



Concord Middle School Sustainability Subcommittee Presentation

October 31, 2019
Presentation Handout

For information about the Town's sustainability goals, initiatives, and how you can take action, please visit: concordma.gov/sustainability

Town Sustainability

Goals

* From a 2008 baseline

25% reduction in town-wide GHG emissions*

2020

100% carbon-free electricity source

2030

80% reduction in town-wide GHG emissions*

2050

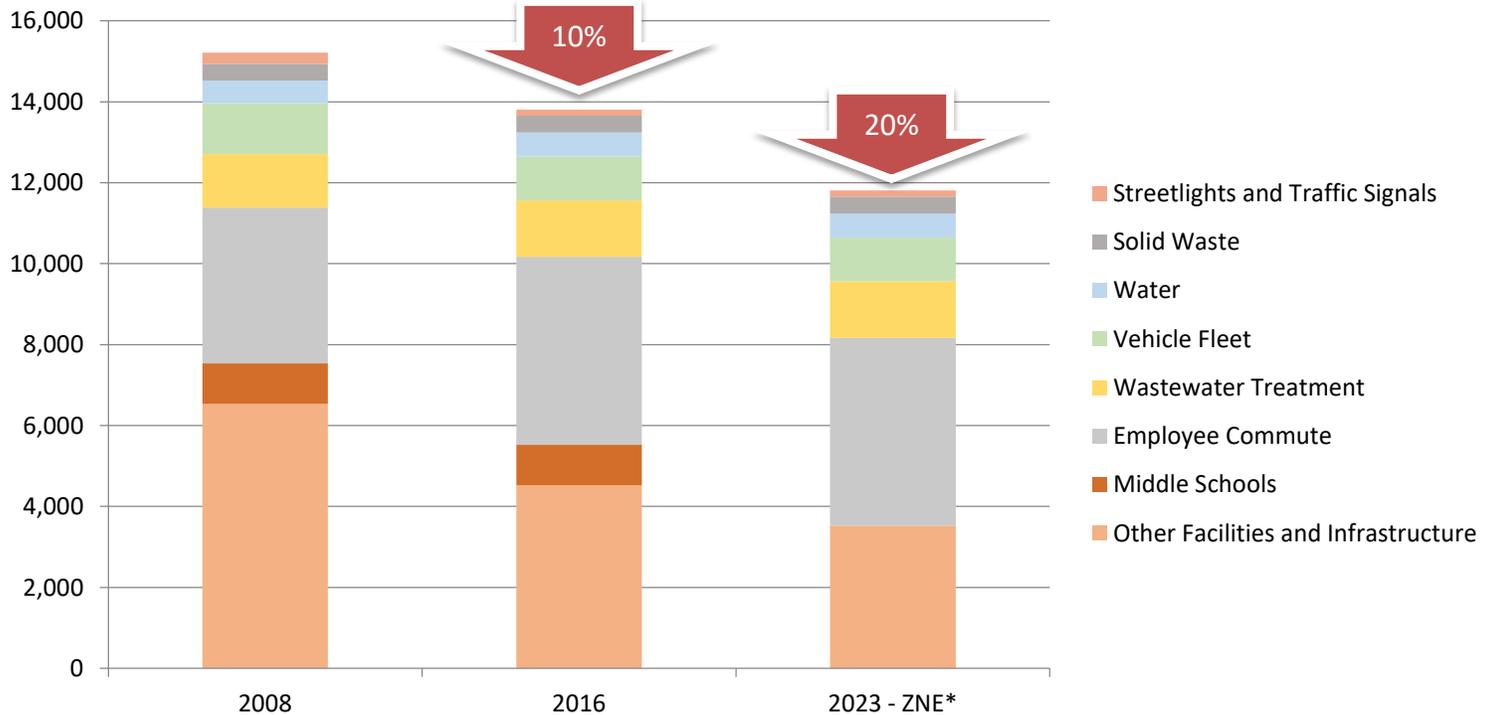
Why do greenhouse gas emissions matter?

We increase the level of greenhouse gases in the atmosphere when we burn fossil fuels to power our homes, businesses, and automobiles and when we dispose of material in landfills to decompose. This increase in GHGs leads to higher global temperatures, changes in climate patterns, and increases in the number and intensity of extreme weather events. MTCO_{2e} is a standard unit of measurement that helps us compare GHG emissions regardless of the type and source.

2017 Town Meeting voted to set Concord's community-wide sustainability goals.



Municipal Greenhouse Gas (GHG) Emissions (MTCO_{2e})



GHG emissions from municipal operations decreased by 10% between 2008 and 2016.

In 2016, Concord Middle Schools contributed 8% of total municipal emissions.

*If a new Concord Middle School is zero net energy, emissions from buildings will decrease by 46% and total emissions by 20%.

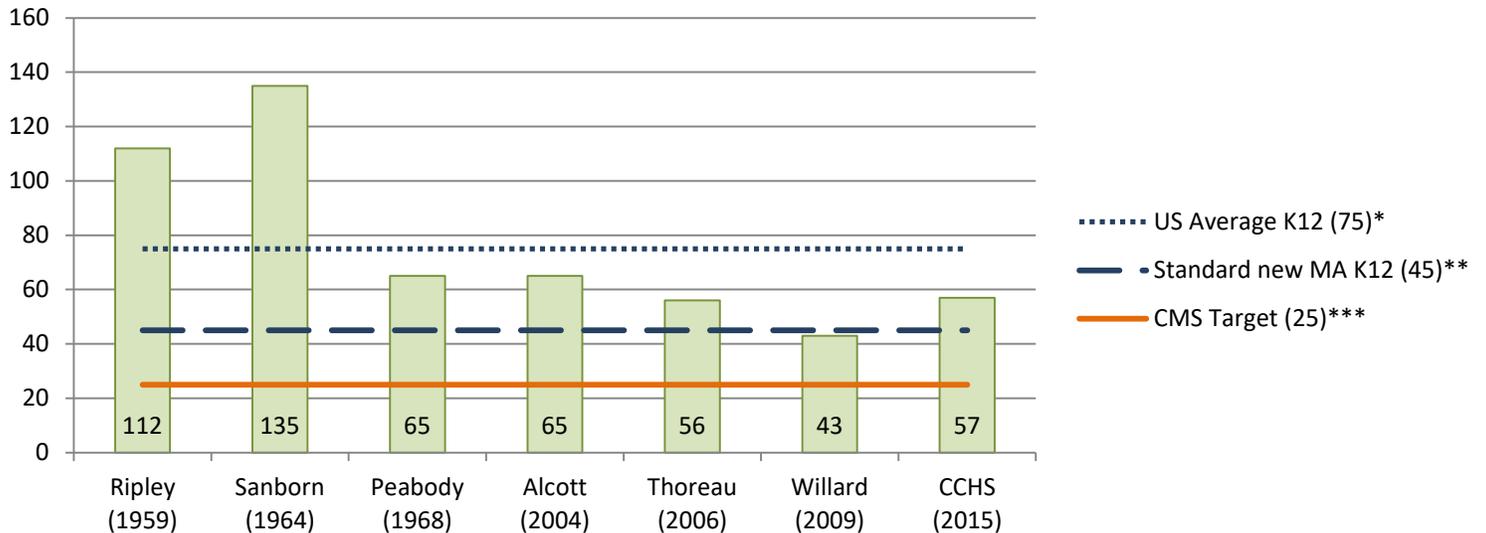
Data source: Concord's Municipal GHG Inventory (2018)

Energy Efficiency

What is EUI?

Energy use intensity, or EUI, is a standard measure of a building's efficiency. It's calculated by dividing the total energy consumed by the building in one year, for things like heating, cooling, hot water, and appliances, by the total gross floor area of the building. Because it takes into account the size of a building, it helps us to measure and compare how efficiently buildings use energy.

EUI (Energy Use Intensity) of Concord Schools in FY18 by Year Opened



*American Institute of Architects, [AIA 2030](#)

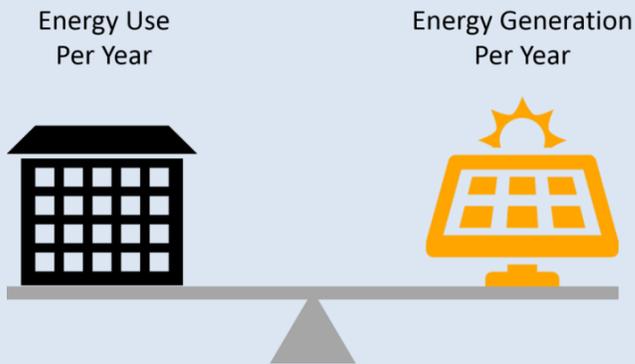
**Baseline MA K12 school, [USGBC 2019 report](#)

***ZNE recommended EUI, [USGBC 2019 report](#)

Below is a select list of nearby Massachusetts towns who have set low target EUIs and zero net energy goals for new schools.

School	School Type	Phase	Target EUI	All Electric	Zero Net Energy Goal
Cambridge - King Open	Elementary	Complete	26-28	Yes	60%
Cambridge - MLK	Elementary	Complete	26-28	No	43%
Worcester - Nelson	Elementary	Complete	25	No	No
Brookline - Coolidge Corner	K-8	Complete	23-26	Yes	Yes
Lexington - Hastings	Elementary	Under Construction	25	Yes	Yes
Westborough - Fales	Elementary	Under Construction	23	Yes	Yes
Belmont	Middle/High	Under Construction	30	Yes	Yes
Lincoln	Elementary	Under Construction	23	Yes	Yes
Arlington	High School	Under Construction	30-33	Yes	Yes
Watertown	Elementary	Design	23	?	Yes
Wellesley - Hunnewell	Elementary	Design	26-28	Yes	Yes
Acton-Boxborough	Elementary	Design	28	Yes	Yes
Swampscott - Hadley	Elementary	Design	20-30	?	?

Zero Net Energy



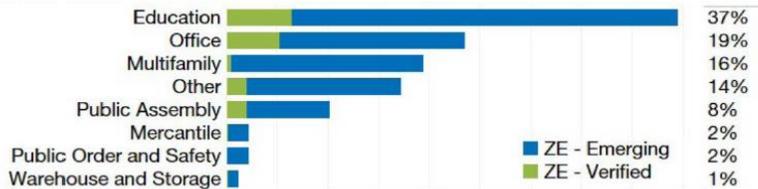
What is “Net Zero”?

A zero net energy (ZNE) building produces as much renewable energy as it consumes over the course of a year. Buildings achieve ZNE by minimizing the building’s load, energy required to operate the building, and producing renewable energy, typically solar PV.

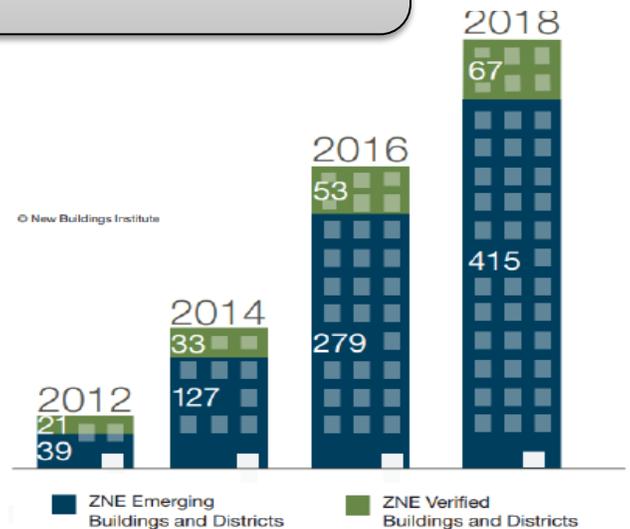
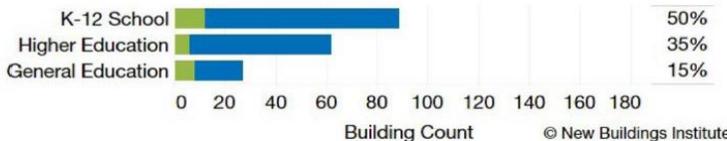
Is this new?

New Buildings Institute, a group that provides ZNE certification, shows that ZNE buildings are becoming more and more prevalent across the country. Education buildings are leading the pack, with K12 leading among educational ZNE buildings. *Source: [New Buildings Institute](#) (2018)*

ZNE Buildings by Type



Education Breakdown



Why is “all-electric” important?

All-electric buildings combust no fossil fuels on-site, meaning they emit no harmful chemicals into the air inside and outside of the school. Electricity is the only “fuel” that we can make 100% renewable. In 2018, over 50% of Concord’s electricity was emissions-free thanks to Concord Municipal Light Plant sourcing our electricity from renewable and carbon-free sources. By 2030, electricity in Concord will be 100% emissions-free. By using only electricity, we can have an emissions-free school.

A [2019 US Green Building Council](#) report looked into the cost of ZNE buildings in Massachusetts and found:

- Found net zero energy buildings are being built today in MA at 0% upfront cost
- Buildings of all types, including K12, can be built zero energy ready for of 0-7% increased upfront costs
- Even at 5% increased upfront cost, a ZNE K12 school can payback in 15 years
- There is potential to achieve 0% increased upfront cost for ZNE buildings when goal set at start of project

Opportunities

High-performance means more than just energy. Studies have shown that students perform better academically in “green” schools.

- ✓ Students exposed to noisy HVAC systems underperformed on achievement tests relative to those utilizing quieter systems
- ✓ Occupants in ventilated spaces had improved scores in crisis response, information usage, and strategy ranging from 100 to 300%
- ✓ Students exposed to daylight attended school 3.2-3.8 more school days per year
- ✓ Students in daylit schools showed a 20-26% improvement on test scores

Source: *New Buildings Institute, [Zero Energy Schools Stakeholder Engagement and Messaging](#)*

Green schools are a living laboratory. Teachers at green schools can use their buildings as the basis for project-based, experiential learning.

- ✓ Math students can track and chart utility cost savings
- ✓ Science students can analyze and compare the difference between eco-friendly and traditional cleaning products
- ✓ Humanities students can debate the impacts communities have on their environments
- ✓ Every student can benefit from the opportunity for hands-on learning that demonstrates the interconnectedness of people, the built environment and natural systems

Schools are the center of the community. A resilient middle school can be a resource to the community.

A new Concord Middle School is an opportunity to demonstrate the community’s commitment to sustainability. It can be a place that students, teacher, and community members can be proud of.

Energy efficient schools cost less to operate. An efficient middle school will save Concord money year after year.

How do we move forward?

- Set clear goals now
- Rely on third-party certification
- Choose Designers that can meet our goals
- Prioritize lowest life-cycle cost

