

# Massachusetts Leading by Example: Fiscal Year 2018 Progress Report



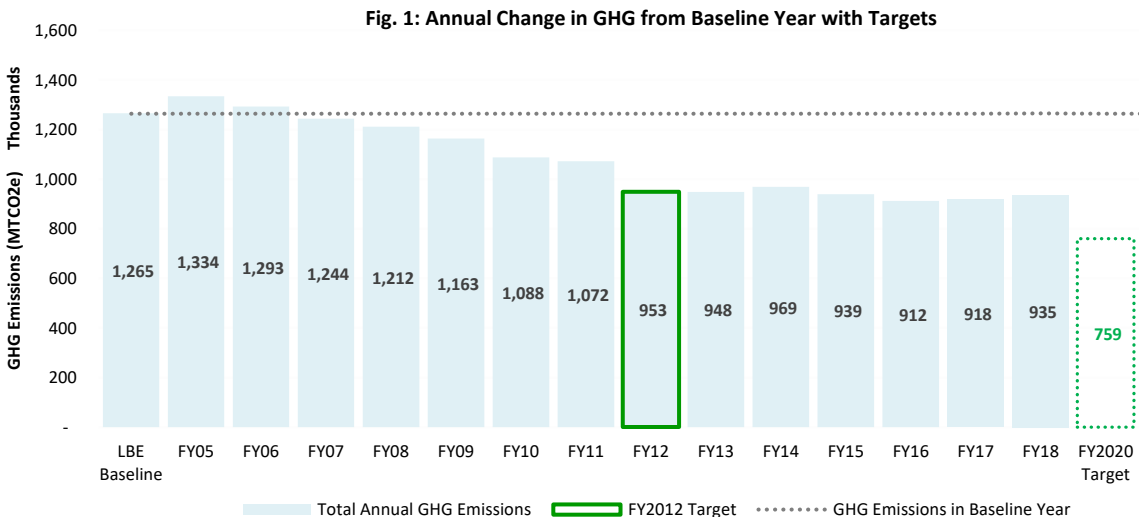
The Leading by Example Program works collaboratively with state agencies and public colleges and universities to advance clean energy and sustainable practices that reduce the environmental impacts of state government operations. This includes reducing greenhouse gas emissions, increasing renewable and 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

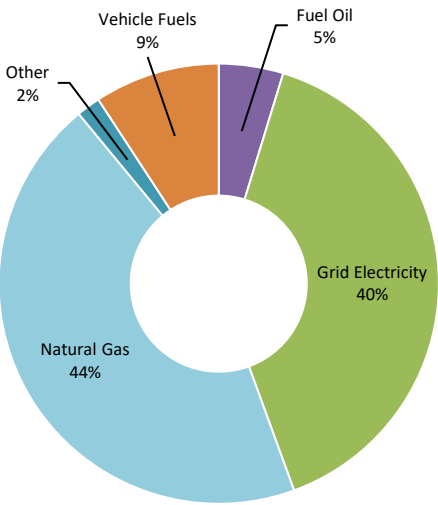
In FY18, efforts at state facilities directly contributed to statewide and regional emissions reductions\* of 331,677 metrics tonnes, equivalent to a 26 percent reduction compared to the LBE baseline\*\* (see Figure 1). In order to reach the FY20 target, GHG emissions must decrease by an additional 174,427 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 -- FY18**

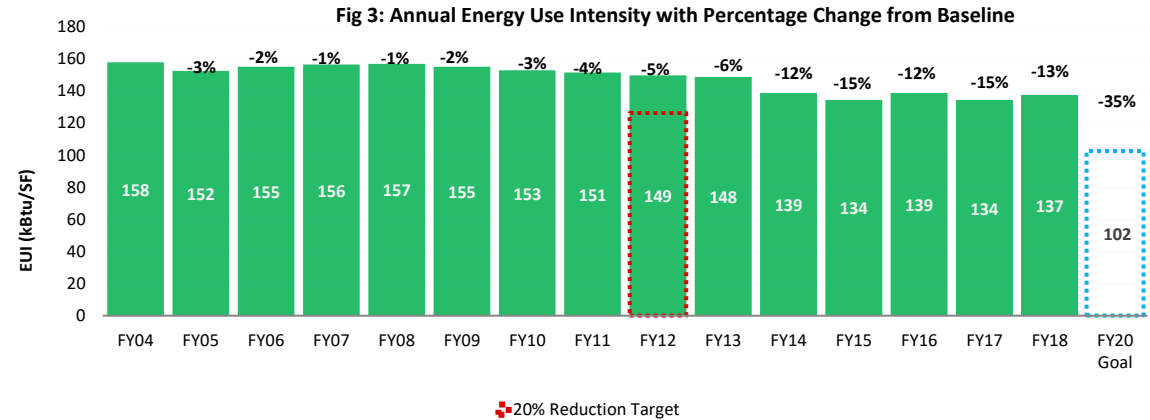


As shown in Figure 2 above, in FY18, natural gas comprised 44 percent of total emissions, with emissions from electricity comprising 40 percent. Together, fuel oils #2, #4 and #6 contributed five percent of total emissions, while vehicle fuels contributed four percent.

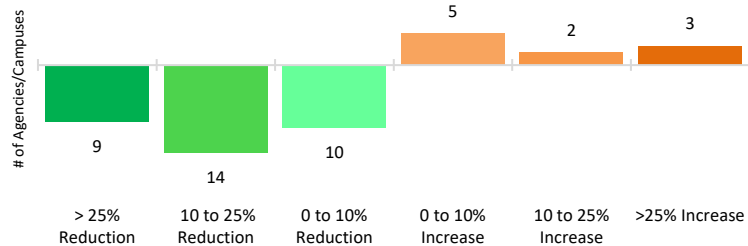
# Energy Use

As of FY18, 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 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 6 of the 49 state partners due to the nature of energy and facility use at these sites.



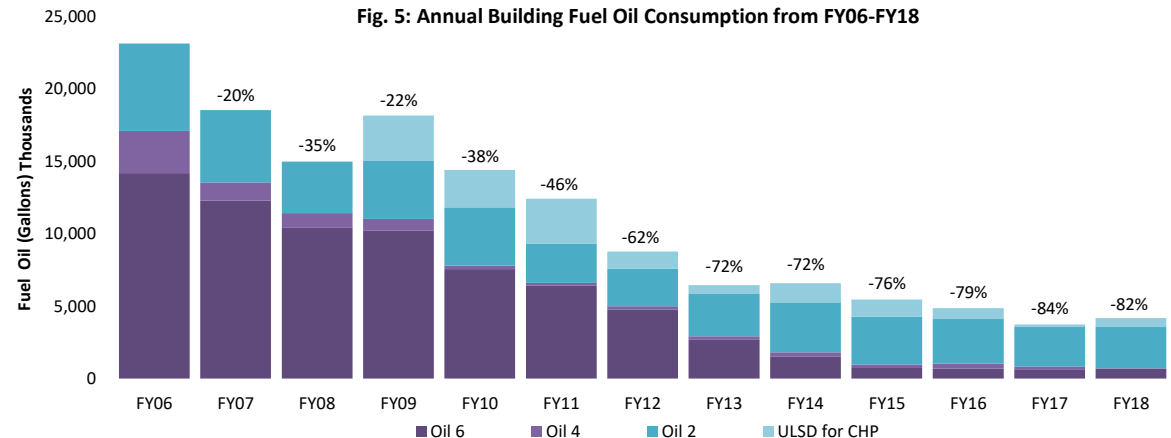
**Fig. 4: Agencies/Campuses by EUI % change from baseline**



As EUI is impacted by facility type and use, progress varies across LBE partner facilities. 33 out of 44 of the LBE partners (77 percent) have reduced overall energy use intensity at their facilities, with nine of those achieving more than a 25 percent reduction from the 2004 baseline. Conversely, overall energy use intensity increased for ten LBE partners (33 percent), three of which increased by more than 25 percent (see Figure 4).

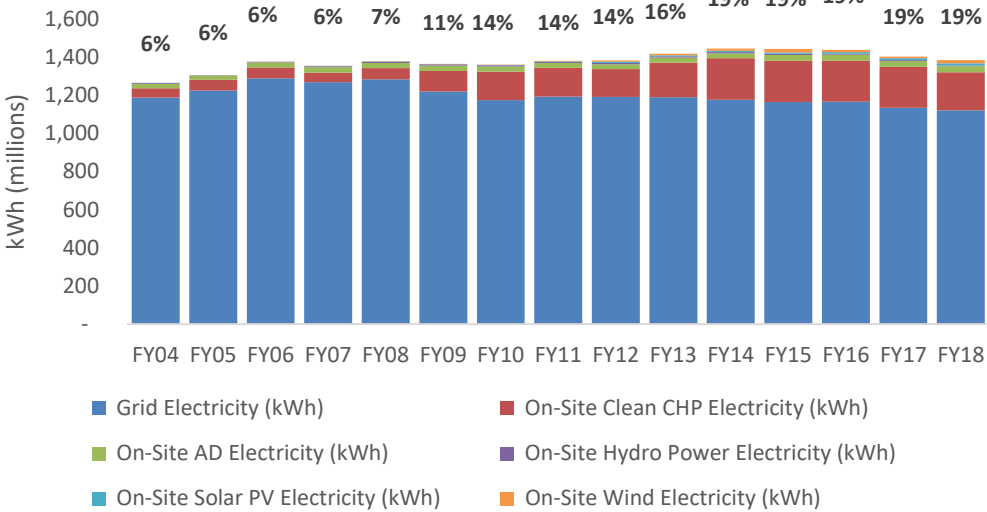
Overall fuel oil consumption in buildings\* has decreased 82 percent from FY04 through FY17 (see Figure 5), a reduction of more than 19 million gallons and resulting from fuel switching to cleaner alternatives. LBE continues to pursue opportunities to eliminate fuel oil consumption by transitioning to cleaner fuels and technologies.

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



# Renewable & Onsite Generation

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



In FY18, state partners reduced grid electricity consumption by 67 million kWh compared to the FY04 baseline, with onsite generation contributing a total of 264 million kWh, compared to 77 million kWh in FY04.

As seen in Figure 6, of the roughly 1.4 billion kWh of electricity consumed, 63 million kWh (equivalent to 5 percent of total) were generated by onsite renewable power and 200 million kWh (equivalent to 14 percent of total) were generated by onsite combined heat and power.

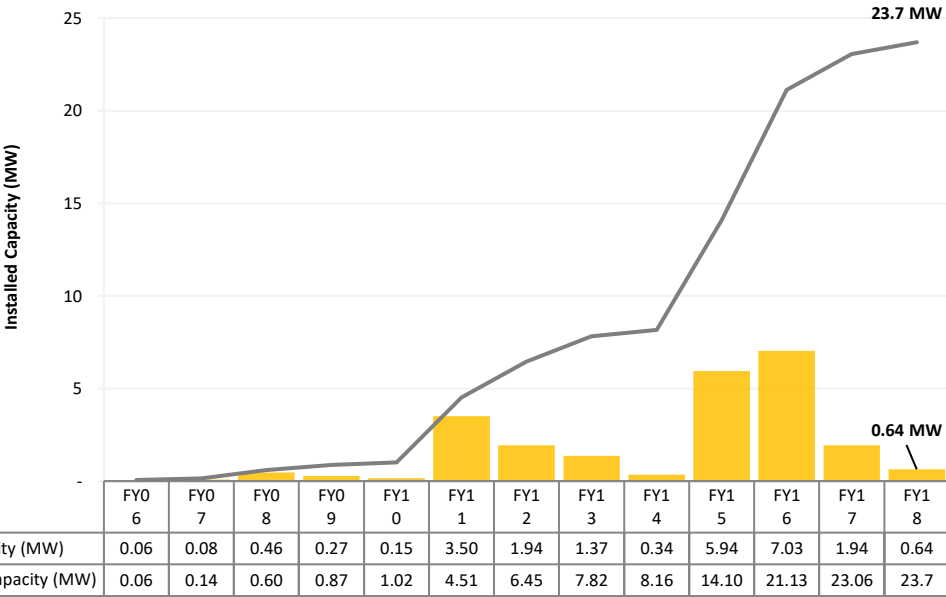
\*Renewable and on-site clean generation includes anaerobic digestion, hydro power, clean combined heat and power (CHP), solar photovoltaic, and wind power.

A significant contributor to growth of onsite installations at state facilities has been solar PV. In FY18, 636 kW of solar PV were installed, bringing the total installed solar capacity at state facilities to 23.7 MW, up from less than 150 kW a decade ago (as shown in Fig. 7). These installations generate an estimated 27 million kWh of solar power a year, equivalent to the annual electricity use of 3,609 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 FY18, 42 renewable thermal systems were installed at state facilities, including:

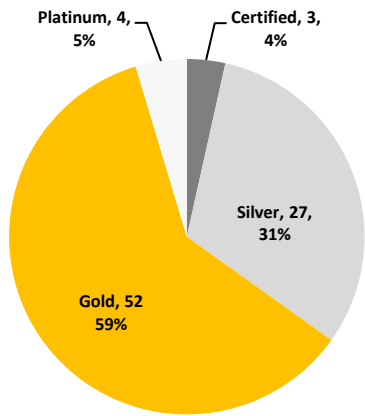
- 17 solar thermal installations
- 9 biomass systems
- 11 ground-source heat pumps
- 5 air-source heat pumps

Solar Installations at State Facilities



## Green Buildings

As of June 2018, the state portfolio included 81 LEED certified buildings, with 51 at the top two levels of Gold and Platinum (63 percent).



In FY18, nine buildings received LEED certification, with five buildings at the Gold and four at the Silver level. Building sizes ranged from 31,000 to 310,000 square feet and included academic and laboratory buildings, a sports and fitness center, and an airport terminal.

| Agency                            | Project                                          | Level  |
|-----------------------------------|--------------------------------------------------|--------|
| Bridgewater State University      | Dana Mohler-Faria Science and Mathematics Center | Silver |
| Framingham State University       | Hemenway Hall Renovation                         | Silver |
| MassDOT                           | Research & Materials Laboratory                  | Gold   |
| MassPort                          | John E Volpe Terminal E NLA Wing                 | Gold   |
| Mount Wachusett Community College | Haley Addition (Asquino Science Center)          | Gold   |
| North Shore Community College     | Thomas McGee Extension Building                  | Silver |
| Northern Essex Community College  | El-Hefni Allied Health & Technology Center       | Silver |
| UMass Lowell                      | Pulichino Tong Business Center                   | Gold   |
| Worcester State University        | Wellness Center                                  | Gold   |

## 2018 Highlight: Clean Transportation

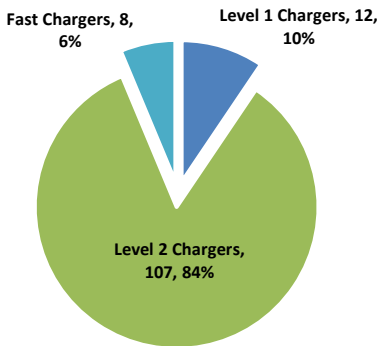
Since the Fuel Efficiency Standard (FES) was established in 2016, the Green Fleet Committee (OVM, DOER and MassDEP) has collaborated with Executive Branch agencies to reduce vehicle fuel consumption in the state fleet by replacing conventional fuel vehicles with hybrid, alternative fuel and electric vehicles.

After two years of implementation, the Executive Branch has added one plug-in hybrid-electric and 14 hybrid-electric vehicles to its fleet and, in FY18, acquired six Chevy Bolts, the fleet’s first battery-electric vehicles. Additionally, 54 vans underwent hybrid conversions. These conversions allow agencies to fulfill the unique operational needs of their vehicles, while incorporating hybrid technology to increase fuel efficiency.

All of these efforts help the Executive Branch reduce tailpipe emissions and fuel consumption, leading to a cleaner and more efficient fleet.

| Alternative Fuel Vehicles in Executive Branch Fleet |                |                  |              |
|-----------------------------------------------------|----------------|------------------|--------------|
| Hybrid                                              | Plug-in Hybrid | Battery-electric | Hybrid Upfit |
| 21                                                  | 3              | 6                | 54           |

To help support a growing electric fleet, nine electric vehicle charging stations were installed in 2018, bringing the total to 127 stations at 29 state agencies and campuses across the Commonwealth. 107 stations (84 percent) are capable of level 2 charging, eight stations capable of DC fast charging, and an additional 12 stations available for level 1 charging.



# Key LBE Accomplishments

## Battery Storage

Two UMass campuses began battery storage projects at their respective campuses. Both projects received grants from the Advancing Commonwealth Energy Storage (ACES) program:

- UMass Boston was awarded a \$850,000 ACES grant to support a project that would provide numerous non-monetizable benefits, including grid resiliency, GHG reductions, educational benefits, and more. The project also has an attractive workforce development component, as UMass-Boston proposes to use the storage system as a living laboratory for the UMass community – generating a variety of educational opportunities, such as tours, demonstrations, guest lectures, class projects, paid internships, technical consultancies, design and innovation competitions, service learning, and creating shared value and sustainability performance.
- UMass Amherst was awarded a \$1.1 million ACES grant to work with an energy storage company to construct a large battery at the Central Heating Plant on campus. UMass Amherst will operate the 1 MW/4 MWh lithium ion battery system to demonstrate the value of peak demand management, optimize the integration of renewable distributed generation, and educate Massachusetts’ next generation of clean energy experts.

## Onsite Generation

- The Massachusetts College of Liberal Arts installed a 75 kW CHP system at its Feigenbaum Science Center. Supported by a \$208,000 LBE grant, the system is expected to reduce grid electricity consumption by 624,000 kWh and CO2e by 97 metric tonnes annually, and result in \$80,000 in energy cost savings and Alternative Energy Credit (AEC) revenue. It will also provide resiliency benefits, as on-site standby generator capacity will be able to generate power to maintain critical laboratory and public safety loads.
- The Franklin County Sheriff’s Department installed a 436 kW solar canopy at the Franklin County Jail and House of Correction. Part of a comprehensive energy project overseen by DCAMM, the canopy is expected to generate 439,000 kWh annually and result in \$1.9 million in energy cost savings over 20 years. As part of the \$545,000 LBE grant to support the canopy, two dual-head level 2 EV charging stations were also installed.



## LBE Awards

In November of 2018, the 12th 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 FY18 LBE Award Recipients are listed by category type below.

| Agency                             | Public Higher Education            | Municipality      | Individual                                             |
|------------------------------------|------------------------------------|-------------------|--------------------------------------------------------|
| Franklin County Sheriff’s Office   | Salem State University             | City of Salem     | Thomas Philbin,<br>Town of Westwood                    |
| Metropolitan Area Planning Council | UMass Amherst (Landscape Services) | Town of Wellesley | James Latini,<br>DCAMM Capitol Complex Operations Team |