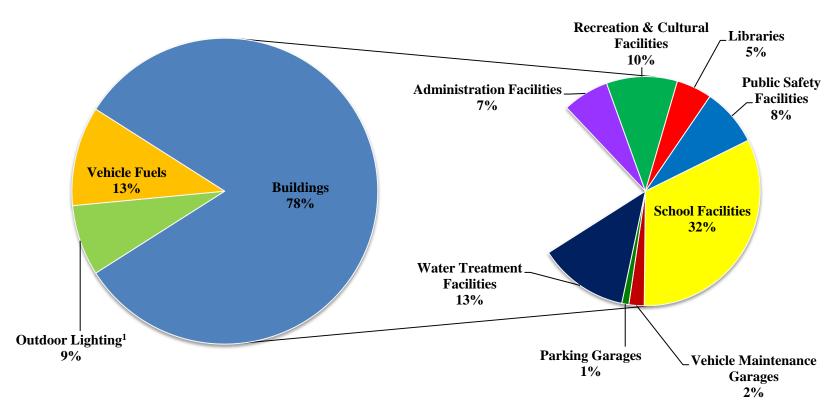
FY12 Municipal Energy Use

Efficient use of energy in City operations continues to be a high priority for the City of Cambridge. In addition to electricity and natural gas, the City uses heating oil, propane, gasoline, diesel and solar electric to power its municipal facilities and operations. Streetlights, athletic fields, youth and senior centers, waste trucks, plows, emergency generators, schools, water and sewer pumps, pedestrian pathways, libraries and traffic signals are just some of the many services provided by the City that require energy. Over the past five years, the City has taken tremendous steps towards reducing energy consumption through building efficiency projects, greening the vehicle fleet, and employee education programs.

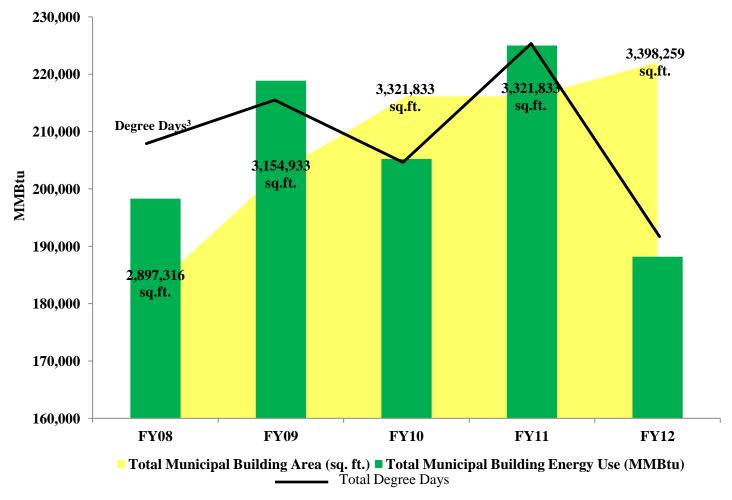
FY12 Municipal Energy Use by Category



This chart illustrates how municipal facilities account for the vast majority, or 78%, of the City's total energy use in FY12. Buildings are further broken out by facility type.

FY08-FY12 Municipal Building Energy Use - Compared to Total Municipal Building Area and Weather

The majority of the City's energy consumption is related to the operation of the City's 74 facilities. Despite the growth in the City's overall building square footage, which increased 17% between Fy08 and FY12 (with the opening of the Robert W. Healy Public Safety Building, War Memorial Recreation Center, Russell Youth & Community Center and Main Library expansion in FY09 & FY10, and the acquisition of the Foundry Building in FY12), the City's commitment to energy efficiency led to a *decrease* in total energy use by 6% over the same period.



The above chart displays the relationship between energy use, building area, and weather intensity (shown in degree days). Despite significant increases in building area and extreme variability in weather intensity, the City is using energy at its facilities more efficiently, decreasing the average amount of energy used per square foot (EUI) by 20% from FY08 to FY12. The City continues to improve data collection and analysis of energy use, and is seeking to have weather-normalized data available for all municipal buildings in FY14.

2

FY08-FY12 Municipal Energy Use Facts

	FY08	FY09	FY10	FY11	FY12
Total City Energy Use (MMBtu ¹)	307,256	324,094	306,125	328,744	287,212
Total City CO ₂ e ² Emissions (lbs)	66,668,465	66,473,764	62,248,701	65,986,582	60,109,839
Total City Energy & Fuel Cost (\$)	\$8,341,447	\$9,937,149	\$8,221,762	\$9,196,947	\$8,582,834
Total Degree Days³ – 65° base	6,256	6,494	6,154	6,802	5,749
Total Municipal Building Area (sq. ft.)	2,897,316	3,154,933	3,321,833	3,321,833	3,398,259
*Average Municipal Building Energy Use Intensity (EUI) ⁴ (kBtu ¹ /sq.ft.)	72	73	65	71	58
Average Municipal Building Energy Cost per Square Foot (\$/sq.ft.)	\$2.15	\$2.35	\$1.94	\$2.17	\$1.89

^{*}EUI figures do not include the 154,000 sq.ft. Walter J. Sullivan Water Purification Facility.

¹Btu, or British Thermal Unit, is a unit of energy measurement that can be used across fuel types.

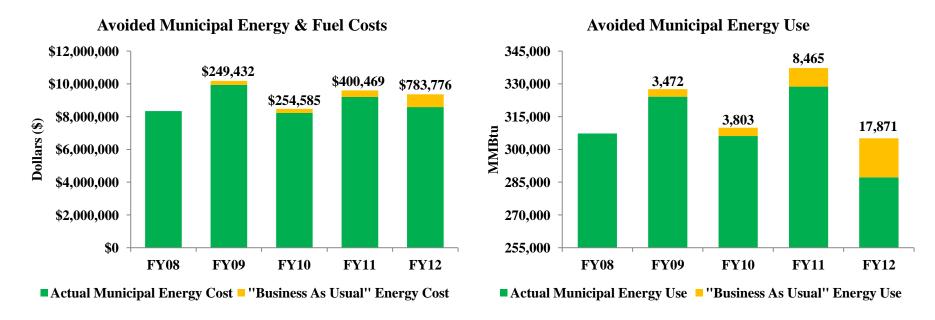
 $^{^{2}}CO_{2}e$, or carbon dioxide equivalent, is a standard unit of measurement that can be used across different greenhouse gas types.

³Degree days are a simplified representation of outside air temperature, measuring how much (in degrees), and for how long (in days), outside air temperature is greater or less than a specified base temperature. The larger the number of degree days the more intense the weather (e.g. hotter in the summer, colder in the winter, and/or longer periods of heat and cold).

⁴EUI, or Energy Use Intensity, is a unit of measurement describing a building's energy use and efficiency. A building with a smaller EUI is using less energy for each square foot of space, and is generally considered to be more efficient than a comparable facility with a higher EUI.

FY08-FY12 Municipal Energy Projects and Savings

Between FY08 and FY12, the City invested \$4.5 million in energy retrofits and building upgrades at 29 municipal and school facilities. These projects save an estimated 3 megawatt hours of electricity and over 73,000 therms of natural gas annually, and avoid \$783,776 in energy costs and 1,916 tons of CO_2 e emissions annually. This is the equivalent to the emissions generated by the energy use of 89 average American homes. Multi-year efficiency projects totaling \$6.9 million which began in FY13 are expected to save an additional 6,900 MMBtu annually.

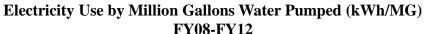


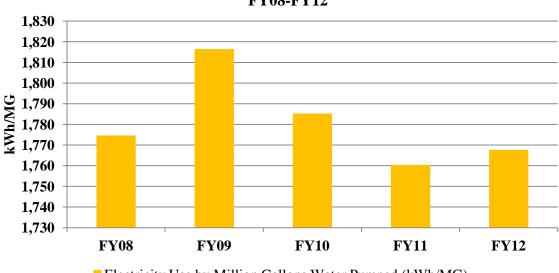
Without these energy saving initiatives, the City would have spent an additional \$1.6 million in utility costs, and used almost 34,000 MMBtu more energy, releasing an additional 7.4 million lbs of greenhouse gas emissions.

Selected Energy Programs

Walter J. Sullivan Water Purification Facility

- The Sullivan plant is the single largest energy user of any individual municipal facility, though it only accounts for 5% of the City's total building area
- Over the past four years, the Sullivan facility's energy use has decreased 12% and Greenhouse Gas (GHG) emissions have decreased 18% due primarily to reduced water demand, energy efficiency measures, and mild winter weather in FY12
- ❖ In FY12, the Water Department completed an intensive energy efficiency audit of the Sullivan Facility. Non-capital-intensive projects were immediately implemented and are estimated to save 2,494 MMBtu annually. Multi-year, capital intensive changes including lighting upgrades and the installation of variable speed drives on pumps began in FY13 and are expected to save an additional 3,000 MMBtu annually.





Electricity Use by Million Gallons Water Pumped (kWh/MG)

School Facilities

- ❖ In FY12, school facilities accounted for 49% of the City's total building area and 32% of the City's total energy use, by far the largest energy user of any facility type in the City
- Over the past four years, energy use decreased 28% and GHG emissions decreased 32%, primarily due to energy conservation measures in 10 buildings, energy awareness programs through the Cambridge Green Schools Initiative, and mild winter weather in FY12
- ❖ In FY12 and 13, the City invested close to \$700,000 in school energy projects for an estimated savings of 4,500 MMBtu of energy, avoiding almost \$160,000 in energy costs and 470 tons of CO₂e emissions annually.
- The Cambridge Rindge & Latin High School renovation, completed in September 2011, expects to receive a LEED Silver rating for new construction.
- ❖ The City has adopted net-zero/carbon neutral design for the renovation of the Dr. Martin Luther King, Jr. School

Additional Municipal Energy Programs

Renewable Energy

Cambridge has installed a total of over 72 kilowatts (kW) of solar photovoltaic (PV) rooftop arrays on five municipal facilities including:

- Cambridge Rindge & Latin High School (31.36kW)
- City Hall Annex (26.5kW)
- Frazier Administration Building (2kW)
- Frisoli Youth Center (3.26kW)
- Russell Youth and Community Center (9.26kW)
- Planned FY14 Walter J. Sullivan Water Purification Facility (in design for solar PV)
- Planned FY16 King School (design plan includes solar PV to support net zero energy/carbon neutral design)

LEED Rated Facilities

Since 2004, the City has operated under the policy that all new construction or major renovations should be designed to be certifiable under the US Green Building Council's LEED rating system. The City of Cambridge currently owns and operates 74 facilities, of which six are LEED certified, and three will be seeking LEED certification:

- City Hall Annex (LEED-Gold, 2004)
- Russell Field Field House (LEED-NC, 2006)
- Russell Youth and Community Center (LEED-Silver, 2010)
- Robert W. Healy Public Safety Facility (LEED-Silver, 2009)
- Cambridge Main Library (LEED-Silver, 2010)
- War Memorial Recreation Center (LEED-Silver, 2010)
- Cambridge Rindge & Latin High School (in application for LEED-Silver certification)
- Planned FY14 5 Western Avenue (in application for LEED-Silver certification)
- Planned FY16 King School (net-zero energy or carbon neutral design)

Fuel-Efficient Fleet

Since 2006, all requested new vehicles must go through a Green Fleet Policy review to address fuel economy and emissions. To date, one third of the City's administrative and light service vehicles are either hybrid (31 vehicles) or plug-in electric (2 vehicles).

City Streetlights

In FY13, the City began to design for the conversion of all citywide street lights to LED technology. The \$6 million project is expected to be completed in three years and save an estimated 3,931 MMBtu annually, avoiding \$360,000 in energy costs and the emission of 555 tons of CO_2e annually.