

Decarbonization Training for Facility Managers

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ABSTRACT

To combat climate change, companies across the globe are setting ambitious decarbonization goals. Facility managers, trained to make sure buildings are operating properly, are now tasked with the additional responsibility of finding ways to make these buildings operate more efficiently and depend less on fossil fuels to help their companies reach their greenhouse gas reduction goals. Eversource, an electric and natural gas utility in the Northeast, has devised several support mechanisms to help train facility managers so they are prepared for these new tasks. Through its facility manager training program, Eversource offers studies that focus on equipment benchmarking and monitoring, energy treasure hunts, and customized training. This training program aims to equitably advance energy performance across the commercial and industrial sectors and help facility managers identify solutions to increase building operations efficiency, track reduced energy consumption, and achieve greenhouse gas reductions.

This paper will discuss the best practices for training facility managers to meet the challenges associated with decarbonization and discuss lessons learned from developing a training-based program. It will also discuss how to engage and train facility managers so they can act as a change agent, proposing solutions that can help their company exceed decarbonization goals. Training the responsible facility managers to look for innovative efficiency and zero-carbon solutions is essential, especially for companies that strive to be successful in meeting their decarbonization goals.

Introduction

After a dip in 2020, greenhouse gas (GHG) emissions continue to rise precipitously (IEA, 2021). The exacerbated consequences of climate change draw closer, including increased global temperatures, more extreme weather events, and limited access to basic resources (IEA, 2021). Scientists have cautioned that GHG emissions must fall by 45% this decade to keep global temperatures from increasing 1.5 degrees Celsius above pre-industrial levels. Failing to do this would cause substantial irreversible damage (IPCC, 2020; Harvey, 2021). The global average temperature has risen 1.2 degrees Celsius and, based on our current trajectory, is on track to rise more than 2.4 degrees Celsius by the end of this century (Harvey, 2021). In response, federal and local governments and industries worldwide have committed to reducing GHG emissions in a last-ditch effort to meet the climate goals set within the Paris Agreement, the goal of which is to keep the average global temperature from rising more than 1.5 degrees Celsius. The latest IPCC report warned that climate resilience development is more urgently needed than previously reported, as we near adaptation limits (IPCC, 2022).

Buildings are a major source of GHG emissions, globally accounting for 37% of energy-related CO₂ emissions in 2020 (UNEP, 2021). To combat climate change and meet climate goals, buildings will need to almost completely decarbonize by 2050, requiring a heavy investment in energy efficiency (UNEP, 2021). The United Nations Framework Convention on Climate Change (UNFCCC) and International Energy Agency (IEA) warned that, to meet these ambitious goals, the built environment will need to cut its GHG emissions in half by 2030. New

buildings will have to be constructed to a net zero standard and existing infrastructure will need to invest deeply in energy efficiency upgrades (UNFCCC, 2021; UNEP 2021). Consequentially, companies across the globe are setting decarbonization goals which entail reducing energy demand through behavior change, electrification, and investing in energy efficiency. Decarbonization has become a key term used to describe efforts to phase out greenhouse gases from the process chain. This involves reducing carbon from generation and, on the demand-side, replacing fossil fuel building equipment with electric alternatives (ETIA S.A.S., 2019). Facility managers have control over the second strategy.

As a result of increased awareness of climate change, the energy efficiency professional services job market has also expanded - with 54,000 net jobs added in 2019 (2020 U.S. Energy and Employment Report Energy Jobs, 2020). There is a wide range of varied specializations within this sector. While some energy professionals lend a macro perspective in reviewing global climate policy and data, others are overseeing the operations of the buildings and systems contributing to overall emissions. There is often a disconnect between the two: those setting GHG goals at an upper level and the facility managers who must deliver on the goals set for them. Facility managers have had energy efficiency measures on their radar for decades, the driver of these initiatives being reduced operating costs and a quick return on investment. However, it is becoming more apparent that company goals are now expanding to include decarbonization. This change tasks facility managers, who are frequently shorthanded, with finding ways to help their companies reduce GHG emissions without compromising proper building operations. Simply put, decarbonization has become part of the facility manager's role. Despite this and given the importance of their daily roles, there is a limited number of decarbonization-focused resources that effectively target facility managers and are easily assessable. Current resources broadly focus on energy efficiency and sustainability and require financial or time investments many facility managers cannot afford. However, training facility managers to act as change agents by proposing solutions that can help companies exceed decarbonization goals has become essential.

Background

Greenhouse Gas Reduction Goals

While there has been renewed interest in establishing decarbonization goals primarily centered around reaching net zero by 2050 at the international and local government levels, companies throughout Connecticut have been setting their own goals. Some companies have gone as far as establishing roadmaps to achieve these goals, which lay out a detailed plan to guide facility managers striving to meet these goals. Eversource, the largest utility provider in New England, was the first utility to set a goal to achieve carbon neutrality by 2030. The utility instituted a plan to increase adoption of electric vehicles and chargers, reduce methane leaks in the natural gas distribution system, reduce line loss, and invest in energy efficiency upgrades throughout its many facilities. GHG emissions are carefully tracked, and progress is reported publicly. Since 2018, Eversource has reduced its GHG footprint by 17%. Establishing a defined goal and roadmap focused on GHG reduction became key to engaging company representatives, including facility managers, to propose solutions designed to keep the utility on target and it served as an example of positive facility manager engagement.

Subsequently, several large companies in Connecticut have also set goals ranging from committing to net zero for Scope 1, 2 and 3 emissions, to a certain percent reduction by 2030 or 2050. After a series of discussions with manufacturers in Connecticut, Eversource discovered that many of the GHG reduction plans proposed are centered around the same strategies including increasing renewable generation, investing in energy efficiency, and electrification of cooling and heating equipment along with transportation. These GHG reduction plans often have short- and long-term goals incorporated. However, when facility managers were asked if they were involved in setting the goal, they answered in the negative – despite how critical facility managers are in accomplishing these goals. In addition, while facility managers stated that their company was tracking GHG emissions, they did not have a clear plan on how to reduce GHGs to reach the established goal. For companies that do not yet have GHG goals, being able to refer to successful examples can assist them in establishing their own plan of action.

As businesses continue to set these goals, utilities can play a crucial role in training this generation of facility managers to look for GHG solutions. Eversource offers 6 programs to assist facility managers and continues to revise program offers to address modern-day challenges associated with reducing GHGs. While utilities have a longstanding history of providing energy efficiency programs, these programs are evolving to place equal importance on GHG reductions as well as electric and natural gas savings.

The Traditional Role of Facilities Managers and Building Operators

The term “facility manager” encompasses a large swath of building management professionals. A facility manager may include entire operations teams of building engineers, energy managers, and technicians as well as contractors who are called upon as needed. As the title of the person managing the facility can vary, so do their roles based on the size and complexity of the site. A facility manager may maintain a portfolio of properties, a campus with a centralized boiler plant and numerous outbuildings, a forty-story skyscraper, or a five-floor brick and mortar construction from the early 1900s. Regardless of building type, historically, facility managers were responsible for everyday building operation including heating, ventilation, and air conditioning (HVAC), plumbing, electrical, structural components, and ground maintenance. The building manager was the person solely responsible for the safety and comfort of the building’s occupants and ensuring that all scheduled maintenance was being handled. They were the first point of contact for any emergencies that should arise and for getting systems back up and running as quickly as possible. Annual budgets were carefully arranged to accommodate necessary capital repairs and improvements while allowing for emergency repairs throughout the year.

Throughout the past 30-40 years, updates in technology have streamlined these tasks. HVAC controls migrating from pneumatic to direct digital control (DDC) and the integration of computer front end systems have provided a visual interface with many of the components that would previously have been physically inspected. Improvements in lighting systems have increased fixture lifespans and eased maintenance. These enhancements have reduced the amount of time facility managers are required to spend on manual tasks. However, while technological advancements are expected, facility managers may not have anticipated dealing with impending greenhouse gas, carbon footprint, or efficiency goals.

There are several certification programs to assist energy professionals in keeping up with modern advancements that provide some training on energy efficiency and sustainability concepts. The Association of Energy Engineers (AEE) offers a Certified Energy Manager (CEM) accreditation along with several other specialized training courses, primarily focused on energy efficiency. The U.S. Green Building Council offers a Leadership in Energy and Environmental Design (LEED) accreditation, focused on sustainability which includes energy efficiency and renewable energy topics. However, these certifications do not necessarily target front-line facility managers. Other certifications that do cater to facility managers include the Certified Facility Manager (CFM) and Sustainability Facility Professional (SFP) credentials offered through the International Facility Management Association which covers a variety of specialties. However, facility managers may need support from leadership to attend and some do not have the time or backup. This limits their personal growth as well as the welfare of their facility. Facility managers need additional tools focused on decarbonization and electrification to assist them in achieving goals. One option for training for facility managers is to turn to utility energy efficiency departments.

Utility Strategies for Facility Managers Outreach and Training

There is no one-size-fits-all approach to energy efficiency and decarbonization training. As utilities in the Northeast shift to focus on GHG reductions, there are several ways to work with facility managers on training through small one-on-ones and larger group settings.

One on One Trainings

The preferred method of training has been direct interaction between the utility and the customer. The ability to sit face-to-face with a customer to learn about their company, their business, and the people that work in the facility is invaluable. Through one-on-one interactions, the utility representatives can learn more about company goals. It is also an opportunity to review the level of understanding the facility manager has regarding GHG reporting. While a facility manager may be well versed in every aspect of their operation, many of the concepts associated with GHGs are ancillary to their everyday operations and they do not have the time, bandwidth, or personnel to leverage a full-scale energy conservation program on their own.

One-on-one training gives utility representatives the opportunity to work with the customer to frame out the goal, better understand how the facility works and to establish a plan of action. It is also a time for the customer to begin thinking about capital and how to present ideas to upper management with the assistance of utility incentives. The drawbacks of one-on-one training are time-constraints; therefore, the utility relies on a network of approved vendors to assist with operating program offerings to increase market penetration.

Industry Specific Group Trainings

The second way utilities interface with facility managers is by working with large industry groups. One of the first industry-based group training courses involved the Connecticut Center for Advanced Technology (CCAT) which focused on the precision manufacturing segment. Connecticut has always been known as a manufacturing state as there is a large presence of aerospace, defense, and precision machining. There are many organizations these manufacturers belong to, and they work in close alignment with one another. Industry specific groups trainings serve as a vital opportunity for the utility to discuss its offerings and to learn

more about how programs should be designed to assist the industry. The CCAT training covered Industry 4.0 and how artificial intelligence is being used in improving efficiency and accuracy in computer numerical control (CNC) manufacturing, the chance for education was reciprocal. Shortly after the CCAT meeting, the utility had additional opportunities to present to various organizations including the Small Manufacturers Association of CT. These ongoing opportunities give the utility a platform to discuss GHG reduction program offerings with customers.

Utility Program Roll-Out Trainings

A third training opportunity is offered at Eversource's annual meetings in CT, MA, and NH - held for program contractors and any customers interested in taking advantage of proposed incentive programs. These trainings serve as a forum not only to announce updates to the existing programs, but to provide a place for discussions about industry trends, the outlook of the energy industry, and how the utility can best serve customers so they may exceed GHG targets. These forums offer an opportunity to engage with hundreds of specialized energy contractors throughout the Northeast who work daily with customers on energy efficiency projects.

Regardless of how utility-customer interactions are initiated, the utility representative's goal is to enroll the customer in a study that can put them on the right path to achieve their GHG goals by finding the best path forward that will lead to a comprehensive list of potential measures and train the facility manager to seek out customized solutions.

Utility Energy Efficiency Programs Aimed to Help Facility Managers

To assist facility managers in helping their companies reach their GHG reduction goals Eversource has tested six programs aimed specifically at engaging facility managers in several ways. These programs are listed below.

- 1 - Eversource's Energy Usage Assessment (EUA)
- 2 - Process Reengineering for Increased Manufacturing Efficiency (PRIME)
- 3 - Strategic Energy Management (SEM)
- 4 - Retro-Commissioning (RCx)
- 5 - Virtual Treasure Hunts
- 6 - Operations and Maintenance Studies (OMS).

Progress through each program is carefully tracked as well as the associated energy savings in kWh or therms/ccf and GHGs not emitted including carbon dioxide (CO₂), SO₂ and NO_x for any measures implemented. Prioritizing GHG savings as part of the reporting structure is one way the utilities are demonstrating the prioritization of GHG reductions and energy efficiency, reframing discussions that primarily focused on energy savings. These numbers are readily available to the customer. In addition, the total GHG savings for all the programs run by the utility through the energy efficiency programs are reported annually to the state. Below are Connecticut's 2021 GHG savings achieved after implementation of the energy efficiency utility programs.

Table 1: Connecticut's 2021 GHG Program Savings

	Estimated Annual Savings 2021 (Tons) ¹			Estimated Lifetime Savings 2021 (Tons) ¹		
	Electric	Natural Gas	Fuel Oil and Propane	Electric	Natural Gas	Fuel Oil and Propane
Air Emissions						
Sulfur oxides (SO _x)	3	0	0	31	3	7
Nitrous oxides (NO _x)	15	28	24	156	448	479
Carbon dioxide (CO ₂)	95,640	37,582	28,507	1,012,266	606,864	579,095

¹ CO₂ emissions are in short tons.

Table 1. Energize Connecticut. Energy Efficiency Board 2021 Programs and Operations Report. March 2022. Print.

The savings in Table 1. were achieved through various program offers including the six described below which often serve as the catalyst for facility managers eager to implement projects that reduce GHGs.

1. Energy Utilization Assessment (EUA)

Energy Utilization Assessment (EUA) aims to actively connect facility managers with Eversource-approved energy efficiency vendors to identify custom energy efficiency solutions that target process equipment. The vendors are expected to make three to four site visits to deploy data loggers and perform an assessment of the on-site process equipment. The EUA program engages the facilities team to help identify solutions and pain points, examining process loads including chilled water, compressed air, conveyor systems, refrigeration, the heating, ventilation and air conditioning (HVAC) system & controls, and dust collection systems. The full assessment cost is eligible to be covered by the utility if the customer moves forward with repairs. To participate in the program, customers must have an annual electric consumption of at least two million kWh. The goal of the EUA is to identify opportunities alongside the facility managers for energy efficiency and GHG reductions. Following the final report, the customer decides which measures to implement based on the greatest energy and cost savings.

Between 2020 and 2021, Eversource worked with nearly a dozen customers on EUA assessments. One customer Eversource worked with has a corporate office in Germany that provided goals for GHG emission and energy reductions based on their overall production with aggressive targets for 2030. The company is looking to take their already-accomplished energy program and build upon it by engaging a team of four facility managers. The EUA will review plant operations including their energy intensive clean-room operations. Throughout the process the company has been receptive to any recommendations for improvement in HVAC, compressed air, and high-pressure steam applications. EUAs are a starting point for facility managers to engage with utilities on devising a GHG reduction roadmap and developing a comprehensive list of measures to assist with achieving those goals. The program is streamlined, 100% of the time leads to the implementation of projects and provides one-on-one mentorship and training through a qualified approved vendor. The quality of GHG training however, does weigh heavily on the approved-vendor expertise. While some vendors make GHG instruction a

priority alongside energy efficiency, other vendors stay within their area of expertise which is primarily energy efficiency.

2. Strategic Energy Management (SEM)

Strategic Energy Management (SEM) is a program that may follow an EUA and involves a more in-depth view of how a customer is using energy. While SEM programs have been around for a while, Eversource has reframed the program to include a GHG reduction lens. This program proactively creates steps to reduce the company's overall energy usage and GHG footprint through long-term strategic planning. It is designed for customers who have a carbon reduction goal they need to achieve and are looking for a more detailed and long-term roadmap. Facility managers may already be familiar with SEM programs for energy efficiency but may not realize that SEM can concurrently address GHG reduction planning. To participate in the program, companies must commit to long-term engagement at the leadership level through a Letter of Intent and must identify an energy champion from the facility. It is encouraged that the facility SEM team is cross-functional and includes the facility managers, business management, and leadership. Since GHG goals require the entire company to be involved, it is important to engage all employees across the company who are impacted by the projects. The SEM program goal is to actively engage and train facility managers to identify their own solutions for inefficiencies, creating greater company buy-in and making SEM and GHG reduction a part of the company culture and operations.

SEM targets commercial and industrial (C&I) customers that use five million kWh or more annually and begins with an in-depth study of current energy and GHG usage. The SEM team includes the customer, a utility representative, and one of the utility's approved SEM vendors. Throughout the program the customer is intimately involved in the improvement of their facility and utilizes program technical assistance and incentives for the measures being implemented. Technical assistance is essential in guiding the customer to look for energy solutions and facility managers learn via the Eversource approved vendor how to do their own energy calculations and use basic data logger tools. The cost of the SEM Eversource-approved vendor is covered by the utility and incentives for behavior or equipment measures vary based on energy savings. The SEM program often runs for 3 years or more, though it is dependent on the customer's ability to stay engaged. Overall, the program helps to change customers' employees' perspectives and allows them to have a closer view of how resources are being utilized.

An example of a successful SEM story starts with one of Connecticut's largest construction companies employing asphalt, concrete, and quarry operations in many locations throughout the state. The company has taken a very progressive stance regarding energy efficiency and GHG reductions. The process began with an EUA and, after determining the varying levels of energy consumers at each of their facilities, resulted in dozens of upgrades that reduced their GHG emissions. Eversource is now guiding the customer through the SEM program. Looking to take on the many low-cost and no-cost energy savings, the program has focused on process and behavior changes, including metering three sites for specific energy usage. This program has yielded several eye-opening results: the first is the lack of automation and real-time data resulted in less visibility to failing equipment or other key production data. The second was the quantity of equipment that was simply left running because "it has always been that way." Chillers, which cool the water needed for concrete manufacturing during only the most extremely sweltering summer days, had traditionally been left on all summer. Some of

the largest GHG savings came from a behavioral change for loader operators supplying crushed stone (aggregate) to the asphalt plant. By pulling aggregate from the top of the piles, it allows for the higher moisture material to remain in the pile. Utilizing lower moisture material requires less fossil fuel to burn off excess moisture as well as reduces the time to make the finished product. The company is now evaluating the potential for covering aggregate to lower moisture levels even further. Through SEM the approved vendor and facility manager worked closely to identify custom solutions like these to reduce emissions.

SEM requires facility managers to stay engaged long-term, which offers additional opportunity for training and tracking progress. However, it caters to a more experienced facility team, therefore the program has reduced participation.

3. Virtual Treasure Hunts

Virtual Treasure Hunts, which have been supported through the Department of Energy's Better Buildings program, have a similar end goal to EUA: to identify and prioritize energy efficiency opportunities at a facility. However, in the case of these treasure hunts, it is fully virtual beyond the facility team who is on site. This program engages and encourages the customer's facility manager's team, with some guidance from Eversource-approved vendor, on identifying their own solutions. A Virtual Treasure Hunt consists of 3-4 virtual meetings consisting of the customer representatives, the utility representative, and the Eversource-approved vendor. During the first two meetings the customer describes what they intend to audit, conducts walk-throughs of the buildings with their facility management team (including equipment operators and the mechanical engineer), and reports these findings to the utility and Eversource-approved vendor. The Eversource-approved vendor and utility representative, not located on-site for the walk through, are remotely available during and afterwards. The final meeting involves an exercise where measures identified by the customer, then analyzed by the Eversource-approved vendor for energy savings and install cost, are prioritized according to feasibility and greenhouse gas emissions reduction. Based on cost and impact, measures are placed into one of the four buckets shown in Figure 1. based on cost and impact.

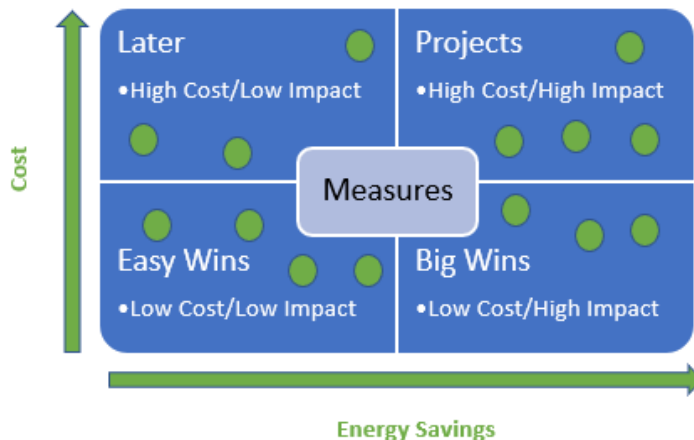


Figure 1: This figure explains the four buckets that measures are categorized into during the treasure hunt priority exercise to determine if the facility manager should prioritize implementing the measure.

The cost of the Eversource-approved vendor for the Treasure Hunt is fully covered by the utility if the customer gets their full team, including the mechanical and electrical engineer and all personnel central to operating the building, to engage in the process.

Recently, Eversource completed its first Treasure Hunt in conjunction with a brewery in Connecticut. There were two half day back-to-back virtual meetings in December including three customer representatives, two utility representatives, and two vendor representatives. Everyone gathered to kick things off, with the Eversource-approved vendor providing guidance to the customer on where and what to look for as the facility team conducted an energy audit. Afterwards, the facility team reported back to the utility representative and Eversource-approved vendor. As the customer generated 17 ideas, the Eversource-approved vendor then helped calculate energy savings, implementation cost, and payback for each proposed measure. Nine measures were prioritized as “Easy Wins” or “Big Wins” based on low-no cost implantation with a potential for GHG and energy savings. The no cost measures included putting the compressor with the variable speed drive (VSD) in lead position, turning off the fixed speed compressor, and decreasing the delivered air pressure which was higher than required.

The Eversource-approved vendor helped the customer prioritize measures by filling in the associated cost and energy savings associated with each measure. What made the Virtual Treasure Hunt unique from other programs is it leaned heavily on the facility managers to identify their own GHG solutions throughout the walkthrough since the vendor was not on site. This effectively became a hands-on learning experience for the team. Despite this success, it was difficult to get commitment from the facility team on deliverables without on-site personnel and the studies have not yet turned into capital projects for GHG reductions.

4. Process Reengineering for Increased Manufacturing Efficiency (PRIME)

The Process Reengineering for Increased Manufacturing Efficiency (PRIME) Program is a study option for customers interested in expanding their operations while incorporating energy efficiency strategies. The program is available for customers who have a minimum annual peak demand of 150 kW. The program pairs the customer’s production team with one of Eversource’s qualified vendors for an initial meeting where troublesome processes are reviewed and goals to increase process efficiency are developed. The vendors follow lean manufacturing strategies and approach the production team in a coaching role to review opportunities for process improvement. Once the initial meeting has taken place, the consultant will check in on the team periodically and will provide an audit report after 90 days with the team’s findings. PRIME events can take place at a facility multiple times with the first two events covered at no cost to the customer. PRIME projects achieve a 10-15% increase in productivity with an overall reduction in energy usage and waste.

One of the most recent PRIME projects is from a repeat participant company, who enrolled in their third PRIME event. The participant is a plating facility that offers services to companies ranging from aerospace to musical instruments. Over the past two years, they have completed two PRIME events, each time evaluating additional production lines in their facility. The team was led by the same internal leader at each event, the team lead of the given process as well as one of the approved PRIME vendors with the utility. The first event focused on the need for increased production due to industry demand. After a review with the PRIME team and a 90-day implementation, the program yielded a major improvement in their production of over 19% while saving over 140,000 kWh. The second event focused on the need to reduce discharge

water from their process due to new environmental regulations. The program succeeded again by discovering a new process that would allow the company to use 50% less water while reducing their overall energy consumption by over 90,000 kWh. The most recent project is related to a specific process of which only three other companies in the US are capable. Their ultimate goal is to increase production while reducing their waste and equipment breakdowns. Only halfway through their program, their first meeting found numerous improvements to their production line and streamlined maintenance practices, reducing downtime dramatically.

While PRIME uniquely addressed business expansion there is limited energy and GHG savings from the projects implemented. The program vendors tend to focus on energy efficiency rather than GHG reduction training.

5. Retro-Commissioning (RCx)

The Retro Commissioning Program (RCx) has received increased interest in recent years from customers with larger building footprints. For this program one of the Eversource-approved RCx vendors review the site with the facility manager and evaluate how the HVAC system is currently operating, reviewing the operation for efficiencies. After years of operation, some of the parameters of a building's HVAC system become outdated and may not perform as intended. A facility manager regularly receives updates from the building management system (BMS) about alarms and communications from building occupants often does not have the time to take a deeper dive into the building's operation. While buildings may be commissioned properly upon construction completion, some buildings are commissioned improperly and left to operate for years or even decades. Buildings and their uses often change, so keeping the building operating at optimum efficiency can be challenging. One noteworthy example is seen in how outside air changes have been made during the COVID-19 pandemic. Before COVID, to maintain building air quality, HVAC systems would mix 15% outside air with 85% inside air. During the pandemic, some buildings have set their outside air inclusion to 50% or more. We are in a new era of building health and proper functionality of building management systems will be paramount in the years to come. The utility programs cover the full cost of the study if the customer moves forward with repairs.

Though RCx offers an opportunity to adjust the facilities operations to meet current demands and potentially reduce GHG emissions, the complexity of RCx can make it challenging to implement. Eversource is working with customers to look at how the building was designed to operate and how it is operating currently. One Eversource customer had a 165,000 SF building and the existing equipment had been operating for 20 years. The building was originally built in 1998 for high-tech manufacturing and has since been converted into an office and data center. The customer was interested in environmental sustainability and reducing CO2 emissions, energy usage and energy demand, the building had a source energy use intensity (EUI) of 383 kBtu/sf at the time of the first assessment. The Eversource-approved vendor addressed the program strategies, including targeted documentation, building operator training, and verification using Energy Star Portfolio Manager Benchmarking to track overall building energy consumption. The customer is currently implementing measures identified from the study including roof top unit (RTU) optimization. During the walk-through, the Eversource-approved vendor found that the space was over-ventilated and it was discovered that reducing outside air

volume and supply fan speeds will better control space temperature. Through implementation of this measure, the customer will improve their EUI and reduce CO2 emissions.

The RCx program is successful at benchmarking, tracking GHG emissions and engaging facility managers over a longer term. However, the complexity of RCx limits the customer opportunities and the program is more successful with customers who have already set GHG goals and are looking to establish a roadmap.

6. Operations and Maintenance Studies (OMS)

Operations and Maintenance Studies (OMS) enables C&I customers to improve the electrical and thermal efficiencies of their operations by making changes and repairs to equipment and existing infrastructure. The offers available for OMS primarily target non-capital investment measures like air and steam trap leaks. Utility customers can submit annually to do an air leak study and/or steam trap study and are encouraged to use an Eversource-qualified vendor. Both air and steam trap leaks are generally inexpensive to fix, but it is vital to identify system leaks to prevent energy waste and avoidable GHG emissions. Through the utility program the full cost of the study can be covered if the customer makes repairs.

On average, Eversource conducts between 20-25 air leak and steam traps studies a year for C&I facilities. In 2021, a food manufacturing customer in Connecticut conducted a study on 22 steam traps. The study cost less than \$2,000 and five traps were found to be leaking. With the repairs completed, the customer is now saving nearly 4,000 ccf a year and has earned back the full cost of the study. These studies are quick to implement and lead to large GHG savings. What makes this program run smoothly is the strong air compressor and steam trap vendor community Eversource has trained to effectively submit projects and connect with customers. However, though this program is one of the most successful in driving GHG reductions because of the pace the study moves there is limited opportunity to train facility managers other than encouraging them to do routine studies.

Summary of Utility Program Offerings

Facility managers may choose to take advantage of one or more of the studies described above, and doing so will build the facility manager's understanding of how the building operates and where the opportunities are to reduce GHG emissions. Table 3 below is a comparison of the different studies offered through the energy efficiency programs.

Table 3: Customer Studies Offered to Assist with GHG Reductions

Utility Study Program	Avg. Number of Facility Manager Engaged	Avg. Time to Complete Study	Percent Study Cost Covered through Utility Program
EUA	2-6	9 months	Up to 100%
PRIME	2-8	6 months	Up to 100%
RCx	3	1 year	Up to 100%
SEM	3-5	3 years+	Up to 100%
Treasure Hunt	3-5	5 months	Up to 100%
OMS	2	3 months	Up to 100%

Table 3. shows the average number of facility managers who participate in the study once implemented. It also indicates the average time it takes to complete a study and the percentage of the study cost covered through the utility energy efficiency programs in Connecticut for the years 2020 and 2021.

Furthermore, Eversource evaluated studies completed in 2020 and 2021 to determine how many facility managers are engaged in each study, if these studies are leading to the implementation of projects, what the expected GHG savings are, and what percent of these studies are taking place in environmental justice communities. Environmental justice communities are defined by the Department of Economic and Community Development (DECD) in Connecticut as distressed municipalities as well as census block groups that are not in distressed municipalities in which 30% or more of the population lives below 200% of the federal poverty level (DEEP, 2021). There are 20 environmental justice communities in Eversource territory in Connecticut.

Table 4: Evaluation of how Customer Studies led to CO2 Savings and if they were conducted in Environmental Justice Communities

Utility Study Programs	Number of Studies Completed	Study Led to Project	Avg. CO2 Savings Per Project Implemented (Tons)	Percent of Studies in Environmental Justice Communities
EUA	10	100%	2,958	50%
PRIME	12	100%	61	8%
RCx	8	38%	541	13%
SEM	4	35%	677	25%
Treasure Hunt	2	50%	Not yet known	0%
OMS	42	81%	440	26%

Table 4. shows the number of studies completed through Connecticut’s energy efficiency program in 2020 and 2021. It also shows the number of facility managers that typically engage, the percent of studies that led to a project, the average CO2 savings expected per project and the percent of studies that took place in environmental justice communities. For OMS projects, only industrial studies were included in this analysis.

Looking at the 2020 and 2021 data, EUAs have led to the greatest amount of GHG reduction per project implemented, however OMS is the fastest to implement. Both EUA, PRIME, and OMS have a strong likelihood of leading to projects where GHG savings can be claimed, though PRIMEs’ average GHG savings per project is relatively small.

Each study offered contributes to a facility manager’s understanding of how to reduce GHG emissions, but there is an opportunity to improve GHG training for facility managers through the studies. Table 5 lists the advantages and disadvantages of each study discussed. Program success was weighted based GHG savings, program participation, continued facility manager engagement, number of facility managers engaged and the programs penetration into environmental justice communities. Additional points are included assessing how each program contributed or did not contribute to training facility managers on decarbonization.

Table 5: Comparison of How Each Program Contributes to Facility Manager GHG Training

Utility Program	Program Advantages and Positive Contributions to Facility Manager GHG Training	Disadvantages and Ways in which the Program was Limited in Facility Manager GHG Training
EUA	Highest GHG savings per program High participation High continued engagement – 100% studies led to project Large number of facility managers engaged Highest number in environmental justice communities Good starting point for facility managers to begin GHG roadmap	Limited number of qualified vendors with decarbonization expertise and capacity to expand Requires investment upfront and corporate buy-in

PRIME	High participation High continued engagement – 100% studies led to project Large number of facility managers engaged Makes facility managers aware of often overlooked GHG inefficiencies	Low GHG savings Low number in environmental justice communities Focus is on increased production and energy efficiency Requires large time commitment from managers
RCx	Medium GHG savings Medium participation Medium number of facility managers engaged Baselines GHG emissions Revisits building design and makes facility managers aware of systems that may have never been properly commissioned or have fallen out of calibration	Low continued engagement Low number in environmental justice communities Complex and time consuming Requires vendors with specialized training
SEM	Medium GHG savings Large number of facility managers engaged Creates GHG roadmap Long term planning /engagement allows for deep dive Builds in behavior measures Creates informed/engaged workforce focused on GHG goal Requires commitment from designated customer	Low participation Low continued engagement Low number in environmental justice communities Intended for experienced customers Large time commitment
Treasure Hunt	Medium continued engagement Large number of facility managers engaged Facility managers propose their own solutions Builds in behavior	Low participation None in environmental justice communities Has not led to projects Requires large time commitment from customer
OMS	High GHG savings Highest participation High continued engagement – most studies led to project Easy to implement Can lead to behavioral training for maintenance plan Can be used to offset capital improvements with longer paybacks	Low number in environmental justice communities Low number of facility managers engaged Limited training opportunity, no roadmap created Short engagement

Table 5. lists the advantages and disadvantages of each study discussed. Program success was weighted based quantity of GHG savings that resulted from study, number of participants that conducted a study, continued facility manager engagement meaning the study led to a project, number of facility managers engaged and the programs penetration into environmental justice communities.

Lessons Learned

Facility managers play a vital role in helping companies, states, and towns meet mission-critical climate goals. The role of the facility manager has expanded, as they are now tasked with not only making sure the facility functions and meets daily operational needs, but also with finding ways to reduce energy use and greenhouse gas emissions. Utility energy efficiency programs serve as a mechanism to assist and train facility managers to address this change.

Of the six programs Eversource offers facility managers, there are several lessons learned from running the various programs that will influence the next suite of study offerings. Despite the fact that all the study costs were fully covered through the utility programs, there was variation in the success of each program. The first lesson learned was that having an active bench of utility-approved vendors with expertise in decarbonization to assist in implementing the program is essential, particularly with a large suite of offerings. Utility-approved vendors mentor and train facility managers to look for decarbonization strategies in a one-on-one setting. There were eight vendors qualified to participate in the EUA program, but only one vendor was active

and predominantly focused on energy efficiency as a priority and had limited capacity or ability to expand. The lapse of a strong bench of active vendors and the process of getting additional vendors approved delayed the participation of some facility managers. However, the opportunity to select new vendors opened a door to analyze how successful the programs were and identify any potential areas of improvement. It was determined that vendors selected need to understand that GHG reduction is a priority. Part of the selection criteria for the new vendors now assesses whether the firm has a sustainability statement and if the firm reports GHGs. Moving forward, Eversource is looking for vendors who clearly demonstrate leadership on GHG reduction and can make suggestions to customers on how to reduce GHGs.

Secondly, some programs could have been more successful if a roadmap with short-term and long-term milestones framed around the customer's GHG goal had been better established. Each program has milestones, but they don't necessarily tie back to a GHG goal. Setting up a roadmap that baselines current GHG emissions and sets a clear target along with deliverables would be more beneficial to facility managers, encouraging them to stay on track and propose solutions to meet milestones, even after completing the study supported by the utility programs. The SEM program was most successful in getting commitment by the customer and creating a roadmap, making GHG goals a part of the process. Having a decarbonization goal that the team understands creates camaraderie and assists in keeping the team focused on meeting that goal. In addition, facility manager efforts to achieve GHG reduction goals were more successful when the facility teams were engaged and cross-functional, providing a more holistic view of operations. Employing certain personnel, including the mechanical engineer, operations manager, leadership representative and a qualified vendor from start to finish leads to a better outcome. Furthermore, customers with clear decarbonization targets are better equipped to take advantage of the multitude of incentive offerings and stay engaged with the programs over a longer period.

Finally, OMS was successful because of its ease of participation, its strong vendor base, and short turnaround. The value of the program is understood by the customer and the program brought in a large amount of GHG savings. However, though the program performed well on a GHG savings there was limited opportunity for training facility managers beyond encouraging them to do air leak and steam trap studies routinely. While certain programs like OMS open the door for facility managers to engage with utility programs and encourage routine behavior change, transitioning the customer to think comprehensively and providing a bridge to another program would be beneficial.

Conclusion: Future Expansion of Utility Decarbonization Trainings

There are several mechanisms that can be used to better equip facility managers, so they are successful in assisting their companies in meeting their decarbonization goals. To achieve climate goals, facility managers need to be deeply involved in their organization's goal-setting process. This includes understanding the company climate goal, reporting on GHG emission reductions with measures, and incorporating GHG reduction goal setting into early conversations and program rules. From our findings, decarbonization training works best in a one-to-one setting, whereby one customer is engaged at a time. The programs offered were successful when the team engaged understood the company decarbonization goal. Though there was not a clear winner among the programs which had to cater to each customer. While SEM took the deepest dive into driving GHG facility manager training and establishing a roadmap, there was limited

participation due to its complexity and commitment requirements. EUA and OMS had the most program participation and GHG savings claimed, EUA specifically had successful continued engagement from facility managers following the study, but efforts to incorporate GHG training could be enhanced. The Virtual Treasure Hunts were most successful in leaning on the facility manager team to propose their own solutions, but the program also had low participation. Programs that required a long-time commitment led to more GHG analysis, but long time-commitments can also serve as disadvantage for customers.

Future efforts to establish programs to support decarbonization training should require an early discussion on what the established decarbonization goal is or will be. All team members should understand the goal set. Next the facility team should establish a roadmap that requires baselining current emissions and incorporating short-term and long-term milestones for achieving the set goal. Reversibly, training programs that lacked success in terms of GHG reductions had unclear goals and no roadmap to achieve them. If companies fail to baseline GHG emissions tracking GHG reductions and progress becomes difficult.

Utilities implementing decarbonization training can measure program success by assessing the amount of GHG emissions reduced, how long facility managers stay engaged with program offerings or circled back, how many customers are participating and if facility managers are proposing their own solutions as part of the training. Furthermore, as efforts to expand decarbonization trainings grow, utilities will need to prioritize GHG reductions by supporting electric alternatives through the incentive programs. GHG reductions require holistic strategies. Eversource offers additional incentives to support electric vehicle chargers, electric heating equipment, storage, demand response, renewable credits, and zero energy buildings and is developing offerings that provide additional support for continuous monitoring, controls, and real-time data feedback. The staff is trained not only assist in identifying energy efficiency opportunities, but electrification, shifting the conversation toward GHG reductions. To continue to support electrification strategies and meet legislative GHG reduction goals, regulators will need to find a way to adequately value GHG reductions in addition to energy efficiency, by considering carbon intensity of generation when developing the constraints by which utility energy efficiency programs can operate.

While the challenges associated with climate change are dire, there are opportunities for better building management. Facility managers play an essential role in helping companies reach their GHG reduction goals and making sure facility managers are trained so they can act as the change agents for driving decarbonization solutions will be critical to meeting climate goals.

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