

Energy Use Profile for MIDDLESEX COMMUNITY COLLEGE

Benchmarking 2016



Photo Credit: Middlesex Community College

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, INCLUDING MIDDLESEX COMMUNITY COLLEGE, HAVE MADE BOLD CLIMATE CHANGE COMMITMENTS. Higher education, the only sector with an 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 use and benchmarking data for **Middlesex 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 Middlesex Community College specifically.

KEY FINDINGS

85%



of Middlesex Community College's annual total energy cost in 2016 was for electricity, even though only half of its total energy was supplied by electricity.

12%

less energy (as measured in site energy use intensity) is being used by Middlesex Community College in 2016, as compared to 2013, though the decrease over time was not linear.

\$372,480

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



Middlesex Community College is comprised of four main buildings that include mixed use spaces such as classrooms, labs, and administrative staff workspaces. Middlesex Community College’s existing gross area is 122,237 square feet. Middlesex also has two campuses, but for the purpose of this report we are focusing on MXCC’s campus, located at 100 Training Hill Road.

Finding 1

Between 2013 and 2016, energy use decreased by 12% for Middlesex Community College.

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

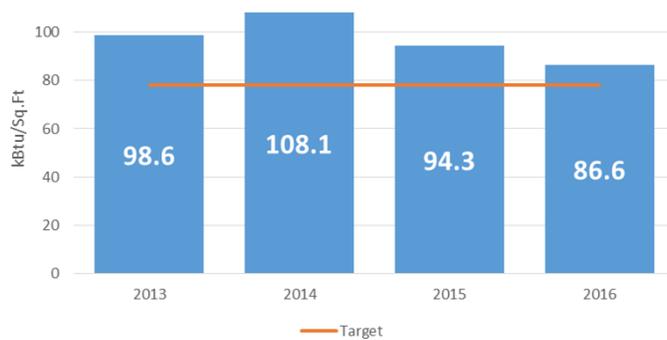


Figure 1. Building energy performance (site EUI) by calendar year from 2013 to 2016 (in blue) and a proposed energy use target (in orange) for Middlesex Community College. The target reflects a 10% reduction in energy use from 2016 use.

community colleges in Connecticut is 101 kBTU/ft² (See **Methods** for source). Middlesex Community College’s site EUI is currently below the Connecticut average, at 86.6 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 98.6 to 86.6 kBTU/ft² (see **Figure 1**), representing a 12% decrease. This report sets forth a 10% reduction in energy use as an attainable further target.

Finding 2

Electricity accounted for 57% of Middlesex Community College’s total energy use but 85% of its total energy costs in 2016.

From July 2015 to June 2016, Middlesex Community College’s total campus energy consumption was split between electricity, fuel oil, and some propane (see **Figure 2** for energy consumption by energy source). However, due to the relatively higher cost per Btu of electricity during this time period, electricity costs were significantly higher at 85% of the total, compared to fuel oil and propane (see **Figure 3**). In order to optimize cost

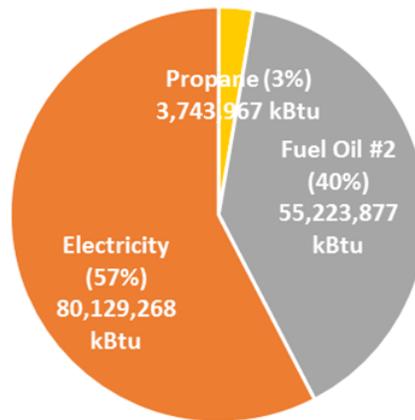


Figure 2. 2016 energy consumption by energy source for Middlesex Community College.

savings, the college might consider prioritizing actions that save electricity use (see **Next Steps** in this report), with

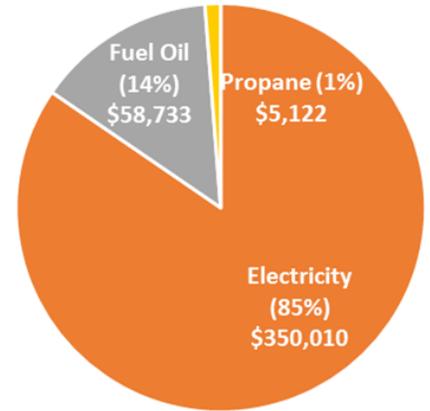


Figure 3. 2016 energy cost for Middlesex Community College.

the understanding that energy prices vary over time and that both electricity and fuel oil prices may vary year to year.

Finding 3

Middlesex Community College has the potential to save up to \$372,480 per year, if building energy use is reduced by 10%.

In 2013, Middlesex Community College spent \$3.12 per square foot on its total energy costs (including electricity, natural gas and fuel oil) versus \$2.73 in 2016 (see **Figure 4**). If Middlesex Community College reduced



Figure 4. Energy cost per square foot for Middlesex Community College from 2013 to 2016 (in blue) and a proposed target (in orange) that assumes a 10% reduction in energy use.

its 2016 energy use by 10%, the cost per square foot would drop to \$2.45,

resulting in potential savings up to \$372,480 per year, assuming energy prices remained constant.

Finding 4

Electricity use at Middlesex Community College varied between 120,000 kWh and 220,000 kWh with peaks in the warmer months.

Detailed electricity use and cost data is available for Middlesex Community College from January 2013 to July 2016 (see **Figure 5**). Over that time frame, electricity use was lowest in January, February and March each year with an average of 133,000 kWh per month. There were peaks in electricity use in June, July and August with the annual highs occurring in June at 226,800 kWh (2013), 200,480 kWh (2014), 199,360 kWh (2015), and 215,040 kWh (2016). Electricity usage was lowest overall in 2014.

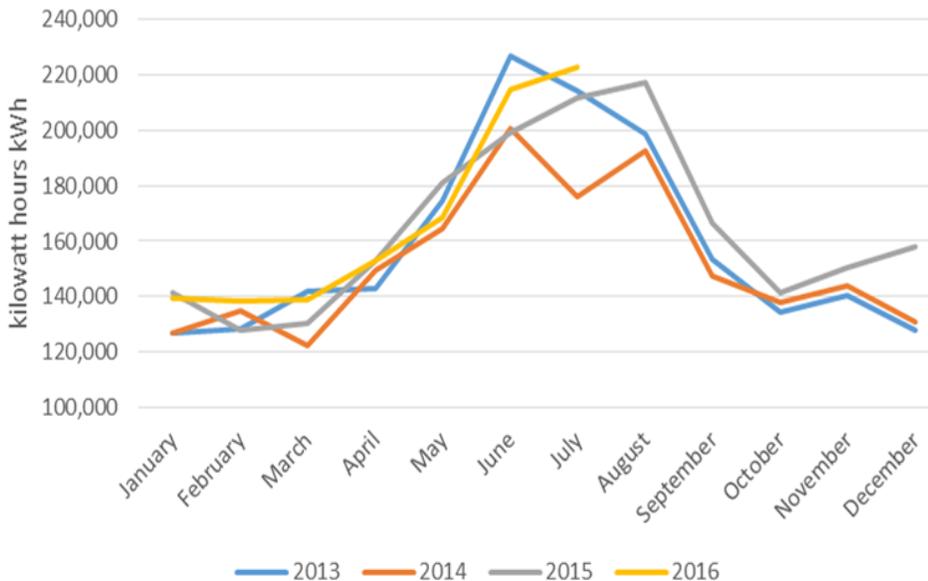


Figure 5. Monthly electric energy use (in kilowatt hours) for Middlesex Community College from January 2013 to July 2016.

Finding 5

Fuel oil use at Middlesex Community College varied seasonally with building heating needs.

Detailed fuel oil use data is available for Middlesex Community College from January 2013 to March 2016 (see **Figure 6**). Over that time frame, there is no fuel oil used between July and September each year, because there are no heating needs. Annually, fuel oil use peaks in the winter months and declines through early spring.

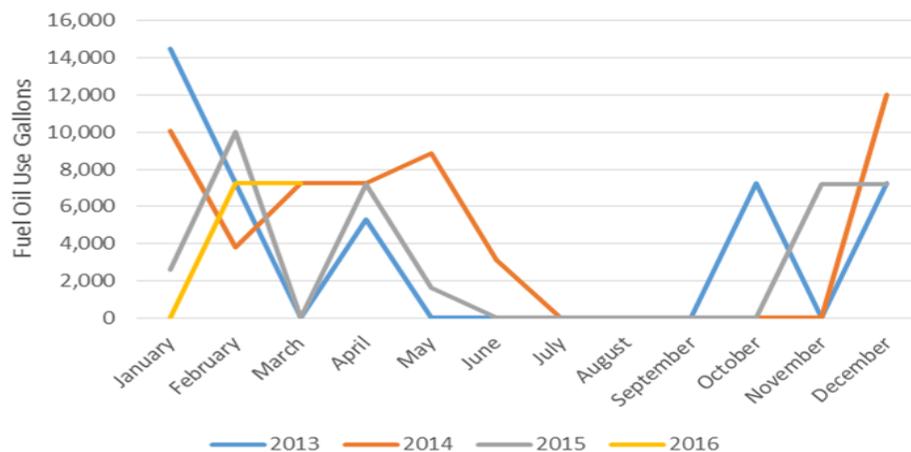


Figure 6. Monthly fuel oil energy use (in gallons) for Middlesex Community College from January 2013 to March 2016.

Finding 6

Propane use at Middlesex Community College varies seasonally with building heating needs.

Detailed propane use and cost data is available for Middlesex Community College from January 2013 to May 2016 (see **Figure 7**). Over that time frame, no propane was used from June through September. There were peaks in use in the winter months.

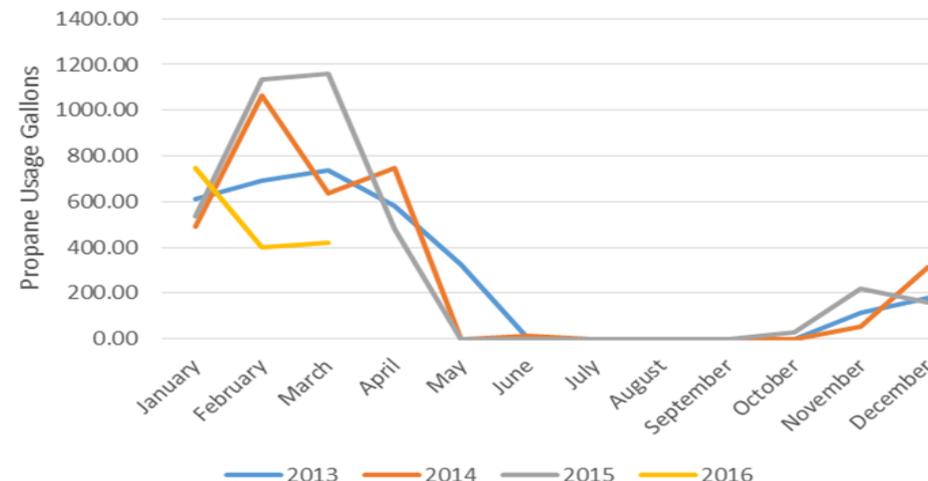


Figure 7. Monthly propane energy use (in gallons) for Middlesex Community College from January 2013 to March 2016.

Next Steps

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

- Although Middlesex Community College decreased its energy use from 2013 to 2016 (see **Figure 1**) there are still significant opportunities to save energy and costs. Discussion with building operations staff and an on-site energy audit, available through the EnergizeCT program, would identify specific energy saving measures.
- The peaks of electricity use in the summer months (see **Figure 5**) and fuel oil and propane use in the winter months (see **Figure 6**) suggest opportunities to explore heating and cooling efficiencies to optimize energy costs relative to building use.
- Middlesex 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.

- Middlesex Community College should continue to explore opportunities for solar energy, which could further reduce energy costs for the college.

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, as stated earlier, 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, propane usage, and cost data for this report.

This report suggests an initial energy

savings target of 10%. This report further references an average site EUI of 101 kBtu/ft² 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 Middlesex 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.

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

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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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