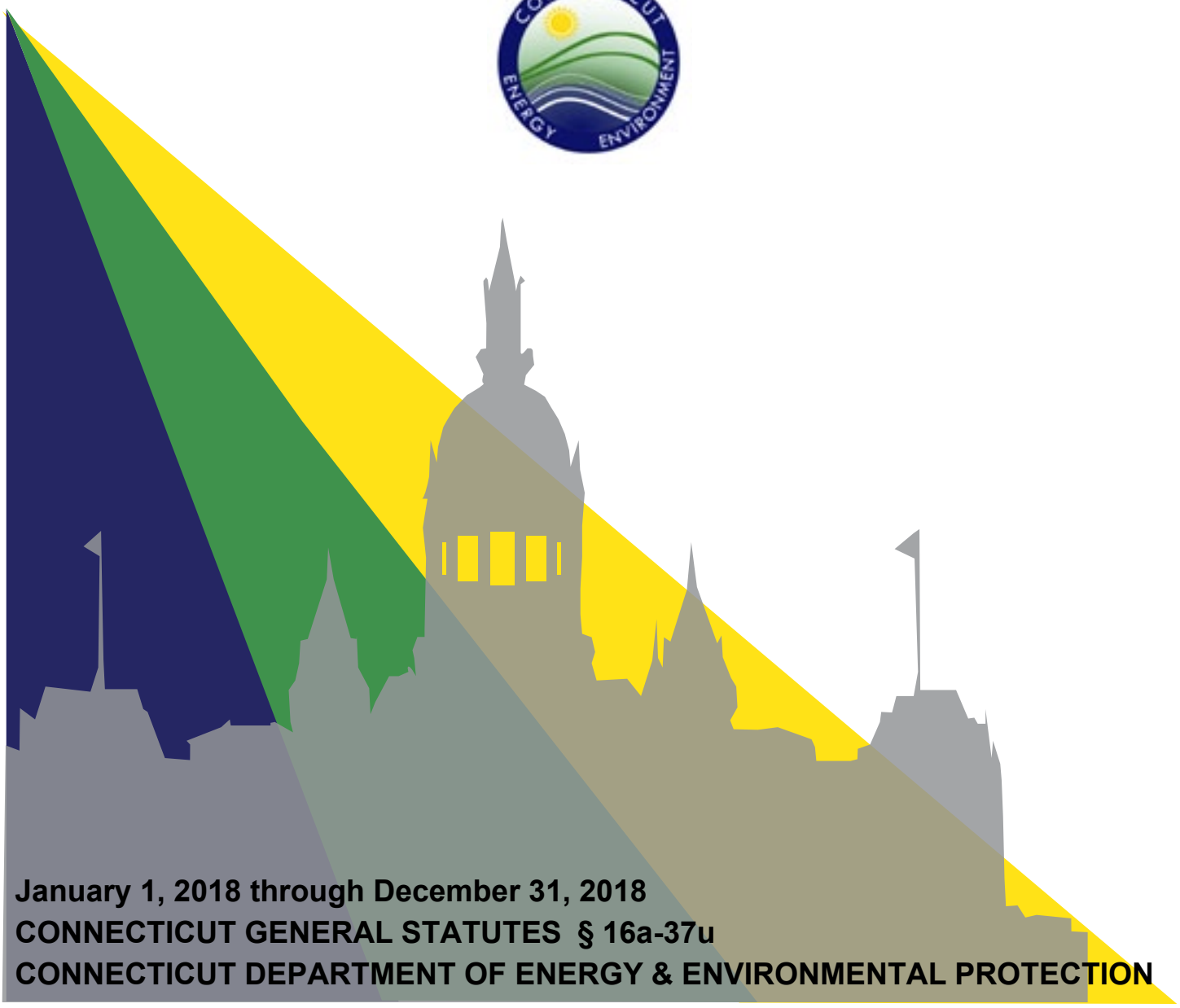
Leading by Example

IMPROVING ENERGY MANAGEMENT AT STATE FACILITIES

2018



January 1, 2018 through December 31, 2018
CONNECTICUT GENERAL STATUTES § 16a-37u
CONNECTICUT DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION

Contents

Executive Summary 2018

Overview

Connecticut's state government is a large energy user in Connecticut's Commercial and Industrial sector, making up between 15%-20% of electricity and natural gas consumption in Eversource and United Illuminating service territories[1]. For this reason, the Connecticut state government plays an important role in achieving the state's energy and climate goals. In 2011, the legislature formalized the state's initiative through the development of a "Lead By Example" (LBE) approach that is pursuant to Public Act 11-80. The Department of Energy and Environmental Protection (DEEP), in consultation with the Department of Administrative Services (DAS) and others are responsible for carrying out the requirements of Public Act 11-80 and in Connecticut General Statutes (C.G.S.) §16a-37u, §16a-38a, §16a-38i, and §16a-38l on maximizing energy efficiency in facilities and operations, strategically improving the management of energy use in state facilities, and implementing the state's plan for reducing energy consumption in state buildings. The LBE approach provides several pathways for state agencies to take advantage of funding for implementing energy efficiency upgrades and overall data management in state buildings. Both of these objectives are established in C.G.S. Section 16-37u[2] and cooperation of all state agencies in the fulfillment of these objectives is required by C.G.S. §16a-6 statutes.

Progress

In 2018, DEEP made great progress approving more bond funded projects with the release of the authorized $20 million from State Fiscal Year 18 (SFY 18) budget.[3] Previously, all capital bond allocations were fully expended at the end of calendar year 2016 and there were no legislative authorizations for funding in calendar year 2017. This resulted in the LBE Bond Funded Program to pause on initiating new projects until funding became available. Of the $20 million that was released in SFY 18, $2 million was allocated to several small and mid-sized projects including DAS and Connecticut's Agriculture Experiment Station while the other $18 million was allocated to the Department of Correction (DOC) for their large-scale energy efficient upgrade to their District 1 facilities. In addition to this funding, another $20 million of General Obligations (GO) bonds were authorized for SFY 19 and are currently awaiting release from the Bond Commission. A portion of these funds will go to DOC for their large-scale energy upgrades while the remaining will be for state agencies to apply for.

Constraints

Although state agencies were eligible to utilize the utility-administered Conservation and Load Management Plan (C&LM Plan) programs, there was limited capital available for investments. In October 2017, a total of $127 million from Connecticut's C&LM Plan was diverted to the state's General

[1] C&LM Plan

[2] DEEP submits this report pursuant to Connecticut General Statutes (C.G.S.) Section 16a-37u(d), which requires that DEEP annually report "on the status of its implementation of the plan [required by C.G.S. §16a-37u(a) and (b)] and provide recommendations regarding energy use in state buildings to the joint standing committee of the General Assembly having cognizance of matters relating to energy." While DEEP routinely updates information on DEEP's webpages, this report specifically meets the reporting requirement for 2018. Reports for 2012 through 2017 have previously been submitted and can be found on the Lead by Example page on DEEP's website.

[3] June Special Session Public Act 17-2, *An Act Concerning the State Budget for the Biennium Ending June 30, 2019, Making Appropriations Therefor, Authorizing and Adjusting Bonds of the State and Implementing Provisions of the Budget* ("June SS P.A. 17-2")

Fund to address the state's deficit. The diversion caused holds on energy efficiency contracts and projects across all utility customers, including state facilities.[4]

Obtaining energy data from all state agencies is another constraint DEEP faces. Currently DEEP receives an electronic flow of Eversource electric and natural gas invoices into our web-based platform EnergyCAP, but has yet to acquire the electronic flow of United Illuminating, Connecticut Natural Gas, and Southern Connecticut Gas invoices. DEEP is working with these utility companies on a path forward to get current and historic information. All other energy invoices must be retrieved from individual state agencies. This is difficult due to limited resources and time, and a lack of agency participation with EnergyCAP and the associated training. To remedy this, DEEP has been working with the agencies individually to get them set up and familiar with the system.

Opportunities and Path Forward

Connecticut spent over $90 million in state building energy costs for SFY18.[5] When energy efficiency measures are implemented, energy costs can be reduced significantly by about 20%-30%. For state buildings, this can have a substantial effect on overall energy demand and reduction of energy waste. The Lead By Example approach can help ensure energy cost avoidance in the future through proper energy data management and collaboration across state agencies. These strategies will help meet our state's energy and climate goals. With a new administration coming in, one of the initiatives' from Governor-Elect Ned Lamont is to support legislation that expands and accelerates the current LBE program in order to create more in-state jobs and encourage economic development while reducing state energy costs. DEEP looks forward to working with the new administration and collaborating together to improve the LBE program by putting a sustainable funding source in place to invest in state building infrastructure and the execution of the C&LM Plan.

This report provides an update on the current status of the LBE program, progress on data coordination efforts, and identifies a number of pathways for state agencies to follow to maximize energy efficiency in their facilities. The report also highlights progress made in implementing energy efficiency projects and renewable energy efforts and culminates with DEEPs recommendations for future energy investments in state buildings.

[4] On October 31, 2017, June Special Session Public Act 17-2, *An Act Concerning the State Budget for the Biennium Ending June 30, 2019, Making Appropriations Therefor, Authorizing and Adjusting Bonds of the State and Implementing Provisions of the Budget* ("June SS P.A. 17-2"), became law, effective on passage. The public act identified the diversion of funds to cover the state budget deficit. These diversions included redirection of $63.5 million each fiscal year from the conservation mill charge on electric ratepayers' bills and a portion of Connecticut's revenue from RGGI auctions, reducing by $68 million per year the funds available to implement the Plan in calendar years 2018 and 2019.

[5] Open checkbook and EnergyCAP

2018 Snapshot of Accomplishments

Leading by Example through Improvements in State Facilities' Energy Management

- ✓ Renewed contract for electricity supply purchase, in partnership with DAS, that procured a competitive rate for electricity supply for state facilities, saving the state approximately $1 million per year in operating costs.

- ✓ Leveraged utility incentive programs for small-scale projects for use by state agencies, achieving more than $1 million in **annual** savings from over 133 projects completed or underway since 2014.

- ✓ Imfplemented additional Bond Funded projects, with the release of the $20 million of GO Bonds from SFY 18.

- ✓ Continued compiling and tracking state energy data, as well as correlating accounts to buildings using an established web-based platform, EnergyCAP.

- ✓ Continued to provide training to state agencies to use EnergyCAP, enabling facilities and business office managers to more fully analyze their energy cost and consumption.

- ✓ Continued enhancing electronic data flow from Eversource electricity and natural gas accounts.

- ✓ Initiated renewable energy projects at Department of Correction, Department of Transportation, and DEEP using contracts developed previously for use by state agencies.

Energy Management at State Facilities

Overview

Energy Management plays a fundamental role for the state government sector. It is based on inventorying all energy accounts and state owned and leased properties, correlating and analyzing data, and prioritizing use of resources for energy upgrades. DEEP has been authorized and charged with the responsibility of planning, managing, and reducing energy consumption in state-owned and leased buildings, pursuant to C.G.S. Sections 16a-37u and 16a-38l. DEEP continues to develop a more accurate and reliable baseline, as data is analyzed to determine how much energy the state consumes and pays for. This helps us prioritize which buildings consume the most energy and where resources should be invested in upgrades to ensure that state buildings perform more efficiently. Data flows into our system daily from Eversource and from state agencies for most of their accounts, and enables us to track the state's energy cost and consumption. With the current available data, we are able to provide estimates of statewide energy consumption (4.55 million MMBtus) and costs (approximately $90-$100 million)[6] for SFY18, reflected in the figure below.[7]

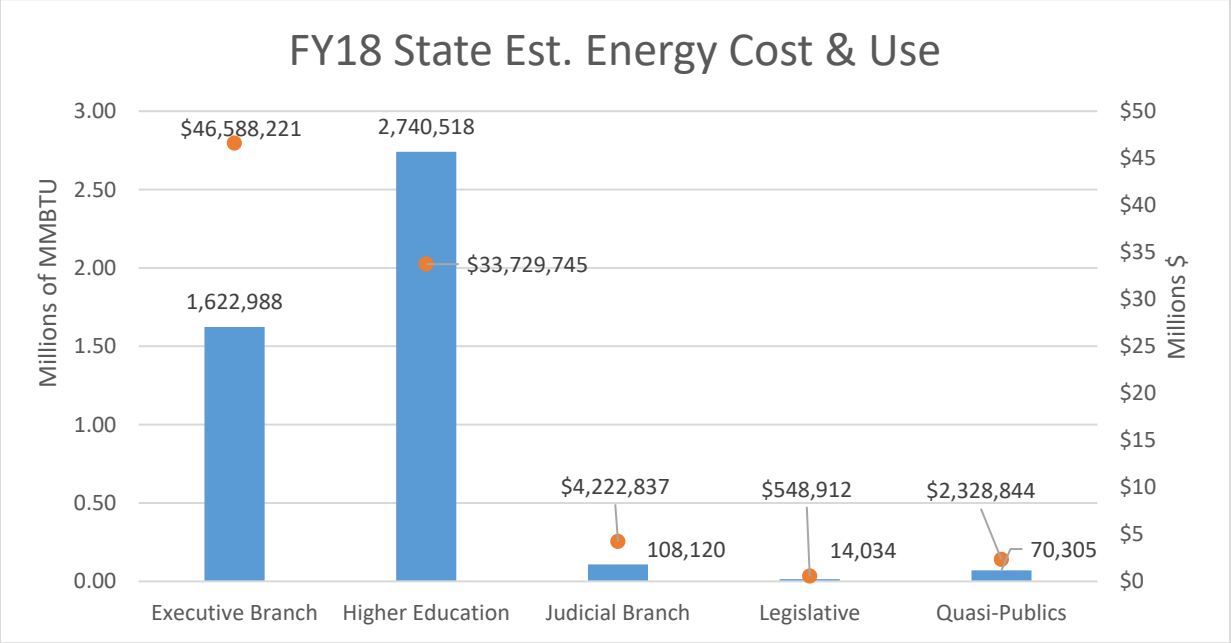


Figure 1: Snapshot of State Fiscal Year 18 Estimated Energy Cost and Use

Concurrently, while data comes through our system, we coordinate inter-agency meetings with state agencies on their energy management needs and goals for their facilities. With DAS and the Office of Policy and Management (OPM), we update the State Facilities Energy Management Plan. In order to understand agencies' needs and where resources are best utilized, all state buildings and accounts need to be identified and correlated, and this is well underway. This correlation between buildings and accounts allows an agency to see what buildings are using the most energy and to strategically plan to

[6] This figure for 2018 is based on a variety of information sources, including DEEP's compilations of energy accounts and Office of the State Comptroller records.

[7] This chart reflects a percentage of the total because UI, CNG, and SCG information is not yet complete, as it is not yet received electronically and deliverable fuels are not completely identified.

implement energy upgrades. DEEP has asked and is working with all agencies to ensure they complete their account-to-building correlations. This is a big task to complete, as buildings and accounts have come on and offline, and meters often feed multiple buildings,; but this does not prevent other actions from being taken to improve energy management at state facilities. The goal is for all agencies to understand how their buildings operate and how much they spend on energy costs.

Figure 2 illustrates the process of planning for reducing energy consumption and cost, and will be described in more detail later in this report.

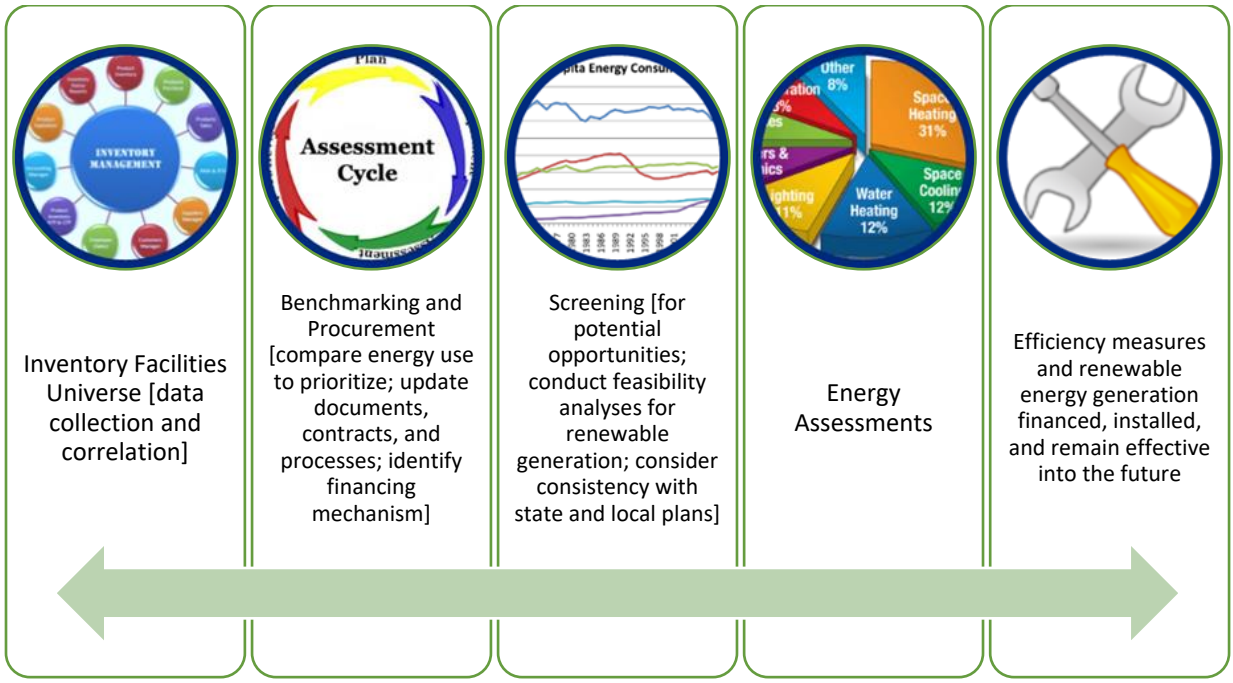


Figure 2: Implementation of State Facilities Energy Use Reduction

Inventory of State Buildings and Energy Accounts

DEEP has made great progress on inventorying energy accounts and state buildings, with the help and cooperation of most state agencies. We've been able to identify state energy accounts to the agency level, which we could not do a couple of years ago. This helps get a sense of how much an agency uses and spends on energy. Continuing the success, we are working with all agencies to get use and cost data down to the building level, which will be an on-going process, as accounts and buildings can change throughout the years.

Connecticut's inventory of state buildings is very dynamic, because it changes from year to year. The state often sells or buys buildings, buildings are being built or demolished, or become surplus, and leases come and go. Each state agency is responsible for updating OPM on their owned and leased buildings for OPM's Inventory of State Real Property. The inventory is available to the public and shows all state owned and lease-to-own buildings by agency (as best updated by each agency). This inventory was used to originally populate EnergyCAP for all state owned and leased buildings, and with the help of facility managers at each state agency to provide additional information that wasn't provided before.

That State has over 5000 thousand energy accounts. These become active and inactive throughout the year and need to be identified, while simultaneously updating the building inventory. Our state accounts are unique as they are not always a one-to-one relationship. There are single meters that feed multiple buildings, multiple meters on a single building, and some agencies have power plants that produce energy that gets distributed to several buildings. In some cases, one agency provides energy to another agency. It is important to know which meters are feeding which buildings, to accurately correlate energy use and cost to the building level. Once identified, if a meter feeds multiple buildings, that meter can be split by square footage of the buildings, for an estimated energy use and cost based on the energy invoice. Sometimes a facility manager will know the percent of energy going to different buildings from a split meter, and some agencies have installed sub-meters to get more accurate data.

DEEP works with each state agency to identify all state energy accounts, the energy commodities consumed, the associated energy costs, as well as matching state owned and leased buildings to accounts and meters. This will always be an on-going task because accounts become active and inactive, and DEEP must rely on the agencies to notify and verify when an account has been created or no longer exists, as there is no formal reporting mechanism for this.

Figure 3 shows a snapshot of the numbers of known state accounts per commodity.[8]

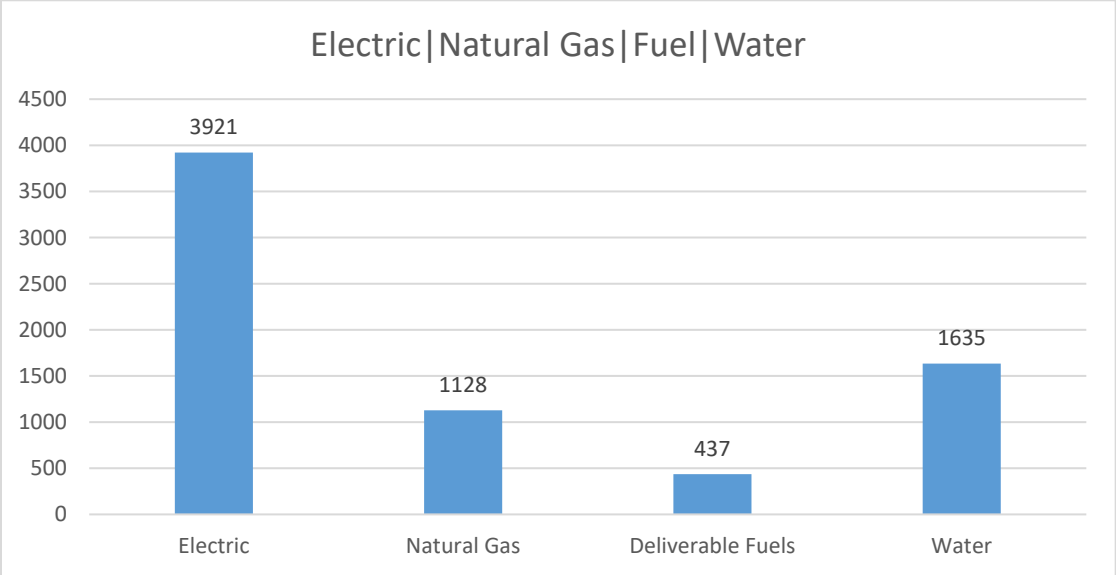


Figure 3: Current number of state accounts identified [data compilation is ongoing]

The goal for inventorying our buildings and accounts is to be able to identify our highest energy use and cost buildings, and strategically plan to reduce their cost and consumption. Another goal is to develop a baseline that we can use to compare data year over year. We previously did not have a baseline to help measure our progress on achieving the state's goals for reducing our energy consumption, cost, and our greenhouse gas emissions (GHG). To help with analyzing all the building and account information and developing a practical baseline, DEEP implemented a web-based platform called EnergyCAP (via the

[8] The number of accounts continuously changes, because they become active and inactive.

federal General Services Administration) to track energy use and cost by building, as mentioned earlier and described in more detail in the next section.

Energy Data Management Platform

EnergyCAP Overview

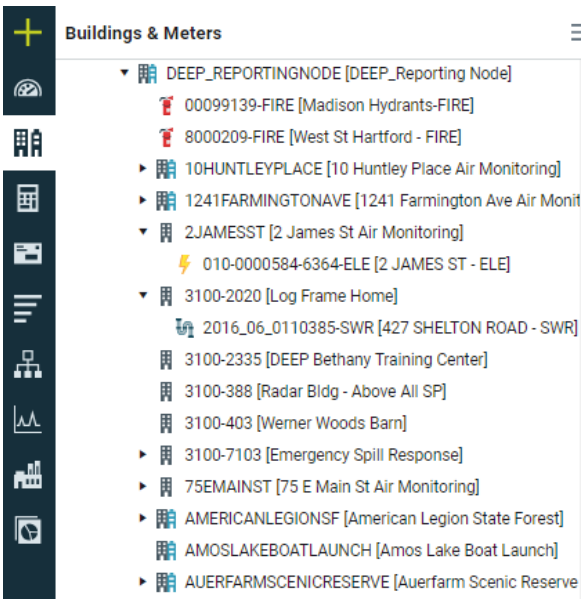
EnergyCAP is used all over the country by other state and local governments and education systems. It is a utility bill and energy management analysis platform that allows clients to track and audit energy commodity and greenhouse gas data. The system helps clients target goals for reducing energy consumption, benchmark buildings and submit to E.P.A. Energy Start Portfolio Manager, measure energy savings and cost avoidance, enter energy projects, process and audit utility bills, show calendarized and weather normalized data and much more. There are hundreds of reports that can be generated for client's needs and dashboards that can be embedded in websites. For more information on EnergyCAP, please visit their website (www.energycap.com).

In 2016, through the federal General Services Administration, DEEP procured the web-based EnergyCAP system. EnergyCAP has allowed DEEP to track energy cost and consumption by state agency, detailed down to the building level for agencies that have completed their account to building correlation.

Connecticut's EnergyCAP Profile

Since the implementation of EnergyCAP in 2016, DEEP has been able to track our state's energy use and cost significantly better than in the past. Implementation began by identifying all known state-owned and leased buildings from OPM's Inventory of State Real Property to be entered into EnergyCAP, and then asking all state agencies to submit one month's worth of energy invoices to establish accounts in EnergyCAP. From there, DEEP has collaborated with all agencies on making sure the information in EnergyCAP for their agency is accurate and if not accurate, correctly updating any information. In order for state agencies to see and update their information, we were able to make EnergyCAP accessible to all state facility managers and business office personnel. The facility managers know their buildings very well and can help identify where meters are located and which buildings they feed. They also know what energy efficiency measures need to be implemented. The business office personnel are familiar with the energy invoices and can see how much energy is used and the cost. EnergyCAP helps bridge that gap, since most facility managers do not get to see the invoices. This will allow them to see how much energy is being consumed at their buildings. In 2016 and 2017, EnergyCAP hosted training at DEEP's Hartford and New Britain offices for facility managers and business office employees to learn how to use the system and the benefits it provides. DEEP continues to offer training to all agencies to get more comfortable with the system and to start using it on a regular basis.

Our state building profile in EnergyCAP is setup like a tree structure, broken out by the three branches of government (Executive, Judicial, and Legislative), as well as the Higher Education, and Quasi-public agencies. Within those organizations, it's segmented further by campus, facility, or buildings, down to the meter attached to the building. See figure 4 as an example. There is a similar tree structure for all utility accounts, broken out by the different branches of government. The tree structure is continuously updated to accurately show building and meter information for each agency, to match the meters to the appropriate buildings, to add new buildings, and to move buildings that are vacant to a specific organization to capture its history.



4: EnergyCAP Tree Structure

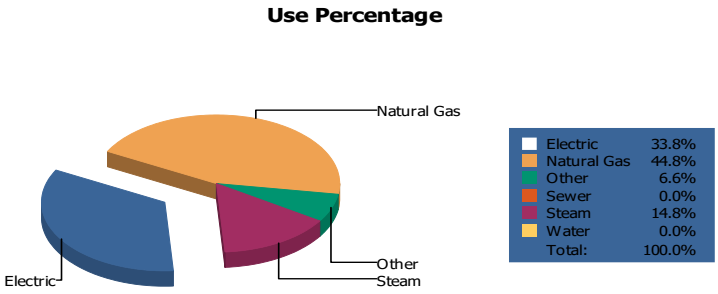


Figure 5: State Energy Usage Percentage [data compilation is ongoing]

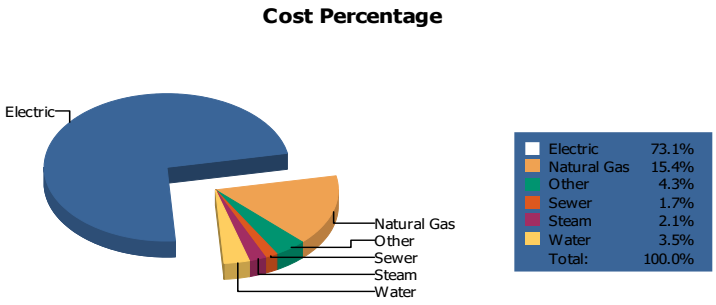


Figure 6: State Energy Cost Percentage [data compilation is ongoing]

In order to get this data, DEEP has agencies provide the utility information pursuant to C.G.S. 16a-6 and 16a-38i to populate EnergyCAP. It started as getting a copy of a months' worth of invoices to establish the accounts and then having agencies trained on how to upload their invoices into EnergyCAP. Concurrently, DEEP is working with Eversource and United Illuminating LLC (UIL) to get utility information streamed electronically into EnergyCAP, helping to eliminate manual uploads of the paper invoices for the electric and natural gas commodities. We ask the agencies to scan and upload any deliverable fuels (oil, propane, gasoline, etc...), water (water, sewer, and fire protection), municipal utilities, and other energy invoices into EnergyCAP. DEEP will monitor the capability of getting electronic information for these invoices from the vendors in future years. We currently have Eversource electric and natural gas invoices electronically streaming into our system and are working with them to get historical data uploaded. UIL (UI Electric, Connecticut Natural Gas, and Southern Natural Gas) is still developing their electronic data interface (EDI) so that invoices from these companies can stream into EnergyCAP. We are working on different methods to acquire the data, so that we can populate the accounts established with more

information. The information that is in EnergyCAP is a snapshot of the currently available data, and is only an estimated value of the amount of energy the state has consumed and spent. Until all agencies manually upload invoices on a regular basis, our database will be incomplete. Figures 5 and 6 are a snapshot of the energy use and cost percentage currently available from EnergyCAP.[9] While this data is estimated, it has proven very valuable to many state agencies that can get a better picture of how their buildings are operating and subsequently find the EnergyCAP tool very useful to them.

Prioritizing & Benchmarking

As utility information gets uploaded into EnergyCAP, DEEP can begin to screen, assess, and prioritize state buildings that have high energy use and cost for potential energy efficiency projects. There are several state buildings that have deferred maintenance and have outdated equipment running at their facilities. However, if we can determine what buildings or energy accounts are using the most energy, then DEEP, in consultation with the Utility Companies and DAS's Division of Construction Services (DCS), can recommend various opportunities that state agencies can take advantage of for retrofit upgrades. Simultaneously, DEEP continues to assess the feasibility of installing renewable energy generation sources. Below is a table that shows a snapshot of our top energy accounts, based on currently available data.[10] Only a few buildings are listed in the table below, because not all accounts have been correlated to buildings. It's important that we continue to work with agencies to match their accounts to their buildings, so they can see how their buildings are operating. Once we get the account to building correlation complete, the data in EnergyCAP can flow into Portfolio Manager and the information we get from Portfolio Manager will be displayed in EnergyCAP. State agencies will be able to see their rating scores from Portfolio Manager on their EnergyCAP profile.

[9] Snap shot of current data in EnergyCAP. Data not complete.

[10] The table represents a snapshot of the information we have currently compiled in EnergyCAP. The data has not been fully correlated to match buildings to accounts. This chart will change.

Department	Facility	Building	Use Per Day (MMBtu/day)	Cost ($)	Use (MMBtu)	Unit Cost ($/MMBtu)
DOC	MacDougall-Walker CI		126.81	$ 4,590,402.93	119,711.28	$ 38.35
DMHAS	CVH	Porter Hall (Power Plant)	102.03	$ 3,917,358.77	96,318.68	$ 40.67
DMHAS	CVH	Porter Hall (Power Plant)	306.86	$ 718,496.15	92,978.10	$ 7.73
DVA	Rocky Hill Campus	Power Plant	233.52	$ 329,995.81	85,236.62	$ 3.87
DOC	York CI		77.95	$ 2,453,694.13	66,567.02	$ 36.86
DOC	York CI		73.62	$ 866,343.19	65,446.84	$ 13.24
DDS	Southbury Training School		207.87	$ 450,683.71	62,983.47	$ 7.16
DOC	To Be Placed		53.21	$ 1,936,032.13	51,775.57	$ 37.39
DOC	York CI		56.56	$ 648,178.28	47,570.16	$ 13.63
DOC	Manson YCI		50.26	$ 1,915,172.60	47,445.03	$ 40.37
DPH	Laboratory		45.48	$ 1,879,929.03	44,254.21	$ 42.48
DOC	MacDougall-Walker CI		142.29	$ 305,261.63	43,114.77	$ 7.08
DOC	To Be Placed		137.26	$ 312,941.02	41,589.34	$ 7.52
DOC	Osborn CI		44.12	$ 1,611,585.90	41,565.32	$ 38.77
DDS	Southbury Training School		42.01	$ 1,568,307.35	40,879.06	$ 38.36
DOC	Corrigan-Radgowski CI	Corrigan CI	42.63	$ 1,571,032.24	40,244.57	$ 39.04
DAS	470 Capitol Ave		39.04	$ 1,840,424.40	36,772.43	$ 50.05
DOC	Hartford CC		37.30	$ 195,242.50	34,207.33	$ 5.71
DAS	55 Farmington Ave		32.47	$ 1,313,356.48	31,625.94	$ 41.53
DOC	Bridgeport CC		35.50	$ 196,463.13	31,485.04	$ 6.24
DOT	Admin Building - HQ		32.96	$ 1,332,543.07	30,982.07	$ 43.01
DCF	CT Juvenile Training School		99.91	$ 232,463.64	30,271.70	$ 7.68
JUD	Superior Courthouse	123 Hoyt St.	29.83	$ 1,317,964.56	29,028.55	$ 45.40
DOC	Osborn CI	Central Plant	155.28	$ 267,301.73	28,416.67	$ 9.41

Table 1: Example of Energy Accounts with High Energy Use (less Higher Education facilities) [data compilation is ongoing]

Connecticut General Statutes Section 16a-37t states that DEEP may benchmark energy and water consumption of all residential and nonresidential buildings owned or operated by the state with a gross floor area of ten thousand square feet or more using the United State Environmental Protection Agency's Energy Star Portfolio Manager tool. Portfolio Manager is a nationally used free tool to compare buildings of similar characteristics across the country that are benchmarked, and assigns an individual building an Energy Use Index score or Energy Star rate score. DEEP has benchmarked buildings into Portfolio Manager for several state agencies, as part of the requirement in a Memorandum of Agreement for participating in the Lead by Example Bond Funded Program. In 2017 and 2018, DEEP worked with Eversource and UIL to implement an electronic data flow into EPA's Portfolio Manager Tool for buildings that have one to one building to account correlation. Each agency has the option to allow the Utility Companies to have full access to their Portfolio Manager profile to upload their utility information. To "Lead by Example," DEEP has benchmarked all DEEP buildings over 4,000 square feet into Portfolio Manager. As a whole, the state has almost 300 state buildings and facilities benchmarked, which is approximately 27 million square feet of state property. In order to be able to get all our buildings benchmarked in Portfolio Manager, the account to building correlation needs to be completed first in EnergyCAP.

In 2018, DEEP worked with a few agencies on prioritizing their buildings for energy upgrades. For example, DAS has been working on doing lighting retrofits at buildings they manage, utilizing Eversource and UIL insights on energy efficiency investments they offer and providing technical assistance and assessments. Department of Veterans Affairs (DVA) is utilizing the Home Energy Assessment (HES) program the utilities offer for their group homes, as well as getting energy audits done at eleven of their

buildings. This is the beginning phases for DVA to determine what upgrades can be done and where sub-meters can be installed, as well as can an electrical upgrade to their campus.

Lead By Example

Overview of Lead By Example

Since 2013, the "Lead By Example" (LBE) program has provided assistance to state agencies to do energy retrofits and upgrades to their facilities and buildings. LBE has helped many state agencies that lack the technical and financial resources to identify and implement sustainable investments in efficiency upgrades. The inter-agency team of DEEP, the Department of Administrative Services, the Attorney General's Office, the Office of the Treasurer, the Office of Policy and Management, the CT Green Bank, and others, have advanced the program to include the following initiatives and financing mechanisms to reduce energy use in state buildings:

1. Established master agreements with Connecticut's utilities to unlock the ability for state agencies to use utility-administered programs to complete small-scale energy efficiency investments in facilities;
2. Continued to install medium-scale energy equipment retrofits in state facilities using up general obligation bond funded allocations from previous years, as no new allocations were received in 2017;
3. Initiated a standardized guaranteed Energy Savings Performance Contracting Program to plan for and implement large-scale, comprehensive projects with multiple energy savings measures at state facilities.

For more information: please refer to the Lead By Example state agencies page on DEEP's website or email leadbyexample@ct.gov.

Small-Scale Projects

Eversource and UIL have a utility-administered program that is designed to provide cost effective, turnkey energy-saving services to smaller utility customer accounts, known as the Small Business Energy Advantage program (SBEA). SBEA offers agencies funding incentives and on-bill financing for the balance of project cost, which eliminates the need for any up front capital investment. The proposed efficiency measures in the program are focused primarily on energy efficiency lighting and controls and some natural gas measures, for a quick payback (2 to 4 years). A Master Agreement between Eversource and United Illuminating and DAS (on behalf of all state agencies) was developed so that all state agencies can participate in the program, and was rolled out in 2014. The original agreement had a 200kw demand cap, which was removed in 2015 when the Master Agreement was amended to allow larger energy users to participate in the program, while keeping the 4 year payback. If a project exceeded the 4 year payback, then prevailing wages would incur and the agencies would be notified in advance if that was the case. United Illuminating does this on a project-by-project basis, due to their smaller budget than Eversource. These projects must fall below a certain project size to participate in this program, which means this program is effective for some smaller buildings, though not larger facilities. In 2018, DEEP and the utilities have begun to update the current Master Agreement, as it expires at the end of 2018. The new Master Agreement has removed the reference of SBEA, to allow agencies to participate in other programs that the utilities offer other than SBEA. It has removed the

Connecticut Energy Efficiency Fund (CEEF) and replaced it with C&LM Plan. The new Master Agreement will go into effect in 2019 for the next 3 years.

All agencies are required to submit a project request form to DEEP in order to participate in the SBEA Program. This helps us keep track of projects coming in. The request form is submitted to either Eversource or UIL (depending on the territory) to be placed in the program queue. The utilities assign a vendor to do a walkthrough of the facility to recommend measures for potential implementation. DEEP will review the estimated cost savings for final approval of the project, to ensure it is within the guidelines of the program requirements.

To date, of the 193 projects that have come through the SBEA program and DEEP, 133 projects are either completed or in development. Some projects were canceled or put on pause for various reasons. For the projects that have were not canceled, they saved an estimated annual cost avoidance of $1.2 million and reduced their electricity consumption by 8.3 million kilowatt-hours. Almost 6,000 metric tons of greenhouse gas emission reduced. Figure 7 shows the estimated cost savings per agency.[11]

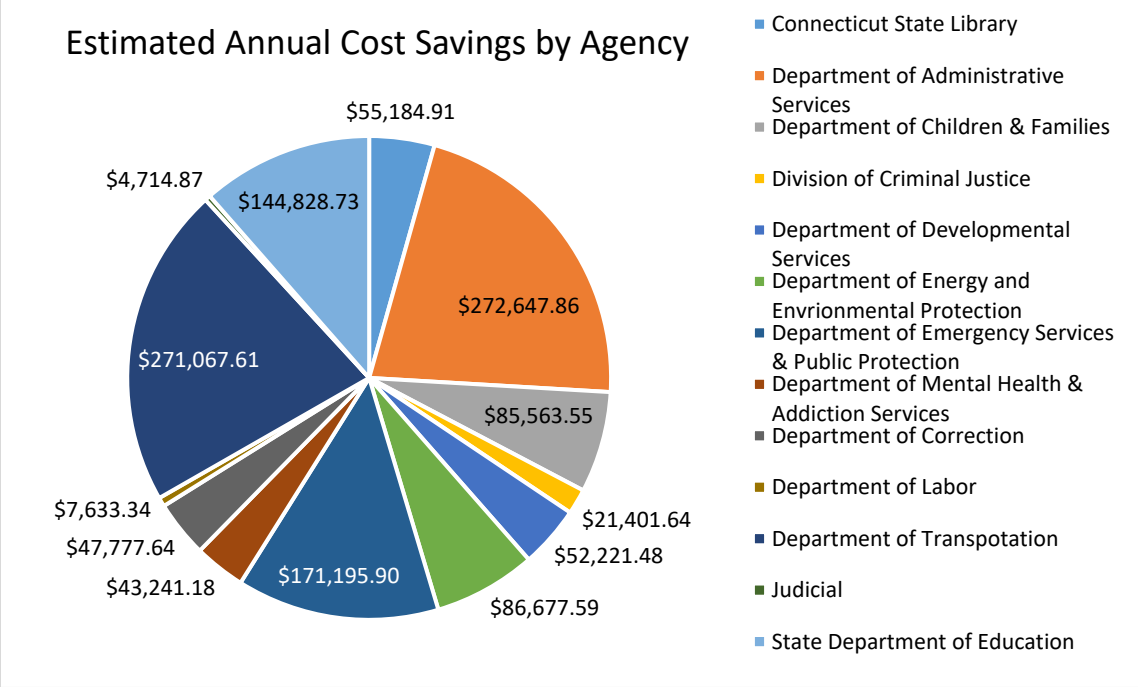


Figure 7: Estimated Annual Cost Savings

[11] DEEP tracks all SBEA projects and works with Eversource and UIL to get completed data on the status of the SBEA Projects.

Department of Emergency Services and Public Protection Headquarters

The Department of Emergency Services and Public Protection (DESPP) participated in the SBEA program in 2017 and was completed at the end of 2017. The project occurred at the departments headquarters building that was an LED lighting upgrade, replacing several inefficient lighting with LEDs. The project is to have an estimated annual cost savings of $27 thousand and an estimated reduction of 186 thousand kWh annually.

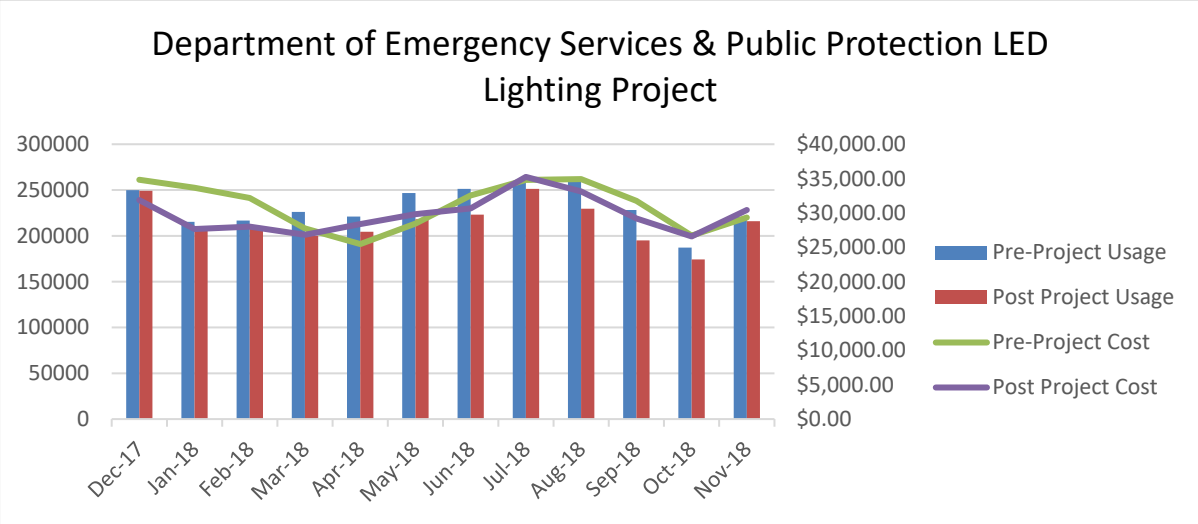


Figure 8: ESPP Headquarters Energy Usage and Cost

Medium-Scale Projects

In 2011, the State Bond Commission allocated $15 million in previously authorized bond funds to implement projects to reduce energy consumption in state buildings for medium-scale projects also known as the Lead By Example (LBE) Bond Funded Program. Due to the tremendous success and popularity of these investments, the State Bond Commission released an additional $5 million in 2015. By the end of 2016, all previously authorized and allocated bond funds had been fully committed, which resulted in DEEP not being able to initiate new projects until funds became available. We continued to allow state agencies to submit project request forms for consideration and to enter a queue, as well as help to quantify the need for additional funds. DEEP requested additional bond funds for energy efficiency projects and in the SFY18-19 budget passed October 2017, $20 million in general obligation bonds was authorized for energy upgrades in SFY 18 and SFY 19. Of that $20 million, $2 million went to the LBE Bond program for mid-sized projects and $18 million was designated for a Department of Correction (DOC) large-scale energy project. The $20 million for SFY 19 budget has not been released by the bond commission. These funds are supplemented by energy efficiency investments made through the Conservation and Load Management Plan implemented by the major electricity and natural gas distribution companies in the state. The utility investments leveraged the bond funding resulting in additional energy savings.

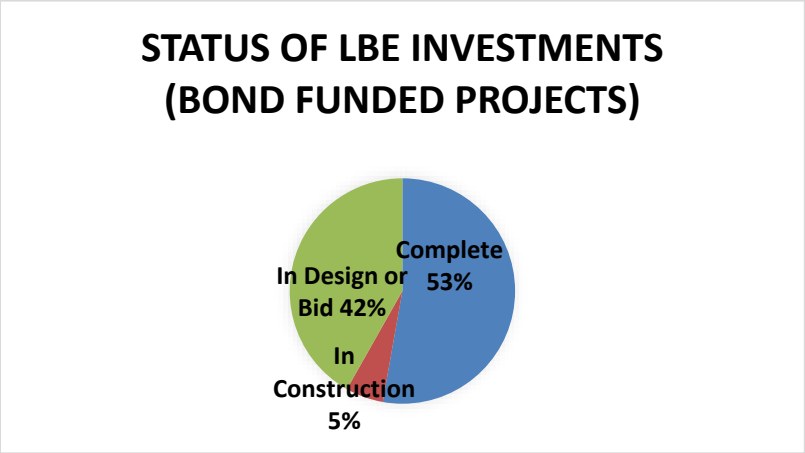


Figure 9: LBE Bond Funds Invested 2012-Present

As of December 2018, the DEEP-led interagency known as the Technical Advisory Committee (TAC) has approved 75 projects since the beginning of the program for energy efficiency measures to be implemented at state buildings. Of these, 62 projects are completed and 13 are still in construction or design phase. The total amount of funds that have been committed is an estimated $21 million. Figure 9 shows the status of the commitments to projects. The estimated annual energy consumption savings exceed 100,000 MMBtus (million British Thermal Units), resulting in an annual cost avoidance of approximately $3.9 million (in 2018 dollars). The average estimated simple return on investment for all the projects is 8.6 years.

Out of the 62 projects completed, 46 projects have a years' worth of data to see what type of savings have been achieved. Figure 10 shows the before and after energy cost and usage in MMBtus for the 46 projects. These projects have saved $2.9 million and reduced 54,605 MMBTUs.

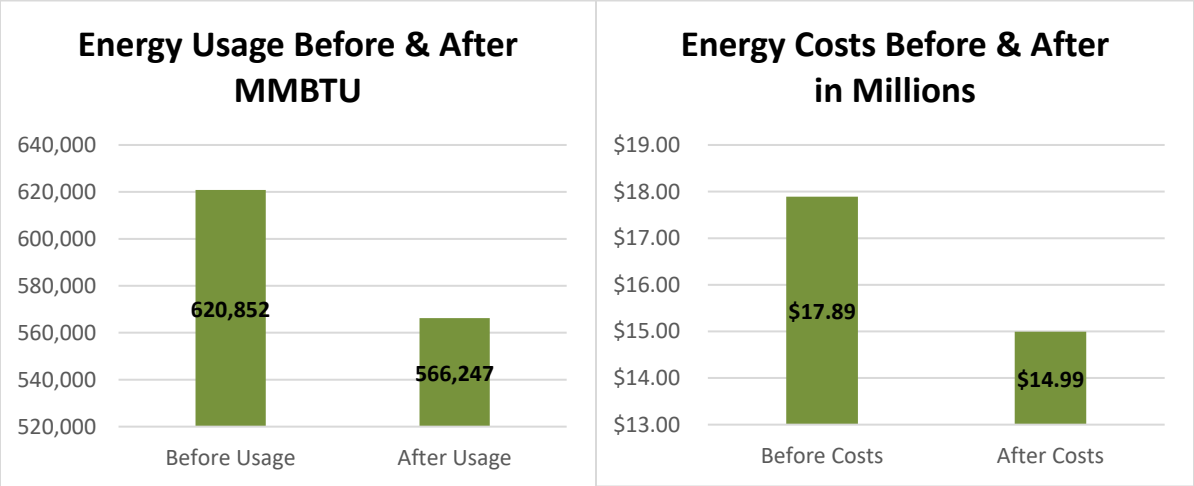


Figure 10: LBE Completed Projects Before and After Energy Usage & Cost

Department of Correction Robinson Correctional Institution

At the end of 2016, the Department of Correction submitted a request to DEEP replace existing exterior high pressure sodium lighting with high efficiency LED lighting. A total of 312 lighting fixtures were replaced with energy efficient LED exterior fixtures. The project was estimated to annually save 233,980 kWh (798 MMBtus), $39,777 in cost avoidance, and an additional $5,000 in maintenance savings with a return on investment of just over 4 years. The project has saved over 750 MMBtus and about $32,000 in cost avoidance. Figure 11 shows the usage and cost of a years' worth of data after project completion.

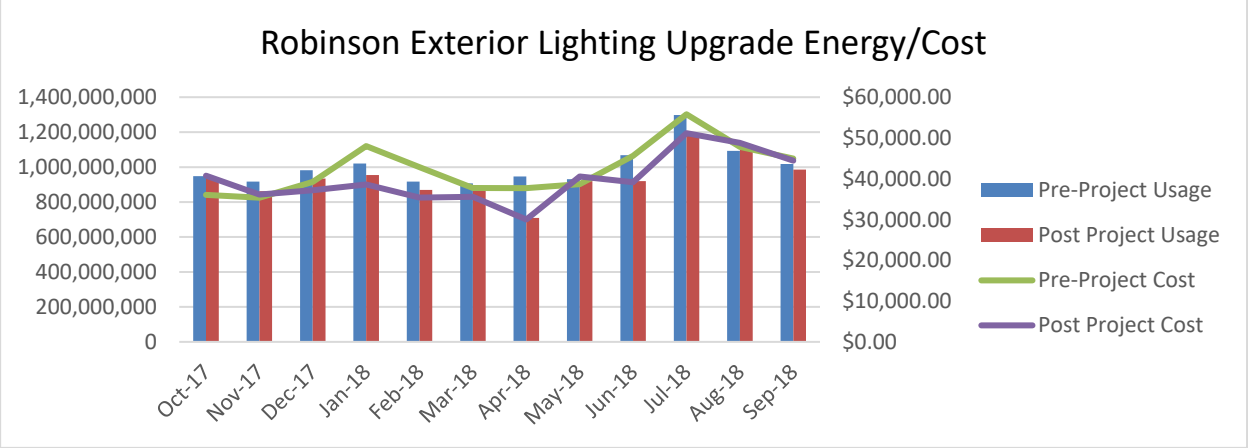


Figure 11: Robinson Correctional Institution Energy Usage & Cost

Large-Scale Projects

One way to contract for large-scale projects is through Energy Savings Performance Contracting (ESPC). This is a mechanism where a Qualified Energy Service Provider (QESP) contractually guarantees a pre-determined amount of future cost savings over the performance period of certain energy upgrades, based on agreed-upon measures and retrofitting upgrades they will complete at a facility. If such savings are not realized the QESP pays for the difference. These projects are based on transparent pricing and rigorous measurement and verification to ensure the energy performance and cost savings match the guarantees provided by the contractors. Ongoing monitoring is also essential to allow facility managers to verify the effectiveness of improvements and to continuously improve building energy use.

In 2013, three large, comprehensive projects were initiated under the Energy Savings Performance Contract program for the Department of Correction, Department of Mental Health and Addiction Service's Connecticut Valley Hospital, and the Department of Motor Vehicles. These projects had an investment estimated at approximately $80 million in energy savings measures across these three agencies, all of which will result in an equivalent level of savings within 15 to 20 years, through future energy savings. An estimated $6 million annually in cost avoidance for these three large-scale projects.

Department of Mental Health and Addiction Services
Connecticut Valley Hospital

In December 2016, the Department of Mental Health and Addiction Services initiated a comprehensive campus-wide energy savings project that will result in energy and maintenance savings of $31.9 million over a 15 year period. The upgrades include new efficient boilers and chillers, lighting upgrades to LED for interior and exterior, new windows, and a new underground steam pipe system.

Figure 12: New central power plant boilers installed

While these projects were initially intended to use the ESPC model for financing, in 2017, difficulties were encountered in the construction phase of the CVH projects, which resulted in implementing the energy efficient measures in 2018 as a capital project implemented through the DAS Division of Construction Services rather than as an ESPC project. The Department of Correction also moved their large-scale project forward as a capital project in 2018 using the $18 million general obligation (GO) bond funds from the $20 million SFY 18 bond authorization. The Department of Motor Vehicles (DMV) has also initiated energy savings projects with the DAS Division of Construction Services for the Wethersfield facility rather than through ESPC financing.

As part of ensuring value for the state and maintaining the best interests of the state through contract implementation and construction, DEEP is reevaluating the best path forward to finance and implement large-scale comprehensive projects. In consultation with other key agencies, a pipeline of additional large-scale projects for different agencies is in development, contingent upon a sustainable financing mechanism being established.

Financing

DEEP has been working, in collaboration with others, towards a sustainable financing mechanism for small, medium, and large scale projects.

The most important roadblock to investing in energy efficiency at state facilities is the lack of predictable, sustainable source of funding to pay for upgrades. Through the utility companies' implementation of the Conservation and Load Management Plan [CGS 16-245m], agencies are able to complete small-scale upgrades routinely, within operating budgets. Larger scale projects require financing and to date, all financing mechanisms have been interpreted as being subject to the state's debt cap. Until this issue is addressed, significant constraints to large-scale investments remain. DEEP and other key agencies continue to confer with the Connecticut Green Bank to support their efforts to close this financing gap in a way that is acceptable to OPM and the Office of the Treasurer.

In 2017 the Connecticut Green Bank (CGB), in partnership with the utility companies, worked to recapitalize the Small Business Energy Advantage Program to increase the opportunities for small-scale upgrades, as this program is capital constrained. The goal of recapitalizing this program is to use alternative capital sources to lower the costs of, and increase the opportunity for, financing projects for small business, municipal, and state facilities. This effort began in 2016, with a goal to find low-cost capital to fund SBEA loans while maintaining the current aspects of the program. Jointly, the CGB and Utilities issued a Request for Proposals (RFP) for private capital to deliver interest rate buy-down savings, and also provide capital to allow UIL to avoid rationing their investments in public sector projects. The RFP was issued in December 2016 to 13 capital providers, and JP Morgan was selected for providing the cheapest cost of capital and being the most flexible solution. However, implementation difficulties indicated a need to re-evaluate the approach and further work continues on this effort into 2018.

DEEP received authorization for $20 million in General Obligation (GO) Bonds for State Fiscal Year 18 and $20 million in GO Bonds for State Fiscal Year 19 in the budget that was passed in the fall of 2017.[12] Of that $20 million, $18 million is anticipated to be used by the Department of Correction, and $2 million will be used for mid-sized projects ($1.6 million for DAS projects and $150K for Agriculture Experiment Station). Since the initial $20 million GO Bonds were fully expended at the end of 2016, several agencies have come forward looking to do energy upgrades at their facilities using the Lead by Example Bond Funded Program. This funding will help agencies to complete mid-size projects that are too big for the SBEA program and too small to participate in an ESPC Project. DEEP is currently waiting for the $20 million for SFY 19 to be released from the Bond Committee.

DEEP has been working with OPM, DAS, and the Office of the State Treasurer (OTT), and the Connecticut Green Bank regarding financing large-scale comprehensive projects, including Energy Savings Performance Contracts. There have been several inter-agency task meetings at the commissioner level and at the staff level to discuss the various financing mechanism to fund large comprehensive projects that address deferred maintenance of energy systems. The approach to financing will continue to be evaluated in the years to come. The large-scale projects currently being implemented are using GO Bonds.

Planning for Future Projects

DEEP, in consultation with several agencies, have been prioritizing state buildings and assessing what buildings are in dire need of energy retrofits to reduce energy wastes and opportunity costs. In 2018, DAS coordinated with DEEP to prioritize their buildings and requested funding to implement energy efficient measures for their facilities. DEEP gave DAS $1.6 million for projects at four of their buildings that included lighting retrofits to LED through the SBEA program, and installation of a hot water boiler for their Capitol Ave complex, which removed them from the Hartford Steam Loop. DAS with be initiating a phase two for energy upgrades at their other buildings they own, once the $20 million bond funds are released.

Other future projects in queue is for Department of Transportation to upgrade their highway lights with LEDs. Department of Correction will get $12 million to continue with their large-scale project. Department of Veterans Affairs, is working on getting their group homes more efficiency with the Home

[12] June Special Session Public Act 17-2, Section 378(e)(2) for SFY18 and Section 397(d)(2) for SFY19.

Energy Solution program through the utilities, as well as getting an electrical upgrade, energy audits complete, and sub-meters installed. DEEP will be working with the utilities to get their residential homes audited for efficiency upgrades. DEEP continues to encourage agencies to pursue energy retrofit opportunities and identifying their energy management needs in their capital plans, and to keep sending project request forms to participate in the LBE Programs.

Aggregated Electricity Supply Procurement for all Agencies

DEEP and DAS conducted a procurement for electricity supply for state agencies in Spring 2017 which resulted in a contract from July 2017 through June 30, 2018. That contract was extended for State Fiscal Year 19, through June 30, 2019. The state continues to save approximately $1 million through the aggregated purchase of electricity.

Effective July 1, 2018, state accounts enrolled in the aggregated purchase are paying 8.423 cents per kWh for 12 months (i.e., through June 30, 2019). That price was below standard service pricing during calendar year 2018. For example, in the second half of calendar year 2018, standard service pricing for Eversource was 9.42 or 8.53 cents, and for UI was 9.01 or 9.05 cents (depending on whether it's a business or residential standard rate). The aggregated purchase price compares even more favorably as of January 1, 2019, since the standard service pricing as of January 1, 2019 for Eversource is 10.14 or 10.85 cents, and for UI is 10.78 or 11.23 cents (depending on whether it's a business or residential standard rate).

The percent of this procurement that is Class 1 Renewable is 17% in 2018 and 19.5% in 2019. Class I renewable energy source, as defined in §16-1(a)(20) of the General Statutes of Connecticut (Conn. Gen. Stat.), means electricity derived from:

- solar power;
- wind power;
- a fuel cell;
- geothermal;
- landfill methane gas, anaerobic digestion or other biogas derived from biological sources;
- thermal electric direct energy conversion from a certified Class I renewable energy source;
- ocean thermal power;
- wave or tidal power; and others.

State accounts enrolled in the aggregated procurement are estimated to consume approximately 300 million kilowatt hours, not including the University of Connecticut and the state colleges and universities, which have their own contract. The accounts include executive branch agencies, and judicial and legislative management branch buildings, as well as Metro North facilities, and some other quasi-public agencies. Approximately 80% of state accounts are in Eversource service territory and 20% in United Illuminating service territory.

DEEP and DAS will be conducting another competitive electricity procurement for SFY 20 and will issue a new RFP in the spring of 2019. In addition, DEEP, along with DAS and PURA's Procurement Manager, are evaluating opportunities for savings from conducting an aggregated procurement for natural gas accounts for state facilities.

Workforce Development

During 2018 DEEP continued to partner with the Connecticut Business and Industry Association's Education and Workforce Partnership to support further development of Connecticut's energy workforce and employment opportunities. Through the CBIA Partnership, DEEP provided funds from a federal grant for administrative support of the Connecticut Energy Workforce Development Consortium (a public-private partnership of representatives from energy-related businesses, government and academia) and to support enhancements of their website.

The A.A.S. Degree in Energy Management

The Applied Associate of Science Degree in Energy Management is a unique two-year technical training program that prepares you for a rewarding career in commercial building energy analysis and energy management.

Students evaluate energy use patterns; develop, implement, market and maintain conservation programs; perform public outreach; recommend energy efficiency techniques; integrate alternative energy sources; and perform systems analysis to solve problems.

You will apply basic physics and analytical techniques to measure and define energy use of today's building systems with the goal of evaluating and recommending alternative energy solutions that will result in greater energy efficiency and lower energy costs. Students need no prior experience to succeed in the program.

Climate change, and our need to reduce energy consumption in buildings, has created new job and career opportunities for energy professionals.

Source: www.tunxis.edu/completion/energy-management

Despite the workforce efforts of a variety of stakeholders and industry leaders, workforce efforts have been undermined through the Legislature's 2017 diversion of the utility collections used to fund the Conservation and Load Management Plan, as the reduced funding has cut deeply into the Plan's workforce development investments, including a 50% reduction in workforce education and training offerings to advance the skills of clean energy technicians and building operators. Energy efficiency companies have been significantly affected by the diversion of Conservation and Load Management Plan funding, with budget uncertainty and volatility limiting investments in workforce training and the reduced capital investments resulting in layoffs at several companies that provide energy efficiency services to residents and businesses throughout the state.

To further enhance the options for energy-related training in Connecticut, in 2018 DEEP continued to contribute federal grant funds to the Tunxis Community College AAS Degree program in Energy Management. DEEP has supported this program that has been developed to help close the gap in workforce training and advance workforce opportunities for energy technicians. As the school website states, the program "prepares students for rewarding careers in the 'clean energy' sector…using the campus as a 'living laboratory'" [www.tunxis.edu/completion/energy-management].

Several of Connecticut's community colleges, along with Connecticut's Technical High Schools, provide opportunities in energy-related training. Stackable certificates and credits increase the accessibility of these programs for people who are employed but looking to enhance or change their careers.

Renewable Generation

Transitioning to renewable energy generation is consistent with the state's Comprehensive Energy Strategy and environmental goals. While several state facilities have installed on-site generation capacity from renewable energy sources such as solar and geothermal systems, the primary challenges in widespread installation of renewable energy generation sources at state facilities has been ensuring that financing for renewable installations is available and that financed pricing is cost-competitive

compared with the very competitive price of the state's aggregated electricity supply. It is important to note that favorable tax incentives have subsidized increased solar generation capacity in Connecticut at residential and private commercial properties in recent years. However, as a tax-exempt organization, the state is not able to directly benefit from tax incentives. Therefore, government sector facilities interested in on-site generation capacity but lacking funding for capital costs and associated maintenance costs may seek financing through power purchase agreements (PPAs). Such agreements hold the developer responsible for supplying the capital for project development and maintenance and the facility enters into a long-term agreement to purchase power from the private developer, while the developer benefits from the tax credits that the government entity cannot claim.

In 2018, DEEP worked in partnership with the Connecticut Green Bank and Connecticut's Attorney General's Office (AGO), and completed the development of standardized documents that meet contracting requirements for Executive Branch state agencies to install renewable energy at their facilities. Specifically, DEEP and the AGO have developed a standard Power Purchase Agreement, Interconnection Agreement, and Virtual Net Metering documents. DEEP, DAS, and the Connecticut Green bank continue to develop a standard for financing agreements. Once financing documents are considered approvable, the CT Green Bank and/or the Department of Administrative Services will competitively procure service providers willing to enter into Power Purchase Agreements that pay for the development and installation of solar generating capacity at selected facilities. DEEP, in partnership with the Connecticut Green Bank, is working with DOC, DOT, and DEEP to finance the installation of solar PV on their properties. The Connecticut Green Bank was awarded LREC/ZRECs at the end of 2018 for DOC facilities. Site visits will occur at DOC, DOT, and DEEP facilities in the beginning of 2019 with the agencies, CT Green Bank, and the CT Green Bank's solar contractor to assess the feasibility of installing on-site solar PV units. The projects will continue development through 2019.

The Connecticut State Colleges and Universities have been installing solar PV systems at various Community Colleges and State Universities, using a variety of applications including ground mounted, rooftop, and/or parking lot canopy units.

Recommendations

To build on the great success of achievements in reducing our energy use and cost, DEEP recommends the following:

1. Identify a sustainable financing mechanism for all types of energy efficiency upgrades at state facilities, and approvable contract vehicles for achieving the projects.
    a. Regular authorizations and allocations of general obligation bonds or revenue neutral Green Bonds to fund projects; and
    b. Non-bond financing acceptable to the Office of the Treasurer and the Office of Policy and Management, including financial mechanisms developed by the Connecticut Green Bank, and mechanisms developed by utility companies.
2. Continue the collaborative inter-agency process to improve energy management across state facilities and develop a continuous pipeline of energy management projects.
    a. Support all branches of state government, UCONN, CSCU, and quasi-public agencies on reporting their energy consumption and expenditures to analyze and strategize energy management decisions, to ensure compliance with state law.
    b. Continue receiving project request forms to develop a project queue.
    c. Educate agencies across the board about opportunities to apply for DEEP programs for energy and cost-saving upgrades.
3. Continue to invest in energy management data analysis platforms, which includes completing electronic data transfers between UIL (UI, CNG and SCG) and the state. Also, invest in obtaining historical data from Eversource and UIL to facilitate establishment of baselines.
4. Work with utility companies, EnergyCAP, OPM, Office of the State Comptroller, and other agencies to streamline billing and other pathways for agencies to benefit from optimizations potentially available through the successful transfer of electronic utility data.
5. Concurrently benchmark state buildings, while accounts to buildings correlations are being completed.
6. Develop a prioritized queue for renewable projects based on feasibility analyses and available funding.
7. Coordinate with the CT Department of Labor to institutionalize funding and training for clean energy workforce development.