MA Leading by Example Council Meeting

DOER Massachusetts Department of Energy Resources

May 14, 2019

Middlesex Fells Visitor Center

MASSACHUSETTS LEADING BY EXAMPLE PROGRAM
PUBLIC LEADERSHIP. STEWARDSHIP. COMMITMENT

State Government Progress – as of May 2019

Greenhouse Gas (GHG) Emissions

↓ 26%

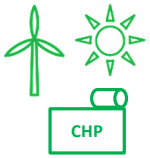
2004 -2018

Energy Use Intensity per Square Foot

↓ 13%

2004-2018

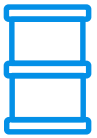
Electricity via Renewable & Onsite Generation



19%

In 2018

Heating Oil Consumption at State Facilities



↓ 84%

2006-2018

24.9 MW Installed Solar PV at State Sites

16.8 MW

Since 2015

86 LEED Certified State Buildings

49

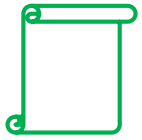
Since 2015

129 Electric Vehicle Charging Stations at State Sites

66

Since 2015

Leading by Example Grants Awarded

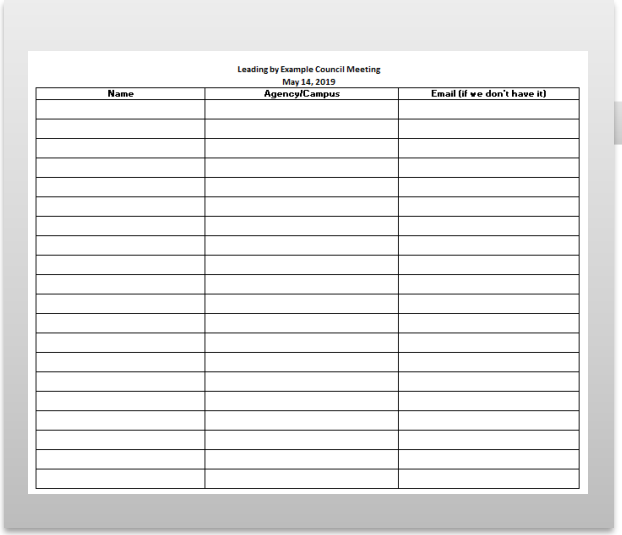


$10.6 M

Since 2015

Welcome and Introductions

Share your name and organization



Leading by Example Council Meeting
May 14, 2019

Name	Agency/Campus	Email (if we don't have it)

Please make sure to add yourself to the sign-in sheet when it comes around

In case you forgot why what we do matters…

- Most comprehensive assessment of planet's health ever undertaken
- 455 authors representing 50 countries
- Findings based on reviews of 15,000 scientific and government sources

1 million (out of 8 million total) of plant and animal species are at risk of extinction, many within just decades

"The health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever…we are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide."

-- Robert Watson, Chair, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

Impacts from Human Activities

Top drivers for biodiversity extinction

1. Land and sea conversion
2. Hunting and fishing (food, body parts)
3. Climate change
4. Pollution
5. Invasive species

- 60 billion tons of resources annually extracted – double since 1980
- 75% of land and 66% of marine environment have been significantly altered by humans
- More than 33% of global land and 75% of freshwater resources are used for crops or livestock
- Plastic pollution increased 10x since 1980
- 300+ million tons of heavy metals, solvents, industrial wastes dumped into worlds water
- Due to insect decline, $577 billion in annual crop production is at risk
- The loss of mangrove forests and coral reefs threaten 300 million people to increased risk of flooding.

Insects as a Barometer

Many fewer insects hitting windshields

Habitat destruction and insecticides

Food sources for many species at risk

Data from 100 western Europe Preserves show 80% decline in winged insects since 1980

Transformative Change

- "It is not too late to make a difference, but only if we start now at every level from local to global. Through 'transformative change', nature can still be conserve, restored and used sustainably…. By transformative change, we mean a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values." -- Professor Watson

  - ✓ Reduce meat consumption
  - ✓ Reduce luxury consumption
  - ✓ End environmentally damaging subsidies
  - ✓ Stop tree cutting in tropical countries
  - ✓ Get used to living in a limited-growth economy

Agenda

- Massachusetts News

- LBE Updates

- Pollinator Efforts at Middlesex Fells

- Battery-Powered Landscaping Equipment

- Progress Tracking
- LBE 2019 Goals Mid-year Review and Discussion

- News From Around the World

Massachusetts News

MA News

Documents, developments available on COMMBUYS

- EEA is seeking to hire a consultant to conduct an **"80 x 50 Study"**
- Scope includes a roadmap to 2050 and a clean energy and climate plan for 2030
  - Lay out possible scenarios, uncertainties, drivers, outcomes, tradeoffs, and benefits
  - Recommend policies and deployment strategies
- Contract estimated to start end of May

MA News

Full Press Release

- DPU has approved long-term, offshore wind energy contracts between Vineyard Wind + the Commonwealth's Electric Distribution Companies
  - 800MW -- *single largest offshore wind project in the United States*

Image source

MA News

Full Press Release

- Kathleen Theoharides was sworn in as the new Secretary of the Executive Office of Energy and Environmental Affairs (EEA) on May 3
- Secretary Theoharides has been overseeing the state's initiatives related to climate change over the past three years
  - Directed development of a new program to help municipalities identify vulnerabilities and plan for ways to adapt to climate change

MA News: APS, CPS, SMART Program

Alternative Energy Portfolio Standard	• Emergency regulations filed in April to amend portions of APS; written comments collected through May 13 • Cancels transition from pre-minting to forward minting for small (residential scale) renewable thermal technologies • Small systems would still receive credits up front in lump-sum • Remains in effect for three months
Clean Peak Standard	• DOER presented a detailed straw proposal in April, collected written comments • Next steps include release of final report and draft regulation for public comment in Q2 2019 • Public hearings anticipated in Q3, final regulations expected in late 2019/early 2020
SMART Program	• DOER is conducting stakeholder meetings in May to gather feedback on potential program proposal

APS, CPS, SMART

MA News: SMART Solar Incentives

- DOER is exploring a revised proposal for SMART, which is currently oversubscribed in some blocks
- Potential considerations include:
  - Program expansion (e.g. additional blocks)
  - Land use limitations
  - Crediting mechanism for behind-the-meter projects
- Stakeholder meetings in May
- Public meeting anticipated in June to present proposal and gather feedback

MA News: Green Communities

- In April, six new towns joined the commitment to work with the state to support a clean, energy efficient future:
  - Billerica
  - Boxford
  - Dracut
  - Haverhill
  - Merrimac
  - Methuen

- There are now over 240 designated Green Communities that include 78% of state residents

Full Press Release

LBE Updates

LBE Updates: Fuel Efficiency Standard

- Standard Released September 2016
  - OSD in collaboration with DOER and MassDEP (Green Fleet Committee)
  - Applies to Executive Branch vehicles weighing <10,000 lbs

Category	FES Requirement 1: **Minimum Combined MPG**	FES Requirement 2: **Minimum AFV acquisition**
I	**32 combined MPG** for sedans	**5% of total acquisitions** each year
II	**22 combined MPG** for SUVs, Trucks & Vans	1st AFV must be acquired upon reaching 10 vehicles

- Green Fleet Committee responsible for review and periodic changes to standard
  - Agencies facing significant barriers in meeting 22 MPG requirement for Category II acquisition
  - Current lack of efficient & alternative fuel options
  - Inflexibility in specific agencies needs for vehicles

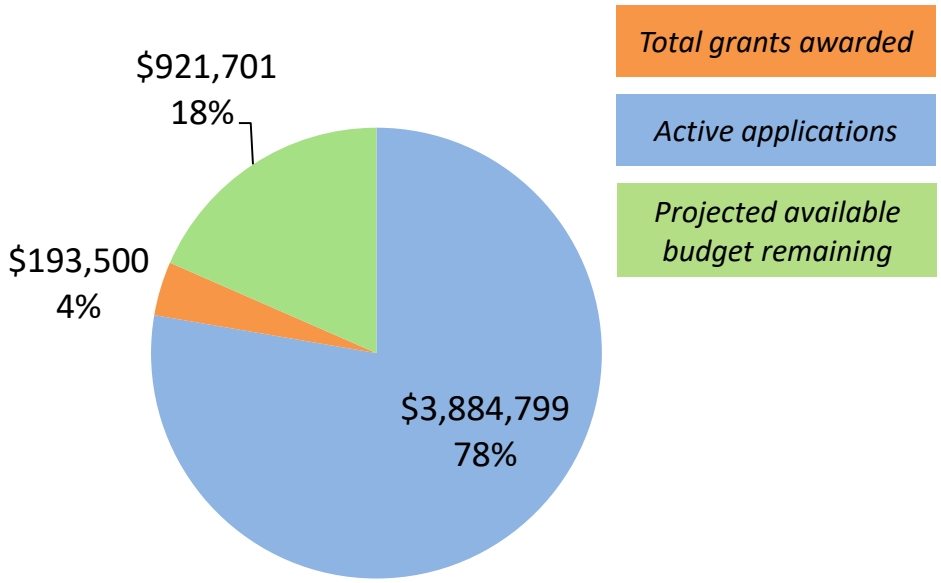
LBE Updates: Solar Grant

1 grant awarded
0.4 MW

1 grant pending
6 applications actively in process
11.2 MW

22 potential projects that may seek LBE grant funding
18.2 MW

$5M LBE Solar Grant Program as of 5/13/19



<u>April 2019 LBE Grant Amendment</u>

- Third-party projects w/o SMART incentives
  - Rooftop: $0.50/watt (increase)
- Reminder to submit applications to Catie Snyder

LBE Updates: MBTA Efficiency Partnership

- DOER launched a new 3-year partnership with the MBTA and utilities to reduce energy consumption across dozens of facilities and stations by implementing energy efficiency measures (lighting, HVAC, etc.)
  - $40M investment
  - Expected annual reduction impacts:
    - 30M kWh electricity
    - $2.7M in energy costs
    - 10,000 metric tons GHGs

Full Press Release

LBE Updates: HHS Resiliency Study

- LBE has been overseeing a study of 12 HHS facilities to look at clean energy opportunities to enhance energy resiliency
  - Examined potential resiliency gaps at each site, developed fiscal and technical analyses for gap mitigation through clean energy solutions
- Key findings:
  - Most sites have full energy resiliency except for cooling systems
  - The predominantly accessible clean energy option in the current market is CHP and/or a combination of battery storage and solar
  - Utility incentives are particularly impactful on clean energy cost-effectiveness; MLP service territories can be at a disadvantage

Stay tuned! Resiliency, including outcomes and examples from this study, will be featured at an upcoming LBE Council Meeting

LBE Updates: Pollinator Summit

- Interagency LBE working group focused on pollinator-friendly and sustainable landscapes

Massachusetts Leading by Example
State Government Progress Data: Sustainable Landscapes

80
Total Acres of Sustainable Landscaping & Green Roofs at MA State Sites

58	20	0.8
Acres of No/Limited Mow Zones at MA State Sites	Acres of Planted Wildflower Meadows & Pollinator-Friendly Gardens at MA State Sites	Acres of Green Roofs at MA State Sites
53 Acres Since 2015	*20 Acres Since 2015*	*0.1 Acres Since 2015*

- Biannual working group summit
  - Making updates to pollinator calculator
  - Reformatting guidance framework document
  - Enhanced site data tracking
  - Moving forward with proposal for formal interagency initiative

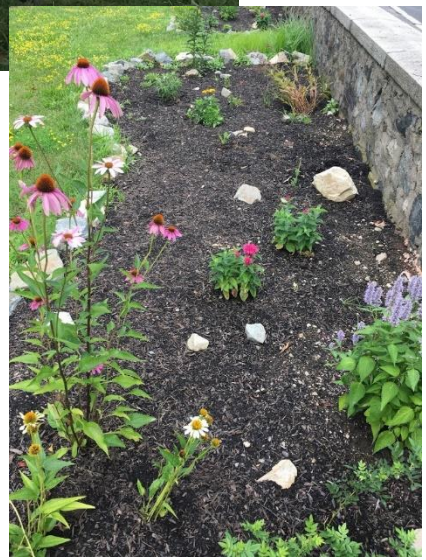
DCR Pollinator Efforts

Gillian Lay, DCR

Pollinator Efforts at Middlesex Fells

- Native / sustainable landscape projects
  - Seeking to be climate, energy, and habitat-friendly
    - Certified monarch butterfly garden
    - Pollinator garden
    - No-mow zone

Pollinator Efforts at Middlesex Fells



Add'l DCR Sustainable Landscape Sites

- **Purgatory Chasm**
  - Planned garden
- **Waquoit Bay Reserve**
  - Planned garden, no/limited mow zone
- **Wachusett Reservoir**
  - No/limited mow zone, wildflower meadow
- **Senator Joseph Finnegan Park**
  - Wildflower meadow

Images Source

Battery-Powered Landscaping Equipment

Julia Wolfe, OSD

Mike Garrity, Mass Aeronautics

OPERATIONAL SERVICES DIVISION

UPDATE: Advancing Commercial Electric Battery Powered Lawn Equipment in MA

Mowers, Blowers and Other Handhelds

Serving Public Buyers and Vendors of the Commonwealth of Massachusetts

@Mass_OSD

mass.gov/osd

Battery Electric Landscape Equipment

OPERATIONAL SERVICES DIVISION

- Zero toxic emissions
- 50% less noise
- No fuel spillage
- No fuel cost
- Less maintenance
- No soil and water pollution
- Zero GHGs

Update

- Developed commercial battery powered landscape specifications for FAC88: Lawns & Grounds, Equipment, Parts, and Services
- Awarded 4 vendors Category 13: EPP
  - Boston Lawnmower
  - Casons Equipment
  - Mean Green Products
  - Orlando's Garage (Ultra Automotive)
- Developed Economic and Environmental Calculator
- Held two "unbranded" trainings/trade shows (9/26 and 9/27)

DCR Walden Pond

Survey of Existing Equipment*
- large (48”) walk-behind Scag mower
- 21” Husqvarna push mower
- Redmax string trimmers
- Redmax backpack leaf blowers
- walk-behind blower
- hedge trimmer

Switching to battery power could eliminate all emissions at point of operation

Existing Emission Estimates*
- 211 lbs/year of non-methane hydrocarbons
- 51 lbs/year of nitrogen oxides
- 5,672 lbs/year of carbon monoxide
- 26 lbs of fine particulate matter (2.5 micron or <)

Existing Greenhouse Gas, Carbon Dioxide Generation*
- Approx. 17,300 lbs/year

*from OSD Report *Advancing Commercial Electric Battery Powered Lawn Equipment in Massachusetts, December 2018*

DCR Walden Pond Environmental Benefits Estimates*

Chris Hoffman, Walden Pond
Walden purchased a Mean Green SK-48 Stalker in 3/2019

Estimated reductions from replacing just the Scag mower*:

- 29% of hydrocarbons
- 91% of nitrogen oxides
- 82% of carbon monoxide
- 3% of fine particulates
- 80% of carbon dioxide

*from OSD Report *Advancing Commercial Electric Battery Powered Lawn Equipment in Massachusetts, December 2018*

Mass Aeronautics

- RFQ for Battery Electric Equipment for 10 Municipal Airports:
  - Chainsaws
  - Backpack style blowers
  - Pole saws
  - Trimmers
- Solar charging canopy mower (Turners Falls Municipal Airport)

MassDOT's Initiative to Reduce Carbon Emissions, Noise and Reap Long-term Savings

It may not be the first thing that comes to mind when you think of airport operations, but clearing and maintaining vegetation in and around airport property is essential to prevent them from becoming obstructions or hazards to airport operations.

This spring, 10 public-use airports around Massachusetts, including New Bedford Regional Airport and Pittsfield Municipal Airport, are taking a more environmentally friendly approach to getting this task done. The Massachusetts Department of Transportation's (MassDOT) Aeronautics Division has moved forward with funding several pieces of commercial-grade, battery-powered landscaping equipment procured through Statewide Contract FAC88 to support their Vegetation Management Program (VMP) in an environmentally friendly and economical way.

Michael Garrity, Project Manager and Environmental Analyst at MassDOT, using a battery-powered chainsaw at the FAC88 event.

The 10 airports will be using a variety of new, lower-emission equipment – including chainsaws, backpack-style blowers, pole saws, and trimmers. Additionally, a solar charging canopy mower was purchased for use at the Turners Falls Municipal Airport, which also is converting their existing gas-engine tractor to propane (through FAC88, Category 2 – Tractor Accessories) – a low-carbon alternative fuel.

Michael Garrity, Project Manager and Environmental Analyst at MassDOT's Aeronautics Division, explained, "This equipment will help reduce carbon emission, support noise reduction initiatives, and contribute to the MassDOT sustainability efforts. These alternatives to gas-powered equipment offer health and environmental benefits, long-term savings opportunities, and are consistent with the Commonwealth's climate change initiatives."

MassDOT was first exposed to these options after trying out several pieces of equipment at an FAC88 Statewide Contract event in Lexington last fall. The event unveiled the addition of commercial-grade, battery lawn equipment to the FAC88 Lawns and Grounds Equipment Statewide Contract and gave attendees the opportunity to try out various pieces of battery-powered lawn equipment offered by newly awarded FAC88 Category 13 vendors.

Nathan Rawding, Environmental Analyst at MassDOT, trying out a solar charging canopy mower at the FAC88 event.

Garrity asserts, "After attending the event in Lexington, we sent out a survey to our airports that participate in the VMP program to see if there was interest in obtaining commercial-grade, battery-operated landscape equipment, and the response was overwhelmingly, 'Yes'."

Learn more about these solutions in the FAC88 Contract User Guide or contact Gayle Gionet at 617-720-3381.

OSD Buy The Way, April 2019

https://bit.ly/2GA4Xem

Other Programs in Public Sector

- Continuing to work with the Town of Lexington

- Others with programs:
  - UMass Amherst
    - Landscape Services Honored with Leading By Example Award
    - Tod Cournoyor presentation: U MA Landscape Management: Battery Powered Outdoor Power Equipment
  - City of Cambridge
    - Dave Webster: City of Cambridge: Battery Operated Equipment Usage

Additional Information

- **COMMBUYS: www.commbuys.com**

- **Websites of Interest:**
  - OSD's Main Website: **www.mass.gov/osd**
  - EPP's Main Website: **www.mass.gov/epp**

Julia Wolfe
Director, Environmental Purchasing
Operational Services Division
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LBE Progress Tracking and 2019 Goals

LBE Goals – Planning and Review

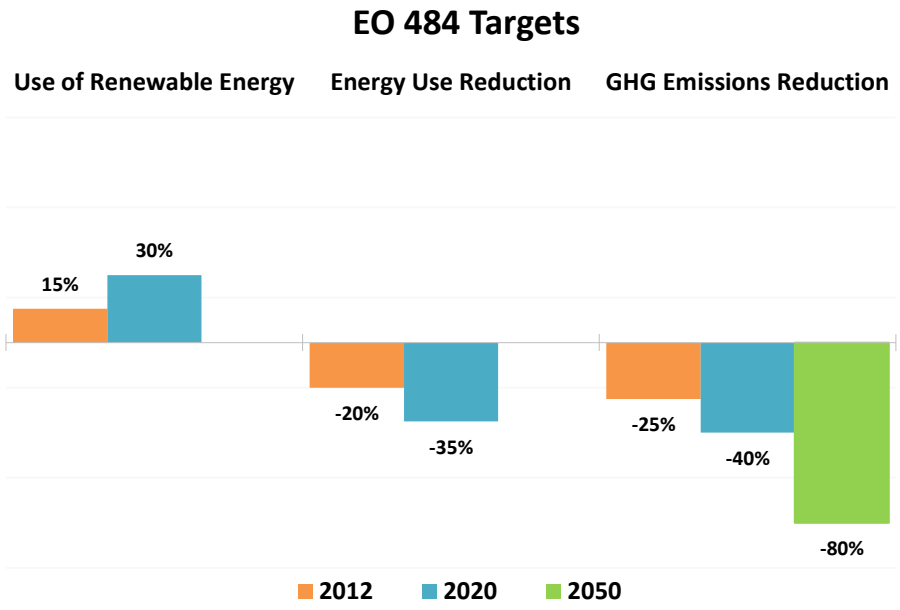
Proposed progress and goals review process with LBE Council:

Council Meeting	LBE Programmatic Targets	Long-Term LBE Goals and Metrics
May / July	Mid-year review of annual LBE programmatic targets	Annual progress reporting on long-term, big picture LBE goals and metrics
January	End of year review of LBE programmatic targets; establish preliminary goals and targets for following year	Mid-fiscal year reporting on tracked progress toward long-term LBE goals

Would it help to present on broader, annual statewide clean energy goals?

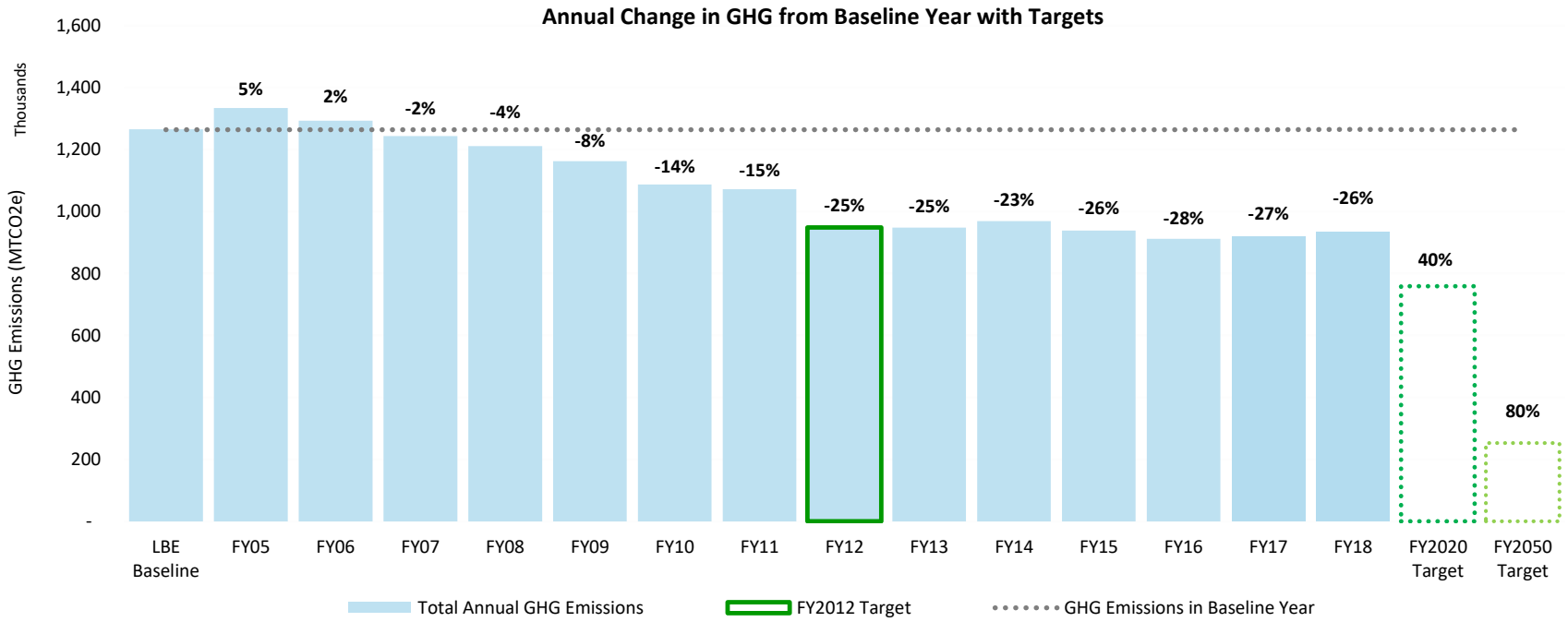
LBE Progress Tracking: Overview

- GHG emissions
- Energy use intensity
- On-site generation
- Solar installations
- Heating oil
- Renewable thermal
- Green buildings
- Clean transportation



LBE Progress Tracking: GHG Emissions

In FY18, overall GHG emissions associated with state operations decreased by 330,690 metric tons, equivalent to a **26%** reduction

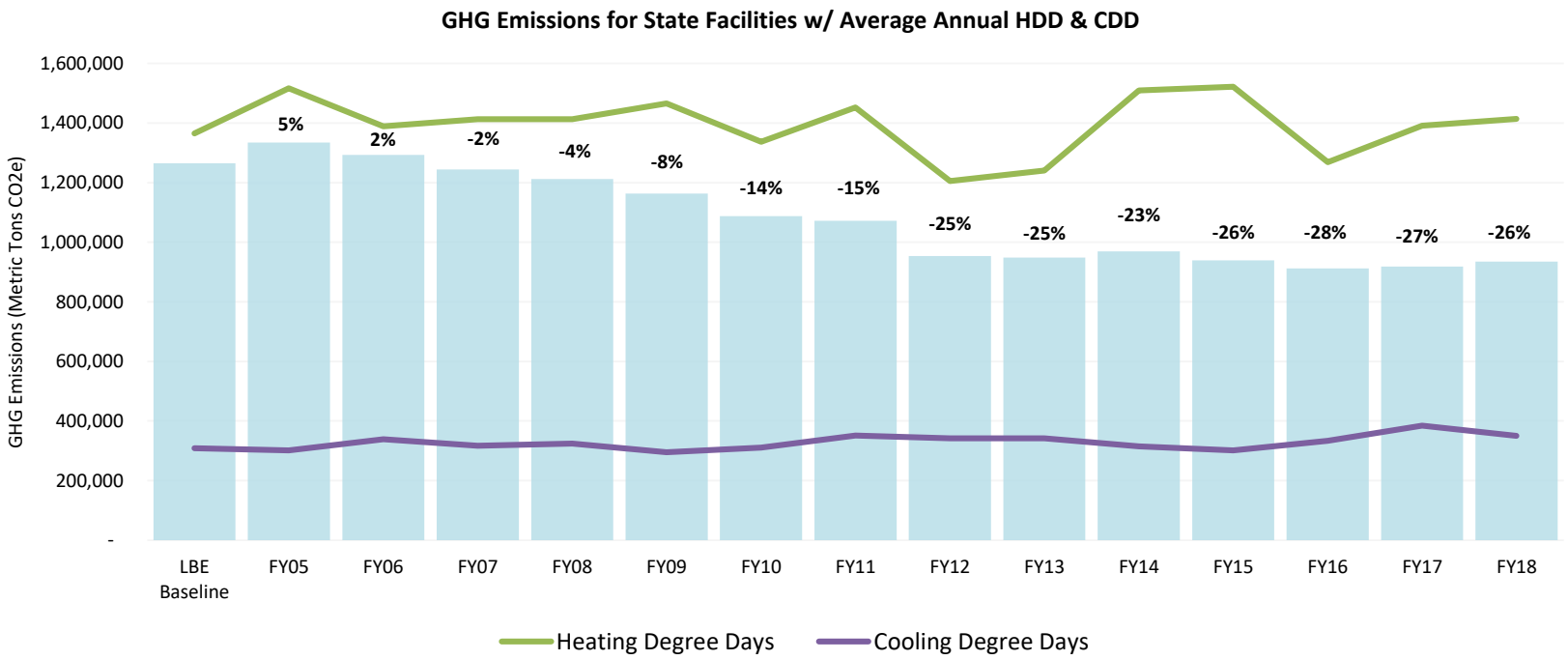


Creating A Clean, Affordable and Resilient Energy Future For the Commonwealth

DOER
Massachusetts Department of Energy Resources

LBE Progress Tracking: GHG Emissions

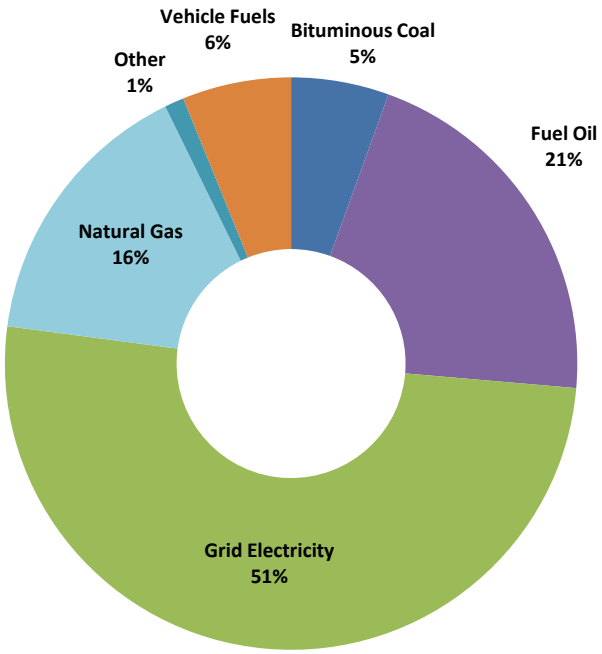
GHG annual emissions reductions show a strong correlation to variances in average annual heating degree days, which could in part account for the reduced progress in past two years and variances in historical data



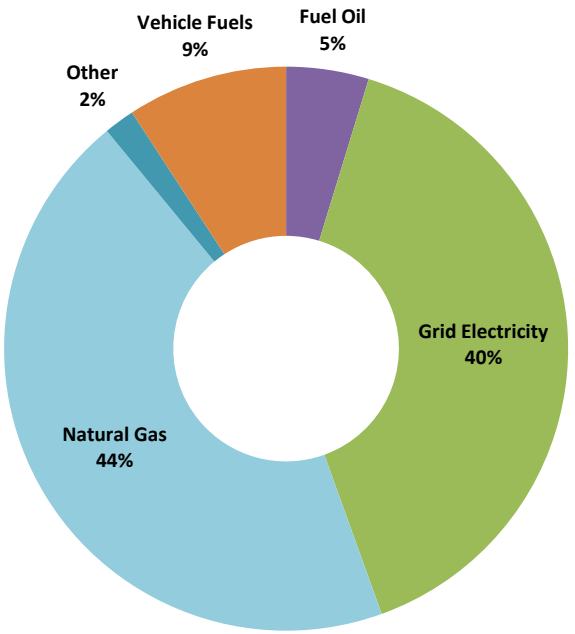
LBE Progress Tracking: GHG Emissions

- Compared to the LBE baseline, emissions from **fuel oil decreased significantly to 5%** of total, with the contribution from **electricity also decreasing by roughly 10%**
- Natural gas contribution **increased significantly to 44%** of total, while vehicle fuels increased slightly

Emissions Contribution by Fuel --LBE Baseline

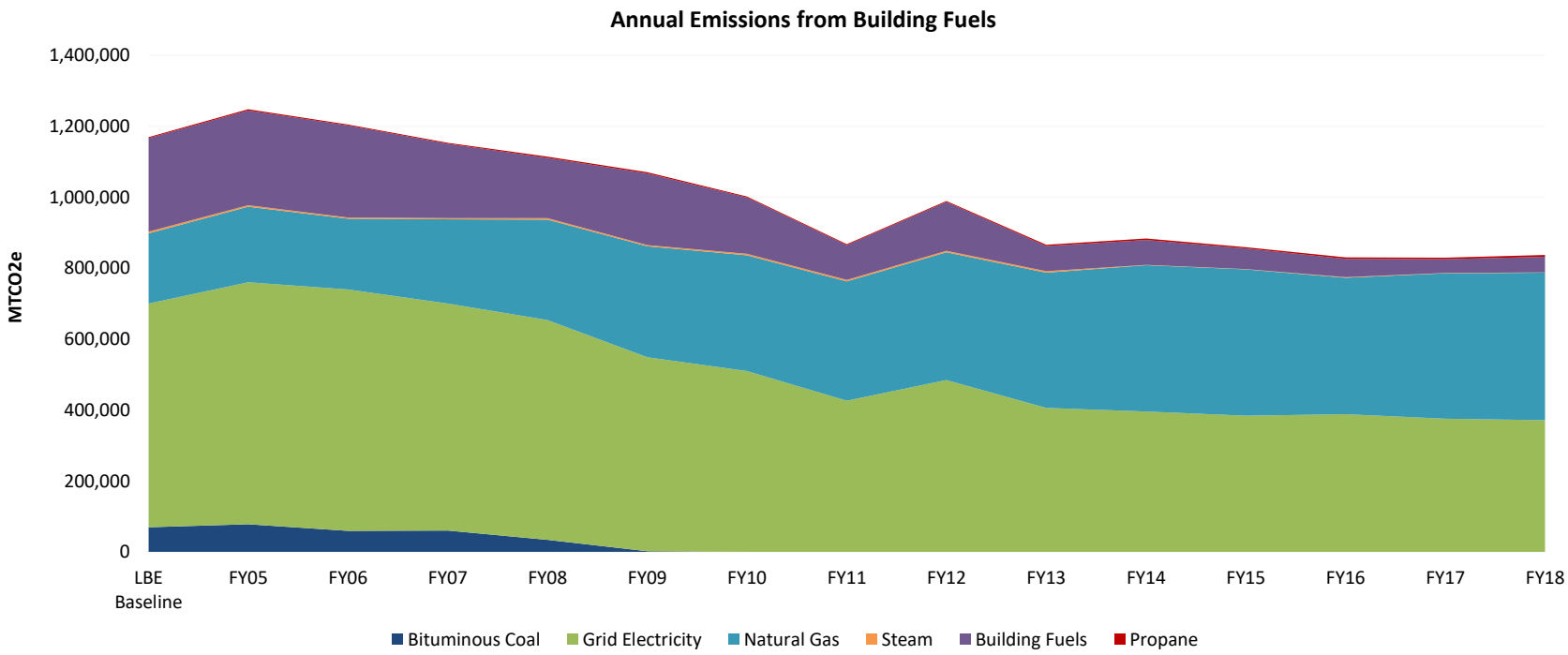


Emissions Contribution by Fuel -- FY18



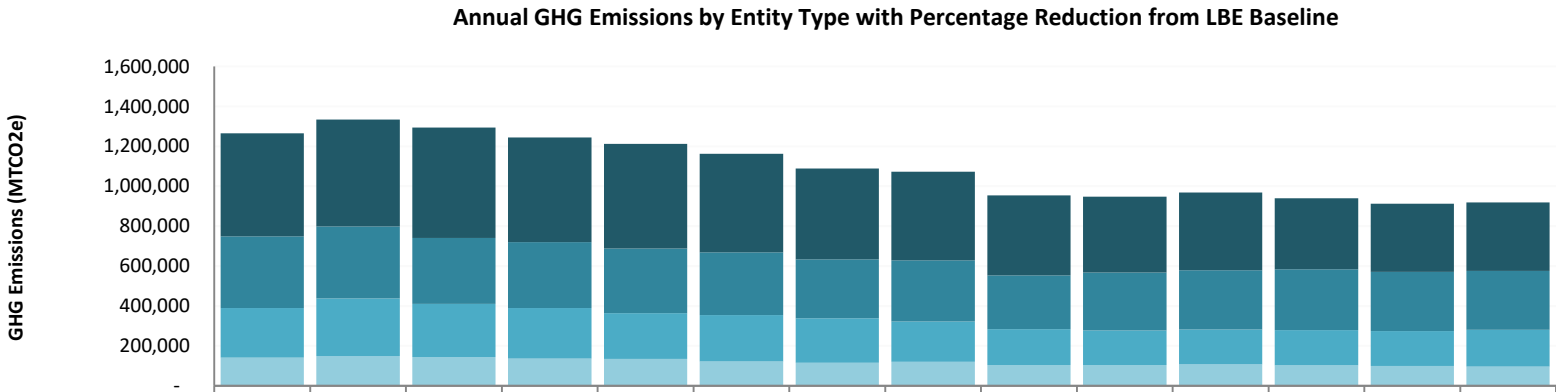
LBE Progress Tracking: GHG Emissions

In FY18, relative emissions contributions from building fuels have changed significantly from the LBE baseline. However, in recent years, emissions reductions have started to flatten out across all fuel types.



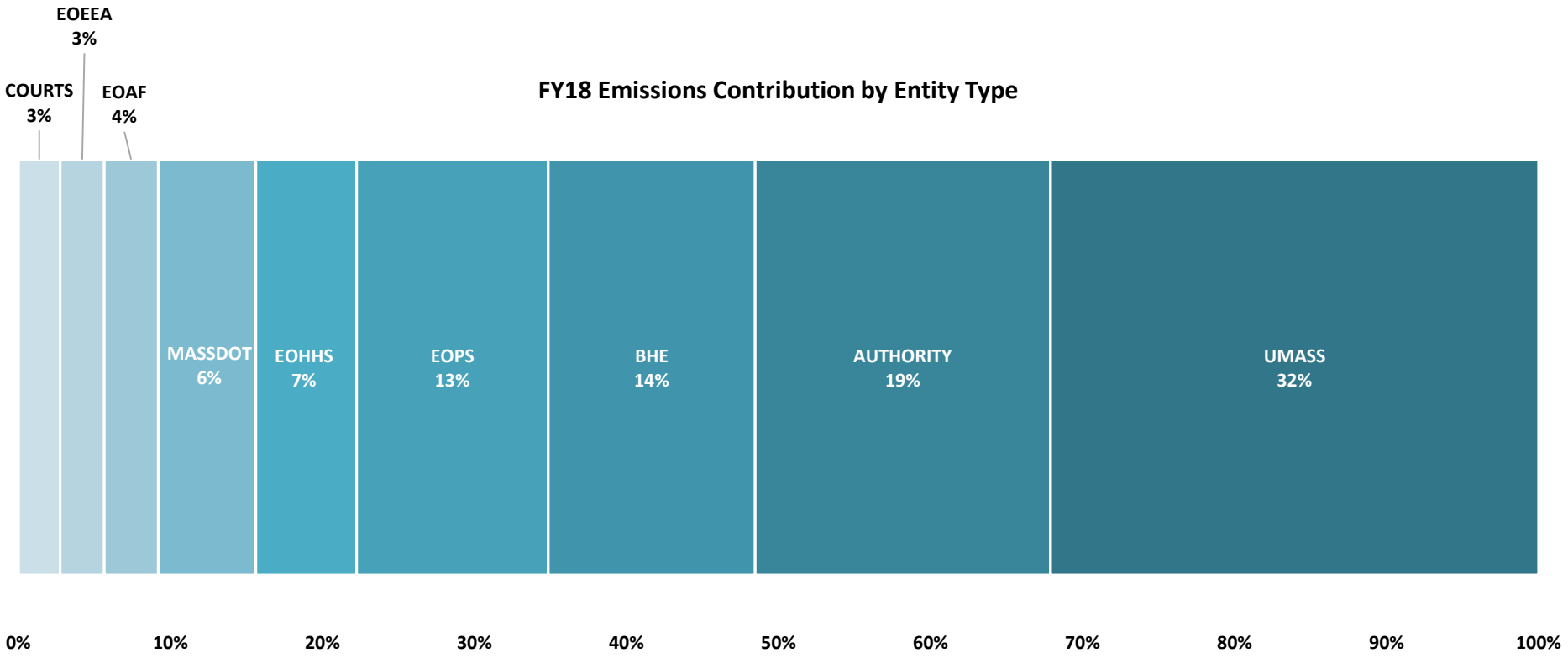
LBE Progress Tracking: GHG Emissions

- **State agencies** have shown the most significant progress with a **34% reduction** overall, followed closely by **colleges & universities with 32%**
- **Authorities & UMass** have also shown significant progress, with **26% and 18%** reductions, respectively



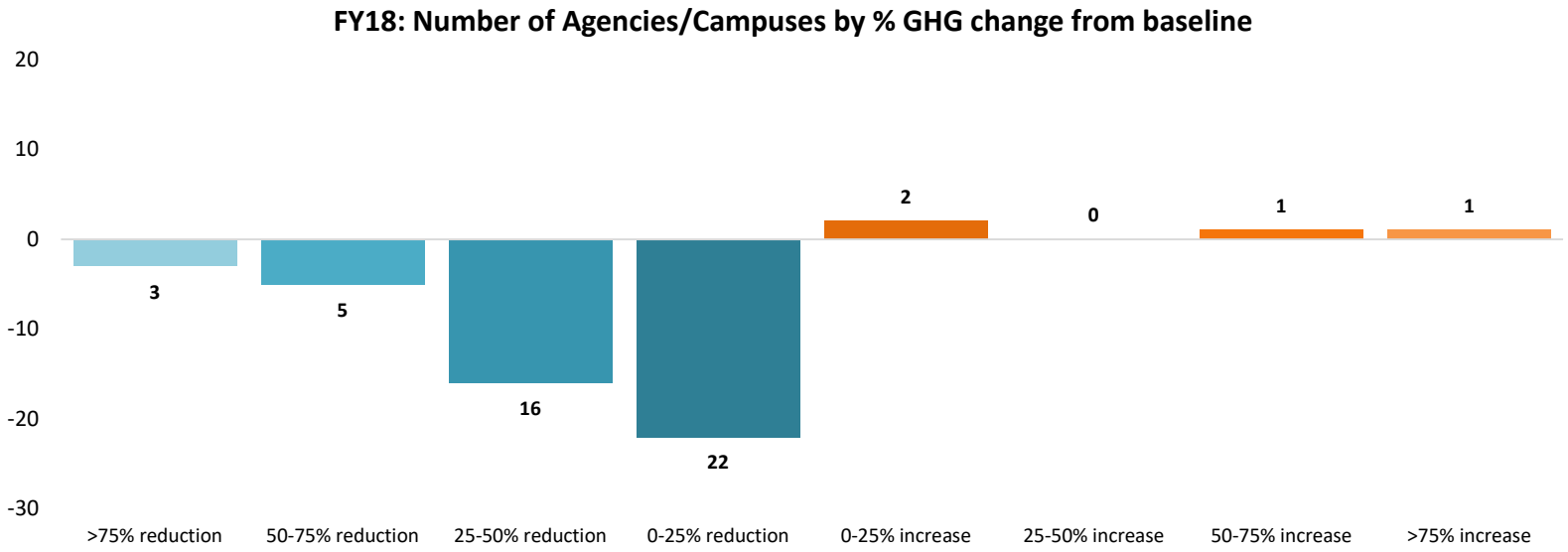
	LBE Baseline	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
Agencies % reduction	0%	4%	7%	2%	1%	-4%	-12%	-14%	-22%	-26%	-24%	-31%	-34%	-34%
UMass % reduction	0%	0%	-8%	-8%	-10%	-13%	-18%	-15%	-25%	-19%	-17%	-15%	-17%	-18%
Authorities % reduction	0%	17%	7%	3%	-7%	-7%	-10%	-18%	-27%	-30%	-29%	-29%	-29%	-26%
Colleges/Universities % reduction	0%	5%	2%	-4%	-5%	-13%	-18%	-15%	-27%	-27%	-24%	-27%	-30%	-32%
Agencies	516,722	536,076	552,728	524,501	523,726	494,543	453,991	443,290	400,644	380,620	390,382	354,849	340,822	342,887
UMass	359,432	360,623	330,379	329,071	324,453	314,353	295,804	306,419	268,848	290,166	296,758	304,891	296,768	294,422
Authorities	247,520	288,499	265,274	253,888	229,118	231,416	222,073	202,312	180,041	173,527	174,609	176,321	175,517	183,987
Colleges/Universities	141,585	149,161	144,641	136,472	134,376	122,710	115,958	120,182	103,828	103,894	107,209	102,867	99,024	96,961

LBE Progress Tracking: GHG Emissions

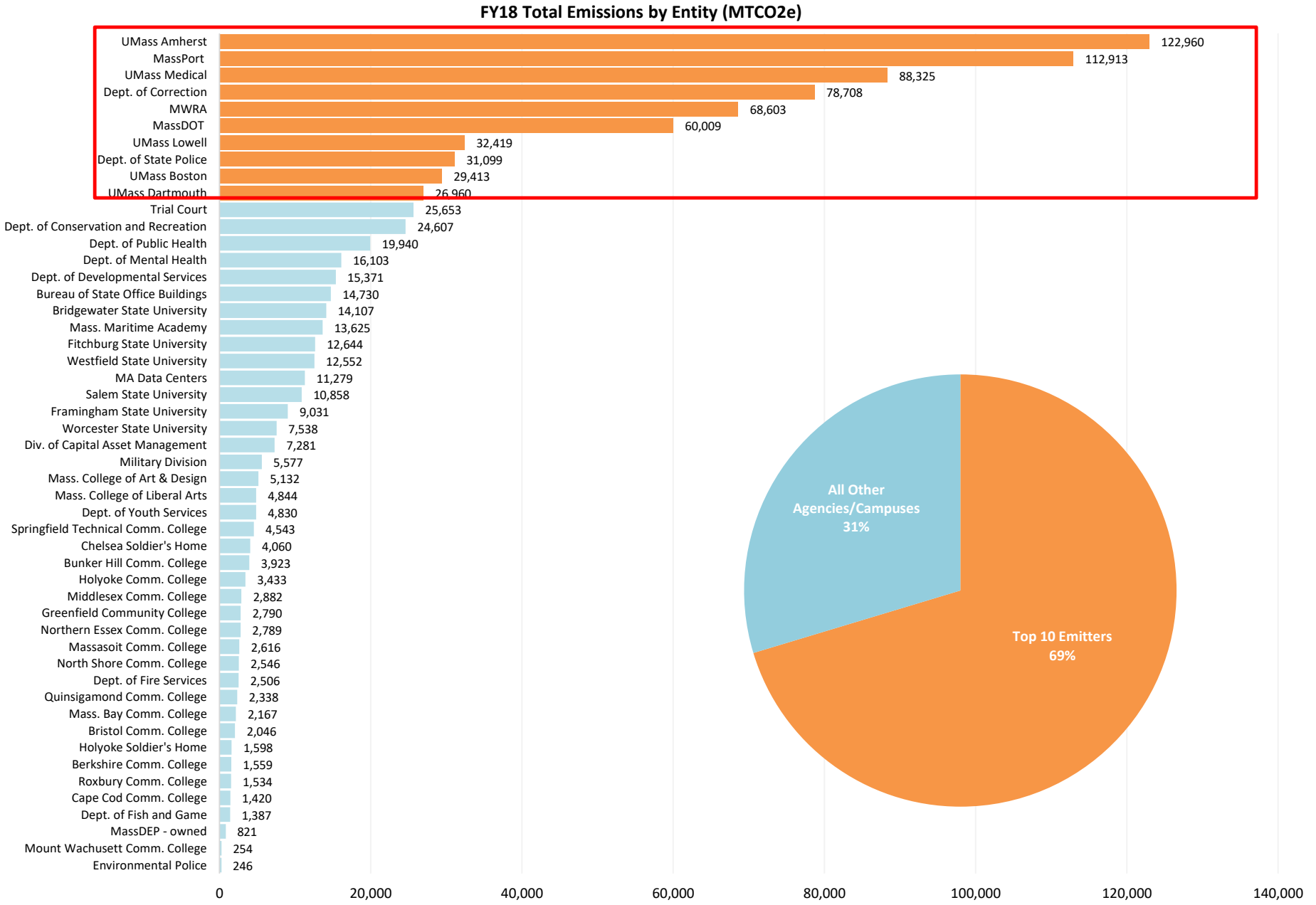


LBE Progress Tracking: GHG Emissions

- **46 of 50 (92%)** of LBE partners reduced emissions from the LBE baseline
- **2/3** of partners reduced emissions between **1-50%**
- **6 partners** reduced emissions by **more than 50%**
- **4 partners increased** emissions, varying between **3% and 119 %**

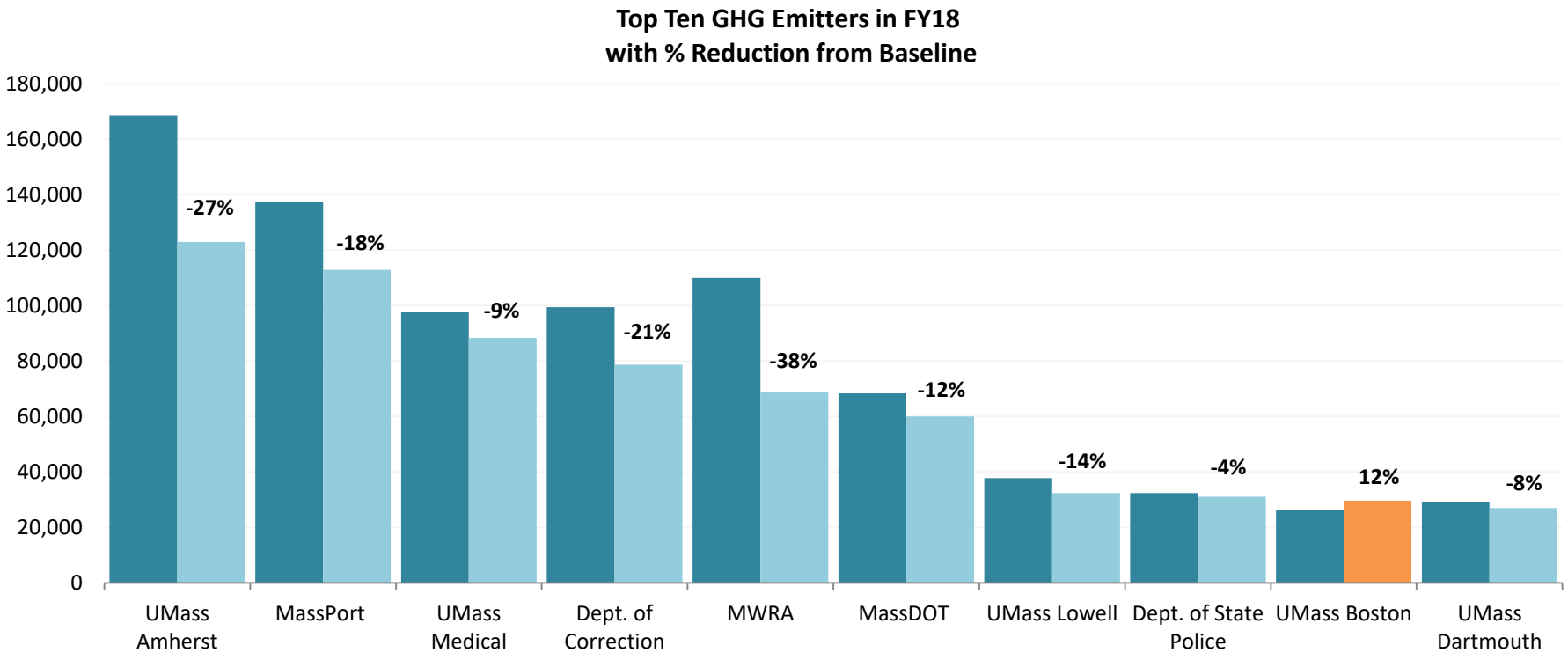


LBE Progress Tracking: GHG Emissions



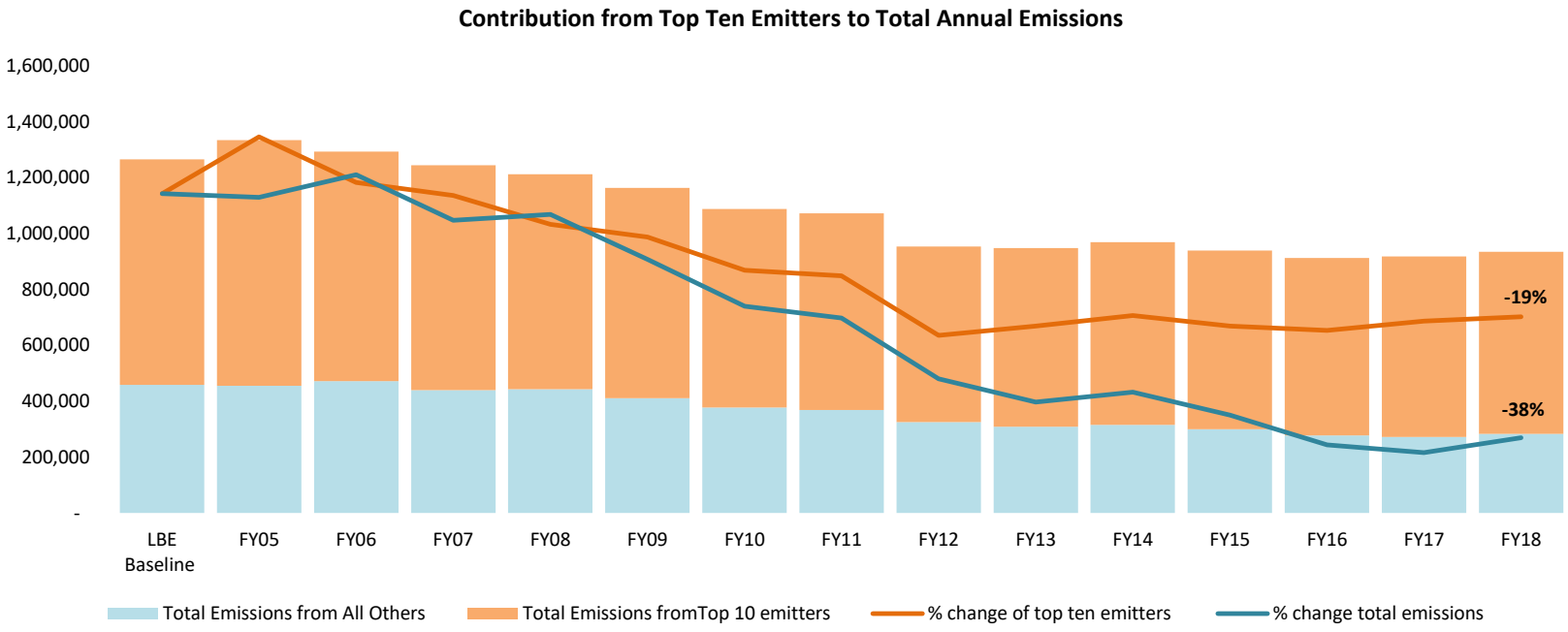
LBE Progress Tracking: GHG Emissions

- **9 of the top 10 emitters** have reduced emissions from the LBE baseline, with reductions **between 4 and 38%**
- **1 campus** has increased emissions by **12%**



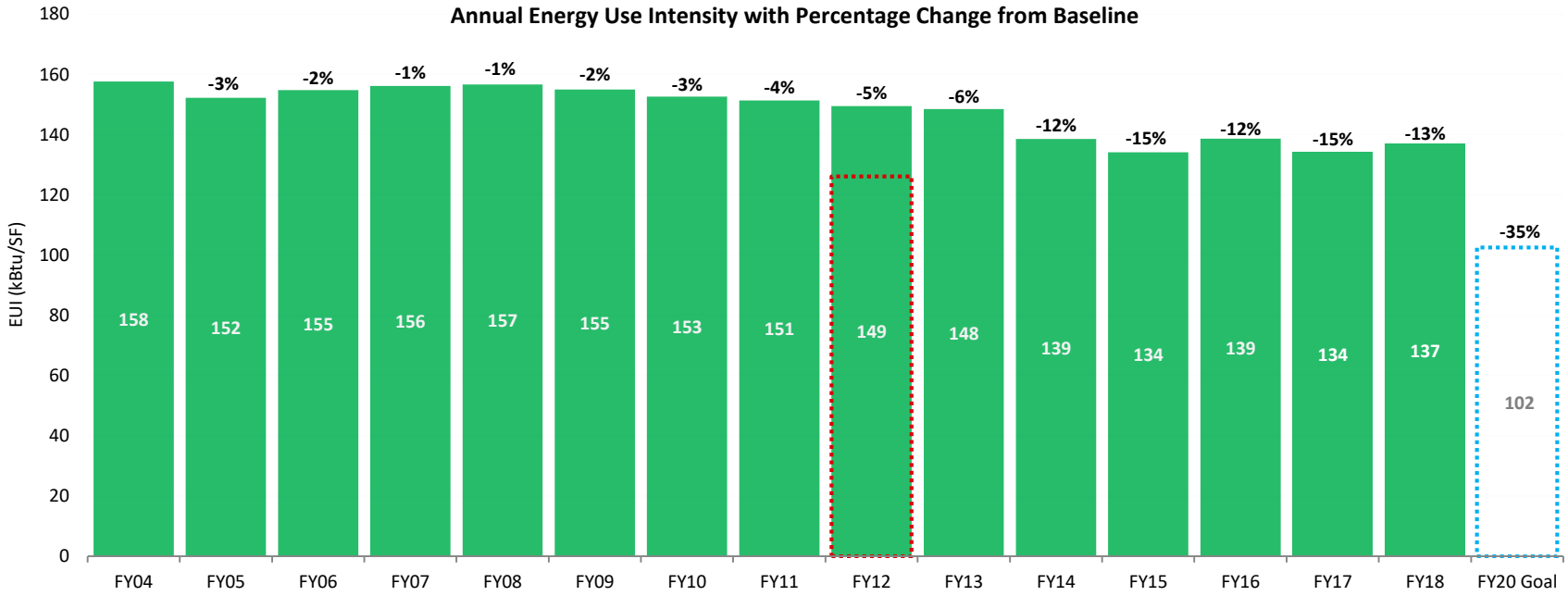
LBE Progress Tracking: GHG Emissions

- **Top 10 emitters** have reduced GHG emissions by **19%**
- **Remaining agencies/campuses** have reduced GHG emissions by **38%**



LBE Progress Tracking: Energy Use Intensity

In FY18, overall energy use intensity (kBtu/per square foot)
decreased 13% from the 2004 baseline
(a 2% increase compared to the previous year)

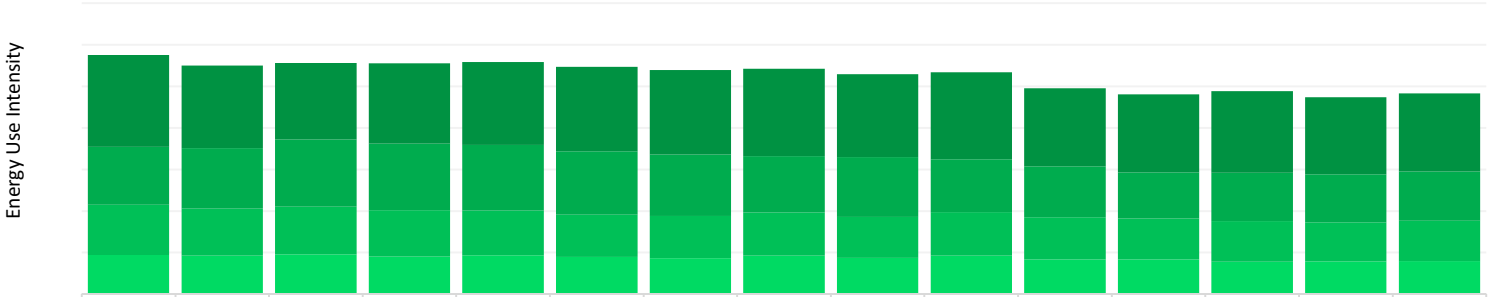


*LBE does not track square footage or EUI for 5 of the 49 state agencies/campuses, due to the nature of energy and facility use at these sites.

LBE Progress Tracking: Energy Use Intensity

- **State universities** showed the most significant progress with a **20% reduction**
- **Agencies, community colleges & UMass** reduced overall EUI by **15%**
- FY18 was first year that energy use intensity increased for all entity types

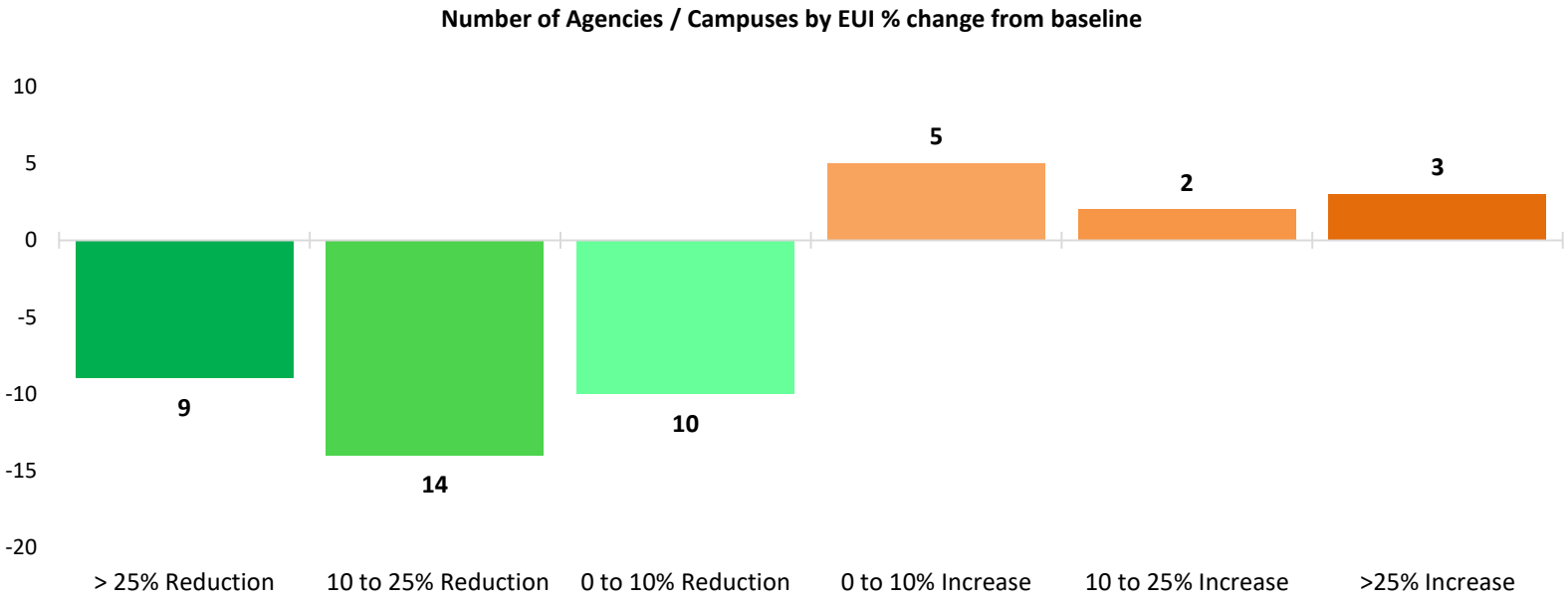
Annual EUI by Entity Type with Percentage reduction from baseline



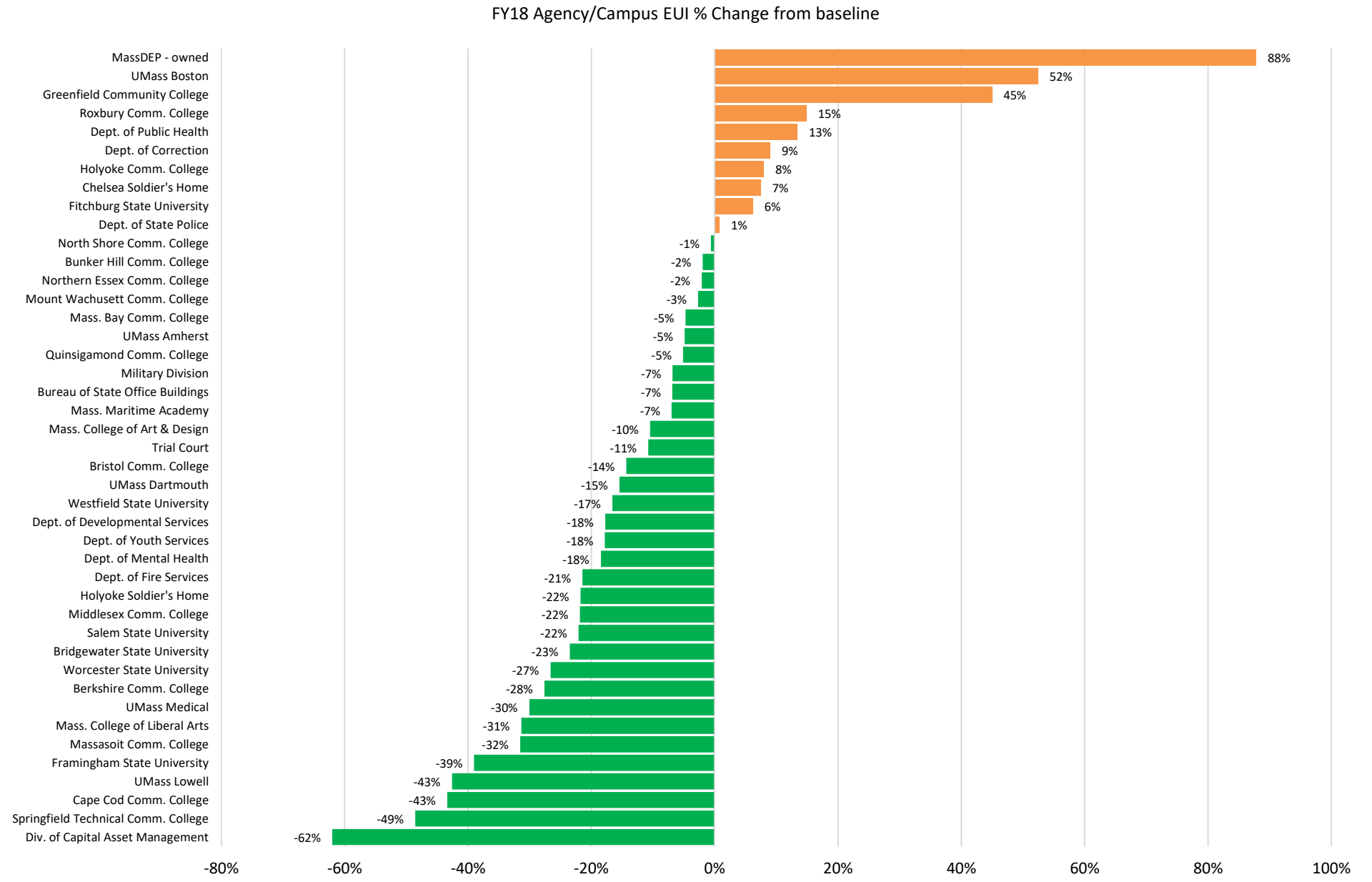
	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
UMass	221	199	184	193	199	203	203	210	200	210	188	189	197	186	187
Agency	139	146	162	160	158	153	148	136	143	127	123	110	116	116	119
State University	121	113	115	112	108	102	102	104	99	105	102	99	98	93	97
Community College	94	92	96	90	93	89	86	92	87	92	83	83	78	79	80

LBE Progress Tracking: Energy Use Intensity

- **33 of 43 (76%)** of LBE partners reduced EUI from the 2004 baseline
- **Roughly ½** of partners reduced EUI between **1-25%**
- **9 partners** reduced EUI by **more than 25%**
- **10 partners increased** EUI, varying between **1% and 88 %**

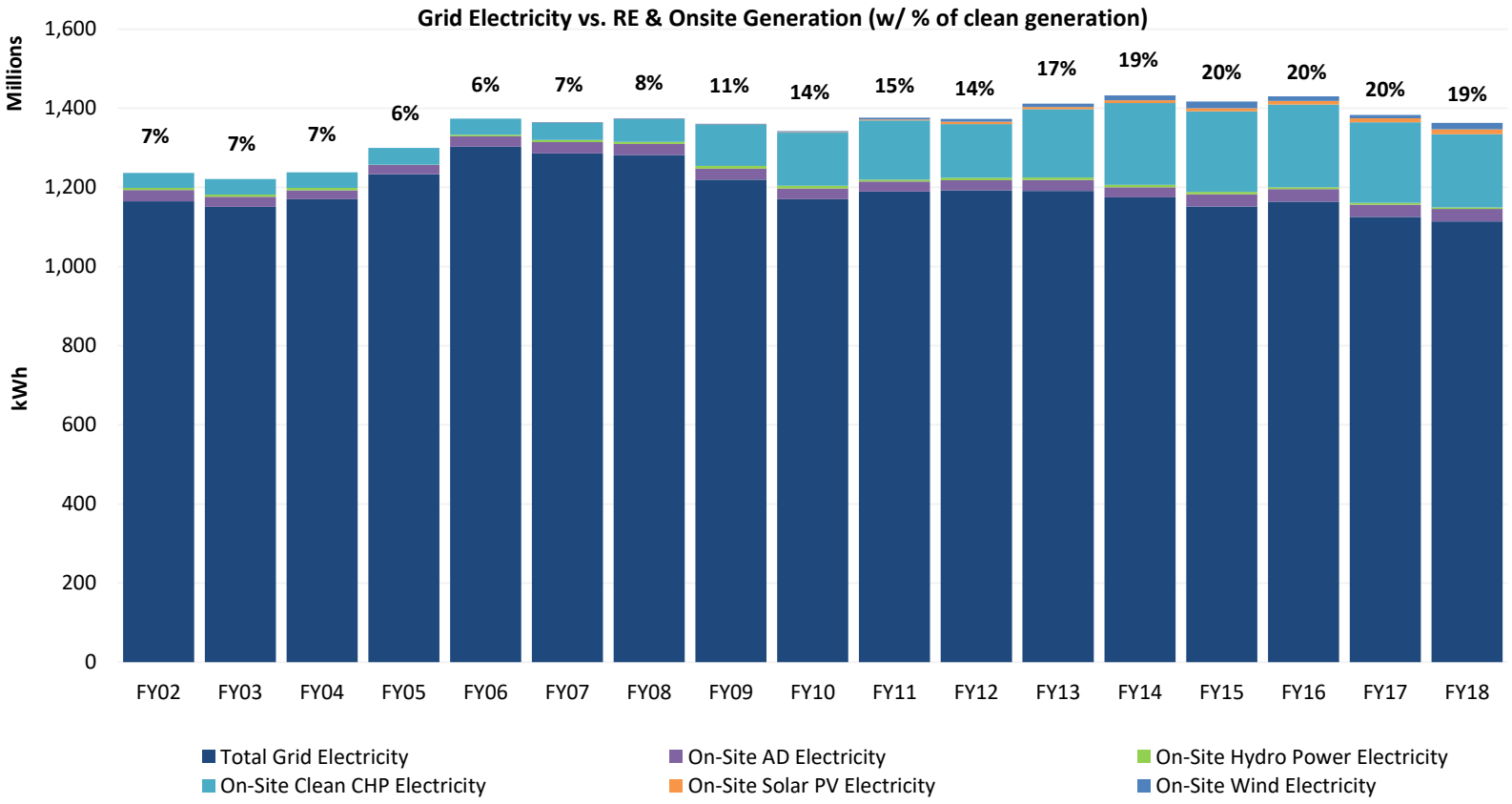


LBE Progress Tracking: Energy Use Intensity



LBE Progress Tracking: On-site Generation

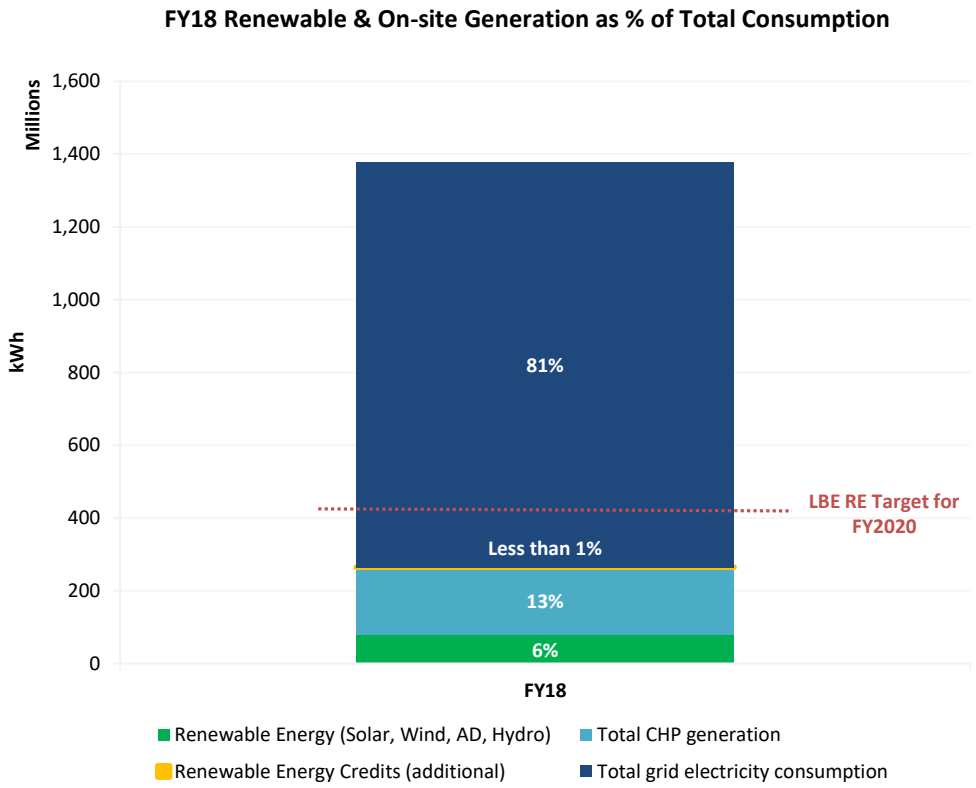
In FY18, state partners **reduced grid electricity consumption by 50 million kWh** compared to the FY02 baseline, with **clean generation contributing a total of 264 million kWh** (compared to 90 million in FY02).



LBE Progress Tracking: On-site Generation

Of the roughly **1.4 billion kWh of electricity consumed**,
79 million kWh (equivalent to 6% of total) was generated by **onsite renewable power**
& **185 million kWh** (equivalent to 13% of total) was generated by **onsite clean CHP**.

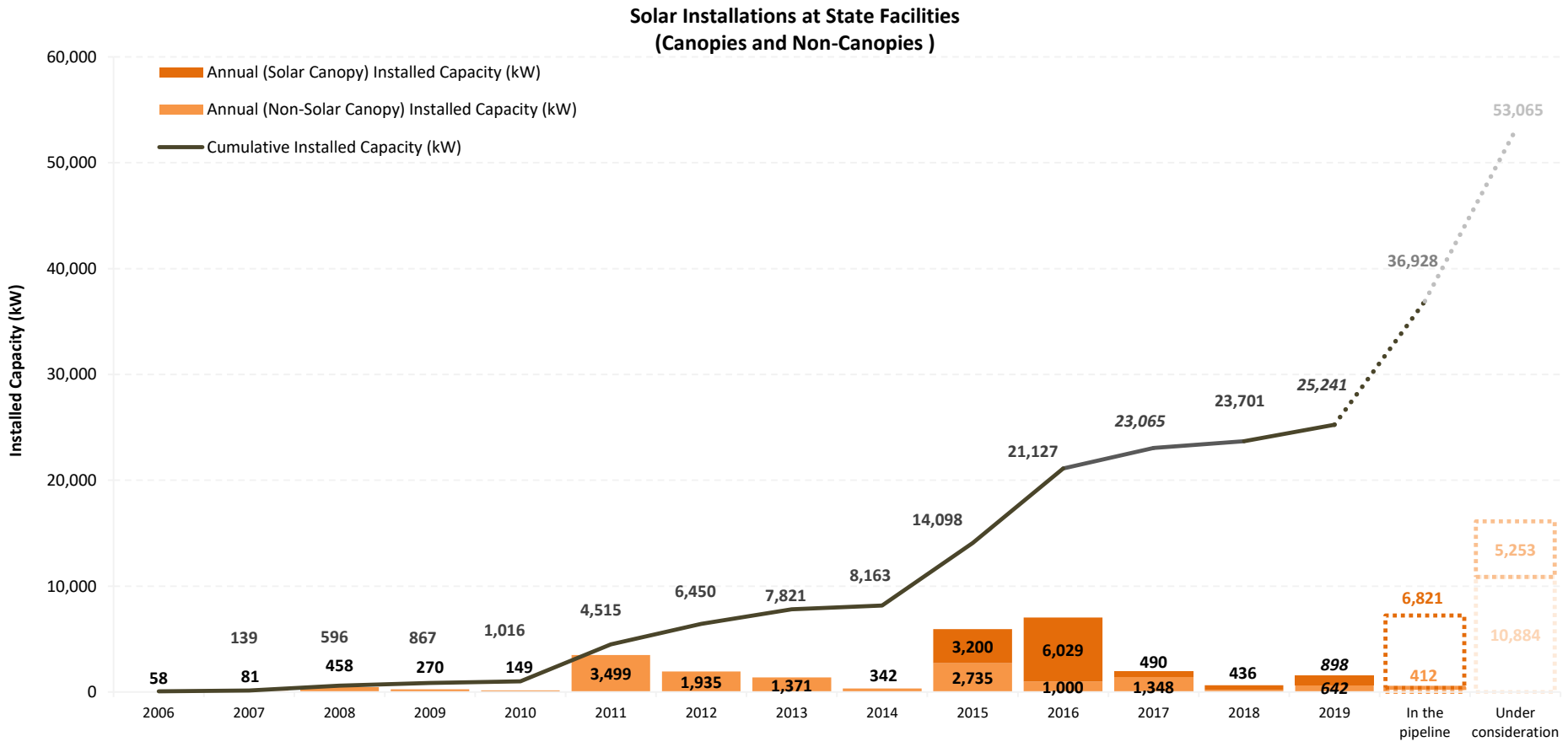
* this data does not account for the renewable attributes and total percentages are based on equivalencies



LBE Progress Tracking: Solar Installations

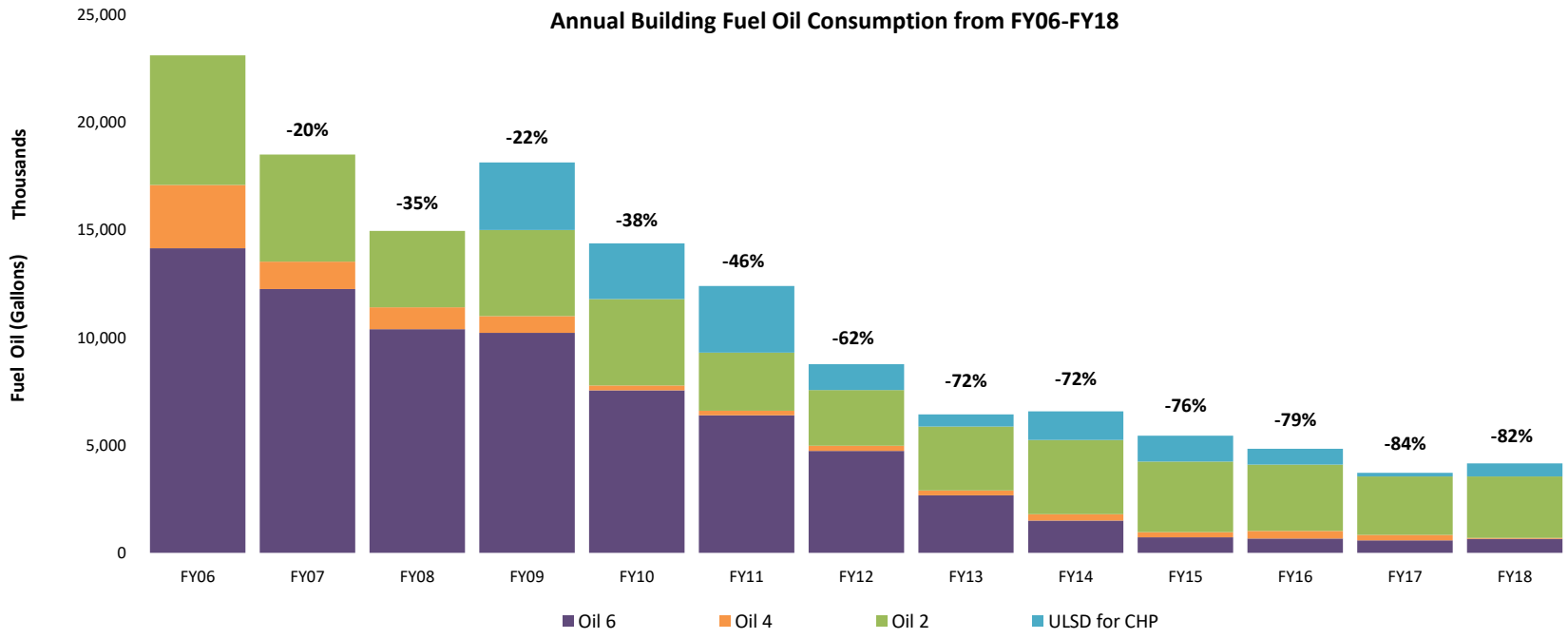
Since FY06, **25.2 MW of solar capacity** are installed at state facilities

- 11 MW of solar canopy (44% of total capacity)
- Installed capacity projected to double with planned and potential projects



LBE Progress Tracking: Heating Oil

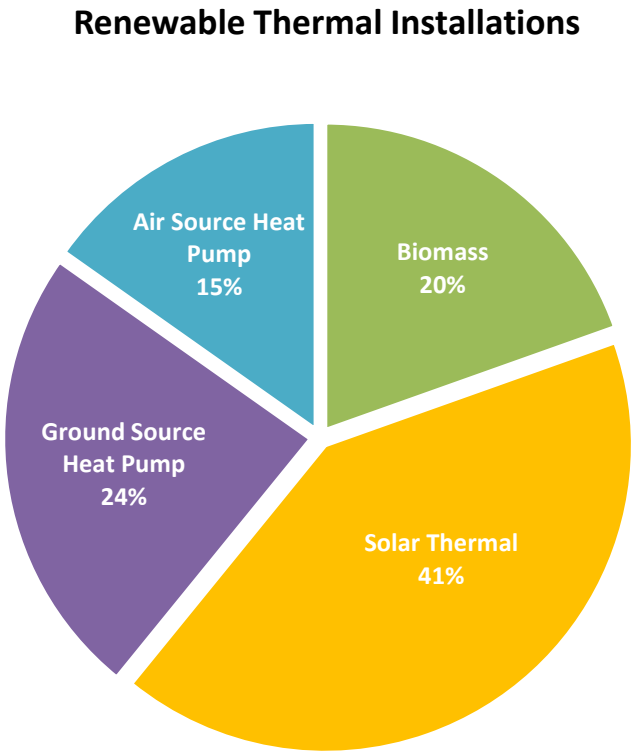
Overall fuel oil consumption for buildings has **decreased 82%** from FY06 through FY18, a reduction of roughly **19 million gallons**.



*Oil consumption for non-building use not included (e.g. maritime vessels, flood control dams, etc.)

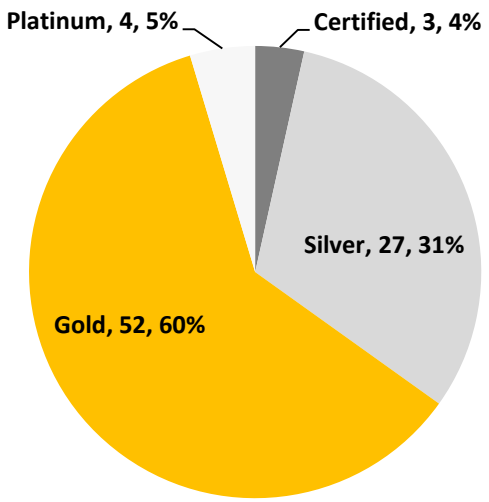
LBE Progress Tracking: Renewable Thermal

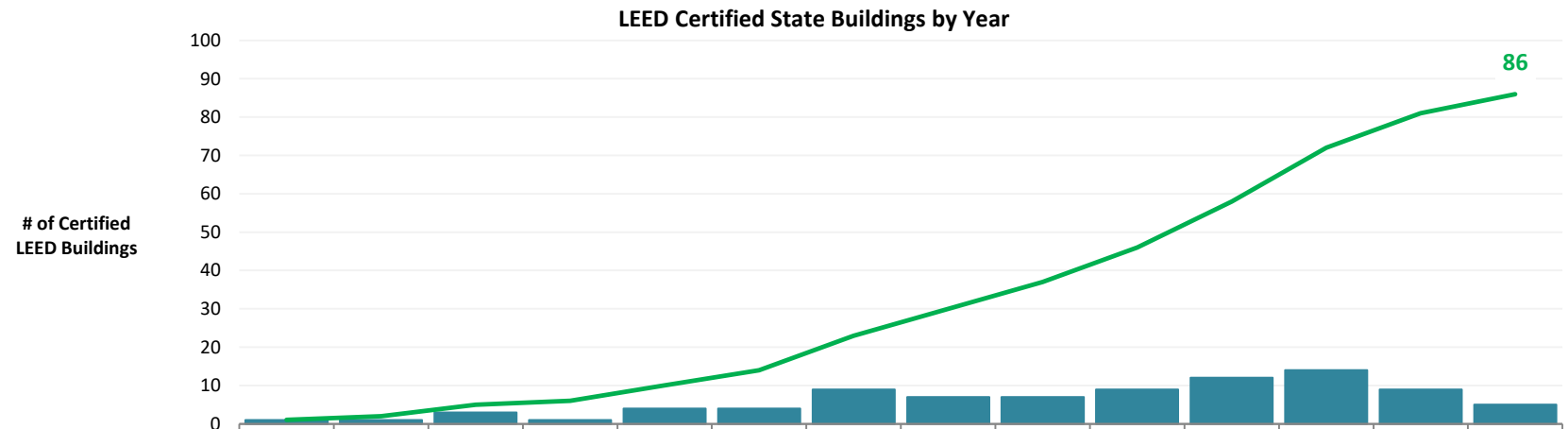
- As of May 2019, **46 renewable thermal systems** have been installed at state facilities
  - 19 solar thermal systems
  - 11 ground source heat pumps
  - 9 biomass systems
  - 7 air source heat pumps



LBE Progress Tracking: Green Buildings

- As of May 2019, **86 state buildings are LEED Certified**, with **65% Platinum & Gold** (LEED's highest certification levels)
- **Since January of 2018, 14 state buildings** have received LEED status





	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 (to date)
# Certified by Year	1	1	3	1	4	4	9	7	7	9	12	14	9	5
Cumulative Certified	1	2	5	6	10	14	23	30	37	46	58	72	81	86

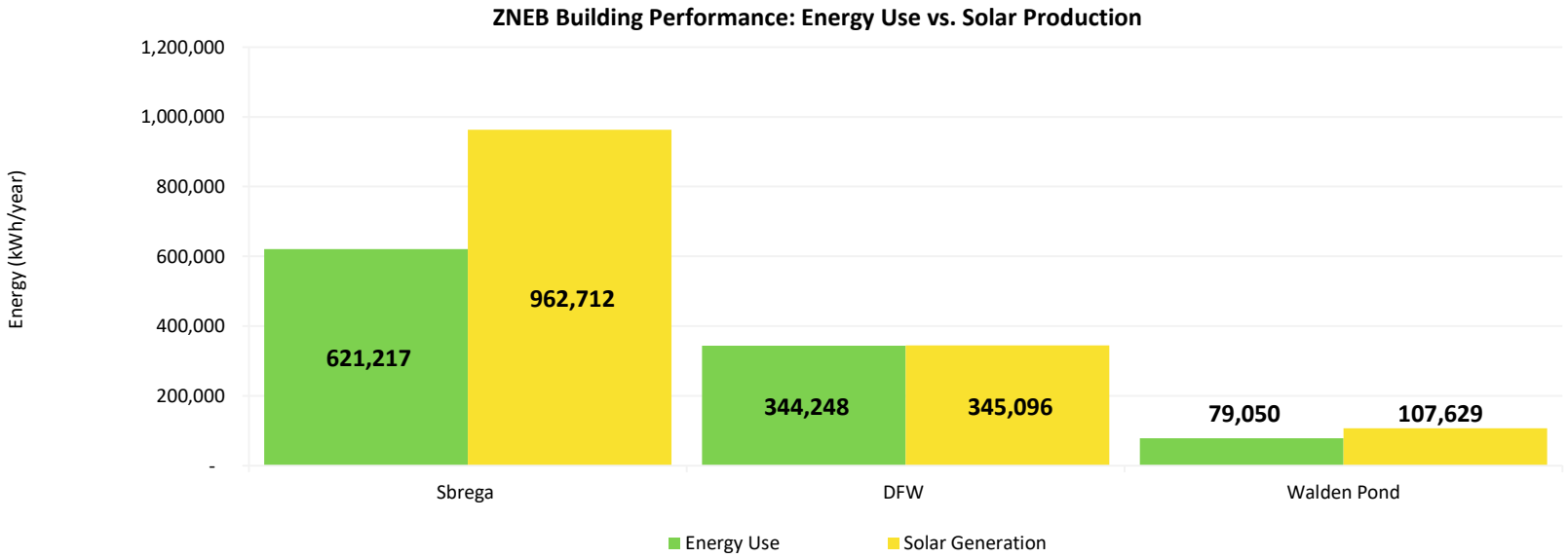
LBE Progress Tracking: Green Buildings

- 5 ZNE buildings in the state portfolio
- In 2018, **3 buildings achieved net zero** by producing more energy from on-site renewables than they consumed in a year

State Buildings Designed to be Zero Net Energy Buildings

(buildings designed to generate as much energy from clean on-site renewable sources as they consume in a year)

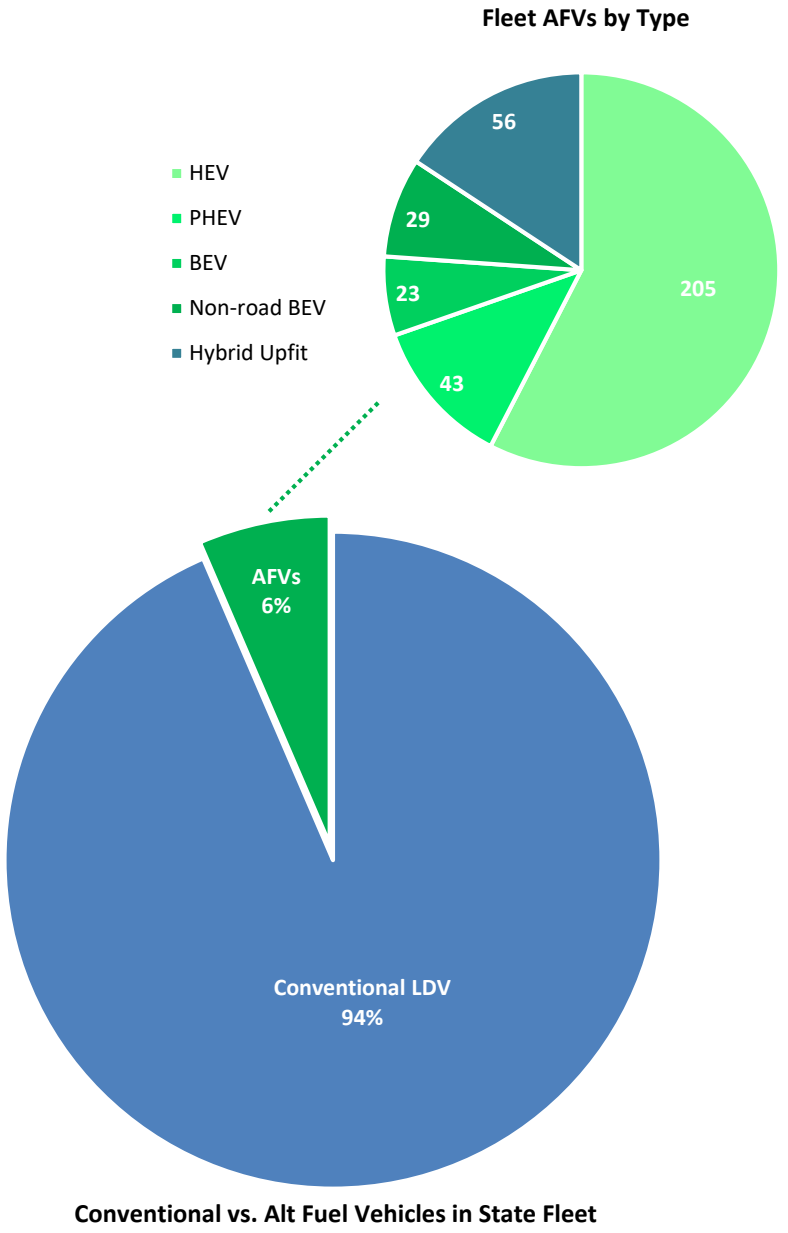
North Shore Community College Health Professions & Student Services Building, Danvers (2011): *58,000 SF*	
Division of Fisheries and Wildlife Field Headquarters, Westborough (2014): *45,000 SF*	
Bristol Community College Sbrega Health & Science Building, Fall River (2016): *50,600 SF*	
Department of Conservation and Recreation Walden Pond Visitor Center, Concord (2016): *6,500 SF*	
UMass Amherst Crotty Hall, Amherst (2017): *16,800 SF*	



LBE Progress Tracking: Clean Transportation

- Agencies
  - 46 agencies
  - Light-duty fleet total: 2,663
  - **AFV total: 234**
    - HEV: 165
    - PHEV: 3
    - BEV: 10
    - Hybrid upfits: 56

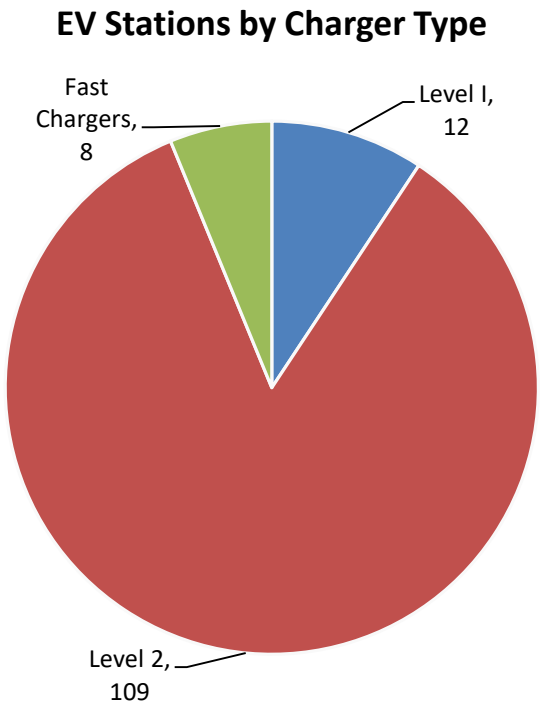
- Colleges/Universities
  - 21 campuses
  - Light-duty fleet total: 955
  - **AFV total: 56**
    - HEV: 40
    - PHEV: 3
    - BEV: 13
    - Non-road BEV: 29



LBE Progress Tracking: Clean Transportation

- As of March 2019, there are **129 electric vehicle (EV) charging stations** across 28 state agencies, authorities, and public higher education campuses

Electric Vehicle Charging Stations at State Sites (as of March 2019)				
Level 1	Level 2	Fast Charger	**Total EV Charging Stations**	**Total Ports/Plugs**
12	109	8	**129**	**211**



LBE 2019 Programmatic Goals

Category	Broad Objective
LBE Goals	Establish LBE Clean Energy goals/targets for the short, medium and long-term
State Building Efficiency	Significantly reduce energy use intensity and fossil fuel use at state facilities through: high efficiency design for new buildings, aggressive adoption of EE strategies and technologies for existing buildings; expansion of operational measures to optimize building energy use
Vehicle Efficiency	Move state fleet toward higher efficiency and electric vehicles, resulting in substantial decrease in fossil fuel use and GHG emissions for the state fleet
Renewable Energy	Dramatically expand deployment of onsite renewable energy including, but not limited to solar PV, solar thermal, biomass, and heat pumps
GHG Emissions	Develop ongoing strategies to reduce GHG emissions across entire state portfolio of buildings, properties and operations and enhance resiliency of state facilities to the impacts of climate change

LBE Target: Goal-Setting

Category	Specific 2019 Targets
Setting LBE Goals	• Draft/release new executive order with goals and targets for LBE beyond 2020 • Enhance transparency of energy and sustainability data for state government to clearly document progress and highlight challenges to help inform future initiatives

Mid-year Review:

- Efforts underway to develop new goals and targets for LBE beyond 2020
- Added or will add information to LBE website
  - ❑ Interactive map
  - ❑ Annual progress reports

LBE Target: Building Efficiency

Category	Specific 2019 Targets
State Building Efficiency	• Establish new high performance building standard for new construction that sets minimum energy performance standards beyond the existing Mass. LEED Plus standard • Increase adoption of innovative energy efficiency strategies through education around new technologies, partnerships with targeted agencies, and coordination with DCAMM on new energy efficiency deployment models • Leverage experience with building energy intelligence real time metering program to expand building energy use optimization across multiple facilities

Mid-year Review:

- LBE working with DCAMM to develop new buildings standard
- Launched efficiency program with MBTA
- CBEI Implementation Results
  - ❑ Since 2016, estimated 6.8 million kWh and $886,565 energy costs savings at 92 state buildings
  - ❑ DCAMM Contract extension through 2021 to expand optimization strategies at these and to other sites across state portfolio

LBE Target: Vehicle Efficiency

Category	Specific 2019 Targets
Vehicle Efficiency	• Develop and implement plan to meet state fleet efficiency goals outlined in the Future of Transportation report • Target 15 new acquisitions of electric vehicles within state fleet and expand education efforts around fleet electrification • Install 25 new EV charging stations at state facilities • Release EV station guidance for state agencies

Mid-year Review:

- Fleet efficiency goals – no progress
- EVs in state fleet
  - 4 BEVs
  - 8 HEVs
  - 1 XL hybrid upfit
- EV charging stations
  - 1 installed & 4 additional planned for 2019
  - 28 stations in various stage of planning (pipeline solar projects)
  - 15 stations under consideration (future solar projects)
- EV station guidance document in development along with EVSE funding roadmap for state entities

LBE Target: Renewable Energy

Category	Specific 2019 Targets
Renewable Energy	• Target 5-10 installations of renewable thermal systems with specific focus on sites that use oil, propane, and/or electric heat • Through LBE Grants, technical assistance, and other efforts, support deployment of additional 10-15 MW of solar PV (24 MW installed at time of goal setting)

Mid-year Review:

- Biomass investigations through DCAMM & DOER underway at several state facilities, including DYS, DCR & DOC
- LBE and DOER working with OSD on statewide biomass fuel contract
- Renewable thermal installations
  - 1 air-source heat pump
  - 1 solar thermal
- Solar PV deployment
  - 1.2 MW installed or awarded
  - 7.2 MW in various stages of planning
  - 16.4 MW being considered

LBE Target: GHG Emissions

Category	Specific 2019 Targets
GHG Emissions: Mitigation, Adaptation	• Develop and implement a targeted suite of strategies to reduce GHG emissions, including, but not limited to: • Efficiencies at high-energy use buildings (e.g. labs), sustainable landscaping practices, and broadening peak demand reduction strategies through deployment of storage and improved response to peak days • Complete clean energy resiliency study for HHS facilities and develop preliminary plan for project implementation at 3-5 sites

Mid-year Review:

- Attempted targeted program for labs, but there was little to no interest from facilities.
- State Contract for Battery Powered landscaping equipment
- Pilot use of Battery Powered Landscaping equipment (DCR & MassAeronautics)
- Resiliency clean energy report completed for 12 HHS facilities
  - ❑ LBE undertaking efforts to engage with HHS, DCAMM, and others for initial overview and site-specific discussions throughout 2019
  - ❑ Efforts underway to identify appropriate projects for implementation

Discussion: LBE Goals, Programmatic Targets

What do you think of the plan to spend more time on reporting + involving the Council in the goal development and feedback process?

Were the metrics, progress, and review data useful?

Which of the data would be helpful on a more granular (facility) level to support your efforts to promote sustainability? In what format and for which audience?

Looking Ahead

- **July 16**
  - Storage
  - Resiliency
- **September 10**
  - Peak demand
  - Clean Peak Standard
- **November 12**
  - Updates on utility energy efficiency plans
  - Potential SMART updates / next phase of solar incentives
  - Building envelope: spotlight on retrofit technologies

- January 14
- March 10
- May 12

What questions do you have about these topics?

What else would you like to learn from us?

World News

MA News

LBE Updates

DCR Pollinator-Friendly Efforts

Battery-Powered Landscaping Equipment

Progress Tracking

2019 LBE Goals and Discussion

News from Around the World

World News

Article: Smart Cities Dive

Article: IMT

Full Press Release

New York Climate Mobilization Act

- Buildings account for ~70% of NYC's carbon pollution
- Requires that emissions from buildings over 25,000 square feet be reduced from 2005 levels…
  - 40% by 2030
  - 80% by 2050
- Uncertain if/how much building owners will be allowed to purchase renewable electricity to substitute for efficiency improvements

NYC is the 2nd major US city to mandate energy improvements across a wide range of existing buildings

MA News

LBE Updates

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Progress Tracking

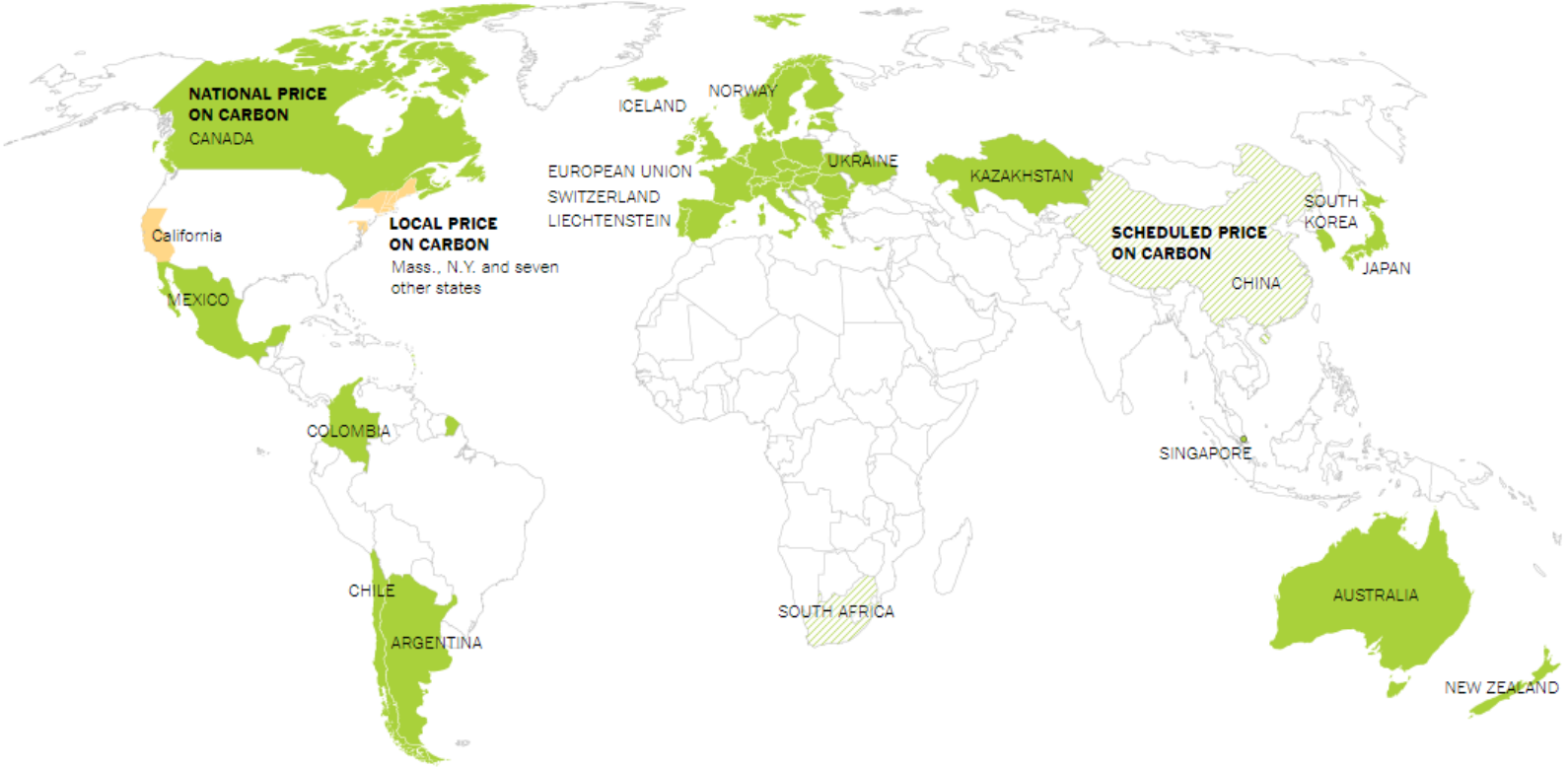
2019 LBE Goals and Discussion

News from Around the World

Article: NY Times

World News

- 40+ governments worldwide have now adopted carbon pricing
  - Direct taxes on fossil fuels, cap-and-trade programs



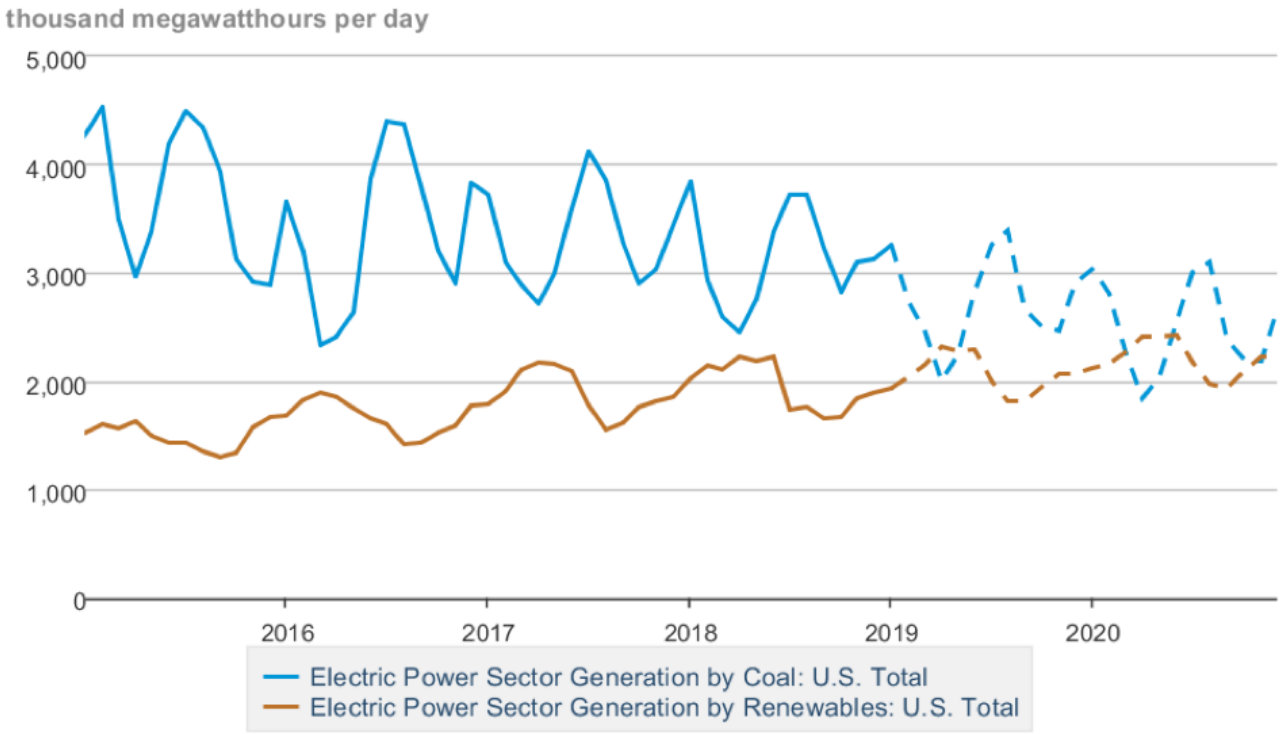
Note: A local price on carbon is only highlighted where no national or European Union rules are in place. Some countries with a national price on carbon also have local-level programs that operate under separate rules. | Source: World Bank

MA News
LBE Updates
DCR Pollinator-Friendly Efforts
Battery-Powered Landscaping Equipment
Progress Tracking
2019 LBE Goals and Discussion
News from Around the World

Article: electrek

World News

- US renewable energy generation to outpace coal for first time in May 2019
  - Renewables now competing with coal in the same way natural gas has in recent years



eia Source: U.S. Energy Information Administration

DOER
Massachusetts Department of Energy Resources

World News

Two Views on Hydrogen Cars

Clean Technica

- 4x annual fuel cost and 2-7x carbon debt of gasoline
- Pumps $1-2M + cost of storage tanks
- Few stations exist due to project economics, difficult to scale
- Hydrogen production, compression, storage, shipping, and pumping is extremely energy intensive

Boston Globe

- Part of future auto market options
- Stations installed in CT, RI, NH, MA
- Charge faster than EVs
- Potentially better option for larger vehicles than battery electric
- CA, China putting $ toward technology
- >300 miles per tank

Battery EVs Available In Market Now

Available Battery Electric Vehicles	Range (miles)	MSRP
Nissan Leaf E+	226	$ 36,550
Jaguar I-PACE	234	$ 76,500
Chevrolet Bolt	238	$ 36,620
Audi E-Tron	248	$ 74,800
Hyundai Kona CUV	258	$ 36,450
Kia Niro	239	$ 39,000
TESLA Model X Long Range	295	$ 88,000
TESLA Model X Performance	289	$ 104,000
TESLA Model 3 Long Range	325	$ 43,000
TESLA Model 3 Mid Range	264	$ 40,000
TESLA Model 3 Standard	220	$ 35,000
TESLA Model S Long Range	335	$ 83,000
TESLA Model S Performance	315	$ 99,000
TESLA Model S Standard	270	$ 79,000
Nissan Leaf	151	$ 29,990
Hyundai Ioniq	124	$ 29,500
Ford Focus	115	$ 29,120
Volkswagon e-Golf	119	$ 30,495
BMW i3	114	$ 44,450
Honda Clarity	89	$ 37,510
Fiat 500e	84	$ 32,995

21 vehicles from
12 manufacturers

DOER
Massachusetts Department of Energy Resources

Next LBE Council Meeting

Save the Date!

July 16, 2019

10:00 am–12:00 pm

Location TBA