.40
Total		**143**	**182.42**	**1,544,143**	**14,596.46**

Table 18 provides the realization rates by strata for the Municipal program.

Table 18. Municipal Program Realization Rates

Strata	Demand Reduction (kW) Realization Rate	Energy Savings (kWh) Realization Rate	Fossil Fuel (MMBtu) Realization Rate
HVAC and Motors	99%	108%	120%
Other	118%	101%	81%
Total	**107%**	**105%**	**112%**

Measures

Cadmus sampled 31 projects within the Municipal program. The sampled projects represent 56% of Municipal program non-lighting kilowatt savings, 61% of Municipal program non-lighting kilowatt-hour savings, and 55% of Municipal program non-lighting fossil fuel savings. Measure types, quantity of sampled measures, and savings methodologies for the Municipal program are shown in Table 19.

Table 19. Municipal Program Reported and Evaluated Savings Methodology

Measure Type	Sampled Projects	Reported Savings Methodology	Evaluation Methodology
Air Conditioning Units	2	Prescriptive savings	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Anti-Sweat Heater Controls	1	Custom calculations	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Boilers	4	Prescriptive savings based on equipment size groupings	2018 Mid-Atlantic TRM methodology and 2019–2021 Massachusetts TRM regional inputs
Building Management Systems	5	Custom calculations	Custom calculations
Computer Management	2	Custom calculations	Regional Technical Forum Non-Res Network Computer Power Management[a]
Custom	1	Custom calculations	Custom calculations
Electronically Commutated (EC) Motors	4	Prescriptive savings per unit	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Energy Recovery Ventilators	2	Custom calculations	2017 *Focus on Energy, Energy Recovery Ventilator* measure methodology with Massachusetts regional weather data
Programmable Thermostats	1	Prescriptive savings per unit	2019 *Connecticut Program Savings Document*. Section 3.2.5 Setback Thermostat
Refrigeration Equipment Controls	2	Custom calculations	Custom calculations

Measure Type	Sampled Projects	Reported Savings Methodology	Evaluation Methodology
Steam Traps	1	Prescriptive savings per unit	Custom calculations based on 2017 Energy and Resource Solutions *Steam Trap Evaluation Study* methodology[b]
Variable Frequency Drives	8	Prescriptive calculations	Custom calculations
Weatherization	4	Energy model or prescriptive savings per unit	Energy model and custom calculations

[a] Regional Technical Forum. "Non-Res Network Computer Power Management." https://rtf.nwcouncil.org/measure/non-res-network-computer-power-management

[b] Energy and Resource Solutions. March 8, 2017. *Final Report: Steam Trap Evaluation Phase 2*. Prepared for Massachusetts Program Administrators and Energy Efficiency Advisory Council. http://ma-eeac.org/wordpress/wp-content/uploads/Steam-Trap-Evaluation-Phase-II.pdf

Findings

Figure 1 through Figure 3 represent the magnitude and associated realization rates for reported kilowatt, kilowatt-hour, and fossil fuel savings among sampled projects.

Figure 1. Municipal Program Non-Lighting Summer On-Peak Demand Reduction (kW)

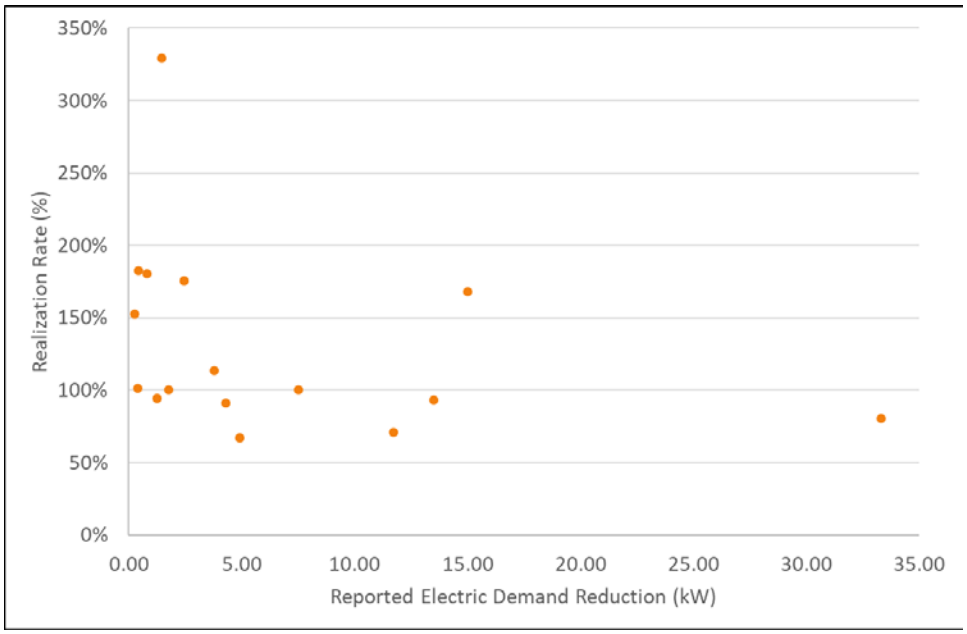

Figure 2. Municipal Program Non-Lighting Electric Savings (kWh)

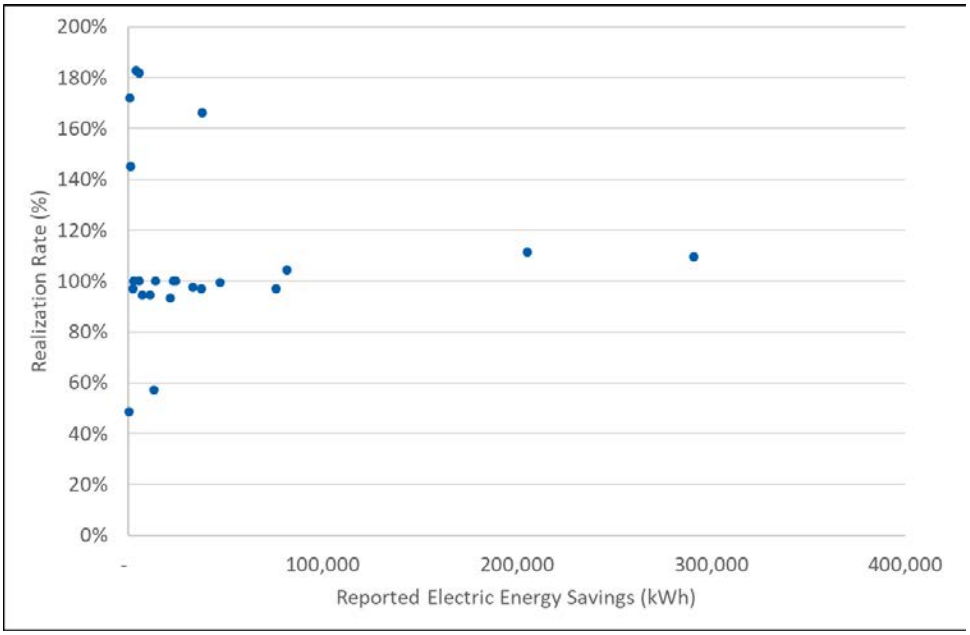

Figure 3. Municipal Program Non-Lighting Fossil Fuel Savings (MMBtu)

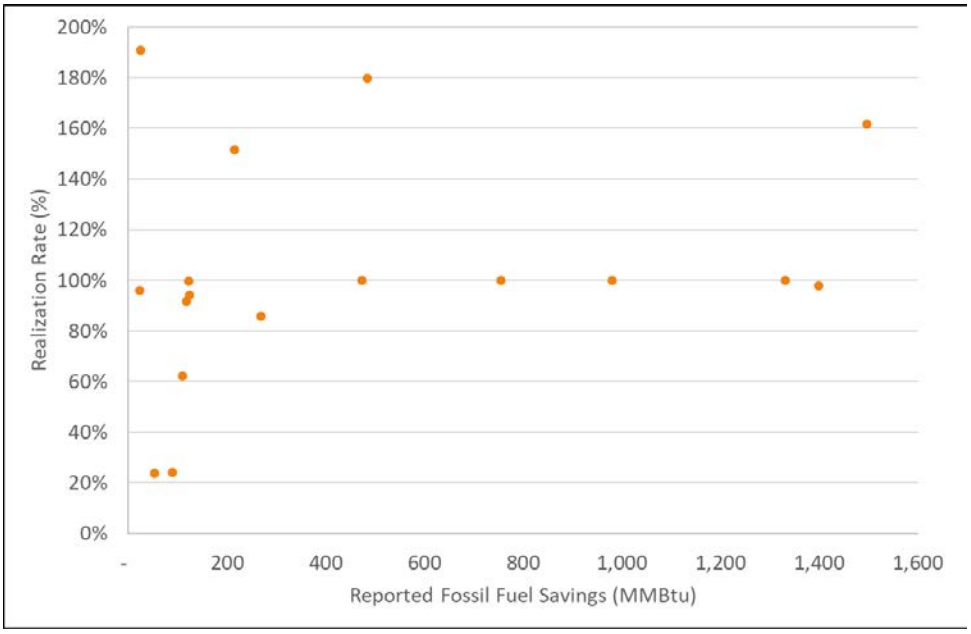

Table 20 provides specific details for measure results and findings within the sampled projects.

Table 20. Municipal Program Sample Detailed Findings

Measure Type	Sampled Projects	Site Realization Rates			Notes
		kW	kWh	MMBtu	
Air Conditioning Units	2	94%	64%	92%	Reported hours of use do not match building type for one project
Anti-Sweat Heater Controls	1	94%	94%	N/A	Minimal discrepancies found
Boilers	4	N/A	N/A	132%	Installed boilers were higher efficiency than reported in utility tracking data
Building Management Systems	5	100%	100%	100%	Minimal discrepancies found
Computer Management	2	183%	133%	N/A	Baseline energy consumption from computers differs between reported and evaluated calculations
Custom	1	71%	166%	98%	Custom calculations do not sufficiently document input assumptions, calculation variables, or methodology. Cadmus calculated savings based on 2016-2018 Massachusetts TRM heat pump measure assumptions and calculation methodology.
EC Motors	4	89%	107%	N/A	Minimal discrepancies found
Energy Recovery Ventilators	2	N/A	111%	146%	Power meters and temperature logging data used in evaluated calculations
Programmable Thermostats	1	N/A	N/A	0%	Setback programming not implemented
Refrigeration Equipment Controls	2	102%	97%	N/A	Minimal discrepancies found
Steam Traps	1	N/A	N/A	162%	Steam pressure observed on-site was higher than assumed in the 2016-2018 Massachusetts TRM
Variable Frequency Drives	8	110%	105%	N/A	Minimal discrepancies found
Weatherization	4	N/A	49%	58%	Temperature sensors informed evaluated savings

The following bullets provide details regarding the sampled projects that were evaluated to exhibit lower than 80% or higher than 120% adjusted gross savings realization rates:

- Two projects involved installing air conditioning units. Cadmus performed power metering and temperature logging at one facility to inform the facility and space use schedules. Using updated hours of use, realization rates for this facility were 153% for demand reduction and 145% for energy savings. For the other project that involved installing air conditioning units (at a school), Cadmus calculated savings based on the building-specific 594 cooling effective full load hours for high school buildings from the 2019 *Connecticut Program Savings Document*. The hours of use from the reported calculations were higher than defined in the high school building type, resulting in a low realization rate for energy savings (57%).
- Four projects involved installing new condensing boilers. Reported savings for condensing boilers varied between 22.10 MMBtu and 195.00 MMBtu based on the boiler capacity and fuel type. The capacities for the boiler savings groups were defined as less than 300 MBh, 300–499 MBh, 500–999 MBh, 1,000–1,700 MBh, and 1,701–2,000 MBh. Because the boiler savings groups had relatively large boundaries, evaluated energy savings showed significant variation if

the installed boiler capacity was close to the boiler group capacity boundaries. Cadmus calculated energy savings for each project based on the actual installed efficiency and capacity. These two site-specific findings drove the variations in realization rates.

- Two projects involved implementing computer management software such that computers at a school may be remotely powered off when not in use. Reported savings are based on custom calculations. Cadmus determined the evaluated savings based on the savings methodology outlined in the Non-Res Network Computer Power Management measure from the Regional Technical Forum. The baseline energy use from computers differs between the reported calculations and evaluated calculations. Cadmus used a higher value for baseline energy use, resulting in evaluated energy savings of 133% for the two projects combined.
- One project involved implementing a custom 80-ton geothermal HVAC system. Minimal spreadsheet calculations were provided in the reported documentation. Cadmus evaluated savings by comparing the energy use of the geothermal system to an equivalent capacity standard efficiency HVAC system. The realization rates for kilowatt and kilowatt-hour annual savings were divergent with demand reduction at 71% for bother winter and summer and energy savings at 166% with MMBtuh savings around 100%. Divergent demand and total energy savings can be explained by higher- than- anticipated annual full- load hours but lower- than-anticipated equipment efficiencies.
- Two projects involved installing energy recovery ventilators, which achieve energy savings by transferring heat from the exhaust air to the incoming outside air by using an enthalpy wheel. Pre-heating the air with “free” exhaust air heat reduces the amount of heat required to be consumed by fossil fuels. Reported savings are based on custom calculations. Cadmus installed power meters and temperature sensors on two energy recovery ventilators for one of these projects and used custom calculations to evaluate energy savings based on the meter data. For the other project, we calculated savings based on the methodology outlined in the Wisconsin Focus on Energy 2017 TRM: Energy Recovery Ventilator measure.
- One project involved installing three new programmable thermostats. Cadmus observed that the setback function was not being used for these thermostats. We installed temperature and relative humidity sensors at the facility and observed operation over a 10-week period. Trend data from the temperature sensors indicated no noticeable increase or decrease in space temperatures at any time. Because the setback function is not being used, no energy savings are being realized.
- Eight projects involved installing VFDs serving pumps, air handling unit fans, and exhaust fans. Reported savings used prescriptive calculations based on the 2016–2018 Massachusetts TRM, with horsepower being the only critical input. The calculations assume typical values for hours of use, load profile, and motor efficiency. Cadmus calculated energy savings based on load profiles specific to the end-use application and assumed hours of use. For three of four projects,

we calculated demand reduction realization rates greater than 100%. Evaluated energy savings closely matched reported savings, with realization rates between 93% and 127%.

- Four projects involved weatherization measures, which consisted of adding insulation to walls and attics or foam sealing cracks and ductwork. Reported savings for these projects were based on energy model calculations or spreadsheet calculations. Cadmus installed temperature and relative humidity sensors at three projects to understand occupancy schedules over a 10-week period. We used trend data to update the energy model inputs and spreadsheet calculations and determined evaluated fossil fuel savings realization rates between 24% and 62%. The fourth project involved roof and wall insulation and realized 94% of the reported fossil fuel savings.

Small Business Energy Solutions Program

NHSaves provided incentives for 1,189 measures in 2016 and 2017, accounting for 1,061.0 kW of summer on-peak demand reduction, 2,394,822 kWh of energy savings, and 56,785 MMBtu of fossil fuel savings. These incentives encompassed 24 types of measures, which Cadmus organized into three strata: HVAC, Refrigeration and Motors, and Other (shown in Table 21).

Table 21. Small Business Energy Solutions Program Reported Savings

Strata	Measure Type	Measures	Reported kW	Reported kWh	Reported MMBtu
HVAC	Heating	1	1.29	1,237.00	-
	Heating and Cooling	147	-	-	2,659.50
	HVAC	94	26.12	75,894.78	7,567.51
	SCI HVAC Air-Source Heat Pump New	1	-	2,757.00	-
	SCI HVAC Unitary/Split System New	16	-	62,188.00	-
	Space Heating	75	-	-	12,986.30
Refrigeration and Motors	Motor	18	39.40	237,838.80	-
	Motor/Drive	1	5.67	32,038.71	-
	Refrigeration	15	52.63	437,500.80	-
	SCI Motor Retrofit	1	-	10,672.00	-
	SCI VFD Retrofit	1	-	28,250.00	-
Other	Appliance	126	-	672.00	2,499.20
	Compressed Air	3	4.60	60,220.09	
	Compressed Air	4	13.15	80,671.69	-
	Cooking	16	-	-	1,275.60
	Cooling	32	172.47	383,790.00	-
	Custom	20	145.13	559,954.00	-
	Domestic Water Heating	313	548.00	-	14,260.41
	Envelope	7	-	-	403.80
	Hot Water	39	-	-	476.82
	Hot Water	61	-	-	1,681.70
	Other	142	-	163,891.00	11,340.58
	Process	56	52.50	257,246.00	1,633.10
Total		**1,189**	**1,061.0**	**2,394,822**	**56,785**

Table 22 provides the realization rates by strata for the Small Business Energy Solutions program.

Table 22. Gas Small Business Energy Solutions Program Realization Rates

Strata	Demand Reduction (kW) RR w/prescriptive measures	Demand Reduction (kW) RR w/out prescriptive measures	Energy Savings (kWh) RR w/prescriptive measures	Energy Savings (kWh) RR w/out prescriptive measures	Natural Gas (MMBtu) Realization Rate w/prescriptive measures	Natural Gas (MMBtu) Realization Rate w/out prescriptive measures
HVAC	NA	NA	NA	NA	133%	77%
Other	59%	NA	125%	134%	84%	78%
Total	**59%**	**NA**	**125%**	**134%**	**101%**	**78%**

Table 23. Electric Small Business Energy Solutions Program Realization Rates

Strata	Demand Reduction (kW) RR w/prescriptive measures	Demand Reduction (kW) RR w/out prescriptive measures	Energy Savings (kWh) RR w/prescriptive measures	Energy Savings (kWh) RR w/out prescriptive measures	Fossil Fuel (MMBtu) RR w/prescriptive measures	Fossil Fuel (MMBtu) RR w/out Realization Rate
HVAC	NA	0%	NA	107%	NA	NA
Refrigeration and Motors	NA	104%	NA	95%	NA	NA
Other	NA	119%	NA	72%	NA	NA
Total	**NA**	**111%**	**NA**	**81%**	**NA**	**NA**

Measures

Cadmus sampled 44 projects within the Small Business Energy Solutions program. The sampled projects represent 11% of Small Business Energy Solutions program non-lighting kilowatt savings, 35% of Small Business Energy Solutions non-lighting kilowatt-hour savings, and 20% of Small Business Energy Solutions program non-lighting fossil fuel savings. Measure types, quantity of sampled measures, and savings methodologies for the Small Business Energy Solutions program are shown in Table 24.

Table 24. Small Business Energy Solutions Program Reported and Evaluated Savings Methodology

Measure Type	Sampled Projects	Reported Savings Methodology	Evaluation Methodology
Aerators	6	Prescriptive savings per unit	2018 Mid-Atlantic TRM methodology and 2019–2021 Massachusetts TRM regional inputs
Air Compressors	6	Prescriptive calculations	Custom calculations
Air Conditioning Units	2	Prescriptive calculations	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Air Handling Unit Controls	3	Custom calculations	Custom calculations
Boilers	13	Prescriptive savings based on equipment size groupings	2018 Mid-Atlantic TRM methodology and Massachusetts regional weather data
Building Management Systems	1	Custom calculations	Custom calculations
EC Motors	5	Prescriptive savings per unit	Prescriptive calculations based on 2019–2021 Massachusetts TRM

Measure Type	Sampled Projects	Reported Savings Methodology	Evaluation Methodology
Energy Recover Ventilators	1	Custom calculations	2017 Focus on Energy *Energy Recovery Ventilator* measure methodology with Massachusetts regional weather data
Fryers	2	Prescriptive savings per unit	2019 *Connecticut Program Savings Document*. Section 2.6.2 Commercial Kitchen Equipment (references the ENERGY STAR Calculator)
Infrared Heaters	1	Prescriptive savings based on equipment capacity	2019 *Connecticut Program Savings Document.* Section 2.2.7 Natural Gas Radiant Heaters measure
Instant-On Plastic Wrappers	1	Custom calculations	Custom calculations
Programmable Thermostats	4	Prescriptive savings per unit	2019 *Connecticut Program Savings Document*. Section 3.2.5 Setback Thermostat
Refrigeration System Upgrades	1	Prescriptive calculations	Custom calculations
Showerheads	4	Prescriptive savings per unit	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Variable Frequency Drives	5	Prescriptive calculations	Custom calculations
Water Heaters	2	Prescriptive savings per unit	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Weatherization	3	Energy model and custom calculations	Energy model and custom calculations

Findings

Figure 4 through Figure 6 represent the magnitude and associated realization rates for reported kilowatt, kilowatt-hour, and fossil fuel savings among sampled projects.

Figure 4. Small Business Energy Solutions Program
Non-Lighting Summer Non-Peak Demand Reduction (kW)

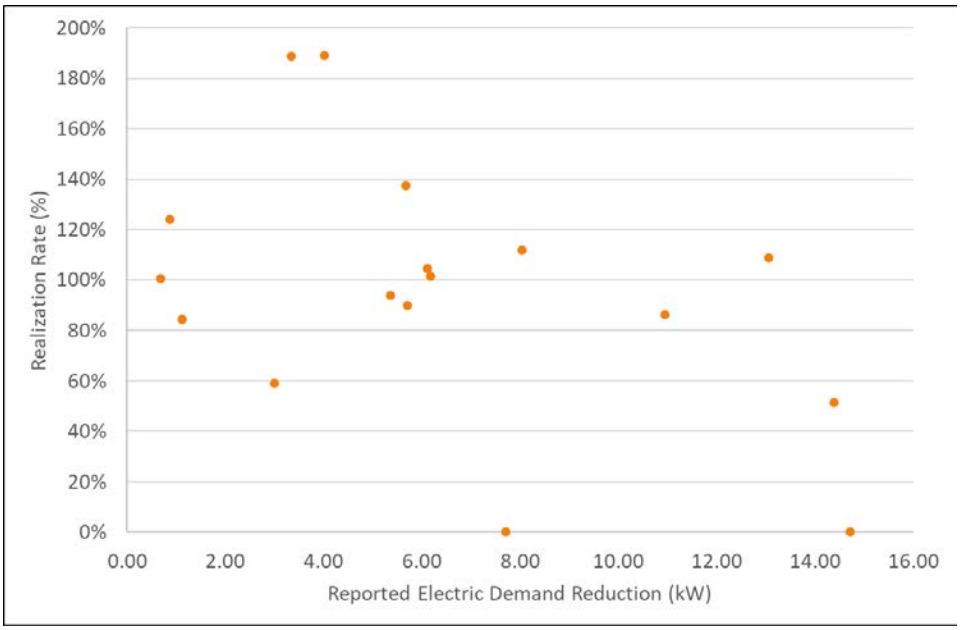

Figure 5. Small Business Energy Solutions Program Non-Lighting Electric Savings (kWh)

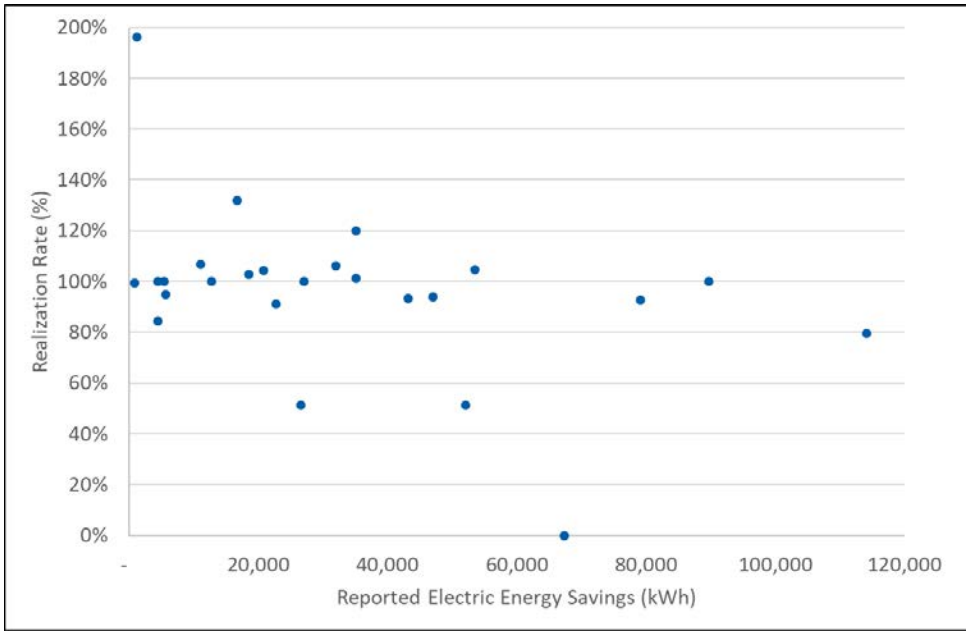

Figure 6. Small Business Energy Solutions Program Fossil Fuel Non-Lighting Savings (MMBtu)

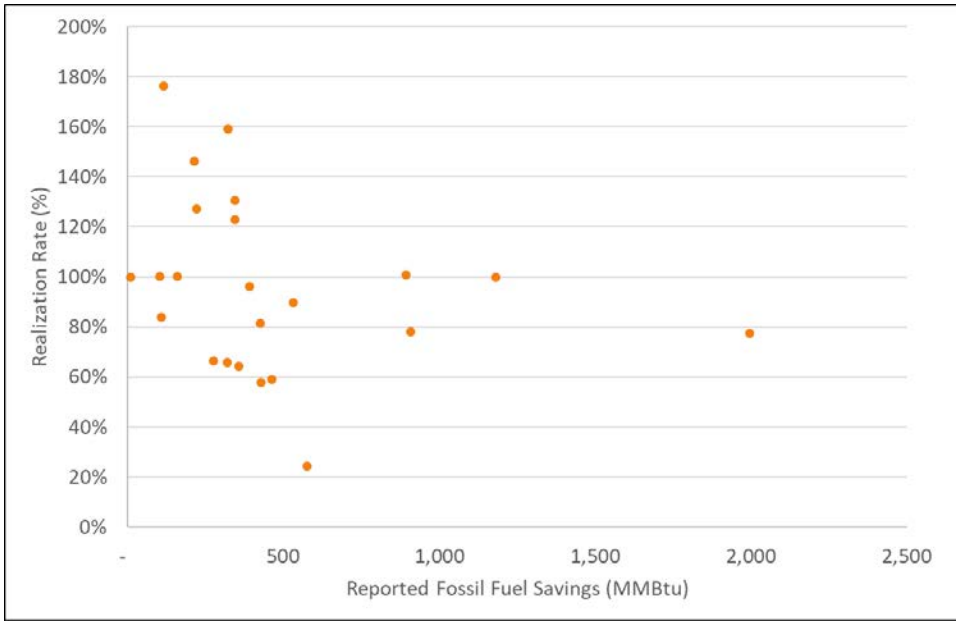

Table 25 and Table 26 provide specific details for measure results and findings within the sampled projects.

Table 25. Gas Small Business Energy Solutions Sample Detailed Findings

Measure Type	Sampled Projects	Site Realization Rates			Notes
		kW RR	kWh RR	MMBtu RR	
Aerators	6	59%	N/A	74%	Time usage per aerator differs between reported and evaluated calculations
Air Handling Unit Controls	3	N/A	100%	101%	Minimal discrepancies found
Boilers	13	N/A	109%	108%	Installed boilers were higher efficiency than the minimum efficiency required by the program
Building Management Systems	1	N/A	100%	100%	Minimal discrepancies found
Energy Recover Ventilators	1	N/A	99%	24%	Power meters and temperature logging data were used in evaluated calculations
Fryers	2	N/A	N/A	64%	Evaluated savings were based on installed heating capacity and hours of use
Infrared Heaters	1	N/A	196%	127%	Power meters and temperature logging data were used for evaluated calculations
Programmable Thermostats	4	N/A	100%	96%	Minimal discrepancies found
Showerheads	4	N/A	N/A	75%	Fewer fixtures were installed than rebated at one hotel
Variable Frequency Drives	1	N/A	N/A	4,109%	Reported fossil fuel and electric savings were swapped in reported documentation.
Water Heaters	2	N/A	100%	101%	Minimal discrepancies found
Weatherization	2	N/A	N/A	100%	No discrepancies found

Table 26. Electric Small Business Energy Solutions Sample Detailed Findings

Measure Type	Sampled Projects	Site Realization Rates			Notes
		kW RR	kWh RR	MMBtu RR	
Air Compressors	6	116%	77%	N/A	Evaluated savings were based on custom load profiles associated with end-use equipment
Air Conditioning Units	2	100%	103%	N/A	Minimal discrepancies found
EC Motors	5	105%	89%		Actual motor sizes differed slightly from assumptions in reported savings
Instant-On Plastic Wrappers	1	N/A	84%	84%	Evaluated savings were based on manufacturer calculation workbook
Refrigeration System Upgrades	1	86%	93%	N/A	Power meters and temperature logging data were used in evaluated calculations
Variable Frequency Drives	4	96%	66%	N/A	One sampled project with a VFD running in manual mode at 100% speed drove the total sampled projects kWh realization rate down from 109% to 66%
Weatherization	1	51%	132%		Discrepancies found in the TREAT energy model inputs

The following bullets provide details regarding the sampled projects that were evaluated to exhibit lower than 80% or higher than 120% adjusted gross savings realization rates:

- Six projects involved installing aerators. Reported savings are based on an assumed 4.5 minutes of use per day. Cadmus observed that most aerators were installed in bathrooms where the 2016-2018 Massachusetts TRM assumes 1.6 minutes of use per day. Cadmus calculated evaluated savings based on the time usage associated with the installation location, resulting in low realization rates for all aerator measures.
- Two projects involved installing high efficiency fryers. The reported savings for all fryers use the same value, regardless of efficiency or heating capacity. The 2016–2018 Massachusetts TRM provides deemed energy savings of 610 kWh for standard size fryers and 2,175 kWh for large size fryers based on assumptions from the ENERGY STAR Commercial Kitchen Equipment Savings Calculator: Fryer Calcs. Cadmus evaluated these projects using the ENERGY STAR Commercial Kitchen Equipment Savings Calculator: Fryer Calcs with site-specific calculation inputs. Both sampled projects had lower evaluated fossil fuel savings due to the as-found fryer sizes.
- One project involved installing an infrared heater. The reported heating savings were based on equipment quantity and do not account for heating capacity. Cadmus calculated energy savings based on the methodology outlined in the 2019 *Connecticut Program Savings Document* using the actual installed capacity and space type served. Cadmus also installed power meters and temperature loggers to inform the hours of use assumptions from the evaluated calculations.
- Four projects installed programmable thermostats with varying degrees of success. One project installing a new building management system in addition to programmable thermostats. The thermostats for this project used appropriate setback temperatures and were implemented

correctly; however, for two other projects, the programmable thermostats were not programmed to use setback temperatures during unoccupied times. Both these projects also involved installing aerators and showerheads at multifamily commercial facilities. Because the thermostats were not programmed and used appropriately, they produced no savings.

- Foure projects involved installing VFDs, two of which were operating appropriately. Cadmus calculated savings based on a load profile associated with the specific end-use application. These projects exhibited realization rates between 101% and 120% for demand reduction and between 112% and 189% for energy savings. One project involved installing VFDs on two chilled water pumps. Cadmus metered both pumps and found that one ran at maximum speed throughout the trend period while the other did not operate. We interviewed the facility operator, who said the pump was placed in "hand" mode and the pumps were operated in a lead/lag fashion, such that only one pump operates at any given time. Because of this finding, no savings were realized for this project. One project involved installing two VFDs serving kitchen exhaust fans. Cadmus metered both exhaust fans and found that they were operating between 20% and 40% when enabled and were being operated for more hours than reported. Because of this, the project had greater energy savings and fossil fuel savings than reported.

Retail and Large Business Program

NHSaves provided incentives for 247 measures in 2016 and 2017, accounting for 19,199 kWh of energy savings and 18,855 MMBtu of fossil fuel savings. NHSaves provided incentives for 24 types of measures, which Cadmus organized into two strata: HVAC and Other (shown in Table 27).

Table 27. Retail and Large Business Reported Savings

Strata	Measure Type	Measures	Reported kW	Reported kWh	Reported MMBtu
HVAC	Boiler	8	-	-	536.22
	Custom - EMS	1	-	5,920.00	174.42
	Custom - Heating	2	-	-	288.06
	EMS	5	-	-	138.62
	Heating and Cooling	15	-	840.00	1,450.80
	HVAC	82	-	535.00	10,793.87

Strata	Measure Type	Measures	Reported kW	Reported kWh	Reported MMBtu
Other	Aerator LP	6	-	-	20.40
	Aerator Oil	4	-	-	34.00
	Custom	79	-	2,029.76	2,153.98
	Custom - Weatherization	18	-	9,874.50	2,230.18
	Domestic Water Heating	3	-	-	53.00
	Dryer	1	-	-	40.19
	Indirect Water Heater	2	-	-	62.10
	Insulation	3	-	-	238.01
	Low-Flow Showerhead LP	2	-	-	36.40
	Low-Flow Showerhead Oil	1	-	-	10.40
	Pipe Insulation LP	7	-	-	7.56
	Pipe Insulation Oil	2	-	-	3.15
	Pre-Rinse Spray Valve LP	1	-	-	12.60
	Pre-Rinse Spray Valve Oil	1	-	-	12.60
	Spray Foam	1	-	-	55.25
	Water Heater	1	-	-	45.90
	Weatherization	2	-	-	457.24
Total		**247**	**0**	**19,199.26**	**18,854.97**

Table 28 provides the realization rates by strata for the Retail and Large Business program.

Table 28. Retail and Large Business Program Realization Rates

Strata	Demand Reduction (kW) Realization Rate	Energy Savings (kWh) Realization Rate	Fossil Fuel (MMBtu) Realization Rate
HVAC	N/A	NA	143%
Other	N/A	100%	75%
Total	**N/A**	**100%**	**123%**

Measures

Cadmus sampled 24 projects within the Retail and Large Business program. The sampled projects represent 12% of Retail and Large Business program non-lighting kilowatt-hour savings and 70% of Retail and Large Business program non-lighting fossil fuel savings. Measure types, quantity of sampled measures, and savings methodologies for the Small Business Energy Solutions program are shown in Table 29.

Table 29. Retail and Large Business Program Reported and Evaluated Savings Methodology

Measure Type	Sampled Projects	Reported Savings Methodology	Evaluation Methodology
Aerators	1	Prescriptive savings per unit	2018 Mid-Atlantic TRM methodology and 2019–2021 Massachusetts TRM regional inputs
Air Handling Unit Controls	1	Custom calculations	Custom calculations
Boilers	6	Prescriptive savings based on equipment size groupings	2018 Mid-Atlantic TRM methodology and 2019–2021 Massachusetts TRM regional inputs
Infrared Heaters	2	Prescriptive savings based on equipment capacity	2019 *Connecticut Program Savings Document*. Section 2.2.7 Gas Radiant Heater
Programmable Thermostats	1	Prescriptive savings per unit	2019 *Connecticut Program Savings Document*. Section 3.2.5 Setback Thermostat
Showerheads	1	Prescriptive savings per unit	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Steam Traps	7	Prescriptive savings per unit	Custom calculations based on 2017 Energy and Resource Solutions *Steam Trap Evaluation Study* methodology
Water Heater	2	Prescriptive savings per unit	Prescriptive calculations based on 2019–2021 Massachusetts TRM
Weatherization	5	Energy model	Energy model and custom calculations
Wi-Fi Thermostats	1	Prescriptive savings per unit	2018 Mid-Atlantic TRM. Smart Thermostat section.

Findings

Figure 7 and Figure 8 represent the magnitude and associated realization rates for reported kilowatt-hour and fossil fuel savings among sampled projects.

Figure 7. Retail and Large Business Program Sample Electric Savings (kWh)

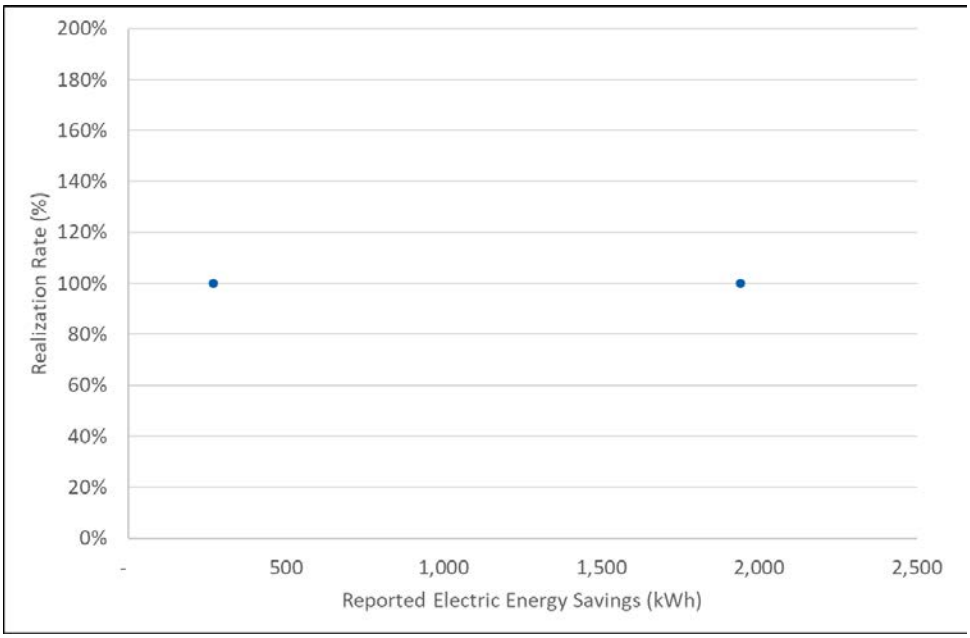

Figure 8. Retail and Large Business Program Fossil Fuel Savings (MMBtu)

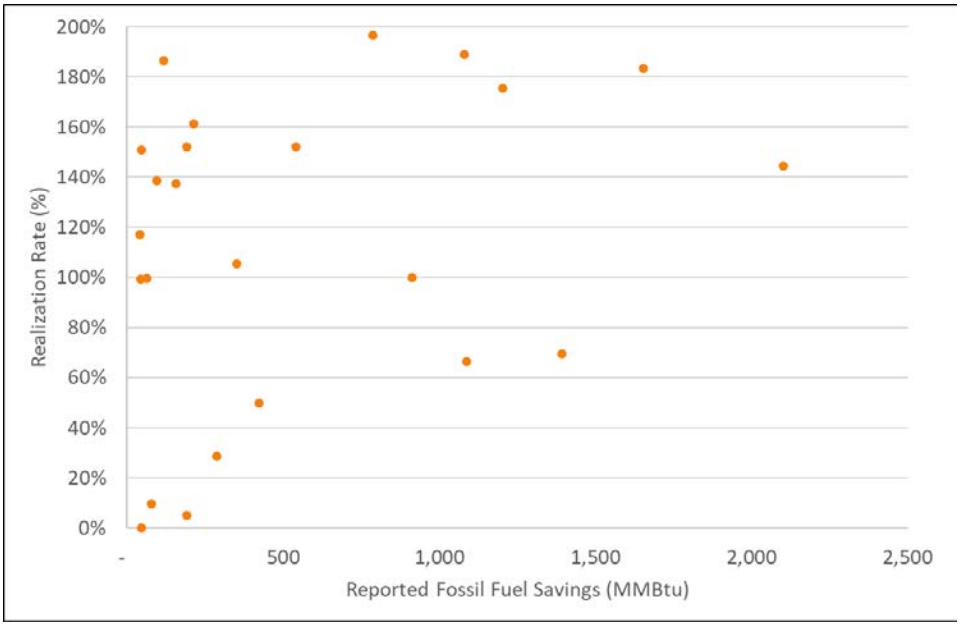

Table 30 provides specific details for measure results and findings within the sampled projects.

Table 30. Retail and Large Business Sample Detailed Findings

Measure Type	Sampled Projects	Site Realization Rates			Notes
		kW	kWh	MMBtu	
Aerators	1	N/A	N/A	10%	Time usage per aerator differs between reported and evaluated calculations
Air Handling Unit Controls	1	N/A	N/A	99%	Minimal discrepancies found
Boilers	6	N/A	N/A	95%	Minimal discrepancies found
Infrared Heaters	2	N/A	N/A	145%	Evaluated savings were based on installed heating capacity and hours of use
Programmable Thermostats	1	N/A	N/A	0%	Thermostats were not programmed to use setback functionality
Showerheads	1	N/A	N/A	29%	Time usage per showerhead differs between reported and evaluated calculations
Steam Traps	7	N/A	N/A	155%	Steam pressure observed on the site was higher than assumed in reported calculations
Water Heaters	2	N/A	N/A	135%	Higher efficiency installed than minimum required
Weatherization	5	N/A	100%	89%	Minimal discrepancies found
Wi-Fi Thermostats	1	N/A	N/A	5%	Minimal setback implemented on thermostats

The following bullets provide details regarding the sampled projects that were evaluated to exhibit lower than 80% or higher than 120% adjusted gross savings realization rates:

- One project involved installing 45 aerators at one facility. Reported savings were based on an assumed 4.5 minutes per use per day. Cadmus observed that most aerators were installed in bathrooms where the 2016-2018 Massachusetts TRM assumes 1.6 minutes per use per day. Cadmus calculated evaluated savings based on the time usage associated with the installation location, resulting in low realization rates for all aerator measures. Cadmus found that 38 of these aerators were installed in restroom lavatories. We evaluated these projects using the observed flow rates and time of use associated with the installation locations. Because most aerators were installed in restroom lavatories, the project realized low fossil fuel savings.
- Two projects involved installing infrared heaters. The reported savings for infrared heaters were based on equipment quantity but did not account for heating capacity. Cadmus calculated energy savings for both projects based on actual installed capacity and space type served; these two inputs were the primary drivers for these projects' 137% and 152% realization rates.
- One project involved installing showerheads, which Cadmus evaluated based on the methodology and inputs variables described in the 2018 Mid-Atlantic TRM. We collected data for each showerhead including installation location, flow rates, water heater efficiency, and shower temperature. The savings for showerheads were reported as a prescriptive savings value per unit. Cadmus calculated evaluated savings based on the site-specific data, which led to lower realized energy savings than reported.
- Seven projects, representing the majority of reported savings in the Retail and Large Business program HVAC strata, involved replacing steam traps. Cadmus calculated savings based on the calculation methodology outlined in the 2016 *DNVGL Steam Trap Evaluation Study*, which specifies steam pressure, operating hours, boiler efficiency, and steam trap orifice size as the driving factors behind steam trap energy savings. The average steam pressure and steam trap orifice size on site was higher than those listed in the 2016 *DNVGL Steam Trap Evaluation Study*, and steam trap projects realized fossil fuel savings between 69% and 197%.
- Two projects involved installing side-arm tanks to boiler systems to serve domestic water heating needs. Because the boilers serving both tanks were higher efficiency than the assumed high efficiency water heater in the prescriptive calculations, greater energy savings were realized.
- One project involved installing Wi-Fi thermostats. Cadmus observed that the thermostat model did not have "learning" capability and essentially operated as a typical standard programmable thermostat. A two-degree temperature setback was implemented for unoccupied/away periods. Because this temperature setback is relatively low, minimal energy savings were realized.

Greenhouse Gas Emissions Reductions

Cadmus calculated the emissions benefits accrued from the savings realized by non-lighting measures incentivized within the Retail and Large Business Program to fulfil the evaluation metric for the RGGI grant used to fund ERPR. The calculation used annual evaluated electric savings, annual evaluated fuel

(natural gas, fuel oil, and propane) savings, and emissions factors. Emissions factors refer to the rate at which pollutants are emitted per unit of energy. The product of the emissions factor and the annual evaluated energy savings is the total weight of air pollutant displaced by the program.

Cadmus used the EPA's eGrid 2016 (updated in March 2018) electric emissions factor for the state of New Hampshire[12] and natural gas emissions factors from the Greenhouse Gas Protocol[13,14]. Table 31 lists these emissions factors.

Table 31. Emissions Factors

Service Fuel Type	CO_2	CH_4	N_2O
Electric Emissions Factor (lbs/MWh)	310.6	0.101	0.013
Natural Gas Emissions Factor (kg/TJ) HHV	50,490	4.5	0.09
Propane Emissions Factor (kg/TJ) HHV	56,790	4.50	0.09
Fuel Oil Emissions Factor (kg/TJ) HHV	70,395	9.50	0.57

Cadmus estimates that the energy saved through the Program avoided 6,009 tonnes of CO_2e emissions, roughly equivalent to the amount of carbon sequestered by 100,000 tree seedlings grown for 10 years.

[12] U.S. Environmental Protection Agency. *Emissions & Generated Resource Integrated Database (eGRID).* Available online: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid

[13] Greenhouse Gas Protocol. *Emissions Factors from Cross-Sector Tools April 2014*. Available online: http://ghgprotocol.org/sites/default/files/ghgp/Emission_Factors_from_Cross_Sector_Tools_April_2014.xlsx

[14] The GHG Protocol is the most widely used greenhouse gas accounting standard. In 2016, 92% of Fortune 500 companies responding to the CDP used GHG Protocol directly or indirectly through a program based on GHG Protocol.

Process Evaluation

The primary goals of the process evaluation were to identify opportunities for increasing energy-efficient, non-lighting installations in the business and municipal markets, assess vendor and contractor participation and performance, and determine the level of program satisfaction among customers, program partners, and utility staff.

The sections below detail Cadmus' findings on the NHSaves C&I program design and process and the customer and program partner experience, including satisfaction and outreach.

Program Overview

Through the 2016 and 2017 C&I and municipal programs (Small Business Energy Solutions, Large Business Energy Solutions, Retail and Large Business, and Municipal), NHSaves offers incentives for electric, natural gas, and nonregulated fuel energy-efficient measure installations.[15] The electric and nonregulated fuels initiatives are administered by the four electric program administrators (Eversource, Liberty, NHEC, Unitil) and the natural gas initiative is administered by the natural gas program administrators (Liberty and Unitil). Individual utilities oversee program management and delivery. With support from program partners, and in some cases, energy audit and direct install subcontractors, utilities promote the program to customers.

The 2016 and 2017 C&I and municipal programs were funded through three primary sources: standard ratepayer charges, a competitive RGGI grant received from the New Hampshire Public Utilities Commission, and proceeds from Independent System Operator of New England Forward Capacity Market.[16] A portion of funding was sourced through a system benefit charge and a local delivery adjustment charge received from electric and natural gas customers, respectively, and used to create the Small Business Energy Solutions, Large Business Energy Solutions, and Municipal programs. The remainder was sourced through a competitive grant issued by the New Hampshire Public Utilities Commission, which the NHSaves utilities jointly used to create the Retail and Large Business program.[17]

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[15] This report provides the results of Cadmus' assessment of the non-lighting components of NHSaves' 2016 and 2017 nonresidential programs, excluding Large Business Energy Solutions.

[16] New Hampshire's CORE Electric Utilities. December 22, 2014. "Retail Energy Reduction Partners Program and Large Business Energy Reduction Partners Program: Response to Energy Efficiency Fund RFP #14-004." Only electric Small Business Energy Solutions customers are eligible to receive ISO-NE Forward Market funds.

[17] The utilities also offer on-bill financing or a SMART Start program through 2012 Retail and Large Business funding legislation.

Program Design

Four programs made up the NHSaves 2016 and 2017 C&I energy efficiency initiatives: Small Business Energy Solutions, Large Business Energy Solutions, Municipal, and Retail and Large Business. Funding sources vary by program.

- The **Small Business Energy Solutions program** serves New Hampshire's small and mid-size businesses with an average monthly electric usage under 200 kW for 12 consecutive months and Unitil and Liberty natural gas customers with monthly usage under 40,000 therms for 12 consecutive months. Through standard utility ratepayer fees, the program incents energy saving upgrades for retrofit and new construction projects, with a rebate cap of up to $50,000 per account.
- The **Large Business Energy Solutions program** serves businesses with monthly usage above 200 kW or 40,000 therms for 12 consecutive months and is funded through standard utility ratepayer fees. Cadmus did not evaluate this program.
- The **Municipal program** targets a wide variety of municipal projects including town halls, schools, fire stations, other government buildings, and street light conversions to LED. The program uses funds from the Retail and Large Business program to offer walk-through audits, direct install measures, and prescriptive and custom incentives for municipally owned retrofit and new construction projects. When these funds are exhausted, NHSaves delivers incentives through standard utility ratepayer funding. Incentives typically cover up to 35% for standard retrofits and 75% for new construction projects' incremental costs, and schools are eligible to receive incentives of up to 100% of the incremental project costs.
- The **Retail and Large Business program** was funded solely through New Hampshire Public Utilities Commission's RGGI: Retail and Large Business program grant. The program targeted greenhouse gas savings. Because of these funds, utilities were able to provide prescriptive and custom incentives to their customers, along with more comprehensive, whole-building services such as expanded audits, weatherization, and additional direct install measures, regardless of fuel type. Goals and achievements for these programs were tracked separately from the standard ratepayer-funded and municipal energy efficiency programs.

Program Management and Delivery Structure

Each NHSaves utility delivered its programs independently. Eversource, Unitil, and Liberty partnered with implementation firms to assist with project management and implementation, while NHEC managed their projects using internal staff. Eversource, Unitil, and Liberty worked with multiple firms to manage separate aspects of program delivery, such as marketing or energy audit delivery, and these utilities determined assignments and activities geographically. The utilities and implementation firms worked together, often on a daily or weekly basis, to recruit customers, assist them through the application process, and execute a project to its completion. The utilities met monthly to collaborate on program design or jointly host seminars.

Since each program offered by the NHSaves utilities is managed differently, Cadmus summarized unique aspects of each program's implementation and delivery below.

Small Business Energy Solutions Program

Small businesses often have unique barriers to participation in energy efficiency programs, including a lack of time, expertise, and resources. The Small Business Energy Solutions program was designed to help alleviate these barriers. Utility staff, often in partnership with an implementation firm, provide consultation services to customers to help determine optimal energy-efficient upgrades. This included phone calls and meetings with staff in addition to more extensive technical assistance, such as cost-effectiveness analyses and facility energy audits. Some implementation firms offered no-cost direct install measures during the audit, such as aerators, showerheads, or spray valves. Through the Retail and Large Business program, these services were expanded to small retail customers interested in projects with potential unregulated fuel savings.

Businesses were required to apply in advance of project implementation and the utility would review vendor and product quotes and the proposed measures for eligibility. After the project was completed the utility or its subcontractor would verify measure installation.

Retail and Large Business Program

Through the Retail and Large Business program, utility or implementation staff worked one-on-one with retail or large business customers to provide financial and technical support to motivate participation in the program and to deliver projects that save electric and unregulated fuels. Utilities and implementation firms completed energy audits and hosted collaborative meetings to help develop a project scope or assist with the incentive application. Customers could also initiate and manage their own participation, including being able to use their own contractors for the work. Utilities completed cost-effectiveness analyses for each project to ensure the projects were eligible for prescriptive or custom incentive funding.

Municipal Program

The Municipal program was designed to make customer participation as easy as possible, including permitting projects to extend beyond one year to alleviate extensive decision-making timelines and limited budgets.

The 2016 and 2017 Municipal program was similar to the Small Business Energy Solutions program in many ways, with utilities and implementation firms assisting with knowledge, capital, and time barriers. For municipal projects, utilities also partnered with energy service companies to provide comprehensive services and deep-dive audits.

Program Application Process

Customers could learn about the programs in multiple ways, since each utility marketed the programs differently. The utilities used traditional marketing techniques such as direct mailers, web-based marketing, and customer leave-behind materials and Eversource, Unitil, and Liberty hired implementer

contractors to support program promotion. Liberty in particular hired an implementation contractor to canvas and assist recruited customers through the application process. More detail regarding the utilities' marketing and outreach practices can be found below in the *Outreach and Marketing* section.

There were two ways a customer could have applied to a program. First, customers could have led the process on their own and managed their application independently. Alternatively, Eversource, Unitil, and Liberty customers could have worked with an implementation contractor to assist them through the application process. While most utilities required customers to submit a paper application, Liberty customers could submit their application through an online portal. When needed, utilities assigned an implementation contractor or one of their own staff to assist a customer through the program application process after the customer had initiated the process (this most often applied to Retail and Large Business program customers). According to program partner interviews, different utilities had different application requirements, so not all NHSaves participants experienced the same application process. This also impacted program partners who worked for multiple utilities, who needed to know the nuances between each application in order to assist their customers.

When managing program applications, each utility processed and tracked their participant data separately. Liberty used a third-party data tracking system that enabled collaboration with their implementation contractors; this tool included an application portal, e-signature capabilities, and an on-bill financing application process. NHEC, Unitil, and Eversource managed their customer and participant data using an internal database or spreadsheet that tracked the stage of the project (prospective, in progress, or complete), measure types, and energy savings and demand reduction at the participant level. Utilities differed in the type and depth of information they tracked. While all the utilities provided as much information as they could to meet our request for participant application data and supporting information, the names of each field varied across the datasets and while the databases met all regulatory requirements, some fields required for the participant surveys and program partner interviews were missing:

- Eversource shared participant data where installation contractor details were missing, a number of participant contact names and phone numbers were missing or incomplete, and some of the measure details lacked quantity and were limited to the measure type (such as cooling, refrigeration, or motors)
- Liberty's participant data did not include installation contractor details and several projects (primarily those with MMBtu savings) lacked participant phone numbers
- NHEC provided participant data containing all the requested fields, but the measure details were often limited (for example, boiler descriptions did not detail the AFUE and water heater descriptions did not include the energy factor)
- Unitil's participant data did not include the installing contractor information and equipment details were sometimes limited to the measure name (such as air conditioning, VFD, or air compressor)

Program Goals

NHSaves' overall objective is to encourage businesses to reduce energy usage and costs in municipal, commercial, and industrial organizations throughout the utility service territory. As required, Eversource, Liberty, and Unitil reported their 2016 and -2017 achievements to the New Hampshire Public Utilities Commission.[18] The utilities did not report results that were exclusive of lighting measures; therefore, the results are comprehensive and do not align with the reported results found in the *Impact Evaluation* section above.

Outreach and Marketing

Through interviews, Cadmus asked program partners and utility staff how they market the NHSaves programs.

Utility Staff

NHSaves utility staff (n=4) reported multiple avenues for marketing the programs:

- Direct mailers to potential participants
- Online promotion through the NHSaves website
- Fliers that are left behind at contractor offices or retail stores
- Through program partners
- Face-to-face marketing and events
- Hosting program partner workshops
- Bill Inserts

In addition, some utility staff reported various marketing approaches by program: mailers and communicating with key influencers (such as energy committee members or energy managers) involved in the Small Business Energy Solutions program, and direct, face-to-face relationships with customers for the Retail and Large Business program. Eversource mentioned relying on partnering energy service companies to obtain projects through municipalities, particularly schools.

Overall, all utility staff interviewed believed that the marketing for the programs was effective. One utility staff stakeholder mentioned that the electric side of the programs did not often need much marketing, while the natural gas side of the programs needed more marketing because natural gas projects typically have a longer return on the customer's investment. Another stakeholder suggested a need to enhance the utility's marketing tactics to go beyond brochures that just give an overview of the programs, perhaps through educational materials that encourage businesses to consider project

[18] NHEC is not required to file an annual report. For RGGI programs, expenditures but not savings are reported; savings for this program were calculated in the same manner as savings for the other programs or deemed as outlined in the utilities' proposal. Electric report: https://www.puc.nh.gov/Electric/AnnualReports.html; natural gas report: https://www.puc.nh.gov/Gas-Steam/gas-steam.htm

benefits beyond monetary savings. One stakeholder indicated during the interview that the utility purposefully did not post its forms about the program online because funding had run out in the middle of the 2016 program year.

Program Partners

Most commonly, customer-selected contractors marketed the programs by including rebate information in cost proposals. By contrast, direct install contractors marketed the programs in a variety of ways, including cost proposals, emails, fliers, workshops, and cold calls. See the *Outreach and Marketing: Program Partners* section in Appendix B for more details on program partner marketing techniques.

Program partners faced several challenges in marketing the NHSaves programs. Two direct install contractors mentioned that the inconsistency in available incentives was a barrier, particularly when working with customers who were denied repeatedly due to funding availability. Similarly, one customer-selected contractor reported challenges in not being alerted when funding ran out. Two customer-selected contractors who complete under 20 program projects per year noted difficulty finding eligible customers. See the *Outreach and Marketing: Program Partners* section in Appendix B for further details on challenges that program partners faced, and for details regarding the benefits of the NHSaves programs they promote.

> "There is a perception, gained over years, because of the stop-start history [of the programs]. Customers don't feel like they will get incentives if they apply because they've been stopped before."
> – direct install contractor

Customer Experience

Cadmus surveyed 53 participants from the 2016 and 2017 Small Business Energy Solutions program (n=47), Retail and Large Business program (n=3), and Municipal program (n=3) to ask about their program experience, including program benefits and barriers, program marketing and outreach, satisfaction, and application ease. In this section of the report we share responses specific to Retail and Large Business and Municipal programs' respondents wherever possible to distinguish these programs from the combined results, comprised primarily of the Small Business Energy Solutions program respondents.[19]

Details on *Program Awareness* and *Participant Firmographics* can be found in Appendix B.

Verification

All survey respondents (n=53) reported that the energy-efficient equipment rebated through the programs were installed and operating as planned.

[19] Because of the small sample sizes for the Retail and Large Business and Municipal programs, differences among findings should be considered with caution.

Program Benefits and Barriers

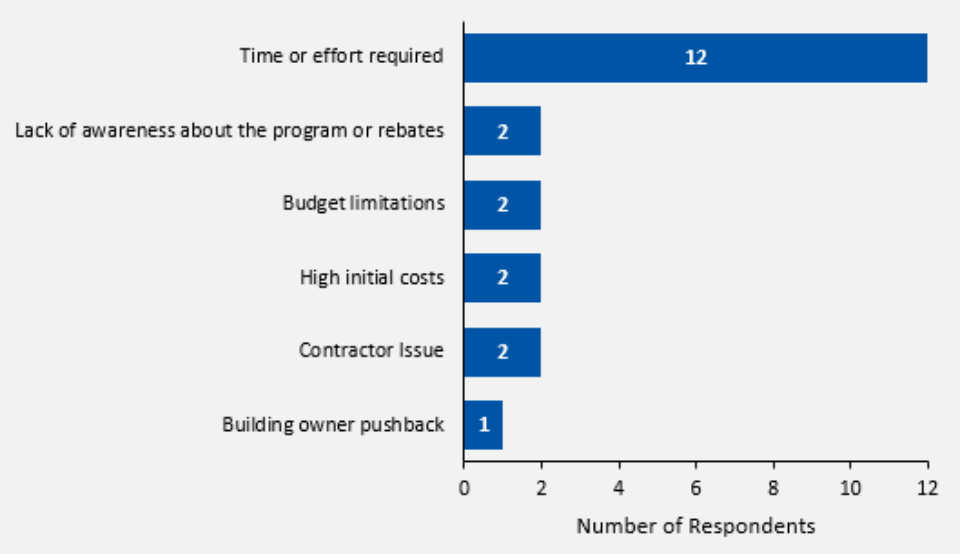
Cadmus asked participants what factors motivated their company's decision to make an energy-efficient upgrade. Reported program benefits and strengths revolved around saving money, saving energy, and taking advantage of rebates. For detailed findings on program benefits, including information on what can be done to overcome participant-identified challenges, please refer to the *Program Benefits and Barriers* section in Appendix B.

Cadmus asked all participants about the biggest challenges to participating in the program for their company. Most respondents (n=52) indicated that there were no challenges to their participation (62%). Those who had challenges (21 respondents) most commonly said that the time or effort required to participate was the biggest challenge (12 respondents; Figure 9).

Takeaway:

Most respondents could not identify a barrier to participation. However, the most common barrier cited was the amount of time and effort it took to participate.

Figure 9. Challenges to Participation



Source: Participant Survey Question D2. "What were the biggest challenges to participating in the program for your company?" Multiple responses allowed, but each respondent provided only one factor. (n=21)

Retail and Large Business and Municipal Program-Specific Findings:

Two of three Retail and Large Business respondents and three of four Municipal respondents identified participation challenges related to the time and effort required to participate (one Municipal respondent did not provide further detail):

- The amount of paperwork required (two Municipal respondents)
- Getting scheduled with a contractor (one Retail and Large Business respondent)
- Removing old equipment to prepare for new equipment (one Retail and Large Business respondent)

Cadmus asked participants who reported challenges to suggest what could have been done to help their company overcome challenges with program participation or making energy-efficiency improvements. Most respondents (n=17) said nothing could be done to help (11 respondents). Suggested changes included providing better or more information about the program (three respondents) and simplifying the paperwork or application (one respondent).

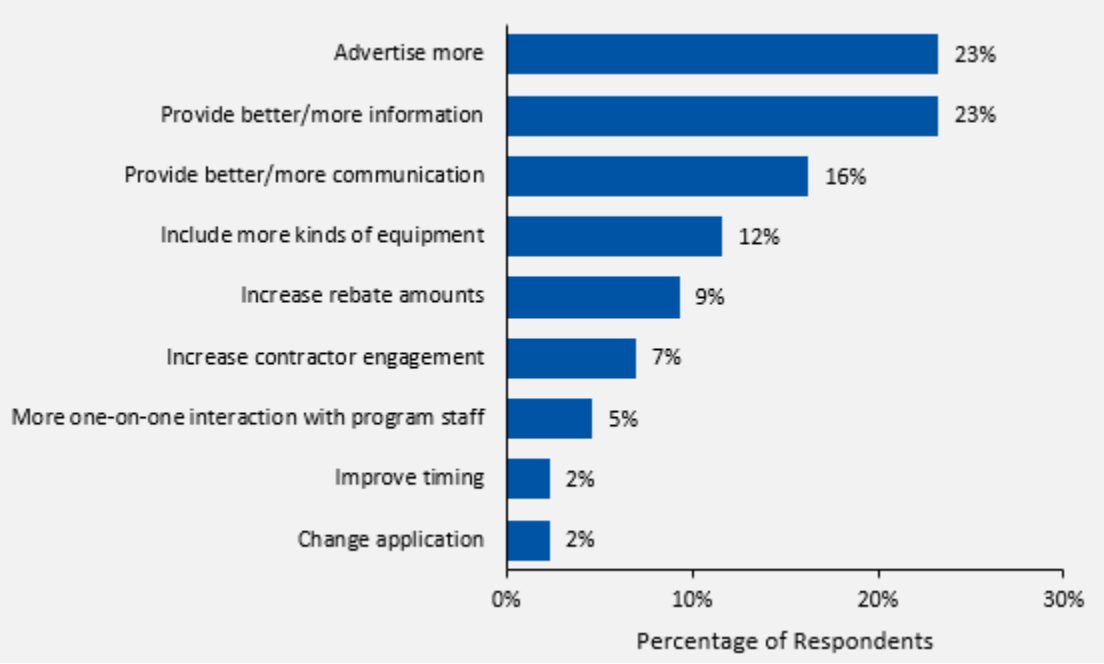
When asked about program weaknesses, most respondents could not think of any (41%, n=51), followed by there not being enough advertising (14%).

Program Marketing and Outreach

Cadmus asked participants about their experience with program marketing materials and the marketing process. Respondents rated the accuracy and completeness of the program materials they received when learning about the program on a scale of 1 to 5, where 1 was *not at all accurate* and 5 was *very accurate*. Almost all respondents rated the materials as a 4 or 5 (96%, n=47). All Retail and Large Business (n=3) and Municipal (n=3) respondents provided a rating of 4 or 5.

When asked for ways that program staff could increase participation, respondents (n=43) commonly suggested more advertising (23%) and providing more or better information about the program (23%). Other common suggestions included providing better or more communication (16%) and including more eligible equipment (12%; Figure 10). For detail on the best way to keep participants informed and for further detail regarding ways to increase participation, please see the *Program Marketing and Outreach* section in Appendix B.

Figure 10. Respondent Suggestions to Improve Participation



Source: Participant Survey Question F3. "What do you think program staff could do to increase participation?" (n=43)

We asked the 10 respondents who indicated *better or more information* to identify what kind of information would be more useful to garner interest. Four respondents indicated that generally, information with more details about the program would be useful. Four respondents requested the program send information out via email, online, or through general advertising. One respondent indicated that fliers would help.

Takeaway:

Overall, respondents believe that the programs are not advertised enough. Providing more detailed information and distributing it electronically or via mail could help increase participation.

We asked respondents who said *better or more communication* is needed to specify who should be more involved in the process. These three respondents requested more electronic communications, citing both email and updating the NHSaves website as important. One respondent also suggested calling property managers to keep them informed.

Program Satisfaction and Application Ease

Cadmus asked participants about their satisfaction with different aspects of the program and with the program overall. All rating questions operated on the same scale of 1 to 5, where 1 was *not at all satisfied* and 5 was *very satisfied*. Details about satisfaction with direct install products, project execution, and likelihood to recommend the program can be found in the *Program Satisfaction and Application Ease* section of Appendix B.

Takeaway:

Overall, most customers were satisfied with their experiences within the NHSaves programs and were likely to recommend the programs.

Satisfaction with Program-Funded Site Assessments and Direct Install Products

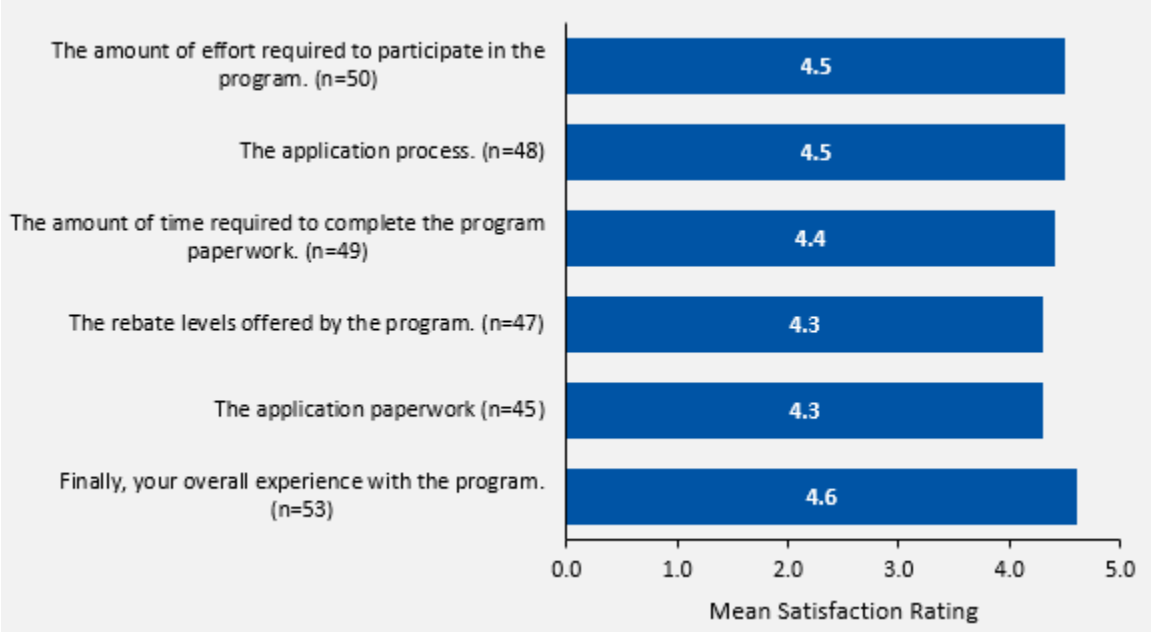
Most respondents (78%, n=45) indicated that utility staff or a contractor hired by utility staff performed a site assessment or energy audit. Respondents who received a site assessment or energy audit rated their satisfaction with the service they received. All respondents who received an audit (n=31), including the Retail and Large Business (n=2) and the Municipal (n=2) respondents, gave the site assessment or audit a 4 or 5 rating. Most of these respondents (97%, n=31) also rated the clarity and content of the assessment or audit as a 4 or 5.

In addition, participants who received direct install measures rated their satisfaction with the products received, and all (n=14) rated the measures as a 4 or 5.

Satisfaction with Program

Participants rated different aspects of their program experience and were most satisfied with the amount of effort required to participate in the program and with the application process (Figure 11). When asked to rate their satisfaction with the program overall, most respondents were *very satisfied*, with 75% providing a rating of 5 (n=53) and 17% providing a rating of 4. All Retail and Large Business respondents (n=3) and two Municipal respondents (n=3) rated the program overall as a 4 or 5, while the remaining Municipal respondent provided a 3 rating.

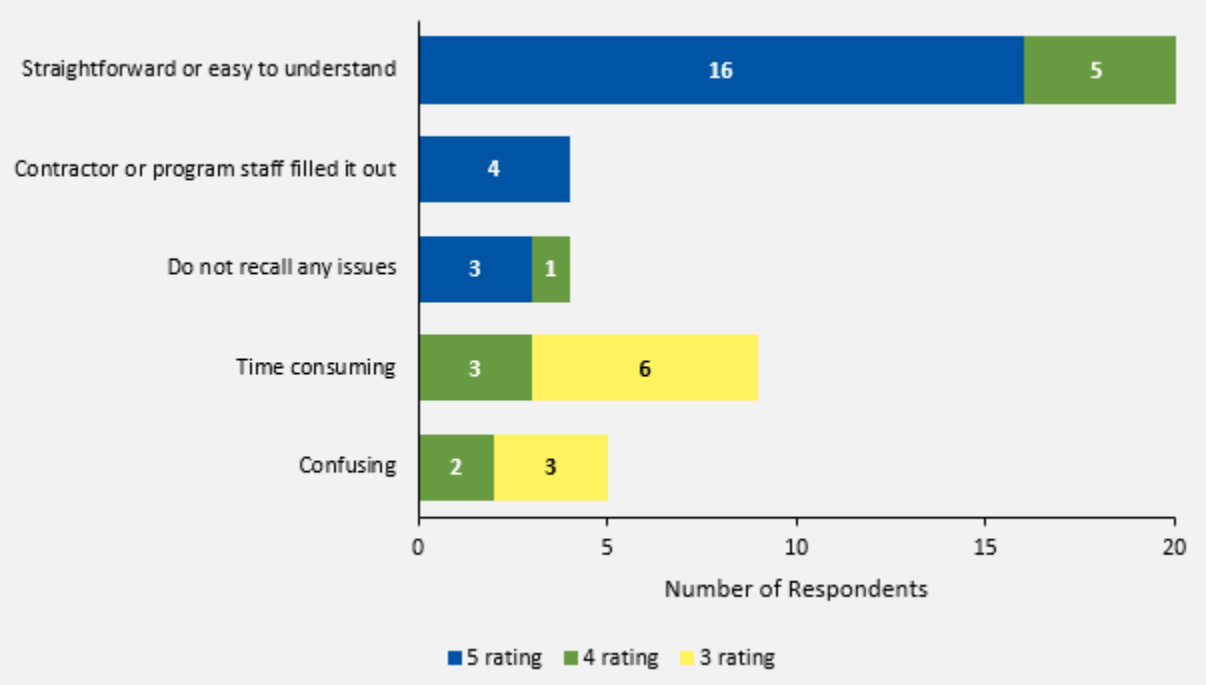
Figure 11. Satisfaction Ratings with Program Components



Source: Participant Survey Question E3. "I'm going to ask you about your satisfaction with different aspects of the program. Please tell me on a scale of 1 to 5 how satisfied you were with each aspect, with 1 meaning *not at all satisfied* and 5 meaning *very satisfied*."

As for satisfaction with the application paperwork, all respondents were asked why they provided their rating. No participant provided a rating below 3. The three Retail and Large Business respondents rated the application paperwork as a 3, 4, and 5, respectively, and all three Municipal respondents provided a 4 rating. Sixteen of 21 respondents who were *very satisfied* (rating of 5) indicated that the application paperwork was straightforward or easy to understand (Figure 12). Six of nine participants who provided a rating of 3 indicated that the paperwork was too time consuming.

Figure 12. Respondent Feedback about Application Paperwork



Source: Participant Survey Question E2. "Why do you say that?" (n=45)

Takeaway:

Participants who provided lower satisfaction ratings tended to indicate that the program process, including the required paperwork, was cumbersome and took too much time and effort to complete.

Respondents who rated the paperwork as a 3 or lower described why they were not as satisfied:

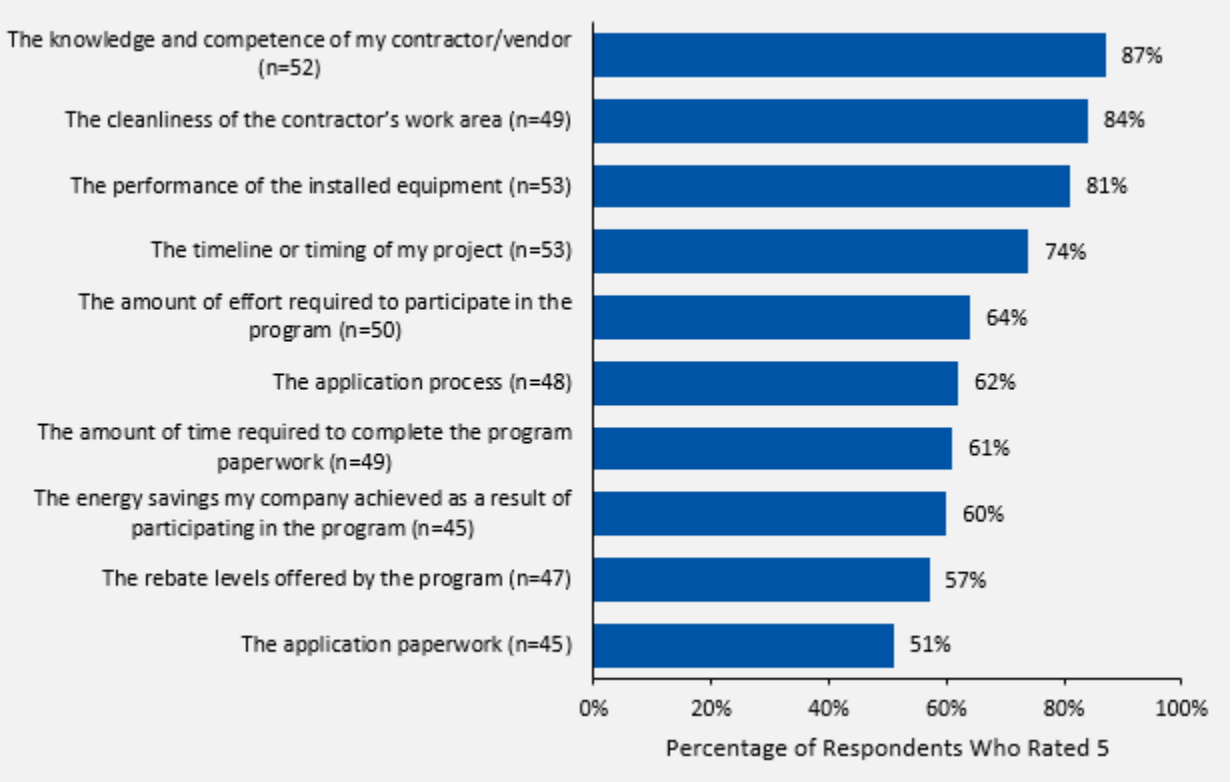
- The eight respondents who were not as satisfied with the *amount of time to complete the program paperwork* said it was because it took too much time (four respondents), required too much supporting documentation (two respondents), was too complicated (one respondent), or the contractor created problems with their application process (one respondent who provided no further detail about this issue). Six of these eight respondents also reported lower satisfaction ratings with the *rebate levels offered by the program*.
- Seven participants reported lower satisfaction with the *rebate levels offered by the program*, generally because they did not receive enough money (six respondents). Another participant said the NHSaves rebates are lower than those provided in other states.
- Respondents who were less satisfied with *the application process* (seven respondents) most commonly said it was because it took too much time (four respondents). One participant mentioned there was too much required documentation and one said the paperwork was confusing. One respondent said it would be better if the application could be completed online.
- Four respondents were less satisfied with *the amount of effort required to participate*, one each who said the program did not meet their expectations and there was too much of a learning

curve. One participant noted that because they work with multiple decision makers within a condominium association, it was difficult to participate. Additionally, one Retail and Large Business respondent said the application process contributed to the program taking too much effort.

- Four respondents who were less satisfied with *the program overall* indicated long project timelines (three respondents) and issues with the contractor (one respondent) as the main reasons for their lower ratings.

Cadmus compared the top ratings across all satisfaction questions. Most commonly, respondents were *very satisfied* (provided a rating of 5) with the knowledge and competence of their contractor (87%, n=52), the cleanliness of their contractor's work area (84%, n=49), and the performance of the installed equipment (81%, n=53). Figure 13 shows the percentage of respondents who provided a rating of 5 for each program component.

Figure 13. Participant Satisfaction with Program Components



Source: Participant Survey Question E1. "Thinking about the application you submitted, how would you rate the application paperwork on a scale of 1 to 5, where 1 is *not easy at all* and 5 is *very easy*?" and Question E3. "I'm going to ask you about your satisfaction with different aspects of the program. Please tell me on a scale of 1 to 5 of how satisfied you were with each aspect, with 1 meaning *not at all satisfied* and 5 meaning *very satisfied*."

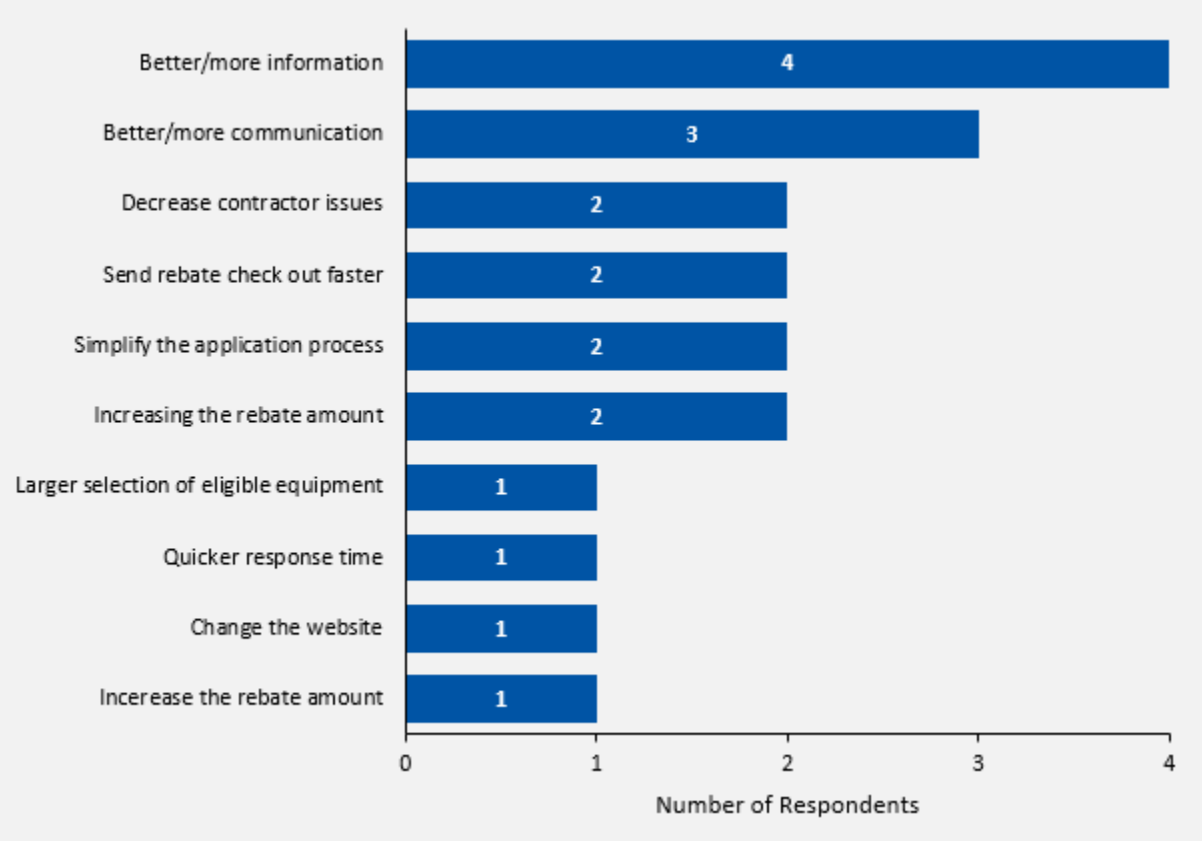
Recommendations for Improvement

Cadmus asked participants if there was anything the program could have done to improve their overall experience. Most respondents said there was nothing the program could have done (63%, n=52). Similar to respondents' suggestions to improve program participation outlined above, those who did provide a recommendation (18 respondents) most commonly said that more or better information about the programs (four respondents) and communication (three respondents) would have improved their own program experience (Figure 14).

Takeaway:

Most participants with a recommendation said the program could be improved through better or more information and communication.

Figure 14. Suggested Program Improvements from Participants



Source: Participant Survey Question E9. "Is there anything the program could have done to improve your overall experience?" Multiple responses allowed. (n=18)

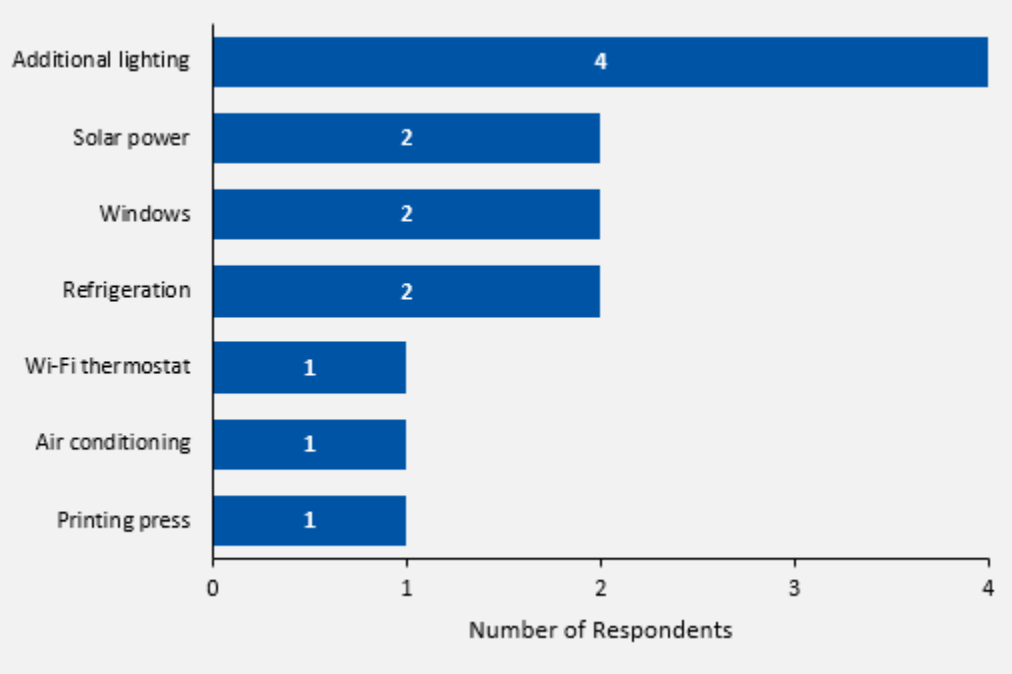
Retail and Large Business and Municipal Program-Specific Findings:

All three Municipal respondents and one of three Retail and Large Business respondents said no changes were needed. One Retail and Large Business respondent had a contractor issue and one suggested to "streamline the process a little bit."

Any respondent who indicated that *better or more information, better or more communication*, *a larger selection of eligible equipment*, or *to simplify the application process* would improve their program experience was asked a follow-up question for further detail. One respondent who suggested that the communication could have been better would like program staff to be more accessible and the two respondents who said the application could be simplified suggested there are too many details required. Of the four respondents who indicated that more or better information would be useful, one said increased awareness about the programs, one said having more detailed information available online would be helpful, and another requested staff be more knowledgeable in equipment functionality, while the remaining respondent specifically requested more information about the rebates. Finally, one respondent suggested the program include bath fans.

Cadmus asked participants who did not already give suggestions for additional equipment to recommend energy-efficient products, equipment, or services not currently covered through the program. Most respondents could not think of any additional measures (73%, n=49). Of those who provided a suggestion (13 respondents), four said to expand the eligible lighting measures to include more equipment (four respondents; Figure 15).

Figure 15. Additional Equipment Suggested by Participants



Source: Participant Survey Question E10. "Is there any energy-efficient product, equipment, or service not currently covered through the program for which you think rebates should be offered?" (n=13)

Comparison to 2010 Participant Survey Results

Where possible, Cadmus designed the 2016-2017 participant survey questions to align with the survey in the 2010 Small Business Energy Solutions program evaluation report.[20] To align with the 2010 results, Cadmus only compared results from 2016-2017 Small Business Energy Solutions program survey respondents, omitting Municipal and Retail and Large Business survey respondents.

In addition to the Program Satisfaction findings described below, detailed findings on *Program Awareness* and *Program Benefits and Barriers* can be found in Appendix B.

Program Satisfaction

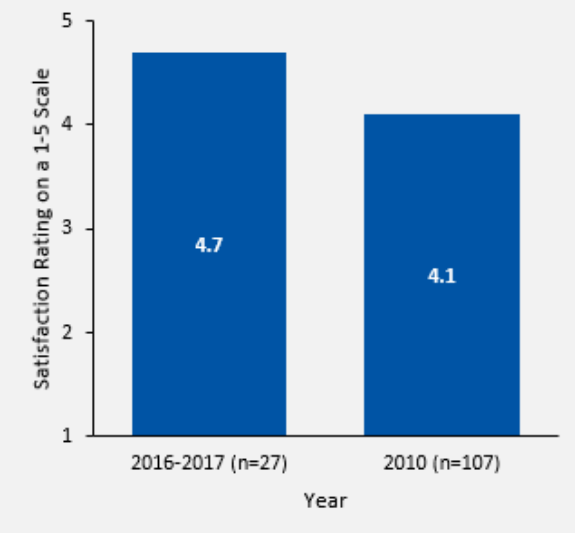
Cadmus designed a series of questions about satisfaction with program components based on the 2010 evaluation report. All rating questions in both surveys operated on the same scale of 1 to 5, where 1 was *not at all satisfied* and 5 was *very satisfied.*

The 2016-2017 participants who received an assessment or audit rated the clarity and content of that assessment or audit, which was also asked in 2010. The 2016-2017 participants (mean=4.7) were significantly more satisfied than 2010 participants (mean=4.1; Figure 16).[21] However, due to the small sample size in the 2016-2017 survey, consider the statistical difference with caution.

[20] DNV GL (formerly KEMA, Inc.). June 27, 2012. "New Hampshire Small Business Energy Solutions Program Impact and Process." http://www.puc.state.nh.us/electric/Monitoring%20and%20Evaluation%20Reports/NH%20SBES%20Final%20Report.pdf

[21] $p<0.05$ using a binomial t-test.

Figure 16. 2016-2017 and 2010 Satisfaction with Assessment Clarity and Content

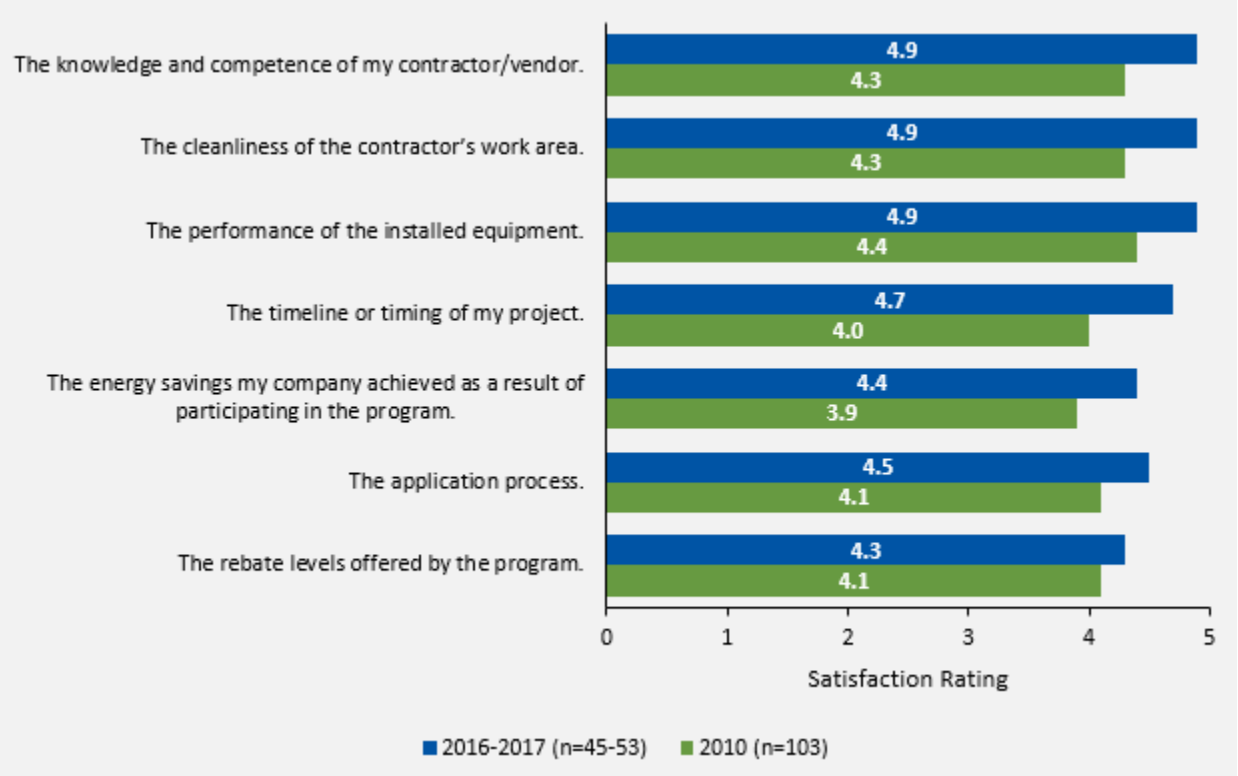


Source: 2016-2017 Participant Survey Question E5. "How would you rate the clarity and content of the assessment or audit report your company received?" 2010 Question PS1K. "On a scale of 1 to 5, where 1 is "*very dissatisfied*" and 5 is "*very satisfied*", please rate your satisfaction with each of the following program aspects- Content and clarity of the assessment report."

Figure 17 shows the mean ratings for each component from the 2010 and the 2016-2017 surveys. Cadmus conducted statistical testing on prompts that were similar in the 2016-2017 and 2010 surveys. Every 2016-2017 mean rating shown in Figure 17 was significantly higher than its 2010 counterpart, except for the rebate levels offered by the program (2016-2017 mean was 4.3 and 2010 mean was 4.1).[22]

[22] $p<0.05$ using a binomial t-test.

Figure 17. 2016-2017 and 2010 Program Satisfaction

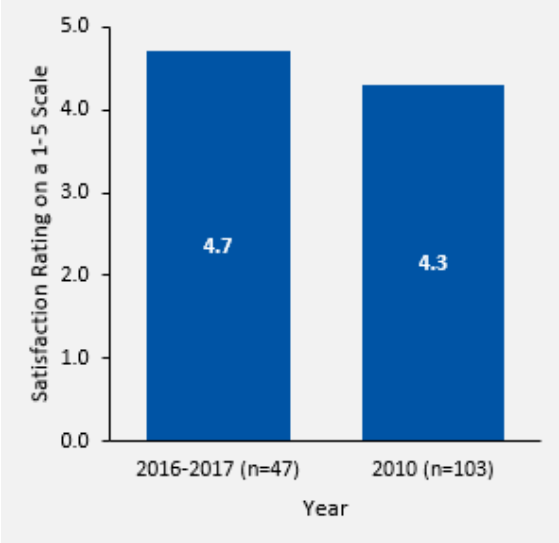


Source: 2016-2017 Participant Survey Question E3. "How satisfied you were with each program aspect, with 1 meaning *not at all satisfied* and 5 meaning *very satisfied*?" 2010 Question PS1. "On a scale of 1 to 5, where 1 is *very dissatisfied* and 5 is *very satisfied*, please rate your satisfaction with each of the following program aspects." and 2010 Question EP2. "On a scale of 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied", how satisfied are you with the time it took to participate?"

Participants also rated their satisfaction with the program overall. The 2016-2017 participants' mean rating (4.7, n=47) was significantly higher than the 2010 participants' mean rating (4.3, n=103; Figure 18).[23]

[23] $p<0.05$ using a binomial t-test.

Figure 18. 2016-2017 and 2010 Overall Satisfaction



Source: 2016-2017 Participant Survey Question E3. "Please tell me on a scale of 1 to 5 how satisfied you were with each aspect, with 1 meaning *not at all satisfied* and 5 meaning *very satisfied*." 2010 Question PS1. "On a scale of 1 to 5, where 1 is *very dissatisfied* and 5 is *very satisfied*, please rate your satisfaction with each of the following program aspects. (If respondent provides a response of 2 or less for any aspect, ask why?)"

Program Partner Experience

Cadmus interviewed 14 program partners—eight customer-selected contractors and six utility-hired direct install contractors. We designed the interview guide to collect data about several research topics: awareness of NHSaves' C&I energy-saving programs (in particular, the Small Business Energy Solutions, Retail and Large Business, and Municipal programs), market baselines and sales practices inside and outside the program, communication with program staff, satisfaction with program components, and barriers to participation.

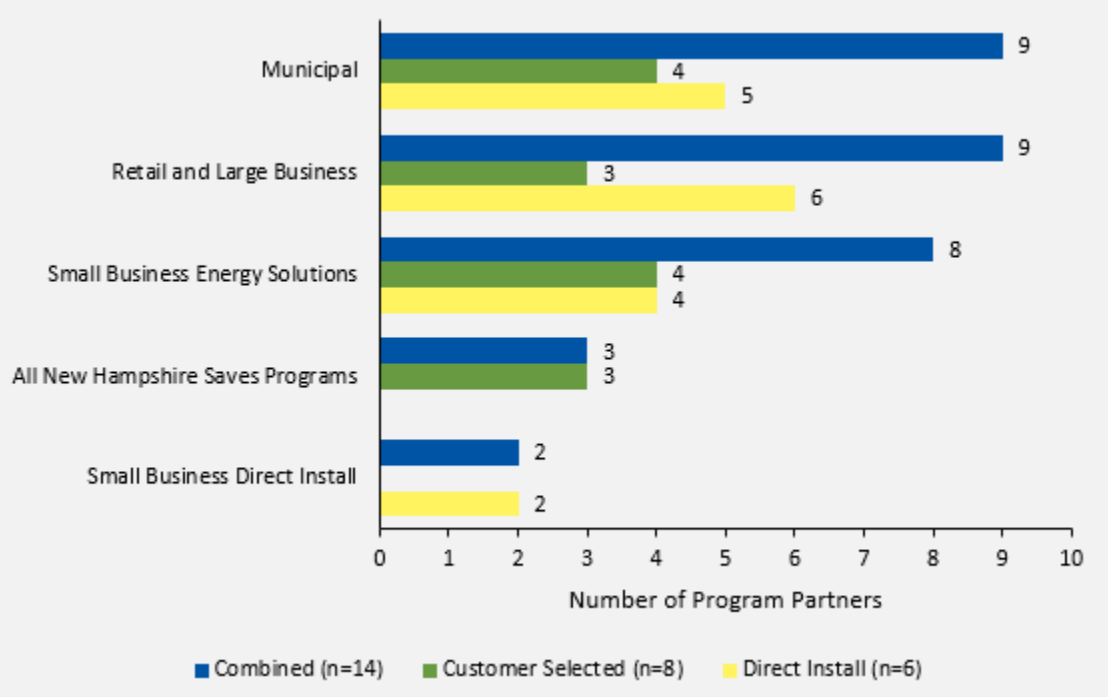
To ensure that respondents provided non-lighting services for NHSaves, we asked interviewees (n=14) what percentage of their completed projects included non-lighting measures. Nine program partners said 100% of their projects included non-lighting measures. One direct install respondent said 75% and three other respondents said 50% of their projects included non-lighting measures. One customer-selected contractor did not know the exact percentage but confirmed working on non-lighting projects.

Program Awareness

Cadmus asked program partners about their participation in NHSaves C&I programs and how they first became aware of these programs. Most interviewees participated in the Municipal (nine respondents) and Small Business Energy Solutions (eight respondents) programs. Nine of 14 contractors had participated in the Retail and Large Business program. Three customer-selected contractors were not aware of the specific program names and said they participated in the NHSaves C&I programs overall.

Two respondents reported providing direct install measures for the Small Business Energy Solutions program (Figure 19).[24]

Figure 19. NHSaves Program Participation by Program Partner



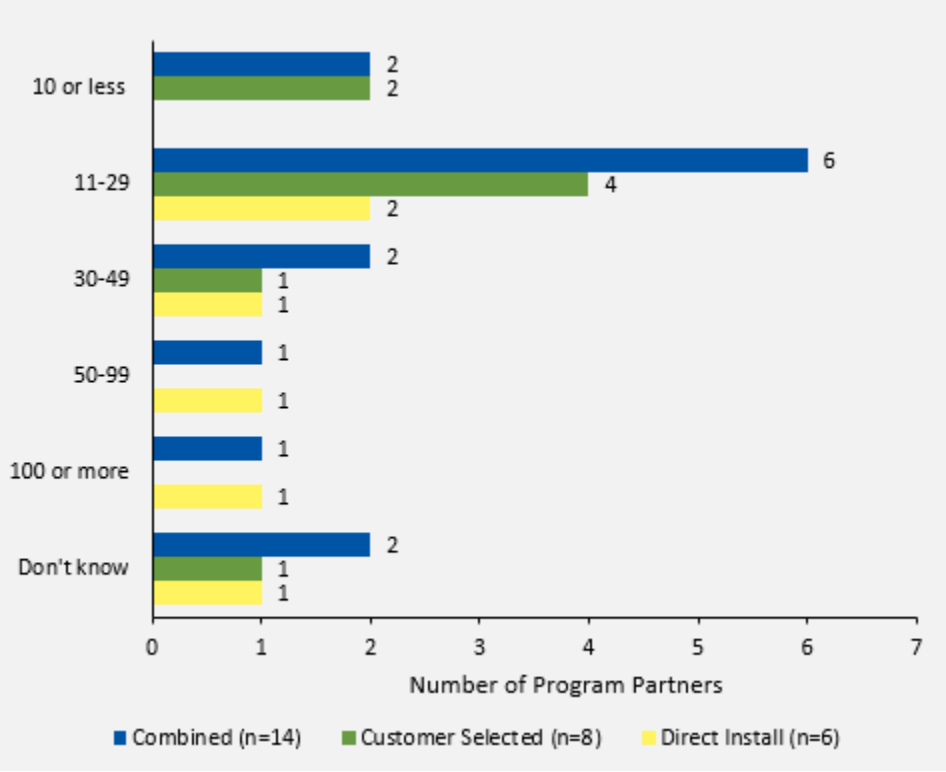
Source: Program Partner Interview Question B1. "Which [UTILIT(Y/IES)] programs do you promote or participate in?" Multiple responses allowed.

Detailed information on how the program partners became aware of the NHSaves programs can be found in the *Program Partner Experience: Program Awareness* section of Appendix B.

Cadmus asked respondent for an estimate of the number of program-eligible, nonresidential, non-lighting projects they completed each year. While the amount varied across the direct install contractors, four of eight customer-selected contractors said they completed between 11 and 29 program projects each year (Figure 20).

[24] Cadmus did not ask whether respondents delivered direct install services through the other programs. We assumed the remaining contractors identified as providing direct install services through sampling efforts provided such services through the Municipal and/or Retail and Large Business programs.

Figure 20. Nonresidential NHSaves Projects Completed Per Year



Source: Program Partner Interview Question B3. "On average, how many projects involving [UTILIT(Y/IES)] non-residential projects do you complete per year? Just an estimate is fine."

Communication

Cadmus asked program partners about their experiences communicating with program and utility staff. For detail on these findings, please refer to the *Communication* section in Appendix B.

Perceptions of Customer Awareness and Experience

Cadmus asked program partners about their perspective on different aspects of the customers' experience with the NHSaves programs, including awareness and satisfaction with rebate levels and measure offerings.

Cadmus asked program partners if they had received any feedback from customers regarding their satisfaction with the measure offerings. Four program partners had not, or were not sure, if they had received feedback. Of the 10 who did get feedback, nine reported receiving positive feedback. One direct install contractor said customers were usually surprised that so many types of equipment were eligible for rebates. Two contractors received negative feedback about the cost-effectiveness results being lower than expected. Because the C&I programs relied on the cost-effectiveness results to determine project eligibility, lower cost-effectiveness results either lowered the customer's rebate or rendered their project ineligible.

Some program partners (n=14, one interviewee did not provide a response) shared suggestions for additional natural gas or electric saving measures that could be offered through the NHSaves programs.

Eleven program partners had no suggestions for additional natural gas measures, since most measures can be included through custom incentive offerings. This aligned with feedback from two utility staff interviewees who mentioned that most measures could be captured through custom incentives. One customer-selected contractor suggested having more natural gas rebates for equipment types that save hot water and another suggested that, in general, the custom rebates should be higher. Most program partners (nine of 14) also had no suggestions for electric saving measures. Customer-selected contractors suggested a few equipment types that could save electricity: one each suggested system controls that switch systems to more efficient equipment, smart pumps, and, though generally not considered to be energy efficient, electric baseboard heating.

One direct install contractor said utilities could be doing more to promote EMS, in particular noting that utilities could better use building performance and fault detection tools.

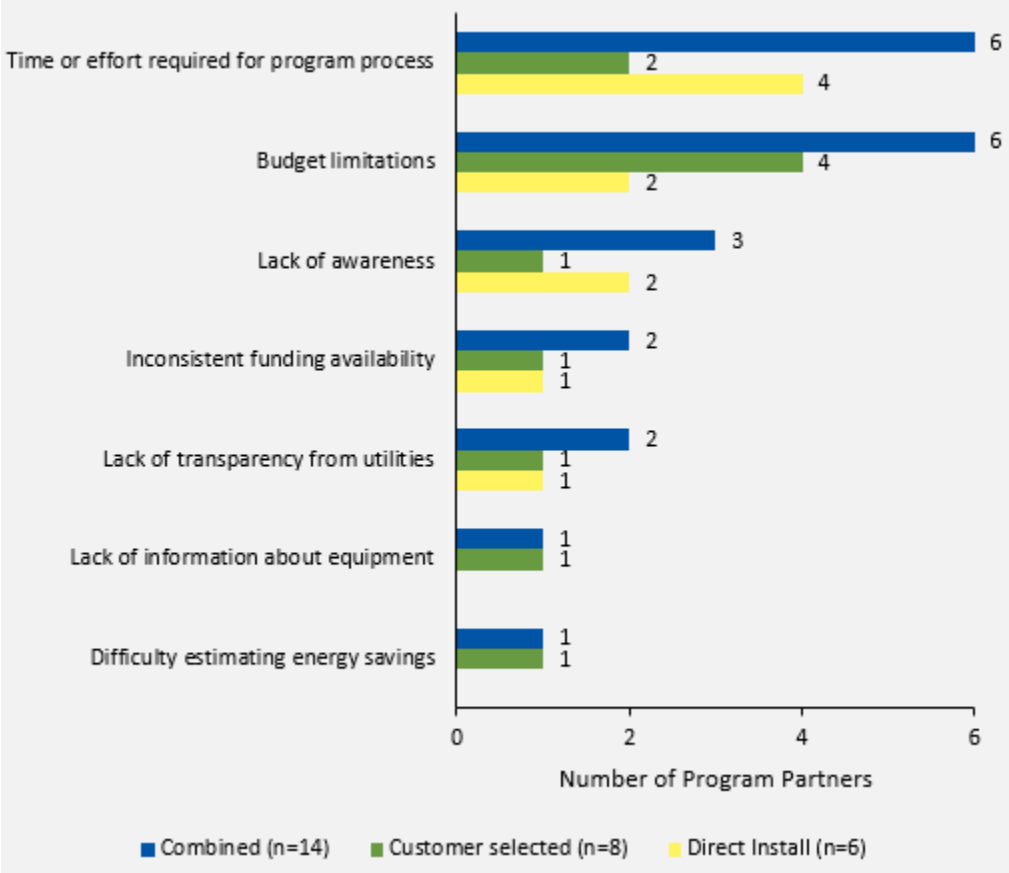
When asked if they or their customers faced any additional bottlenecks or challenges in the program, two program partners again mentioned problems when funding ran out in the middle of the year or when it ran out for a particular measure.

Further detail about program partners' perceptions of customers' awareness and satisfaction can be found in the *Perceptions of Customer Awareness and Experience* section of Appendix B.

Program Partner Impressions of Participation Barriers

Cadmus asked program partners about their impressions of customer challenges with participating in the NHSaves programs. Four direct install and two customer-selected contractors mentioned the time or effort required for program processes, while two direct install and four customer-selected contractors mentioned budget limitations (Figure 21).

Figure 21. Perceived Barriers to Customer Participation



Source: Program Partner Interview Question E1. "What do you see as the biggest challenges for customers with participating in the programs?" Multiple responses allowed.

During stakeholder interviews, utility staff mentioned similar barriers to customer participation. The time or effort required to participate (two respondents) and the availability of capital (two respondents) were most commonly mentioned, particularly for small business customers. Other barriers mentioned by one utility staff member each were a lack of understanding with project cost and benefit analyses, a lack of understanding about how the programs work, and challenges with large business customers who might need international approval from parent companies.

Program partners had several suggestions to help address participation barriers. Two customer-selected and two direct install contractors indicated that more transparency from the utilities could help alleviate issues. These program contractors elaborated further, requesting to be kept informed about how much funding is available and real-time updates on each project's application status. One direct install contractor suggested that utilities provide some sort of tool, similar to a customer portal, to show application and funding status updates. Another direct install contractor indicated that, because the utilities have different approval timelines and operate their programs differently, keeping the technology review and pre-approval process moving and updating the customer each step along the way could help increase the predictability from job to job and among utilities.

Another suggestion from two direct install and one customer-selected contractor was to offer more or different marketing. One direct install contractor explained that general NHSaves marketing, as opposed to utility-specific marketing, could be used for advertising through social media, newspapers, and other wide-reaching mediums, then shared by the individual utilities. Another direct install contractor mentioned that radio ads specifically could be helpful, particularly because New Hampshire borders Massachusetts, which uses radio advertising for Mass Saves energy efficiency programs. These program partners indicated that marketing helps customers understand the program and project process and compare their energy usage to similar companies/buildings, which could be particularly effective at increasing awareness and participation. Beginning in 2018, NHSaves allocated additional funding for statewide marketing.

Three program partners also suggested changes to the program funding structure. One direct install contractor mentioned that allowing some funding to roll over year to year could be helpful. One direct install and one customer-selected contractor said that maintaining program funding throughout the year and into future years could help build customer confidence in the program and build participation momentum.

Two customer-selected contractors did not provide any suggestions for improvements.

Barriers by Customer Type

Cadmus asked program partners if participation barriers differed by customer type or size. Most program partners indicated that these barriers did not vary (eight of 14 respondents), while one was unsure as to how they might vary. Details on how these barriers differ by customer type can be found in the *Program Partner Impressions of Participation Barriers: Barriers by Customer Type* section of Appendix B.

Contractor Participation Barriers

About half of program partners could not think of any challenges or barriers to their own participation (six of 14 respondents, with two interviewees who did not provide any response). Two of those who could think of a challenge identified feeling understaffed relative to the amount of available project work. There were several additional barriers identified by one respondent each:

- Too much paperwork
- Not enough available information about the programs
- Not enough funding available
- Inconsistent timing of available funding
- Inability to determine customer eligibility
- Program software incompatibility

When we asked program partners if there was anything NHSaves could do to help them promote non-lighting energy-efficient equipment, the most commonly mentioned intervention was more or different marketing (six respondents). Three of these six respondents completed fewer than 10 NHSaves projects each year. One direct install contractor said having a web resource dedicated to marketing the customer

journey with real examples could be particularly helpful. Another direct install contractor mentioned that more marketing to other contractors, vendors, and developers would help. One customer-selected contractor said creating NHSaves marketing that includes a list of partnering contractors could help customers reach contractors more easily.

Program partners recommended that NHSaves also provide support in several additional ways:

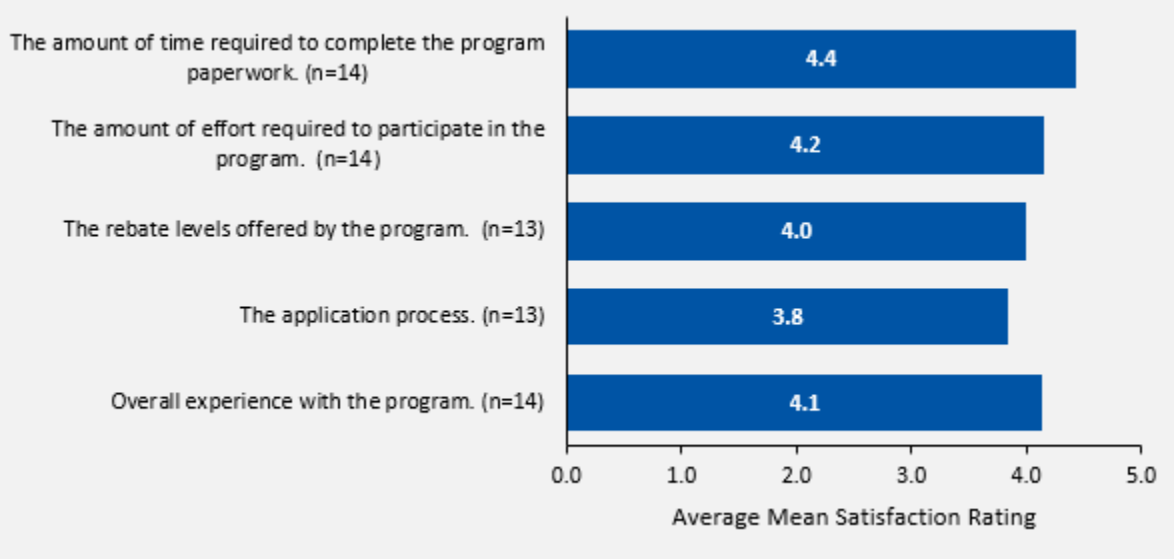
- Host collaboration meetings between contractors and the utilities (two respondents)
- Provide more transparency during the application process (two respondents)
- Provide more training opportunities to walk them through the nuances of the programs (one respondent)
- Offer programs for a longer period of time (one respondent)

Program Partner Satisfaction

Cadmus asked program partners about their satisfaction with various aspects of the program on a scale of 1 to 5, where 1 was *not at all satisfied* and 5 was *very satisfied*. Five of eight customer-selected contractors provided a rating of 5, while only two of six direct install contractors provided a rating of 5, for the program overall. Program partners who completed fewer than 15 NHSaves projects per year gave the three lowest overall satisfaction ratings. The satisfaction statements and ratings are shown in Figure 22.

> "I think there are a ton of opportunities for energy savings, and as long as [the utilities] keep developing the program and continue [offering the program], they [customers] can realize those savings."
> – direct install contractor

Figure 22. Program Partner Satisfaction with NHSaves Programs



Source: Program Partner Interview Question G1. "I'm going to read a list of factors about the program or programs. For each one, please tell me how satisfied you are with…"

As shown above, program partners (n=13, one direct install contractor did not provide a rating) were the least satisfied with the application process. Program partners indicated that the paperwork, particularly when paired with inconsistent communication from the utility, can be cumbersome and confusing for the customer. One customer-selected contractor suggested an online application or the ability to submit an application on behalf of the customer.

We asked program partners who provided a rating of 3 or less why they were dissatisfied with different aspects of the programs, and they responded with ways their satisfaction could be improved:

- Shorten the amount of time to provide feedback or answer questions (two respondents)
- Increase the rebate levels (two respondents)
- Ensure that programs are consistent and reliable to regain customer trust (three respondents)

"When you're doing [whole] system upgrades, the money given back on some measures—not all measures, but some—can be pretty insignificant."
– direct install contractor

Through stakeholder interviews, utility staff (n=4) also rated their satisfaction with the program overall on the same 1 to 5 scale. All were satisfied with the program overall, with an average rating of 4.1 Interviewees said they reported high satisfaction because the programs met (or exceeded) their goals or because they felt that the program provided a robust mix of offerings for the New Hampshire market. Areas for improvement mentioned by one utility staff member were increasing the amount of small business direct install or HVAC measures and increasing communication with the program partners.

Program Partner Firmographics

As part of the program partner interviews, Cadmus collected responses on firmographics shown in the *Program Partner Firmographics* section of Appendix B.

Market Baselines

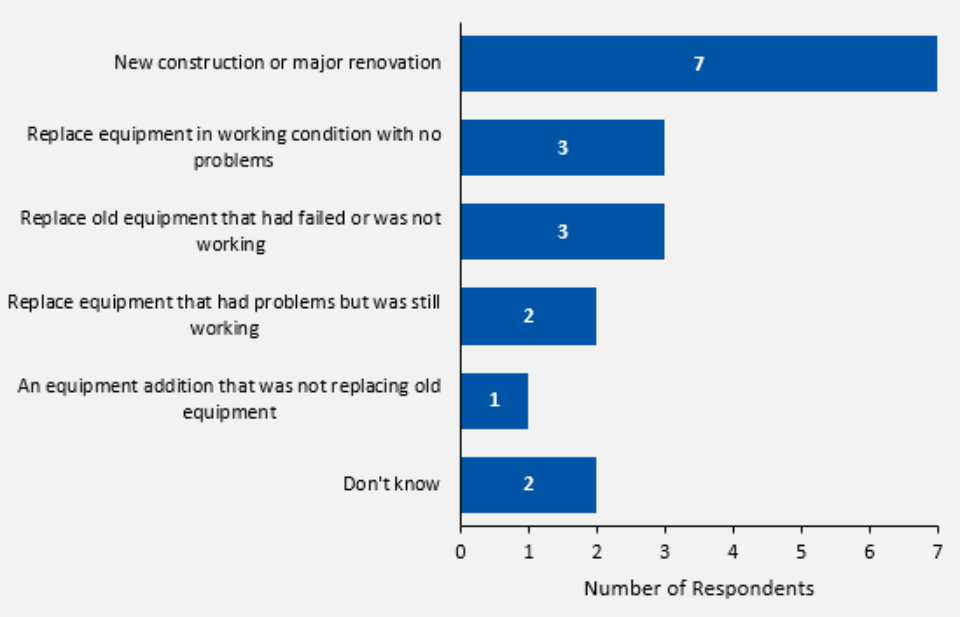
Customer Market Baseline Experience

To capture sales within the NHSaves service territory, Cadmus asked program participants about the sales process they experienced while participating in the programs. Program participants who installed a water heater, infrared heater, heat pump or ground-source heat pump, evaporative fan, compressed air, boiler, or air conditioner were asked a series of questions about the reasons for installing their equipment, what other equipment they considered, and their experience with the sales process as a whole. We received responses from participants who installed the following:

- Five boiler respondents
- Five air conditioner respondents
- Two water heater respondents
- Two infrared heater respondents
- One heat pump respondent
- One ground-source heat pump respondent
- One evaporative fan respondent
- One compressed air respondent

Cadmus first asked participants whether their project was part of a new construction or retrofit and, if a retrofit application, whether the equipment had been replaced prior to failure. Most commonly, participants reported that their new equipment was part of a new construction or major renovation project (seven of 18 respondents; Figure 23). Because we were interested in exploring the sales process for new construction and replacement on or near failure projects, Cadmus did not ask subsequent market baseline questions of participants who were not sure what type of application occurred (two respondents said *don't know*) or who were *replacing equipment in working condition with no problems* (three respondents).

Figure 23. Participant Reasons for Equipment Installation



Source: Participant Survey Question B7. "Please tell me why your organization installed the [STRATA] equipment. Was it…" (n=18)

Most respondents (n=13) hired a contractor to install their equipment (11 respondents), while one respondent performed the installation using internal staff and another completed the installation using internal staff and a contractor.

Takeaway:

Almost all respondents researched options themselves or through a contractor before installing their equipment. Most respondents could not recall the efficiency level of the equipment they considered or installed (six of 12 respondents). Those who could recall (six of 12 respondents) considered alternate equipment of less or the same efficiency than the equipment installed.

Twelve of 13 respondents said they performed their own research or talked to contractors about equipment or service options that offered varying levels of energy efficiency, and one remaining respondent could not recall exploring installation options.

Six of these 12 participants could not recall how many options they explored. Those who could most commonly considered two other pieces of equipment in addition to the unit they installed (five respondents) and one participant considered three other pieces of equipment.

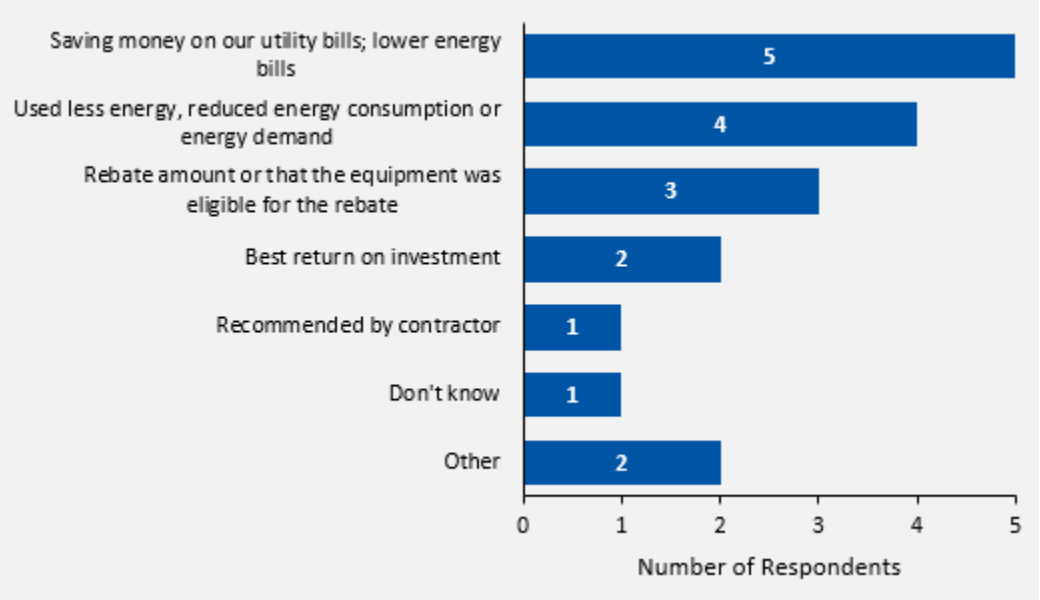
In a series of follow up questions, Cadmus asked participants who considered multiple pieces of equipment detailed questions about the equipment they chose and the other option(s) considered:

- Of the four respondents who installed boilers, one recalled that at least one of the other options explored had an efficiency rating between 94% and 98% AFUE (this respondent installed a boiler with a minimum of 95% AFUE). Respondents who said *don't know* to these initial questions were asked a final question about whether the alternate equipment was more, less, or of the same efficiency as the equipment they installed. Two boiler respondents indicated that at least one other piece equipment was of the same efficiency. Of those two, one said at least one other piece of equipment was less efficient. The fourth boiler respondent could not recall.
- One compressed air respondent could not specifically recall the kinds of other options explored, but that both were less efficient than the option the participant chose, and the deciding factor was the option that would save the most money over time.
- Four respondents who installed air conditioners could not recall the efficiency level of the equipment they purchased. In a follow-up question, these respondents were unable to identify whether the other equipment they were considering was more, less, or of the same efficiency as the equipment they ultimately ended up installing.
- Two storage water heater participants were both unable to recall the efficiency level of the other options explored or whether they researched water heaters that were tankless or not condensing and therefore fell outside of the program. When asked if the other equipment they were considering was more, less, or of the same efficiency as the equipment they installed, neither could recall.

We asked participants what factors motivated their decision to proceed with the specific equipment installed (n=18). Most commonly, participants indicated that saving money on their utility bills (five

respondents) or using less energy (four respondents) motivated their selection (Figure 24). Participants who selected *Other* cited lower maintenance costs (one respondent) or that their equipment was the best fit for the space (one respondent).

Figure 24. Motivating Factors to Purchase Selected Equipment



Source: Participant Survey Question B26. "What factors motivated your decision to proceed with the specific option you installed?" Multiple responses allowed, but each respondent provided only one factor. (n=18)

Program Partner Market Baselines

To better understand the NHSaves programs' market penetration, Cadmus asked program partners a series of questions regarding their inventory practices and sales processes inside and outside the programs.

Program Influence on Stocking Practices

Cadmus asked, on a scale of 1 to 5 where 1 was *not at all important* and 5 was *very important*, how important the NHSaves program was to program partners' decision to stock, promote, and sell energy-efficient equipment. The 14 respondents gave a mean rating of 3.5, with six rating the NHSaves programs importance as a 4 or 5 (Figure 25). Program partners who gave a rating less than 4 completed fewer than 20 projects through the program per year. Two direct install contractors did not provide any responses to this question and another responded *don't know*.

Figure 25. Program Importance for Program Partners to Stock Energy-Efficient Equipment

Source: Program Partner Interview Question E8. "Let's talk a bit more about your sales process. How important would you say NHSaves programs are to your company's decision to stock, promote, and install high-efficiency equipment?" Two direct install contractors did not provide any responses to this question and another responded *don't know*.

New Construction Market Baselines

To understand the market in New Hampshire, Cadmus asked program partners a series of questions regarding how they promoted energy-efficient equipment to customers implementing a new construction project. First, we asked customer-selected contractors whether they worked on new construction projects, and six of the eight said they did. Customer-selected contractors who worked on new construction projects reported that, on average, 70% of their new construction projects were not funded through NHSaves or any other energy efficiency program. Note that the two program partners who answered this question and completed fewer than 10 NHSaves projects per year said that 90% of their new construction projects did not participate in the program.

Cadmus then asked program partners (n=6) how they promoted the following measures to new construction *nonparticipants*:

- Compressed air systems
- Air conditioners
- Heat pumps
- Boilers
- Furnaces
- Unit heaters
- Motors
- Pumps
- Water heaters

Despite only asking about nonparticipants, four of six program partners said they presented efficiency options to both participants and nonparticipants. Three of six program partners reported promoting

energy-efficient equipment in the same way to nonparticipants as they did to participants. All three said they presented good/better/best options for all kinds of equipment sold.

Cadmus then asked which equipment option nonparticipating new construction customers typically choose. Five of six customer-selected contractors reported that their nonparticipating customers usually chose the "better" or "best" options. Another customer-selected contractor said it varied, and about half go for the less efficient options while the other half go for the more efficient option (if they were convinced of the energy savings available from the upgrade).

Replacement on Failure Market Baselines

Cadmus asked all contractors a series of questions regarding how they promoted energy-efficient equipment to customers who were replacing equipment on failure, as opposed to early replacement or new construction projects. We first asked what percentage of contractor's replacement-on-failure customers do not participate in NHSaves or any other energy efficiency program (n=14). Five contractors did not know, but four direct install contractors noted that, on average, 51% of their customers did not participate, while five customer-selected contractors said 80% of their customers did not participate. This difference may be because one direct install contractor reported receiving all project work through the utilities and, therefore all customers who were recruited through that direct install contractor ended up participating.

Program partners (n=7) then explained how they promoted the following measures to replace-on-failure nonparticipants:

- Compressed air systems
- Air conditioners
- Heat pumps
- Boilers
- Furnaces
- Unit heaters
- Motors
- Pumps
- Water heaters

At this point in the interviews, several program partners interrupted and repeatedly stated that they had no variation in their sales tactics. Five of six program partners presented good/better/best options to nonparticipants, and three partners also presented varying efficiency levels. One direct install contractor indicated that even if the customer does not participate, the contractor still typically promoted equipment that is eligible for the rebate. Another direct install company did not answer the question.

In a follow-up question, Cadmus asked program partners which equipment option nonparticipants typically choose, and responses were nearly identical to those regarding new construction sales, with two exceptions: only three customer-selected contractors indicated that their nonparticipating customers usually choose the "better" or "best" options, while two direct install contractors said nonparticipants usually only go for the "good" or most basic option.

> "If someone is purchasing something that qualifies, we will do everything we can to help them participate."
> – direct install contractor

Energy Management Systems

EMS, also called Building Management Systems or Building Automation Systems, consist of a centralized computer-based control system that monitors and controls the buildings HVAC and lighting equipment. EMSs provide the ability to implement advanced control strategies to save energy across all HVAC and lighting systems within a facility. Similar to VFDs, the installation of an EMS does not necessarily save energy. Energy savings are achieved through the performance changes of HVAC and lighting systems from advanced controls implemented as part of an EMS installation. Eight program partners (four customer-selected and four direct install) indicated they sell or install EMS. We asked these program partners a series of questions about their EMS projects and about how many EMS customers participated in the NHSaves programs. Customer-selected contractor EMS project activity is primarily focused on the new construction (74%, n=4) and replacement (45%, n=4) markets (see Figure 26 below). For customer-selected contractors, the replacement (28%, n=3) and new construction (28%, n=3) EMS project participation rates were lower than for the expansion projects (50%, n=2), likely due to the typical timing of these projects and to the owner or developer's willingness to delay a project for pre-approval (see Figure 27 below). The following subsections provide a breakdown of customer-selected contractors and direct install contractor response details.

Energy Management Systems in New Construction

Program partners (n=8) first explained about the EMS completed as part of their new construction projects. Of all the EMS projects, on average, the four direct install contractors indicated that 20% of their EMS projects are new construction, compared to 74% of the four customer-selected contractors' projects. Because all of one direct install contractor's work comes through the utilities and based on an understanding that new construction EMS projects were not eligible for rebates, none of this contractor's EMS projects were new construction.

Cadmus then asked contractors how many of their new construction EMS customers participated in NHSaves or some other energy efficiency program. Direct install contractors indicated that 100% of their new construction EMS customers participated (two respondents), while 28% of customer-selected contractors' customers participated (three respondents). Three program partners were not sure.

Energy Management System Expansions

Cadmus asked program partners (n=8) about EMS projects that are an expansion of existing systems. Direct install contractors with expansion projects indicated that, on average, 50% of their EMS projects were expansions (four respondents) and customer-selected contractors indicated that an average of 19% of their projects were expansions (four respondents). Two customer-selected contractors said none of their EMS projects are expansions.

As a follow up question, we asked contractors (n=6) how many of these EMS expansion customers participated in NHSaves or some other energy efficiency program. Direct install contractors indicated that an average of 88% of their EMS expansion customers participated (four respondents) while an average of 50% of customer-selected contractors' customers participated (two respondents).

> "If we're involved and we did the assessment, close to 100% [participate]." – direct install contractor

Program partners (n=8, one did not provide an answer) also reported the age of the existing EMS systems they encountered, though most were unsure as the age could vary widely (four respondents). The remaining three program partners estimated that most EMS systems they see are at least 10 years old: one estimated 10 to 15 years and two said 10 or more years.

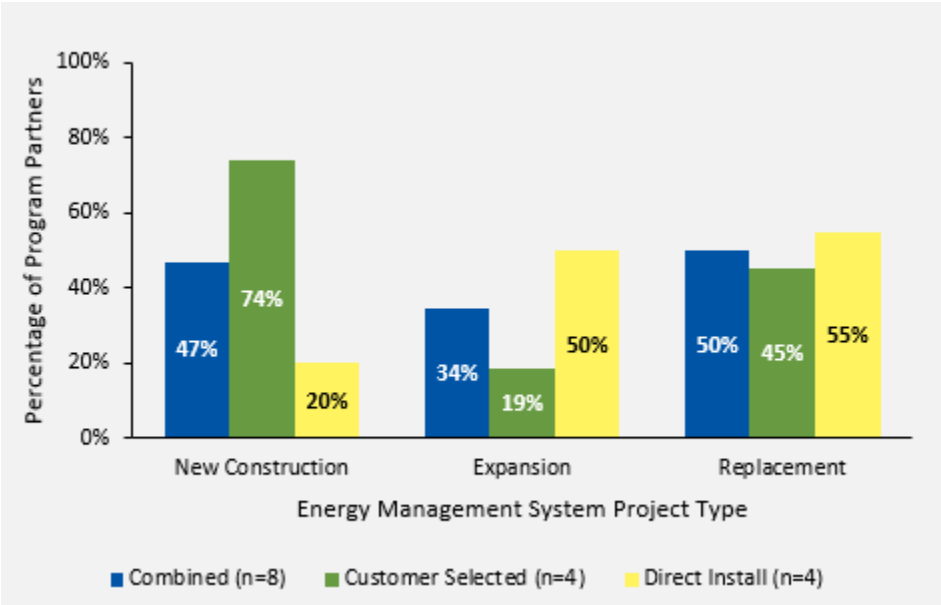
Energy Management System Replacements

Finally, Cadmus asked these eight program partners about EMS projects that are replacing existing systems. Of all their EMS projects, direct install contractors indicated that 55% are replacements (four respondents) and customer-selected contractors indicated that 45% are replacements (four respondents) on average. Similar to EMS expansions, one customer-selected contractor and one direct install contractor said none of their EMS projects are replacements.

Direct install contractors (n=3) then reported that 83% of their replacement EMS customers participated in NHSaves or some other energy efficiency program, and 28% of customer-selected contractors' (n=3) customers participated in NHSaves or some other energy efficiency program.

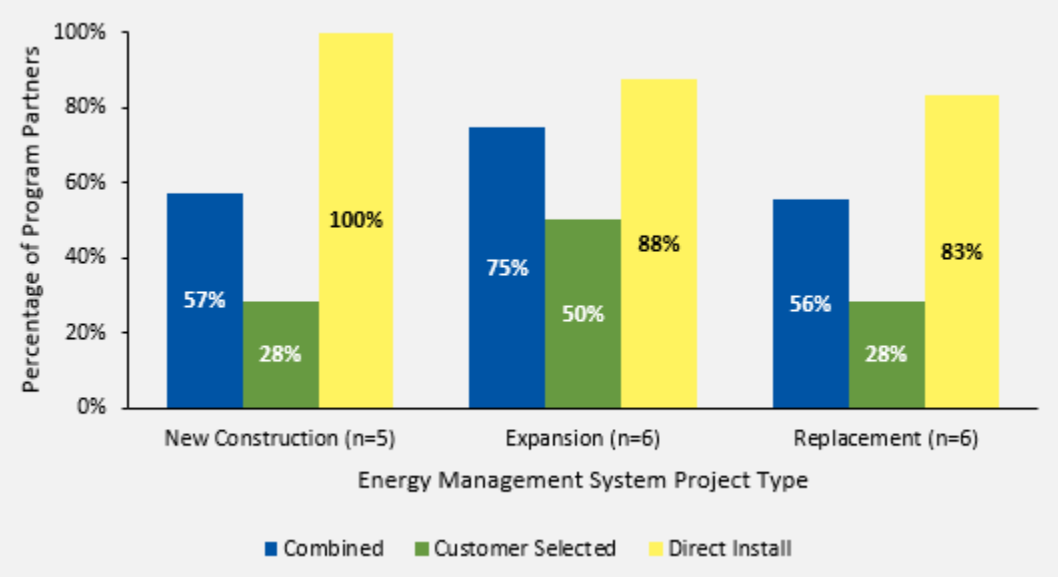
Figure 26 and Figure 27 highlight the average EMS installation and participation rates by project and partner type. These percentages are the average reported percentage of EMS installations by project type, then by contractor type. Though an individual contractor's percentages would add to 100%, because we took the average over the respondent group, the percentages in the figures below do not add up to 100%.

Figure 26. Average Percentage of Energy Management System Installations by Project and Program Partner Type



Source: Program Partner Interview Questions E15, E17, and E19. "Regardless of whether your business customer participates in the NHSaves program, what percentage of your energy management system installations in existing buildings are [new construction/expansions/replacements], as opposed to [new construction/expansions/replacements]?"

Figure 27. Average Energy Management System Participation Rate by Project and Program Partner Type



Source: Program Partner Interview Questions E16, E18, and E20. "What percentage of these [new construction/expansions/replacements] are for business customers who participate in the NHSaves program or some other energy efficiency program?"

Conclusions and Recommendations

The 2016 and 2017 program evaluation yielded an overall gross realization rate of 113.5% for summer on-peak demand reduction, 93.7% for electric energy savings, and 98.8% for fossil fuel savings, with respective precisions of 32.7%, 5.6%, and 10.9% at 90% confidence. Significant variation in realization rates occurred per sampled project for measures that use prescriptive methodologies for reporting savings. Overall, evaluated savings closely match reported savings for most measure types. This section provides the Cadmus team's conclusions and recommendations based on findings presented in this report.

Conclusion: Aerator measures realized low fossil fuel energy savings within the Small Business Energy Solutions and Retail and Large Business programs.

NH Saves reports 1.70 MMBtu for all rebated aerators. Reported savings match the 2016-2018 Massachusetts TRM and are based on an assumed use of 30 minutes per day for 260 days per year. Cadmus evaluated these projects based on 2018 Mid-Atlantic TRM, which defines aerator use based on the installation location. Over 90% of rebated aerators were installed in restroom locations at sampled projects. Because the estimated use time for bathroom faucets (1.6 minutes) is lower than the estimated use time for kitchen faucets (4.5 minutes), lower energy savings are realized.

- **Recommendation:** Make one of the following changes to the aerator measure:
  - Require customers to provide the aerator end use. Report fossil fuels savings per unit as 1.7 MMBtu for kitchen faucet applications and 0.6 MMBtu for restroom faucet applications (corresponding to the estimated use time by faucet location).
  - Reduce the reported fossil fuel savings per unit from 1.7 MMBtu to 1.2 MMBtu for all aerators to account for the difference in estimated distribution of aerators between bathroom faucets and kitchen faucets. The recommended 1.2 MMBtu is based on seven projects sampled by Cadmus.

Conclusion: Programmable and Wi-Fi thermostat measures realized low fossil fuel energy savings and electric savings among all programs.

Cadmus reviewed seven programmable thermostat and Wi-Fi thermostat projects that all realized low energy savings, with an overall MMBtu realization rate of 62%. Unoccupied or night temperature setback setpoints were not implemented at six projects. One project was found to have 2 degree temperature setback setpoint. Because the HVAC systems associated with the thermostats are not reducing run hours during unoccupied times, energy savings are not being realized. When installed correctly and programmed appropriately, these measures lead to higher savings values.

- **Recommendation:** Review and improve communication with customers regarding the use of the energy saving features of Wi-Fi and programmable thermostats. Review program-qualified thermostat documentation to ensure sufficient instructions are provided regarding the energy savings features of thermostats. Consider providing additional training documentation or resources to customers to improve their awareness of how to most effectively save energy with their Wi-Fi and programmable thermostats.

Conclusion: Steam trap measures realized high fossil fuel energy savings within the Municipal and Retail and Large Business programs.

NH Saves reports 25.70 MMBtu for all rebated steam traps. Reported savings match the 2016-2018 Massachusetts TRM and are based on an average assumed steam pressure and trap size. Cadmus collected steam pressure and trap size at all sampled projects and calculated evaluated savings using these site-specific inputs. Of the eight sampled steam trap projects, all except one showed high realization rates, with an overall realization rate of 156% for fossil fuel MMBtu. The 2019-2021 Massachusetts TRM has revised the deemed value to 12.2 MMBtu for steam traps.

- **Recommendation:** Make one of the following changes to the steam trap measure:
  - Require customers to provide the steam pressure system setpoint where the steam trap is installed and calculate reported savings using steam pressure setpoint input. Many variables impact the steam trap savings calculations, but steam trap pressure has the greatest impact with the highest confidence of collecting accurate data from the customer. Using the following assumptions (operating hours=2,800, steam trap orifice size=1/4-inch, boiler efficiency=80%), annual MMBtu fossil fuel savings savings will be calculated as 43.4 x steam pressure in psig + 954.
  - Increase the reported fossil fuel savings per unit from 25.70 MMBtu to 40.1 MMBtu to account for the higher average steam pressure and trap size found in the seven projects sampled by Cadmus.

Conclusion: Participants and program partners are satisfied with the NHSaves programs but struggled with staying informed about the application status and funding availability.

Most participants are satisfied with the programs overall (40 of 53 customers provided a rating of 5 out of 5 and the mean rating for all participants was 4.6) and most are very likely to recommend the program (46 of 52 customers provided a rating of 5, with a mean rating of 4.8). The 2016 and 2017 participant Small Business Energy Solutions program overall satisfaction mean rating (4.7, n=47) was significantly higher than the mean satisfaction rating found during the 2010 program evaluation (4.3, n=103).

Participants were most satisfied with their contractor (45 of 52 provided a rating of 5, with a mean rating of 4.9) and with the equipment installed (43 of 53 provided a rating of 5, with a mean rating of 4.8) and believe that saving money is one of the main benefits they receive from the program, which was also noted by program partners.

Participants reported the lowest satisfaction with the application paperwork and the rebate levels.

Similarly, most program partners are satisfied with the program overall (seven of 14 provided a rating of 5, with a mean rating of 4.4) and do not perceive barriers to their own participation. For those who did perceive barriers, the application process and inconsistent communication were the main drivers of dissatisfaction. However, program partners felt generally uninformed during the beginning stages of a project, especially in the application process. They said the response time from one utility to the next

can be variable. Program partners also felt uncertain about the amount of funding available at any given time, which poses challenges with program marketing.

- **Recommendation:** Ensure that program partners are supported. Keep open lines of communication, particularly with direct install contractors. Consider hosting conference calls or webinars that program partners can join to ask questions or explore alternative methods of communication to ensure consistent feedback.
- **Recommendation:** Prioritize transparency during the application and funding process by setting accurate estimates of how long an application will take to process and by providing a customer or contractor portal to check the application status. Provide program partners and customers with updates as applications go through each step of the process. Utilities should also be transparent and update program partners as soon as possible if funding runs out for a particular program. Two utilities said they already track participants' application status online, so it may be possible to use existing infrastructure to update program partners and participants.

Conclusion: Customer time commitment is a barrier to participation.

The most common barrier to participation identified by program partners was the time or effort required to participate, particularly with the program application process. Within the customer survey, those who cited a program barrier or challenge most commonly said it took too much time or effort to participate. Most participants who reported that it took too much time and effort to participate were also less satisfied with the rebate amount, suggesting that the level of effort for participating is not worth the benefit collected.

- **Recommendation:** To encourage participation even for a small financial reward, consider ways to streamline the application process for participants and for contractors who fill out an application on the customer's behalf. For example, consider creating application forms that are the same across the utilities so that contractors working within multiple utility territories can familiarize themselves with the form layout and become comfortable with compiling the same supporting documentation for every project.

Conclusion: Most participants were pleased with the energy audit process and with the direct installation measures received with the audit.

Through Retail and Large Business grant funding, NHSaves provided organizations with energy audits to identify opportunities specific to their buildings and to help customers achieve energy savings. All participants who received an audit (78% of survey respondents) rated the site assessment, its clarity, and its content as a 4 or 5 out of 5. In addition, participants who received direct install measures through the audit process rated the measures as a 4 or 5.

- **Recommendation:** For utilities where program audits and direct installations are no longer available once Retail and Large Business grant funding is exhausted, consider allocating a portion of the NHSaves budget to delivering energy audits and direct installation measures through program partners or implementation contractors.

Conclusion: Customer-focused marketing can engage a wider range of customers and set accurate expectations about the program experience.

Program partners and participants suggested more marketing to improve the program experience and increase participation. Program partners advocated for general marketing that can be pushed out at the state level or that is focused on the customer's journey. Participants also said marketing should be more detailed to reflect all program offerings, as some were unaware of opportunities that may be offered through the program, such as the opportunity to receive a loan through the program.

- **Recommendation:** Coordinate under the NHSaves umbrella to develop marketing materials that every utility and program partner can use with customers. Use real examples of previous projects to help potential participants understand the process and set accurate expectations.

Conclusion: Some program partners, in particular customer-selected contractors and contractors who complete a minimal number of program-funded projects per year, do not understand the nuances of the different NHSaves C&I programs.

Three of the interviewed program partners completed fewer than 10 NHSaves projects per year. Overall, these program partners appeared to be less engaged with the programs. Two were unaware of any available marketing materials for the programs and the third did not answer. In a follow-up question, all three said more marketing could improve their ability to promote the programs and programs' benefits. When asked what benefits of the programs they promote, two did not answer and the third said they only promote the rebates.

- **Recommendation:** Encourage new program partners, or program partners that submit fewer than 10 applications per year, to participate in NHSaves programs more regularly. To reduce confusion and better enable these partners to market the programs, provide additional educational materials that summarize the details of each program. Support program partners through periodic outreach campaigns, such as quarterly emails or phone calls to formally introduce program staff, check on project leads, and discuss program changes.

Conclusion: NHSaves supports most of the project types that nonresidential customers are interested in pursuing.

Most customers could not identify equipment or services that the programs do not support. Similarly, program partners said the custom incentives within the NHSaves programs cover most customers' project applications and that most measures are eligible for incentives if the project is deemed cost-effective.

Conclusion: Most program participants explored and were offered options of varying degrees of efficiency. Contractors reported promoting high-efficiency equipment both inside and outside the program and to cite NHSaves as an important factor in their equipment stocking practices.

Twelve of 13 participants said they performed their own research or talked to contractors about equipment or service options of varying levels of energy efficiency. On average, direct install contractors (when not working on retrofit, direct install projects) noted that 25% of their new construction customers with eligible projects do not participate, while 70% of customer-selected contractors' new construction customers do not participate. For equipment replaced on failure, direct install contractors

noted that 51% of their customers do not participate, while 80% of customer-selected contractors' customers do not participate. Because direct install contractors are generally contracted with the utilities to perform these services, they appear to be more engaged and to be proactively encouraging their customers to participate in the NHSaves programs beyond the direct installation measures.

Regardless of project type, most program partners (seven of 10) said they still offer good/better/best options or promote efficiency to nonparticipants. The six of 12 participants who could recall how many other equipment options they explored most commonly considered at least two other pieces of equipment (while six respondents could not recall). Most participants could not remember the efficiency level of the other options they considered (seven of 12 respondents, one respondent did not provide a response). Of those who could recall, all four said the options they explored were of the same efficiency level or were less efficient than the equipment selected.

- **Recommendation:** Foster a closer relationship with customer-selected contractors to help decrease the rate of nonparticipation, particularly because these contractors are still promoting and selling program-eligible equipment. Offer more support and educational resources to help empower customer-selected contractors. For example, reach out to these contractors the first time they submit an application with or on behalf of a participant to connect that contractor with a staff member, familiarize them with the programs, provide marketing materials, and offer one-on-one training as needed.

Conclusion: Although the utilities were very responsive to requests for participant application data and supporting documentation, the documentation did not contain some details needed to support the evaluation activities.

All the NHSaves utilities were very responsive to Cadmus' requests for program application data and subsequent requests for supporting documentation. Although we obtained all the data and documentation recorded, the names of each field varied across the datasets and that there were a few critical details missing, which made it difficult to gather samples for the participant surveys and program partner interviews and to substantiate savings assumptions. Missing fields or data included participant phone and contact name, measure quantity, measure descriptions, and installing contractor details like business name, contact name, address, phone, and email address. Within the supporting documentation, measure savings calculations and energy models were in some cases not available or were only provided as images without the formulas or calculation workbooks. The utilities would benefit from a unified approach to collecting participant data and documenting energy savings assumptions.

- **Recommendation:** In addition to developing application forms that are the same across utilities (recommended above), create a coordinated data library that identifies each field name, defines what each field captures, and documents savings assumptions or algorithms and energy savings sources. Within that data library, consider creating measure reference IDs or categorized measure names and descriptions.

- **Recommendation:** Consistently capture these data in program databases: participant phone number and contact name, measure quantity, measure reference ID or categorized measure

descriptions, savings source, contractor business name, contractor contact name, contractor address, contractor phone, contractor email.

Appendix A. Sample Measure Evaluation Methodology

Table 32. Sample Measure Evaluation Methodology

Measure	Evaluation Methodology	Data Collection Points
Aerators	2018 Mid-Atlantic TRM: Faucet Aerator (Residential)	Baseline aerator flow High-efficiency aerator flow Number of people assigned per aerator Minutes per use Uses per day per person Percentage of water flowing down drain per use Water temperature at faucet Water temperature entering water heater Water heater efficiency Water heater type (natural gas or electric)
Air Compressors	Custom calculation model	Compressor type (natural gas or electric) Compressor controls (such as load/unload or VFD) Compressor horsepower (HP) Compressor rated flow (CFM) Plant elevation (feet) Pressure at rated flow (psi) Receiver volume (gallons) Baseline operating pressure (psi) Observed operating pressure (psi) Annual hours of operations (hours) Load profile of compressed air demand (%)
Air Compressor Dryers	Custom calculation model	Dryer type (natural gas or electric) Rated dryer capacity (CFM) Full load kilowatts (kW) Ambient air temperature (°F) Load profile of compressed air demand (%)
Air Conditioners	2019–2021 Massachusetts TRM Plan. Section 2.81. Unitary Air Conditioner - Prescriptive Calculations	Baseline air conditioner SEER Baseline air conditioner EER High-efficiency air conditioner SEER High-efficiency air conditioner EER Equivalent full-load cooling hours

Measure	Evaluation Methodology	Data Collection Points
Anti-Sweat Heater Controls	2019–2021 Massachusetts TRM Plan. Section 3.23. Door Heater - Prescriptive Calculations	Door heater volts Door heater amperage Annual run hours before controls (assumed 8,760) Door heater off time (%; deemed values for freezer and cooler doors)
Boilers	2018 Mid-Atlantic TRM, Gas Boiler	Boiler capacity Equivalent full-load heating hours (value from 2019-2021 Massachusetts TRM) Baseline boiler efficiency Installed boiler efficiency
Building Management Systems	Energy model	Whole building energy model inputs
Chillers	2019–2021 Massachusetts TRM Plan. Section 3.49. High Efficiency Chiller - Prescriptive Calculations	Tons of capacity Equivalent full-load hours (hours) Baseline EER of air-cooled chillers Installed EER of air-cooled chillers Baseline kilowatts per ton efficiency of water-cooled chillers Installed kilowatts per ton efficiency of water-cooled chillers Load factor for water-cooled chillers
EC Motors on Evaporator Fans for Refrigeration Systems	2019–2021 Massachusetts TRM Plan. Section 3.29. ECM Evaporator Fan Motors for Walk-in Coolers and Freezers - Prescriptive Calculations	Evaporator fan amperage Evaporator fan voltage Evaporator fan power factor (default=0.55) Evaporator fan number of phases Load reduction factor (default=0.65) Annual fan operating hours Typical refrigeration system efficiency (default=1.6 kW/ton)
EC Motors	2019-2021 Massachusetts TRM Plan. Section 3.30. ECM Fan Motors	Supply airflow (CFM) Installed efficiency (watts/CFM) Load factor or annual flow percentage (%) Annual fan operating hours

Measure	Evaluation Methodology	Data Collection Points
Energy Recovery Ventilators	*2017 Focus on Energy, Energy Recovery Ventilator*	Supply airflow (CFM) Average inside air enthalpy Average outside air enthalpy Cooling system efficiency Pressure drop across heat exchanger Filter pressure drop Fan motor efficiency Summer heat exchanger efficiency Winter heat exchanger efficiency Operating hours
Evaporator Fan Controls	2019–2021 Massachusetts TRM Plan. Section 3.37. Evaporator Fan Controls	Note: This calculator was only used to calculate energy savings from a condensing fan EC Motor. Condensing fan EC Motor voltage Condensing fan EC Motor amperage Condensing fan EC Motor power factor Condensing fan EC Motor phase Annual equivalent full-load hours of compressor operation Reduced run-time of compressor due to electronic temperature controls
Natural Gas Fryers	2019–2021 Massachusetts TRM Plan. Section 3.31. Electric Fryer(which references the ENERGY STAR Savings Calculator)	Vat size (standard or large) Pounds of food cooked per day per fryer Operating hours per day Operating days per year Cooking energy efficiency
Heat Pumps	2019–2021 Massachusetts TRM Plan. Section 3.47. Heat Pump System - Prescriptive Calculations	Cooling capacity (kBtu/h) Heating capacity (kBtu/h) Baseline cooling efficiency (SEER) Baseline cooling efficiency (EER) Installed cooling efficiency (SEER) Installed cooling efficiency (EER) Baseline heating efficiency (HSPF) Baseline heating efficiency (COP) Installed heating efficiency (HSPF) Installed heating efficiency (COP) Weekly facility operating hours Facility type and associated annual lighting hours

Measure	Evaluation Methodology	Data Collection Points
Infrared Heaters	2017 CT PSD. 2.2.7 Gas Radiant Heater	Heater capacity Equivalent full-load heating hours (for warehouse, storage, fire station, manufacturing, retail sales, and other) Savings fraction Baseline efficiency Oversize factor
Instant-On Plastic Wrappers	Savings calculator provided by manufacturer (Heat Seal Co.)	Deemed baseline plastic wrapper kilowatt-hour usage and ENERGY STAR kilowatt-hour usage.
Programmable Thermostats	2017 CT PSD. Section 3.2.5 Set Back Thermostat	Electric heating energy savings : Electric heat savings factor Occupied hours per week Kilowatt capacity Electric cooling energy savings: Cooling savings factor Occupied hours per week Cooling capacity (tons) Fossil fuel heating energy savings: Savings factor Occupied hours per week Output capacity of heating equipment Peak day natural gas savings: Annual natural gas savings Peak day factor
Showerheads	2018 Mid-Atlantic TRM, Low-Flow Shower Head	Showers per day Base showerhead flow High-efficiency showerhead flow Number of people using shower per day Type of water heater (natural gas or electric) Average showerhead temperature Water heater recovery efficiency

Measure	Evaluation Methodology	Data Collection Points
Steam Traps	Custom calculator based on the *Steam Trap Evaluation* report[b] and the *Two-Tier Steam Trap Savings Study*[c]	Steam system gauge pressure Atmospheric pressure Discharge coefficient Operating hours Percent condensate return Percentage of time trap is open (load factor) Boiler efficiency Number of steam traps Orifice Size (inches)
Variable Frequency Drives	Custom calculation model	Horsepower (HP) Nameplate efficiency (%) Motor load factor (%) Operating hours per year (hours) Baseline control type Installed control type Time at capacity (%)
Weatherization (weatherization, insulation, air sealing)	Energy model	Whole-building energy model inputs
Wi-Fi Thermostats	2018 Mid-Atlantic TRM. Smart Thermostat	Cooling savings (kWh): Cooling capacity of existing air conditioner (kBtu/hour) Equivalent full-load cooling hours Existing cooling efficiency (SEER) Electrical cooling percentage savings from thermostat relative to baseline control Heating savings (kWh): Heating capacity of existing equipment (kBtu/hour) Equivalent full-load heating hours Existing heating efficiency (HSPF) Electrical heating percentage savings from thermostat relative to baseline control Fossil fuel savings (MMBtu): Heating capacity of existing furnace unit (MMBtu/hour) Existing heating efficiency (AFUE) Heating fuel percentage savings from thermostat relative to baseline control

Appendix B. Detailed Process Evaluation Findings

Outreach and Marketing

Through interviews, Cadmus asked program partners and utility staff how they market the NHSaves programs. For details on utility staff findings, please reference the *Outreach and Marketing: Utility Staff* section above.

Program Partners

Most commonly, customer-selected contractors marketed the programs by including rebate information in cost proposals (six respondents; Table 33). Only two customer-selected contractors proactively marketed the programs in order to gain business through trade shows, local advertising, or face-to-face marketing. By contrast, direct install contractors marketed the programs in a variety of ways, including cost proposals, emails, fliers, workshops, and cold calls. One direct install contractor promoted the direct install aspect of the Small Business Energy Solutions program through email or by going door-to-door and offering energy audits. Three direct install contractors (n=5) and one customer-selected contractor (n=6) reported conducting no marketing for the programs because the utilities provide customer leads directly. One program partner did not answer this question.

Table 33. Program Promotion Methods by Program Partner Type

Promotion Method	Customer Selected (n=8)	Direct Install (n=6)	Combined (n=14)
Cost proposals	6	1	7
Face-to-face	1	1	2
Emails	0	2	2
Fliers	0	2	2
Workshops	0	2	2
Local Advertising	1	0	1
Website	0	1	1
Trade Shows	1	0	1
Cold Calls	0	1	1
None	1	3	4
Refused	1	0	1

Source: Program Partner Interview Question D1. "How does your firm promote the programs?" Multiple responses allowed.

Cadmus asked program partners (n=14, four program partners did not provide responses) whether they promoted the NHSaves C&I programs in different ways. Five customer-selected contactors and one direct install contractor reported no variation in how they promote the programs. The remaining four contractors noted that while they do promote the programs, there is no specific way that they differentiate the programs other than describing individual program nuances to customers.

Program partners who promoted the programs to more than one customer type (seven customer-selected contractors and five direct install contractors) were asked to explain if, and how, they promote the programs differently depending on customer type. While all customer-selected contractors said they promote the programs the same across customer types, all five direct install contractors said they

differentiate by customer type; two of whom specifically mentioned that differentiating the type of program information by customer business type is important. For example, one mentioned that municipal projects are fundamentally different from those of large businesses due to the differences in their decision making and review processes. This aligned with utility staff interview findings, with one utility staff interviewee saying the Municipal program was designed to work with the way that municipalities make project and funding decisions, which typically need more lead time than C&I projects. Alternatively, since smaller businesses usually struggle with capital costs and a technical expertise, one contractor mentioned changing the marketing approach with small businesses when compared to marketing to large business customers. Other direct install contractors mentioned that the utility (one respondent) or recommended equipment (one respondent) drive the differences in how the contractor promotes to customers.

Three customer-selected and three direct install contractors were aware of the utility-developed marketing materials for the NHSaves programs. All those aware of these materials reported using them, with two program partners using the materials daily, while other program partners use them on a weekly (one respondent), bi-monthly (one respondent), monthly (one respondent), or quarterly (one respondent) basis. Note that all three program partners who completed fewer than 10 NHSaves projects per year were either not aware of these materials (two respondents) or did not provide an answer (one respondent). Six program partners who used utility-developed marketing materials said the materials that advertise free measures (two respondents), synopsize the offerings well (three respondents), or are readily available online (two respondents) tend to be the most effective. A direct install contractor indicated that the materials that advertise free food are effective at getting people to come into workshops that promote the programs. One customer-selected and one direct install contractor could not identify any specific marketing piece as the most effective.

Program partners faced several challenges in marketing the NHSaves programs. Two direct install contractors mentioned that the inconsistency in available incentives was a barrier, particularly when working with customers who were denied repeatedly due to funding availability. Similarly, one customer-selected contractor reported challenges in not being alerted when funding ran out. Two customer-selected contractors who complete under 20 program projects per year noted difficulty finding eligible customers. Other challenges included:

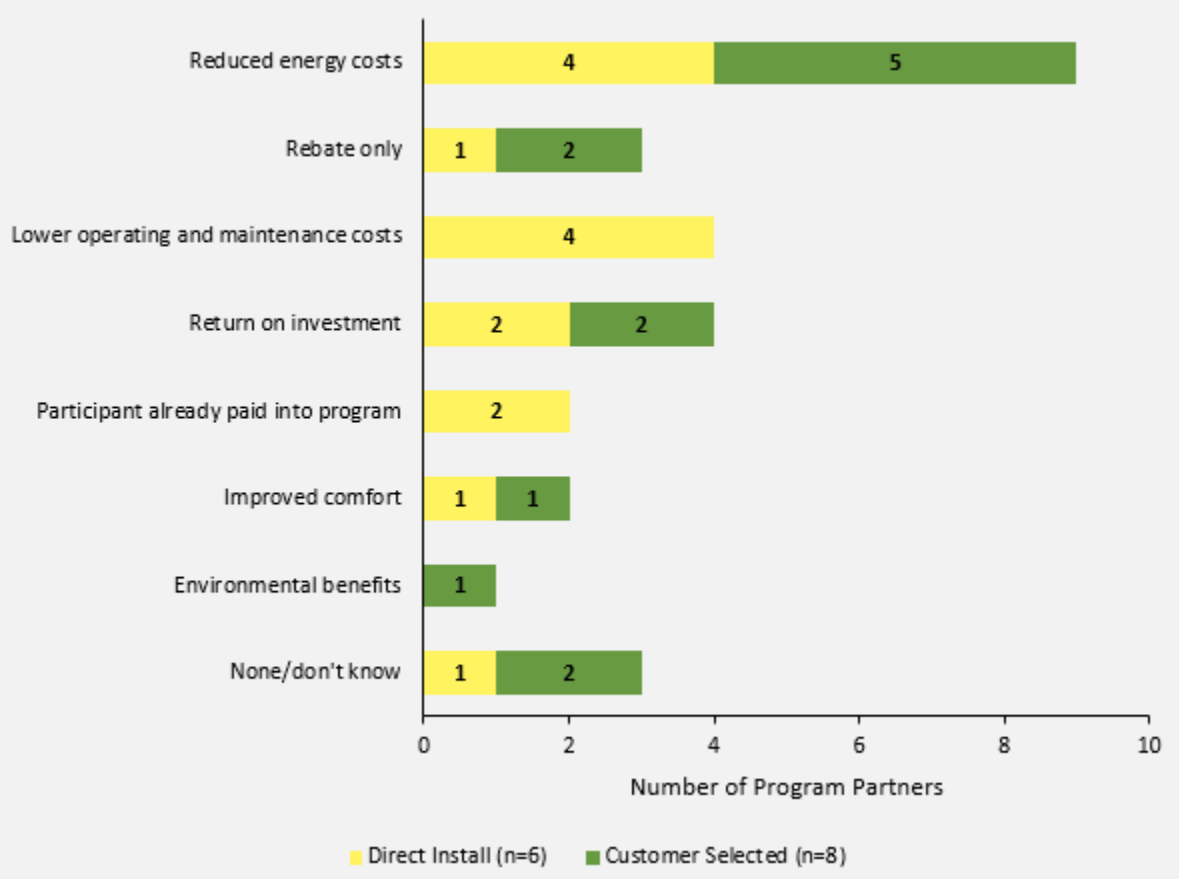
> "There is a perception, gained over years, because of the stop-start history [of the programs]. Customers don't feel like they will get incentives if they apply because they've been stopped before." – direct install contractor

- Getting customers to fill out the paperwork (one direct install contractor)
- Losing work to contractors from out of state (one customer-selected contractor)
- Not being able to promote the appropriate equipment when participants are focused on receiving a certain rebate (one customer-selected contractor)

Three customer-selected contractors and two direct install contractors were unsure what challenges they faced.

When asked what benefits of the NHSaves programs they promote, most program partners reported promoting reduced energy costs (seven of 11 respondents). Other commonly promoted benefits include the rebate amount (three respondents), lower operating and maintenance costs (four respondents), and the project's return on investment (four respondents). Two of the three customer-selected contractors who promote only the rebate amount complete under 15 program projects per year. In addition, two direct install contractors who promote over 50 projects per year mentioned that they often explain the customer has already paid into the program, so they should take advantage of it. Three program partners did not provide responses to this question. A full breakdown of the benefits promoted by program partners is shown in Figure 28.

Figure 28. Program Benefits Promoted to Customers



Source: Program Partner Interview Question D10. "In general, what benefits of the program do you promote to your customers?" Multiple responses allowed. Three program partners did not provide responses.

Customer Experience

Cadmus surveyed 53 participants from the 2016-2017 Small Business Energy Solutions program (n=47), Retail and Large Business program (n=3), and Municipal program (n=3) to ask about their program experience, including program benefits and barriers, program marketing and outreach, satisfaction, and application ease. In this section of the report we share responses specific to Retail and Large Business

and Municipal programs' respondents wherever possible to distinguish these programs from the combined results, comprised primarily of the Small Business Energy Solutions program respondents.[25]

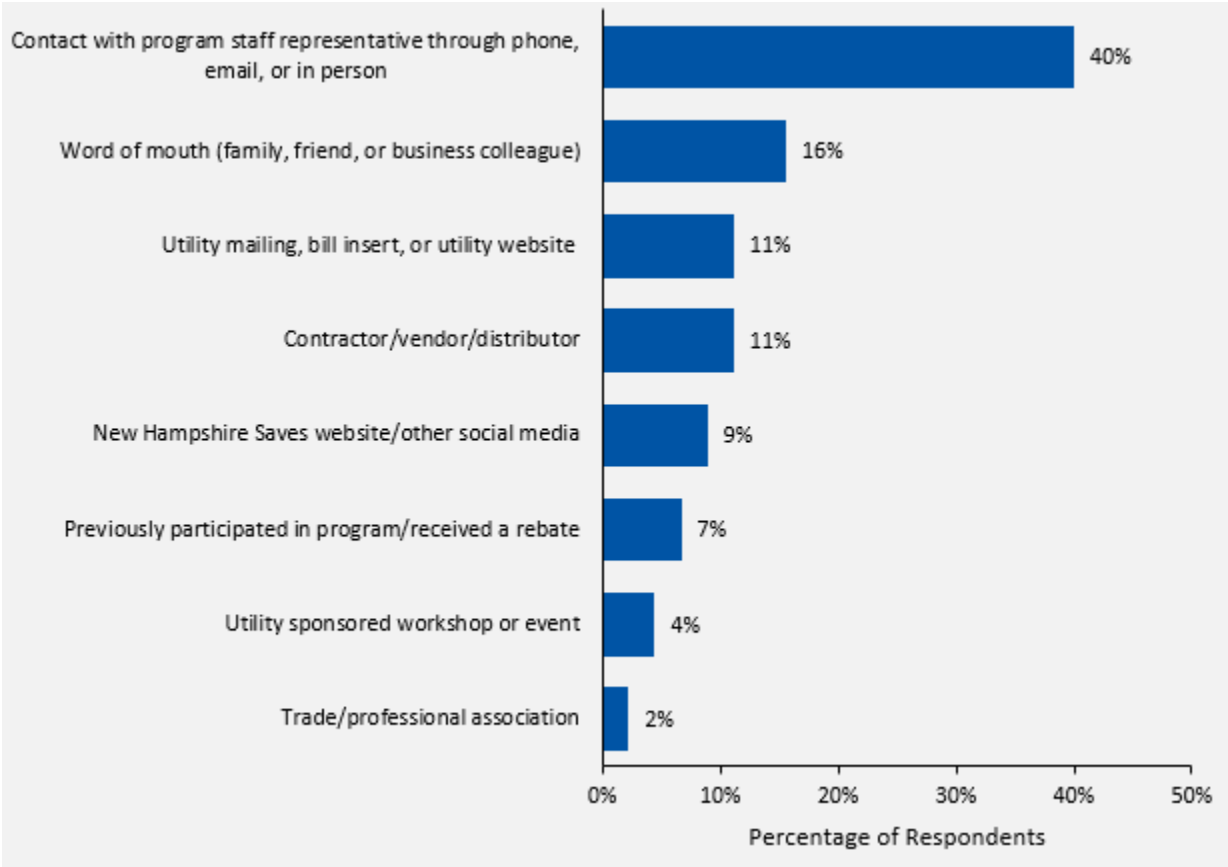
Program Awareness

Cadmus assessed participant awareness of NHSaves programs. First, we asked participants how their organization learned about the NHSaves rebates that were available for their programs. Respondents (n=45) found that contact with program staff (40%) and word of mouth (16%) were the most influential in their decision to participate (Figure 29).

Takeaway:

Interpersonal interaction, whether with program or utility staff, a friend, or colleague, are the most influential sources of awareness.

Figure 29. Most Influential Participant Awareness Source



Source: Participant Survey Question C1. "How did your organization learn about the NHSaves rebates available for this project?" and Question C2. "Of those sources, which source was the most influential in your company's decision to participate in the program?" (n=45)

[25] Because of the small sample sizes for the Retail and Large Business and Municipal programs, differences among findings should be considered with caution.

Retail and Large Business and Municipal Program-Specific Findings:

Retail and Large Business program (n=2) and Municipal program (n=3) respondents reported varying sources of program awareness:

- Program staff (one Retail and Large Business respondent and one Municipal respondent)
- Word of mouth (one Retail and Large Business respondent)
- Utility mailing, bill insert, or the utility website (one Municipal respondent)
- Trade/professional association (one Municipal respondent)

Retail and Large Business program (n=2) and Municipal program (n=3) respondents reported varying sources of program awareness:

Verification

All survey respondents (n=53) reported that the energy-efficient equipment rebated through the programs were installed and operating as planned.

Market Baselines

To capture sales within the NHSaves service territory, Cadmus asked program participants about the sales process they experienced while participating in the programs. Detailed findings on this section can be found in the *Customer Experience: Market Baselines* section above.

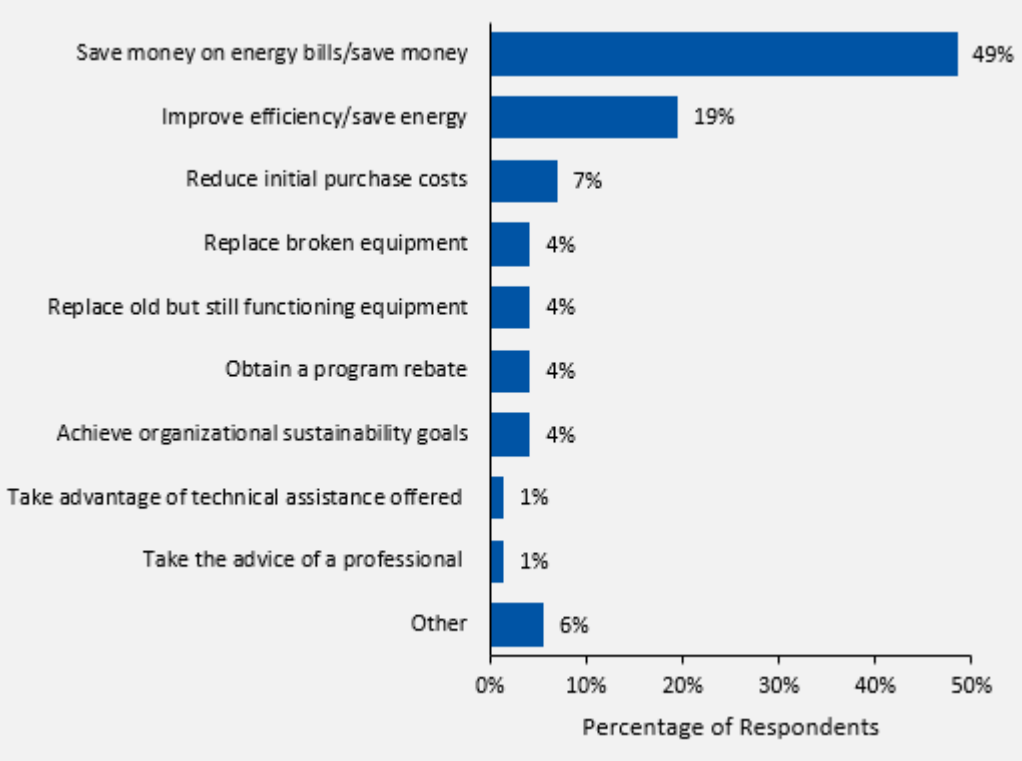
Program Benefits and Barriers

Cadmus asked participants what factors motivated their company's decision to make an energy-efficient upgrade. Most commonly, respondents (n=72) said saving money (49%) and saving energy (19%; Figure 30). Those who responded *Other* (6%) indicated that general benefits motivated them to participate, such as by saying that participating "made the most sense." When asked the greatest program strengths, respondents most commonly reported rebates or incentives (34%, n=53).

Takeaway:

Reported program benefits and strengths revolved around saving money, saving energy, and taking advantage of rebates.

Figure 30. Factors that Motivated Participation



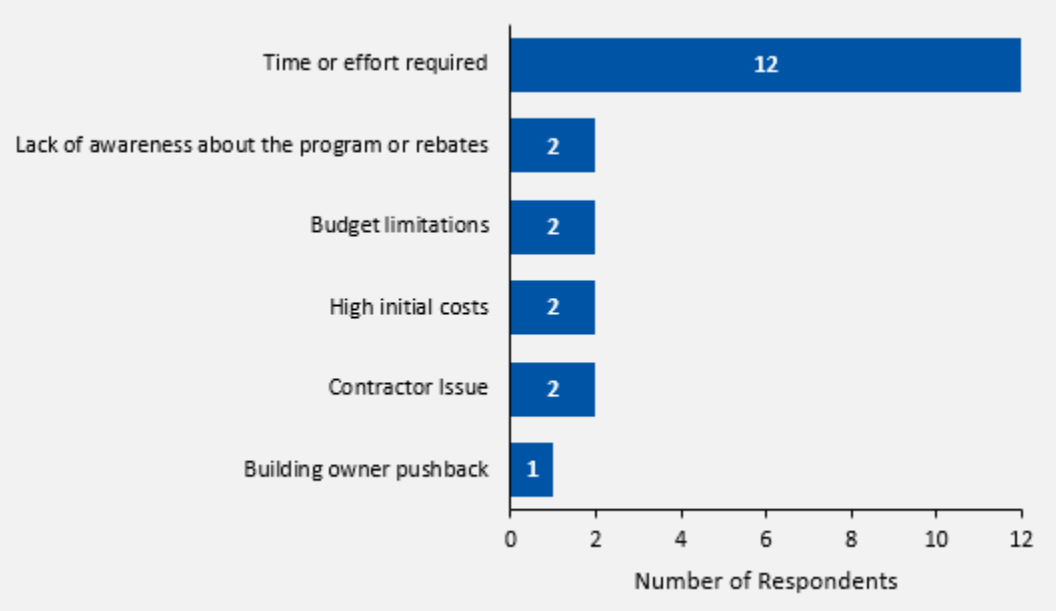
Source: Participant Survey Question D1. "What factors motivated your company's decision to make an energy-efficient upgrade?" Multiple responses allowed, but each respondent provided only one factor. (n=72)

Retail and Large Business and Municipal Program-Specific Findings:

Responses from the Retail and Large Business and Municipal programs' respondents varied. Two Retail and Large Business (n=5) and one Municipal (n=4) respondent reported that saving money was the factor that motivated their company's decision to move forward with an energy-efficient upgrade. One Retail and Large Business respondent cited two additional benefits: saving energy and obtaining a program rebate. One Municipal respondent indicated that reducing the initial purchase costs and replacing broken equipment were motivating benefits. Another Municipal respondent was motivated to replace old but still functioning equipment.

Cadmus asked all participants about the biggest challenges to participating in the program for their company. Most respondents (n=52) indicated that there were no challenges to their participation (62%). Those who had challenges (21 respondents) most commonly said that the time or effort required to participate was the biggest challenge (12 respondents; Figure 31). Of the two respondents who noted issues with their contractor, one respondent noted that their contractor double charged them, and then they had to take the initiative to get the mistake fixed.

Figure 31. Challenges to Participation



Source: Participant Survey Question D2. "What were the biggest challenges to participating in the program for your company?" Multiple responses allowed, but each respondent provided only one factor. (n=21)

Retail and Large Business and Municipal Program-Specific Findings:

Two of three Retail and Large Business respondents and three of four Municipal respondents identified participation challenges related to the time and effort required to participate (one Municipal respondent did not provide further detail):

- The amount of paperwork required (two Municipal respondents)
- Getting scheduled with a contractor (one Retail and Large Business respondent)
- Removing old equipment to prepare for new equipment (one Retail and Large Business respondent)

Cadmus asked participants who reported challenges to suggest what could have been done to help their company overcome challenges with program participation or making energy-efficiency improvements. Most respondents (n=17) said nothing could be done to help (11 respondents). Suggested changes included providing better or more information about the program (three respondents) and simplifying the paperwork or application (one respondent). Of the two who provided *Other* responses, one had issues with their contractor and one suggested a loan program (Unitil customer), even though some

Takeaway:

Most respondents could not identify a barrier to participation. However, the most common barrier cited was the amount of time and effort it took to participate.

utilities within NHSaves, including Unitil, already offer a loan option for participants.[26]

Retail and Large Business and Municipal Program-Specific Findings:

All Retail and Large Business (n=2) and Municipal (n=1) respondents who reported challenges indicated there were no changes that could help overcome barriers to their participation.

When asked about program weaknesses, most respondents could not think of any (41%, n=51), followed by there not being enough advertising (14%).

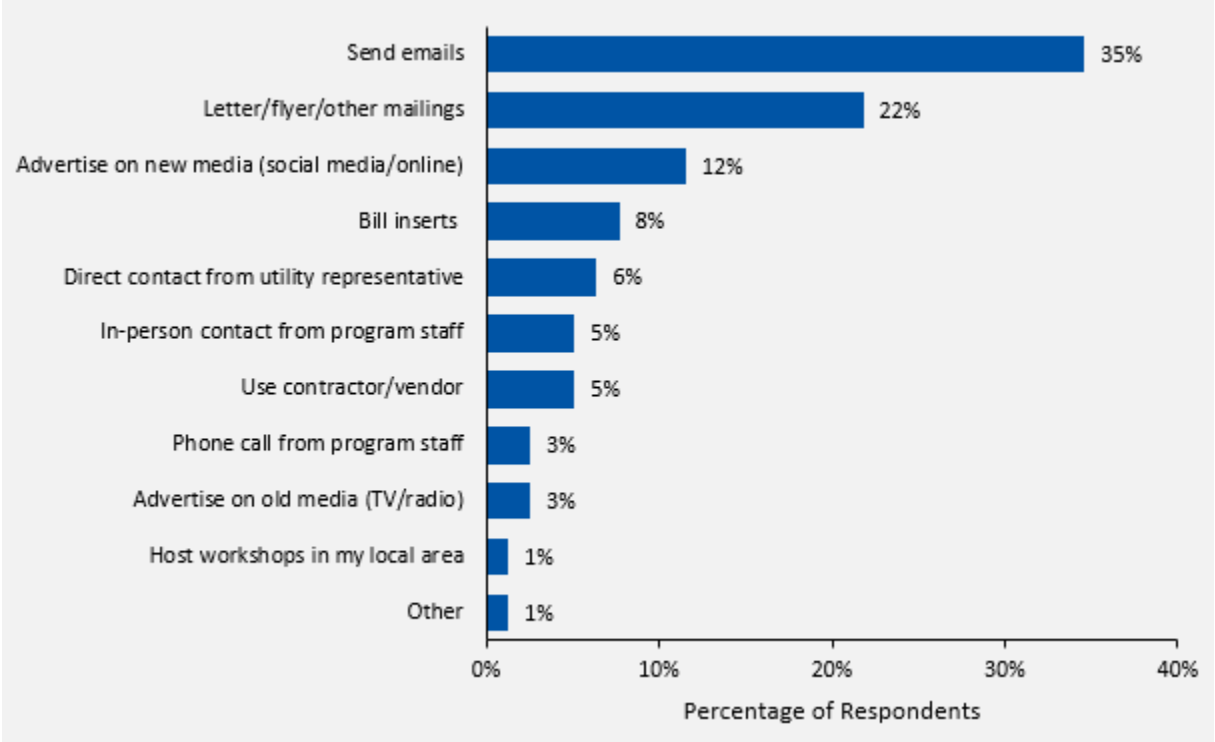
Program Marketing and Outreach

Cadmus asked participants about their experience with program marketing materials and the marketing process. Respondents rated the accuracy and completeness of the program materials they received when learning about the program on a scale of 1 to 5, where 1 was *not at all accurate* and 5 was *very accurate*. Almost all respondents rated the materials as a 4 or 5 (96%, n=47). All Retail and Large Business (n=3) and Municipal (n=3) respondents provided a rating of 4 or 5.

Respondents (n=78) then identified the best way for program staff to keep organizations informed about program opportunities. Most commonly, respondents indicated that sending emails (35%), sending letters, fliers, or other mailings (22%), and advertising on new media such as social media (12%) are the best way to keep organizations informed (Figure 32).

[26] Due to funding constraints, the loan option was not available for C&I natural gas customers or Retail and Large Business customers, unless they were also participating in the electric program. Since then, Unitil has established a small C&I Gas On-Bill Financing program.

Figure 32. Preferred Sources for Information



Source: Participant Survey Question F2. "In your opinion, what is the best way for program staff to keep organizations like yours informed about program opportunities to save energy?" Multiple responses allowed. (n=78)

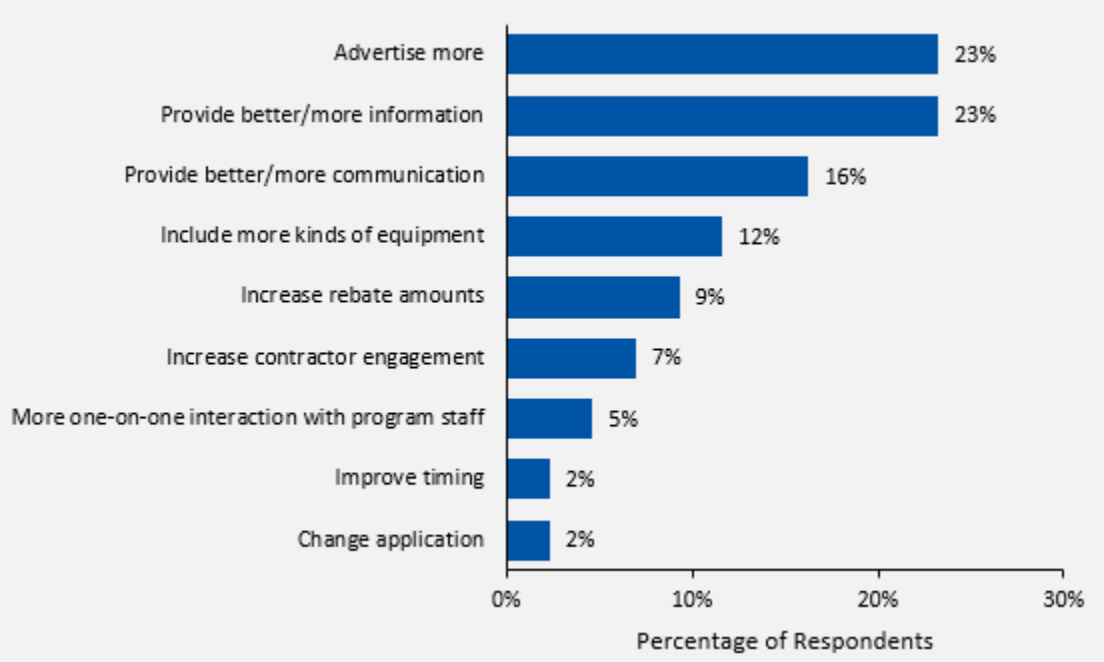
Retail and Large Business and Municipal Program-Specific Findings:

Retail and Large Business (n=4) and Municipal (n=5) respondents reported the following as the best ways to keep them informed:

- Email (two Retail and Large Business and one Municipal respondent)
- Direct contact from a utility representative (one Retail and Large Business and one Municipal respondent)
- News media such as social media (two Municipal respondents)
- Letters/fliers/other mailings (one Retail and Large Business respondent)
- In-person contact from program staff (one Municipal respondent)

When asked for ways that program staff could increase participation, respondents (n=43) commonly suggested more advertising (23%) and providing more or better information about the program (23%). Other common suggestions included providing better or more communication (16%) and including more eligible equipment (12%; Figure 33).

Figure 33. Respondent Suggestions to Improve Participation



Source: Participant Survey Question F3. "What do you think program staff could do to increase participation?" (n=43)

Of respondents who suggested *more eligible equipment*, Cadmus asked what kind of equipment they would like to see added to the program. Two of the three respondents gave general statements without specifying any particular type of equipment. The third respondent expressed confusion about the kinds of heating and cooling measures that are eligible and noted that capacitors are currently in demand.

Similarly, we asked the 10 respondents who indicated *better or more information* to identify what kind of information would be more useful to garner interest. Four respondents indicated that generally, information with more details about the program would be useful. Four respondents requested the program send information out via email, online, or through general advertising. One respondent indicated that fliers would help.

Takeaway:

Overall, respondents believe that the programs are not advertised enough. Providing more detailed information and distributing it electronically or via mail could help increase participation.

We asked respondents who said *better or more communication* is needed to specify who should be more involved in the process. These three respondents requested more electronic communications, citing both email and updating the NHSaves website as important. One respondent also suggested calling property managers to keep them informed.

Program Satisfaction and Application Ease

Cadmus asked participants about their satisfaction with different aspects of the program and with the program overall. All rating questions operated on the same scale of 1 to 5, where 1 was *not at all satisfied* and 5 was *very satisfied*.

> ***Takeaway:***
>
> Overall, most customers were satisfied with their experiences within the NHSaves programs and were likely to recommend the programs.

Satisfaction with Program-Funded Site Assessments and Direct Install Products

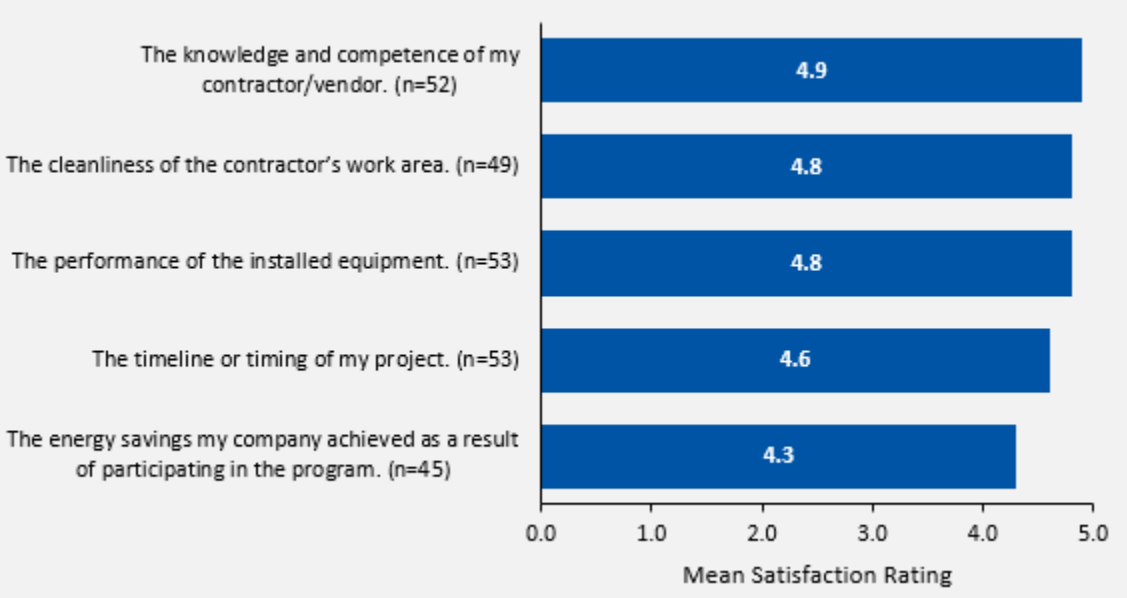
Most respondents (78%, n=45) indicated that utility staff or a contractor hired by utility staff performed a site assessment or energy audit. Respondents who received a site assessment or energy audit rated their satisfaction with the service they received. All respondents who received an audit (n=31), including the Retail and Large Business (n=2) and the Municipal (n=2) respondents, gave the site assessment or audit a 4 or 5 rating. Most of these respondents (97%, n=31) also rated the clarity and content of the assessment or audit as a 4 or 5.

In addition, participants who received direct install measures rated their satisfaction with the products received, and all (n=14) rated the measures as a 4 or 5.

Satisfaction with Project Execution

Participants rated their satisfaction with aspects of their project, such as the timeline or timing. Overall, participants (n=53) were most satisfied with the knowledge and competence of their contractor, the cleanliness of the contractor's work area, and the performance of the installed equipment (Figure 34).

Figure 34. Satisfaction Ratings with Aspects of Program Execution



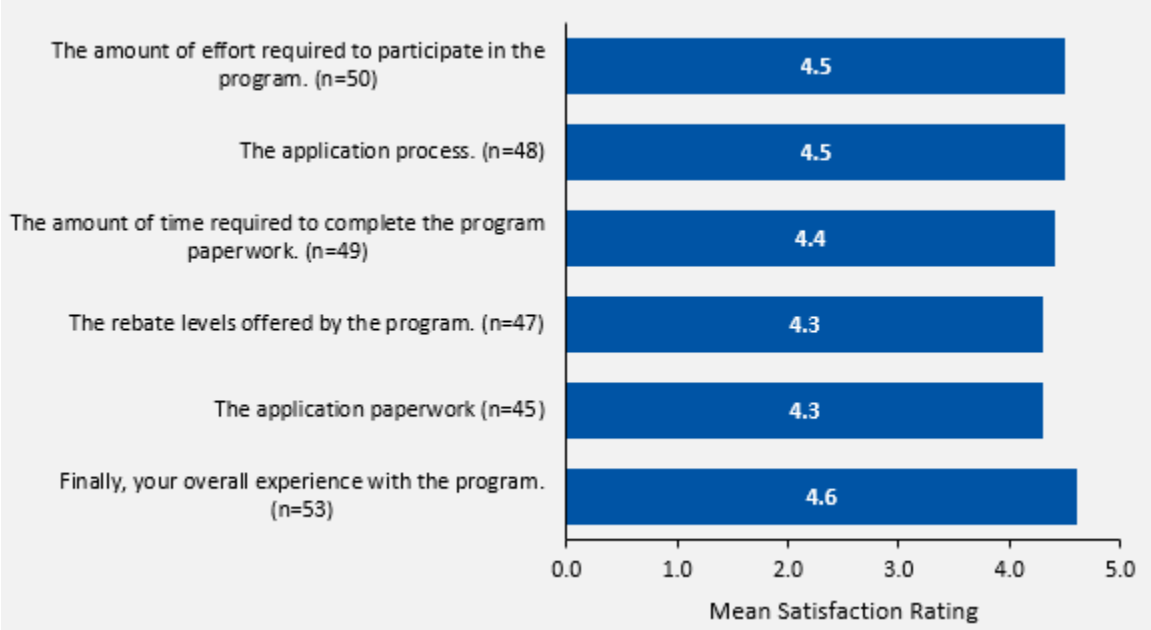
Source: Participant Survey Question E3. "I'm going to ask you about your satisfaction with different aspects of the program. Please tell me on a scale of 1 to 5 how satisfied you were with each aspect, with 1 meaning *not at all satisfied* and 5 meaning *very satisfied*."

Participants who rated the timing of their project as a 3 or below (three respondents) indicated that the project took too long from start to finish (two respondents) or that it took too long to hear back from the utility (one respondent). Respondents who were less than satisfied with the energy savings achieved as a result of the program (n=7) most often indicated that they expected to achieve higher savings than they actually did.

Satisfaction with Program

Participants rated different aspects of their program experience and were most satisfied with the amount of effort required to participate in the program and with the application process (Figure 35). When asked to rate their satisfaction with the program overall, most respondents were *very satisfied*, with 75% providing a rating of 5 (n=53) and 17% providing a rating of 4. All Retail and Large Business respondents (n=3) and two Municipal respondents (n=3) rated the program overall as a 4 or 5, while the remaining Municipal respondent provided a 3 rating.

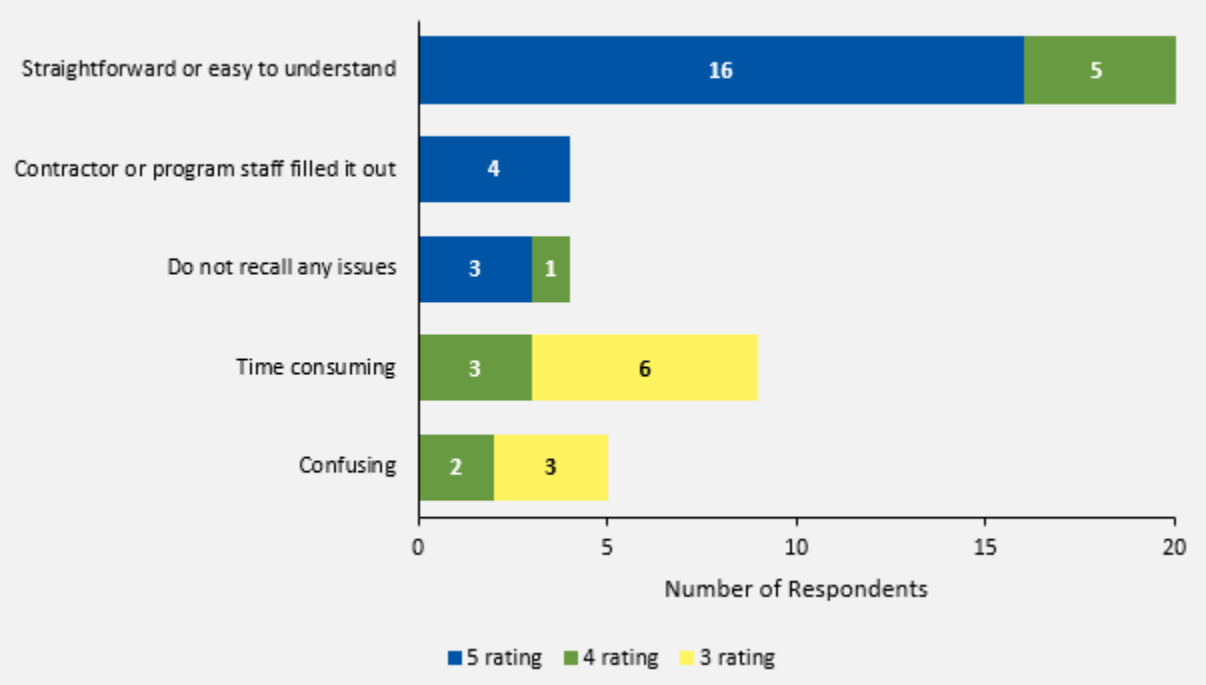
Figure 35. Satisfaction Ratings with Program Components



Source: Participant Survey Question E3. "I'm going to ask you about your satisfaction with different aspects of the program. Please tell me on a scale of 1 to 5 how satisfied you were with each aspect, with 1 meaning *not at all satisfied* and 5 meaning *very satisfied*."

As for satisfaction with the application paperwork, all respondents were asked why they provided their rating. No participant provided a rating below 3. The three Retail and Large Business respondents rated the application paperwork as a 3, 4, and 5, respectively, and all three Municipal respondents provided a 4 rating. Sixteen of 21 respondents who were *very satisfied* (rating of 5) indicated that the application paperwork was straightforward or easy to understand (Figure 36). Six of nine participants who provided a rating of 3 indicated that the paperwork was too time consuming.

Figure 36. Respondent Feedback about Application Paperwork



Source: Participant Survey Question E2. "Why do you say that?" (n=45)

> ***Takeaway:***
>
> Participants who provided lower satisfaction ratings tended to indicate that the program process, including the required paperwork, was cumbersome and took too much time and effort to complete.

Respondents who rated the paperwork as a 3 or lower described why they were not as satisfied:

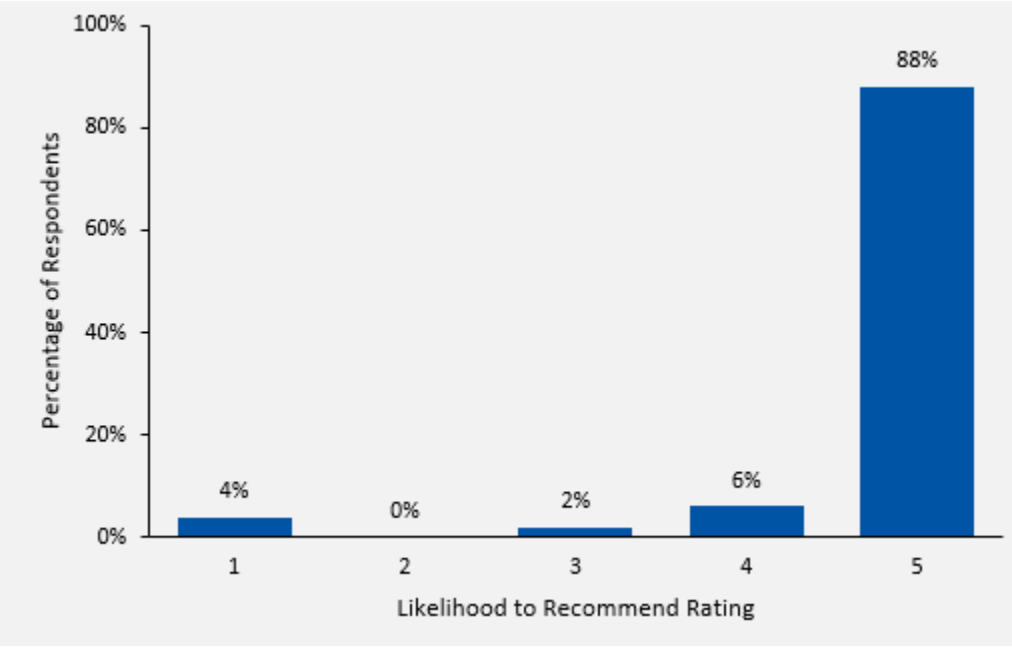
- The eight respondents who were not as satisfied with the *amount of time to complete the program paperwork* said it was because it took too much time (four respondents), required too much supporting documentation (two respondents), was too complicated (one respondent), or the contractor created problems with their application process (one respondent who provided no further detail about this issue). Six of these eight respondents also reported lower satisfaction ratings with the *rebate levels offered by the program*.
- Seven participants reported lower satisfaction with the *rebate levels offered by the program*, generally because they did not receive enough money (six respondents). Another participant said the NHSaves rebates are lower than those provided in other states.
- Respondents who were less satisfied with *the application process* (seven respondents) most commonly said it was because it took too much time (four respondents). One participant mentioned there was too much required documentation and one said the paperwork was confusing. One respondent said it would be better if the application could be completed online.
- Four respondents were less satisfied with *the amount of effort required to participate*, one each who said the program did not meet their expectations and there was too much of a learning

curve. One participant noted that because they work with multiple decision makers within a condominium association, it was difficult to participate. Additionally, one Retail and Large Business respondent said the application process contributed to the program taking too much effort.

- Four respondents who were less satisfied with *the program overall* indicated long project timelines (three respondents) and issues with the contractor (one respondent) as the main reasons for their lower ratings.

When asked how likely they were to recommend the program on a scale of 1 to 5 where 1 is *not at all likely* and 5 is *very likely,* 88% of respondents (n=52) gave a rating of 5 (Figure 37), and the mean rating across respondents was 4.8. All three Municipal respondents and two of three Retail and Large Business Respondents rated their likelihood to recommend as a 4 or 5.

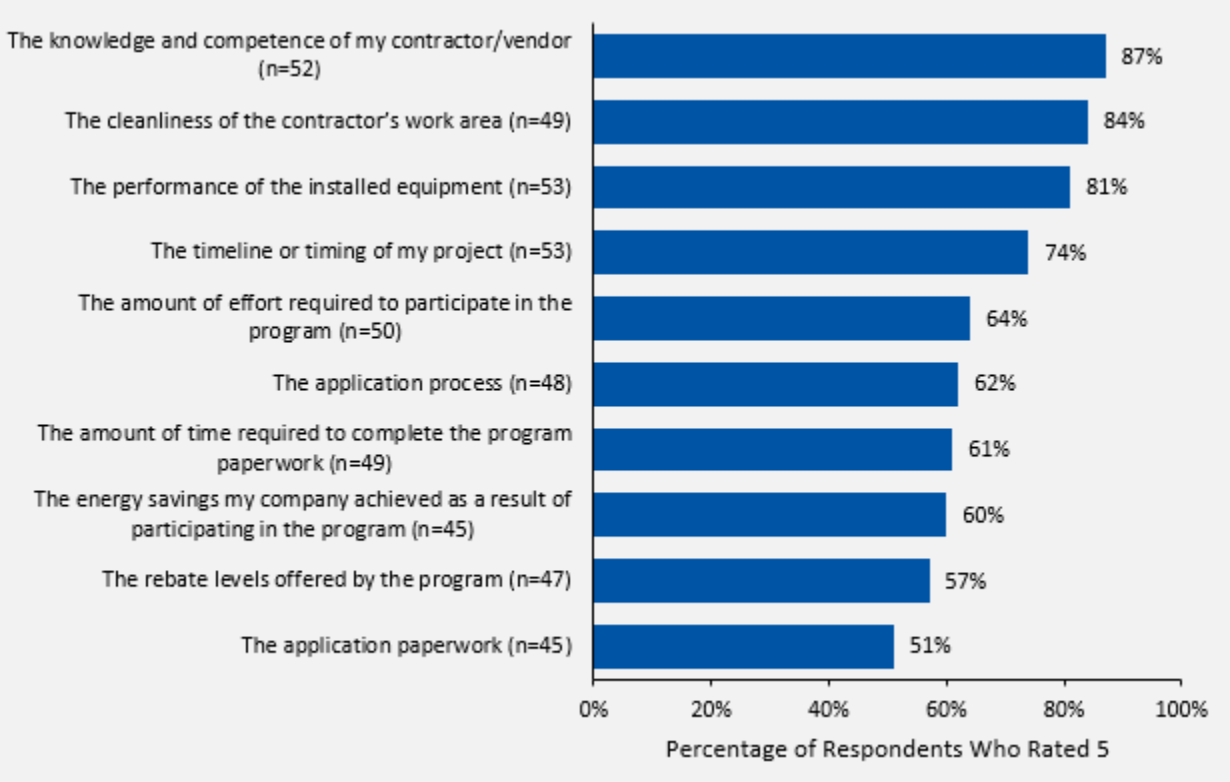
Figure 37. Participant Likelihood to Recommend Program



Source: Participant Survey Question E13. "How likely are you to recommend the program on a scale of 1 to 5, where 1 is *not at all likely* and 5 is *very likely*?" (n=52)

Cadmus compared the top ratings across all satisfaction questions. Most commonly, respondents were *very satisfied* (provided a rating of 5) with the knowledge and competence of their contractor (87%, n=52), the cleanliness of their contractor's work area (84%, n=49), and the performance of the installed equipment (81%, n=53). Figure 38 shows the percentage of respondents who provided a rating of 5 for each program component.

Figure 38. Participant Satisfaction with Program Components



Source: Participant Survey Question E1. "Thinking about the application you submitted, how would you rate the application paperwork on a scale of 1 to 5, where 1 is *not easy at all* and 5 is *very easy*?" and Question E3. "I'm going to ask you about your satisfaction with different aspects of the program. Please tell me on a scale of 1 to 5 of how satisfied you were with each aspect, with 1 meaning *not at all satisfied* and 5 meaning *very satisfied*."

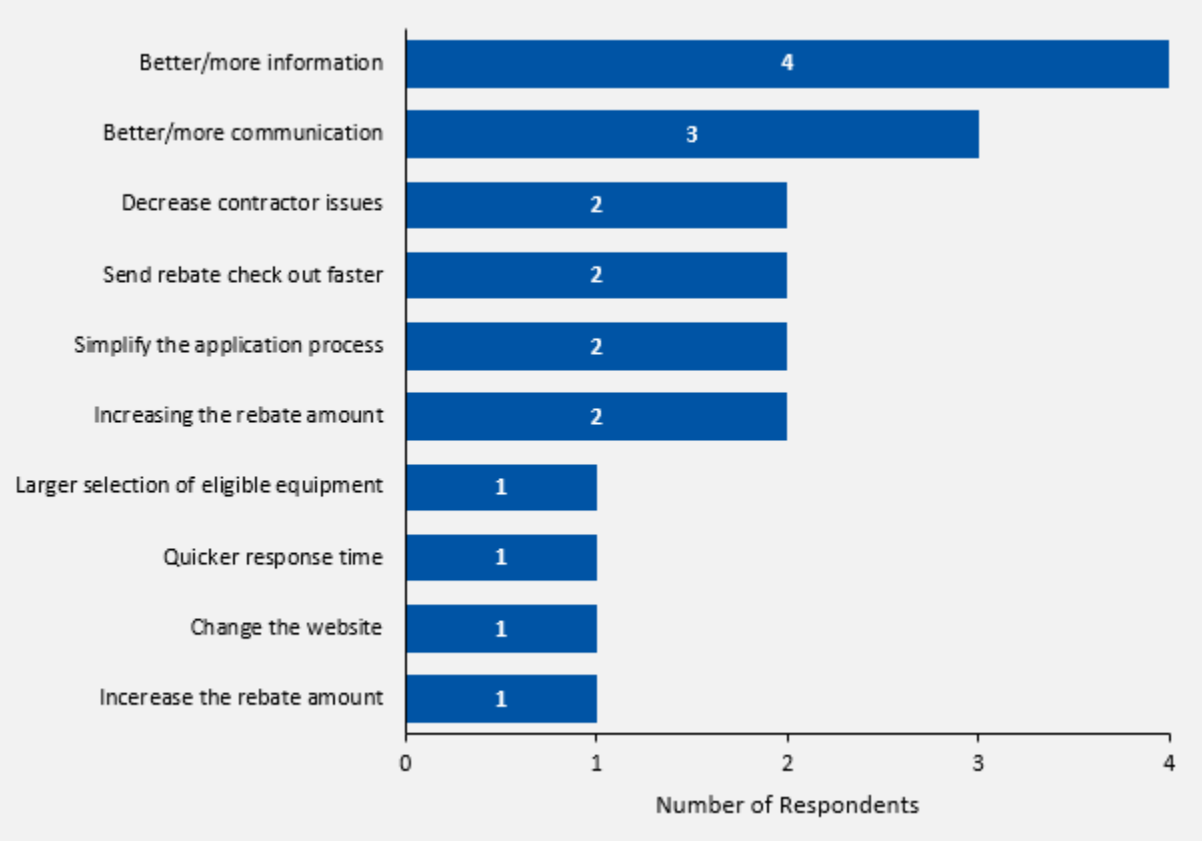
Recommendations for Improvement

Cadmus asked participants if there was anything the program could have done to improve their overall experience. Most respondents said there was nothing the program could have done (63%, n=52). Similar to respondents' suggestions to improve program participation outlined above, those who did provide a recommendation (18 respondents) most commonly said that more or better information about the programs (four respondents) and communication (three respondents) would have improved their own program experience (Figure 39).

Takeaway:

Most participants with a recommendation said the program could be improved through better or more information and communication.

Figure 39. Suggested Program Improvements from Participants



Source: Participant Survey Question E9. "Is there anything the program could have done to improve your overall experience?" Multiple responses allowed. (n=18)

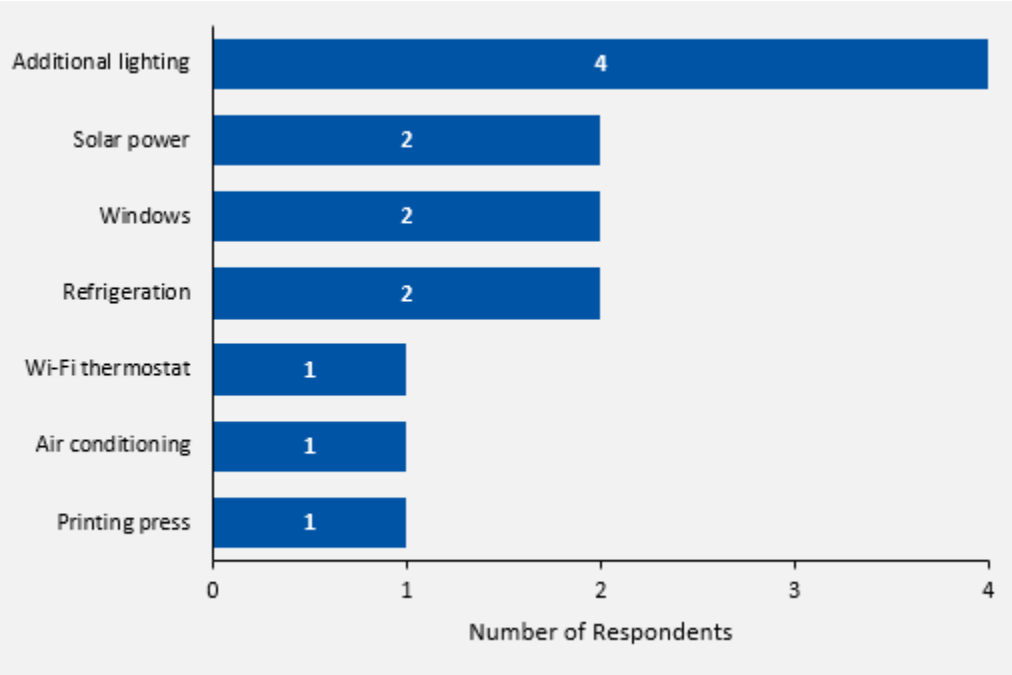
Retail and Large Business and Municipal Program-Specific Findings:

All three Municipal respondents and one of three Retail and Large Business respondents said no changes were needed. One Retail and Large Business respondent had a contractor issue and one suggested to "streamline the process a little bit."

Any respondent who indicated that *better or more information, better or more communication*, *a larger selection of eligible equipment*, or *to simplify the application process* would improve their program experience was asked a follow-up question for further detail. One respondent who suggested that the communication could have been better would like program staff to be more accessible and the two respondents who said the application could be simplified suggested there are too many details required. Of the four respondents who indicated that more or better information would be useful, one said increased awareness about the programs, one said having more detailed information available online would be helpful, and another requested staff be more knowledgeable in equipment functionality, while the remaining respondent specifically requested more information about the rebates. Finally, one respondent suggested the program include bath fans.

Cadmus asked participants who did not already give suggestions for additional equipment to recommend energy-efficient products, equipment, or services not currently covered through the program. Most respondents could not think of any additional measures (73%, n=49). Of those who provided a suggestion (13 respondents), four said to expand the eligible lighting measures to include more equipment (four respondents; Figure 40).

Figure 40. Additional Equipment Suggested by Participants



Source: Participant Survey Question E10. "Is there any energy-efficient product, equipment, or service not currently covered through the program for which you think rebates should be offered?" (n=13)

Participant Firmographics

As part of the 2016 and 2017 participant survey, Cadmus collected responses on the firmographics shown in Table 34.

Table 34. Participant Firmographics

Firmographic	Percentage of Respondents
Industry	**(n=53)**
Retail, Wholesale	17%
Manufacturing	15%
Nonprofit, Church, School	15%
Finance, Insurance, Real Estate	13%
Food Service (Restaurant)	8%
Transportation	6%
Education	6%
Communications	4%
Construction	4%
Government	4%
Health Care	4%
Hotel/Motel	4%
Other	2%
Building Ownership	**(n=51)**
Own	73%
Lease	18%
Both	8%
Other (Property Manager)	2%
Number of Employees	**(n=47)**
0 to 9	40%
10 to 19	30%
20 to 49	17%
50 to 99	6%
100 to 400	6%

Comparison to 2010 Participant Survey Results

Where possible, Cadmus designed the 2016-2017 participant survey questions to align with the survey in the 2010 Small Business Energy Solutions program evaluation report.[27] To align with the 2010 results, Cadmus only compared results from 2016-2017 Small Business Energy Solutions program survey respondents, omitting Municipal and Retail and Large Business survey respondents.

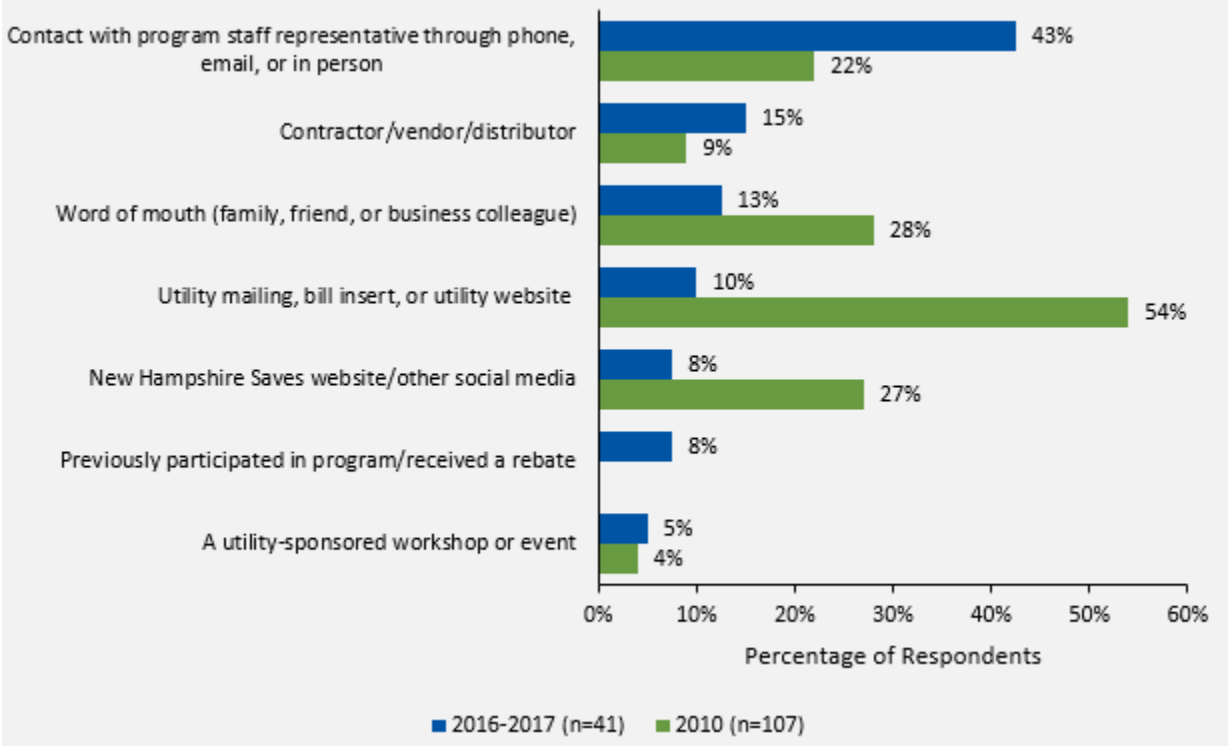
Program Awareness

In 2010, the most common source of program awareness was from a utility mailing or through a utility website (54%, n=107) compared to 10% of 2016-2017 Small Business Energy Solutions respondents

[27] DNV GL (formerly KEMA, Inc.) June 27, 2012. "New Hampshire Small Business Energy Solutions Program Impact and Process." http://www.puc.state.nh.us/electric/Monitoring%20and%20Evaluation%20Reports/NH%20SBES%20Final%20Report.pdf

(n=45) who learned about the program through a utility mailing, bill insert, or utility website. In 2016-2017, the most common way respondents found out about the program was through contact with program staff (43%; Figure 41), compared to 22% in 2010. These differences may also be attributable to the differences in survey question wording from 2010 to 2016-2017. In 2010, Cadmus read potential sources of program awareness to respondents but in 2016-2017 we did not prompt respondents for their awareness sources.

Figure 41. 2016-2017 and 2010 Program Awareness Sources



Source: 2016-2017 Participant Survey Question C1. "How did your organization learn about the NHSaves rebates available for this project?" and Question C2. "Of those sources, which was the most influential in your company's decision to participate in the program?" (n=45). Single response. 2010 Question PE1. "I'm going to read you a list of ways that you might have heard about the Small Business Energy Solutions program. Please let me know if you heard of the program through any of the following sources." Multiple responses allowed.

Program Benefits and Barriers

The 2010 respondents (n=188) identified saving money (35%) and saving energy (19%) as the main benefits of participating in the program. These findings are similar to the 2016-2017 survey results, with respondents (n=63) identifying saving money (49%) and saving energy (21%) as the main benefits of participating in the program.

In both 2010 and 2016-2017, the majority of respondents (55%, 2010 n=107; 64%, 2016-2017 n=50) could not name a barrier to participation. However, the most common barrier reported in 2010 was the cost of a project (22%), which was a significantly higher percentage of participants than in 2016-2018

(4%).[28] In 2016-2017, the most common barrier was the time or effort required to participate (20%), which was a statistically higher percentage than in 2010 (6%).[29] In both 2010 and 2016-2017, the second largest barrier was the lack of available information about the program or rebates (11% and 6%, respectively).

Program Satisfaction

Cadmus designed a series of questions about satisfaction with program components based on the 2010 evaluation report. Detailed findings can be found in the *Program Satisfaction* section above.

Program Partner Experience

Cadmus interviewed 14 program partners—eight customer-selected contractors and six utility-hired direct install contractors. We designed the interview guide to collect data about several research topics: awareness of NHSaves' C&I energy-saving programs (in particular, the Small Business Energy Solutions, Retail and Large Business, and Municipal programs), market baselines and sales practices inside and outside the program, communication with program staff, satisfaction with program components, and barriers to participation.

To ensure that respondents provided non-lighting services for NHSaves, we asked interviewees (n=14) what percentage of their completed projects included non-lighting measures. Nine program partners said 100% of their projects included non-lighting measures. One direct install respondent said 75% and three other respondents said 50% of their projects included non-lighting measures. One customer-selected contractor did not know the exact percentage but confirmed working on non-lighting projects.

Program Awareness

Cadmus asked program partners about their participation in NHSaves C&I programs and how they first became aware of these programs. Most interviewees participated in the Municipal (nine respondents) and Small Business Energy Solutions (eight respondents) programs. Nine of 14 contractors had participated in the Retail and Large Business program. Three customer-selected contractors were not aware of the specific program names and said they participated in the NHSaves C&I programs overall. Two respondents reported providing direct install measures for the Small Business Energy Solutions program (Figure 42).[30]

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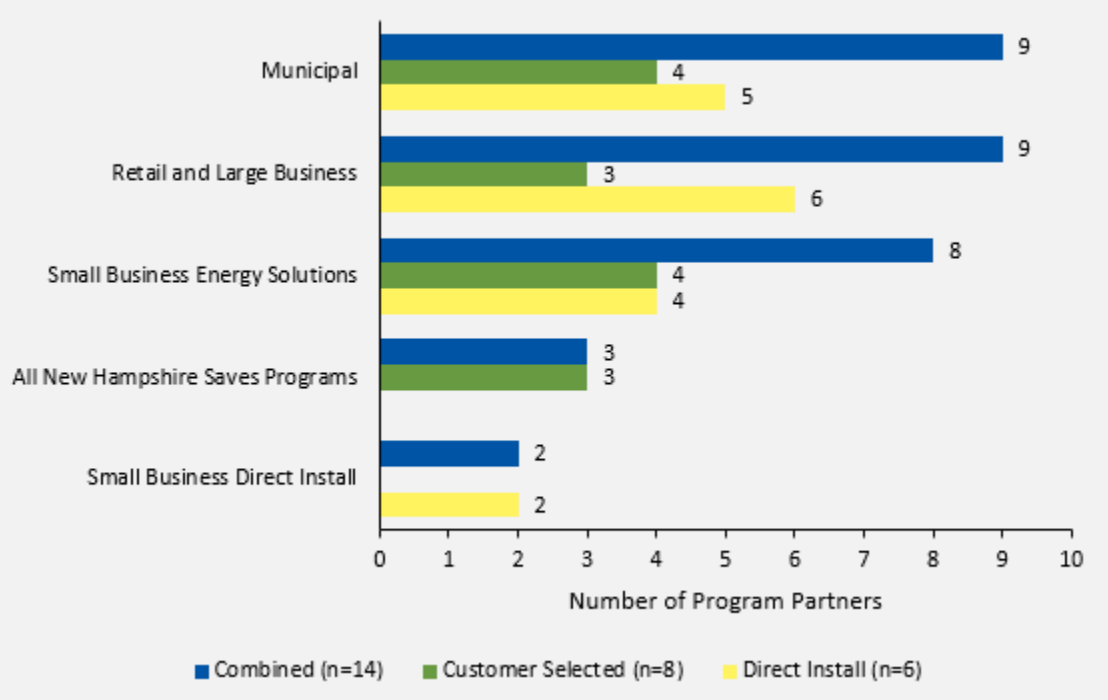
[28] $p<0.05$ using a binomial t-test.

[29] $p<0.05$ using a binomial t-test.

[30] Cadmus did not ask whether respondents delivered direct install services through the other programs. We assumed the remaining contractors identified as providing direct install services through sampling efforts provided such services through the Municipal and/or Retail and Large Business programs.

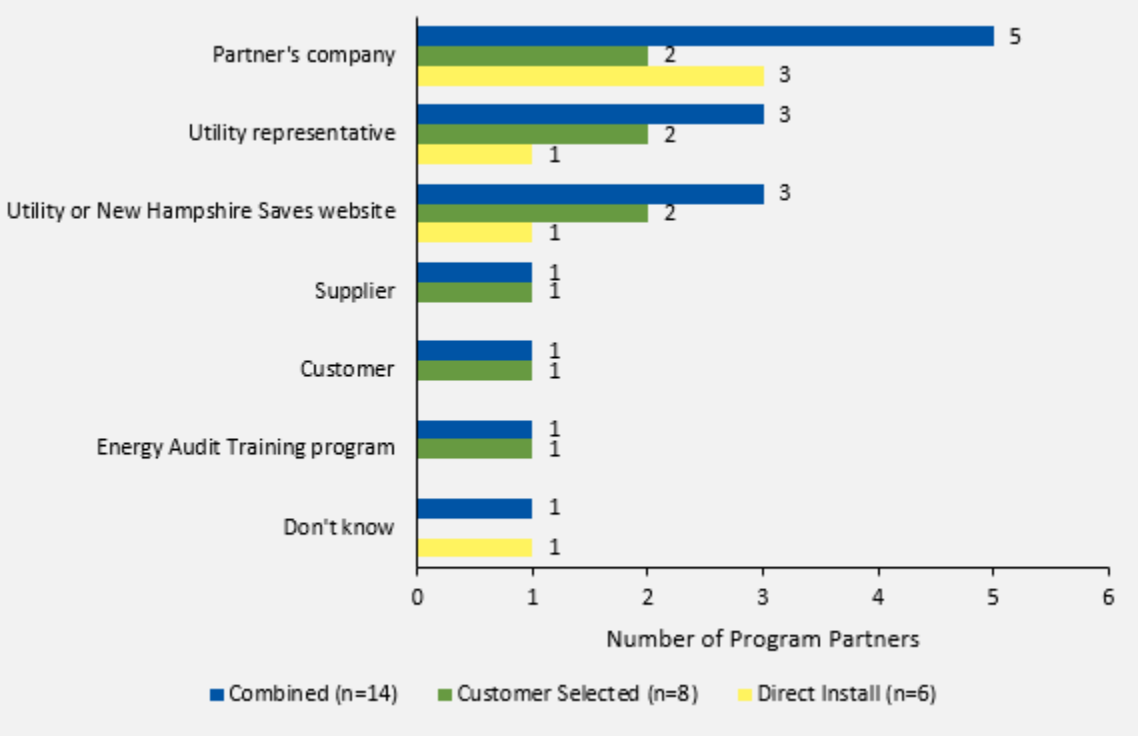
Figure 42. NHSaves Program Participation by Program Partner



Source: Program Partner Interview Question B1. "Which [UTILIT(Y/IES)] programs do you promote or participate in?" Multiple responses allowed.

When asked how they became aware of the NHSaves programs, five of 14 program partners either held previous industry knowledge they brought with them to their current company or said the company was already involved with the programs when they started. The second most common ways that program partners became aware was through utility representatives (three respondents) and the NHSaves or utility website (three respondents; Figure 43).

Figure 43. Source of Program Awareness for Program Partners



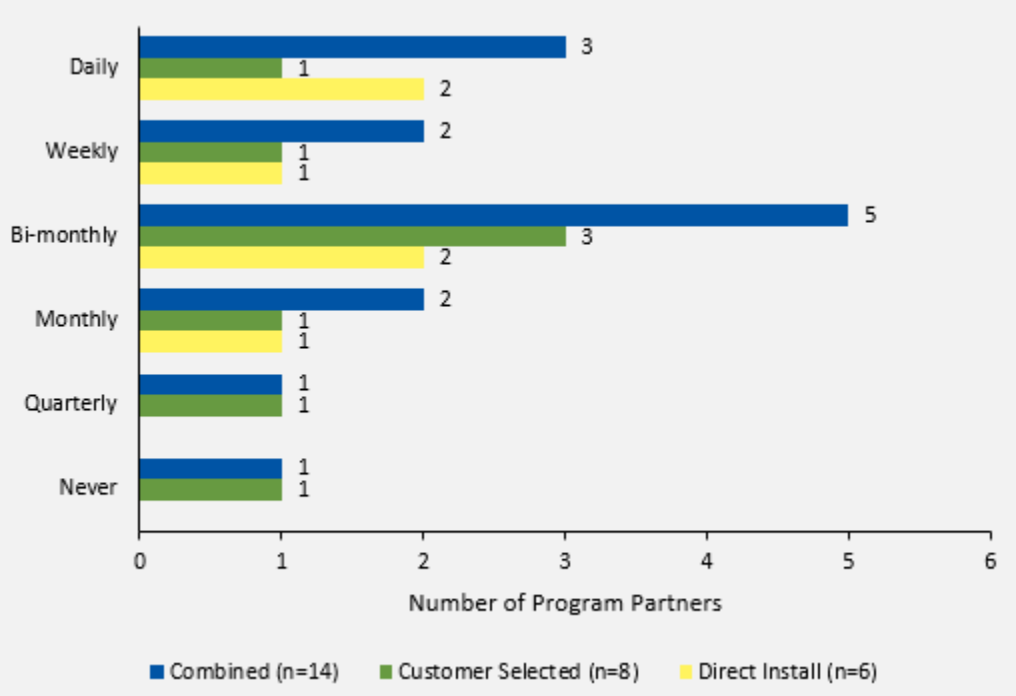
Source: Program Partner Interview Question B2. "How did you first learn about the [UTILIT(Y/IES)] rebates for non-lighting commercial and industrial equipment, such as insulation, HVAC, and water heating equipment?" Multiple responses allowed.

Cadmus asked respondent for an estimate of the number of program-eligible, nonresidential, non-lighting projects they completed each year. Please see the *Program Partner Experience: Program Awareness* section for more details.

Communication

Cadmus asked program partners about their experiences communicating with program and utility staff. While responses varied, most often program partners communicated with utility staff bi-monthly (five respondents; Figure 44).

Figure 44. Frequency of Communication with Utility Staff

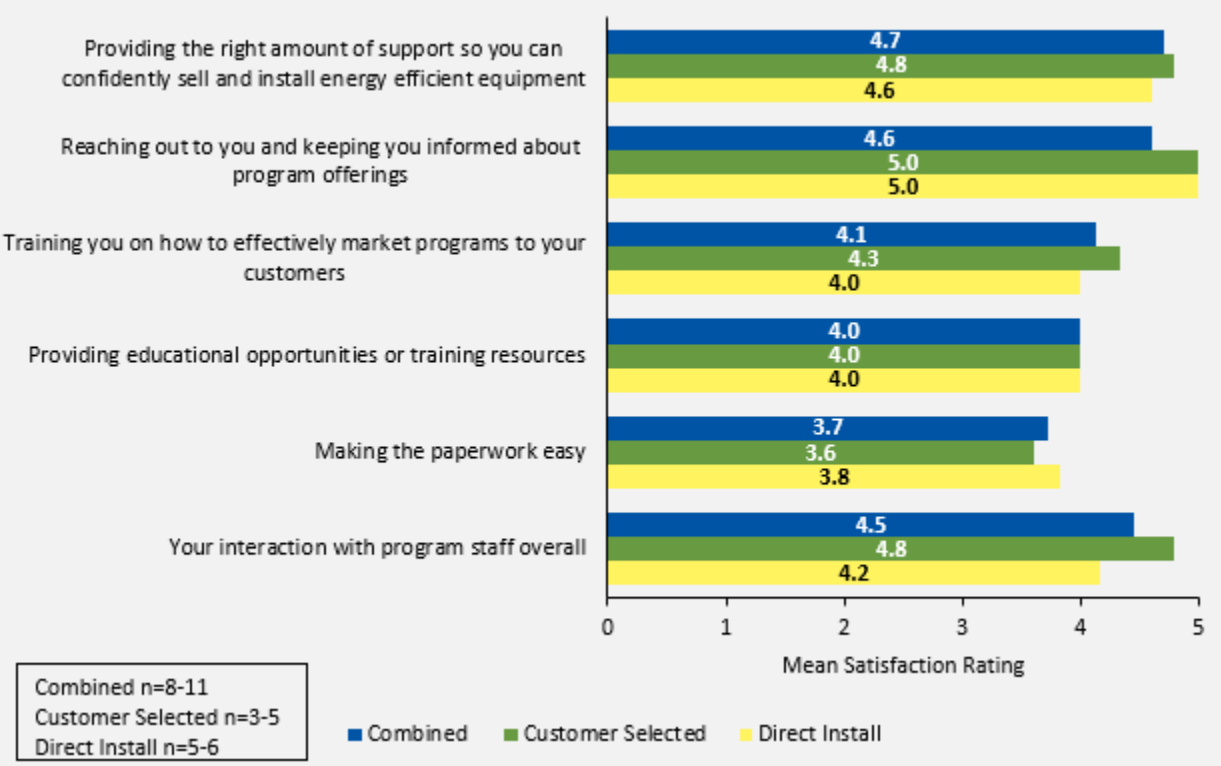


Source: Program Partner Interview Question C1. "How often did you interact with program or utility staff? Would you say…"

Program partners who communicated with utility staff at least quarterly rated their satisfaction with these interactions on a scale of 1 to 5, where 1 was *not at all satisfied* and 5 was *very satisfied*. The mean rating for overall satisfaction with program staff was 4.5 (Figure 45), with seven of 11 program partners provided a rating of 5 (one direct install and two customer-selected partners did not provide a response to one or more prompts).

"Generally speaking, the interactions we have are positive! It could be improved if there was a better timeline and expectation set of how quickly a project will be reviewed. Sometimes it can take two weeks and sometimes it can take two months. It's hard to keep a customer's attention if something takes that long." – direct install contractor

Figure 45. Satisfaction Ratings with Utility Staff Interactions



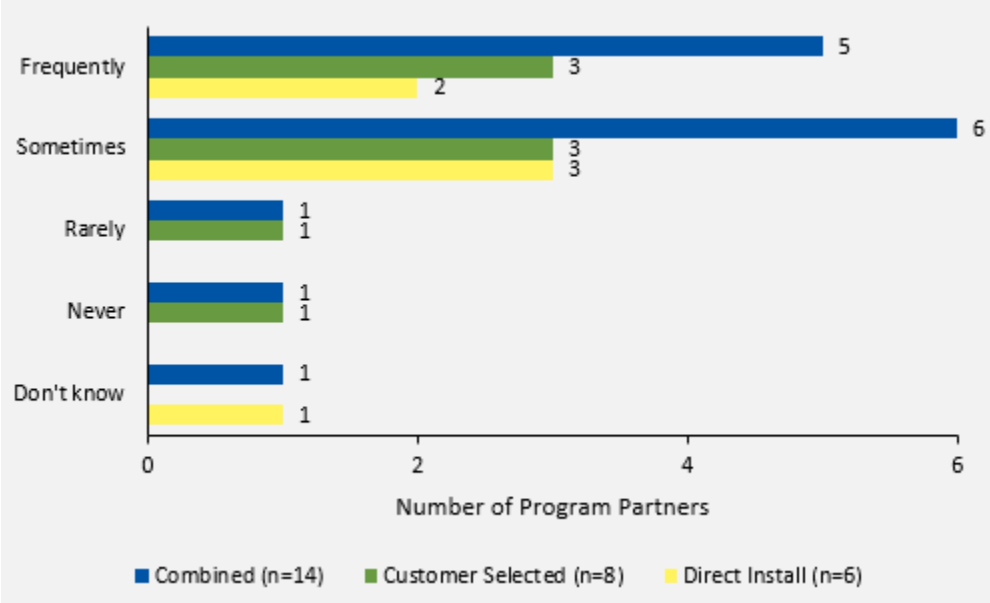
Source: Program Partner Interview Question C2. "I'm going to read you a couple of statements about program or utility staff and would like you to tell me how satisfied you are with each component on a scale of 1 to 5, where 1 is *not at all satisfied* and 5 is *very satisfied*." Variations in response counts are due to *don't know* or *refused* responses.

Most feedback about communication with the program staff were general, positive comments (nine respondents). Some suggestions for improvements included providing feedback faster (four respondents), providing more clear communication (one respondent), and providing a specific point-of-contact for when questions arose (one respondent).

Perceptions of Customer Awareness and Experience

Cadmus asked program partners about their perspective on different aspects of the customers' experience with the NHSaves programs, including awareness and satisfaction with rebate levels and measure offerings. Program partners (n=14) indicated that most of their customers *frequently* (five respondents) or *sometimes* (six respondents) were aware of the NHSaves programs before they mentioned the programs (Figure 46), though two respondents noted that might be because they have numerous repeat customers.

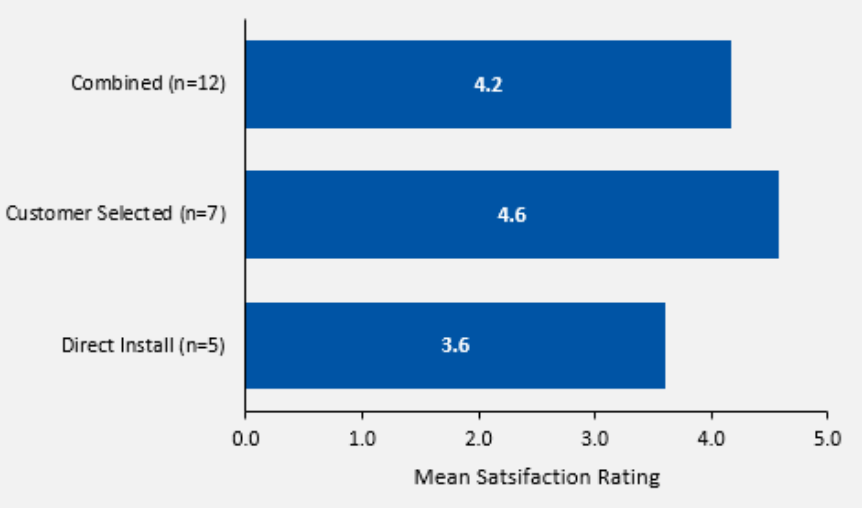
Figure 46. Program Partners' Perception of Customers' Awareness of Programs



Source: Program Partner Interview Question F1. "How often would you say that your eligible customers already know about [UTILIT(Y/IES)] programs? Would you say…"

On a scale of 1 to 5, where 1 was *not at all satisfied* and 5 was *very satisfied*, program partners rated how satisfied their customers were with the rebate levels offered by the NHSaves programs. Five of seven customer-selected contractors provided a rating of 5, while none of the five direct install contractors provided a rating of 5. One direct install contractor had previously mentioned incentives in Massachusetts were more motivating, and another, when asked for the reason for the lower rating, said it "depends on if it is a custom incentive or not. It also depends on the benefit-cost analysis." Two program partners said *don't know*. The mean satisfaction ratings are shown in Figure 47.

Figure 47. Customer Satisfaction with Rebate Levels Estimated by Program Partners



Source: Program Partner Interview Question F2. "In your opinion from talking with New Hampshire business customers, on a scale of 1 to 5, where 1 is *not at all satisfied* and 5 is *very satisfied*, how satisfied are NHSaves participants with the rebate levels offered by the programs?"

"The representatives at the utility companies are very helpful with guaranteeing a certain [incentive] amount and seeing that through." – customer-selected contractor

Almost all program partners (10 of 14, with three program partners responding *don't know*) believed that rebate levels awarded at the end of the program matched their customers' expectations from the beginning of the projects. Two program partners attributed this to the fact that they lean on the utilities to inform the customers what their rebate levels should be, rather than trying to promise something themselves. Two others said their cost proposals are crafted specifically with the rebate in mind to ensure the expectations match at the end. One direct install contractor said sometimes customers who were aware of the Massachusetts rebate levels were disappointed with the NHSaves rebate levels in comparison.

Cadmus asked program partners if they had received any feedback from customers regarding their satisfaction with the measure offerings. Four program partners had not, or were not sure, if they had received feedback. Of the 10 who did get feedback, nine reported receiving positive feedback. One direct install contractor said customers were usually surprised that so many types of equipment were eligible for rebates. Two contractors received negative feedback about the cost-effectiveness results being lower than expected. Because the C&I programs relied on the cost-effectiveness results to determine project eligibility, lower cost-effectiveness results either lowered the customer's rebate or rendered their project ineligible.

Some program partners (n=14, one interviewee did not provide a response) shared suggestions for additional natural gas or electric saving measures that could be offered through the NHSaves programs. Eleven program partners had no suggestions for additional natural gas measures, since most measures can be included through custom incentive offerings. This aligned with feedback from two utility staff interviewees who mentioned that most measures could be captured through custom incentives. One

customer-selected contractor suggested having more natural gas rebates for equipment types that save hot water and another suggested that, in general, the custom rebates should be higher. Most program partners (nine of 14) also had no suggestions for electric saving measures. Customer-selected contractors suggested a few equipment types that could save electricity: one each suggested system controls that switch systems to more efficient equipment, smart pumps, and, though generally not considered to be energy efficient, electric baseboard heating.

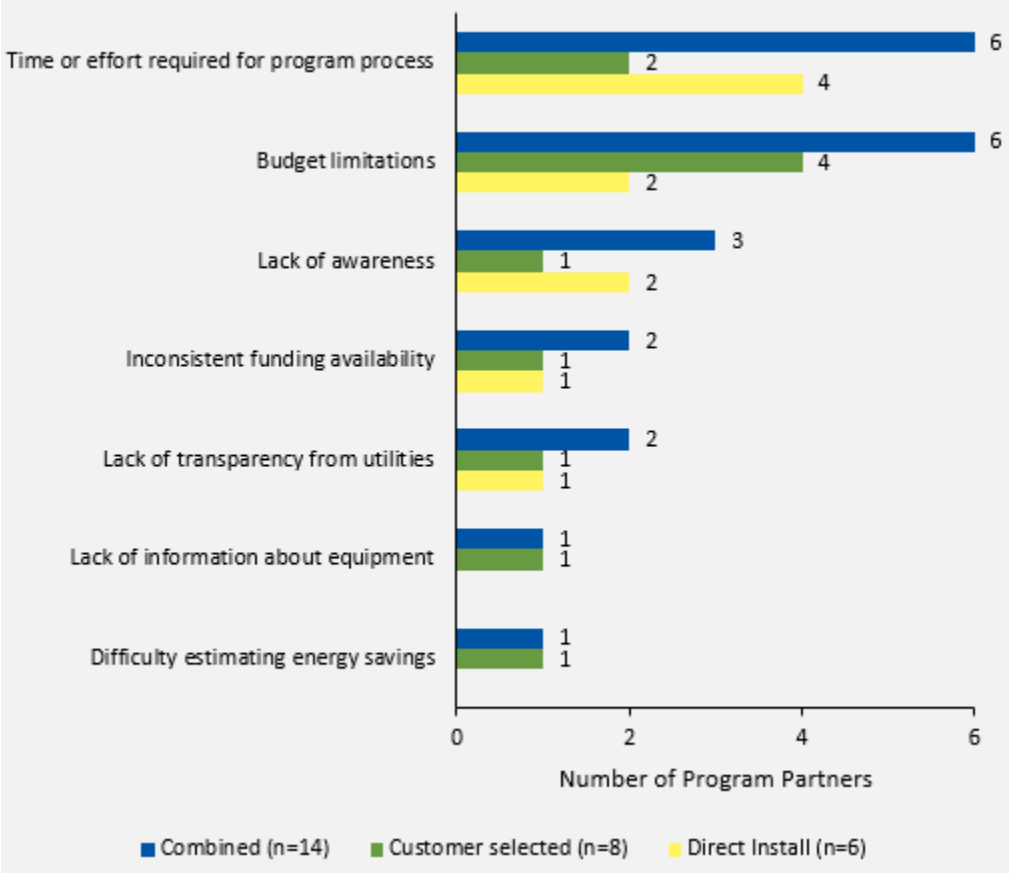
One direct install contractor said utilities could be doing more to promote EMS, in particular noting that utilities could better use building performance and fault detection tools.

When asked if they or their customers faced any additional bottlenecks or challenges in the program, two program partners again mentioned problems when funding ran out in the middle of the year or when it ran out for a particular measure.

Program Partner Impressions of Participation Barriers

Cadmus asked program partners about their impressions of customer challenges with participating in the NHSaves programs. Four direct install and two customer-selected contractors mentioned the time or effort required for program processes, while two direct install and four customer-selected contractors mentioned budget limitations (Figure 48).

Figure 48. Perceived Barriers to Customer Participation



Source: Program Partner Interview Question E1. "What do you see as the biggest challenges for customers with participating in the programs?" Multiple responses allowed.

During stakeholder interviews, utility staff mentioned similar barriers to customer participation. The time or effort required to participate (two respondents) and the availability of capital (two respondents) were most commonly mentioned, particularly for small business customers. Other barriers mentioned by one utility staff member each were a lack of understanding with project cost and benefit analyses, a lack of understanding about how the programs work, and challenges with large business customers who might need international approval from parent companies.

Program partners had several suggestions to help address participation barriers. Two customer-selected and two direct install contractors indicated that more transparency from the utilities could help alleviate issues. These program contractors elaborated further, requesting to be kept informed about how much funding is available and real-time updates on a project's application status. One direct install contractor suggested that utilities provide some sort of tool, similar to a customer portal, to show application and funding status updates. Another direct install contractor indicated that, because the utilities have different approval timelines and operate their programs differently, keeping the technology review and pre-approval process moving and updating the customer each step along the way could help increase the predictability from job to job and among utilities.

Another suggestion from two direct install and one customer-selected contractor was to offer more or different marketing. For more detail, please see the *Program Partner Impressions of Participation Barriers* section above.

Three program partners also suggested changes to the program funding structure. One direct install contractor mentioned that allowing some funding to roll over year to year could be helpful. One direct install and one customer-selected contractor said that maintaining program funding throughout the year and into future years could help build customer confidence in the program and build participation momentum.

Two customer-selected contractors did not provide any suggestions for improvements.

Barriers by Customer Type

Cadmus asked program partners if participation barriers differed by customer type or size. Most program partners indicated that these barriers did not vary (eight of 14 respondents), while one was unsure as to how they might vary.

Three of five program partners who indicated differences in barriers by customer type or size said the differences were due to customer size. Program partners indicated that small businesses typically had both capital barriers and knowledge or expertise barriers that prevented them from participating. Comparatively, large businesses typically had the overhead needed to fund the projects or to hire an expert to help execute the projects. Time spent on applying and executing a project could also be difficult for businesses; small businesses may not have the staff to manage the project, whereas large businesses may not think the savings are worth the time or money invested. This aligned with some of the previously mentioned utility staff interview findings, as two of four utility staff interviewees said small businesses typically have more barriers to overcome, such as finding the available time or capital to participate. One utility staff interviewee also said the necessary lead time for project approvals was challenging for municipal customers.

> "The small commercial customers [struggle] to understand the participation process because so much of their bandwidth is focused specifically on [their] business. […] Though, sometimes you will get large customers who don't think it's worth their time to participate." - direct install contractor

Contractor Participation Barriers

Cadmus asked program partners to provide detail on their barriers to participation. Details of these findings are in the *Contractor Participation Barriers* section above.

Market Baseline

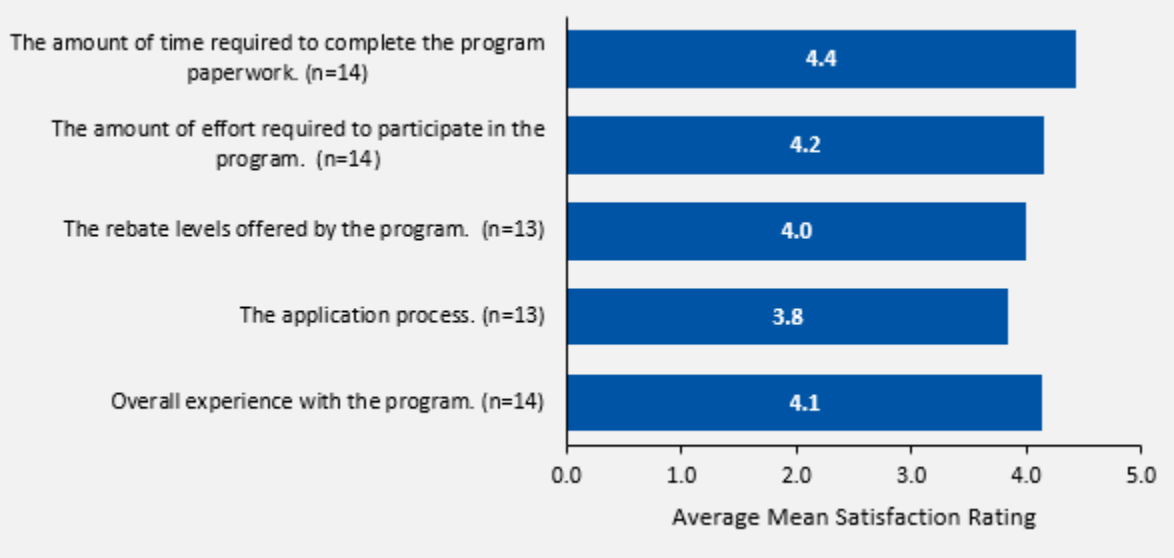
To better understand the NHSaves programs' market penetration, Cadmus asked program partners a series of questions regarding their inventory practices and sales processes inside and outside the programs. For details on this section, please see the Market Baselines section above.

Program Partner Satisfaction

Cadmus asked program partners about their satisfaction with various aspects of the program on a scale of 1 to 5, where 1 was *not at all satisfied* and 5 was *very satisfied*. Five of eight customer-selected contractors provided a rating of 5, while only two of six direct install contractors provided a rating of 5, for the program overall. Program partners who completed fewer than 15 NHSaves projects per year gave the three lowest overall satisfaction ratings. The satisfaction statements and ratings are shown in Figure 49.

> "I think there are a ton of opportunities for energy savings, and as long as [the utilities] keep developing the program and continue [offering the program], they [customers] can realize those savings."
> – direct install contractor

Figure 49. Program Partner Satisfaction with NHSaves Programs



Source: Program Partner Interview Question G1. "I'm going to read a list of factors about the program or programs. For each one, please tell me how satisfied you are with…"

As shown above, program partners (n=13, one direct install contractor did not provide a rating) were the least satisfied with the application process. Program partners indicated that the paperwork, particularly when paired with inconsistent communication from the utility, can be cumbersome and confusing for the customer. One customer-selected contractor suggested an online application or the ability to submit an application on behalf of the customer.

We asked program partners who provided a rating of 3 or less why they were dissatisfied with different aspects of the programs, and they responded with ways their satisfaction could be improved:

- Shorten the amount of time to provide feedback or answer questions (two respondents)
- Increase the rebate levels (two respondents)
- Ensure that programs are consistent and reliable to regain customer trust (three respondents)

> "When you're doing [whole] system upgrades, the money given back on some measures—not all measures, but some—can be pretty insignificant."
> – direct install contractor

Through stakeholder interviews, utility staff (n=4) also rated their satisfaction with the program overall on the same 1 to 5 scale. All were satisfied with the program overall, with an average rating of 4.1 Interviewees said they reported high satisfaction because the programs met (or exceeded) their goals or because they felt that the program provided a robust mix of offerings for the New Hampshire market. Areas for improvement mentioned by one utility staff member were increasing the amount of small business direct install or HVAC measures and increasing communication with the program partners.

Program Partner Firmographics

As part of the program partner interviews, Cadmus collected responses on firmographics shown in Table 35. Services noted as *Other (miscellaneous)* included equipment such as installing variable speed drive(s), commercial laundry equipment, and geothermal equipment.

Table 35. Program Partner Firmographics

Firmographic	Percentage of Respondents		
Services Offered[a]	**Combined (n=14)**	**Customer Selected (n=8)**	**Direct Install (n=6)**
Lighting	3	2	1
HVAC	2	1	1
Plumbing or hydronics (water heating and boilers)	5	4	1
EMS	5	4	1
Refrigeration	2	1	1
Compressed air	3	3	0
Weatherization	5	3	2
Other (miscellaneous)	7	6	1
Consulting only	3	0	3
Number of Employees	**Combined (n=14)**	**Customer Selected (n=8)**	**Direct Install (n=6)**
Less than 10	5	3	2
11 to 100	5	4	1
101 to 200	2	1	1
201 to 999	0	0	0
1,000 or more	2	0	2
NHSaves Utilities Served[a]	**Combined (n=14)**	**Customer Selected (n=8)**	**Direct Install (n=6)**
Eversource Energy	13	8	5
Unitil Energy Systems, Inc.	7	3	4
Liberty Utilities	10	5	5
New Hampshire Electric Cooperative	7	5	2
No utility or no specific utility mentioned	11	7	4

[a] Multiple responses allowed.

Appendix C. NHSaves Small Business Energy Solutions, Municipal, Retail and Large Business Non-Lighting Participant Survey

Research Objectives		
Key Research Topics	**Areas of Investigation**	**Related Questions**
Awareness	Source of program awareness	C1
Verification and Market Baseline	Installation verification	B1-B5
	Sales process and options offered in the marketplace	B7-B26
Site Assessments and Direct Install Measures	Use and perceived value of site assessments/energy audits and no-cost, direct install measures	B27, E5
Marketing and Outreach	Reasons and motivations for participation	C2, D1
	Effectiveness of marketing materials and channels	C1, F1, F2
	Value of the program	D1-D3
	Opportunities for program improvements	E1-E13, F3
Barriers	Barriers to participation	D2, D3
Satisfaction	Interaction with utility staff and program partners	E3-E6
	Program satisfaction levels	E1-E13
Firmographics	Determine building and company characteristics of participants	G1-G4

Interviewer instructions are in green.

CATI programming instructions are in red.

Words in (parentheses) should not be read to respondent

~ indicates a question that has been adapted from the 2012 Evaluation Report.

A. Introduction

A1. [SKIP TO A2 IF CONTACT NAME NOT PROVIDED] [IF CONTACT PROVIDED] Hello, may I speak with [CONTACT]? [IF NOT AT THIS LOCATION, ASK FOR PHONE NUMBER AND NAME AT CORRECT LOCATION AND CALL RESPONDENT]

1. (Yes) [CONTINUE WITH RESPONDENT ON PHONE]
99. (Refused) **[THANK AND TERMINATE]**

Back-up information, not to be programmed:

[If "No – Not available," ask if Respondent would like to arrange a more convenient time for us to call them back or if you can leave a message for that person.]

A2. Hello, I am [INSERT NAME] calling with a short survey on behalf of **[UTILITY NAME]**'s NHSaves energy efficiency rebate programs. Our records show that you installed **[MEASURE NAME]** through the NHSaves programs at **[SITE ADDRESS]** in **[YEAR]**. Are you the person responsible for making energy decisions and are willing to share your experiences through this survey? To show our appreciation, we are offering a $50 Visa gift card for completing the survey. [IF NEEDED: NHSaves is a utility-funded program to encourage energy efficiency.]

1. (Yes)
2. (No, but person can come to phone) [START OVER WITH NEW RESPONDENT]
3. (No, not available) [SCHEDULE CALLBACK]

88. (Don't know) **[ASK TO SPEAK WITH SOMEONE WHO WOULD KNOW AND START AGAIN]**

99. (Refused) **[THANK AND TERMINATE]**

[IF RESPONDENT ASKS HOW LONG, SAY: "APPROXIMATELY 20 MINUTES."]

[IF NEEDED:] This survey is for research purposes only and this is not a marketing call. Your participation in this study is important so that **[UTILITY NAME]** can improve the energy efficiency programs it offers to businesses and other organizations.

[**Only if asked** for a NHSaves Contact verifiability information here. Provide respondent's utility (**[UTILITY NAME]**) contact, then let respondent know you will call back the next business day:

Eversource Energy: Miles Ingram (860-665-2441)

Liberty Utilities: Bob Reals (603-216-3634)

New Hampshire Electric Coop: Joe Lajewski (603-536-8663)

Unitil: Joe Van Gombos (603-294-5023)]

[Provide appropriate program description **only if** contact cannot remember what the program was:

Respondent participated in the **[PROGRAM NAME]** program

SMALL BUSINESS ENERGY SOLUTIONS: This program offers rebates to encourage businesses to increase equipment efficiency through retrofits of old equipment, or through the installation of new equipment. Your organization would have participated through a program-hired contractor, hired a contractor, or performed the installation yourself.

MUNICIPAL ENERGY-EFFICIENCY PROGRAM: This program offers rebates for electric, natural gas, and other fossil fuel equipment to municipal customers who are constructing new facilities or retrofitting existing facilities.

LARGE BUSINESS ENERGY SOLUTIONS PROGRAM: The Large Business Energy Solutions program offers prescriptive and custom rebates to customers who replace equipment at their facility with more energy efficient equipment, or install energy efficient equipment in a new facility]

[**Only if respondent says they already participated in a site visit/verification:** Thank you for your help with that process. This is another NHSaves study that you have been selected for, that asks questions about your experience with the program and your decision-making. If you have a few more spare minutes, we would greatly appreciate your responses.]

A3. Our records show that you installed energy efficient equipment through the NHSaves programs at **[SITE ADDRESS]** in **[YEAR]**. To ensure our records are correct, can you confirm that you received a rebate or discount for this/these upgrades at this time?

1. (Yes)
2. (No, wrong year) **[RECORD CORRECT YEAR:_____]**
3. (No, wrong address**) [RECORD CORRECT ADDRESS]**
4. (No, I did not install any measures) **[THANK AND TERMINATE]**

88. (Don't know) **IS THERE SOMEONE WE COULD SPEAK WITH THAT WOULD KNOW THIS? [RECORD NAME AND CONTACT INFORMATION, BEGIN WITH A2 IF PERSON IS AVAILABLE:_____]**

99. (Refused) **[THANK AND TERMINATE]**

[THANK AND TERMINATE TEXT: THOSE ARE ALL OF OUR QUESTIONS. THANKS FOR YOUR HELP. HAVE A NICE DAY.]

B. Verification and Market Baseline

B1. Is all of the energy efficient equipment installed through the program at **[SITE ADDRESS]** still in place and operating as planned?

1. (Yes)
2. (No)

88. (Don't know)

99. (Refused)

B2. **[IF B1=2]** Which equipment is no longer installed or operating as planned? [OPEN END]

B3. **[IF B1=2]** How many did you or your contractor originally install?
[OPEN END NUMERIC RANGE 1-87] 88 = (Don't Know) 99 = (Refused)

B4. **[IF B1=2]** And how many are installed and operating now?
[OPEN END NUMERIC RANGE 1 – 87] 88 = (Don't Know) 99 = (Refused)

B5. **[IF B4<B3]** When was the equipment removed? [OPEN END]

B6. **[IF B1=2]** Why is the equipment no longer installed or operating as planned?
[OPEN END]

[IF DI=TRUE OR STRATA=FALSE, SKIP TO B27]

B7. Please tell me why your organization installed the **[STRATA]** equipment. Was it… **[READ LIST]**

1. Part of a new construction or major renovation project
2. An equipment addition that was not replacing old equipment
3. To replace old equipment that had failed or was not working
4. To replace equipment that had problems but was still working
5. To replace equipment in working condition with no problems **[SKIP TO B27]**

88. (Don't know) **[SKIP TO B27]**
99. (Refused) **[SKIP TO B27]**

[IF STRATA=ENERGY MANAGEMENT SYSTEM, SKIP TO B27]

B8. Did your organization work with an installation contractor, or did you or your staff install the efficient equipment yourself?

1. (Installation contractor or vendor installed)
2. (Self/staff installed)
3. (Combination of contractor and self/staff installed)

88. (Don't know)
99. (Refused)

B9. **[IF B8=1, 2 OR 3]** Thinking back to when you were first considering this project at **[SITE ADDRESS]**, did your organization perform its own research or talk to contractors about equipment or service options that offer varying levels of energy efficiency?

1. (Yes)
2. (No)

88. (Don't know)
99. (Refused)

B10. **[IF B9=1]** Besides the **[STRATA]** option you purchased, how many other types of **[STRATA]** options did you explore? **[THE NEXT QUESTIONS ASK ABOUT THESE SPECIFIC OPTIONS; DO YOUR BEST TO COLLECT A NUMERICAL RESPONSE [1-4]]**

1. (One other option)
2. (Two other options)
3. (Three other options)
4. (Four or more other options)
5. (Other [SPECIFY:_____])

88. (Don't know)
99. (Refused)

B11. **[IF B9=1 AND STRATA ≠ AIR CONDITIONER, BOILER, WATER HEATER, FURNACE, HEAT PUMP]** What types of **[STRATA]** options did you explore? [OPEN END]

B12. **[IF B10=1 AND STRATA ≠ AIR CONDITIONER, BOILER, WATER HEATER, FURNACE, HEAT PUMP]** Was the other option more efficient, less efficient, or of the same efficiency as the option you chose?

6. (More efficient)
7. (Less efficient)
8. (Of the same efficiency)
9. (Other [SPECIFY:_____])
88. (Don't know)
99. (Refused)

B13. **[IF B10=2-4 AND STRATA ≠ AIR CONDITIONER, BOILER, WATER HEATER, FURNACE, HEAT PUMP, REPEAT FOR OPTION ONE, OPTION TWO, OPTION THREE, OPTION FOUR]**

B13.1 [ASK IF B10 = 1,2,3,4] Was the **FIRST** option more efficient, less efficient, or of the same efficiency as the option you chose?

B13.2[ASK IF B10 = 2,3,4] Was the SECOND option more efficient, less efficient, or of the same efficiency as the option you chose?

B13.3[ASK IF B10 = 3,4] Was the THIRD option more efficient, less efficient, or of the same efficiency as the option you chose?

B13.4[ASK IF B10 = 4] Was the FOURTH option more efficient, less efficient, or of the same efficiency as the option you chose?

1. (More efficient)
2. (Less efficient)
3. (Of the same efficiency)
4. (Other [SPECIFY:_____])
88. (Don't know)
99. (Refused)

B14. **[IF B9=1 AND STRATA=AIR CONDITIONER OR HEAT PUMP]** What was the efficiency level of the **[STRATA]** you purchased? [SINGLE RESPONSE]

[RECORD ONE RESPONSE OF SEER, EER, OR HSPF, BASED ON HOW RESPONDENT PROVIDES EFFICIENCY LEVEL.]

[PROMPT AS NEEDED, USING EXAMPLES: "WAS THE UNIT A 16 SEER, 12 EER, OR 10 HSPF, FOR INSTANCE?"]

1. (____ SEER)
2. (____ EER)
3. (____ HSPF)
4. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])
88. (Don't know)
99. (Refused)

B15. **[IF B9=1 AND B14=1]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, what SEER levels did you discuss? **[READ LIST IF NEEDED; MULTIPLE RESPONSES POSSIBLE]**

1. 13 SEER
2. 14 SEER
3. 15 SEER
4. 16 SEER
5. 17 SEER
6. 18 SEER
7. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

88. (Don't know)
99. (Refused)

B16. **[IF B9=1 AND B14=2]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, what EER levels did you discuss? **[READ LIST IF NEEDED; MULTIPLE RESPONSES POSSIBLE]**

1. 8 EER
2. 9 EER
3. 10 EER
4. 11 EER
5. 12 EER
6. 13 EER
7. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

88. (Don't know)
99. (Refused)

B17. **[IF B9=1 AND B14=3]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, what HSPF levels did you discuss? **[READ LIST IF NEEDED; MULTIPLE RESPONSES POSSIBLE]**

1. 7 HSPF
2. 8 HSPF
3. 9 HSPF
4. 10 HSPF
5. 11 HSPF
6. 12 HSPF
7. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

88. (Don't know)
99. (Refused)

B18. **[IF B9=1 AND STRATA=FURNACE]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, did you discuss… **[READ LIST; MULTIPLE RESPONSES POSSIBLE; RECORD "0" IF FALSE, "1" IF TRUE, 88 IF DON'T KNOW, 99 IF REFUSED]**

1. Installing a furnace that was not condensing?
2. Installing a furnace without an energy-efficient, electronically-commutated motor or ECM?
3. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

B19. **[IF B9=1 AND STRATA=FURNACE]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, did you discuss… **[READ LIST; MULTIPLE RESPONSES POSSIBLE; RECORD "0" IF FALSE, "1" IF TRUE, 88 IF DON'T KNOW, 99 IF REFUSED]**

1. Equipment efficiency between 94% and 98% AFUE?
2. Equipment efficiency between 90% and 93% AFUE?
3. Equipment efficiency between 82% and 89% AFUE?
4. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

B20. **[IF B9=1 AND STRATA=WATER HEATER AND MEASURE DETAIL = STORAGE WATER HEATER]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, did you discuss… **[READ LIST; MULTIPLE RESPONSES POSSIBLE; RECORD "0" IF FALSE, "1" IF TRUE, 88 IF DON'T KNOW, 99 IF REFUSED]**

1. Installing a water heater that was not condensing?
2. Installing a tankless or on-demand water heater?
3. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

B21. **[IF B9=1 AND STRATA=WATER HEATER AND MEASURE DETAIL = STORAGE WATER HEATER]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, did you discuss… **[READ LIST; MULTIPLE RESPONSES POSSIBLE; RECORD "0" IF FALSE, "1" IF TRUE, 88 IF DON'T KNOW, 99 IF REFUSED]**

1. Water heaters with an Energy Factor rating between 0.90 and 0.94 EF?
2. Water heaters with an Energy Factor rating between 0.80 and 0.89 EF?
3. Water heaters with an Energy Factor rating between 0.59 and 0.79 EF?
4. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

B22. **[IF B9=1 AND STRATA=WATER HEATER AND MEASURE DETAIL = TANKLESS WATER HEATER]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, did you discuss… **[READ LIST; MULTIPLE RESPONSES POSSIBLE; RECORD "0" IF FALSE, "1" IF TRUE, 88 IF DON'T KNOW, 99 IF REFUSED]**

1. Installing a water heater that was not condensing?
2. Installing a storage or tank-type water heater?
3. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

B23. **[IF B9=1 AND STRATA=WATER HEATER AND MEASURE DETAIL = TANKLESS WATER HEATER]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, did you discuss… **[READ LIST; MULTIPLE RESPONSES POSSIBLE; RECORD "0" IF FALSE, "1" IF TRUE, 88 IF DON'T KNOW, 99 IF REFUSED]**

1. Water heaters with an Energy Factor rating between 0.90 and 0.94 EF?
2. Water heaters with an Energy Factor rating between 0.80 and 0.89 EF?
3. Water heaters with an Energy Factor rating between 0.59 and 0.79 EF?
4. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

B24. **[IF B9=1 AND STRATA=BOILER]** Thinking back to the efficiency level of the other **[STRATA]** options you explored, did you discuss… **[READ LIST; MULTIPLE RESPONSES POSSIBLE; RECORD "0" IF FALSE, "1" IF TRUE, 88 IF DON'T KNOW, 99 IF REFUSED]**

1. Installing a boiler that was not condensing?
2. Installing a boiler with an AFUE between 94% and 98% AFUE?
3. Boilers with an AFUE rating between 90% and 93% AFUE?
4. Boilers with an AFUE rating between 82% and 89% AFUE?
5. (Other [PROVIDE ANY DETAIL FROM RESPONDENT FALLING OUTSIDE OF RESPONSE OPTIONS:_____])

B25. **[IF B14=4, 88, OR 99, OR B15 THROUGH B2424=88 OR 99]** Were the other **[STRATA]** options…? **[READ 1-3; MULTIPLE RESPONSES POSSIBLE]**

1. More efficient
2. Less efficient
3. Of the same efficiency as the equipment purchased
4. (Other [SPECIFY:_____])

88. (Don't know)

99. (Refused)

B26. **[IF B9=1]** What factors motivated your decision to proceed with the specific option you installed? [DO NOT READ LIST; MULTIPLE RESPONSES POSSIBLE] PROBE: Any other factor(s)?

1. (Rebate amount/eligible for the rebate)
2. (Used less energy, reduced energy consumption or energy demand)
3. (Saving money on our utility bills; lower energy bills)
4. (Best return on investment [ROI])
5. (Increased occupant comfort)
6. (Better aesthetics)
7. (Met code requirements)
8. (Helping achieve organizational sustainability goals)
9. (Recommended by contractor)
10. (Other [SPECIFY:_____])
88. (Don't know)
99. (Refused)

B27. Did utility staff or a contractor hired by the utility perform a site assessment or energy audit?

11. (Yes)
12. (No)
88. (Don't know)
99. (Refused)

C. Awareness

C1. These next questions are about your program participation. ~How did your organization learn about the NHSaves rebates available for this project? **[DO NOT READ LIST; MULTIPLE RESPONSES POSSIBLE]**

1. (Contact with program staff representative through phone, email, or in person)
2. (NHSaves website/other social media)
3. (Old Media [i.e.,TV/Radio])
4. (A utility sponsored workshop or event)
5. (Printed program materials)
6. (Contact with utility representative)
7. (Utility mailing, bill insert, or utility website)
8. (Word of mouth [family, friend, or business colleague])
9. (I contacted my contractor/vendor/distributor to ask)
10. (My contractor/vendor/distributor let me know about them)
11. (Previously participated in program/received a rebate)
12. (Through a trade association or professional organization SPECIFY:_____])
13. (Other [SPECIFY:_____])
88. (Don't know)
99. (Refused)

C2. ~ **[IF C1> ONE RESPONSE]** Of those sources, which source was the **most** influential in your company's decision to participate in the program? **[LIST ONLY C1 RESPONSES]** **[READ LIST IF NEEDED, SINGLE RESPONSE ONLY]**

1. (Contact with program staff representative through phone, email, or in person)
2. (NHSaves website/other social media)
3. (Old Media [i.e., TV/Radio])
4. (A utility sponsored workshop or event)
5. (Printed program materials)
6. (Contact with utility representative)
7. (Utility mailing, bill insert, or utility Website)
8. (Word of mouth [family, friend, or business colleague])
9. (I contacted my contractor/vendor/distributor to ask)
10. (My contractor/vendor/distributor let me know about them)
11. (Previously participated in program/received a rebate)
12. (Through a trade association or professional organization SPECIFY:_____])
13. (Other [SPECIFY:_____])
88. (Don't know)
99. (Refused)

D. Benefits and Barriers

Now I'd like to understand more about how your organization made decisions about your specific energy efficiency project.

D1. ~What factors motivated your company's decision to make an energy-efficient upgrade? **[DO NOT READ LIST; MULTIPLE RESPONSES ALLOWED]**

1. (To save money on energy bills/save money)
2. (To improve efficiency/save energy)
3. (To obtain a program or bonus rebate)
4. (To reduce initial purchase costs)
5. (To replace old (but still functioning) equipment)
6. (To replace broken equipment)
7. (To reduce maintenance costs)
8. (Took the advice of a professional)
9. (Because of past program participation)
10. (To take advantage of technical assistance offered)
11. (Helping achieve organizational sustainability goals)
12. (Other [SPECIFY_____])
88. (Don't know)
99. (Refused)

D2. ~What were the biggest challenges to participating in the program for your company? **[DO NOT READ LIST; RECORD ALL THAT APPLY; PROBE FOR MULTIPLE RESPONSES]**

1. (No challenges)
2. (High initial costs)
3. (Budget limitations)
4. (Long payback period)
5. (Time/effort required)
6. (Understanding potential areas for improvement)
7. (Lack of awareness about the program/available rebates for energy efficient equipment)
8. (Lack of information about what kind of equipment is available)
9. (Issues with program application process)
10. (Finding a contractor/vendor with which to work)
11. (Other [SPECIFY:_____])

88. (Don't know)
99. (Refused)

D3. **[SKIP IF D2= 1, 88, 99]** ~What could have been done to help your company overcome challenges with program participation or making energy-efficiency improvements? **[DO NOT READ LIST, ALLOW MULTIPLE RESPONSES]**

1. (Nothing)
2. (Higher rebates)
3. (Provide upfront rewards/instant discount from contractor)
4. (Simplify the paperwork/**APPLICATION [ASK: WHAT WOULD YOU CHANGE ABOUT THE APPLICATION PROCESS?_____]**)
5. (Provide better/more information about program **[ASK: WHAT KIND OF INFORMATION WOULD BE HELPFUL TO YOU? _____]**)
6. (Make it easier to participate **[ASK: IN WHAT WAY?_____]**)
7. (Provide a point of contact/program staff member)
8. (Other [SPECIFY_____])

88. (Don't know)
99. (Refused)

E. Satisfaction and Application Ease

Next, I have a few questions for you about your program experience.

E1. ~Thinking about the application you submitted, how would you rate the application paperwork on a scale of 1 to 5, where 1 is not easy at all and 5 is very easy?

1. [RECORD NUMERIC RESPONSE]

88. (Don't know)
99. (Refused)

E2. **[ASK IF E1≠88 or 99]** Why do you say that? [OPEN END]

E3. ~I'm going to ask you about your satisfaction with different aspects of the program. Please tell me on a scale of 1-5 of how satisfied you were with each aspect, with 1 meaning not at all satisfied, and 5 meaning very satisfied. If a factor is not applicable to you, please say so. **[RANDOMIZE ALL BUT LAST ASPECT]** **[USE 88 FOR DON'T KNOW OR NA AND 99 FOR REFUSED]**

2. The amount of effort required to participate in the program.
3. The amount of time required to complete the program paperwork.
4. The energy savings my company achieved as a result of participating in the program.
5. The rebate levels offered by the program.
6. The application process.
7. The timeline or timing of my project.
8. The knowledge and competence of my contractor/vendor.
9. The cleanliness of the contractor's work area.
10. The performance of the installed equipment.
11. Finally, your overall experience with the program.

E4. **[ASK E4.1 – E4.10 IF E3= 1, 2, OR 3]**

E4.1 [ASK IF E3=1] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.2 [ASK IF E3=2] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.3 [ASK IF E3=3] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.4 [ASK IF E3=4] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.5 [ASK IF E3 =5] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.6 [ASK IF E3 =6] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.7 [ASK IF E3 =7] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.8 [ASK IF E3 =8] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.9 [ASK IF E3 = 9] Why were you less than satisfied with **[RESPONSE FROM E3]**?
E4.10 [ASK IF E3=10] Why were you less than satisfied with **[RESPONSE FROM E3]**?

1. [RECORD RESPONSE: _____]
88. (Don't know)
99. (Refused)

E5. ~ **[IF B27=1]** Now I would like to ask you about your satisfaction with the site assessment or energy audit you received. Again, if a factor is not applicable to you, please say so. Using that same 1-5 scale **[REPEAT SCALE IF NECESSARY: 1 IS NOT AT ALL SATISFIED AND 5 IS VERY SATISFIED, USE 88 FOR DON'T KNOW OR NA AND 99 FOR REFUSED]**, how would you rate…

1. The site assessment or audit that your company received?
2. The clarity and content of the assessment or audit report your company received?

E6. **[FOR EVERY PROMPT IN E5=1, 2**

E6.1 Why were you less than satisfied with **[RESPONSE FROM E5 = 1]**?

E6.2 Why were you less than satisfied with **[RESPONSE FROM E5 = 2]**?

1. [RECORD RESPONSE: _____]
88. (Don't know)
99. (Refused)

E7. **[IF DI =TRUE]** Using the same 1-5 scale, how would you rate the no-cost products, such as aerators, spray valves, or shower heads, that the contractor installed? **[REPEAT SCALE IF NECESSARY: 1 IS NOT AT ALL SATISFIED AND 5 IS VERY SATISFIED, USE 88 FOR DON'T KNOW OR NA AND 99 FOR REFUSED]**

E8. **[IF E7=1, 2, OR 3]** Why were you less than satisfied with the no-cost products installed?

1. [RECORD RESPONSE: _____]
88. (Don't know)
99. (Refused)

E9. ~Is there anything that the program could have done to improve your overall experience? **[DO NOT READ THE LIST, RECORD ALL THAT APPLY]**

1. (Better/more communication **[SPECIFY: WHAT TYPE OF COMMUNICATION WOULD HAVE BEEN USEFUL?_____]**)
2. (Better/more information **[SPECIFY: WHAT TYPES OF INFORMATION DO YOU FEEL WOULD HAVE BEEN USEFUL DURING YOUR PROGRAM EXPERIENCE?_____]**)
3. (Quicker response time **[SPECIFY: WHO WOULD YOU LIKE A QUICKER RESPONSE TIME FROM?__]**)
4. (Larger selection of eligible equipment **[ASK: WHAT ENERGY-EFFICIENT EQUIPMENT SHOULD THE PROGRAM OFFER REBATES FOR?_____]**)
5. (Increasing the rebate amount)
6. (Simplify the application process **[ASK: IN WHAT WAYS CAN THE APPLICATION BE IMPROVED?_____]**)
7. (Allow me to fill out the applications online)
8. (Change the website **[ASK: IN WHAT WAY?_____]**)
9. (Provide quicker approval on applications)
10. (Send rebate check out faster)
11. (Provide more one-on-one interaction with program staff)
12. (Other [SPECIFY:_____])
13. (No, nothing)

88. (Don't know)
99. (Refused)

E10. **[IF E9≠4]** Is there any energy-efficient product, equipment, or service not currently covered through the program for which you think rebates should be offered? [OPEN END]

E11. ~Overall, what do you think are the strengths of the program? [OPEN END]

E12. ~Overall, what do you think are the weaknesses of the program? [OPEN END]

E13. How likely are you to recommend the program, on a scale of 1 to 5, where 1 is not at all likely and 5 is very likely?

1. [RECORD NUMERIC RESPONSE]
88. (Don't know)
99. (Refused)

F. Marketing & Outreach

F1. ~When learning about the program, how would you rate the completeness and accuracy of program materials on a scale of 1 to 5, where 1 is not at all accurate and 5 is very accurate?

1. [RECORD NUMERIC RESPONSE]
88. (Don't know)
99. (Refused)

F2. ~In your opinion, what is the best way for program staff to keep organizations like yours informed about program opportunities to save energy? **[DO NOT READ THE LIST, RECORD ALL THAT APPLY]**

1. (Direct contact from utility representative)
2. (Letter/flyer/other mailings)
3. (Bill inserts)
4. (Advertise on old media (TV/radio))
5. (Advertise on new media (social media/online))
6. (Send emails)
7. (Host workshops in my local area)
8. (Advertise at trade shows/conferences/events)
9. (Contact corporate office)
10. (Use contractor/vendor)
11. (In-person contact from program staff)
12. (Phone call from program staff)
13. (Other [SPECIFY:_____])
88. (Don't know)
99. (Refused)

F3. ~What do you think program staff could do to increase participation?

1. (Increase rebate amounts)
2. (Provide funding throughout the year)
3. (Include more kinds of equipment **[SPECIFY: WHAT KIND OF EQUIPMENT DO YOU THINK SHOULD BE INCLUDED IN THE PROGRAM?_____]**)
4. (Change application **[SPECIFY: WHAT ABOUT THE APPLICATION WOULD YOU CHANGE?_____]**)
5. (Provide better/more information **[SPECIFY: WHAT KIND OF INFORMATION WOULD BE MORE USEFUL TO GARNER MORE INTEREST?_____]**)
6. (Provide better/more communication **[SPECIFY: WHO WOULD YOU LIKE TO BE MORE INVOLVED IN THE PROCESS?_____]**)
7. (Improve timing)
8. (More one-on-one interaction with program staff)
9. (Other [SPECIFY: _____])

88. (Don't know)
99. (Refused)

G. Firmographics

Finally, I would like to ask you some questions about your organization.

G1. What industry is your organization in? **[CODE ONE RESPONSE BELOW; DON'T READ UNLESS NECESSARY]**

1. (Agriculture)
2. (Communications)
3. (Construction)
4. (Education)
5. (Finance, Insurance, Real Estate)
6. (Food Service (restaurants))
7. (Government)
8. (Health Care)
9. (Manufacturing)
10. (Nonprofit / churches / schools)
11. (Retail, Wholesale)
12. (Transportation)
13. (Hotel/motels)
14. (Mining)
15. (Other [SPECIFY:_____])

88. (Don't know)
99. (Refused)

G2. How many locations does your organization operate in New Hampshire?

1. [RECORD NUMBER:_____]
88. (Don't know)
99. (Refused)

G3. Does your organization lease or own the facility or facilities?

1. (Lease)
2. (Own)
3. (Both)
4. (Other [SPECIFY:_____])
88. (Don't know)
99. (Refused)

G4. How many people are employed at the location where the project took place?

1. [RECORD NUMBER:_____]
88. (Don't know)
99. (Refused)

H. Closing

H1. On occasion, NHSaves may want to contact a customer to learn more about their participation experience. May we share your responses with a program manager, who may contact you regarding your experience?

1. (Yes)
2. (No)
88. (Don't know)
99. (Refused)

H2. Thank you so much for your time. NHSaves greatly values your feedback. To what name and address should I mail your gift card? Let's also collect your phone number in case there are any questions while processing the card.

Name	
Address	
Phone	

Thank you. We appreciate your help with this survey. Have a nice day.

CADMUS

Appendix D. Program Partner Interview Guide

NHSaves 2016-2017 C&I Non-Lighting Programs
December 2018

Respondent company:_____

Respondent name:_____

Respondent phone: _____

Interview date: _____ Interviewer initials: _____

Research Objectives	Related Questions
How aware are contractors of NHSaves' programs? Do they understand how the program operates and the types of equipment offered?	B1 - B3, D5
How satisfied are contractors with information and resources provided by NHSaves and partnering utilities? How satisfied are contractors with NHSaves and utility staff?	C1 - C3, D5 - D8
How do contractors market the program? How do contractors promote the program to customers? Are there challenges in promotion?	D1 - D10
What are barriers to contractor and customer participation?	E1 - E7
How aware are participants of NHSaves' programs? How satisfied are participants with NHSaves' programs?	F1 - F5
What are nonparticipants purchasing outside of the NHSaves program?	E8 - E20
What additional measures would contractors like to see in the program? How can NHSaves achieve deeper market penetration?	F3 - F7
How satisfied are contractors with the different aspect of the program and with NHSaves overall? How can satisfaction be improved?	G1 - G2

Introduction

Hello, my name is _____. I'm calling from Cadmus on behalf of **[UTILIT(Y/IES)]** and NHSaves. Our firm has been hired by NHSaves to evaluate their energy efficiency programs, with non-lighting measures, provided to commercial, industrial, and municipal customers. We are talking with contractors who participate in the programs to get feedback and suggestions for improvements. If you have time to provide your feedback, we are offering a **$50 Visa gift card** for completing the interview.

I'd like to speak with **[CONTACT NAME]** or the person at your company who is most familiar with your participation in the **[UTILIT(Y/IES)]** programs.

1. Yes
2. No **[ASK: COULD I SCHEDULE A TIME TO CALL BACK AND REACH THEM? [RECORD DATE AND TIME ___]**

[REPEAT INTRODUCTION IF TRANSFERRED TO NEW PERSON]

We are interested in your perspective on **[UTILIT(Y/IES)]** commercial, industrial and municipal customers energy efficiency programs with non-lighting measures. Your feedback is extremely important and appreciated by NHSaves and will enable them to improve their program. To show our appreciation, we are offering a $50 Visa gift card for completing the interview.

[Sales concern] This is not a sales call. I am only interested in your perspective on the NHSaves programs. Your feedback will help to improve the programs.

[Time] This interview will take approximately 30 minutes.

[Confidentiality concern] Although the answers you provide will be used in the report we submit, your answers will not be identified as yours. I appreciate your candid feedback on the program.

While you may have participated in other **[UTILIT(Y/IES)]** programs, such as Residential programs, for this interview I would like us to focus on just the Non-Residential (e.g., Municipal, Small Business Energy Solutions) programs., and specifically on measures *other than lighting* that were installed through the programs (e.g., cooling, heating, refrigeration, motors, etc.). The purpose of these interviews is to understand and get your perspective on the **2016** and **2017** programs, including what worked well or what could be improved.

A. Firmographics

A1. How many employees does your company have?

A2. What services or equipment does your company regularly sell or specialize in? Do you offer: **[READ LIST, RECORD Y/N. PROMPT FOR HVAC, ENERGY MANAGEMENT SYSTEMS, REFRIGERATION, AND COMPRESSED AIR SERVICES. IF ONLY LIGHTING, THANK & TERMINATE]**

1. Lighting
2. HVAC
3. Plumbing or Hydronics (water heating and boilers)
4. Energy management systems
5. Refrigeration
6. Compressed air
7. Any others? _____ **[RECORD RESPONSE]**

A3. What kinds of customers do you service? **[PROMPT FOR NEW CONSTRUCTION AND/OR RETROFIT. IDENTIFY SEGMENTS, SUCH AS SCHOOL, MUNICIPALITY, SMALL BUSINESS, LARGE BUSINESS. IF ONLY RESIDENTIAL, THANK & TERMINATE]**

A4. **WHICH UTILITIES DO YOU SERVICE? [LISTEN FOR: EVERSOURCE ENERGY, LIBERTY UTILITIES, UNITIL, AND NEW HAMPSHIRE ELECTRIC COOPERATIVE]**

B. Program Awareness

B1. Which **[UTILIT(Y/IES)]** programs do you promote or participate in? **[READ LIST]**

1. Small Business Energy Solutions: Yes/No
   (a) **[IF YES]** Do you offer direct installation of no-cost measures? What direct install measures do you offer? **[PROMPT FOR AERATORS, SHOWERHEADS, SPRAY VALVES]**
2. Municipal: Yes/No
3. Large Business Energy Solutions: Yes/No
4. Regional Greenhouse Gas Initiative grant Retail/Large Business program: Yes/No

B2. How did you first learn about the **[UTILIT(Y/IES)]** rebates for non-lighting commercial and industrial equipment, such as insulation, HVAC, and water heating equipment? **[DO NOT READ, MARK ALL THAT APPLY]**

1. Utility representative **[SPECIFY: WHICH UTILITY? _____]**
2. NHSaves website
3. Utility website **[SPECIFY: WHICH UTILITY? _____]**
4. Trade/professional organization
5. Customer
6. Mailing or brochure **[SPECIFY: WHICH UTILITY? _____]**
7. Advertisement **[SPECIFY: WHICH UTILITY? _____]**
8. Other _____ **[RECORD RESPONSE]**

98. (Don't know)
99. (Refused)

B3. On average, how many projects involving **[UTILIT(Y/IES)]** **non-residential** projects do you complete per year? Just an estimate is fine. **[OPEN END]**

1. About how many projects are lighting only?
2. How many projects include non-lighting measures?

C. Communication

C1. How often did you interact with program or utility staff? **[READ LIST. IF NEEDED: FOR EXAMPLE, THIS COULD BE REGARDING THE APPLICATION PROCESS, TRAININGS, UPDATES ON PROGRAM OFFERINGS, ETC.]** Would you say…

1. Daily
2. Weekly
3. Bi-weekly
4. Monthly
5. Quarterly
6. Annually
7. Never **[SKIP C2]**

98. (Don't know)
99. (Refused)

C2. I'm going to read you a couple of statements about program or utility staff and would like you to tell me how satisfied you are with each component on a scale of 1-5, where 1 is not at all satisfied and 5 is very satisfied. **[RECORD NUMERIC RESPONSES]**

1. Reaching out to you and keeping you informed about program offerings
2. Making the paperwork easy
3. Training you on how to effectively market programs to your customers
4. Providing educational opportunities or training resources
5. Providing the right amount of support so you can confidently sell and install energy efficient equipment
6. Your interaction with program staff overall.

C3. How useful were your interactions with program staff? How could any of these interactions be improved? **[OPEN END]**

D. Contractor Outreach and Marketing

D1. How does your firm promote the **[UTILIT(Y/IES)]** programs? For example, do you send out mailers or include rebate information in cost proposals?

D2. **[IF COMPANY OFFERS MORE THAN ONE PROGRAM]** Do you promote different programs in different ways? **[IF NEEDED PROVIDE EXAMPLES SUCH AS MUNICIPAL REBATES IN CUSTOMER COST PROPOSALS, LARGE BUSINESS ENERGY SOLUTIONS CUSTOMER EDUCATION, SMALL BUSINESS ENERGY SOLUTIONS MAILERS]**

D3. **[IF COMPANY SERVICES MORE THAN ONE CUSTOMER TYPE]** Do you promote differently between small business, municipals, and/or large business customers? **[PROMPT FOR DIFFERENCES BY SECTOR: RETAIL, FOOD SERVICES, HEALTH CARE, ETC.]**

D4. **[IF COMPANY OFFERS SMALL BUSINESS DIRECT INSTALL]** How do you promote the direct install aspect of the Small Business Energy Solutions program? **[IF NEEDED PROVIDE EXAMPLES SUCH AS MAILERS, RESPOND TO UTILITY LEADS, COLD CALLING, DOOR-TO-DOOR BUSINESS VISITS]**

D5. Are you aware of any marketing materials for **[UTILIT(Y/IES)]** commercial, industrial, or municipal programs?

1. Yes
2. No
98. (Don't know)
99. (Refused)

D6. Does your business use any utility marketing materials to market rebates and rebates for energy efficient equipment?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK IF D6 = 1]

D7. Would you say you use the NHSaves materials…? **[READ LIST]**

1. Daily
2. Weekly
3. Bi-weekly
4. Monthly
5. Quarterly
6. Annually
7. Never **[SKIP D8]**
98. (Don't know)
99. (Refused)

D8. What marketing materials do you find most effective? **[OPEN END]**

1. Why do you find those materials to be particularly effective?

D9. What challenges, if any, does your company face when marketing NHSaves services? **[OPEN END]**

D10. In general, what benefits of the program do you promote to your customers? **[DO NOT READ, MARK ALL THAT APPLY]**

1. Reduced energy use
2. Reduced energy costs
3. Improved productivity
4. Improved comfort
5. Lower Operating & Maintenance costs
6. Environmental benefits
7. Good investment **[PROBE FURTHER]**
8. Improved Life Cycle Cost
9. ROI
10. Simple Payback
11. Other _____ **[RECORD RESPONSE]**

98. (Don't know)
99. (Refused)

E. Barriers to Participation and Market Baselines

E1. What do you see as the biggest challenges for customers to participating in the programs? **[DO NOT READ, RECORD VERBATIM COMMENTS FOR LATER BINNING TO THESE CATEGORIES]**

1. No barriers
2. High initial costs
3. Budget limitation
4. Long payback period/ROI
5. Time/effort required
6. Understanding potential areas for improvement
7. Lack of awareness about the program/available rebates
8. Lack of information about what kind of equipment is available
9. Issues with program application process
10. Finding an available contractor/vendor with which to work
11. Other _____

98. (Don't know)
99. (Refused)

E2. What changes would help you and the program more effectively address these issues? **[OPEN END]**

E3. Do these barriers differ by business type, size, or industry? If so, please explain. **[OPEN END]**

E4. Are there any customer segments the program does not currently reach? For example, customer or industry types, or certain sizes of customer businesses. If so, what are they? **[OPEN END]**

E5. What is needed for utilities to address those segments?

E6. Are there any challenges to your participation in the program? **[OPEN END] [PROBE FOR THEIR CAPACITY TO SERVE MORE CUSTOMERS. E.G., TECHINCAL CAPACITY FOR DIFFERENT TYPES OF PROJECTS, NUMBER OF STAFF TO HANDLE THE VOLUME OF PROJECTS, ETC.]**

E7. Is there anything else NHSaves could do to help you promote non-lighting energy efficient equipment to your customers? **[OPEN END]**

E8. Let's talk a bit more about your sales process. On a 1 to 5 scale, where 1 is not at all important and 5 is very important, how important would you say NHSaves programs are to your company's decision to stock, promote and install high-efficiency equipment? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E9. **[IF RESPONDENT PROVIDES NEW CONSTRUCTION SERVICES, NOTED IN A3. IF NOT, SKIP TO E12]** What percentage of your business customers who undergo a new construction project do not participate in NHSaves or any other energy efficiency program? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E10. **[IF E9>0%]** When talking to new construction business customers **who do not participate** in NHSaves or other efficiency programs about their potential projects, what types of options you present them? Let's walk through a few examples. **[IDENTIFY APPLICABLE EXAMPLES FROM LIST, BASED ON RESPONSES TO A2. ASK WHETHER THEY OFFER OPTION GOOD, BETTER, BEST OPTIONS, AND THE EFFICIENCY LEVEL OF THOSE GOOD, BETTER, BEST OPTIONS]**

1. Compressed air systems **[GOOD, BETTER, BEST (Y/N) AND EFFICIENCY LEVEL OF EACH OPTION]**
2. Air conditioners **[GOOD, BETTER, BEST (Y/N) AND SEER OR EER OF EACH OPTION]**
3. Heat pumps **[GOOD, BETTER, BEST (Y/N) AND SEER, EER, OR HSPF OF EACH OPTION]**
4. Boilers **[GOOD, BETTER, BEST (Y/N) AND AFUE OF EACH OPTION]**
5. Furnaces **[GOOD, BETTER, BEST (Y/N) AND AFUE OF EACH OPTION]**
6. Unit heaters **[GOOD, BETTER, BEST (Y/N) AND AFUE OF EACH OPTION]**
7. Motors **[GOOD, BETTER (Y/N) AND EFFICIENCY OF EACH OPTION, TYPICALLY WITHOUT AND WITH ECM]**
8. Pumps **[GOOD, BETTER (Y/N) AND EFFICIENCY OF EACH OPTION, TYPICALLY WITHOUT AND WITH ECM]**
9. Water heaters **[GOOD, BETTER, BEST (Y/N) AND THERMAL EFFICIENCY OR ENERGY FACTOR OF EACH OPTION]**

E11. **[IF E9>0%]** What option do new construction business customers **who do not participate** in NHSaves or other efficiency programs typically choose? Again, let's review the equipment. **[EMPHASIZE THIS IS ONLY FOR NEW CONSTRUCTION NONPARTICIPANTS. USING EXAMPLES FROM E10, ASK WHETHER NONPARTICIPANTS TYPICALLY CHOOSE GOOD, BETTER, OR BEST OPTION]**

1. Compressed air systems
2. Air conditioners
3. Heat pumps
4. Boilers
5. Furnaces
6. Unit heaters
7. Motors
8. Pumps
9. Water heaters

E12. What percentage of your business customers who replace equipment on failure, as opposed to early replacement or as part of a new construction project, **do not participate** in NHSaves or any other energy efficiency program? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E13. **[IF E12>0%]** When talking to **nonparticipating** business customers who are replacing equipment on failure, what types of options you present them? Let's walk through a few examples. **[IDENTIFY APPLICABLE EXAMPLES FROM LIST, BASED ON RESPONSES TO A2. ASK WHETHER THEY OFFER OPTION GOOD, BETTER, BEST OPTIONS, AND THE EFFICIENCY LEVEL OF THOSE GOOD, BETTER, BEST OPTIONS]**

1. Compressed air systems **[GOOD, BETTER, BEST (Y/N) AND EFFICIENCY LEVEL OF EACH OPTION]**
2. Air conditioners **[GOOD, BETTER, BEST (Y/N) AND SEER OR EER OF EACH OPTION]**
3. Heat pumps **[GOOD, BETTER, BEST (Y/N) AND SEER, EER, OR HSPF OF EACH OPTION]**
4. Boilers **[GOOD, BETTER, BEST (Y/N) AND AFUE OF EACH OPTION]**
5. Furnaces **[GOOD, BETTER, BEST (Y/N) AND AFUE OF EACH OPTION]**
6. Unit heaters **[GOOD, BETTER, BEST (Y/N) AND AFUE OF EACH OPTION]**
7. Motors **[GOOD, BETTER (Y/N) AND EFFICIENCY OF EACH OPTION, TYPICALLY WITHOUT AND WITH ECM]**
8. Pumps **[GOOD, BETTER (Y/N) AND EFFICIENCY OF EACH OPTION, TYPICALLY WITHOUT AND WITH ECM]**
9. Water heaters **[GOOD, BETTER, BEST (Y/N) AND THERMAL EFFICIENCY OR ENERGY FACTOR OF EACH OPTION]**

E14. **[IF E12>0%]** What option do business customers who **do not participate** in NHSaves or other efficiency programs typically choose? Again, let's review the equipment. **[USING EXAMPLES FROM E10, ASK WHETHER NONPARTICIPANTS TYPICALLY CHOOSE GOOD, BETTER, OR BEST OPTION]**

1. Compressed air systems
2. Air conditioners
3. Heat pumps
4. Boilers
5. Furnaces
6. Unit heaters
7. Motors
8. Pumps
9. Water heaters

E15. **[IF RESPONDENT INSTALLS ENERGY MANAGEMENT SYSTEMS]** Regardless of whether your business customer participates in the NHSaves program, what percent of your energy management system installations in existing buildings are new installations, as opposed to expansions or replacements? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E16. **[IF E15>0%]** What percent of these new installations are for business customers who participate in the NHSaves program or some other energy efficiency program? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E17. **[IF RESPONDENT INSTALLS ENERGY MANAGEMENT SYSTEMS]** Regardless of whether your business customer participates in the NHSaves program, what percent of your energy management systems are expansions of existing systems, as opposed to new installations or replacements? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E18. **[IF E17>0%]** What percent of these expansions are for business customers who participate in the NHSaves program or some other energy efficiency program? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E19. **[IF RESPONDENT INSTALLS ENERGY MANAGEMENT SYSTEMS]** Regardless of whether your business customer participates in the NHSaves program, what percent of your energy management systems are replacements of existing systems, as opposed to new installations or expansions? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

E20. **[IF E19>0%]** What percent of these replacements are for business customers who participate in the NHSaves program or some other energy efficiency program? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

F. Perceptions of Customer Awareness and Experience

F1. How often would you say that your eligible customers already know about **[UTILIT(Y/IES)]** programs? Would you say…

1. Frequently
2. Sometimes
3. Rarely
4. Never

98. (Don't know)
99. (Refused)

F2. In your opinion from talking with New Hampshire business customers, on a scale of 1 to 5 where 1 is not at all satisfied and 5 is very satisfied, how satisfied are NHSaves participants with the rebate levels offered by the programs? **[RECORD NUMERIC RESPONSE]**

98. (Don't know)
99. (Refused)

F3. Generally, do the rebates provided at the end of the project by NHSaves typically match your expectations (or your customers' expectations) from when the project was first initiated? Why or why not? **[OPEN END]**

F4. Have you received any feedback from customers about their satisfaction with the measure offerings? If so, please describe? **[OPEN END]**

F5. Are there any other areas of the program that cause bottlenecks or challenges for you, or your customers? If yes, what are they? **[OPEN END]**

F6. Do you have recommendations for additional nonresidential natural gas–saving measures that the program could rebate? If so, what are they? **[OPEN END]**

F7. Do you have recommendations for additional non-residential electric-saving measures that the program could rebate? If so, what are they? **[OPEN END]**

G. Program Partner Satisfaction

The next questions are about your satisfaction with the program.

G1. I'm going to read a list of factors about the program or programs. For each one, please tell me your level of satisfaction on a scale from 1 to 5, where 1 is not at all satisfied and 5 is very satisfied. How satisfied are you with:

1. The amount of effort required to participate in the program.
2. The amount of time required to complete the program paperwork.
3. The rebate levels offered by the program.
4. The application process.
5. Finally, your overall experience with the program.

[ASK FOR EACH RESPONSE IN G1 = 1, 2, or 3]

G2. What contributed most to your dissatisfaction with the **[COMPONENT FROM G1]**? **[OPEN END]**

H. Closing

H1. Do you have any additional comments about any of the **[UTILIT(Y/IES)]** programs we've talked about today? **[OPEN END]**

H2. Thank you so much for your time. NHSaves and **[UTILIT(Y/IES)]** greatly value your feedback. To what name and address should I mail your gift card?

Name	
Address	

Appendix E. Detailed Sample Project Findings

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	115166
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	(6) VFDs were incentivized serving the following equipment: (1) 50 hp AHU supply fan. (1) 25 hp AHU return fan. (2) 5 hp hot water pumps. (2) 7.5 water booster pumps. EC motors were installed on (2) 3 hp hot water pumps, (2) 5 hp hot water pumps, (1) 50 hp AHU supply fan, (1) 25 hp AHU exhaust fan, (2) 7.5 water booster pumps
Reported Calculations	Reported savings for VFDs and EC motors based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor. Baseline condition for VFDs are a constant speed drive.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment. Interactive effects are accounted for by combining the savings calculations for EC motors and VFDs.
Notes on findings	EC Motors and VFDs installed on large AHU fans. Full calculations analysis workbooks were created.
Summer Reported savings (kW)	4.9
Reported savings (kWh)	205,387.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	3.3
Evaluated savings (kWh)	228,599.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	67%
kWh Realization Rate	111%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	115199
Utility	Unitil
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	(3) VFDs were incentivized serving the following equipment: (3) 20 hp water booster pumps
Reported Calculations	Reported savings for VFDs based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations and power metering data.
Notes on findings	Power metering data indicated low peak load demand resulting in high realization rates for demand savings during peak periods
Summer Reported savings (kW)	1.5
Reported savings (kWh)	46,955.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	4.8
Evaluated savings (kWh)	46,675.5
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	329%
kWh Realization Rate	99%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	115206
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	(2) VFDs were incentivized serving the following equipment: (1) 3hp kitchen exhaust fan, (1) 3hp make-up air handling unit fan
Reported Calculations	Reported savings for VFDs based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment
Notes on findings	Higher savings for VFDs serving kitchen MAU and EF than reported based on custom load profile.
Summer Reported savings (kW)	1.3
Reported savings (kWh)	10,954.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	1.2
Evaluated savings (kWh)	10,344.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	94%
kWh Realization Rate	94%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	AK-003-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	57 Steam Traps replaced or rebuilt.
Reported Calculations	Reported savings for Steam Traps are based on the Process - Steam Traps measure from the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology (source documentation to the Steam Traps measure from the MA TRM 2016-2018) and as-found steam system pressure, trap size, and boiler efficiency.
Notes on findings	-The pressure set point observed on site (40psig) is higher than the average setpoint used by the MA TRM resulting in high realization rates
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	1,496.7
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	2,421.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	162%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Oil
Sample Type	Random
Project ID	AK-007A-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	(1) Viessmann Vitodens Model 200-W Model (< 200 MBH) wall hung condensing oil boiler at 95% eff.
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on the MA TRM 2016-2018. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. 95% AFUE efficient 200 MBH propane condensing boiler installed. Baseline efficiency based on the International Energy Conservation Code 2012.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	24.6
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	47.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	191%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	AK-011-CN-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	3 Energy Recovery Ventilators incentivized to replace unit ventilators and furnaces.
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software version 4.9.
Evaluation Analysis	Cadmus installed power meters and temperature sensors and monitored performance of the ERVs over a period of 6 weeks in March and April, 2019. Custom calculations were performed based on actual meter data, measured energy recovery effectiveness, and weather data. Performance was extrapolated to TMY2 data to determine annual energy savings. The baseline condition is a code minimum efficiency packaged rooftop unit air conditioning unit without heat recovery.
Notes on findings	Energy model utilized in reported calculations were not provided. Cadmus used metered data of the Supply fan of the ERV's along with Temperature data for outside air, supply air, return air, and exhaust air.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	2,436.0
Fossil Fuel Reported savings (MMBtu)	484.7
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	2,363.0
Evaluated Fossil Fuel savings (MMBtu)	871.1
Summer kW Realization Rate	#N/A
kWh Realization Rate	97%
Fossil Fuel MMBtuh Realization Rate	180%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	AK-012-CR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Installing Reliable DDC controls that will: control and stagger boilers, provide outdoor temp reset for boilers, reduce OCC building set points, provide demand control ventilation for gym, cafeteria, and library.
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software version 4.9.
Evaluation Analysis	Cadmus performed a site visit to verify the energy model inputs and proposed sequences of operation. Cadmus accepted the energy model reported savings due to minimal discrepancies found on-site compared with the energy model inputs.
Notes on findings	Energy model inputs reviewed. Equipment was scheduled to run 24/7 and many RCx measures implemented with DDC. Expected savings of 10% electric bill and fuel oil seem reasonable.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	13,942.0
Fossil Fuel Reported savings (MMBtu)	980.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	13,942.0
Evaluated Fossil Fuel savings (MMBtu)	980.9
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	AK-015-CR-17
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	DDC controls system upgrade. Energy conservation measures implemented include outdoor boiler reset, building set backs, and demand control ventilation.
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus reviewed the energy model inputs and accepted the energy model reported savings. Energy savings by measure type are reasonable no additional information provided to justify a revision to the energy model.
Notes on findings	DDC upgrade. Energy model inputs reviewed and similar to other school projects.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	24,385.0
Fossil Fuel Reported savings (MMBtu)	1,331.5
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	24,385.0
Evaluated Fossil Fuel savings (MMBtu)	1,331.5
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	E17-C&IMU-11
Utility	Liberty
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	2 heat pumps units serving fire station
Reported Calculations	Reported savings are based on the HVAC - Heat Pump Systems measure from the MA TRM 2016-2018 with baseline efficiencies based on the 2012 International Energy Conservation Code. Installed efficiency assumed to be 20.0 SEER and 9.6 HSPF.
Evaluation Analysis	Cadmus installed power meters to determine run hours of the heat pumps and occupancy schedules over a period of 6 weeks. Savings were calculated based on the HVAC - Heat Pump Systems measure from the MA TRM utilizing actual installed efficiency and effective full load hours based to meter data.
Notes on findings	Power meters installed on both heat pumps indicate higher hours of operation than assumed in the TRM resulting in high realization rates.
Summer Reported savings (kW)	0.3
Reported savings (kWh)	1,072.8
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	0.4
Evaluated savings (kWh)	1,558.4
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	153%
kWh Realization Rate	145%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Propane
Sample Type	Random
Project ID	E17-C&IMU-7
Utility	Liberty
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	2 condensing propane boilers (301-499 MBH each)
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Cadmus installed a temperature sensor and a power meter on the boiler burner motor to determine run hours. Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings and meter data. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	A methane boiler is the primary source of heating for the building. Logger data has been downloaded to SharePoint for existing methane boiler. Due to the majority of the load being satisfied by the methane boiler, low hours of use are realized by the incentivized boilers. EMS data and discussions with the facility manager support this assessment.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	116.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	107.2
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	92%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	E17-C&IMU-8
Utility	Liberty
Evaluation Type	Desk Review
Meter status	
Measure Description	(45) Air Conditioning Units serving a school.
Reported Calculations	Reported savings are based on the Unitary Air Conditioners measure from the MA TRM 2016-2018 with baseline efficiencies based on the 2012 International Energy Conservation Code. Installed efficiency varies by AC unit capacity.
Evaluation Analysis	Evaluated savings were calculated based on the methodology described in the Unitary Air Conditioner measure from the MA TRM 2019-2021, baseline AC unit efficiencies described in the MA TRM 2016-2018, and full load hour estimates defined by building type in the 2017 Connecticut Program Savings Document.
Notes on findings	Evaluated HOU based on Jr./Highschool cooling FLHrs from CT PSD (594). A typical office building would have Cooling FLHrs of 797. Schools have lower full load cooling hours than a typical office building resulting in low realization rates.
Summer Reported savings (kW)	13.5
Reported savings (kWh)	13,043.3
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	12.6
Evaluated savings (kWh)	7,468.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	93%
kWh Realization Rate	57%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Selected
Project ID	GR-043-HN-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	(1) 214 MBH Condensing Boiler
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Cadmus installed a temperature sensor and a power meter on the boiler burner motor to determine run hours. Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on the MA TRM 2016-2018. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Boiler burner motor operated for 767 hours during the performance period. Hours of operation are consistent and reasonably match the assumed full load heating hours based on the MA TRM 2016-2018.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	22.6
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	21.7
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	96%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	N17228
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Project implemented 22 VFDs on pumps in Wastewater Treatment Plant and Aearation
Reported Calculations	Reported savings are based on custom calculations. Load profiles were provided for some pumps, but associated calculation workbooks were unavailable.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on an interview with facility staff and observed speeds for each of the 22 VFDs.
Notes on findings	Savings were calculated using spreadsheet models with custom load profiles for the various pump applications. Higher speeds during peak periods result in lower realization rates for demand savings.
Summer Reported savings (kW)	33.3
Reported savings (kWh)	291,112.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	26.8
Evaluated savings (kWh)	318,572.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	80%
kWh Realization Rate	109%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Propane
Sample Type	Random
Project ID	PH-042-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	(2) 492 MBH Propane Boilers. Mt. Caeser Elementary School.
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. (2) 492 mbh 98.4% thermal efficiency boilers installed.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	215.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	326.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	152%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	RP-055-CR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	EEI PROJECT, RETROFIT EMS DDC system. Savings based on implemenation of setback schedule. Savings assumed improved envelope from WRX project.
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus performed a site visit to verify the energy model inputs and proposed sequences of operation. Cadmus accepted the energy model reported savings due to minimal discrepancies were found on-site and appropriate energy model inputs.
Notes on findings	Savings based on implementation of setback schedule. Savings assumed improved envelope from WRX project. % of savings for HVAC systems match other school energy models (~40%). Fuel oil also at similar levels.
Summer Reported savings (kW)	7.5
Reported savings (kWh)	23,099.0
Fossil Fuel Reported savings (MMBtu)	754.8
Summer Evaluated savings (kW)	7.5
Evaluated savings (kWh)	23,099.0
Evaluated Fossil Fuel savings (MMBtu)	754.8
Summer kW Realization Rate	100%
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	RP-064-CR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Honeywell computer power management controls project serving 410 computers at a middle school
Reported Calculations	Reported savings are based on custom calculations using an audit of the school's computer inventory and performance. Data was recorded in the baseline mode for several weeks and determined operation hours in various power states: On, Off, Sleep, Hibernate.
Evaluation Analysis	Cadmus calculated saving based on the Non-res Network Computer Power Management measure from the Regional Technical Form. Performance inputs based on the audit provided in the reported documentation was utilized in calculating savings.
Notes on findings	- Justification for baseline computer consumption in the reported savings calculations were unclear. Based on historical performance of a wide range of desktop computers and monitors as indicated in the RTF, Cadmus determines the baseline computer load to be 264 kWh/yr - Cadmus is unsure how a savings of 25% over the baseline was determined in the reported savings. Based on various referenced studies, Cadmus calculates a savings of 117 kWh/yr per computer. - Cadmus assumes a heating in the school is through heat pumps. HVAC is not discussed in the reported savings.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	5,613.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	10,206.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	#N/A
kWh Realization Rate	182%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Small Business**
Strata	Refrigeration and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S16076
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	(70) EC Motors
Reported Calculations	Reported savings are based on the ECM Evaporator Fan Motors for Walk-In Coolers and Freezers measure from the MA TRM 2016-2018 and assume 8,760 hours of operation, no evaporative fan controls, and 5.36kW fan load.
Evaluation Analysis	Cadmus calculated saving based on the ECM Evaporator Fan Motors for Walk-In Coolers and Freezers measure from the MA TRM 2016-2018 with power reduction per unit calculated based on installed EC Motor nameplate information from the reported documentation.
Notes on findings	Nameplate motor data indicates slightly smaller motor sizes than assumed in the reported savings calculation
Summer Reported savings (kW)	5.4
Reported savings (kWh)	47,000.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	5.0
Evaluated savings (kWh)	44,193.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	94%
kWh Realization Rate	94%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Small Business**
Strata	Refrigeration and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S16089
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	(91) EC Motors
Reported Calculations	Reported savings are based on MA TRM 2016-2018 and assume 8,760 hours of operation, no evaporative fan controls, and 5.36kW fan load.
Evaluation Analysis	Cadmus calculated saving based on the ECM Evaporator Fan Motors for Walk-In Coolers and Freezers measure from the MA TRM 2016-2018 with power reduction per unit calculated based on installed EC Motor nameplate information from the reported documentation.
Notes on findings	Nameplate motor data indicates slightly higher motor sizes than assumed in the reported savings calculation
Summer Reported savings (kW)	6.1
Reported savings (kWh)	53,515.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	6.4
Evaluated savings (kWh)	55,954.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	105%
kWh Realization Rate	105%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17208
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	(1) 7.5 HP VFD on AHU supply fan
Reported Calculations	Reported savings for VFDs based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor. Contractor assumed flat 75% load profile for VFD.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment
Notes on findings	High demand realization rate due to lower estimated speed during peak periods than assumed with the reported calculations.
Summer Reported savings (kW)	0.8
Reported savings (kWh)	6,932.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	1.4
Evaluated savings (kWh)	6,554.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	180%
kWh Realization Rate	95%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17377
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	(2) 7.5 HP VFDs serving hot water pump, (1) 5hp fan vfd, (1) 3 hp fan vfd
Reported Calculations	Reported savings for VFDs based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment
Notes on findings	High demand realization rate due to lower estimated speed during peak periods than assumed with the reported calculations
Summer Reported savings (kW)	2.5
Reported savings (kWh)	21,519.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	4.3
Evaluated savings (kWh)	20,104.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	175%
kWh Realization Rate	93%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	SJE-020-CN-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	For complete 80 ton Geothermal HVAC system. Water source heat pumps transfer heat from / to ground via two ground loops and distributed heating and cooling is performed by zoned water to air heat pumps throughout building. 22 SEER / 22 HPSF rating.
Reported Calculations	Reported savings based on custom calculations with assumed inputs for maximum space conditioning cooling tonnage, maximum space heating tonnage, diversity factors to account for load profiles , hours per year, VRV heat pump assumed performance inputs, 4 pipe fan coil unit assumed performance inputs, geothermal heat pump system heat pump inputs, and water source heat pump inputs. An hourly analysis was not performed and local weather data was not utilized.
Evaluation Analysis	Evaluated savings were based on the heat pump measure within the MA TRM 2019-2021 with code minimum baseline efficiencies from the date of installation and total heating and cooling capacity that matches the reported calculations.
Notes on findings	Minimal spreadsheet calculations used in reported documentation.
Summer Reported savings (kW)	11.7
Reported savings (kWh)	37,952.0
Fossil Fuel Reported savings (MMBtu)	1,399.1
Summer Evaluated savings (kW)	8.3
Evaluated savings (kWh)	63,097.0
Evaluated Fossil Fuel savings (MMBtu)	1,369.0
Summer kW Realization Rate	71%
kWh Realization Rate	166%
Fossil Fuel MMBtuh Realization Rate	98%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	SJE-023-CR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	EMS controls retrofit. Adding DDC controls to school. Existing system: traditional, locally controlled zone thermostats without autmatic set back controls.
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus reviewed the energy model inputs and accepted the energy model reported savings.
Notes on findings	Energy model inputs reviewed. Total savings account for 1% of elec bill and 40% of propane gallons.Propane savings seem high, but inputs are appropriate. School DDC upgrade.
Summer Reported savings (kW)	0.4
Reported savings (kWh)	2,637.0
Fossil Fuel Reported savings (MMBtu)	122.3
Summer Evaluated savings (kW)	0.4
Evaluated savings (kWh)	2,637.0
Evaluated Fossil Fuel savings (MMBtu)	122.0
Summer kW Realization Rate	101%
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	**Municipal**
Strata	HVAC and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	SJE-025-CN-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	Energy Recovery Ventilators replacing traditional RTU. 4000 cfm
Reported Calculations	Reported savings are based on an energy model using Carrier HAP v4.90 Software. Output results of savings were available for review. The energy model inputs were unavailable.
Evaluation Analysis	Cadmus installed power meters and temperature sensors and monitored performance of the ERVs over a period of 6 weeks in March and April, 2019. Custom calculations were performed based on actual meter data, measured energy recovery effectiveness, and weather data. Performance was extrapolated to TMY2 data to determine annual energy savings.
Notes on findings	Energy model utilized in reported calculations were not provided. Cadmus used metered data of the Supply fan of the ERV's along with Temperature data for outside air, supply air, return air, and exhaust air.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	543.0
Fossil Fuel Reported savings (MMBtu)	268.7
Summer Evaluated savings (kW)	0.0
Evaluated savings (kWh)	935.0
Evaluated Fossil Fuel savings (MMBtu)	230.8
Summer kW Realization Rate	#N/A
kWh Realization Rate	172%
Fossil Fuel MMBtuh Realization Rate	86%

Program Type	**Municipal**
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	70797
Utility	NHEC
Evaluation Type	Site Visit
Meter status	
Measure Description	roof and wall insulation
Reported Calculations	Reported savings are based on a custom energy model. The energy model was not available for review.
Evaluation Analysis	Evaluated savings were calculated based on the building shell measures from the MA TRM 2016-2018.
Notes on findings	
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	124.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	117.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	94%

Program Type	**Municipal**
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	71792
Utility	NHEC
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	air barrier sealing, 3 new programmable thermostats
Reported Calculations	Reported savings are based on a custom energy model. The energy model was not available for review.
Evaluation Analysis	Cadmus installed temperature sensors in three rooms of the community center to measure the effectiveness of night temperature setback savings from programmable thermostats. Evaluated savings were calculated based on the building shell measures from the MA TRM 2016-2018 and the programmable thermostate measure from the 2017 Connecticut Program Savings Document.
Notes on findings	Logger data from three rooms in the childcare part of the community center support the site observations that setback schedules have not been implemented effectively. Temperature data generally reflects field observations that rooms were set to about 70 °F when occupied.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	53.4
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	12.7
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	24%

Program Type	**Municipal**
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	71795
Utility	NHEC
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	air sealing and insulation
Reported Calculations	Reported savings are based on a custom energy model. The energy model was not available for review.
Evaluation Analysis	Cadmus installed temperature sensors in the facility. Evaluated savings were calculated based on the building shell measures from the MA TRM 2016-2018.
Notes on findings	NO ENERGY MODEL RECEIVED. MMBtuh RR is low because air sealing upgrades (i.e. weatherstripping) were likely associated with energy savings but no infiltration reductions were quantified and no true project documents were provided to justify the reported savings of 109 MMBtuh. The Main garage bay had an average temperature of about 67.5 °F with a standard deviation of about 1.75 °F (meaning 68% of recorded temperatures were between 65.75-69.25 °F). In the Fire Department bay, there was an average temperature of about 55 °F with a standard deviation of about 3.4 °F (meaning 68% of recorded temperature were between 51.6-58.4 °F). The trends in the fire department bay reflected the facilities manager's comment that the garages are maintained at about 58 °F all winter long, but it appears as though the main bay was maintained at a higher temperature. Finally worth noting that the overall propane purchase trends did not drop dramatically between 2015 and 2018.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	108.7
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	67.5
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	62%

Program Type	**Municipal**
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	75394
Utility	NHEC
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	air sealing and insulation
Reported Calculations	Reported savings are based on a custom energy model. The energy model was not available for review.
Evaluation Analysis	Cadmus installed temperature sensors in the police facility. Evaluated savings were calculated based on the building shell measures from the MA TRM 2016-2018.
Notes on findings	Temperature logger data from the conference room and patrol room had average temperatures of 73 °F (both located on one side of the building with offices) and the weight room and upstairs lockers which were less occupied had average temperature of about 63 °F. The standard deviations for the weight room and upstairs temperatures were 2.8 °F and 4.5 °F respectively which suggests that the weight room was more consistently occupied and maintained at a smaller temperature band range as opposed to the upstairs. The standard deviation for the office spaces was about 3.8 °F so about 68% of all readings in the conference room and patrol room were between 69.2 °F and 76.8 °F. This all suggests that the setpoint that was communicated by one of the PD chiefs was actually lower than the true setpoint in the office areas. However, the less occupied zones (weight room and upstairs) have lower setpoints. Lower temperature setpoints result in less heating savings during the winter due to weatherization measures.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	173.0
Fossil Fuel Reported savings (MMBtu)	89.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	84.0
Evaluated Fossil Fuel savings (MMBtu)	21.6
Summer kW Realization Rate	#N/A
kWh Realization Rate	49%
Fossil Fuel MMBtuh Realization Rate	24%

Program Type	**Municipal**
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	E16-C&IMU-2
Utility	Liberty
Evaluation Type	Desk Review
Meter status	
Measure Description	VFD on (1) 125 hp serving a lift pump at a wastewater plant
Reported Calculations	Reported savings for VFDs based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment. The baseline condition assumes the flow is controlled by a modulating valve instead of a variable frequency drive.
Notes on findings	Project installed a VFD on one 125HP lift pump. VFD reduces pump speed to match 90% flow requirment for 8 hours per day. Evaluated calculations assume lower average speed during peak periods as the pumps are not as weather dependant as other HVAC VFD applications.
Summer Reported savings (kW)	15.0
Reported savings (kWh)	75,968.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	25.2
Evaluated savings (kWh)	73,616.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	168%
kWh Realization Rate	97%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	N16147
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	Cycling Evaporator fan sets, Electronic temperature controls, EC Motors on Evaporator fans, Door closers, Reach-in door heaters
Reported Calculations	Reported savings based on custom spreadsheet calculations provided by contractor with assumed performance inputs for load profiles, duty cycles, and hours of operation in various conditions
Evaluation Analysis	Evaluated savings based on Refrigeration measures within the MA TRM 2016-2018 with inputs based on project specific data provided by the customer.
Notes on findings	
Summer Reported savings (kW)	4.3
Reported savings (kWh)	37,689.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	3.9
Evaluated savings (kWh)	36,512.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	91%
kWh Realization Rate	97%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	**Municipal**
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	N16173
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	computer management at a school - 103 computers in total
Reported Calculations	Reported savings are based on custom calculations using an audit of the school's computer inventory and performance. Data was recorded in the baseline mode for several weeks and determined operation hours in various power states: On, Off, Sleep, Hibernate.
Evaluation Analysis	Cadmus calculated saving based on the Non-res Network Computer Power Management measure from the Regional Technical Form. Performance inputs based on the audit provided in the reported documentation was utilized in calculating savings.
Notes on findings	Justification for baseline computer consumption in the reported savings calculations were unclear. Based on historical performance of a wide range of desktop computers and monitors as indicated in the RTF, Cadmus determines the baseline computer load to be 264 kWh/yr. The reported savings estimation of 25% savings over baseline was not documented. Based on various referenced studies, Cadmus calculates a savings of 117 kWh/yr. Cadmus assumes a heating in the school is through heat pumps. HVAC is not discussed in the reported savings.
Summer Reported savings (kW)	0.4
Reported savings (kWh)	3,811.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	0.8
Evaluated savings (kWh)	6,962.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	183%
kWh Realization Rate	183%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Municipal
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	RP-056-CR-16
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	DDC controls system upgrade
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus reviewed the energy model inputs and accepted the energy model reported savings.
Notes on findings	For this desk review, the energy model inputs were reviewed. Heating and cooling savings are reasonable with minimal documentation provided for support any changes to the energy model.
Summer Reported savings (kW)	1.8
Reported savings (kWh)	5,443.0
Fossil Fuel Reported savings (MMBtu)	473.9
Summer Evaluated savings (kW)	1.8
Evaluated savings (kWh)	5,443.0
Evaluated Fossil Fuel savings (MMBtu)	474.0
Summer kW Realization Rate	100%
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	Municipal
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S15237
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	EC Motors, evaporator controls, temp controls, glassdoor closers, door heater, drain pan heater
Reported Calculations	Reported savings based on custom spreadsheet calculations provided by contractor with assumed performance inputs for load profiles, duty cycles, and hours of operation in various conditions
Evaluation Analysis	Evaluated savings based on Refrigeration measures within the MA TRM 2016-2018 with inputs based on project specific data provided by the customer.
Notes on findings	
Summer Reported savings (kW)	3.8
Reported savings (kWh)	33,138.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	4.3
Evaluated savings (kWh)	32,321.3
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	114%
kWh Realization Rate	98%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Municipal
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	S17086
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	VFDs serving two 15 HP Hot water circulation pumps, one5HP fan, one 1.5HP fan, one 7.5HP fan, and one 5HP fan.
Reported Calculations	Reported savings for VFDs based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment. The baseline condition for pumps assume the flow is controlled by a modulating valve instead of a variable frequency drive. The baseline condition for fans are assumed to be constant speed without flow control.
Notes on findings	1) The load profile of the fan was modeled using best judgement and research. Cadmus modeled a low load pumps and HVAC fans.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	81,537.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	85,130.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	#N/A
kWh Realization Rate	104%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Propane
Sample Type	Random
Project ID	76481
Utility	NHEC
Evaluation Type	Site Visit
Meter status	
Measure Description	new condensing boiler and indirect water heater
Reported Calculations	Reported savings for boilers are based on the HVAC - Combo Water HEater/Boiler measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency. Evaluated savings for the indirect water heater were based on the indirect water heater measure from the MA TRM 2016-2018.
Notes on findings	Implementer's deemed savings values do not have a verified / cited source within the project application documents. MA 2019 TRM deemed savings values used as evaluated savings.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	42.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	49.5
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	117%

Program Type	RGGI
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	77366
Utility	NHEC
Evaluation Type	Site Visit
Meter status	
Measure Description	condensing boiler and side-arm water heater
Reported Calculations	Reported savings for boilers are based on the HVAC - Combo Water HEater/Boiler measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency. Evaluated savings for the indirect water heater were based on the indirect water heater measure from the MA TRM 2016-2018.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	45.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	69.2
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	151%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	AK-006A-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	Rise direct installed 2 programmable thermostats at Saddleback Pet Services and 9 feet of pipe insulation
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review.
Evaluation Analysis	Cadmus installed temperature sensors in three rooms of the community center to measure the effectiveness of night temperature setback savings from programmable thermostats. Evaluated savings were calculated based on the building shell measures from the MA TRM 2016-2018 and the programmable thermostate measure from the 2017 Connecticut Program Savings Document.
Notes on findings	programmable thermostats installed were not programmed when observed onsite.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	47.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	0%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	AK-20a-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Aerator - Rise direct installed 45 aerators - uploaded docs indicate audit report. No details on where aerators installed.
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review.
Evaluation Analysis	Evaluated savings were calculated based on the faucet aerator measure from the Mid-Atlantic TRM 2018. Faucet aerator inputs include observed flow rate, baseline flow rate, minutes of use per aerator per day, location (kitchen, restroom), average supply temperature, water heater type, and water heater efficiency. The baseline assumes a standard aerator flow rate of 2.5 gallons per minute.
Notes on findings	38 of 45 aerators installed in bathrooms. Restrooms assume 1.6 minutes per use instead of 4.5 minutes per use with kitchen faucet applications. Also, kitchen aerators (1.5 gpm) were installed at 90% of faucets instead of bathroom aerators (0.5 gpm). Lower use per aerator and higher flow per aerator resulted in a low realization rate.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	78.1
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	7.6
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	10%

Program Type	RGGI
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	CT-060-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	2 Propane boilers, Lochinvar model FTX850L (850 MBH ea, 97% eff) for CETA2 Building
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	215.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	347.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	161%

Program Type	RGGI
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Selected
Project ID	E17-RGCLB-2
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	Dartmouth College Steam Traps
Reported Calculations	Reported savings for Steam Traps are based on the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology and as-found steam system pressure and trap size.
Notes on findings	Note: This site is a university campus that has 1000's of steam traps. Site contact was not certain as to which steam traps were changed through this incentive making the evaluation a difficult task. Initial Steam pressure is set to 160 psi based on boiler observations. This is significantly higher than the assumed high pressure steam pressure from the TRM. MA TRM assumes pressure steam of 86.7 psi for a high pressure system. High steam pressure results in greater savings from steam traps and high realization rates
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	1,079.4
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	2,039.9
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	189%

Program Type	RGGI
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Selected
Project ID	PH-055-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	80 Steam Traps replaced or rebuilt, oil fired steam distribution system.
Reported Calculations	Reported savings for Steam Traps are based on the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology and as-found steam system pressure and trap size.
Notes on findings	Actual pressure observed onsite of 50 psig is used instead of the standard pressures used in the TRM. High steam pressure results in greater savings from steam traps and high realization rates.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	2,100.6
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	3,034.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	144%

Program Type	RGGI
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	PH-062-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Boiler in Granite Hall. 3,500 mmbtu oil fired boiler. HB Smith, 18 section
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Cadmus installed a power meter on the boiler blower to determine hours of use. Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	A biomass pellet boiler serves as a backup boiler for the incentivized oil boiler (Smith Cast 28HE Series). Installed efficiency = 86%. Baseline = 82%. The logger data shows consistent usage through March and even into April so any reduction in FLHrs due to the biomass boiler are negligible or incalculable.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	352.6
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	371.2
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	105%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Selected
Project ID	PH-076-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	APM replaced or rebuilt 46 steam traps.
Reported Calculations	Reported savings for Steam Traps are based on the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology and as-found steam system pressure and trap size.
Notes on findings	Actual pressure observed onsite of 66 psig is used instead of the standard pressures used in the TRM. High steam pressure results in greater savings from steam traps and high realization rates.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	1,201.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	2,110.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	176%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	PH-088-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	21 Stream Traps replaced or rebuilt
Reported Calculations	Reported savings for Steam Traps are based on the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology and as-found steam system pressure and trap size.
Notes on findings	Based on site data the hours of operations per year for the nine steam straps are 8,760 instead of the TRM standard hours of 2800 hours per year and for the remaining 12 steam traps it was 5,760 hours per year. Rather than use a 1/4 as recommended by the TRM we use a 7/32 or 0.218 as indicated in hte trap specifications. These changes result in a high realization rate.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	540.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	823.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	152%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	PH-100-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Installed 25 WiFi tstats
Reported Calculations	Reported savings for WiFi thermostats are based on prescriptive savings per thermostat. No site-specific project data impacts the reported savings and no calculations are provided.
Evaluation Analysis	Cadmus calculated savings for WiFi thermostats based on the calculation methodology outlined within the Set Back Thermostat measure within the 2017 Connecticut Program Savings Document. The baseline energy savings assume the space temperature is constant at all times. The WiFi thermostat energy use predictions are based on observed site findings for heating and cooling temperature setbacks, facility type, occupied hours per week, cooling capacity, heating capacity, and heating type.
Notes on findings	While WiFi connected, the Ecobee thermostats installed are not ES certified and do not meet all of the other product requirements set forth in the Mid-Atlantic TRM to be considered "Smart" and therefore are being evaluated as programmable thermostats instead. Thermostat setpoints observed to only have 2 degree setback temperature resulting in significantly lower savings.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	192.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	9.7
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	5%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	PH-111-HSR-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Installed 54 x 1.5GPM low flow shower heads.
Reported Calculations	Reported savings for showerheads are based on prescriptive savings per showerhead. No site-specific project data impacts the reported savings and no calculations are provided.
Evaluation Analysis	Cadmus calculated savings for showerheads based on the methodology outlined from the Low Flow Shower Head measure in the 2018 Mid-Atlantic Technical Reference Manual. Cadmus referenced the manufacturer's product specifications and performed spot measurements to determine the installed case flow rates.
Notes on findings	Calculations use default values with 1.5 gpm flow for the efficient case and 2.5 gpm for the baseline case. Reported savings calculations and inputs were not provided to understand why savings differ between the evaluated and reported calculations.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	286.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	136.9
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	48%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	PH-115-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Replacement of all 200 thermostatic steam traps.
Reported Calculations	Reported savings for Steam Traps are based on the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology and as-found steam system pressure and trap size.
Notes on findings	Reported savings account for only 15% of all traps since customer replaces all traps every 5-6 years. High steam pressure results in greater savings from steam traps and high realization rates.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	787.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	1,548.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	197%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	PH-116-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Replacing or rebuilding 63 steam traps.
Reported Calculations	Reported savings for Steam Traps are based on the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology and as-found steam system pressure and trap size.
Notes on findings	Actual pressure observed onsite of 50 psig is used instead of the standard pressures used in the TRM. High steam pressure results in greater savings from steam traps and high realization rates.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	1,654.2
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	3,034.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	183%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	PH-121-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Replaced or rebuilt 53 failed steam traps in kiln operation.
Reported Calculations	Reported savings for Steam Traps are based on the MA TRM 2016-2018 and utilize average steam trap pressure, average trap size, and expected trap failure rate.
Evaluation Analysis	Custom calculations utilize the 2016 ERS Steam Trap Evaluation Study methodology and as-found steam system pressure and trap size.
Notes on findings	-This site had both high pressure and low pressure steam systems. We are not sure if the reported savings were calculated using only high pressure steam. It is important to note that both the high and low pressure steam pressure setpoints observed on site and in the documentation are higher than those used by the MA TRM. The installed trap size is lower than assumed by the reported savings resulting in a low realization rate.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	1,391.7
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	966.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	69%

Program Type	RGGI
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	RH-076-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	Customer proposes to install 4 x Superior U model 220K BTU infrared heaters in tennis courts
Reported Calculations	Reported savings for Infrared Heaters are based on the Infrared Heaters measure from the MA TRM 2016-2018. The baseline efficiency case is a standard efficiency gas-fired unit hear with 80% combustion efficiency. The prescriptive savings do not account for heating capacity as all infrared heaters report 12.0 MMBtu savings per unit.
Evaluation Analysis	Cadmus installed temperature sensors to determine hours of use by IR heaters. Cadmus calculated savings based on the Gas Radiant Heater measure from the 2017 Connecticut Program Savings Document. The evaluated savings account for installed efficiency, heating capacity, and equivalent full load hours based on occupancy category.
Notes on findings	MA TRM uses deemed savings per unit heater regardless of size. Evaluation calculations utilized the temperature sensor data to determine IR heater hours of use associated with outside air temperature and occupancy schedule to inform the Equivalent Full Load Hours determination. Ultimately, hours of use data resulted in minimal differences in EFLH. The IR heater capacity is larger than assumed in the reported calculations resulting in high realization rates.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	192.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	292.5
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	152%

Program Type	RGGI
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	RH-102-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	New Store Renovation: Installation of two Viessmann 200W-100A, 352 MBH condensing boilers, 94.5% AFUE
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	117.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	218.2
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	186%

Program Type	RGGI
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	RP-017-HSR-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Installed 13 x Sunstar SIU 175 IR heaters.
Reported Calculations	Reported savings for Infrared Heaters are based on the Infrared Heaters measure from the MA TRM 2016-2018. The baseline efficiency case is a standard efficiency gas-fired unit hear with 80% combustion efficiency. The prescriptive savings do not account for heating capacity as all infrared heaters report 12.0 MMBtu savings per unit.
Evaluation Analysis	Cadmus calculated savings based on the Gas Radiant Heater measure from the 2017 Connecticut Program Savings Document. The evaluated savings account for installed efficiency, heating capacity, and equivalent full load hours based on occupancy category.
Notes on findings	MA TRM uses deemed savings per unit heater regardless of size . CT PSD calculation methodology used to calculate savings based on actual capacity (175k each). Eval uses 302 EFLH based on Kema study used to determine the reported deemed value
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	156.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	214.7
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	137%

Program Type	RGGI
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	73804
Utility	NHEC
Evaluation Type	Site Visit
Meter status	
Measure Description	insulating and sealing a crack in roof at high school
Reported Calculations	Reported savings were based on custom heat loss calculations. The calculations utilize crack or hole dimensions from a facility audit and calculates heat loss as a function of crack or hole area, average wind speed, average space temperature, average outside air temperature, average heating plant efficiency, and assumed heating degree days.
Evaluation Analysis	Cadmus performed a site visit to verify the sealed areas at the high school and calculated savings based on the Building Shell - Air Sealing Measure and Building Shell - Insulation measure from the MA TRM 2016-2018. The evaluated and reported calculations utilize an 80% baseline heating plant efficiency.
Notes on findings	savings reported based on simple heat loss calculation. Inputs and assumptions seem reasonable. Site observations indicate insulation and sealing has occurred. savings evaluated using MA TRM for multifamily insulation and air sealing measures. Savings discrepancies lie in the difference in calculation methodologies and inputs between reported and evaluated savings.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	422.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	211.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	50%

Program Type	RGGI
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Selected
Project ID	E17-RGCLB-1
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	Custom asphalt boiler and calculations (custom calcs provided)
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Because the boilers are used to process asphalt, the site contact indicated the boiler does not run during periods of the year when rain is forecasted or shortly after rain events. Total hours of use in evaluation methodology reduced based on projected precipitation hours in TMY3 weather data.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	1,088.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	721.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	66%

Program Type	RGGI
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Selected
Project ID	RH-007-WRX-16
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Comprehensive weatherization - R49 attic insulation. Duct sealing. (energy model used) - RH requested
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus reviewed the energy model inputs and accepted the energy model reported savings.
Notes on findings	Energy Model inputs reviewed. Comparison of energy model inputs shows that ceiling insulation and building sealing upgrades are modeled reasonably.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	1,939.0
Fossil Fuel Reported savings (MMBtu)	913.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	1,939.0
Evaluated Fossil Fuel savings (MMBtu)	913.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	RGGI
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	RH-092-WRX-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	air sealing, roof insulation, temperature setbacks
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus reviewed the energy model inputs and accepted the energy model reported savings.
Notes on findings	Energy model inputs reviewed. Heating energy savings of 31% due to improved insulation, reduced infiltration and temperature setbacks seem reasonable
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	43.4
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	43.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	99%

Program Type	RGGI
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	RH-101-CN-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	As part of gut reh-hab of restaurant and Inn rooms, upgrade building envelope beyond code. Average wall thickness 10" (R30 from densepack cavities) and R50 Roof (from spray insulation and rigid foam sheets).
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus reviewed the energy model inputs and accepted the energy model reported savings.
Notes on findings	Comparison of energy model inputs shows that the addition of wall and roof insulation has been modeled reasonably
Summer Reported savings (kW)	0.0
Reported savings (kWh)	270.0
Fossil Fuel Reported savings (MMBtu)	64.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	270.0
Evaluated Fossil Fuel savings (MMBtu)	64.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	99%

Program Type	RGGI
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	RH-103-WRX-17
Utility	Eversource
Evaluation Type	Site Visit
Meter status	
Measure Description	Building Envelope Upgrades: Adding attic insulation to R30, adding 6" fg batt insulation (R15) to exterior walls, and replacing windows.
Reported Calculations	Reported savings are based on an energy model using Carrier HAP Software.
Evaluation Analysis	Cadmus reviewed the energy model inputs and found differences between the site visit observations and the model inputs. Evaluated savings for insulation upgrades were calculated based on the DOE savings tool.
Notes on findings	Low realization rate attributed to difference in calculation methodology and inputs between the reported and evaluated savings.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	95.1
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	131.8
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	139%

Program Type	Small Business
Strata	HVAC
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	99484
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	(12) Air conditioners
Reported Calculations	Reported savings are based on the MA TRM 2016-2018 with baseline efficiencies based on the 2012 International Energy Conservation Code. Installed efficiency varies by AC unit capacity.
Evaluation Analysis	Evaluated savings were calculated based on the methodology described in the Unitary Air Conditioner measure from the MA TRM 2019-2021, baseline AC unit efficiencies described in the MA TRM 2016-2018, and full load hour estimates defined by building type in the 2017 Connecticut Program Savings Document.
Notes on findings	Evaluated HOU based on Retail cooling FLHrs from CT PSD (837). A typical office building would have Cooling FLHrs of 797. Retail facilities have higher full load cooling hours than a typical office building resulting in high realization rates.
Summer Reported savings (kW)	14.7
Reported savings (kWh)	11,117.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	11,858.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	0%
kWh Realization Rate	107%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	108845
Utility	Unitil
Evaluation Type	Site Visit
Meter status	
Measure Description	3 condensing boilers
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	321.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	512.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	159%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	109992
Utility	Unitil
Evaluation Type	Site Visit
Meter status	
Measure Description	2 condensing boilers
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	(2) 470 MBH 94% thermal efficiency boilers installed. Unclear why reported savings are high.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	429.2
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	248.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	58%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	119254
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	3 condensing boilers
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Mid-Atlantic TRM methodology with assumed full load heating hours based site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	321.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	512.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	159%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	120474
Utility	Unitil
Evaluation Type	Site Visit
Meter status	
Measure Description	1 condensing boiler
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	345.1
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	451.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	131%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G16-C&ISB-502
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	2 condensing boilers
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	214.6
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	314.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	146%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G16-C&ISB-86
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	Condensing boiler
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency units installed resulting in high realization rates. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	345.1
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	424.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	123%

Program Type	Small Business
Strata	HVAC
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-105
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	(5) condensing boilers
Reported Calculations	Reported savings for boilers are based on custom calculations utilizing annual gas consumption projections. Savings assume 23% reduction in therms.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Cadmus was unable to confirm the reported energy use reduction projections based on site visit observations. Low realization rates due to difference in calculation methodologies, assumed performance, and site observations.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	1,995.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	1,543.3
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	77%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-125
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	condensing boiler
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Very high efficiency unit installed resulting in a high realization rate. Installed efficiency not utilized in reported savings calculation
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	116.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	206.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	176%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-130
Utility	Liberty
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	condensing boiler
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Cadmus installed a power meter to monitor boiler burner operation. Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Motor logger results have been correlated to snow days during the logged period which amount to 11.3 hours of operation during and "around" (up to one day before and after) 28 days of snow (approximately 40%). The average number of snowfall days for 2014-2018 was averaged to 30.6 days/year and using the same ratio of 40%, we calculated an average run time of 12.35 day per year or 296.4 hours. Ajusted full load Heating hours to 870 based on ASHRAE Table. Previous hours of 296 per year seemed low for climate zone. Realization rate result due to difference in projected hours of use per year.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	107.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	90.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	84%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-274
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	insulation and direct fired makeup air units
Reported Calculations	Reported savings are based on a combination of custom and prescriptive calculations for. Calculation methodologies are based on the MA TRM 2016-2018 with inputs based on site visit audits.
Evaluation Analysis	Evaluated savings were calculated based on the MA TRM 2016-2018 with site-specific inputs found on site. Observed findings matched the reported calculation inputs and quantities. No discrepancies were observed onsite.
Notes on findings	Custom calculator was utilized for reported savings. Cadmus reviewed inputs and found assumptions reasonable.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	102.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	103.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	Small Business
Strata	HVAC
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-434
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	condensing boiler and programmable thermostat
Reported Calculations	Reported savings for boilers are based on the HVAC - Boilers measure from the MA TRM 2016-2018 and assume baseline efficiency that satisfies the International Energy Conservation Code 2012. Installed boiler thermal efficiency is assumed to be 0.9 based on the MA TRM 2016-2018.
Evaluation Analysis	Evaluated savings were calculated based on the Gas Boiler measure from the Mid-Atlantic TRM methodology with assumed full load heating hours based on site findings. Baseline boiler efficiency based on the MA TRM 2016-2018 and savings are calculated using the installed boiler efficiency.
Notes on findings	Installed boilers (2,500 MBH) are significantly larger than the boilers identified in the incentive documentation (500-999 MBH) and of higher efficiency resulting in high realization rates.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	110.5
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	363.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	329%

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	107645
Utility	Unitil
Evaluation Type	Site Visit
Meter status	
Measure Description	45 aerators (76.5 mmBTU), 47 showerheads (244.4 mmBTU), 1 programmable thermostat (7.7 mmBTU)
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review. Reported savings for showerheads are based on prescriptive savings per showerhead. No site-specific project data impacts the reported savings and no calculations are provided. Reported savings for programmable thermostats are based on prescriptive savings per thermostat. No site-specific project data impacts the reported savings and no calculations are provided.
Evaluation Analysis	Evaluated savings were calculated based on the faucet aerator measure from the Mid-Atlantic TRM 2018. Faucet aerator inputs include observed flow rate, baseline flow rate, minutes of use per aerator per day, location (kitchen, restroom), average supply temperature, water heater type, and water heater efficiency. The baseline assumes a standard aerator flow rate of 2.5 gallons per minute. Cadmus calculated savings for showerheads based on the methodology outlined from the Low Flow Shower Head measure in the 2018 Mid-Atlantic Technical Reference Manual. Cadmus referenced the manufacturer's product specifications and performed spot measurements to determine the installed case flow rates. Cadmus calculated savings for programmable thermostats based on the calculation methodology outlined within the Set Back Thermostat measure within the 2017 Connecticut Program Savings Document. The baseline energy savings assume the space temperature is constant at all times. The programmable thermostat energy use predictions are based on observed site findings for heating and cooling temperature setbacks, facility type, occupied hours per week, cooling capacity, heating capacity, and heating type.
Notes on findings	Aerators installed in bathrooms. Assume 1.6 min per use (as compared to 4.5 min per use for kitchen faucets). Programmable thermostat was not programmed. Evaluated calculations for showerheads increased daily use from the default value of 0.6 to 1 since this is the expectation for a hotel. Low realization rate primarily due to the majority of aerators installed in bathrooms instead of kitchens.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	320.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	211.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	66%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	110660
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	Compressed Air Project
Reported Calculations	Reported savings are derived from the MA TRM 2016-2018 savings algorithm for 25-75 HP compressors. Calculations assume 2,500 hours of operation with a 0.189 savings factor for the air compressor and a 0.00554 savings factor for the air dryer. The savings factors are derived from the MA 2016-2018, but no specific calculations are provided.
Evaluation Analysis	Evaluated savings are based on custom calculations utilizing the baseline and installed compressor horsepower, flow, plant elevation, pressure at rated flow, receiver volume, average operating pressure, hours of operation, and assumed load profile. The baseline compressor is assumed to be a 25 hp inlet modulating screw compressor.
Notes on findings	Differences in realization rates due to the differences in calculation inputs and calculation methodology.
Summer Reported savings (kW)	0.9
Reported savings (kWh)	26,588.9
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	5.3
Evaluated savings (kWh)	13,671.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	604%
kWh Realization Rate	51%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	111970
Utility	Unitil
Evaluation Type	Site Visit
Meter status	
Measure Description	7 Fryers
Reported Calculations	Reported savings calculations were not available for review. Tracking documentation indicates quantity of Fryers and total savings. MA TRM 2016-2018 assumed 51 mmBTU savings per fryer of any capacity.
Evaluation Analysis	Evaluated savings are based on the Energy Start Certified Commercial Kitchen Equipment calculator with inputs based on the site visit findings.
Notes on findings	Hours of operation adjusted to 14 hours per day based on site observations and staff interview. Reduced hours of use are the primary driver for a low realization rate.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	355.6
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	228.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	64%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	113024
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	Compressed Air Project
Reported Calculations	Reported savings are based on custom spreadsheet calculations. Calculations assume 3,380 hours of operation with a 0.206 savings factor derived from the MA 2015 Report TRM.
Evaluation Analysis	Evaluated savings are based on custom calculations utilizing the baseline and installed compressor horsepower, flow, plant elevation, pressure at rated flow, receiver volumen, average operating pressure, hours of operation, and assumed load profile. The baseline compressor is assumed to be a 25 hp inlet modulating screw compressor.
Notes on findings	Differences in realization rates due to the differences in calculation inputs and calculation methodology.
Summer Reported savings (kW)	3.3
Reported savings (kWh)	20,888.4
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	6.3
Evaluated savings (kWh)	21,792.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	189%
kWh Realization Rate	104%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	115210
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	Compressed Air Project
Reported Calculations	Reported savings are based on the MA TRM 2016-2018 savings algorithm. Calculations assume 2,500 hours of operation with a 0.189 savings factor for the air compressor and a 0.00554 savings factor for the air dryer. The savings factors are derived from the MA 2016-2018.
Evaluation Analysis	Evaluated savings are based on custom calculations utilizing the baseline and installed compressor horsepower, flow, plant elevation, pressure at rated flow, receiver volumen, average operating pressure, hours of operation, and assumed load profile. The baseline compressors are assumed to be inlet modulating screw compressors.
Notes on findings	Upgraded compressor from 15hp and 20 hp to 40 hp compressor. The project was not a 1 for 1 replacement. Differences in realization rates due to the differences in calculation inputs and calculation methodology.
Summer Reported savings (kW)	1.7
Reported savings (kWh)	52,074.5
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	8.6
Evaluated savings (kWh)	26,783.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	519%
kWh Realization Rate	51%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	119123
Utility	Unitil
Evaluation Type	Site Visit
Meter status	
Measure Description	1 tankless water heater
Reported Calculations	Reported savings are based on the Tankless Water Heater measure within the MA TRM 2016-2018. The measure assumes the baseline efficiecy satisfies the International Energy Conservation Code 2012. The assumptions that are used to determine the deemed savings within the MA TRM measure are based on a 2005 Tankless water heater study for the Energy Trust of Oregion.
Evaluation Analysis	Evaluated savings are based on the Tankless Water Heater measure algorithm within the MA TRM 2016-2018 and site observations.
Notes on findings	No discrepancies found between the calculation inputs and site findings.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	9.0
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	9.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	E16-C&ISB-6
Utility	Liberty
Evaluation Type	Desk Review
Meter status	
Measure Description	new air compressor
Reported Calculations	Reported savings are based on the MA TRM 2016-2018 savings algorithm. Calculations utilize hours of operation provided by the customer and savings factors derived from the MA 2016-2018 TRM.
Evaluation Analysis	Evaluated savings are based on custom calculations utilizing the baseline and installed compressor horsepower, flow, plant elevation, pressure at rated flow, receiver volumen, average operating pressure, hours of operation, and assumed load profile. The baseline compressors are assumed to be inlet modulating screw compressors.
Notes on findings	Load profile updated based engineering judgment. No load profile available in files. Realization rates due to difference in assumed load profile.
Summer Reported savings (kW)	5.7
Reported savings (kWh)	22,800.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	5.1
Evaluated savings (kWh)	20,746.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	90%
kWh Realization Rate	91%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	E17-C&ISB-6
Utility	Liberty
Evaluation Type	Desk Review
Meter status	
Measure Description	air compressor and storage tank
Reported Calculations	Reported savings are based on the MA TRM 2016-2018 savings algorithm. Calculations utilize hours of operation provided by the customer and savings factors derived from the MA 2016-2018 TRM.
Evaluation Analysis	Evaluated savings are based on custom calculations utilizing the baseline and installed compressor horsepower, flow, plant elevation, pressure at rated flow, receiver volumen, average operating pressure, hours of operation, and assumed load profile. The baseline compressors are assumed to be inlet modulating screw compressors.
Notes on findings	Differences in realization rates due to the differences in calculation inputs and calculation methodology.
Summer Reported savings (kW)	6.2
Reported savings (kWh)	18,540.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	6.3
Evaluated savings (kWh)	19,061.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	101%
kWh Realization Rate	103%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G16-C&ISB-197
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	(4) IR hreaters, 8,621 sqft of insulation at fire department
Reported Calculations	Reported savings for Infrared Heaters are based on the Infrared Heaters measure from the MA TRM 2016-2018. The baseline efficiency case is a standard efficiency gas-fired unit heater with 80% combustion efficiency. The prescriptive savings do not account for heating capacity as all infrared heaters report 12.0 MMBtu savings per unit.
Evaluation Analysis	Cadmus installed temperature sensors to determine infrared heater hours of use. Cadmus calculated savings based on the Gas Radiant Heater measure from the 2017 Connecticut Program Savings Document. The evaluated savings account for installed efficiency, heating capacity, and equivalent full load hours based on occupancy category.
Notes on findings	Logger data supports the assumed EFLH value of 1,416 hours from the 2017 CT PSD. Higher realization rates primarily due to the high heating capacity of the incentivized IR heaters.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	1,288.0
Fossil Fuel Reported savings (MMBtu)	220.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	2,526.0
Evaluated Fossil Fuel savings (MMBtu)	280.8
Summer kW Realization Rate	#N/A
kWh Realization Rate	196%
Fossil Fuel MMBtuh Realization Rate	127%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	G16-C&ISB-308
Utility	Liberty
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	2 VFDs
Reported Calculations	Reported savings for VFDs are based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Cadmus installed power meters to determine the load profile of the incentivized VFDs. Evaluated savings were based on custom calculations with load profiles based on end-use equipment.
Notes on findings	Reported values swapped mMBTUand kWh values when input into tracking workbook. 1) Cadmus uses metered data from site visit to calculate savings. 2) There should be no coincidence factor for kW demand savings as this is a restaurant and operates similarly throughout the year. 3) It was noted that the two fans were controlled by one controller on the kitchen floor. This controller as per the site contact is set to between 20% and 40% speeds when operating. this speed is significantly less than the assumptions made in the reported savings which were between 50% and 80% hence the main reason for the difference in savings.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	392.0
Fossil Fuel Reported savings (MMBtu)	908.5
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	16,109.0
Evaluated Fossil Fuel savings (MMBtu)	710.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	4109%
Fossil Fuel MMBtuh Realization Rate	78%

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G16-C&ISB-31
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	48 showerheads, 126 aerators
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review.
Evaluation Analysis	Cadmus calculated savings for showerheads based on the methodology outlined from the Low Flow Shower Head measure in the 2018 Mid-Atlantic Technical Reference Manual. Cadmus referenced the manufacturer's product specifications and performed spot measurements to determine the installed case flow rates. Evaluated savings were calculated based on the faucet aerator measure from the Mid-Atlantic TRM 2018. Faucet aerator inputs include observed flow rate, baseline flow rate, minutes of use per aerator per day, location (kitchen, restroom), average supply temperature, water heater type, and water heater efficiency. The baseline assumes a standard aerator flow rate of 2.5 gallons per minute.
Notes on findings	(10) of 126 aerators found in storage. Only 116 installed. 77% RR. For aerators (43) of 48 showerheads installed. 40% RR for showerheads
Summer Reported savings (kW)	3.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	463.8
Summer Evaluated savings (kW)	1.8
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	273.3
Summer kW Realization Rate	59%
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	59%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	G16-C&ISB-8
Utility	Liberty
Evaluation Type	Desk Review
Meter status	
Measure Description	Makeup Air Unit
Reported Calculations	Reported savings based on custom calculations with assumed inputs for building type, occupancy schedule, heating capacity, heating efficiency, cooling capacity, cooling efficiency, outside air tmmperature, and RTU control sequences of operation.
Evaluation Analysis	Evaluated savings based on a review of the reported custom calculations and comparison with energy model savings for a typical RTU with demand control ventilation control.
Notes on findings	
Summer Reported savings (kW)	0.0
Reported savings (kWh)	4,443.0
Fossil Fuel Reported savings (MMBtu)	160.9
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	4,443.0
Evaluated Fossil Fuel savings (MMBtu)	161.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	G16-C&ISB-98
Utility	Liberty
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	3 energy recovery ventilators, 13 furnaces - Use ERV Calculator
Reported Calculations	Reported savings based on custom calculations with assumed inputs for building type, occupancy schedule, heat recovery type, enthalpy wheel effectiveness, total airflow, heating capacity, heating efficiency, cooling capacity, cooling efficiency, outside air tmmperature, and RTU control sequences of operation.
Evaluation Analysis	Cadmus installed power meters on all three energy recovery ventilators. Evaluated savings were based on custom calculations utilizing power meter and temperature data to determine heat recovery effectiveness, hours of operation, airflow, and enable/disable setpoints.
Notes on findings	Variances in realization rates due to the measured heat recovery effectiveness, enthalpy wheel enable setpoints, and hours of operation.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	893.0
Fossil Fuel Reported savings (MMBtu)	574.8
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	887.0
Evaluated Fossil Fuel savings (MMBtu)	140.3
Summer kW Realization Rate	#N/A
kWh Realization Rate	99%
Fossil Fuel MMBtuh Realization Rate	24%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-106
Utility	Liberty
Evaluation Type	Desk Review
Meter status	
Measure Description	Kitchen Hood, MAU, water heater, fryer, oven, griddle, sprayer
Reported Calculations	Reported savings for the Make-Up Air handling unit are based on simple spreadsheet calculations with minimal inputs. Kitchen hood savings are based on custom calculations with assumed inputs for exhaust airflow, operating schedule, fan efficiency, and associated supply air ventilation conditioning requirements. Baseline condition assumes constant speed exhaust and supply fans.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on assumed kitchen use schedules and ventilation requirements.
Notes on findings	
Summer Reported savings (kW)	0.0
Reported savings (kWh)	27,117.0
Fossil Fuel Reported savings (MMBtu)	893.6
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	27,124.0
Evaluated Fossil Fuel savings (MMBtu)	900.8
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	101%

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-166
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	162 aerators
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review.
Evaluation Analysis	Evaluated savings were calculated based on the faucet aerator measure from the Mid-Atlantic TRM 2018. Faucet aerator inputs include observed flow rate, baseline flow rate, minutes of use per aerator per day, location (kitchen, restroom), average supply temperature, water heater type, and water heater efficiency. The baseline assumes a standard aerator flow rate of 2.5 gallons per minute.
Notes on findings	98% of aerators installed in bathrooms using 1.6 min per use instead of 4.5 min per use as specified for kitchen faucets. Due to lower use per aerator, lowere energy savings are realizaed.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	275.4
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	182.7
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	66%

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Selected
Project ID	G17-C&ISB-225
Utility	Liberty
Evaluation Type	Desk Review
Meter status	
Measure Description	DDC controls system upgrade, aerators
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review.
Evaluation Analysis	Evaluated savings were calculated based on the faucet aerator measure from the Mid-Atlantic TRM 2018. Faucet aerator inputs include observed flow rate, baseline flow rate, minutes of use per aerator per day, location (kitchen, restroom), average supply temperature, water heater type, and water heater efficiency. The baseline assumes a standard aerator flow rate of 2.5 gallons per minute.
Notes on findings	Controls upgrade - Night Setback and Scheduling. Energy model not available for review
Summer Reported savings (kW)	0.0
Reported savings (kWh)	89,706.0
Fossil Fuel Reported savings (MMBtu)	1,182.1
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	89,706.0
Evaluated Fossil Fuel savings (MMBtu)	1,182.0
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	100%

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-276
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	95 aerators, 100 showerheads
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review.
Evaluation Analysis	Evaluated savings were calculated based on the faucet aerator measure from the Mid-Atlantic TRM 2018. Faucet aerator inputs include observed flow rate, baseline flow rate, minutes of use per aerator per day, location (kitchen, restroom), average supply temperature, water heater type, and water heater efficiency. The baseline assumes a standard aerator flow rate of 2.5 gallons per minute.Cadmus calculated savings for showerheads based on the methodology outlined from the Low Flow Shower Head measure in the 2018 Mid-Atlantic Technical Reference Manual. Cadmus referenced the manufacturer's product specifications and performed spot measurements to determine the installed case flow rates.
Notes on findings	Calculated savings based on measured flow rates at a sample of aerators, measured hot water supply temperature. Low realization ratdes due to the high percentage of aerators installed in bathrooms instead of kitchens.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	426.5
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	346.9
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	81%

Program Type	Small Business
Strata	Other
Calculation Type	Deemed
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-278
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	177 aerators, 87 showerheads, 85 programmable thermostats
Reported Calculations	Reported savings are based on an energy audit. The energy audit savings calculations were not available for review. Reported savings for showerheads are based on prescriptive savings per showerhead. No site-specific project data impacts the reported savings and no calculations are provided. Reported savings for programmable thermostats are based on prescriptive savings per thermostat. No site-specific project data impacts the reported savings and no calculations are provided.
Evaluation Analysis	Evaluated savings were calculated based on the faucet aerator measure from the Mid-Atlantic TRM 2018. Faucet aerator inputs include observed flow rate, baseline flow rate, minutes of use per aerator per day, location (kitchen, restroom), average supply temperature, water heater type, and water heater efficiency. The baseline assumes a standard aerator flow rate of 2.5 gallons per minute. Cadmus calculated savings for showerheads based on the methodology outlined from the Low Flow Shower Head measure in the 2018 Mid-Atlantic Technical Reference Manual. Cadmus referenced the manufacturer's product specifications and performed spot measurements to determine the installed case flow rates. Cadmus calculated savings for programmable thermostats based on the calculation methodology outlined within the Set Back Thermostat measure within the 2017 Connecticut Program Savings Document. The baseline energy savings assume the space temperature is constant at all times. The programmable thermostat energy use predictions are based on observed site findings for heating and cooling temperature setbacks, facility type, occupied hours per week, cooling capacity, heating capacity, and heating type.
Notes on findings	Reduced evaluated energy savings are primarily due to variances in observed setback temperatures for programmable thermostats.
Summer Reported savings (kW)	0.0
Reported savings (kWh)	0.0
Fossil Fuel Reported savings (MMBtu)	531.5
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	476.4
Summer kW Realization Rate	#N/A
kWh Realization Rate	#N/A
Fossil Fuel MMBtuh Realization Rate	90%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Gas
Sample Type	Random
Project ID	G17-C&ISB-98
Utility	Liberty
Evaluation Type	Site Visit
Meter status	
Measure Description	controls upgrade and programmable thermostats
Reported Calculations	Reported savings are based on a custom spreadsheet calculation workbook. Calculation inputs include weather data, building envelope characteristics, occupancy schedule, space temperature setpoints, night temperature setback setpoints, insulation characteristics, and infiltration assumptions.
Evaluation Analysis	Cadmus calculated savings for programmable thermostats based on the calculation methodology outlined within the Set Back Thermostat measure within the 2017 Connecticut Program Savings Document. The baseline energy savings assume the space temperature is constant at all times. The programmable thermostat energy use predictions are based on observed site findings for heating and cooling temperature setbacks, facility type, occupied hours per week, cooling capacity, heating capacity, and heating type. Cadmus reviewed the calculation inputs and assumptions for the controls upgrade and found them to be reasonable and accurate.
Notes on findings	
Summer Reported savings (kW)	0.0
Reported savings (kWh)	12,817.0
Fossil Fuel Reported savings (MMBtu)	392.3
Summer Evaluated savings (kW)	
Evaluated savings (kWh)	12,817.0
Evaluated Fossil Fuel savings (MMBtu)	377.1
Summer kW Realization Rate	#N/A
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	96%

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S16088
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	instant on plastic wrappers
Reported Calculations	Reported savings for instant-on plastic wrap machines are based on custom calculations. Calculation inputs include quantity, wattage, and run hours per year. The baseline calculations assume the wrap machines are not utilized 90% of the time they are on.
Evaluation Analysis	Evaluated savings based on a custom calculator from the product manufacturer. Evaluated inputs match the reported inputs.
Notes on findings	Lower energy savings are realized when energy performance is calculated using the maufactuerer's product specific calculations as compared to the reported calculations.
Summer Reported savings (kW)	1.1
Reported savings (kWh)	4,508.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	0.9
Evaluated savings (kWh)	3,798.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	84%
kWh Realization Rate	84%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17033
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	Project installed 8 VFDs, 7 on 5HP HVAC Supply Fans and 1 on a 3HP Supply HVAC Fan
Reported Calculations	Reported savings for VFDs are based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment. Interactive effects are accounted for by combining the savings calculations for VFDs.
Notes on findings	Realization rate variances due to differences in the assumed load profiles of the VFDs.
Summer Reported savings (kW)	8.0
Reported savings (kWh)	35,122.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	9.0
Evaluated savings (kWh)	35,538.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	112%
kWh Realization Rate	101%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17034
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	9 VFDs on 5HP HVAC Supply Fans
Reported Calculations	Reported savings for VFDs are based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment. Interactive effects are accounted for by combining the savings calculations for VFDs.
Notes on findings	Realization rate variances due to differences in the assumed load profiles of the VFDs.
Summer Reported savings (kW)	4.0
Reported savings (kWh)	35,122.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	7.6
Evaluated savings (kWh)	42,084.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	189%
kWh Realization Rate	120%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17078
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	air sealing and insulation
Reported Calculations	Reported savings are based on a custom energy model. The energy model was not available for review.
Evaluation Analysis	Cadmus reviewed the energy model inputs and created a custom energy model to determine evaluated savings.
Notes on findings	TREAT model inputs reviewed. Analysis workbook shows annual energy and demand savings. Energy savings based on package savings listed in Proposed Treat File XML (as opposed to individual improvements which are higher by themselves but do not account for interactive effects) minus window replacement which was not included in the final scope. Demand savings for insulation was based on MA 2019 TRM algorithm and for infiltration reductions it was based on the NY 2019 TRM.
Summer Reported savings (kW)	14.4
Reported savings (kWh)	16,764.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	7.4
Evaluated savings (kWh)	22,104.1
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	51%
kWh Realization Rate	132%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17164
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	air compressor and storage tank
Reported Calculations	Reported savings are based on the MA TRM 2016-2018 savings algorithm. Calculations utilize hours of operation provided by the customer and savings factors derived from the MA 2016-2018 TRM.
Evaluation Analysis	Evaluated savings are based on custom calculations utilizing the baseline and installed compressor horsepower, flow, plant elevation, pressure at rated flow, receiver volumen, average operating pressure, hours of operation, and assumed load profile. The baseline compressors are assumed to be inlet modulating screw compressors.
Notes on findings	Load profile updated based engineering judgment. No load profile available in files. Realization rates due to difference in assumed load profile.
Summer Reported savings (kW)	4.9
Reported savings (kWh)	43,229.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	12.6
Evaluated savings (kWh)	40,370.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	255%
kWh Realization Rate	93%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Other
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17228
Utility	Eversource
Evaluation Type	Site Visit
Meter status	Meters installed
Measure Description	hot water pump VFDs.
Reported Calculations	Reported savings for VFDs are based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment. Interactive effects are accounted for by combining the savings calculations for VFDs.
Notes on findings	1) Cadmus realizes zero savings for this project. Based on the metered data only one pump operates and it is at full load. The second pump is in off mode. The pump that operates (Pump 2) is set to on-hand and is running at 53 hertz. See pictures and data. 2) Therefore the VFDs are not operating as per design and are not controlling the pump speed
Summer Reported savings (kW)	7.7
Reported savings (kWh)	67,314.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	0.0
Evaluated savings (kWh)	
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	0%
kWh Realization Rate	0%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Refrigeration and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	115545
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	Project installed 9 VFDs in total on RTUs. Three 2 hp motors, five 3 hp motors, and one five hp motor
Reported Calculations	Reported savings for VFDs are based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment. Interactive effects are accounted for by combining the savings calculations for VFDs.
Notes on findings	Load profile of the fans was estimated to be a standard profile for HVAC fans. However the TRM load profile is different and hence the possible difference in savings.
Summer Reported savings (kW)	5.7
Reported savings (kWh)	32,038.7
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	7.8
Evaluated savings (kWh)	33,989.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	138%
kWh Realization Rate	106%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Refrigeration and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	116121
Utility	Unitil
Evaluation Type	Desk Review
Meter status	
Measure Description	EC Motors
Reported Calculations	Reported savings for VFDs based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Evaluated savings were based on custom calculations with load profiles based on end-use equipment
Notes on findings	
Summer Reported savings (kW)	0.7
Reported savings (kWh)	5,388.8
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	0.7
Evaluated savings (kWh)	5,389.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	101%
kWh Realization Rate	100%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Refrigeration and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Selected
Project ID	N17109
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	EC Motor Controller, EC Motors
Reported Calculations	Reported savings for EC motors are based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Cadmus calculated saving based on the MA TRM 2016-2018 with power reduction per unit calculated based on installed EC Motor nameplate
Notes on findings	The 114,000+ kWh annual savings is cited briefly in project documents but unjustified based on all calculation documents. The implementer assumed that the motors would operate for 8,760 hours which contradicts all TRMs (specifically the MA TRM which we referenced to calculated ECM savings).
Summer Reported savings (kW)	13.1
Reported savings (kWh)	114,060.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	14.2
Evaluated savings (kWh)	90,818.2
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	109%
kWh Realization Rate	80%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Refrigeration and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	S17327
Utility	Eversource
Evaluation Type	Desk Review
Meter status	
Measure Description	EC Motors
Reported Calculations	Reported savings for EC motors are based on custom calculations with assumed motor efficiencies, hours of use, and load profiles provided by contractor.
Evaluation Analysis	Cadmus calculated saving based on the MA TRM 2016-2018 with power reduction per unit calculated based on installed EC Motor nameplate
Notes on findings	savings updated based on cutsheets
Summer Reported savings (kW)	0.9
Reported savings (kWh)	5,697.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	1.1
Evaluated savings (kWh)	5,397.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	124%
kWh Realization Rate	95%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	Small Business
Strata	Refrigeration and Motors
Calculation Type	Calculated
Energy Type	Electric
Sample Type	Random
Project ID	W17099
Utility	Eversource
Evaluation Type	Site Visit
Meter status	Trend data collected
Measure Description	condensors, evaporator fans, door heaters for refrigeration system
Reported Calculations	Reported savings are based on custom calculation workbooks generated vy the vendor. The calculation account for assumptions including compressor power, compressor efficiency, condensor power, condensor efficiency, run-time hours, temperature setpoints, door heater characteristics, case motor characteristics, door lights energy use, outside air temperatures, and load profiles.
Evaluation Analysis	Cadmus collected one year of trend data from the refrigeration system including condenser fan energy use, compressor energy use, circulation fan energy use, cooler temperature, space tempeature, evaporator temperature, free aire control mode status, and outside air temperature. With the collected data, Cadmus developed custom calculations to simulate energy use between the baseline and proposed conditions. Evaluated savings are based on the difference in these two simulations.
Notes on findings	Main reason for the difference in savings is that the Freeaire system operates less than was assumed in the reported savings. Cadmus determined that the freeaire system operates when the outside temperature is less than 30F. Based on the daily average temperature for a 1 year period and the power metering of the unit, Cadmus is able to Simulate the performance of the unit in the pre and post periods. It was determined that the Freeaire system does not completely shut of the compressors in the unit, but it does reduce the load of the compressors by 16-20%. This was based on data from the freeaire online system over a period of 1 year
Summer Reported savings (kW)	10.9
Reported savings (kWh)	79,174.0
Fossil Fuel Reported savings (MMBtu)	0.0
Summer Evaluated savings (kW)	9.4
Evaluated savings (kWh)	73,273.0
Evaluated Fossil Fuel savings (MMBtu)	
Summer kW Realization Rate	86%
kWh Realization Rate	93%
Fossil Fuel MMBtuh Realization Rate	#N/A

Program Type	
Strata	
Calculation Type	
Energy Type	
Sample Type	
Project ID	
Utility	
Evaluation Type	
Meter status	
Measure Description	
Reported Calculations	
Evaluation Analysis	
Notes on findings	
Summer Reported savings (kW)	0.0
Reported savings (kWh)	1,288.0
Fossil Fuel Reported savings (MMBtu)	323.7
Summer Evaluated savings (kW)	0.0
Evaluated savings (kWh)	2,526.0
Evaluated Fossil Fuel savings (MMBtu)	383.8
Summer kW Realization Rate	#N/A
kWh Realization Rate	196%
Fossil Fuel MMBtuh Realization Rate	119%