

# Massachusetts Leading by Example: Fiscal Year 2019 Progress Report



The Leading by Example Program works collaboratively with state agencies and public colleges and universities to advance clean energy and sustainable practices that reduce the environmental impacts of state government operations. This includes reducing greenhouse gas emissions, increasing renewable and onsite generation, improving energy efficiency, and much more. Through strategic partnerships, technical assistance, grant funding and nation leading best practices, LBE serves as a trusted resource, helping transform policy into action. This update details annual progress towards LBE goals and highlights key recent accomplishments.

## Greenhouse Gas Emissions

In FY19, efforts at state facilities directly contributed to statewide and regional emissions reductions\* of 387,062 metrics tonnes, equivalent to a 31 percent reduction compared to the LBE baseline\*\* (see Figure 1). In order to reach the FY20 target, GHG emissions must decrease by an additional 113,454 metric tonnes annually.

\* LBE site-specific emissions calculations do not account for the sale of RECS; however, certain efforts at state facilities, such as onsite renewable generation and local net metering purchases, directly contribute to overall reductions in statewide emissions.  
\*\*The LBE Baseline uses a 3-year average from FY02-FY04.

Fig 1: Annual Change in GHG Emissions from Baseline Year with Targets

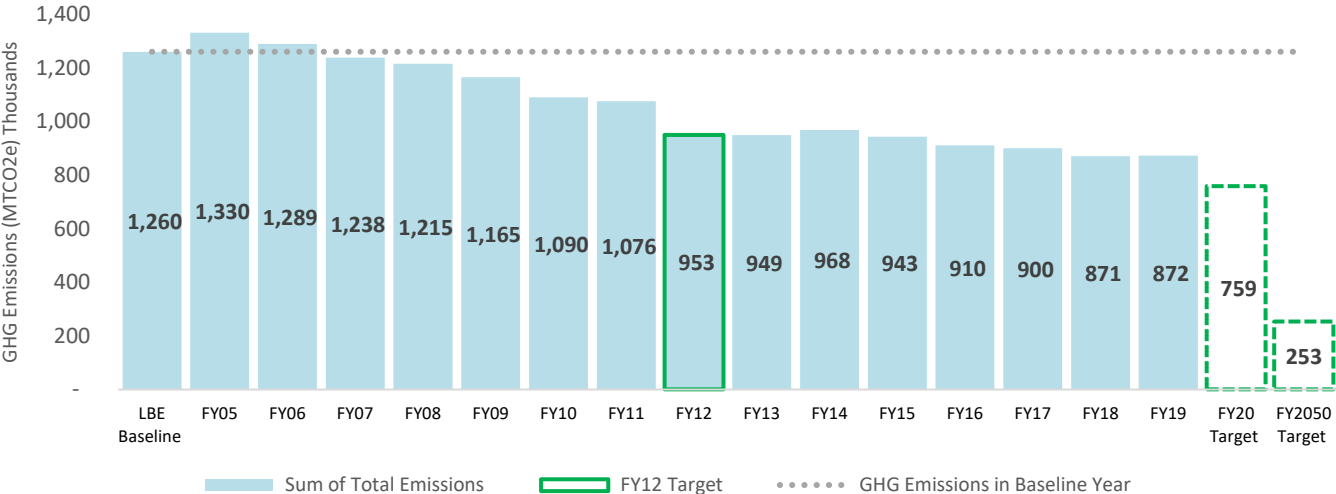
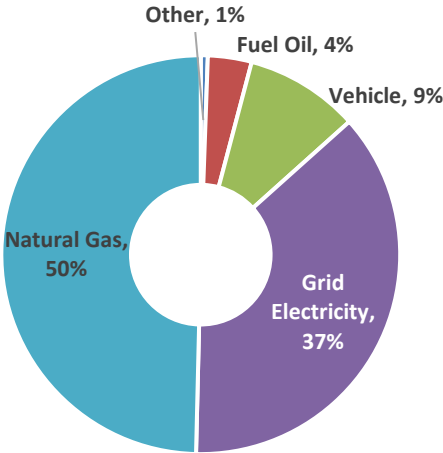


Fig. 2: Emissions Contribution by Fuel - FY19



As shown in Figure 2 above, in FY19, natural gas comprised 50 percent of total emissions, with emissions from electricity comprising 37 percent. Together, fuel oils #2, #4 and #6 contributed four percent of total emissions, while vehicle fuels contributed nine percent.

# Energy Use

As of FY19, overall energy use intensity (kBtu/per square foot) decreased 13 percent from FY04 for the 43 Leading by Example partners whose energy use\* is tracked using this metric. Annual EUI needs to decrease by an additional 22 percent to reach the FY20 35 percent reduction target (see Figure 3).

\*EUI is measured as kBtu per square foot. LBE does not track square footage or energy use intensity for 7 of the 50 state partners due to the nature of energy and facility use at these sites.

Fig 3: Annual Energy Use Intensity with Percentage Change from Baseline

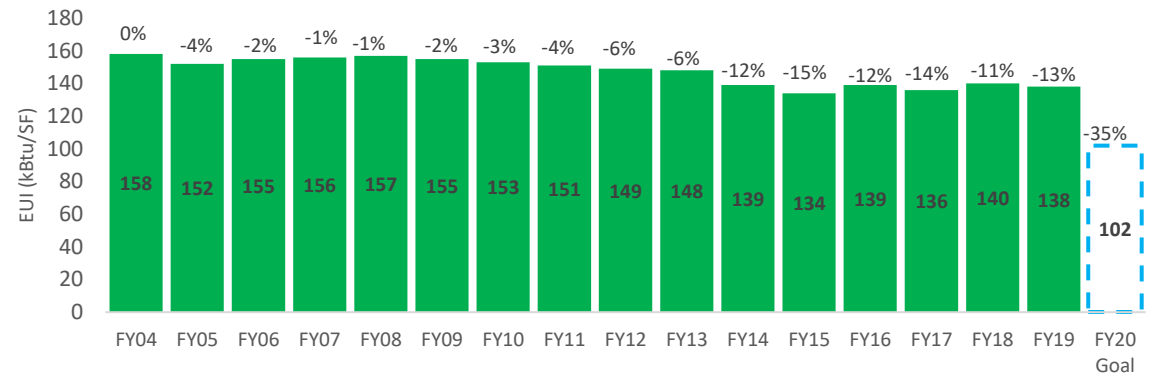
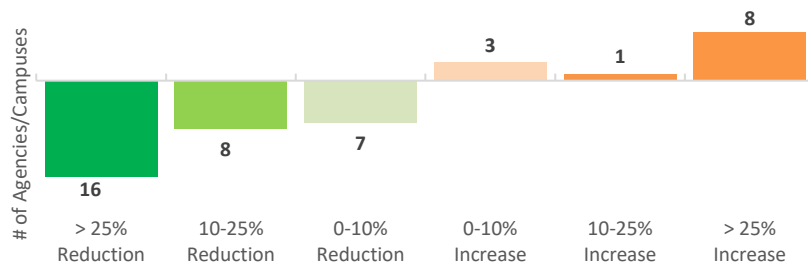


Fig 4: Agencies/Campuses by EUI % Change from Baseline

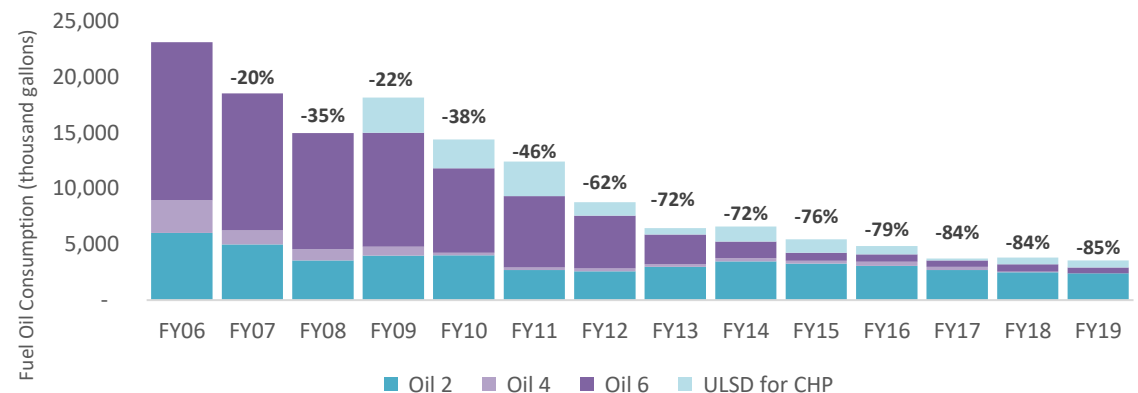


As EUI is impacted by facility type and use, progress varies across LBE partner facilities. 31 out of 43 of the LBE partners (72 percent) have reduced overall energy use intensity at their facilities, with sixteen of those achieving more than a 25 percent reduction from the 2004 baseline. Conversely, overall energy use intensity increased for twelve LBE partners (28 percent), eight of which increased by more than 25 percent (see Figure 4).

Overall fuel oil consumption in buildings\* has decreased 85 percent from FY04 through FY19 (see Figure 5), a reduction of more than 19 million gallons and resulting from fuel switching to cleaner alternatives. LBE continues to pursue opportunities to eliminate fuel oil consumption by transitioning to cleaner fuels and technologies.

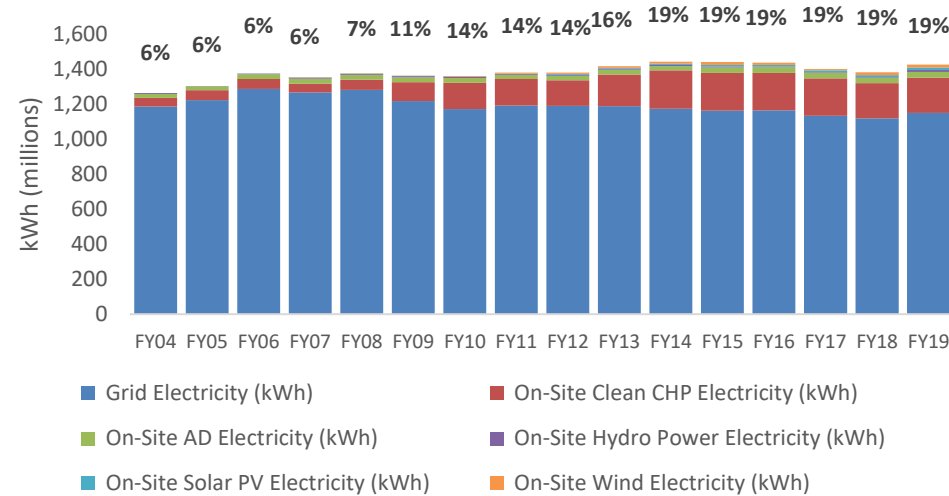
\*Oil consumption for non-building use is not included, such as for vehicles, maritime vessels, flood control, etc.

Fig 5: Annual Building Fuel Oil Consumption from FY06-FY19



# Renewable & Onsite Generation

Fig. 6: Grid Electricity Consumption vs. Clean Onsite Generation (w/ % of clean generation)



In FY19, state partners reduced grid electricity consumption by 36 million kWh compared to the FY04 baseline, with onsite generation contributing a total of 276 million kWh, compared to 77 million kWh in FY04.

As seen in Figure 6, of the roughly 1.4 billion kWh of electricity consumed, 75 million kWh (equivalent to 5 percent of total) were generated by onsite renewable power and 201 million kWh (equivalent to 14 percent of total) were generated by onsite combined heat and power.

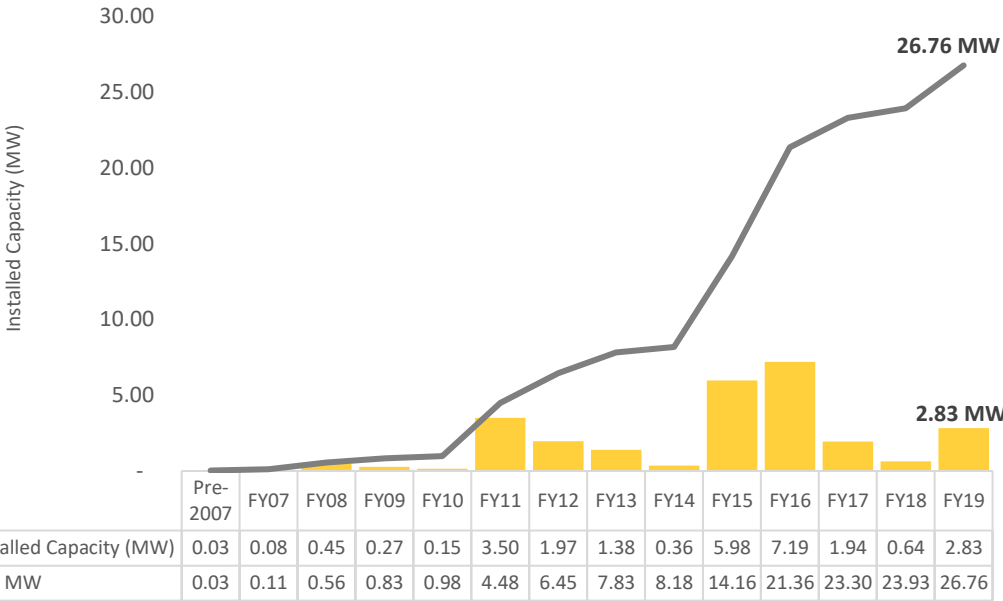
\*Renewable and on-site clean generation includes anaerobic digestion, hydro power, clean combined heat and power (CHP), solar photovoltaic, and wind power.

A significant contributor to growth of onsite installations at state facilities has been solar PV. In FY19, 2,828 kW of solar PV were installed, bringing the total installed solar capacity at state facilities to more than 26.7 MW, up from less than 850 kW a decade ago (as shown in Fig. 7). These installations generate an estimated 30.4 million kWh of solar power a year, equivalent to the annual electricity use of 4,007 Massachusetts homes.

Additional to onsite power, renewable thermal technologies provide facilities the opportunity to move away from dirtier heating fuels, such as oil, particularly in cases where existing systems are reaching their end of use. As of FY19, 44 renewable thermal systems were installed at state facilities, including:

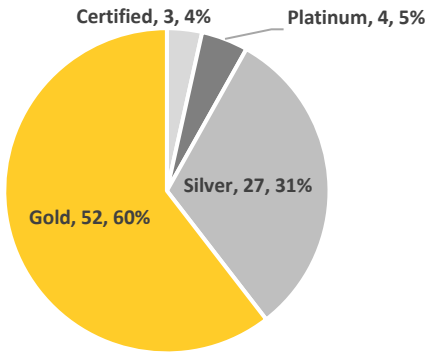
- 18 solar thermal installations
- 9 biomass systems
- 11 ground-source heat pumps
- 6 air-source heat pumps

Fig 7: Solar Installations at State Facilities



# Green Buildings

As of June 2019, the state portfolio included 86 LEED certified buildings, with 56 at the top two levels of Gold and Platinum (65 percent).



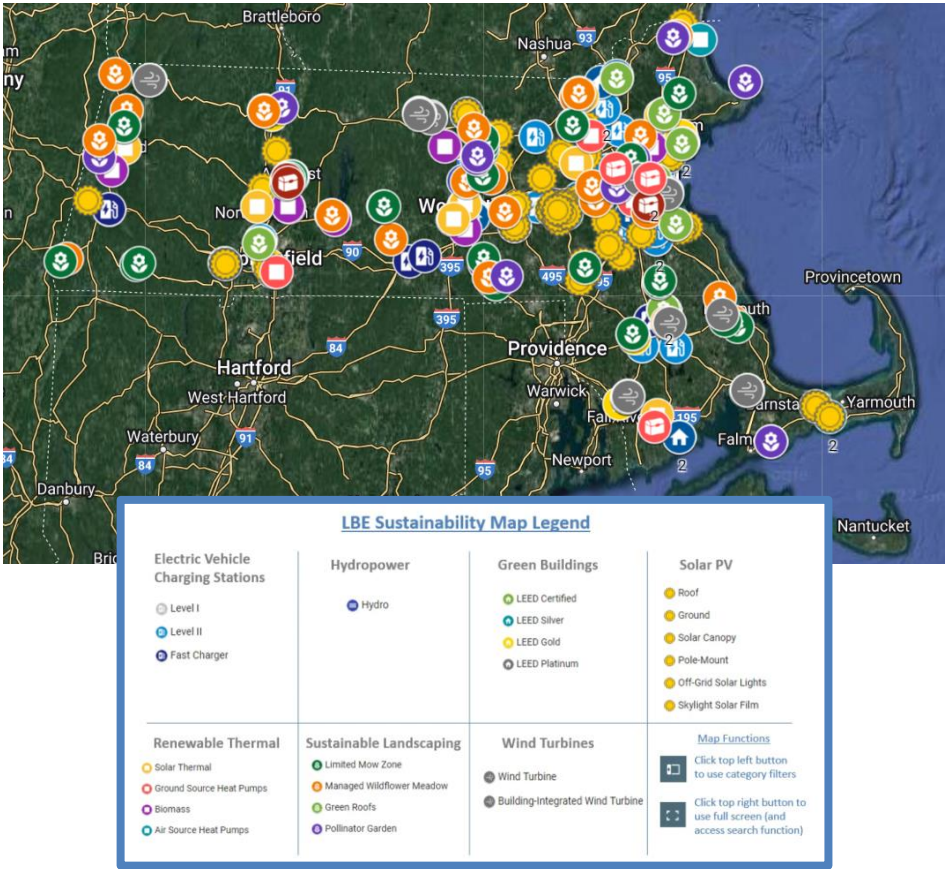
In FY19, eleven buildings received LEED certification, with one building at the Platinum level, eight buildings at the Gold and two at the Silver level. Building sizes ranged from 20,000 to over 262,000 square feet and included academic and laboratory buildings, a theater, court buildings, a residence hall, and an airport terminal connector.

Agency	Project	Level
MassPort	Logan Terminal B Gates 37-38 Connector	Gold
Salem State University	Mainstage Theater	Gold
Trial Court	Greenfield Trial Court	Gold
Trial Court	Salem Probate and Family Court Building Renovation	Gold
UMass Amherst	John W. Olver Design Building	Gold
UMass Amherst	Physical Sciences Building	Gold
UMass Boston	Residence Hall East	Gold
UMass Dartmouth	Charlton College of Business Learning Pavilion	Gold
Bristol Community College	John J. Sbrega Health and Science Building	Platinum
UMass Dartmouth	School for Marine Science and Technology (East)	Silver
Westfield State University	Science Center	Silver

# 2019 Highlight: Interactive Sustainability Map

State agencies, authorities, and public institutes of higher education are advancing a wide array of clean energy and sustainability efforts at their respective facilities, including clean energy systems, creating pollinator habitats, designing and constructing LEED buildings, and more. In order to showcase many of these efforts, LBE developed the Leading by Example Interactive Map of clean energy and sustainability projects.

Although not inclusive of every single sustainability project, the LBE team works to continuously update the map as new projects are completed such as recently installed EV charging stations, newly certified LEED buildings, and newly operational solar PV systems.



# Key LBE Accomplishments

## Renewable Thermal

- Many state entities have begun installing renewable thermal systems to offset or replace fossil fuel-based heating systems.
- As part of an extensive building rehabilitation project, the Department of Conservation and Recreation replaced an aging ground source heating system with two renewable thermal systems – one air source heat pump (ASHP) system and one solar thermal system – at the Halibut Point State Park Visitor’s Center in Rockport. The ASHP system is projected to reduce annual electricity consumption by 32,309 kWh, lower GHG emissions by 11 metric tons, and save more than \$4,500 annually.
  - As part of a comprehensive energy and water efficiency project, Roxbury Community College installed a 933-kW photovoltaic parking canopy. The array successfully produces about 15% of the campus' electricity needs and saves 1 million kWh annually. Efforts are ongoing to transition campus heating and cooling to a ground-source heat pump system. The comprehensive energy project also campus-wide energy and water upgrades, which include LED lighting improvements, further reducing grid electricity demand.

## Onsite Solar Generation

- The Cape Cod Regional Transit Authority (CCRTA) installed a 360-kW solar canopy at its Hyannis parking lot and bus station that is estimated to generate 388,800 kWh of electricity per year and is expected to save the CCRTA over \$35,000 in average annual electricity costs. As part of the \$396,000 LBE grant to support the canopy deployment, 10 new dual-head electric vehicle charging stations were also installed.
- The Massachusetts Energy Management Agency (MEMA), in partnership with the Division of Capital Asset Management and Maintenance, installed a 275-kW solar canopy array atop the MEMA Bunker in Framingham. Supported by a \$453,750 LBE grant, this clean energy project is estimated to save MEMA over \$27,000 in average annual electricity costs and generate approximately 376,000 kWh of renewable electricity annually.



Cape Cod Regional Transit Authority solar canopy

## LBE Awards

In November of 2019, the 13th annual Leading by Example (LBE) Awards Ceremony was held at the State House, where eight award recipients were recognized for a diverse set of policies and initiatives that demonstrate public sector leadership and innovation in reducing the environmental impacts of government operations, many of which also reduce public facility energy costs. The FY19 LBE Award Recipients are listed by category type below.

Agency	Public Higher Education	Municipality	Individual
Massachusetts Port Authority	Berkshire Community College	City of Worcester	Claudine Ellyin, MA College of Art & Design
Department of Correction	UMass Lowell	Cape Cod Regional Transit Authority	Jillian Wilson-Martin, Town of Natick