Energy Use Profile for
CAPITAL COMMUNITY COLLEGE

Benchmarking **2016**

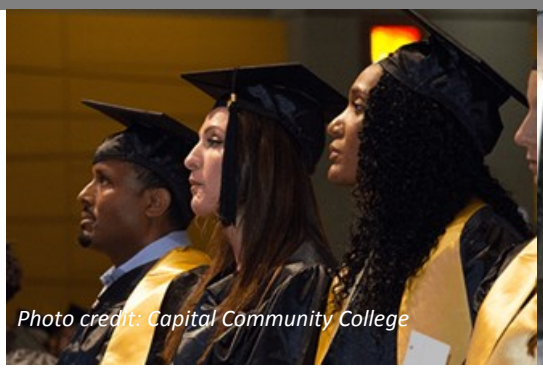
Photo credit: Capital Community College

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Strategic energy management presents a significant opportunity for campuses throughout Connecticut to improve building energy performance, save money and reduce carbon emissions.

Benchmarking is the process of comparing current energy usage data to previous years' energy usage data for the same facility or to the energy performance of comparable facilities. Benchmarking provides an opportunity to stimulate conversation and deeper inquiry into energy use, opportunities for savings, and optimizing building performance.

MANY OF CONNECTICUT'S HIGHER EDUCATION INSTITUTIONS HAVE MADE BOLD CLIMATE CHANGE COMMITMENTS. Higher education, the only sector with a coordinated organizational commitment to carbon neutrality, provides a model for setting and tracking climate targets and accountability in meeting climate commitments.

In Connecticut, 27% of colleges and universities have made commitments to become carbon neutral and have developed greenhouse gas inventories and climate action plans for their campuses. These commitments impact over 44% of the full-time students enrolled at higher education institutions in Connecticut.

Accordingly, Connecticut's higher education institutions will provide a strong contribution to meeting Connecticut's goals for reducing greenhouse gas emissions by 80% by 2050.

Connecticut State Colleges and Universities (CSCU) campuses - which include 12 community colleges and 4 state universities - provide opportunities to approach sustainable energy management systemically and make significant contributions toward the state's 20% energy reduction goals. Moreover, the CSCU campuses comprise 18% of the total square footage of all state agency buildings and 30% of all higher education students in Connecticut.

This report analyzes energy and water use benchmarking data for **Capital Community College**. It was produced with companion reports for each of the 11 other community colleges in the CSCU system, with the goal of providing data and analysis to inform the CSCU Energy Master Plan and to improve energy management at Capital Community College specifically.

KEY FINDINGS

46%

of Capital Community College's annual total energy cost in 2016 was for chilled water, even though only a third of its total energy was supplied by chilled water.

2.5%

less energy (as measured in site energy use intensity) is being used by Capital Community College in 2016, as compared to 2013, though use increased from 2015 to 2016.

$83,300

in annual potential savings could be realized if Capital Community College reduced its building energy use by 10%.

Capital Community College is located in a former department store in Hartford. Within the building, Capital is currently utilizing spaces for early childhood education, classrooms, and offices, with a gross area of 304,000 feet^2.

Finding 1

Energy use at Capital Community College decreased slightly from 2013 to 2016, falling 2.5%.

The energy performance of a building is a reflection of the building's design, systems, equipment and operating and maintenance practices, as well as the behavior of those using the building. Site energy is the annual amount of all energy a property consumes onsite, as reported on utility bills. Site energy use intensity (EUI) is the site energy use per square foot of property.

The current average site EUI for community colleges in Connecticut is 101 kBtu/ft^2 (See **Methods** for source).

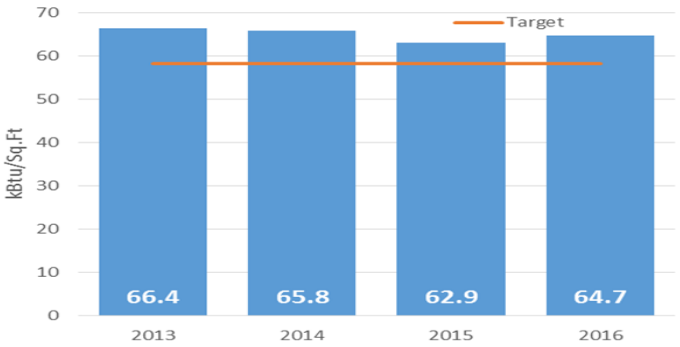

Figure 1. Building energy performance (site EUI) by calendar year from 2013 to 2016 (in blue) and a proposed energy use target (in orange) for Capital Community College. The target reflects a 10% reduction in energy use from 2016 use.

Capital Community College's site EUI is significantly below the Connecticut average, at 64.7 kBtu/ft, indicating better than average energy performance among Connecticut community colleges. Additionally, from calendar year 2013 to calendar year 2016, site EUI decreased from 66.4 to 64.7 kBtu/ft^2 (see **Figure 1**), representing a 2.5% decrease, though site EUI increased by 2.8% after a steady decline over the previous years. This report sets forth a 10% reduction in energy use as an attainable further target.

Finding 2

Chilled water accounted for 32% of Capital Community College's total energy use and 46% of its total energy costs in 2016.

Although most modern buildings use energy sources like electricity, natural gas, and oil for heating and cooling, some older buildings use systems like district steam and chilled water. Capital Community College uses 3 major source of energy: electricity (44%), chilled water (32%) and district steam (23%) (see **Figure 2**). Chilled water costs, however, account for 46% of energy costs in 2015 (see **Figure 3**).

Capital Community College is unique among Connecticut community college in its use of chilled water and district steam, as part of Hartford Steam's Down District Energy System. Accordingly, to optimize cost savings, the college might consider prioritizing actions that save on use of chilled water, electricity and district steam (see **Next Steps** section), with the understanding that energy prices vary over time.

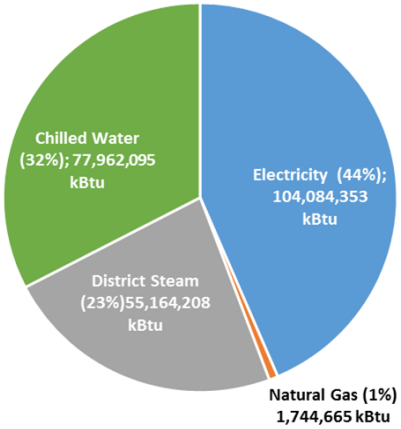

Figure 2. 2015 energy consumption by energy source for Capital Community College.

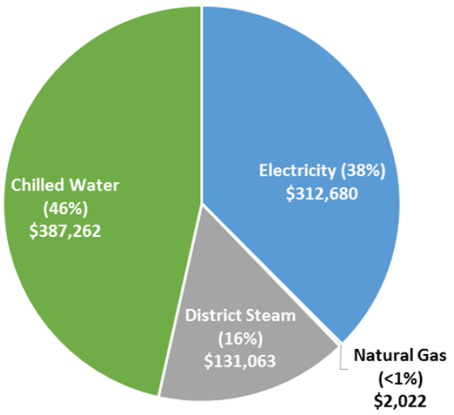

Figure 3. 2015 energy cost for Capital Community College.

Finding 3

Capital Community College has the potential to save up to $83,300 per year, if building energy use is reduced by 10%.

In 2013, Capital Community College spent $2.57 per square foot on its total energy costs (including electricity, chilled water, district steam, and natural gas) versus $2.67 in 2016 (see **Figure 4**). If Capital reduced its 2016 energy use by 10%, the cost per square foot would drop to $2.40, resulting in potential savings up to $80,300 per year, assuming energy prices remained constant.

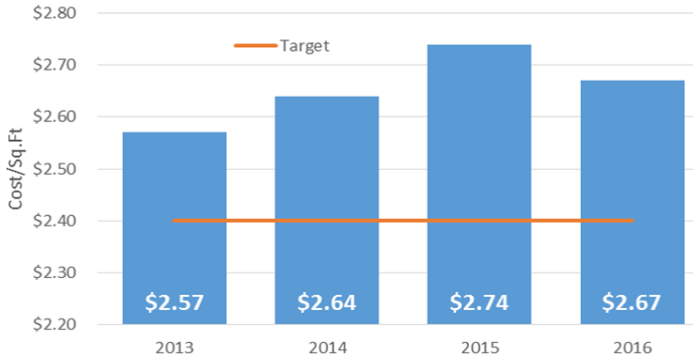

Figure 4. Energy cost per square foot for Capital Community College from 2013 to 2016 (in blue) and a proposed target (in orange) that assumes a10% reduction in energy use.

Finding 4

Electricity use at Capital Community College varied between 190,000 kWh and 245,000 kWh , with seasonal variations.

Detailed electricity use and cost data is available for Capital Community College from January 2013 to July 2016 (see **Figure 5**). In general, electric use peaks in spring and fall and is lower in the summer months.

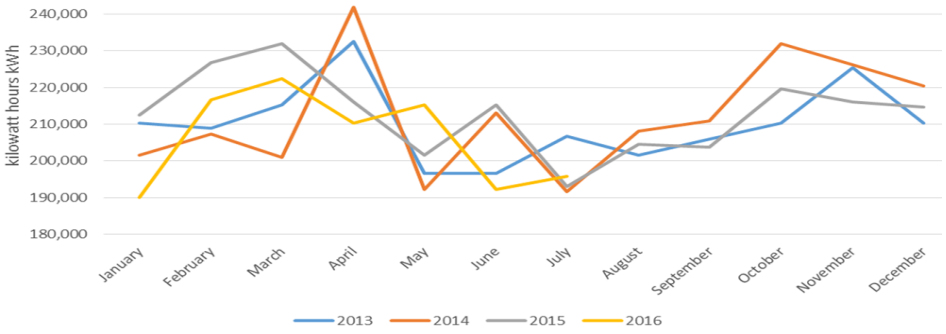

Figure 5. **Monthly electric energy use** (in kilowatt hours) for Capital Community College January 2013-July 2016.

Finding 5

Chilled water use decreased by 6% from 2013 to 2016, but costs increased.

Annual chilled water and district steam data is available for Capital Community College from 2013 through 2015 (see **Figure 6**).

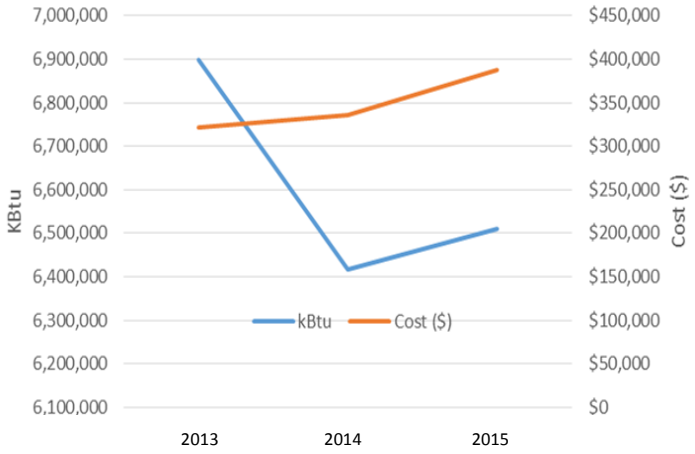

Figure 6. **Annual chilled water use graphs** for Capital Community College from January 2013 to December 2015.

Finding 6

District Steam use decreased 18% from 2013 to 2016, with a decrease in costs.

Annual chilled water and district steam data is available for Capital Community College from 2013 through 2015 (see **Figure 7**).

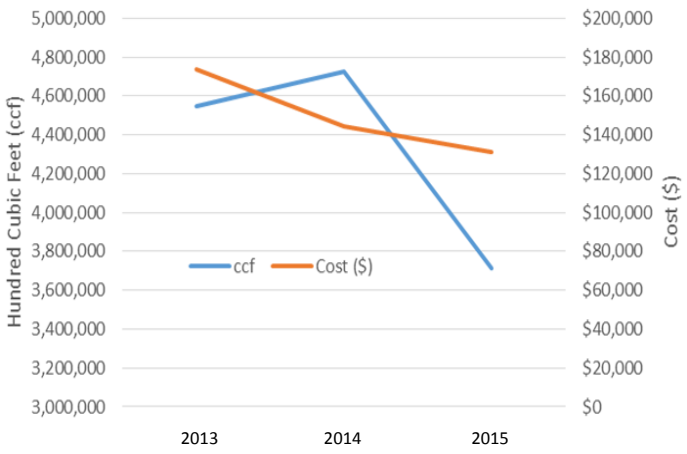

Figure 7. **Annual district steam use graphs** for Capital Community College from January 2013 to December 2015.

Finding 7

Water use at Capital Community College varied between 30,000 gallons and 230,000 gallons over time.

Detailed water use and cost data is available for Capital Community from January 2013 to June 2016 (see **Figure 8**). Water data includes domestic hot and cold water only and does not include water used in District Steam and chilling. Annual water cost per year is around $7,000.

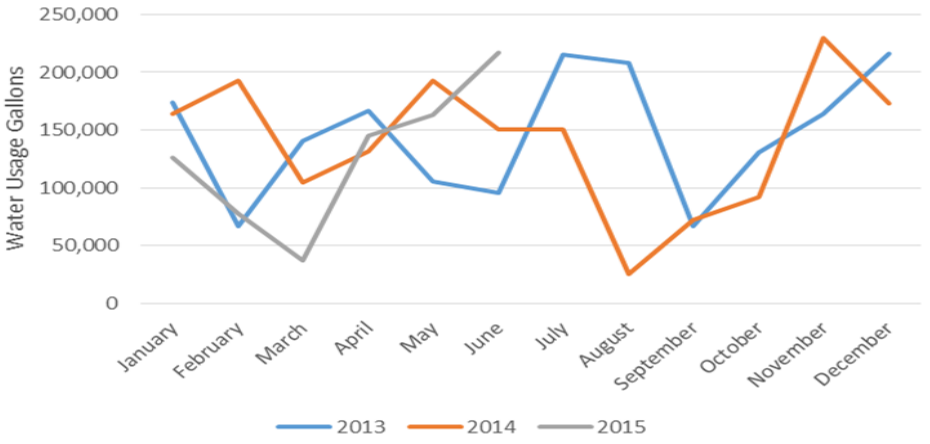

Figure 8. **Monthly water use** (in gallons) for Capital Community College from January 2013 to June 2015.

Next Steps

Energy and water use benchmarking data provide a critical foundation to understanding building energy performance and tracking changes in energy and water use over time. While data alone cannot identify why a building is efficient or inefficient or what is causing a change in energy or water use, the data and graphs in this report are very useful tools in identifying the areas of further inquiry. For example:

- Although Capital Community College decreased its energy use from 2013 to 2016 (see **Figure 1**), there are still significant opportunities to save energy and costs, especially in light of the increase from 2015 to 2016. Discussion with building operations staff and an on-site energy audit, available through the EnergizeCT program, would identify specific energy saving measures.
- The variability in peaks of electricity use, chilled water and district steam (see **Figures 5, 6 and 7**) suggest opportunities to explore heating and cooling efficiencies to optimize energy costs relative to building use.
- Capital Community College should consider adopting building energy performance targets, beginning with a 10% reduction in energy use. Many resources are available to help identify, finance and implement reductions.
- Capital Community College should explore opportunities for solar energy, which could further reduce energy costs.
- Capital Community College should also continue to track water use and identify opportunities for water efficiency.

The CSCU Energy Master Plan (2016) provides additional detail on current operations and energy management practices and recommendations for improvement. The Energy Master Plan will provide a useful roadmap for coordinated, system-wide energy savings initiatives.

In addition, there are many resources available through EnergizeCT and the Connecticut Green Bank to help implement energy saving actions. These include energy audits, retro commissioning, equipment financial incentives, and financing. Information on these programs is available through utility account representatives and at www.energizect.com.

Additional Background and Methods

Benchmarking Experience and Value

The Institute for Sustainable Energy has benchmarked over 900 buildings in Connecticut using Energy Star Portfolio Manager. This benchmarking work has helped building owners understand energy use and take the next steps to identify opportunities and implement actions to save energy. According to the U.S. Environmental Protection Agency, buildings that were benchmarked consistently in Portfolio Manager over a 3-year period reduced energy use by an average of 2.4 percent per year, for a total savings of 7 percent.

Data Sources and Energy Target

In 2015, Eversource launched an online, interactive data tool, known as the Eversource Customer Engagement Platform (CEP). In partnership with Eversource and the Connecticut State Colleges and Universities (CSCU) system office, the Institute for Sustainable Energy helped pilot the use of the CEP to obtain monthly electricity, natural gas usage, and cost data for this report. Water data was self-reported by Capital Community College and obtained by the Institute from the CSCU System Office.

This report suggests an initial energy savings target going forward of 10%. This report further references an average site EUI of 101 kBtu/ft^2 for community colleges in Connecticut. It was calculated by consultants Woodard & Curran for the 2016 CSCU Energy Master Plan using aggregate 2014 fiscal year energy data for all 11 community colleges in Connecticut.

Energy Star Portfolio Manager

Energy Star Portfolio Manager is an online tool created by the U.S. Environmental Protection Agency, designed to track and assess energy and water use across multiple buildings. Portfolio Manager controls for key variables affecting a building's energy performance, including climate, hours of operation and building size, allowing for meaningful comparison of buildings within the same building type. In addition to energy use and cost data, Portfolio Manager analysis relies on building demographic data, such as the number of kitchens, walk-in freezers, pools, and other building features.

Currently, Portfolio Manager does not include "Community College" as a building type. Data for all 11 community college campuses in Connecticut were coded as the "K-12 School" building type because community colleges, as non-residential centers of education, often function most similarly to this type of building. This coding enables appropriate comparisons between community colleges but should not be used to determine an Energy Star building score.

The Energy Star Portfolio Manager benchmarking account prepared for Capital Community College is available to authorized users, who have been provided the username and password to the account by the Institute for Sustainable Energy.

Time Period Covered

Unless otherwise indicated in this report, data is substantially complete from January 2013 to July 2016, and annual data is reported by calendar year. Further, in Figure 1, the most recent year of data shown is not for a calendar year. Rather, it represents a full year data, going back from July 2016 2015.

Process and Quality Control

Source data were entered into Microsoft Excel before being uploaded to Energy Star's Portfolio Manager. Two independent reviewers cross-checked data to verify the accuracy of the data input.

AUTHORS AND PARTNERS

Institute for Sustainable Energy at Eastern Connecticut State University

This report was prepared by the professional staff and student interns of the Institute for Sustainable Energy at Eastern Connecticut State University. For over 15 years, the Institute has provided technical support to Connecticut's colleges and universities, state agencies, municipalities, K-12 schools, and others to implement practical solutions that increase energy efficiency, sustainability and resilience. www.easternct.edu/sustainenergy

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