

# Massachusetts Leading by Example: Fiscal Year 2015 Progress Report



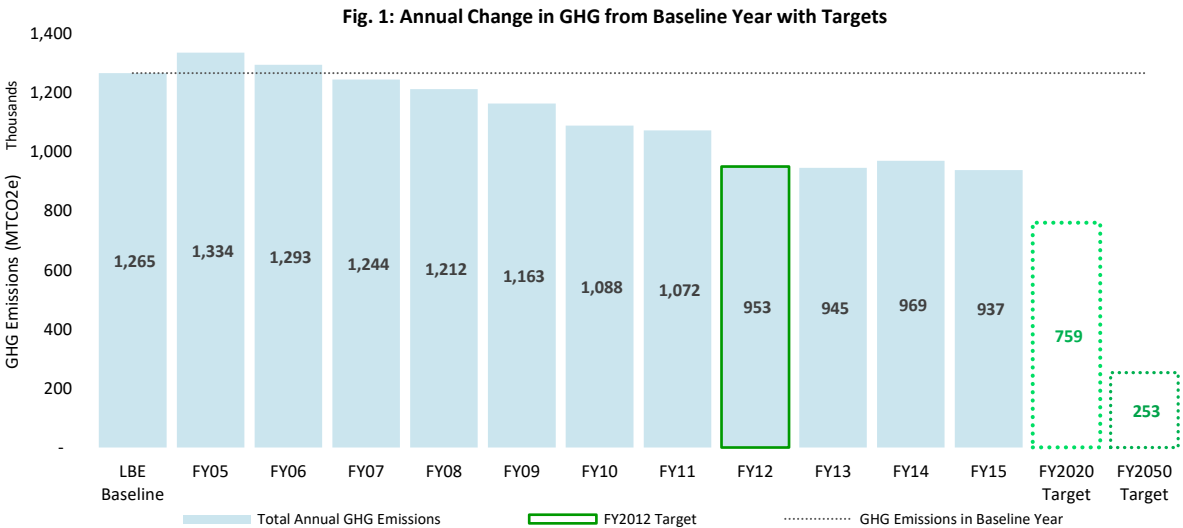
The Leading by Example Program works collaboratively with state agencies and public colleges and universities to advance clean energy and sustainable practices that reduce the environmental impacts of state government operations. This includes reducing greenhouse gas emissions, increasing renewable and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

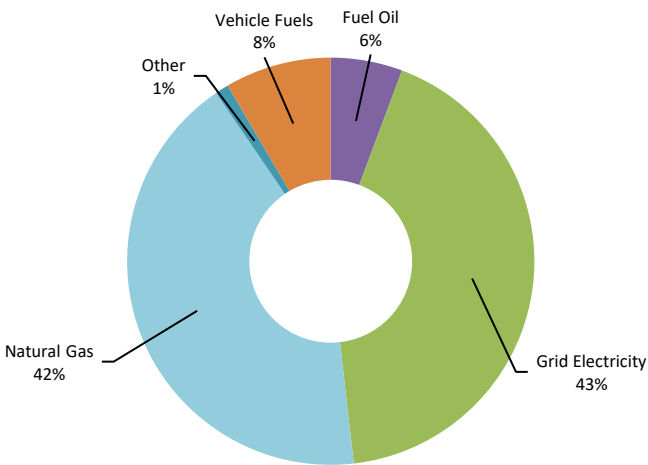
In FY15, overall GHG emissions associated with state operations decreased by 327,892 metric tonnes of CO2 equivalent compared to the LBE baseline\* (see Figure 1), equivalent to a 26 percent reduction\*\*. In order to reach the FY20 40 percent reduction target, GHG emissions will need to decrease by an additional 156,000 metric tonnes annually.

\* The LBE Baseline uses a 3-year average from FY02-FY04.

\*\* LBE GHG emissions calculations do not account for the sale of RECS, thus, overall emissions reductions at state facilities contribute to overall reductions in statewide emissions and not to facility specific reductions.



**Fig. 2: Emissions Contribution by Fuel -- FY15**

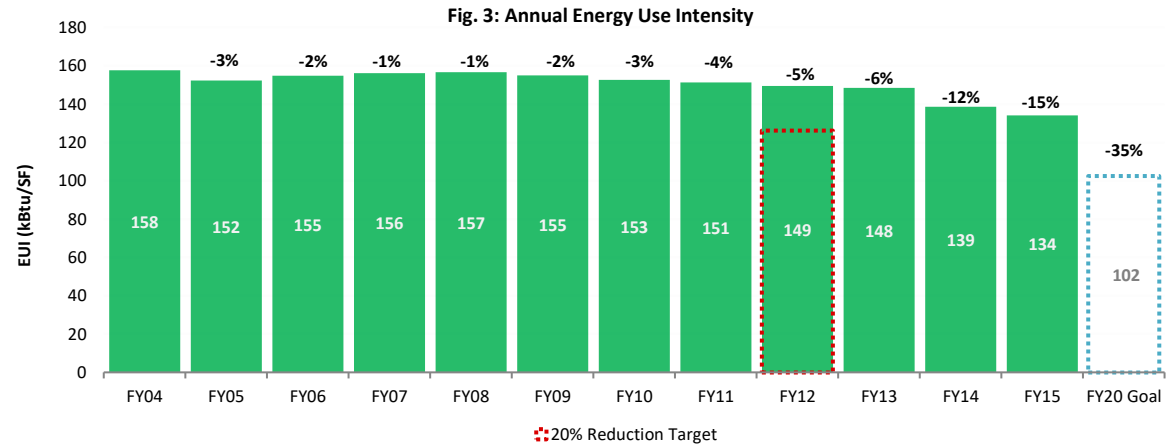


As shown in Figure 2 above, in FY15, natural gas comprised 42 percent of total emissions, with emissions from electricity just above at 43 percent. Together, fuel oils #2, #4 and #6 contributed 6 percent of total emissions, while vehicle fuels contributed 8 percent.

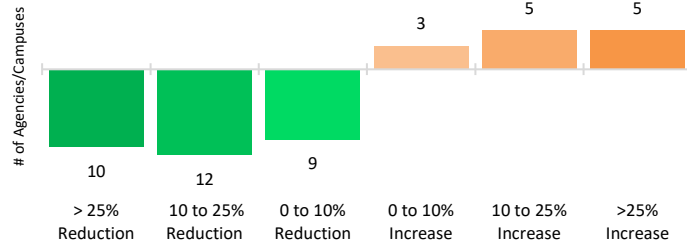
# Energy Use

Overall energy use intensity (kBtu/per square foot) decreased 15 percent from the Leading by Example FY04 baseline through FY15 for the 44 Leading by Example partners whose energy use\* is tracked using this metric. Annual EUI will need to decrease by an additional 20 percent to reach the FY20 35 percent reduction target (see Figure 3).

\*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.



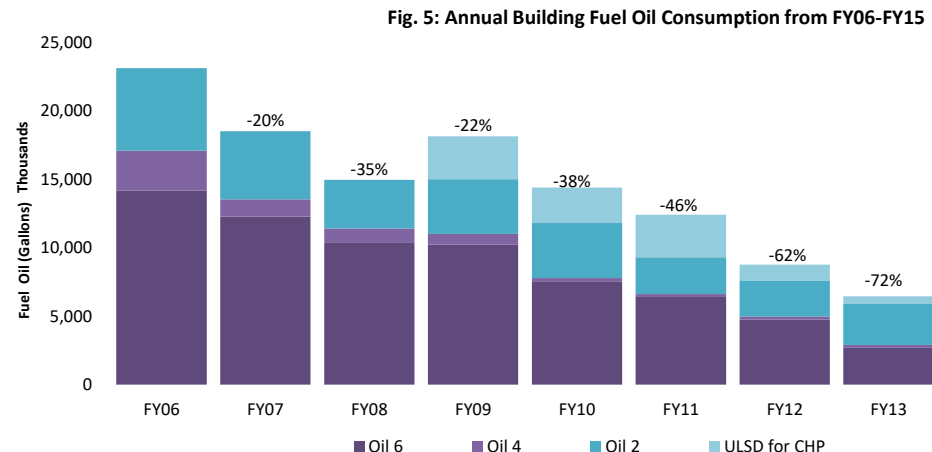
**Fig. 4: Agencies/Campuses by EUI % Change from Baseline**



As EUI is impacted by facility type and use, progress varies across LBE partner facilities. 31 out of 44 of the LBE partners have reduced overall energy use intensity at their facilities, with 10 of those achieving more than a 25 percent reduction from the FY04 baseline. Conversely, overall EUI increased for 13 LBE partners, five of which increased by more than 25 percent (see Figure 4).

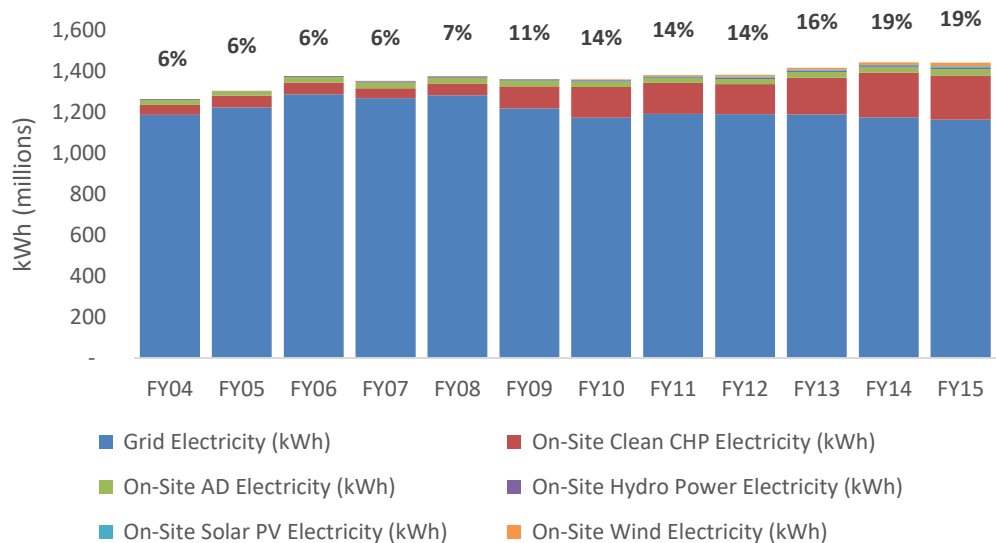
Overall fuel oil consumption\* in buildings has decreased 76 percent from FY06 through FY15 (see Figure 5), a reduction of more than 17 million gallons. LBE continues to pursue opportunities to eliminate fuel oil consumption by transitioning to cleaner fuels and technologies.

\*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 FY15, state partners reduced grid electricity consumption 23 million kWh compared to FY04, with clean onsite generation contributing a total of 278 million kWh, compared to 77 million kWh in FY04.

As seen in Figure 6, of the roughly 1.4 billion kWh of electricity consumed, 62 million kWh (equivalent to 4 percent of total) were generated by onsite renewable power and 216 million kWh (equivalent to 15 percent of total) were generated by onsite clean CHP.

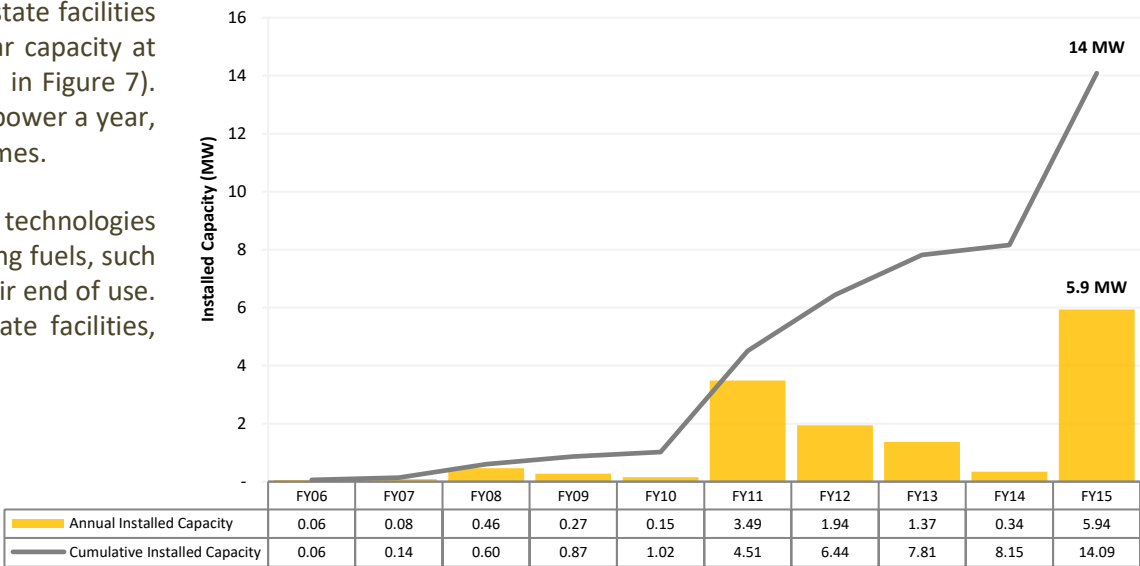
\*Renewable and on-site clean generation includes anaerobic digestion, hydro power, clean combined heat and power (CHP), solar photovoltaic, and wind power.

A significant contributor to growth of onsite renewable power at state facilities has been solar PV. As of FY15, there are 14 MW of installed solar capacity at state facilities, up from less than 150 kW a decade ago (as shown in Figure 7). These installations generate an estimated 16 million kWh of solar power a year, equivalent to the annual electricity use of 2,154 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 FY15, 25 renewable thermal systems were installed at state facilities, including:

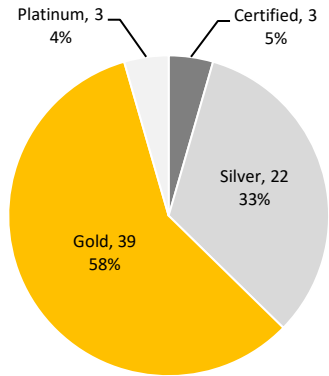
- 10 solar thermal installations
- 6 biomass systems
- 8 ground-source heat pumps
- 1 air-source heat pumps

Fig. 7: Solar Installations at State Facilities



# Green Buildings

As of June 2015, the state portfolio included 40 LEED certified buildings, with 28 at the top two levels of Gold and Platinum (70 percent).



In FY15 alone, 8 buildings received LEED certification, with 7 buildings at the Gold level and 1 at the Silver level. Building sizes ranged from 40,000 to 300,000 square feet and included residence and dining halls, an academic and laboratory building, a sports and fitness center, a transportation facility, and a rental car center.

Agency	Project	Level
Bridgewater State University	Weygand Hall	Gold
Massachusetts College of Art & Design	Tree House Residence Hall	Gold
Massachusetts Port Authority	Logan Green Bus Depot	Silver
Massachusetts Port Authority	Logan Rental Car Center	Gold
UMass Amherst	Hampshire Dining Commons	Gold
UMass Amherst	McGuirk Football Training Facility	Gold
UMass Amherst	Life Sciences Laboratories I	Gold
Westfield State University	University Hall	Gold

# FY15 Highlight: Renewable Thermal

In Fiscal Year 2015, an effort was undertaken to assess the feasibility of renewable thermal technologies at state facilities. The objective of the feasibility studies was to determine clean, efficient alternatives to ailing fossil fuel-based infrastructure, thereby reducing onsite energy demand and greenhouse gas emissions.

12 renewable thermal studies were conducted across two state agencies:

- The Department of Fish and Wildlife received a \$50,000 LBE grant to explore renewable thermal technologies at 4 sites.
- The Department of Conservation and Recreation received a \$46,418 LBE grant to explore renewable thermal technologies at 8 sites.

The renewable thermal technologies considered to replace existing oil-burning systems included pellet-fueled biomass boilers and high-efficiency air-source heat pump systems, determined by the heating needs of each facilities. Of the 12 studies, two DFW sites and three DCR sites were greenlighted for projects to move forward.

Site	Technology	LBE Grant
DFW Plum Island Shellfish Purification Plant	Air-source heat pump	\$44,058
DFW Belchertown McLaughlin Fish Hatchery	Wood-pellet biomass	\$258,583
DCR Quabbin Conference Center	Air-source heat pump	\$31,300
DCR Halibut Point Visitor Center	Air-source heat pump	\$45,683
DCR Scusset Beach Maintenance Garage	Air-source heat pump	\$41,250



# Key LBE Accomplishments

## Energy Efficiency

In 2015, DCAMM, the Commonwealth’s planning and construction agency, evaluated, initiated, or successfully completed efficiency projects at all of 700 existing state sites in Phase 1 the Accelerated Energy Program (AEP) by the program’s target date of December 31, 2014. The AEP expects to reduce annual energy bills by \$43 million and greenhouse gas emissions by 135,000 metric tons.

## Green Buildings

The Commonwealth completed its first state office building (second state building overall) built to the zero net energy standard. The 45,000 square foot Division of Fisheries and Wildlife’s Field Headquarters in Westborough is designed to produce more energy annually than it consumes, utilizing various high efficiency and renewable energy features, including:

- 294kW rooftop solar array
- Closed-loop ground source heat pump system
- High-performance building envelope
- Efficient R5 windows



## Solar Installations

Over 5.9 MW of solar capacity were installed in FY15, totaling over 14 MW at state facilities since 2006. The 8 solar projects spanned a variety of sites and installation types, including:

- 3.2 MW solar canopy and 50 kW roof-mounted array at Bristol Community College
- 2.3 MW of ground-mounted arrays along five highway rights-of-way in Framingham, Natick and Plymouth



## LBE Awards

In November 2015, the 9th 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 FY15 LBE Award Recipients are listed by category type below.

Agency	Public Higher Education	Municipality	Individual
Massachusetts State College Building Authority	Worcester State University	Town of Kingston	DCR Energy & Sustainability Team: Stephen Brown, Yvonne Jones & Raul Silva
Massachusetts Clean Energy Partnership for Wastewater & Drinking Water Facilities	UMass Boston	Belmont Light	Martha Grover, City of Melrose