

Energy Use Profile for NAUGATUCK VALLEY COMMUNITY COLLEGE

Benchmarking 2016



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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 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 systematically 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 **Naugatuck Valley 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 Naugatuck Valley Community College specifically.

KEY FINDINGS

72%



of Naugatuck Valley Community College's annual total energy cost in 2016 was for electricity, even though less than one-third of its total energy was supplied by electricity.

8.6%

less energy (as measured in site energy use intensity) is being used by Naugatuck Valley Community College in 2016, as compared to 2013.

\$109,230

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



Naugatuck Valley Community College is comprised of four interconnected buildings. Its existing gross area is 598,276 square feet, though beginning in 2016, Founders Hall went offline for renovations. Completion of construction will eventually lead to an increase of 15,000 gross square feet.

Finding 1

Between 2013 and 2016, energy use decreased by 8.6% for Naugatuck Valley 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 community colleges in Connecticut is 101

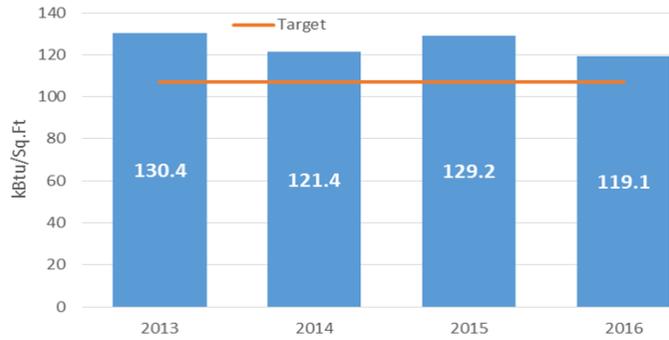


Figure 1. Building energy performance (site EUI) by calendar year from 2013 to 2016 (in blue) and a proposed energy use target (in orange) for Naugatuck Valley Community College. The target reflects a 10% reduction in energy use from 2016 use.

kBtu/ft² (See **Methods** for source). Naugatuck Valley Community College’s site EUI is currently above the Connecticut average, at 119.1 kBtu/ft, indicating a higher than average energy performance among Connecticut community colleges. From calendar year 2013 to calendar year 2016, site EUI decreased from 130.4 to 119.1

kBtu/ft² (see **Figure 1**), representing a 8.6% decrease. This report sets forth a 10% reduction in energy use as an attainable initial target, though even reaching that target would still represent below average energy performance, compared to other Connecticut Community Colleges.

Finding 2

Electricity accounted for less than one third of Naugatuck Valley Community College’s total energy use but 72% of its total energy costs in 2016.

From July 2015 to June 2016, Naugatuck Valley Community College’s campus energy consumption was approximately 29% electricity and 71% natural gas (see **Figure 2** for energy consumption by fuel type). However, due to the relatively higher cost per Btu of electricity during this time period, electricity costs were significantly higher at 72% of the total, compared to natural gas (see **Figure 3**). In order to optimize cost savings, the college might consider

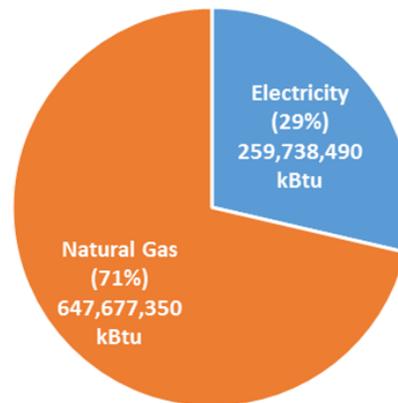


Figure 2. 2016 energy consumption by energy source for Naugatuck Valley Community College.

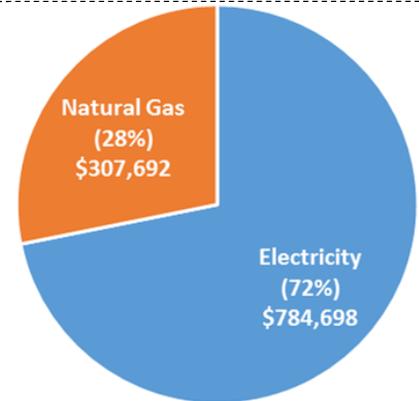


Figure 3. 2016 energy cost for Naugatuck Valley Community College.

prioritizing actions that save electricity use (see **Next Steps** in this report), with the understanding that energy prices vary

over time and that both electricity and natural gas prices may vary year to year.

Finding 3

Naugatuck Valley Community College has the potential to save up to \$109,230 per year, if building energy use is reduced by 10%.

In 2013, Naugatuck Valley Community College spent \$1.74 per square foot on its total energy costs (including electricity and gas) versus \$1.83 in 2016 (see **Figure 4**). If Naugatuck Valley Community College reduced



Figure 4. Energy cost per square foot for Naugatuck Valley 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 \$1.64, resulting in

potential savings up to \$109,230 per year, assuming energy prices remained constant.

Finding 4

Electricity use at Naugatuck Valley Community College varied between 452,760 kWh and 584,472 kWh, with seasonal variations.

Detailed electricity use data is available for Naugatuck Valley Community College from January 2013 to August 2016 (see **Figure 5**). In 2013, peaks in electricity use occur in March with 543,312 kWh, in July with 559,776 kWh, and in November with 559,776 kWh. In 2014 the peaks occurred in February with 559,776 kWh, in August with 559,776 kWh, and in November with 568,008 kWh.

Interestingly 2016 seems to have a smoother trend line for electricity use,

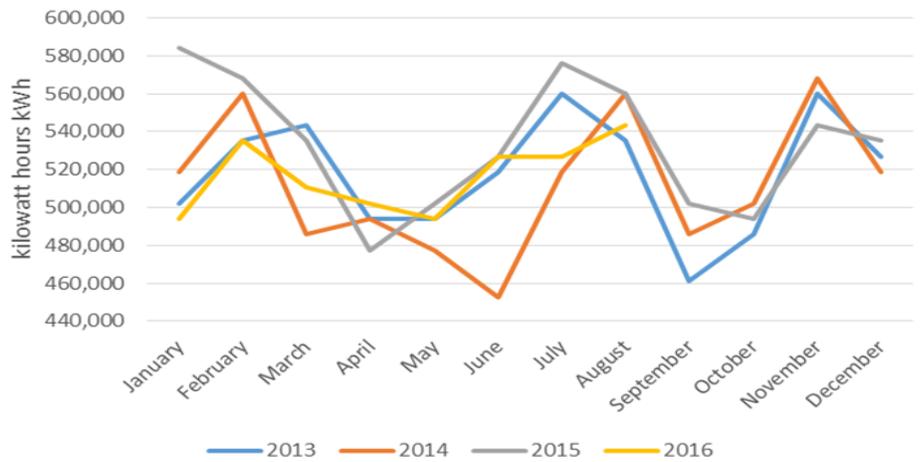


Figure 5. Monthly electric energy use (in kilowatt hours) for Naugatuck Valley Community College from January 2013 to August 2016.

with less obvious peaks, while the years 2013—2015 follow very similar trends. In

June 2014, electricity use was lower than any other time.

Finding 5

Natural gas use at Naugatuck Valley Community College varied seasonally based on building heating needs.

Detailed natural gas use data is available for Naugatuck Valley Community College from January 2013 to August 2016 (see **Figure 6**). Over that time frame, there is little natural gas used in March and September each year. Annually, natural gas use steadily climbs through the fall, as outside temperature drops. Each year the average natural gas

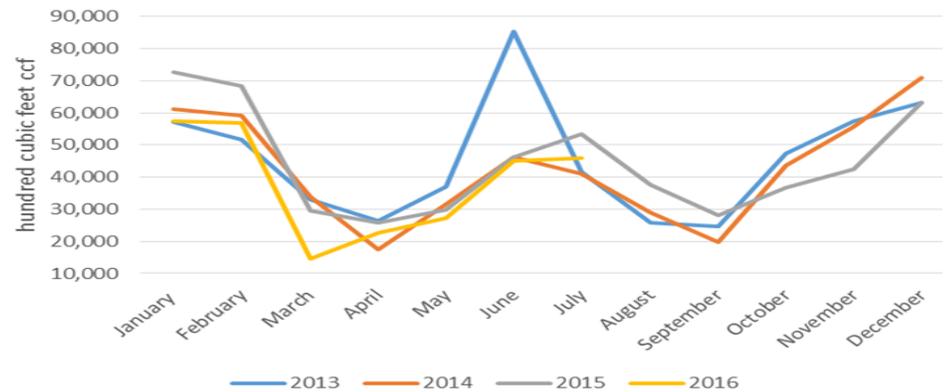


Figure 6. Monthly natural gas energy use (hundred cubic feet) for Naugatuck Valley Community College from January 2013 to August 2016.

use each month is 44,282 ccf. Interestingly 2013 appears to be the

only year where natural gas use did not follow the annual trend, and instead

Finding 6

Water use at Naugatuck Valley Community College varied between 2,300 gallons and 3,200 gallons for each billing cycle.

As with energy benchmarking, benchmarking water consumption can stimulate conversation about water use, opportunities for savings and optimizing water use.

Detailed water use data is available for Naugatuck Valley Community College from January 2013 until June 2015 (see **Figure 7**). Typically, water meters are read and a bill is issued every three months. **Figure 7** reflects use according to these meter readings, with each bar representing total use between meter readings. For example, the bars shown

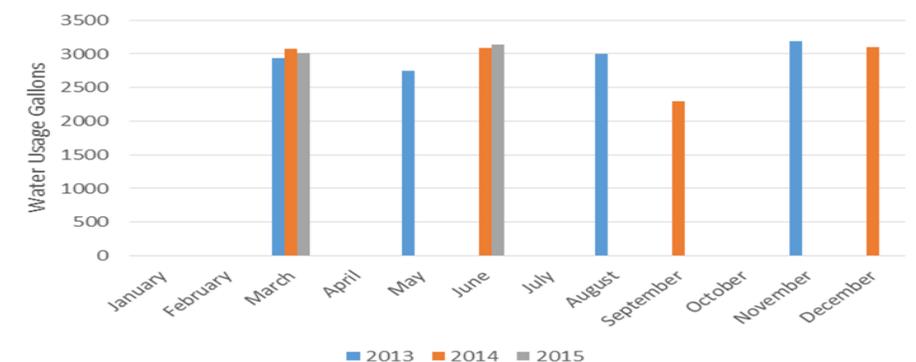


Figure 7. Monthly water use (in gallons) for Naugatuck Valley Community College from January 2013 to June 2015, by meter reading.

as “March” reflect total water use for January, February and March of the year being graphed. Total annual water use was

higher in 2013 (11,880 gallons) than in 2014. Annual water cost for Naugatuck was around \$31,000.

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 Naugatuck Valley 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 its below average performance relative to other community colleges in Connecticut. Discussion with building operations staff and an on-site energy audit, available through the EnergizeCT program, would identify specific energy saving measures.
- The seasonal peaks of electricity use (see **Figure 5**) and natural gas (see **Figure 6**) suggest opportunities to explore heating and cooling efficiencies to optimize energy cost relative to building use.
- Naugatuck Valley 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.

- Naugatuck Valley Community College should explore opportunities for solar energy, which could further reduce energy costs.
- Naugatuck Valley 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 Naugatuck Valley Community College and obtained by the Institute from the CSCU System Office.

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 Naugatuck Valley 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 August 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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