MA Leading by Example Council Meeting

DOER Massachusetts Department of Energy Resources

March 12, 2019

MASSACHUSETTS LEADING BY EXAMPLE PROGRAM
PUBLIC LEADERSHIP. STEWARDSHIP. COMMITMENT

State Government Progress – as of March 2019

Greenhouse Gas (GHG) Emissions

↓ 28%

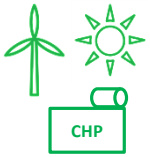
2004 -2017

Energy Use Intensity per Square Foot

↓ 15%

2004-2017

Electricity via Renewable or Onsite Generation



20%

In 2017

Heating Oil Consumption at State Facilities

↓ 84%

2006-2017

24.1 MW Installed Solar PV at State Sites

15.9 MW

Since 2015

84 LEED Certified State Buildings

47

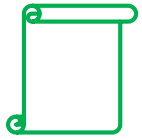
Since 2015

128 Electric Vehicle Charging Stations at State Sites

58

Since 2015

Leading by Example Grants Awarded



$10.7 M

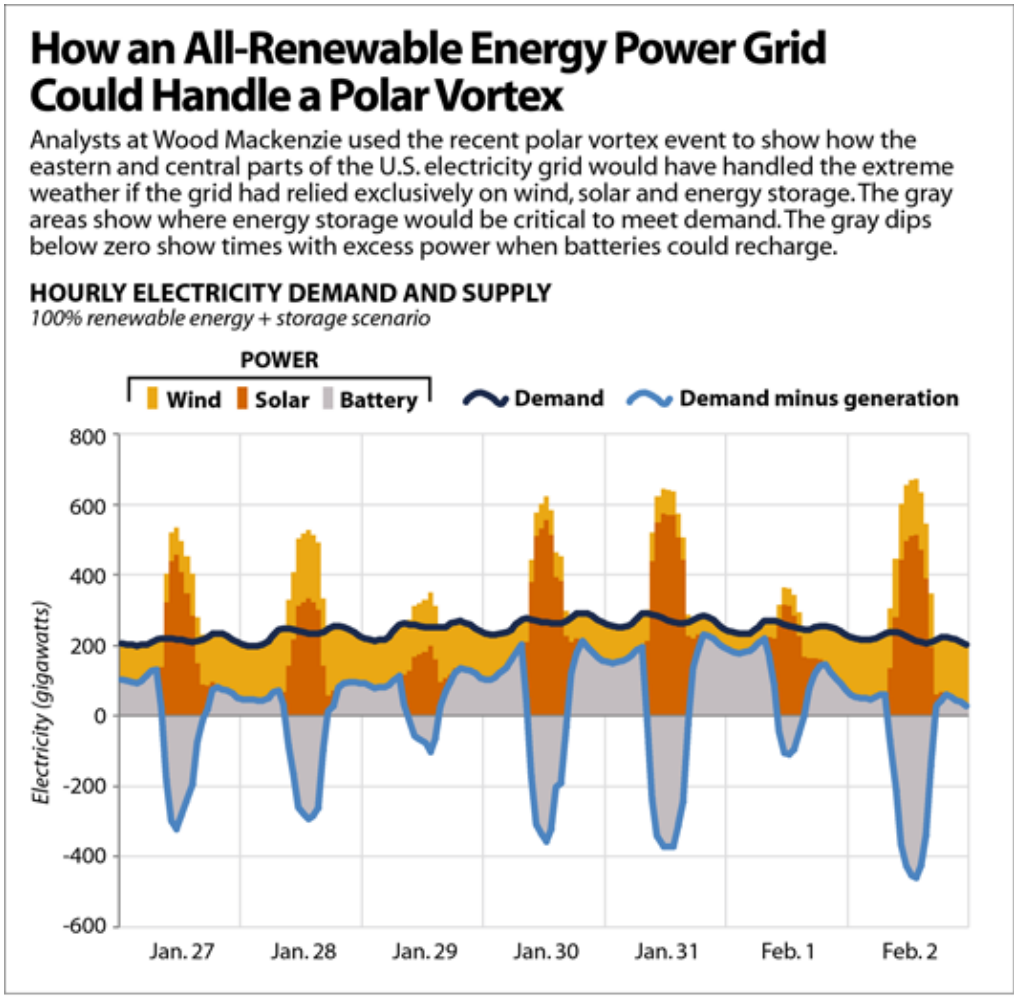
Since 2015

Revised Federal Executive Order

2015 EO 13963: Planning for Federal Sustainability in the Next Decade	2018 EO 13834: Efficient Federal Operations (Revokes EO 13963)
Set agency GHG emission targets; reduce federal building energy use by 2.5% annually; participate in demand management programs	Achieve annual reductions in building energy use; implement energy efficiency measures
30% building electricity from renewables and 25% total energy consumption from clean energy sources in 10 years	Meet statutory requirements relating to the consumption of renewable energy and electricity
Reduce building and potable water intensity by 2% per year; install water meters	Reduce potable and non-potable water consumption
Utilize performance contracting towards the goal of $4B in Federal performance-based contracts, including annual target-setting	Utilize performance contracting to achieve energy, water, building modernization, and infrastructure goals
Achieve ZNE in all new construction by 2030	Ensure new construction/major renovations conform to applicable requirements and sustainable design principles
Divert at least 50% non-hazardous solid waste, construction, and demolition debris annually	Implement waste prevention and recycling measures
Reduce per-mile GHG emissions from Federal fleets by 30% by 2025, increase percentage of zero emission and plug in hybrid vehicles in Federal fleets	Agencies shall manage fleets in a manner consistent with the policy set forth in the EO to the extent they determine practicable

All-Renewables + Storage Scenario

- Storage Capacity Now: **11 GW**
- During polar vortex, a 50% wind, 50% solar grid would have had 18 hours in which renewable sources were not producing enough electricity to meet demand
- Storage Needed for 100% Renewable: **277.9 GW**
  - Double projection for 2040
- For grid regions that include NE, NY, Mid-Atlantic, Midwest and parts of the South



Inside Climate News story

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

DOER
Massachusetts Department of Energy Resources

MA Clean Peak

Note: All details to change

- *An Act to Advance Clean Energy* (2018) – DOER directed to create Clean Peak Standard for qualified resources w/ in-service date on or after 1/1/19

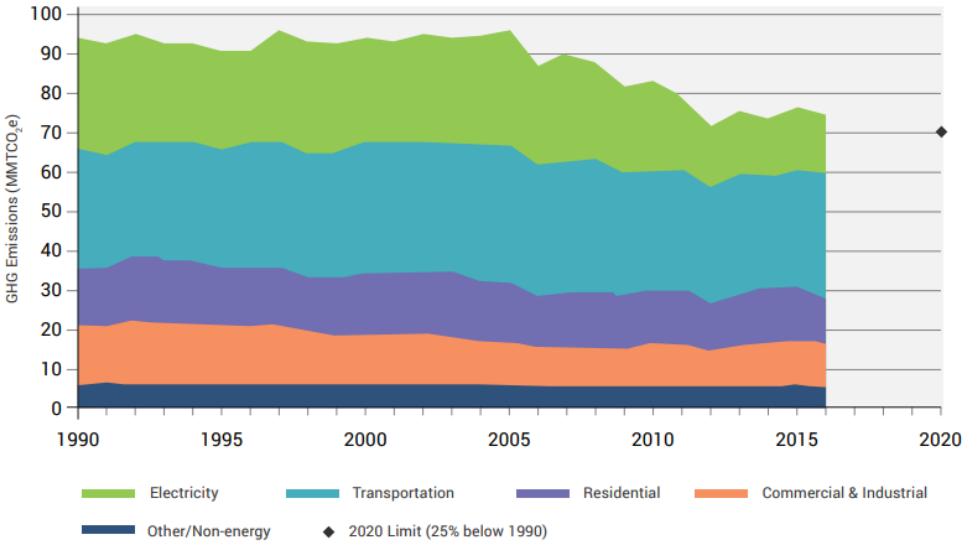
  - Align clean energy generation with periods of peak demand to mitigate costs and emissions associated with peak periods
  - Incentivize and enable continued deployment of renewable generation by flattening load curve
  - Qualified Clean Peak Resources to be eligible to generate Clean Peak Certificates (CPCs) during 4 Seasonal Peak Periods
  - Program design in progress

EEA, 2019

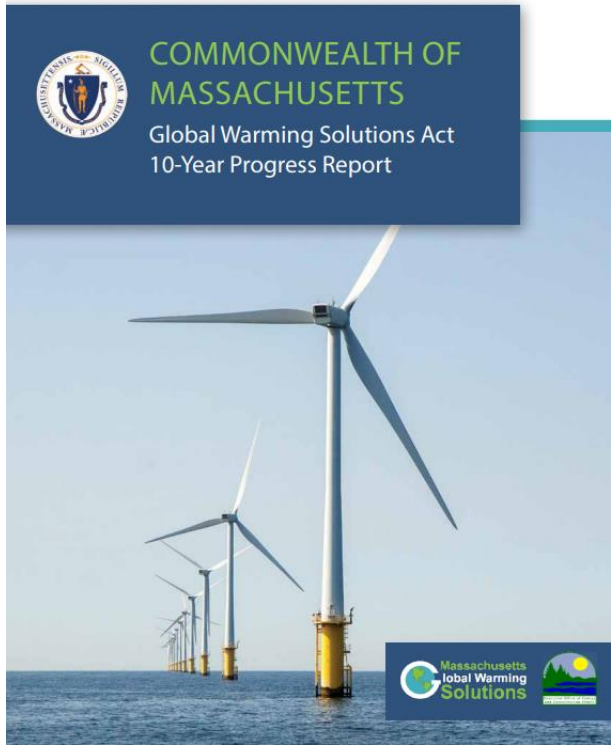
Global Warming Solutions Act: 10 Year Progress Report

- **Massachusetts Overall**
  - **GHG Emissions ↓ 21%** *(1990 vs. 2016)*
  - Population ↑ 13% *(1990 vs. 2016)*
  - Gross State Product ↑ 21% (2008 vs. 2017)
- Substantial reductions in electric sector
- Transportation sector is largest share of emissions
- Health Benefits: 300-500 fewer premature deaths and 860 fewer hospitalizations (est.)
- 100,000+ clean energy jobs added, contributing $11B annually to MA economy

FIGURE 2 | MASSACHUSETTS GHG EMISSIONS, 1990 – 2016



- ***Looking Ahead***
  - *Support electrification of building thermal conditioning*
  - *Support electrification of the transportation network*
  - *Integrate climate change mitigation and adaptation*



Renewable Heating Infrastructure Funding

- Baker-Polito Administration awarded $2.8M in matching funding for renewable heating infrastructure

- Funding to 5 businesses for:
  - Woody biomass processing and delivery equipment
  - Testing of modern wood heating and emission control devices to current EPA standards
  - Installation of a tank to blend eligible biofuels with conventional heating oils

EEA Secretary Beaton speaks at February event in Amherst

DOER Press Release, 2018

LBE Solar Grant Program Update

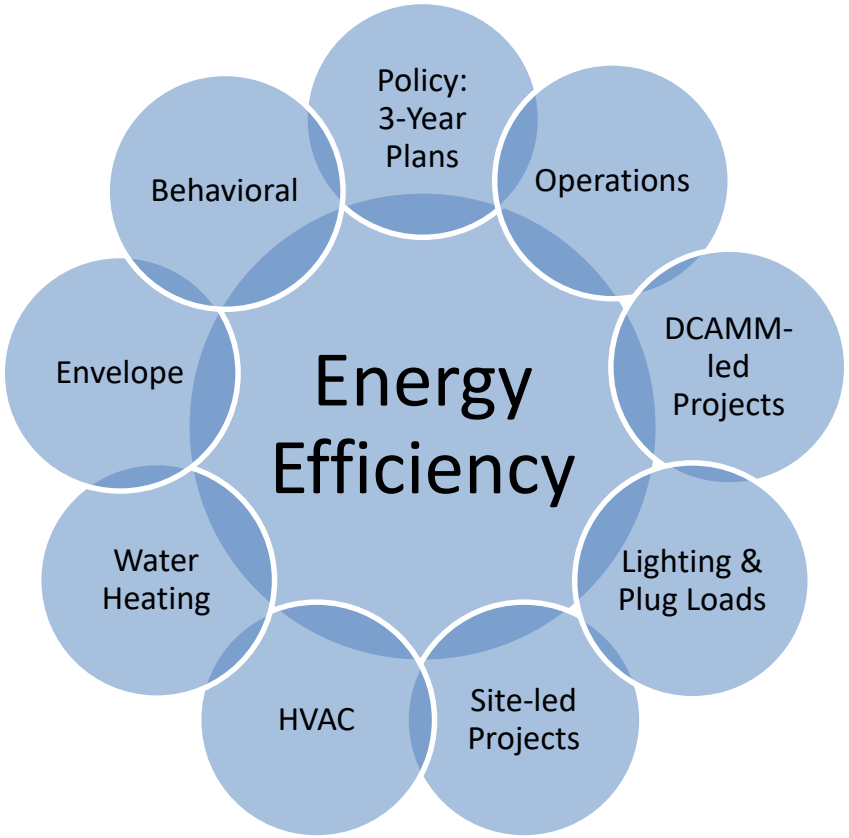
PON ENE-2018-017 (LBE Solar Grant) Changes in Amendment Two	
Revised Certain Canopy Maximum Grant Amounts	• (Third-Party) SMART Eligible Projects: ○ Projects in Block 7: maximum grant changed from $750,000 to $825,000 ○ Projects in Block 8: maximum grant changed from $750,000 to $900,000
	• (Third-Party Owned) Non-SMART Eligible Projects ○ Maximum grant raised from $750,000 to $900,000
Added Ground-Mount Solar Habitat Requirement	• Requires pollinator-friendly plantings around ground-mounted projects

COMMBUYS posting	See File Attachments section on COMMBUYS Posting for full details: https://www.commbuys.com/bso/external/bidDetail.sdo?docId=BD-18-1041-ENE01-ENE01-27494&external=true&parentUrl=bid • Grant Program Description Document (Word) • Grant Application Form (Excel)

EV Charging Station Funding Programs

Program	Info	Link
Utility Make Ready/EV Infrastructure Programs (ongoing)	❑ Cover 100% of costs associated with infrastructure improvements ❑ National Grid covers 50-75% of equipment costs ❑ Equipment costs in disadvantaged communities may be eligible for 100%	https://www.eversource.com/content/ema-c/residential/save-money-energy/explore-alternatives/electric-vehicles/charging-stations www.ngrid.com/ma-evcharging
MassEVIP Fleet Charging (rolling applications)	❑ Public entities eligible for $7,500 to purchase a BEV or $5,000 for a PHEV ❑ Leased vehicles: $5,000 per BEV, $3,000 per PHEV ❑ EV station rebate: $2,500 with 2 BEVs, $5,000 with 4 BEVs, and maximum of $7,500 with 6 or more BEVs	https://www.mass.gov/how-to/apply-for-massevip-fleets-incentives
MassEVIP Workplace Charging (rolling applications)	❑ All entities with at least 15 employees eligible for up to 60% of equipment costs ❑ Must be available to all employees	https://www.mass.gov/how-to/apply-for-massevip-workplace-charging-incentives
MassEVIP Public Access Charging (application by 3/18/19)	❑ Rebates for up to 80% of installation and equipment costs -- maximum of $6,250 per port and $50,000 per address ❑ Must be available 24 hours or 12 hours if site has restrictions	https://www.mass.gov/how-to/apply-for-massevip-public-access-charging-incentives

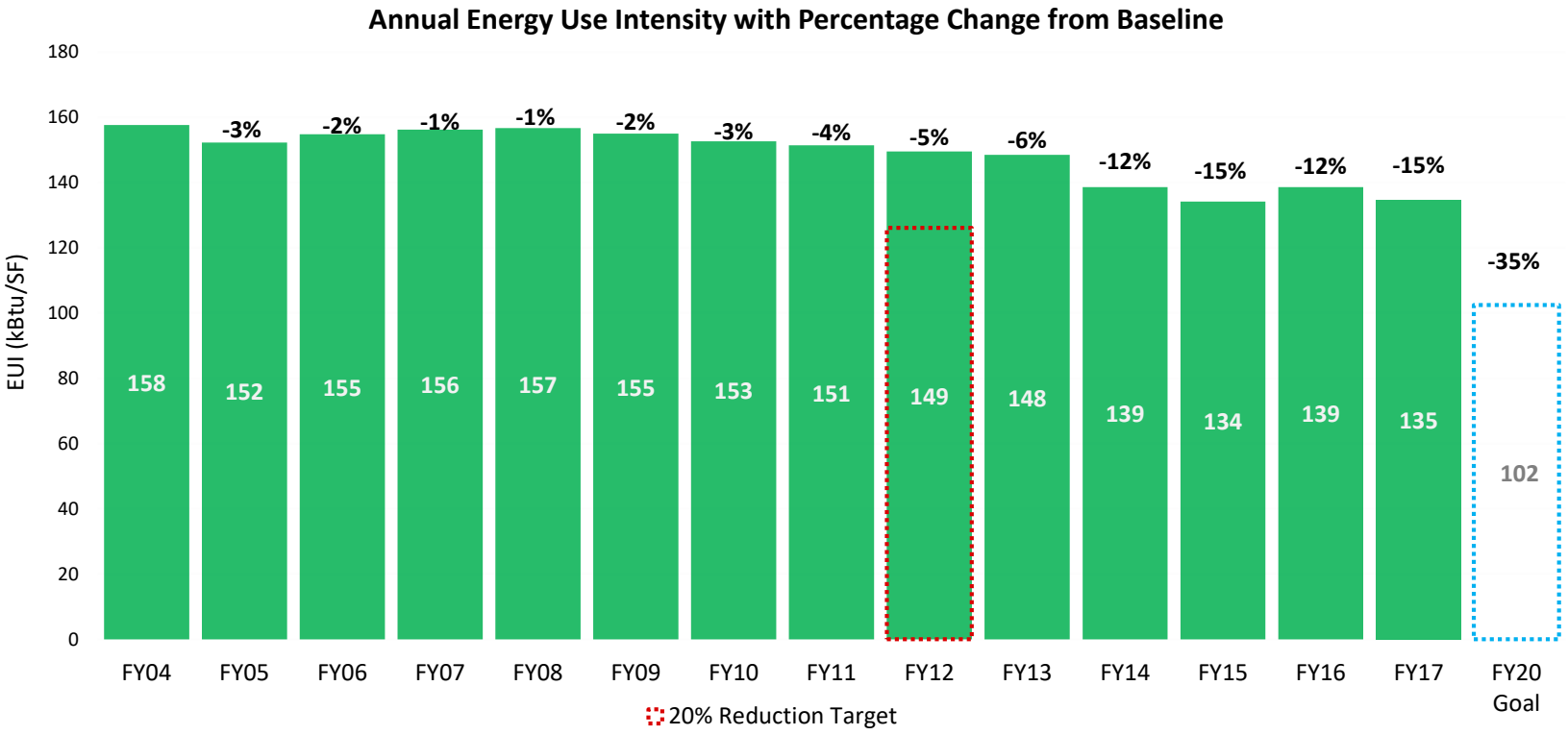
Energy Efficiency at MA State Facilities: Discussing Policy, Projects, and Practice



1. Chelsea Kehne, LBE – What Efficiency Data Tells Us
2. Catie Snyder, LBE – Setting the Efficiency Stage
3. Maggie McCarey, DOER – Utility 3 year Efficiency Plans
4. Betsy Isenstein, DCAMM – State Facility Energy Program
5. James Latini, DCAMM – Efficiency from the operations side
6. Catie Snyder, LBE – Building envelope overview
7. All - Building Efficiency Discussion

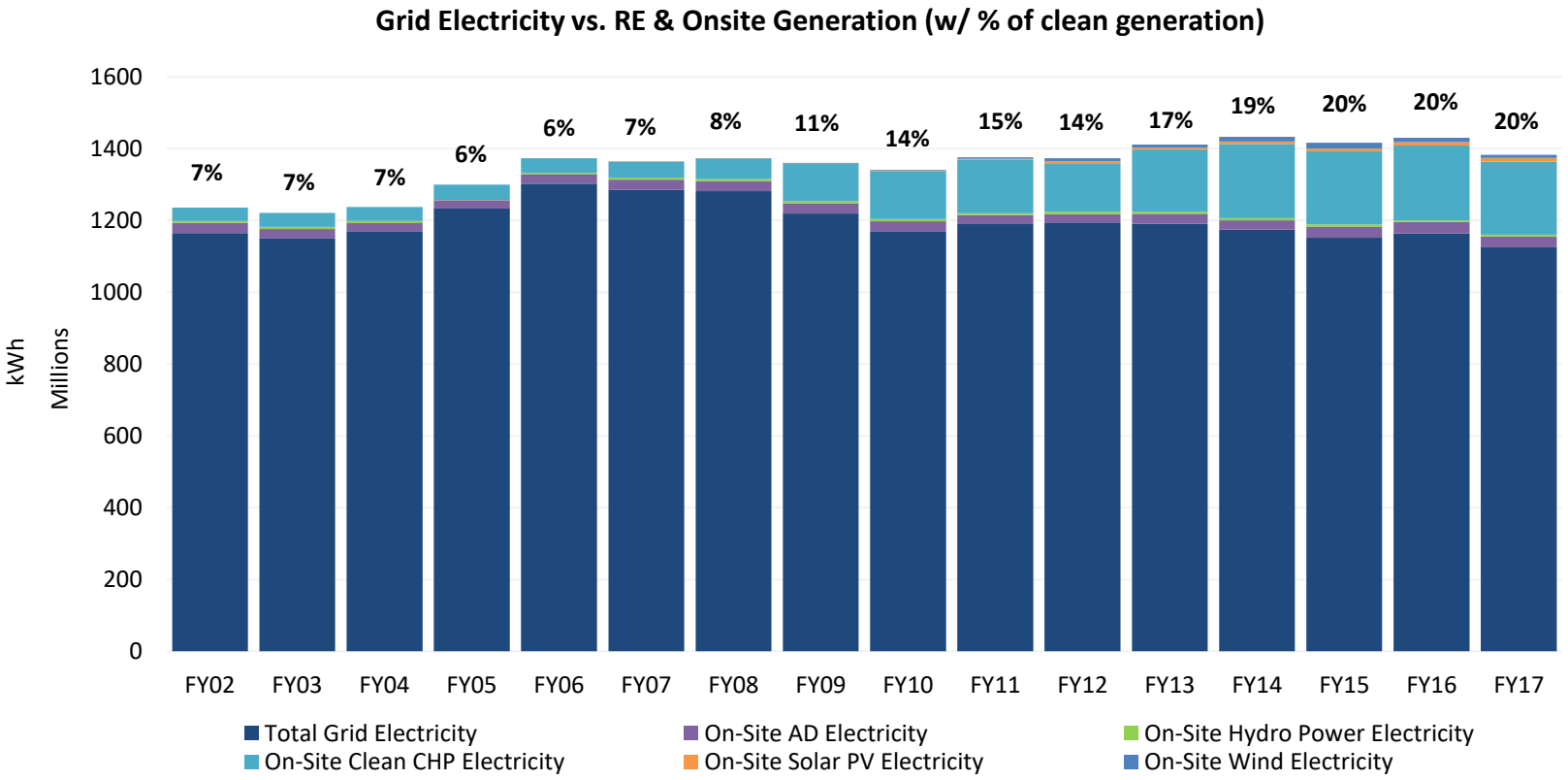
Energy Efficiency: State Portfolio EUI

- Overall energy use intensity (kBtu/per square foot) decreased 15% from the LBE 2004 through FY17 for the 44 Leading by Example partners whose energy use is tracked using this metric.



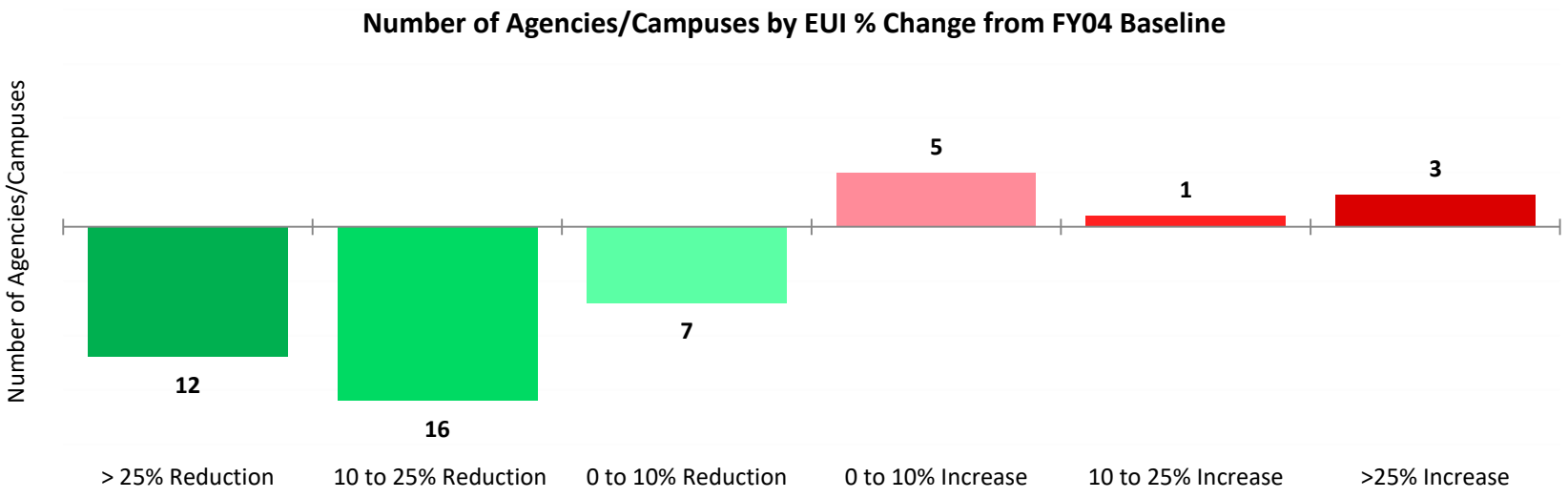
Energy Efficiency: State Portfolio EUI

- In FY17, 20% of state government's electricity consumption came from on-site clean generation, an increase from 7% in FY02
- While on-site generation has increased, electricity consumption overall has remained relatively stagnant



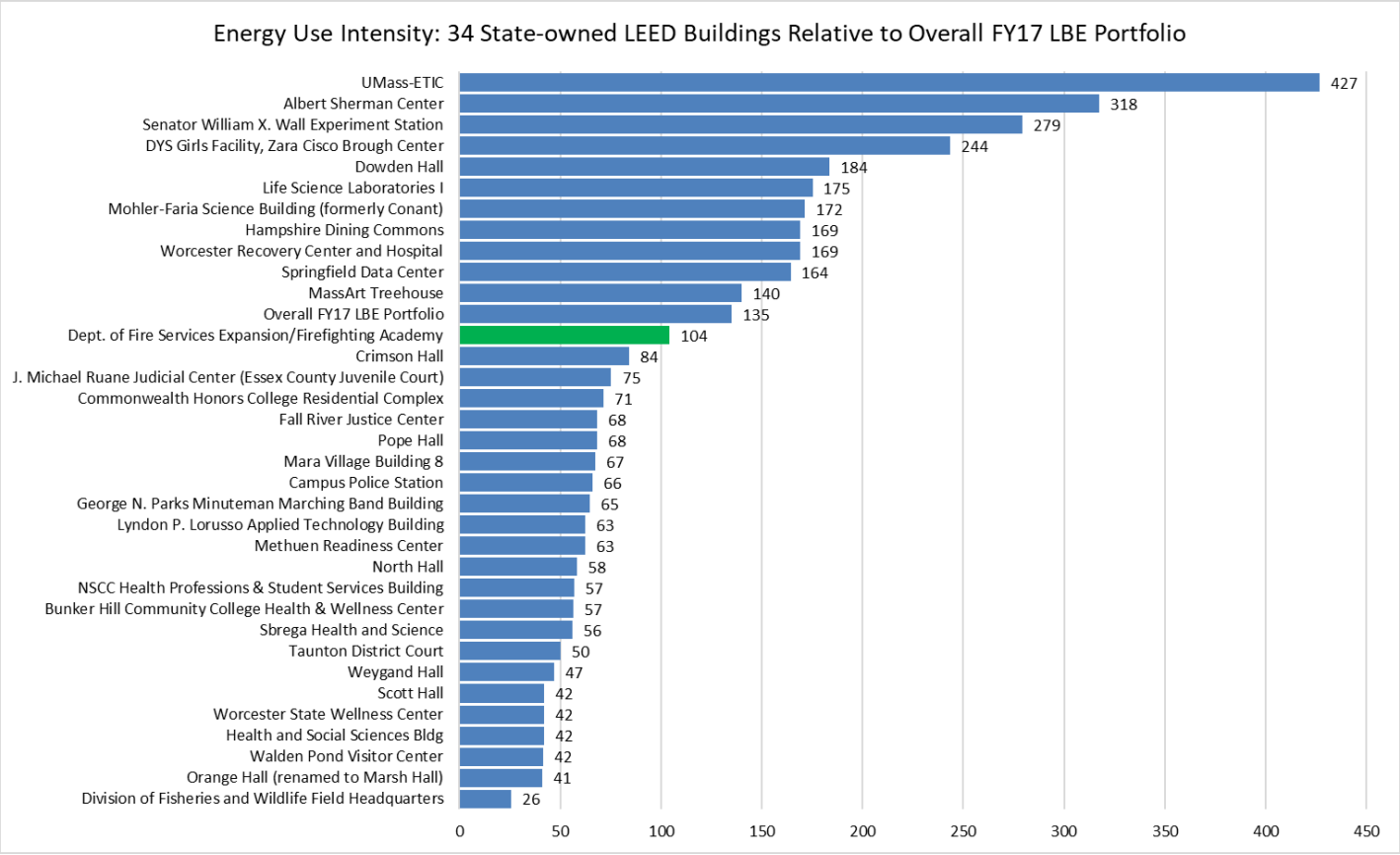
Energy Efficiency: State Portfolio EUI

- In FY17, 35 agencies/campuses reduced their EUI from the 2004 baseline year, with 12 achieving >25 % percent reduction
- 9 agencies/campuses have seen increases in their EUI from the baseline year



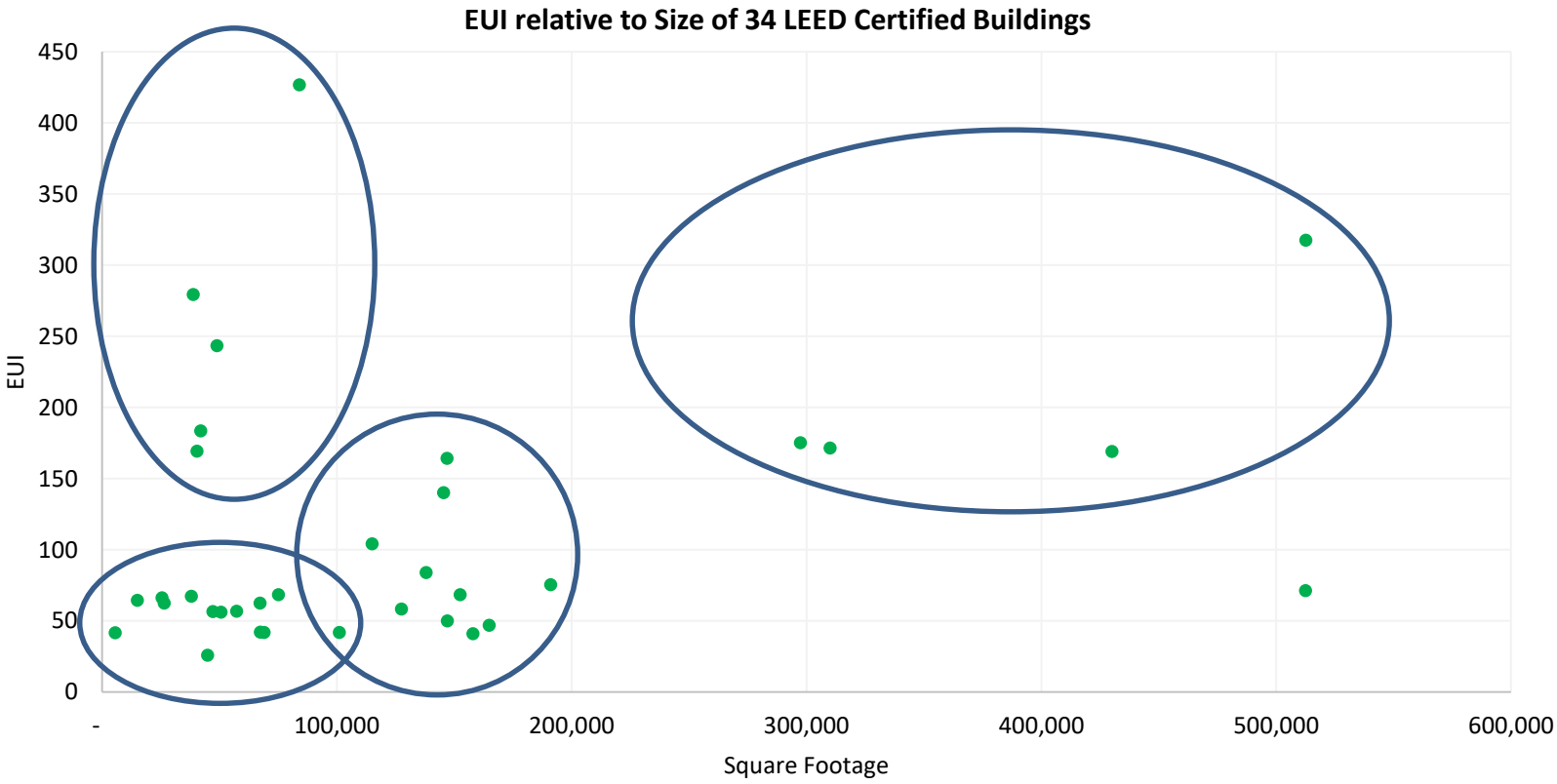
Energy Efficiency: New Construction

- 84 state-owned LEED certified buildings
- 8.5 million square feet of new construction
- Overall FY17 EUI: 135
- Average EUI of 34 LEED buildings: 115
- Portfolio EUI (of 34 building subset): 134



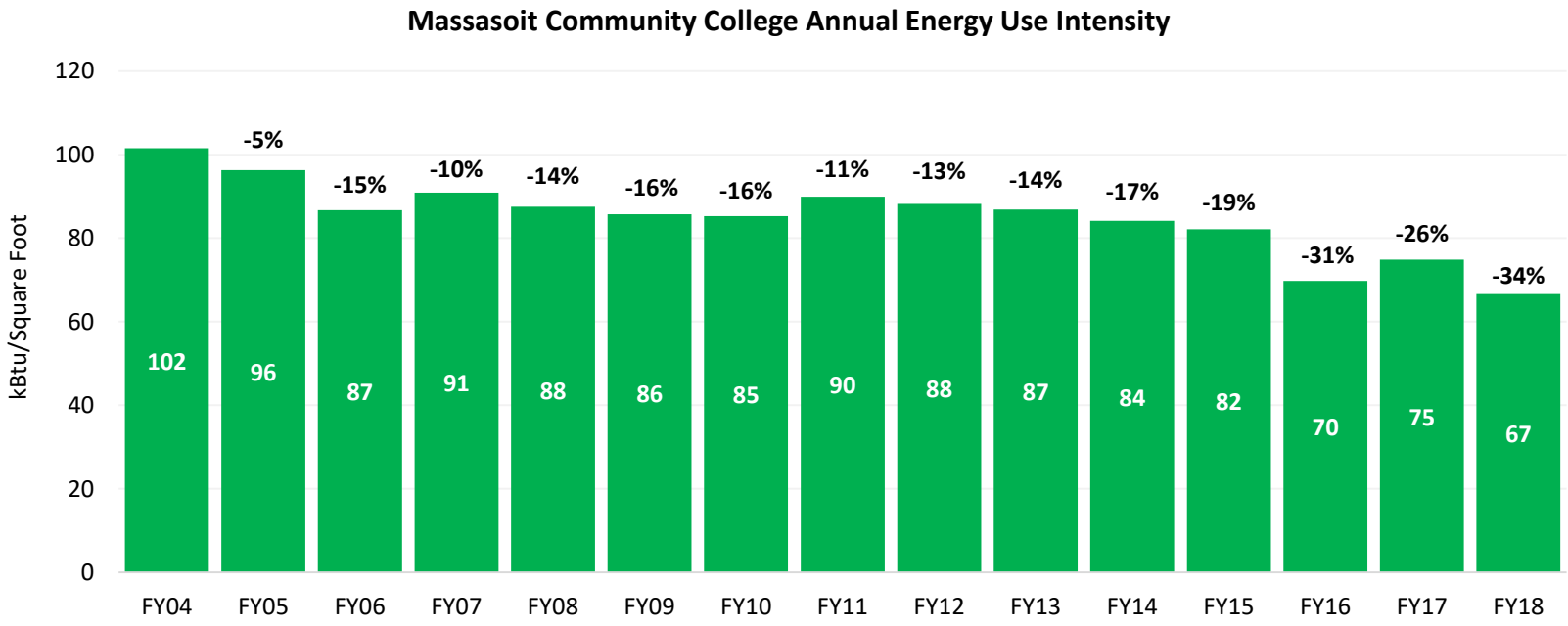
Energy Efficiency: New Construction

- Majority of buildings under 200,000 SF have EUIs under 100 (significantly below the FY17 overall portfolio EUI of 135)
- Larger buildings tend to be more energy intensive and thus can negatively impact portfolio EUI when added to overall square footage



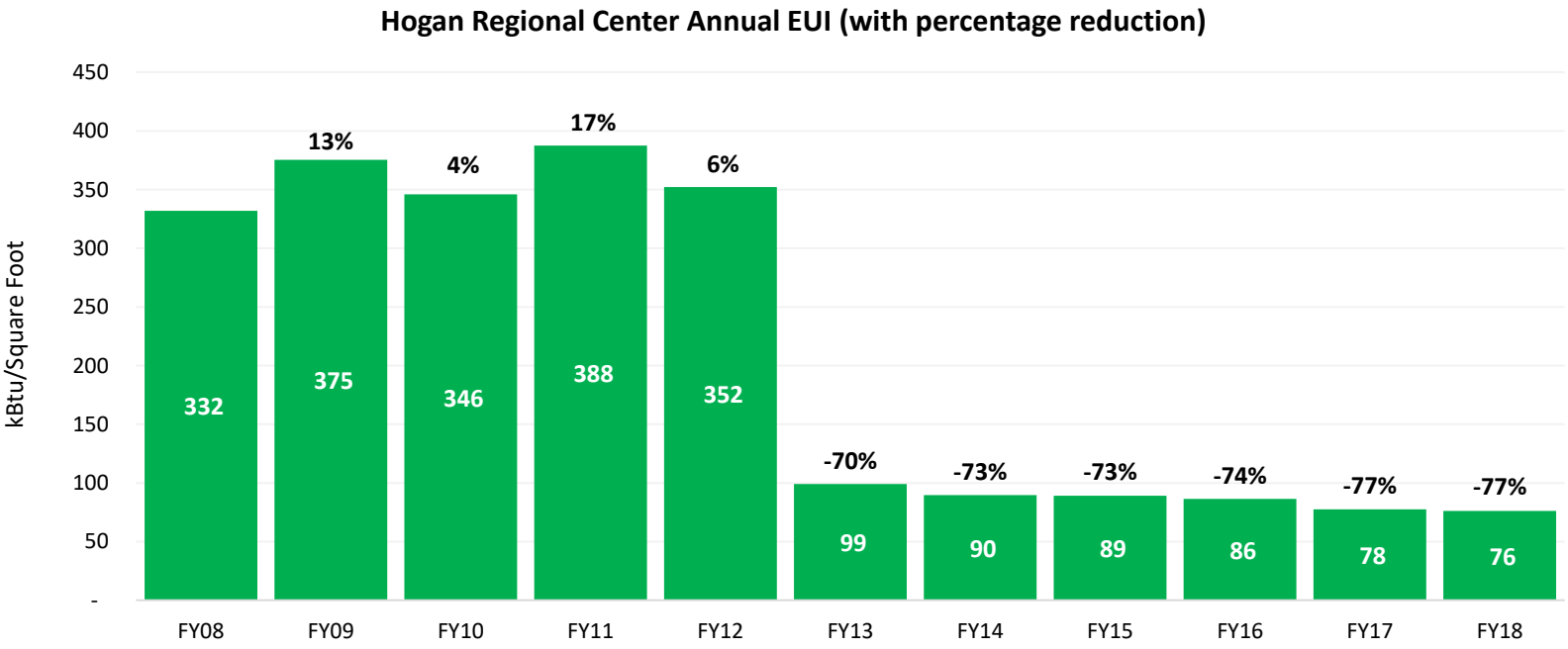
Energy Efficiency: Large Energy Projects

- Through a comprehensive energy project, including extensive LED lighting retrofits, Massasoit Community College has reduced overall EUI by 34% since the 2004 baseline



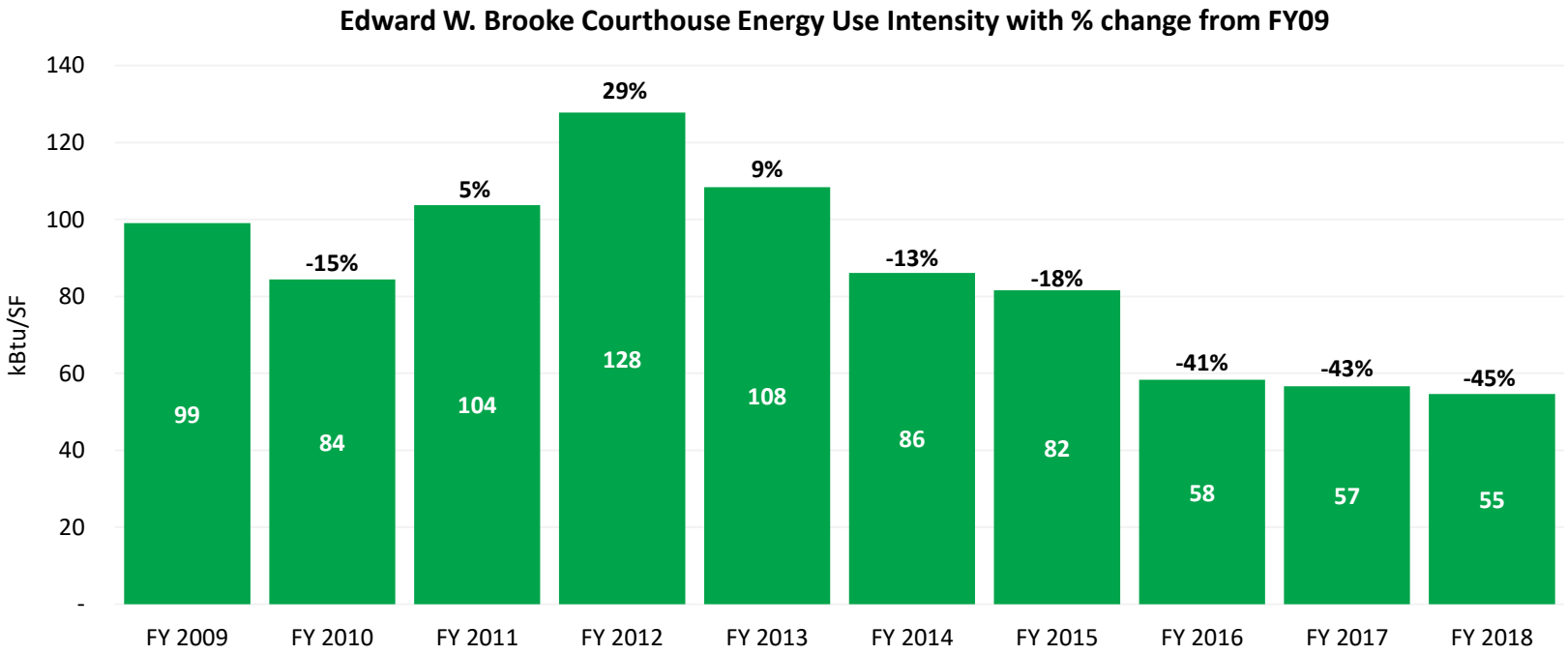
Energy Efficiency: Large Energy Projects

- After completion of a major energy project, including switching away from a fuel oil-fired power plant to high-efficiency natural gas boilers, Hogan Regional has reduced it EUI from 332 to 76 since FY08, a 77% reduction



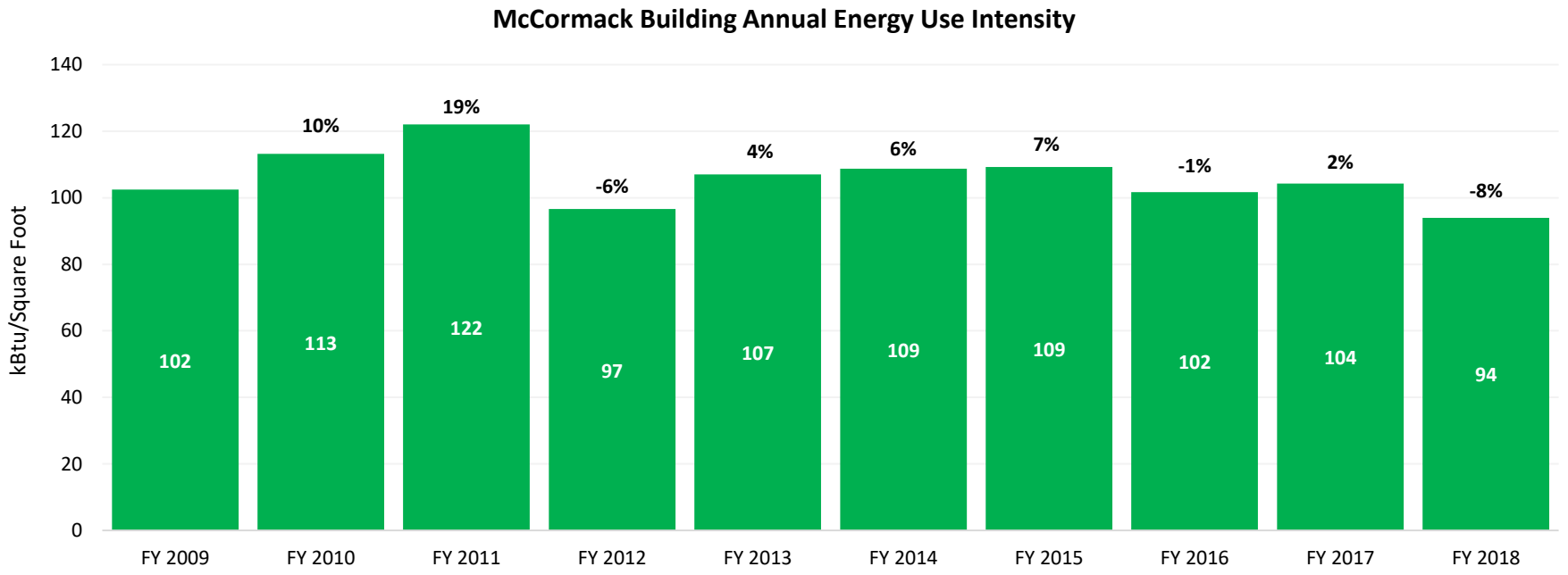
Energy Efficiency: Operational Improvements

- Through improved operations, high-efficiency lighting upgrades, and other efficiency projects, the Brooke Courthouse has reduced its EUI by 45% since 2009



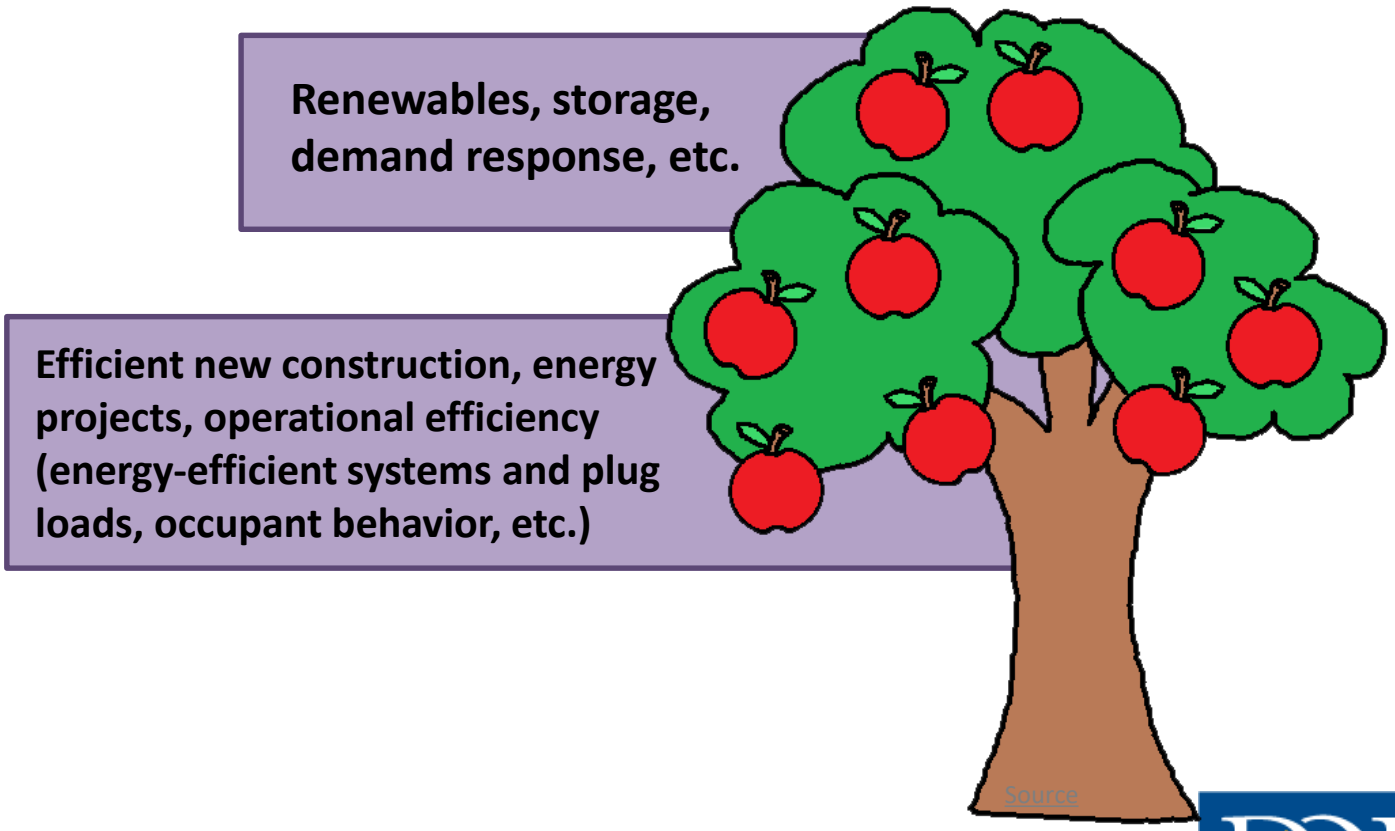
Energy Efficiency: Operational Improvements

- In FY18, operational improvements--including delayed start times, night time shutdowns and altered holiday operations—helped the McCormack building reduce its EUI by 10% in just one year



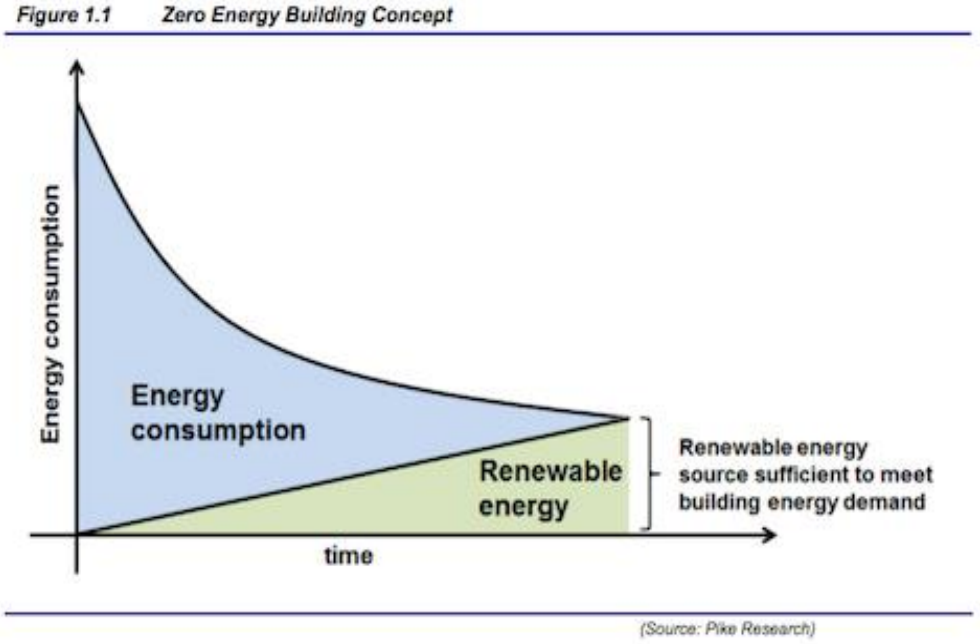
Reminder: Energy Efficiency as a "First Fuel"

- Starting at the bottom of the tree reduces costs, and maximizes benefits from other resources



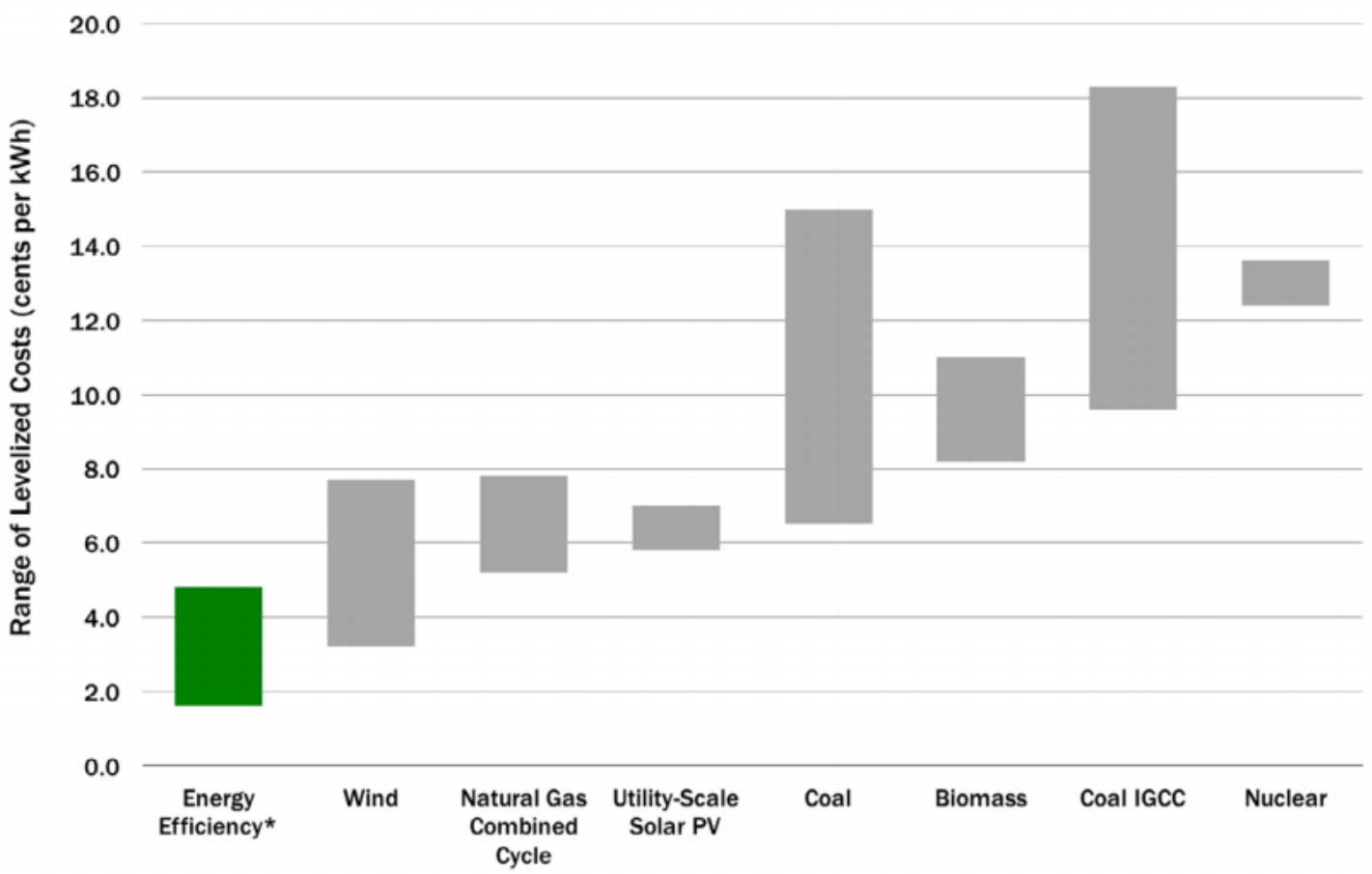
Integrating EE and Renewable Energy

- Synergies between energy efficiency and renewable energy
  - Efficiency can **reduce upfront costs and paybacks** of renewable energy systems by reducing energy loads, thereby reducing renewable capacity needs
  - Efficiency can lower demand so that clean energy solutions can more effectively meet resiliency needs



Sources: ACEEE, IRENA

How Much Does Energy Efficiency Cost?



Source: ACEEE, A National Review of the Cost of Utility Energy Efficiency Programs

LEADING BY EXAMPLE

MARCH 12, 2019

MASSACHUSETTS DEPT. OF ENERGY RESOURCES
ENERGY EFFICIENCY DIV DIRECTOR MAGGIE MCCAREY

National Leader in Energy Efficiency

- **#1 eight years in a row** for energy efficiency programs and policies
- Three Year Energy Efficiency Plans consistently have the most aggressive goals in U.S.
- Major source of GHG savings in the 2020 Clean Energy and Climate Plan
- 65,000 jobs and growing

mass save®
Savings through energy efficiency

Massachusetts Energy Efficiency Overview

- **2016-2018 EE Plans:**
- On track to achieve highest savings goals in the country
- Peak demand demonstration projects

Electric 2.94% of sales
Gas 1.24% of sales
Projected $7.8 billion benefits to customers

- **Green Communities Act (2008)** requires all cost-effective energy efficiency and demand reduction
- **An Act to Advance Clean Energy (2018):**
  - Expands allowable energy efficiency investments to include active demand management, strategic electrification, and fuel switching to clean energy sources.
  - Broadens electric efficiency plans to “energy” efficiency plans.
  - Changes Department of Public Utilities cost-effectiveness review to sector-level.

2019-2021 Three Year Planning Process

6 EEAC workshops to establish Council priorities for Plan	Fall 2017/Winter 2018
EEAC votes on its 2019-2021 priorities	February 2018
8 Public listening sessions	Winter/Spring 2018

3 Year Energy Efficiency Plan: 2019 – 2021

HIGHEST GAS SAVINGS GOALS TO DATE

Electric Program Expansion
More focus on demand, Less on lighting

New Initiatives

- **Fuel Switching**: customers will be provided information on cleaner fuel options for heating with new incentives for customers to fuel switch to air source heat pumps and other renewable heating options.

- **Active Demand Reduction**: Programs that help offset the most expensive hours of the year through load reduction and active dispatch from things like energy storage.

- **Passive House Incentives** – training and rebates achieve greater energy efficiency in new construction

- **Home Energy Scorecards:** through in-home energy audits, providing information to customers on the benefits of energy efficiency upgrades

- **Improved Outreach:** Enhanced strategies and community outreach efforts targeting increased participation and savings for renters, moderate income customers and non-English speaking customers

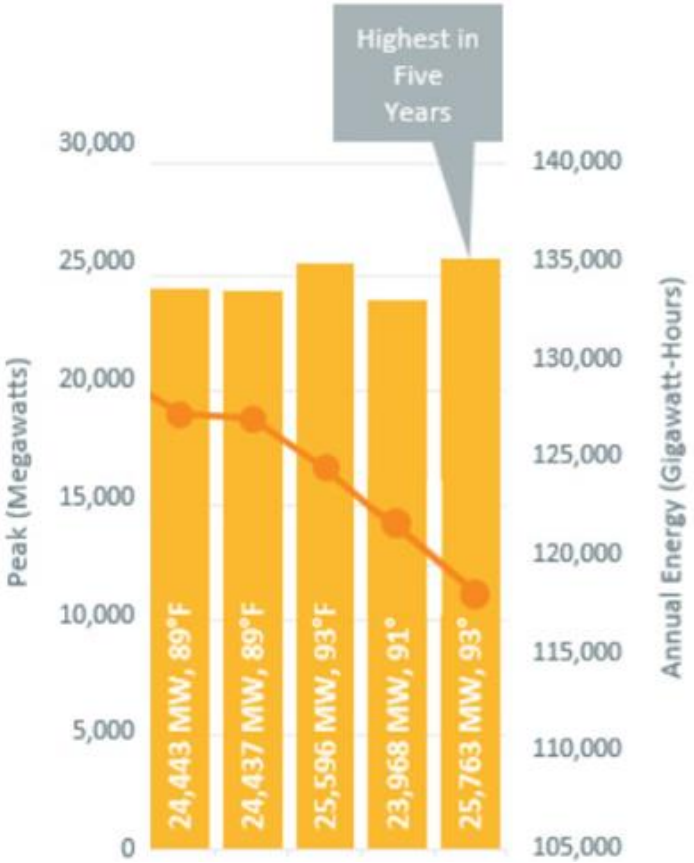
SUMMARY 2019-2021 PLAN AS APPROVED

Statewide Goals	2019-2021
Net Lifetime MMBtu Savings	261 million
CO2e Reductions (tons)	2.6 million
Total Budget	$2.7 billion
Total Benefits	$9.3 billion
Electric Savings as % of Sales	2.7 %
Gas Savings as % of Sales	1.25%

2019-2021 Themes: Peak Reduction

- Continue to focus on energy efficiency, while pivoting to focus on reducing energy usage during times when demand is highest on the system and costs are highest for customers.
- Active Demand Management Programs include residential direct load control, energy storage, C&I load curtailment

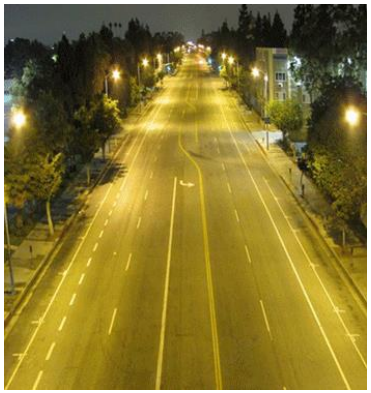
Goal	2019-2021
Summer MW Total	665
Winter MW Total	500
Active Summer MW	200
Active Winter MW	50



Source: ISO New England

2019-2021 Themes: Winter Reliability

- Focus on **natural gas savings** (therm savings goals increased over 12% from previous plan)
- Utilizing **active demand technologies** in winter, including storage
- LED streetlight conversions



2019-2021 Themes: Residential Enhancements

- Enable broad participation and energy justice
  - Moderate income, non-English speakers, and renter focus
  - Pre-weatherization barrier financing
- Municipal partnerships
- Home Energy Scorecards as part of in-home assessment

2019-2021:
ENERGY OPTIMIZATION AND FUEL SWITCHING

New energy efficiency goals for electric programs:
MMBtu of total energy reduction

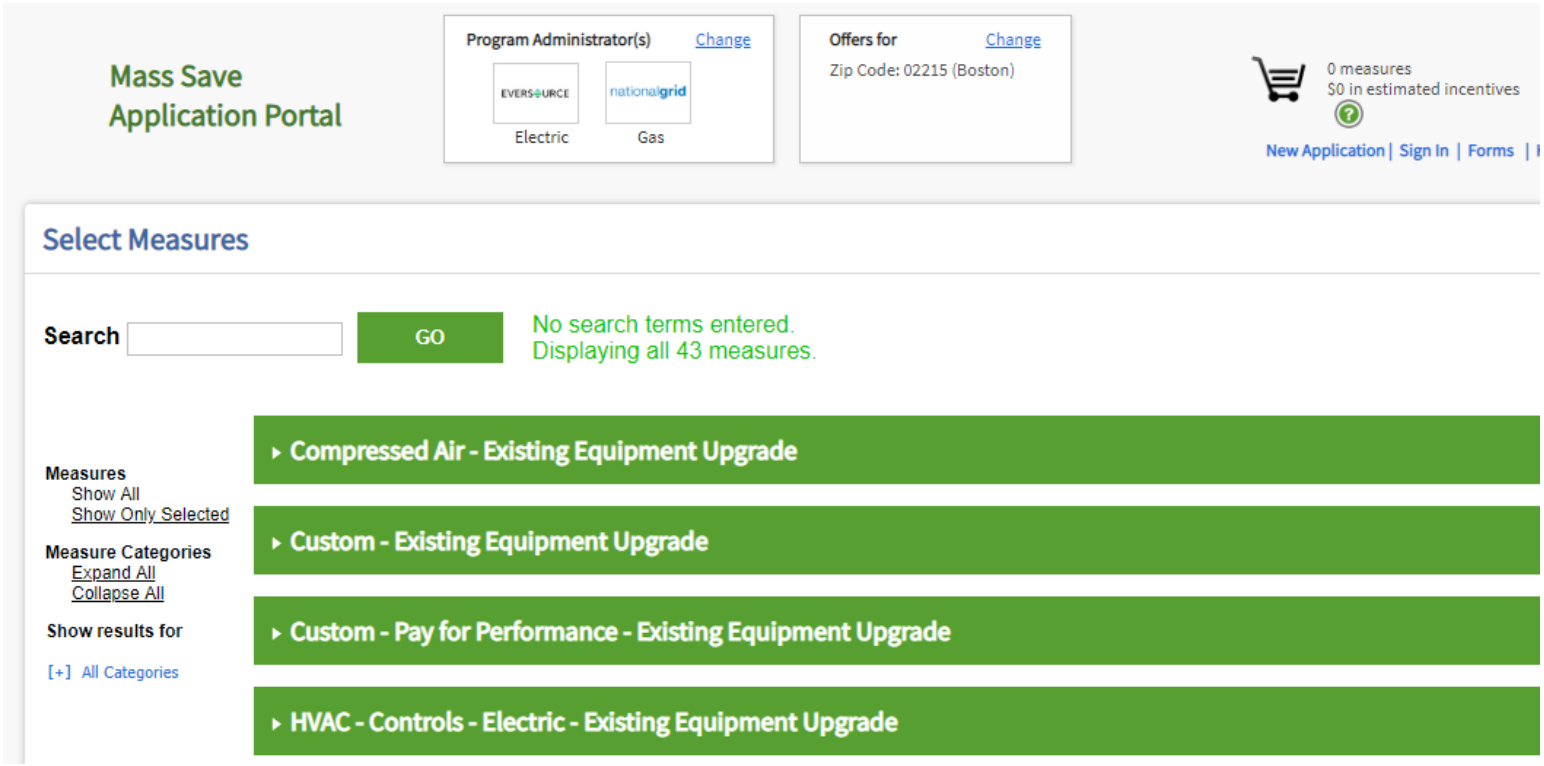
- Consumer education through **fuel-neutral heating and hot water recommendations** during in-home assessments
- Significant **increases in incentives for cold climate heat pumps** (air and ground source)
- Opportunities for C&I optimization – HVAC especially

C&I Program Innovations

- Eversource and National Grid are the #1 & #2 PAs in the Country
- Shift to customer focused programs
- Streamlined ways to participate
- O&M Savings now incentivized
- Trainings
- New Construction enhancements

Mass Save Application Portal

- https://www.masssaveapplicationportal.com



Operational Savings

- Prescriptive O&M Incentives
  - Make changes, get paid, claim savings
- Retro commissioning (RCx)
  - Redesigned program first half 2019
  - More upfront technical assistance
- Strategic Energy Management
  - Cohort based approach to save through operational changes and culture of efficiency

Advanced Trainings

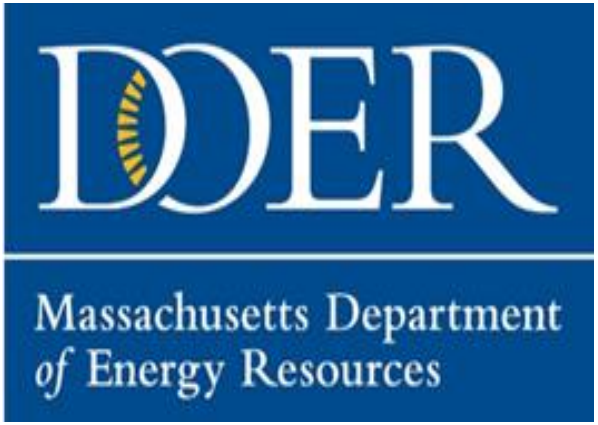
- Vendor trainings
  - Proper equipment sizing, new tech
- Advanced systems trainings
  - Networked lighting controls
  - HVAC system optimization
- On site facility training
  - Specific to your building and systems
  - Eversource trying it first

New Construction

- Small & Large buildings eligible
- Major renovations as well
- Enhanced technical assistance and design support
- Passive House for Multi-Family
  - Incentives to help PHIUS certification process
- Trying new approaches
  - EUI targets and performance goals

Plan Highlight: Proposed Passive House Offering

- Focused on multi-family low-rise and high-rise new construction
- Soft Cost Incentives
  - Modeling Subsidy
  - Design Team Incentive
  - Design Charrette
  - Certification Subsidy
- Performance Incentives: $/kWh, $/therm savings
- PH Training: Goal to double the number of trained and certified PH professionals over next three years



THANK YOU

DIVISION OF CAPITAL ASSET MANAGEMENT & MAINTENANCE

Energy & Sustainability Program

FRAMING THE ENERGY TEAM AGENDA

Energy Program Overview

Program Impact

Capital Projects: large & small

CBEI (metering)

Demand Response, Energy Credits

What's next?

ENERGY PROGRAM OVERVIEW -- CURRENT

1. Capital Projects
   - Large: Comprehensive Energy Design Build
   - Small: Utility Vendor

2. Operational improvements
   - Existing building commissioning
   - Real time metering (CBEI)

3. Grid opportunities
   - Demand Response and load management
   - Solar and alternative energy credits
   - Repair and maintenance of solar assets

4. Advisory services
   - DCAMM staff
   - State agencies and offices
   - Utility incentive programs
   - Resilience

DCAMM IMPACT: ENERGY PROGRAM

75 energy projects completed
41 comprehensive design-build/existing building commissioning
336 Utility Vendor sites (34 projects)

$242.3 million invested

$12.4 million saved annually

448,000 million BTUs saved annually
enough to heat and power **3,473 homes** in MA

or

36,000 Metric Tons GHG reduced annually
equivalent to **7,579 cars** off the road each year

Monitor 65 solar arrays, facilitate repair and maintenance
6,500,000 kWh generated in FY18
Equivalent to **460 cars** off the road each year

25A COMPREHENSIVE PROJECT EXAMPLE: MEMA

Project Overview

- Building
- Project Cost- $5 million
- Project Savings- $207,000
- Project Incentives- $136,000
- Energy Payback- 12 years
- Energy Conservation Measures
- Building Upgrades- sprinklers

Project Status

- Construction- end of April 2019
- Completion- end of November 2019

Items of Interest

- Heat Pump
- Solar Canopy

UTILITY VENDOR PROJECT UPDATES

Recent Improvements:

- Vendors will still sign T&Cs and separate “targeted” projects will be added as identified.
- T&Cs have an initial 3-year term, with 2 successive 1-year renewal periods (previous T&Cs had a 3-term).
- The base audit fee is increased to $500 (from $200). The audit narrative requirement is reduced. No audit fees will be awarded without the submission of the correct audit templates.

Future:

- Bundles with targeted projects.
- Focusing on the usual ECMs but a bit more on Lighting, Power Factor correction, Steam Traps, sensors, etc.

We are always open to new ideas. Please let us know if you have a project of interest.

CBEI: COMMONWEALTH BUILDING ENERGY INTELLIGENCE UPDATE

1. Signing contract extension with Enel X.
2. Continue working on meters
3. Identifying what is needed at site
   - Removing meters
   - Reusing meters

4. Please let us know if your schedules seem incorrect. We will update them!
5. Let us know if not all of your bills are in. We can update this!
6. Using metering data to help direct projects, especially Existing Building Commissioning (EBx).

DEMAND RESPONSE AND ENERGY CREDITS

Leading-By-Example

Teamwork

What's Next

DEMAND RESPONSE AND ENERGY CREDITS

Contact Dave Lewis (Dave.Lewis@mass.gov) regarding:

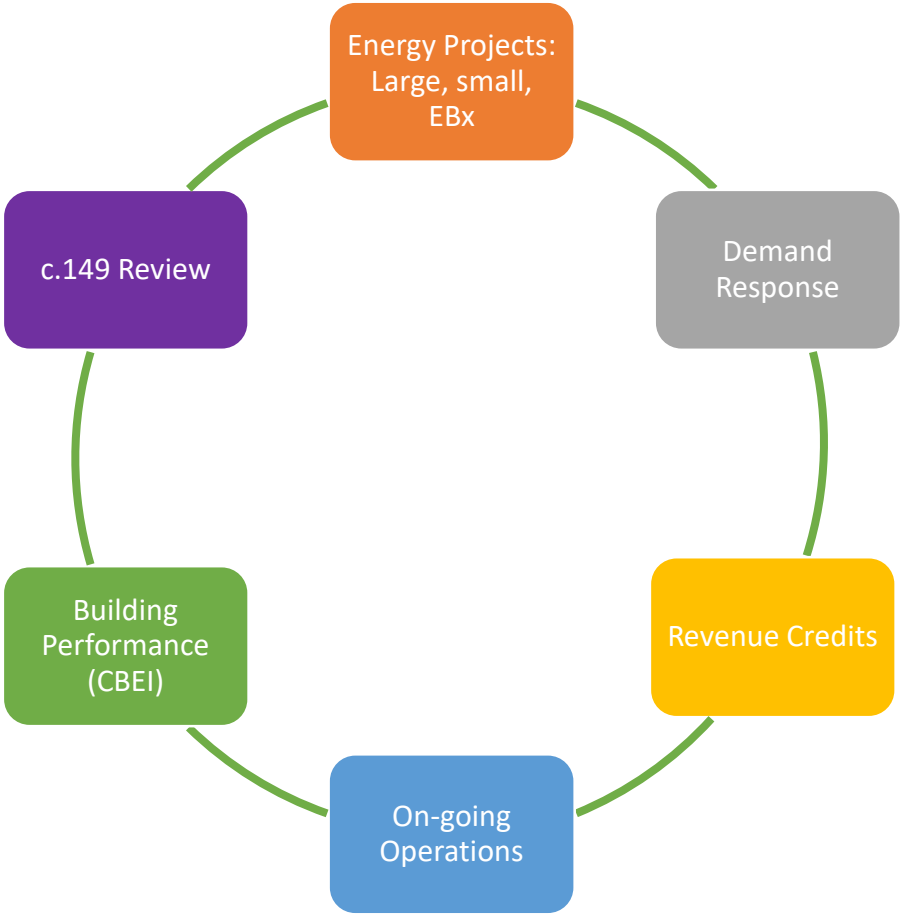
Demand Response

- On Peak time use reduction
- EMS upgrades
- Generator
  - New - registration
  - Not new – may be able to retrofit, upgrade
- Energy Efficiency measures being implemented

Energy Credits

- Solar Array – earnings and production
  - Earnings and registration: SREC, SMART
  - PPA – power purchase agreement
  - Maintenance – FAC91 Inspections, TRD01 Maintenance and Repairs
- Cogen/CHP/Turbine
  - AEC/APS – Alternate Energy Credit

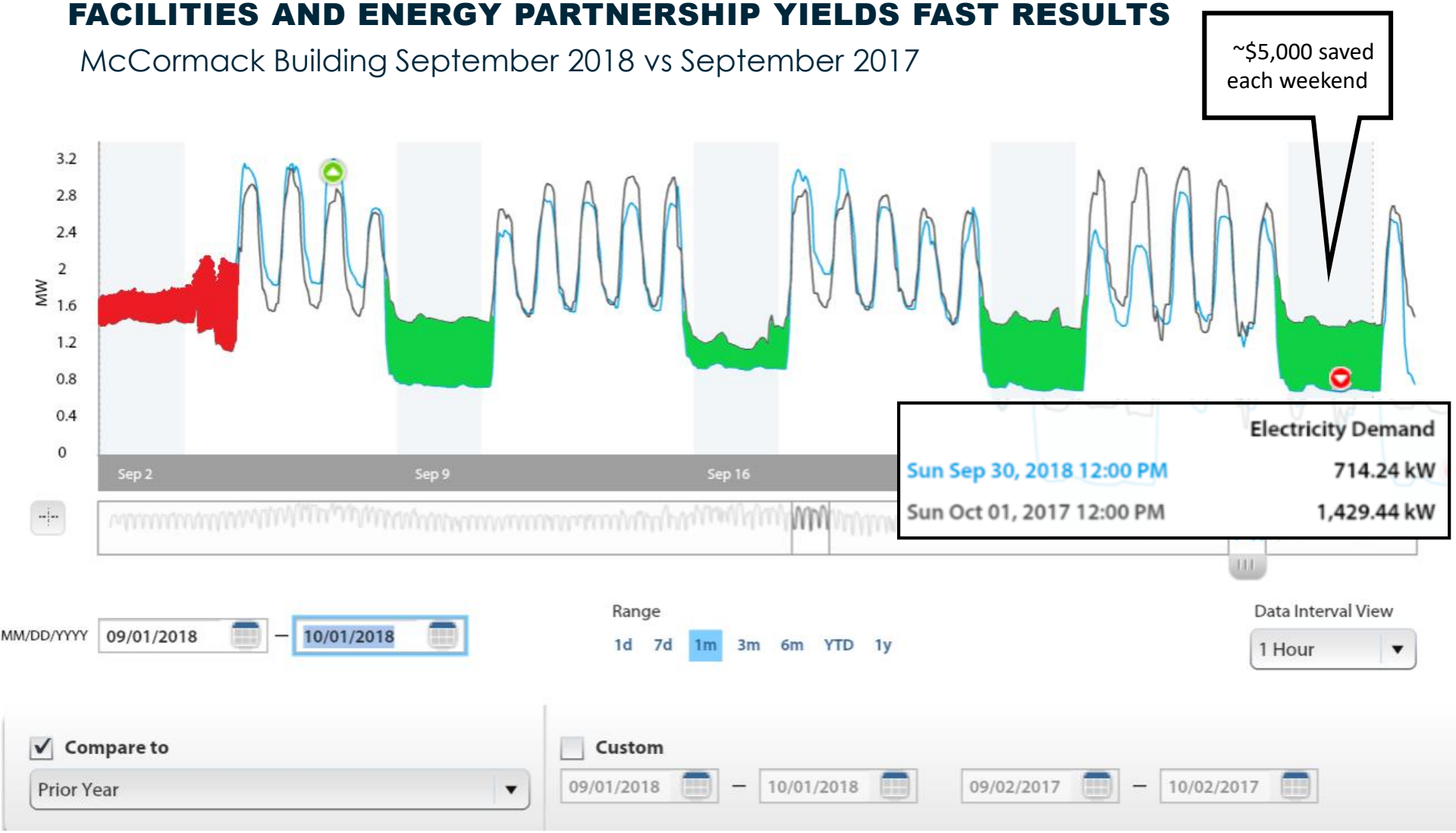
WHAT'S NEXT FOR THE E TEAM?



Contact us at e-team.dcamm@mass.gov

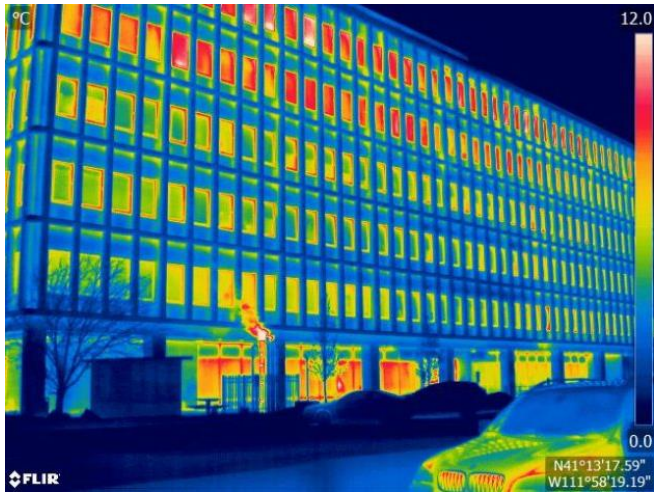
FACILITIES AND ENERGY PARTNERSHIP YIELDS FAST RESULTS

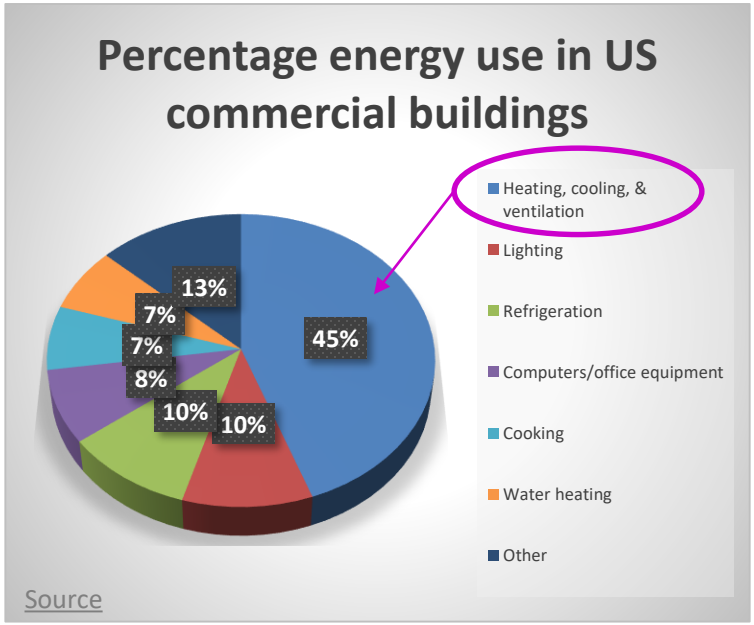
McCormack Building September 2018 vs September 2017



Spotlight on Envelope

- Range of envelope opportunities
  - Roof, windows, doors, leaks, basement
- HVAC accounts for approximately 30-45% of energy use in commercial buildings – directly tied to envelope performance
- Benefits of building envelope measures
  - Comfort, health, lower energy use, lower peak heating and cooling costs, etc.





Pushing the Envelope in New Construction

1. Zero Net Energy

Utilizes well-insulated and air-tight building envelopes along with solar PV, heat pumps, etc.

Division of Fisheries & Wildlife Headquarters

- Pre-fabricated insulated panels
- Triple glazed windows

2. Passive House

Emphasizes very efficient and tight envelope to drive building loads down significantly and dramatically reduce HVAC needs

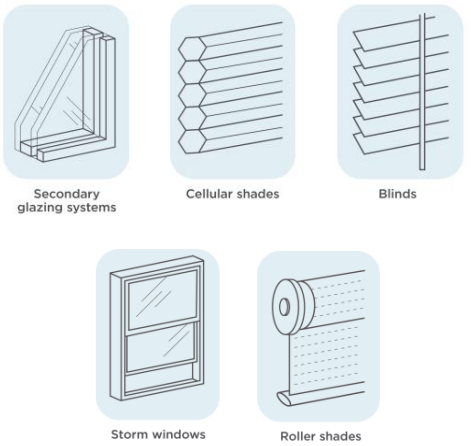
Distillery Apartment Building in Boston

- Triple pane windows
- Solid core doors
- Air-tight envelope
- Many middle units do not need any heat

Sources: Passive House Institute US, Passive House Institute, Pathways to Zero Net Energy Program, ZNEB Report

Envelope Retrofit Technology Solutions

- Examples of retrofit technologies include…
  - Micro-injection insulation foam
  - Double- and triple-paned window replacements
  - Window attachments
    - Films and glazing systems
    - Interior storm windows
    - Shades
  - Cool / warm roof coating
  - Air sealing (e.g. caulk, expanding foam, weather-stripping to reduce leaks around openings)
  - Increased ceiling insulation



See BBI and MassCEC for some additional technologies, information and case studies

Efficiency Discussion

- *What are some key challenges related to implementation of efficiency measures?*
- *What efficiency area(s) are you planning to focus on over the next 1-2 years?*
- *What would be most helpful in supporting your work to expand efficiency efforts?*
- *For those without real-time metering, are you implementing operational improvements? Are they successful?*

Meeting Impressions

- What parts of the meeting were effective and/or helpful?
- Which parts were not?
- Are there other efficiency topics you'd like to hear more about?
- Are there other topics you'd like to hear more about?

Supplemental Slides

EO 13693 and EO 13834 (Detailed)

EO 13693

- Establish new reduction targets for Scope 1, 2, and 3 GHG emissions
- Achieve energy net zero (and water or waste net zero, where feasible) by FY 2030 in all new construction of federal buildings greater than 5,000 gross square feet that enter the planning process in FY 2020 or later.
- Identify a percentage of existing buildings greater than 5,000 gross square feet that will be energy, waste or water net zero buildings by FY 2025.
- Achieve compliance with the revised *Guiding Principles* in 15 percent (or more) of existing buildings by FY 2025.
- Incorporate resilient design and management elements into all new construction, renovation, alteration and repair of agency buildings.
- Reduce potable water intensity by 2 percent annually through FY 2025 in comparison to an FY 2007 baseline.
- Install water meters and collect building water balance data.
- Reduce nonpotable water use 2 percent annually by FY 2025 compared to an FY 2010 baseline.
- Reduce GHG emissions per mile 30 percent by FY 2025, compared to an FY 2014 baseline.
- Promote sustainable commuting and work-related travel practices, including vehicle charging, telecommuting, teleconferencing, carpooling and public transportation.
- Incorporate resilient design and management elements into the operation, repair and renovation of existing buildings and design of new buildings.
- Purchase sustainable and environmentally preferable products and services identified by EPA or the U.S. Department of Energy.
- Divert at least 50 percent of non-hazardous solid waste annually.
- Divert at least 50 percent of non-hazardous construction and demolition debris.
- Utilize performance contracting as an important tool to help meet identified energy efficiency and management goals while deploying life-cycle cost-effective energy efficiency and clean energy technology and water conservation measures.
- Provide annual agency targets for performance contracting for energy savings.
- Ensure procurement preference for environmentally sustainable electronic products.
- Establish and implement policies to enable power management, duplex printing and other energy-efficient or environmentally sustainable features on electronic products.
- Dispose of all agency excess or surplus electronic products in an environmentally sound manner.
- Develop, implement and annually update an integrated Strategic Sustainability Performance Plan.

EO 13834

- Achieve and maintain annual reductions in building energy use and implement energy efficiency measures
- Meet statutory requirements relating to the consumption of renewable energy and electricity
- Reduce potable and non-potable water consumption, comply with stormwater management requirements;
- Utilize performance contracting to achieve energy, water, building modernization, and infrastructure goals;
- Ensure that new construction and major renovations conform to applicable building energy efficiency requirements and sustainable design principles; consider building efficiency when renewing or entering into leases; implement space utilization and optimization practices; and annually assess and report on building conformance to sustainability metrics;
- Implement waste prevention and recycling measures and comply with all Federal requirements with regard to solid, hazardous, and toxic waste management and disposal;
- Acquire, use, and dispose of products and services, including electronics, in accordance with statutory mandates for purchasing preference, Federal Acquisition Regulation requirements, and other applicable Federal procurement policies; and
- Track and, as required by section 7(b) of this order, report on energy management activities, performance improvements, cost reductions, greenhouse gas emissions, energy and water savings, and other appropriate performance measures.

Passive House EUI Example