Energy Use Profile for
MANCHESTER COMMUNITY COLLEGE

Benchmarking **2016**

MANCHESTER 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 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 use and benchmarking data for **Manchester Community College (MCC)**. 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 MCC specifically.

KEY FINDINGS

84%

of Manchester Community College's annual total energy cost in 2016 was for electricity, even though only 37% of its total energy was supplied by electricity.

8%

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

$112,680

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

This report presents its findings first for the campus as a whole, then for separately metered areas on campus, as explained more fully below.

Total Campus Findings

Demographics

Manchester Community College is comprised of three main buildings that are interconnected. These buildings are used primarily for classes, labs, and faculty and staff offices. In 2009, the Great Path Academy was added as an extension to the Student Services Center. There are also six additional smaller buildings known as the Village which are used for classroom spaces. Manchester Community College's gross area is 473,662 square feet.

This report analyzes total campus energy use, followed by energy use in three campus areas (see **Figure 1**). The sub-metered areas include: (1) those buildings in green circles—Arts, Sciences and Technology (AST) and the 6 village buildings, (2) the red circle—the Library Resource Center (LRC), and (3) the yellow circle—Student Services Center/ Lowe (SSC) and Great Path Academy (GPA). Electricity, natural gas, and water use are sub-metered by these three campus areas.

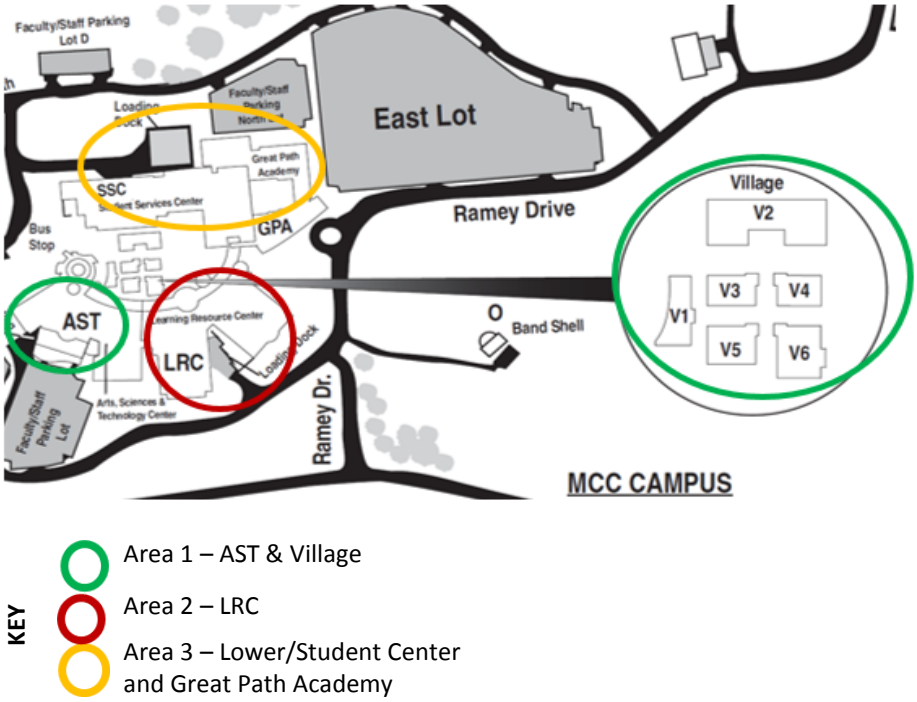


Figure 1. Campus Map of Manchester Community College.

Finding 1

Between 2013 and 2016, energy use increased by 8% for Manchester 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 kBtu/ft^2 (See **Methods** for calculation). Manchester Community College's site EUI is currently below the Connecticut average, at 80.7 kBtu/ft, indicating better than average energy performance among Connecticut community colleges. However, from calendar year 2013 to calendar year 2016, site EUI increased from 74.7 to 80.7 kBtu/ft^2 (see **Figure 2**), representing an 8% increase. This report sets forth a 10% reduction in energy use as an attainable initial target.

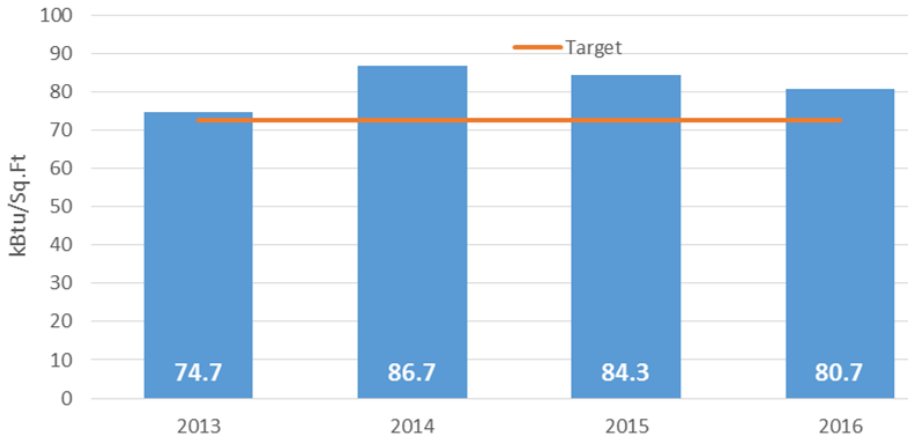


Figure 2. Building energy performance (site EUI) by calendar year from 2013 to 2016 (in blue) and a proposed energy use target (in orange) for Manchester Community College. The target reflects a 10% reduction in energy use from 2016 use.

Finding 2

Electricity accounted for 37% of Manchester Community College's total energy use but 84% of its total energy costs in 2016.

From June 2015 to June 2016, Manchester Community College's total campus energy consumption was split between electricity and natural gas (see **Figure 3** 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 84% of the total, compared to natural gas (see **Figure 4**). In order to optimize cost savings, the college might consider 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.

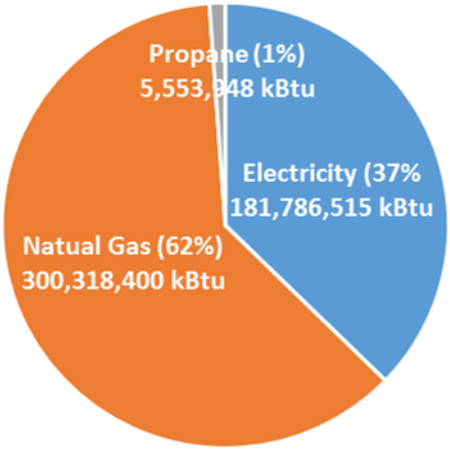


Figure 3. 2016 energy consumption by energy source for Manchester Community College.

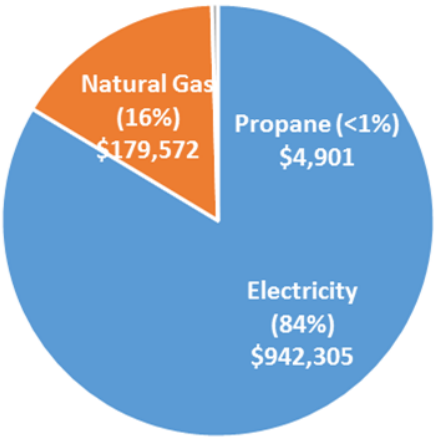


Figure 4. 2016 energy cost for Manchester Community College.

Finding 3

Manchester Community College has the potential to save up to $112,680 per year, if building energy use is reduced by 10%.

In 2013, Manchester Community College spent $1.97 per square foot on its total energy costs (including electricity and natural gas) versus $2.22 in 2016 (see **Figure 5**). If Manchester reduced its energy use by 10% below 2016 levels, the cost per square foot would drop to $2.00, resulting in potential savings up to $112,680 per year, assuming energy prices remained constant.

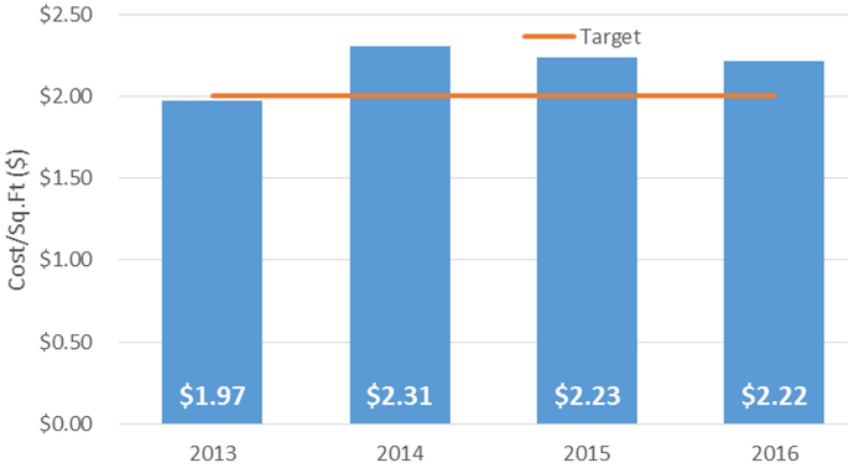


Figure 5. Energy cost per square foot for Manchester Community College from 2013 to 2016 (in blue) and a proposed target (in orange) that assumes a 10% reduction in energy use.

Finding 4

Electricity use at Manchester Community College varied between 475,000 kWh and 800,000 kWh over the course of the year, with peaks typically occurring in June.

Detailed electricity use data is available for Manchester Community College from January 2013 to August 2016 (see **Figure 6**). Electricity use typically peaked in the summer. Of the annual data available thus far for full calendar years, electricity use was highest in 2014.

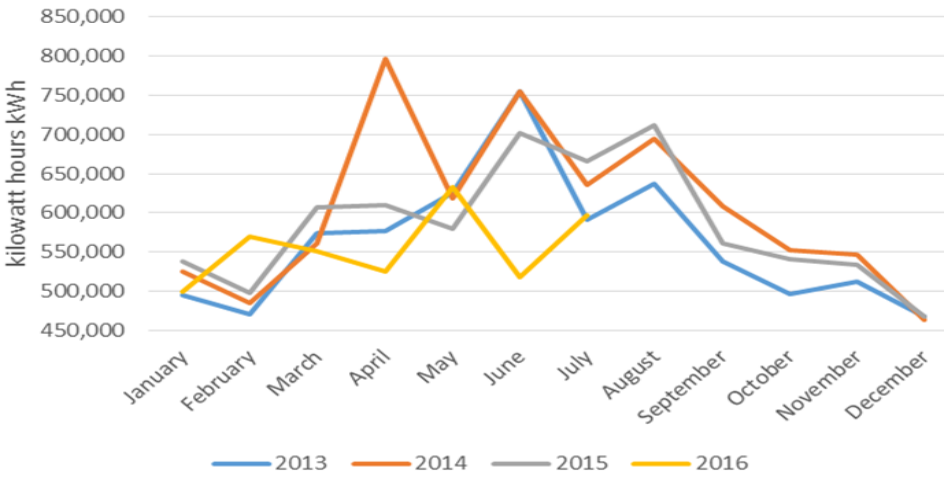


Figure 6. Monthly electric energy use (in kilowatt hours) for Manchester Community College from January 2013 to July 2016.

Finding 5

Natural gas use at Manchester Community College varied seasonally with building heating needs.

Detailed natural gas use data is available for Manchester Community College from January 2013 to February 2016 (see **Figure 7**). During the months of July – October there was little natural gas use because there were no heating needs. Annually, natural gas use steadily climbed through the fall as outside temperature dropped, peaking at an average of 35,000 ccf in January, and declined through late winter and early spring. The highest reported use was for 2014, with an annual use total of 242,810 ccf.

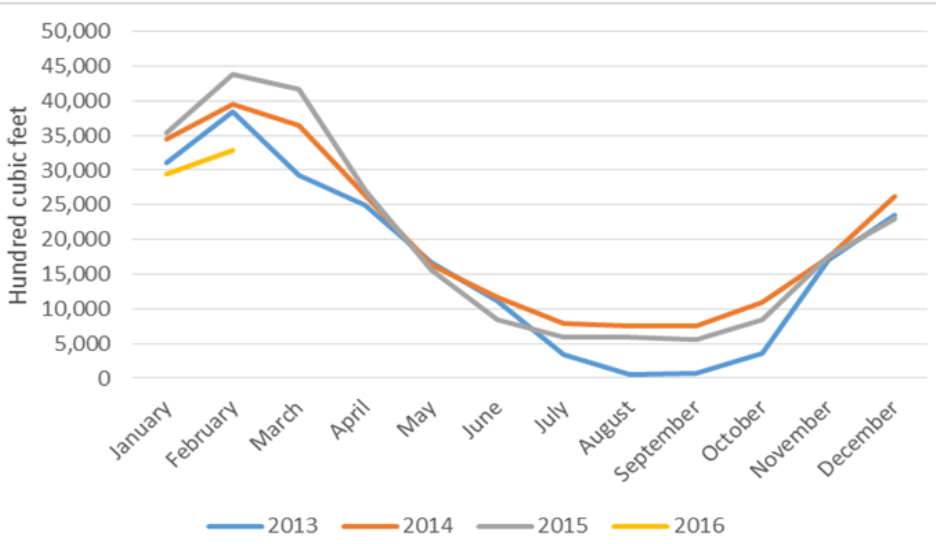


Figure 7. **Monthly natural gas energy use** (by hundred cubic feet) for Manchester Community College from January 2013 to June 2016.

Finding 6

Water use at Manchester Community College varied over the course of each year, with peaks typically occurring during the October to December time period.

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 Manchester Community College from January 2013 to July 2016 (see **Figure 8**). Typically, water meters are read and a bill is issued every 3 months. **Figure 8** reflects use according to these meter readings, with omitted bars representing unavailable data.

As is evident from the bar chart above trends in water use are very similar from year to year, with most water use occurring between October and December, and the least occurring between April and July. Annual costs for water use at Manchester Community College are around $30,800 for the entire campus.

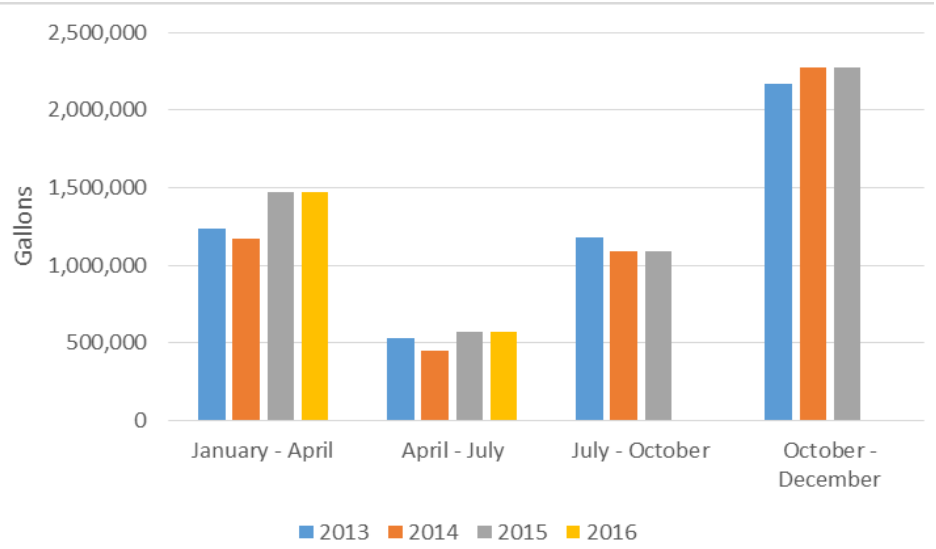


Figure 8. **Monthly water use** (in gallons) for Manchester Community College 2013 to 2016.

Area 1 Findings:

Arts, Sciences and Technology Building and Village Buildings

Building Information

The Arts, Sciences and Technology Building (AST) at Manchester Community College has a total gross area of 112,101 square feet, and it was built in 2001. The Village area is comprised of six buildings used primarily for academic classrooms and offices with each totaling between 1,000 and 3,000 square feet. All Village buildings were built in 2003. The Arts, Sciences and Technology building and the Village share the same electric, natural gas, and water meter. The findings below show the total energy and water use for these buildings.

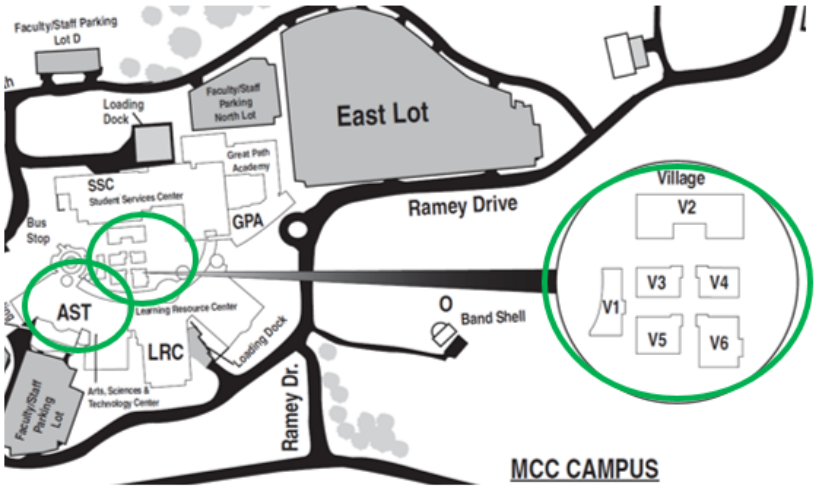


Figure 9. Campus Map of Manchester Community College. The green areas, or Area 1 (see Figure 1), include the Arts Sciences and Technology Building and Village Buildings.

Finding 7

Between 2013 and 2016, energy use increased by 2.75% for AST and the Village.

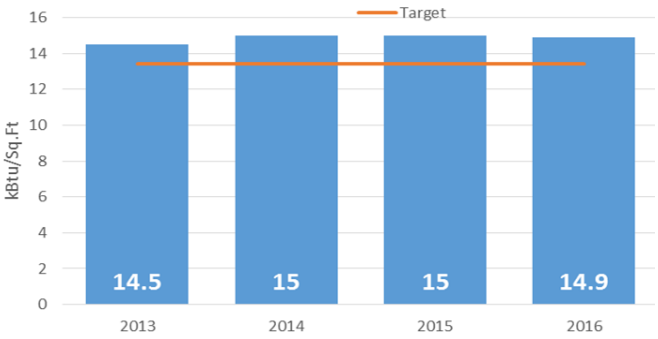


Figure 10. Arts, Sciences and Technology Building (AST) and Village Buildings **energy performance** (site EUI) by calendar year from 2013 to 2016 (in blue) and a proposed energy use target (in orange). The target reflects a 10% reduction in energy use from 2016 use.

Finding 8

AST and the Village have the potential to save up to $21,800 per year, if building energy use is reduced by 10%.

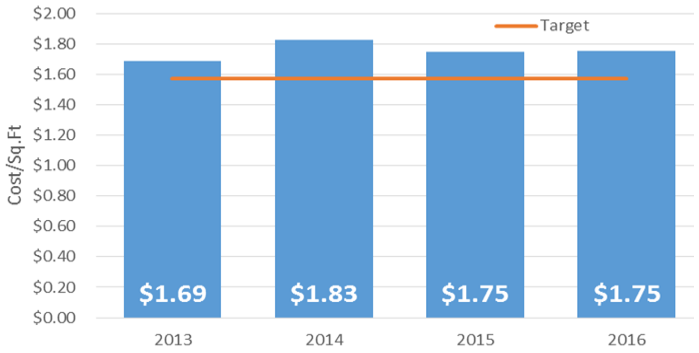
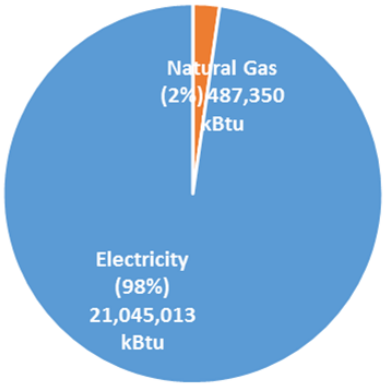


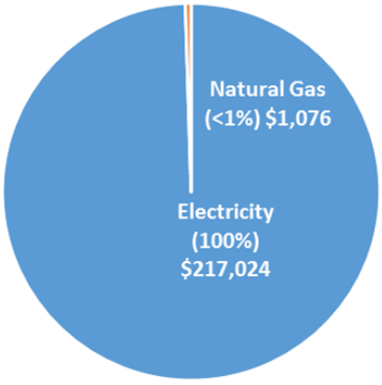
Figure 11. **Energy cost per square foot** for AST and Village Buildings from 2013 to 2016 (in blue) and a proposed target (in orange) that assumes a 10% reduction in energy use.

Finding 9

Electricity accounted for 98% of AST and the Village's total energy use and 100% of its total energy costs in 2016.

Figure 12 (left pie chart). **2016 energy consumption by energy source** for AST and Village Buildings.
Figure 13 (right pie chart). **2016 energy cost** for AST and Village Buildings.





Finding 10

Electricity use at AST and the Village varied between 122,000 kWh and 171,000 kWh.

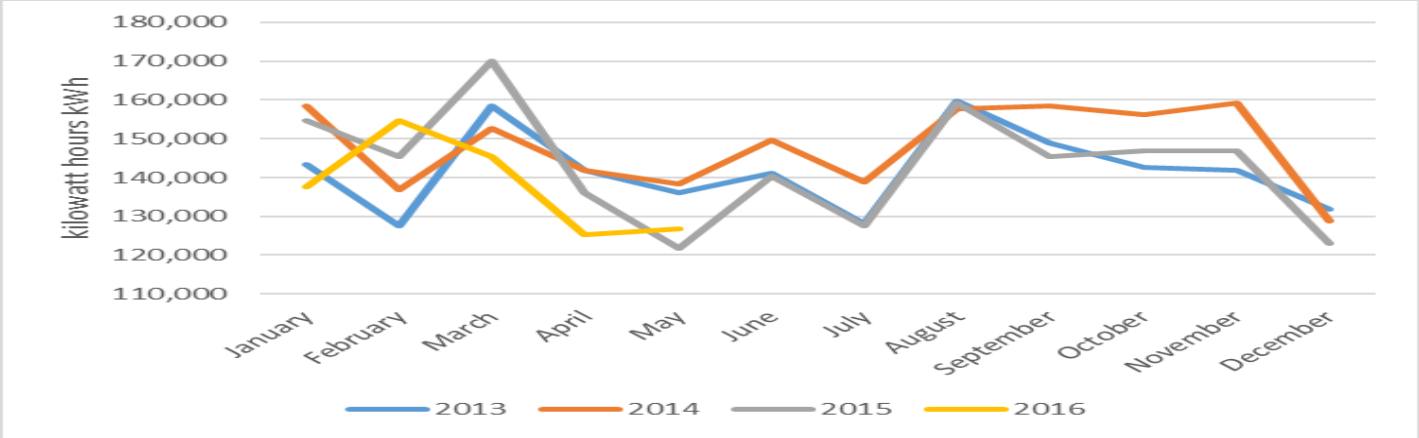


Figure 14. **Monthly electric use** (in kilowatt hours) for AST and the Village from January 2013 to May 2016.

Finding 11

Natural gas use at AST varied seasonally with building heating needs.

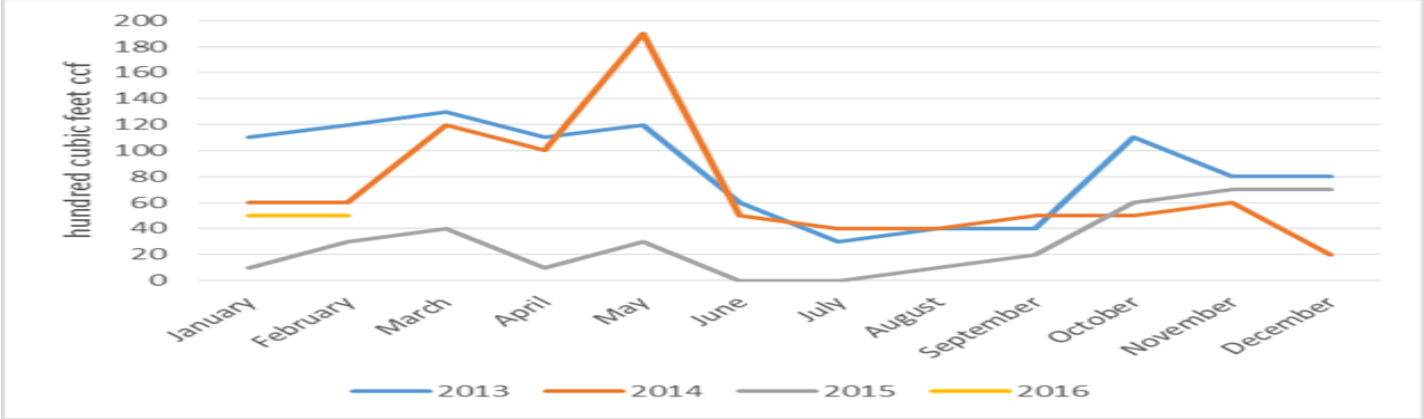


Figure 15. **Monthly natural gas energy use** (by hundred cubic feet) for AST from January 2013 to June 2016.

Finding 12

Water use at AST and the Village varied over the course of each year, with lowest use October—December.

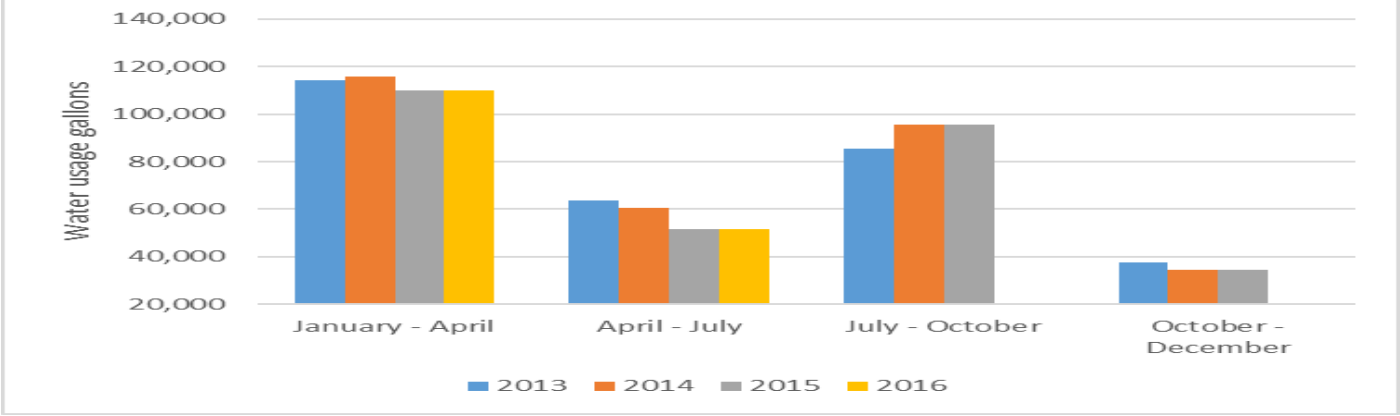


Figure 16. **Monthly water use** (in gallons) for AST and the Village 2013 to 2016.

Area 2 Findings:
The Library Resource Center

Building Information

The Library Resource Center (LRC) at Manchester Community College has a total gross area of 113,504 square feet and was built in 2000. The LRC is primarily for academic use, including office and classroom spaces.
The LRC has its own electric, natural gas, and water meter, in addition to a separate natural gas meter for a lab within the building. The findings below show the energy and water use for the LRC including a separate natural gas use graph for the lab.

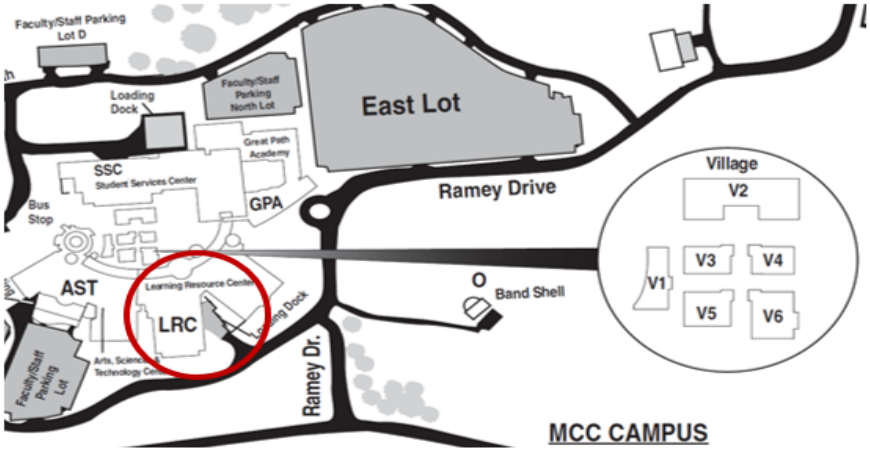


Figure 17. Campus Map of Manchester Community College. The red area, or Area 2 (see Figure 1), includes the Library Resource Center.

Finding 13

Between 2013 and 2016, energy use increased by 14% for LRC.

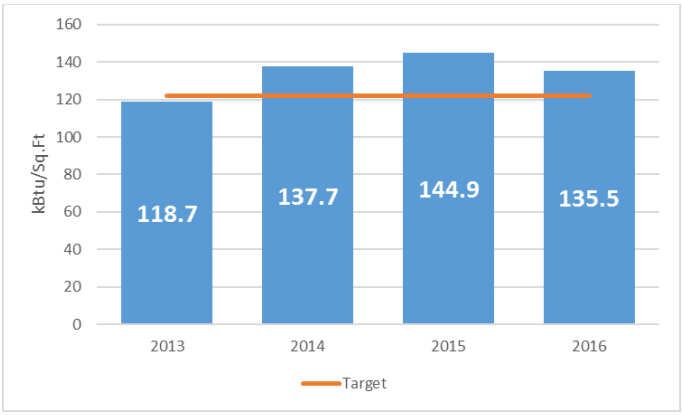


Figure 18. **Building energy performance** (site EUI) by calendar year from 2013 to 2016 (in blue) and a proposed energy use target (in orange) for LRC. The target reflects a 10% reduction in energy use from 2016 use.

Finding 14

The LRC has the potential to save up to $35,820 per year, if building energy use is reduced by 10%.

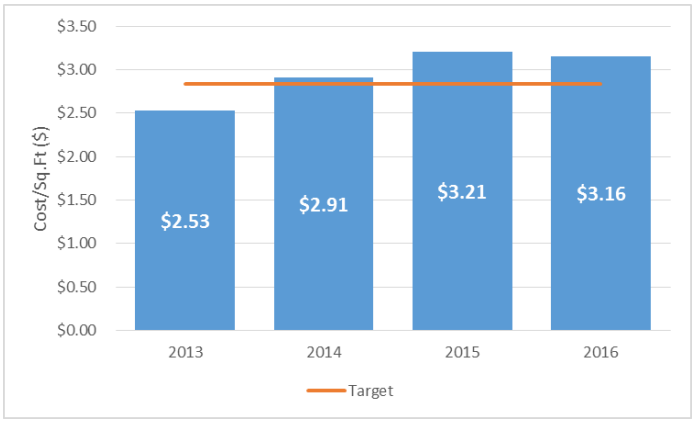
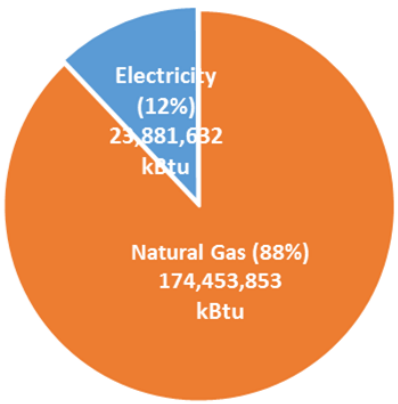


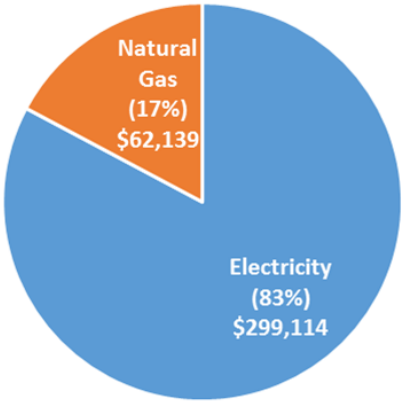
Figure 19. **Energy cost per square foot** for LRC from 2013 to 2016 (in blue) and a proposed target (in orange) that assumes a 10% reduction in energy use from 2016 use.

Finding 15

Electricity accounted for 12% of the LRC's total energy use but 83% of its total energy costs in 2016.

Figure 20 (left pie chart). **2016 energy consumption by energy source** for LRC.
Figure 21 (left pie chart). **2016 energy cost** for LRC.





Finding 16

Electricity use at LRC varied between 118,000 kWh and 255,000 kWh over time, with peaks in June.

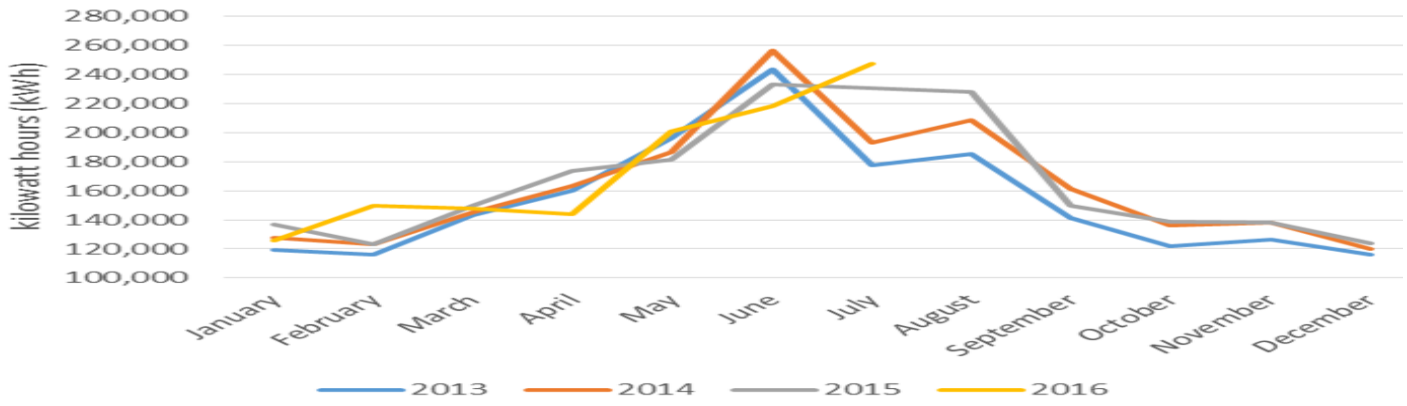


Figure 22. **Monthly electric energy use** (in kilowatt hours) for LRC from January 2013 to July 2016.

Finding 17

Natural gas use at LRC varied seasonally with building heating needs.

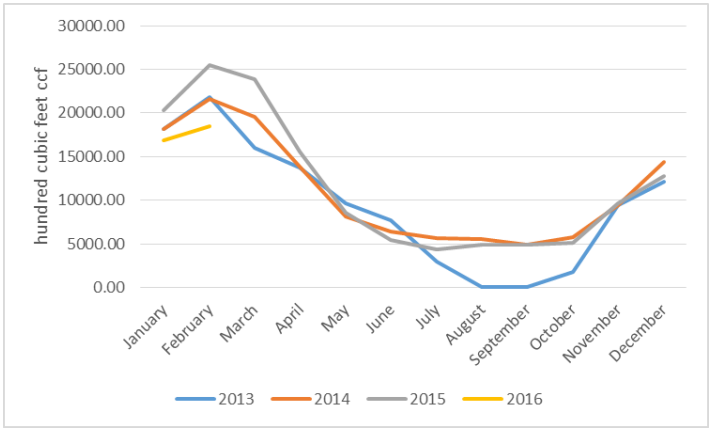


Figure 23. **Monthly natural gas energy use** (by hundred cubic feet) for LRC from January 2013 to June 2016.

Finding 18

Natural gas use at the LRC Lab varied seasonally with building heating needs.

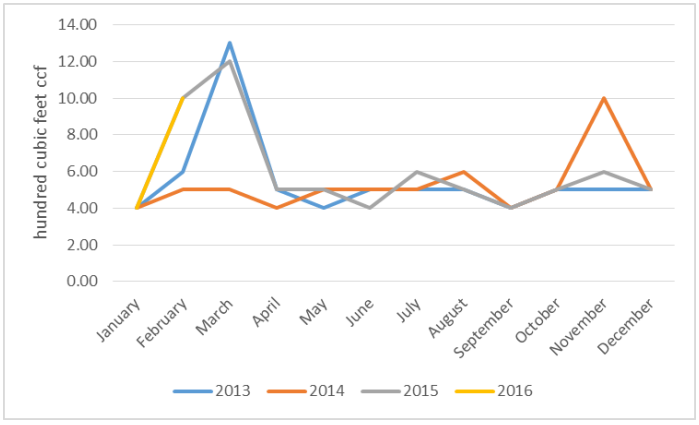


Figure 24. **Monthly natural gas energy use** (by hundred cubic feet) for LRC Lab from January 2013 to February 2016.

Finding 19

Water use at LRC varied over the course of each year, with highest use in October—December.

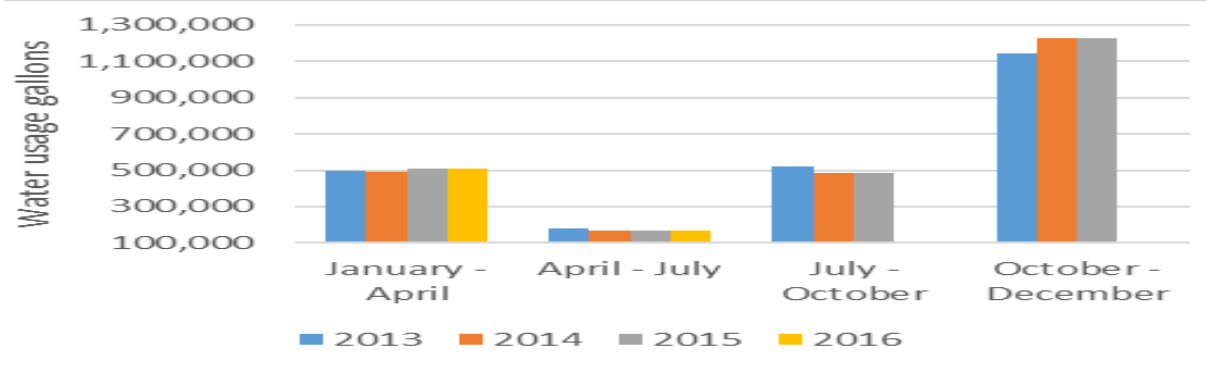


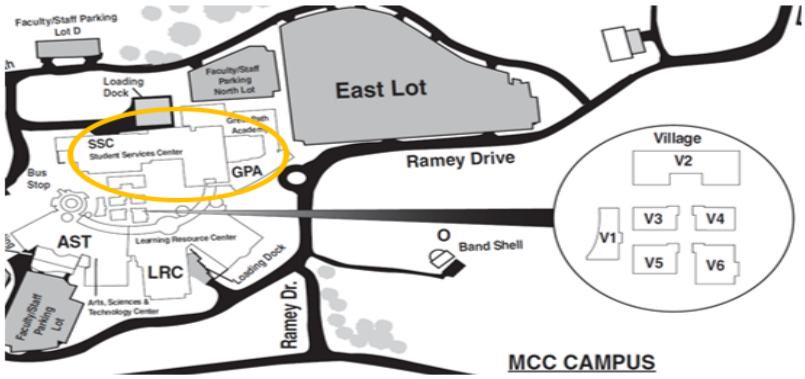
Figure 25. **Monthly water use** (in gallons) for LRC 2013-2016.

Area 3 Findings:

Student Services Center Building/Lowe and Great Path Academy

Building Information

The Student Services Center at Manchester Community College has a total area of 155,582 square feet and was built in 1984. In 2009, there was an addition to this building that increased the gross area by 80,593 square feet. Lowe includes academic spaces such as offices, labs, and classrooms for Manchester Community College students, while Great Path Academy is a magnet school that offers classroom and office spaces for grades 9-12 students. These buildings operate on the same electricity meter, but are on separate meters for natural gas and water. In addition, Lowe also has its own propane meter.



Finding 20

Figure 26. Campus Map of Manchester Community College. The yellow area, or Area 3 (see Figure 1), includes the Library Resource Center.

Finding 20

Between 2013 and 2016, energy use increased by 4.6% for Lowe and the Great Path Academy.

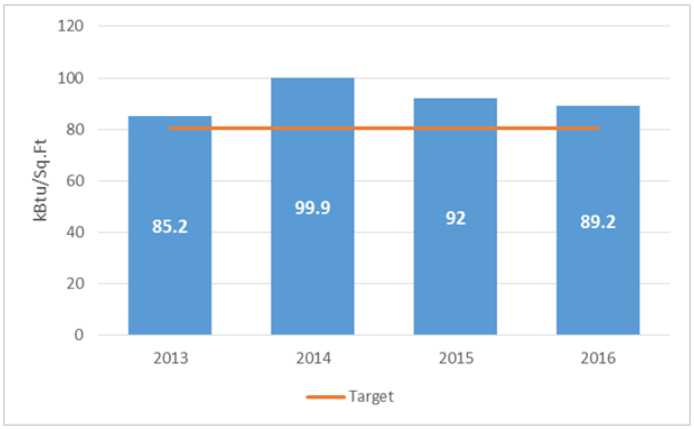


Figure 27. Building energy performance (site EUI) by calendar year from 2013 to 2016 (in blue) and a proposed energy use target (in orange) for Lowe and Great Path Academy. The target reflects a 10% reduction in energy use from 2016 use.

Finding 21

Lowe and Great Path Academy have the potential to save up to $47,860 per year, if building energy use is reduced by 10%.

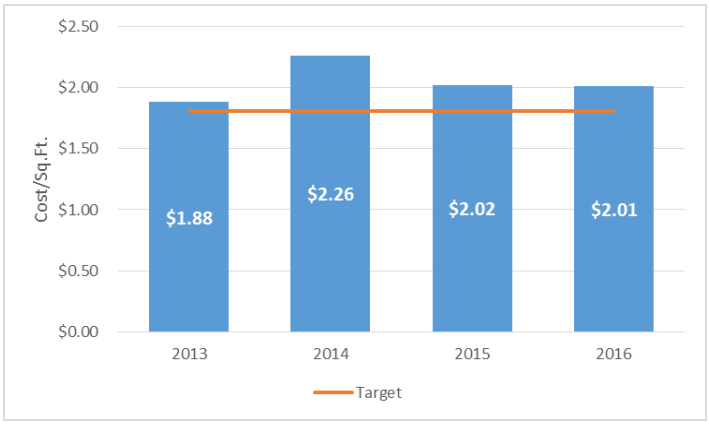
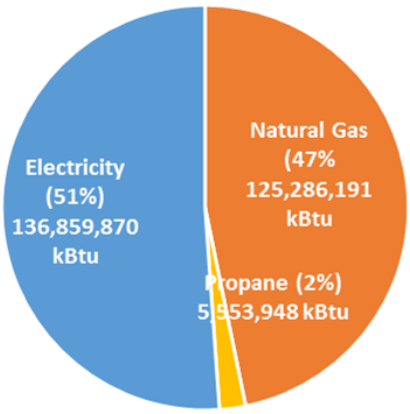


Figure 28. Energy cost per square foot for Lowe and Great Path Academy from 2013 to 2016 (in blue) and a proposed target (in orange) that assumes a 10% reduction in energy use from 2016 use.

Finding 22

Electricity accounted for half of Lowe and Great Path Academy's total energy use but 89% of its total energy costs in 2016.



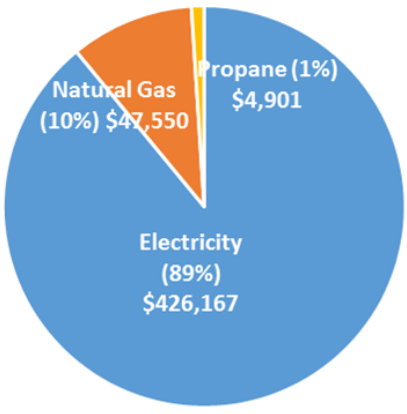


Figure 29 (left pie chart). **2016 energy consumption by energy source** for Lowe and Great Path Academy.
Figure 30 (right pie chart). **2016 energy cost** for Lowe and Great Path Academy.

Finding 23

Electricity use at Lowe and the Great Path Academy varied between 247,000 kWh and 352,000 kWh over the course of the year, with peaks typically occurring in June.

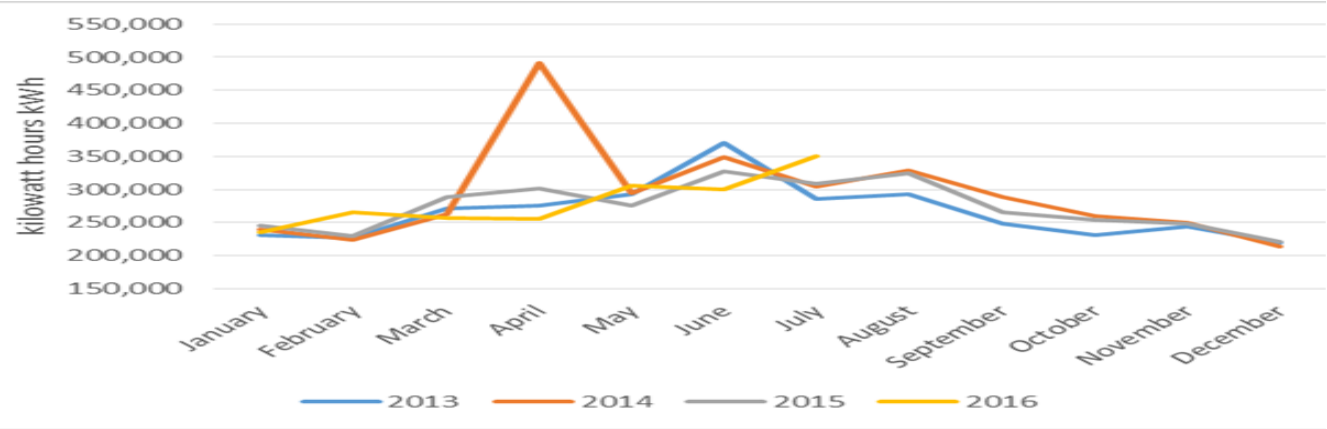


Figure 31. **Monthly electric energy use** (in kilowatt hours) for Lowe and Great Path Academy from January 2013 to July 2016.

Finding 24

Natural gas use at Lowe varied seasonally with building heating needs.

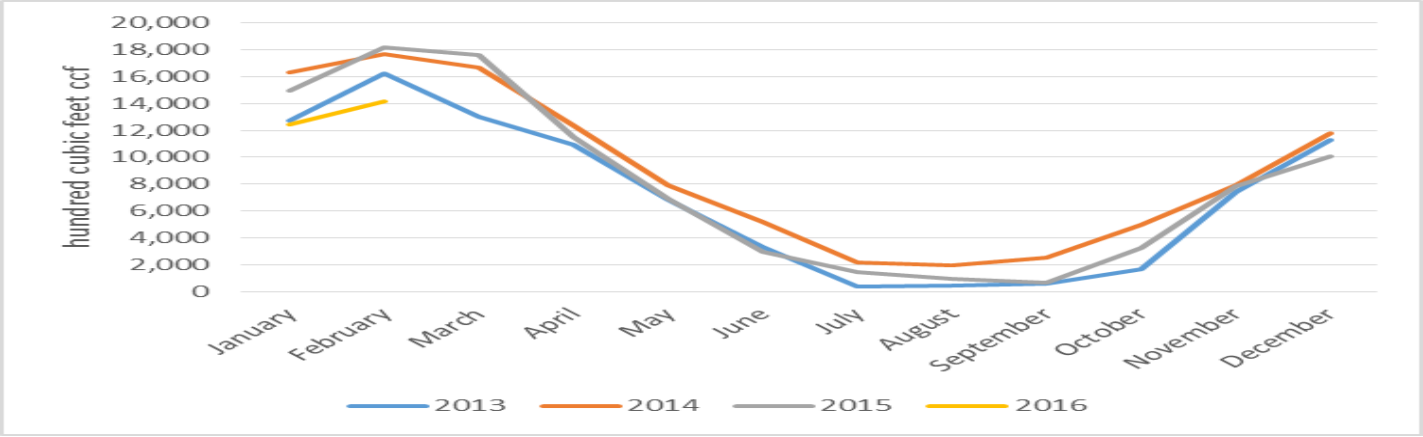


Figure 32. **Monthly natural gas energy use** (by hundred cubic feet) for Lowe from January 2013 to June 2016.

Finding 25

Natural gas use at the Great Path Academy was variable over time.

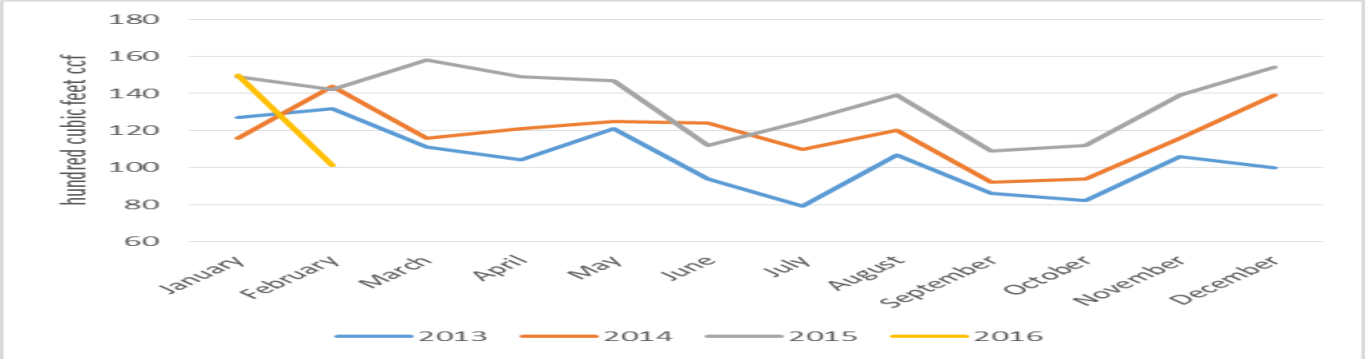


Figure 33. **Monthly natural gas energy use** (by hundred cubic feet) for Great Path Academy from January 2013 to June 2016.

Finding 26

Propane use at Lowe varied over time.

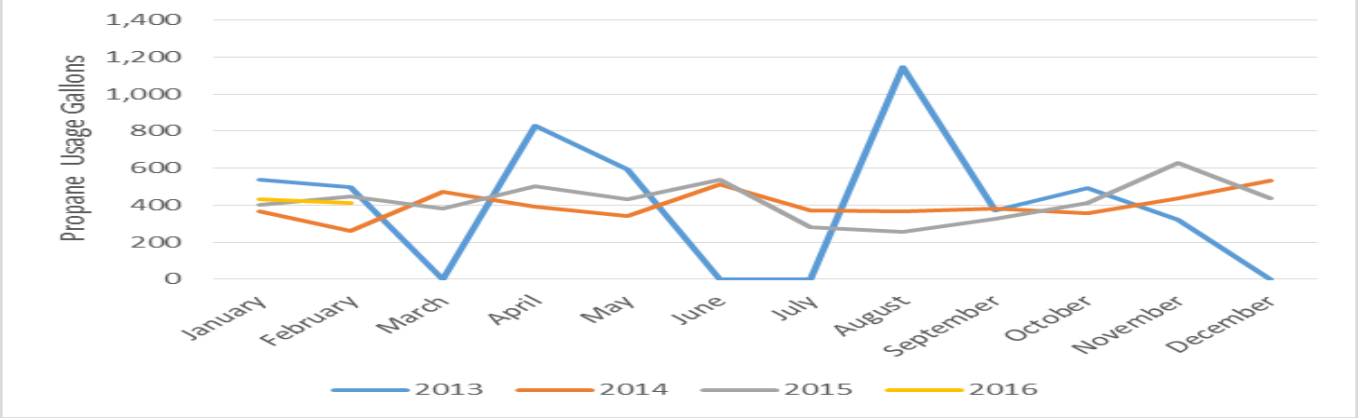


Figure 34. **Monthly propane use** (by gallons) for Lowe from January 2013 to February 2016

Finding 27

Water use at Lowe varied over the course of each year, with peaks typically occurring during the October - December time period.

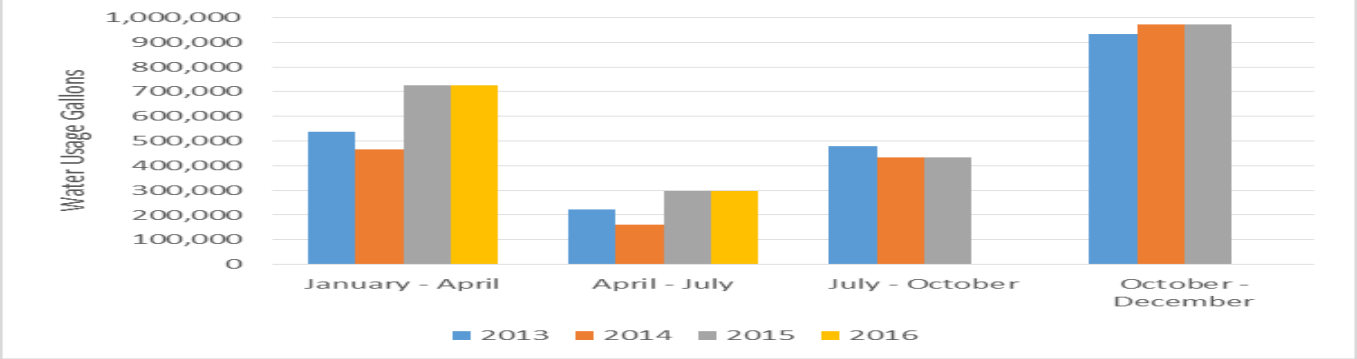


Figure 35. **Monthly Water use** (in gallons) for Lowe from 2013—2016.

Finding 28

Water use at Great Path Academy varied over the course of each year, with peaks typically occurring in during the January—April time period.

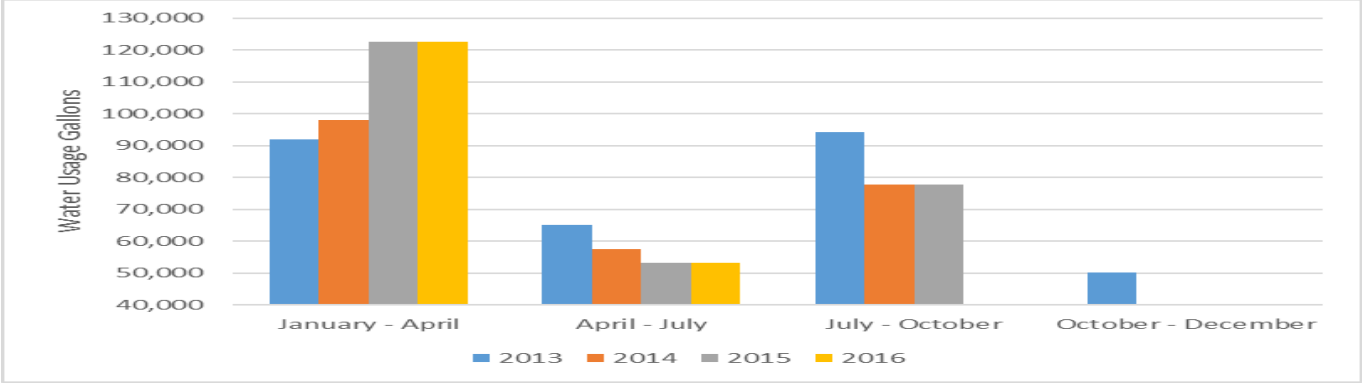


Figure 36. **Monthly water use** (in gallons) for Great Path Academy from 2013—2016.

Next Steps

Energy use, water 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 a building's efficiency or the cause of a change in energy use, the data and graphs in this report are useful tools in identifying the areas of further inquiry regarding energy and water use. For example:

- Although Manchester Community College decreased its energy use from 2013 to 2015 (see **Figure 2**) 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.
- Seasonal variations in electricity use (see **Figure 6**) and peaks of natural gas use in the winter months (see **Figure 7**) suggest opportunities to explore heating and cooling efficiencies to optimize energy costs, relative to building use.
- Manchester 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.
- Manchester Community College should explore opportunities for solar energy, which could further reduce energy costs.
- Of the three sub-metered areas on campus, the LRC has the highest EUI and energy costs and should be targeted for energy audit to identify energy savings and opportunities.
- Manchester Community College's high water use over the October-December time period should be explored to identify potential opportunities to optimize use.

The CSCU Energy Master Plan (Fall 2016 draft) 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 saving 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, and cost data for this report. Water data was self-reported by Manchester 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/ft^2 for community colleges in Connecticut. This figure 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 Manchester 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.

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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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