

Massachusetts Leading by Example: Fiscal Year 2017 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 on-site 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 FY17, efforts at state facilities directly contributed to statewide and regional emissions reductions* of 350,354 metrics tonnes, equivalent to a 28 percent reduction compared to the LBE baseline** (see Figure 1). In order to reach the FY20 target, GHG emissions must decrease by an additional 156,000 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.

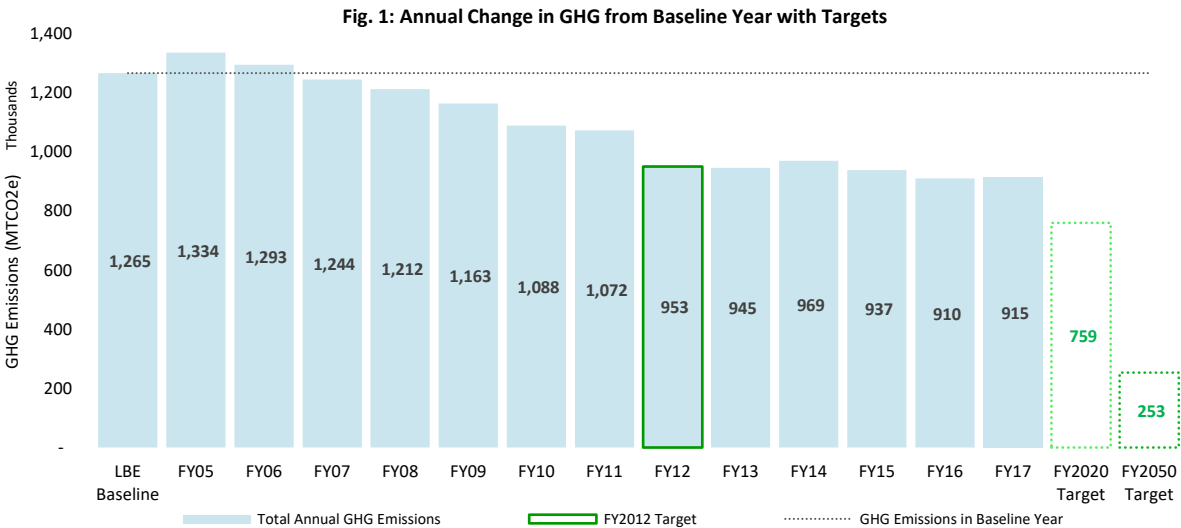
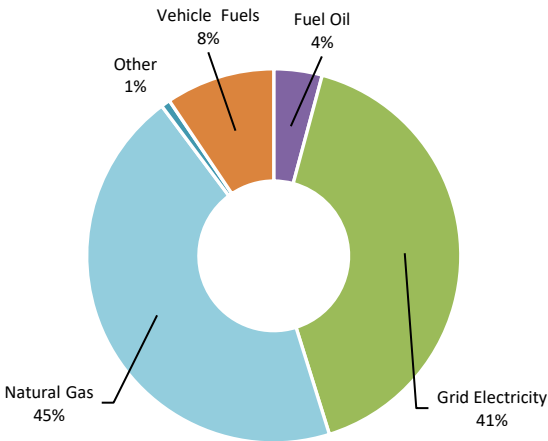


Fig .2: Emissions Contribution by Fuel -- FY17



As shown in Figure 2 above, in FY17, natural gas comprised 45 percent of total emissions, with emissions from electricity comprising 41 percent. Together, fuel oils #2, #4 and #6 contributed four percent of total emissions, while vehicle fuels contributed nine percent.

Energy Use

In FY17, overall energy use intensity (kBtu/per square foot) decreased 15 percent from FY04, for the 44 Leading by Example partners whose energy use* is tracked using this metric. Annual overall EUI needs to decrease by an additional 20 percent to reach the FY2020 35 percent reduction target (see Figure 3).

*LBE does not track square footage or energy use intensity for 5 of the 49 state partners due to the nature of energy and facility use at these sites.

Fig. 3: Annual Energy Use Intensity (EUI)

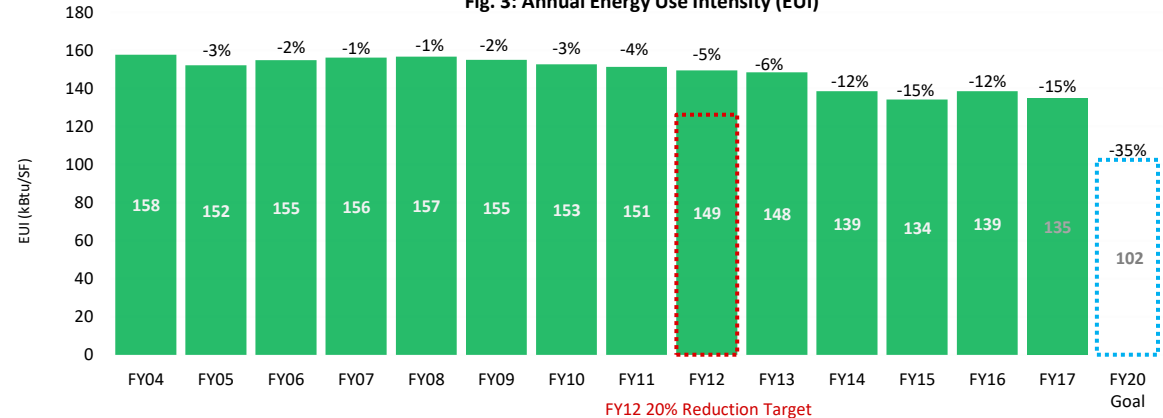
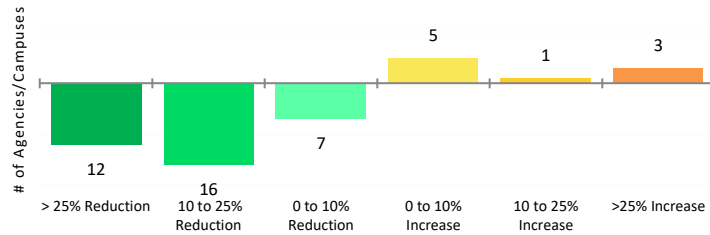


Fig. 4: Agencies/Campuses by EUI % Change from Baseline

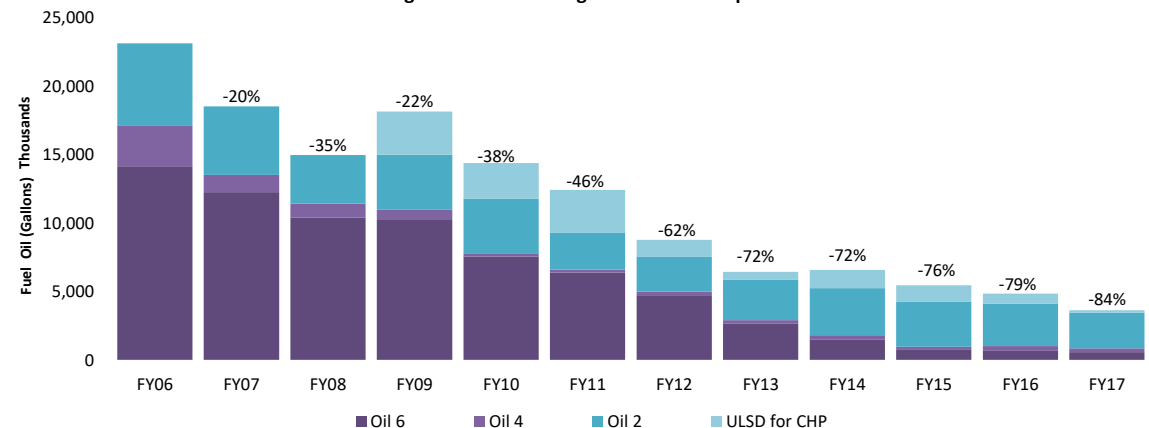


As EUI is impacted by facility type and use, progress varies across LBE partner facilities. 35 (out of 44) of the LBE partners have reduced overall energy use intensity at their facilities, with 12 of those achieving more than a 25 percent reduction from the FY04 baseline. Conversely, overall EUI increased for nine LBE partners, three of which increased by more than 25 percent (see Figure 4).

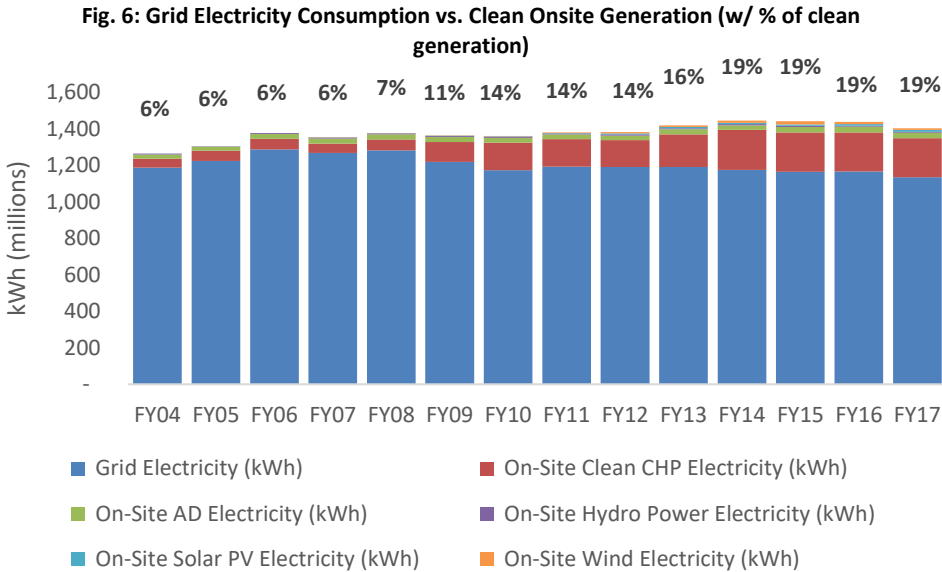
Overall fuel oil consumption in buildings* has decreased 84 percent from FY04 through FY17 (see Figure 5), a reduction of more than 19 million gallons and resulting from fuel switching to cleaner alternatives. LBE continues to pursue opportunities to eliminate fuel oil consumption by transitioning to 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-FY17



Renewable & Onsite Generation



In FY17, state partners reduced grid electricity consumption by 53 million kWh compared to FY04, with onsite generation contributing a total of 269 million kWh (compared to 77 million kWh in FY04).

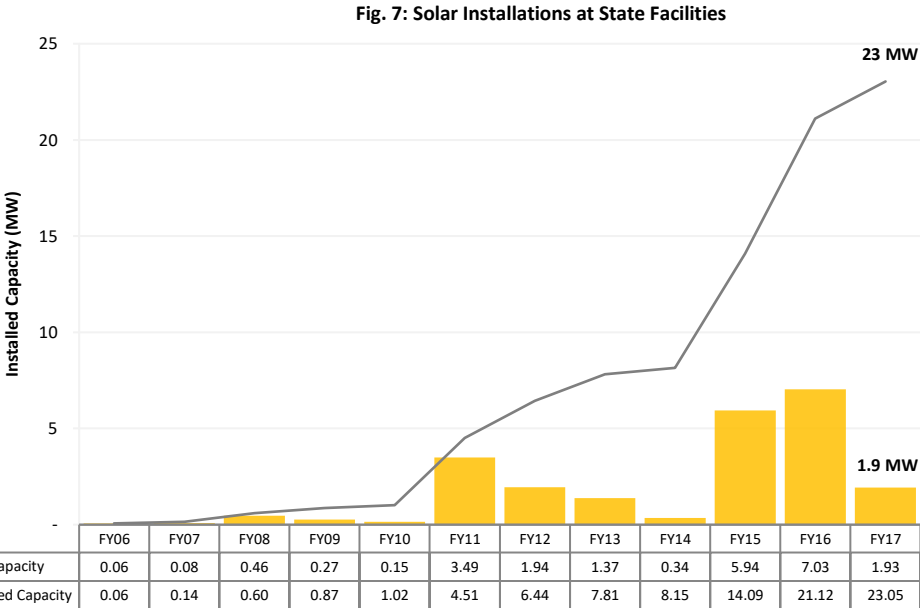
As seen in Figure 6, of the roughly 1.4 billion kWh of electricity consumed, 54 million kWh (equivalent to 4 percent of total) were generated by onsite renewable power and 214 million kWh (equivalent to 15 percent of total) were generated by onsite clean CHP.

*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 renewable power at state facilities has been solar PV. As of FY17, there were 23 MW of installed solar capacity at state facilities, up from less than 150 kW a decade ago (as shown in Fig. 7). These installations are expected to generate 26 million kWh of solar power a year, equivalent to the annual electricity use of 3,502 Massachusetts homes.

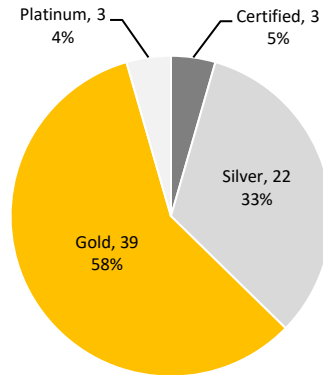
Additional to onsite renewable power, renewable thermal technologies provide facilities the opportunity to move away from dirtier heating fuels, such as oil, particularly in cases where existing systems are reaching their end of use. As of FY17, 39 renewable thermal systems were installed at state facilities, including:

-  17 solar thermal installations
-  8 biomass systems
-  10 ground-source heat pumps
-  4 air-source heat pumps



Green Buildings

As of June 2017, the state portfolio included 66 LEED certified buildings, with 42 at the top two levels of Gold and Platinum (62 percent).



In FY17, 14 buildings received LEED certification, with 10 buildings at the Gold level and four at the Silver level. Building sizes ranged from 18,000 to 230,000 square feet and included residence and dining halls, academic and laboratory buildings, a chapel, and a correctional center.

Agency	Project	Level
Hampden County Sheriff's Office	Western MA Regional Women's Correctional Center	Gold
Massachusetts College of Art & Design	Design and Media Center	Silver
Salem State University	Viking Hall	Gold
UMass Amherst	Paige Laboratory Renovations	Silver
UMass Amherst	Old Chapel Renovation	Gold
UMass Amherst	Lincoln Campus Center Dining Renovation	Gold
UMass Amherst	Integrative Learning Center	Gold
UMass Boston	Integrated Sciences Complex	Gold
UMass Boston	University Hall	Gold
UMass Lowell	McGauvran Dining Hall	Silver
Worcester State University	Sheehan Hall	Gold

2017 Highlight: Zero Net Energy Buildings

Beyond LEED, the state portfolio welcomed three new buildings targeting zero-net energy, bringing the total to five. Zero-net energy buildings are designed to generate as much energy from onsite clean renewable sources as they consume in a year.

In FY17, BCC's Sbrega Health & Science building, DCR's Walden Pond Visitor Center, and DFW's Westborough Field Headquarters (not pictured) achieved net-zero.

- **Sbrega Health & Science Building, Bristol Community College, July 2016: 50,600 gross sq. ft.**

Building and site sustainability features include:

- Hybrid-source heat pumps
- Enthalpy wheel heat recovery system
- Filtered fume hoods
- Natural ventilation
- 50 kW rooftop solar



- **Walden Pond Visitor Center, Department of Conservation & Recreation, September 2016: 5,608 gross sq. ft.**

Building and site sustainability features include:

- Triple-pane windows & efficient envelope
- Solar water heating system
- Variable Refrigerant Flow heat pump
- 100 kW solar canopy
- EV charging stations



- **Department of Economics Crotty Hall, University of Massachusetts Amherst, March 2017: 16,800 gross sq. ft.**

Building and site sustainability features include:

- High efficiency building envelope
- Geothermal system
- Daylighting
- Heat recovery system
- Onsite storm water recharge



Key LBE Accomplishments

Energy Resilience

In August of 2016, LBE partnered with consultant Arup to examine the potential of clean energy solutions to support added resiliency at 12 Commonwealth-owned Health and Human Services critical care facilities that operate 24/7. The goal of the study is to examine existing energy resiliency conditions and identify clean energy technologies that could improve site energy resilience by expanding or increasing the duration of maintaining power in the case of a grid outage. Critical care facilities were chosen for the study due to the complications associated with the relocation of facility residents, many of whom require significant medical attention.

Onsite Generation

Additionally, in FY17, 1.9 MW of solar capacity was installed at state facilities, including:

- MassDOT installed an additional 1.3 MW of ground-mounted solar in West Stockbridge and Salisbury as part of its Highway Right-of-Way Solar Project, as well as a 540 kW solar canopy and rooftop installation at the new Research & Materials Lab in Hopkinton.
- MBTA installed a 100 kW rooftop solar installation at the Orient Heights T stop on the Blue Line, which will provide roughly 20 percent of the energy required to run the station.



Clean Transportation

The Operational Services Division, in partnership with the MassDEP and DOER, released the Fuel Efficiency Standard for the State Fleet (FES) in September of 2016.

The FES sets minimum MPG and alternative fuel vehicle acquisition requirements for Executive Branch agencies. The FES will help achieve the greenhouse gas emission reduction targets for state agencies and the statewide emission reduction targets established in the Clean Energy and Climate Plan for 2020; as well as support the multi-state memorandum of understanding that commits eight states on the East and West coasts to putting 3.3 million zero-emission vehicles (ZEVs) on the road by 2025.

LBE Awards

In November of 2017, the 11th 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 FY17 LBE Award Recipients are listed by category type below.

Agency	Public Higher Education	Municipality	Individual
Department of Fish & Game	Roxbury Community College	Town of Sterling & Sterling Municipal Light Department	Alex Giannantonio, Cheryl Cushman & Karen Rasnick: Office of Vehicle Management Team
MassDOT - Highway	Massachusetts College of Liberal Arts	Town of Lexington & Sustainable Lexington	Kate Crosby, Acton-Boxborough Regional School District