

ZNE 2015 CHARRETTES

MAY 21, 2015

www.mass.gov/DCAMM/aep

<http://www.mass.gov/cea/leadingbyexample>



Division of Capital Asset Management and Maintenance

D · C · A · M · M



WELCOME & INTRODUCTIONS

Carol Gladstone, DCAMM 9:00am – 9:20am
Judith Judson, DOER

PURPOSE OF ZNE 2015 CHARRETTES

Hope Davis, DCAMM 9:20 am – 9:30am

COMMON UNDERSTANDING

- DOER Related Initiatives
- DCAMM New Construction & Existing Buildings
- Other policies and programs

9:30am – 10:30am
Eric Friedman, DOER *9:30am - 9:50am*
Jenna Ide, DCAMM *9:50am – 10:10am*
Kevin Bernier, Fort Hill *10:10am – 10:30am*

BREAK

VISIONING BREAK-OUT SESSION

Everyone 10:45am - 11:30pm

VISIONING REPORT OUT

11:30am - 12:15pm

LUNCH

12:15pm – 1:00pm

- Presentation on Bristol CC ZNE Lab

Sasaki & BR+A *12:30pm – 12:50pm*

ACTIONS BREAK-OUT SESSION

Everyone 1:00 pm – 2:00 pm

PRIORITY ACTIONS REPORT OUT

2:00 pm – 2:30 pm

WRAP UP

Team 2:30pm – 3:00 pm

Welcome & Introductions

Purpose:

1. Develop consensus of a vision for the future of state facilities in regard to energy and sustainability
2. Define actions needed to achieve this vision

Two charrettes - one in Eastern MA, and one in Western MA.

Participants will work together to answer:

What is our common vision for sustainability at state facilities?

1. What are our **long term clean energy goals**?
 - ZNE, high levels of LEED, etc.
 - Timeframe, practical and achievable
 - Where does it apply? (new construction, existing buildings, leased, etc.)
2. What **other sustainability elements** should be included?
 - Water, waste, resiliency, transportation, etc.

Participants will work together to answer:

1. What is needed throughout the facility lifecycle?

- New construction
- Existing buildings
- Operations and maintenance

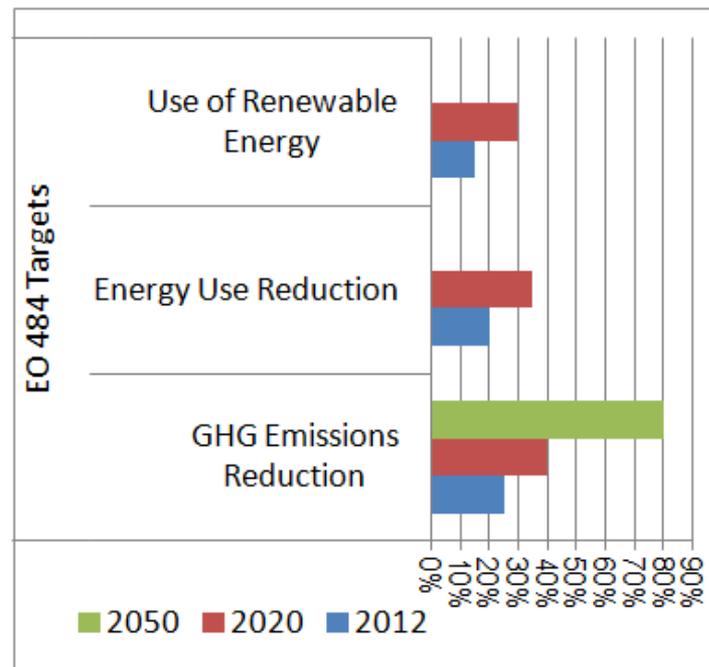
2. What actions should be considered?

- Policies (laws, E.O., etc.)
- Procedures
- Integrated long range planning
- Financing
- Innovations
- Training and professional development
- Post occupancy

Common Understanding Presentations

Leading by Example Overview

- **EO 484 2020 Targets**
 - 40% ghg emission reduction
 - 35% energy reduction
 - 30% use of renewable power
- **Mass LEED Plus New Construction standards**
 - Requires LEED certification
 - 20% better than code
 - Independent 3rd party commissioning
- **Partners**
 - state colleges & universities
 - agencies & authorities
 - across buildings and fleets



DER

Massachusetts Department
of Energy Resources

Leading by Example Progress

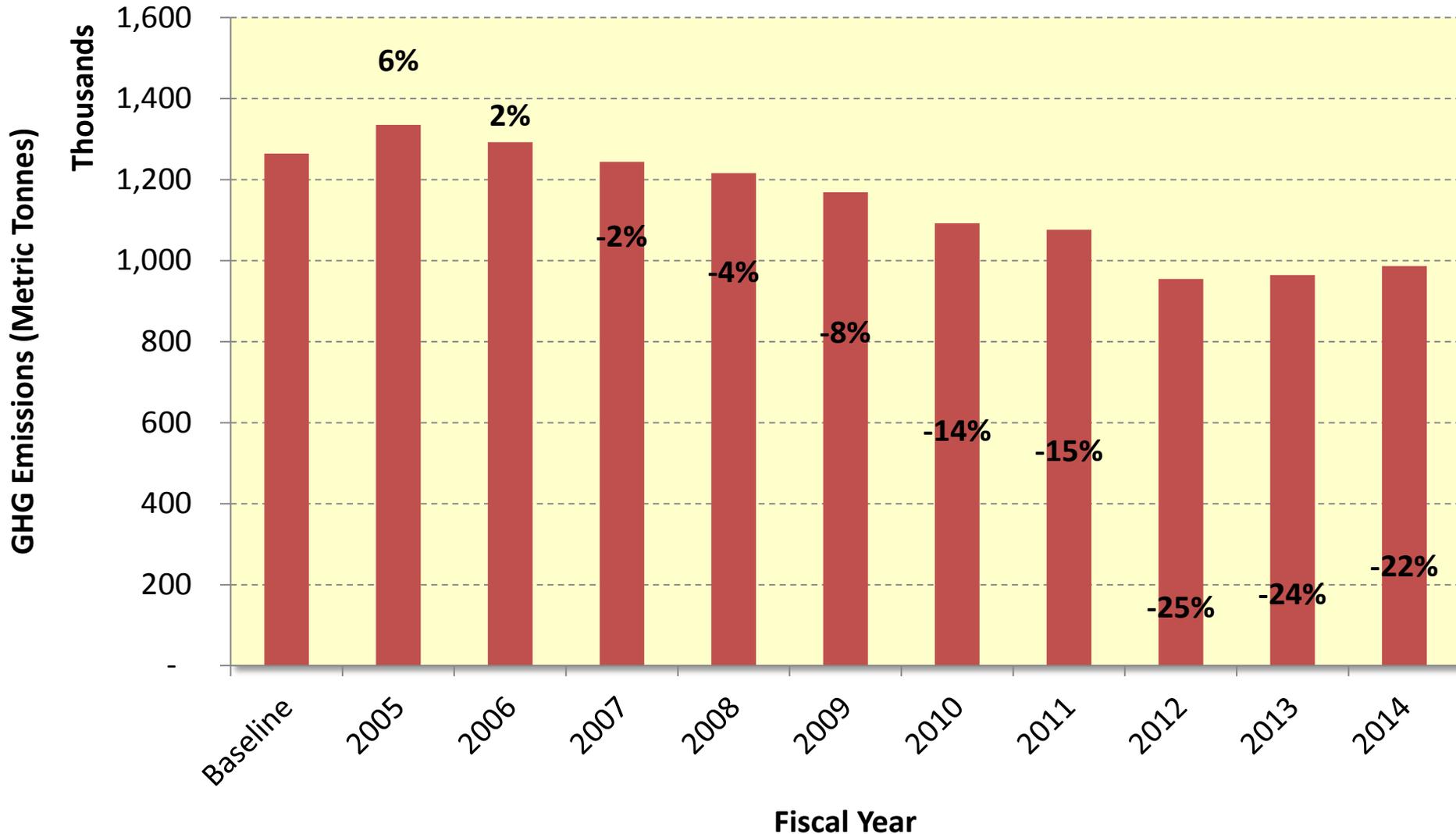
Creating A Cleaner Energy Future For the Commonwealth

DER

Massachusetts Department
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Met GHG Emissions Reduction target

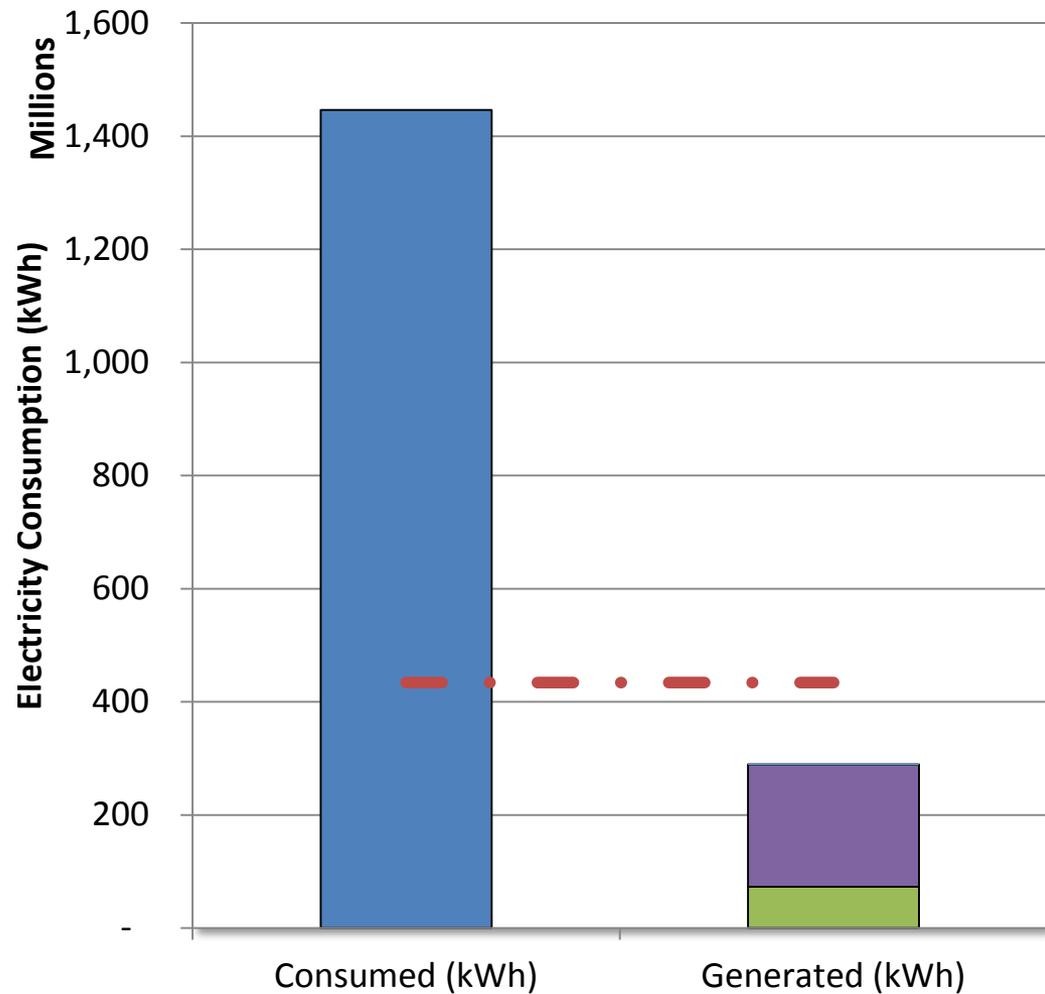
➤ 2012 GHG Emissions reduced by 25% from the LBE Baseline



Renewable Energy and On-site Generation

In 2013, 20% of state government's total electricity consumption came from on-site generation

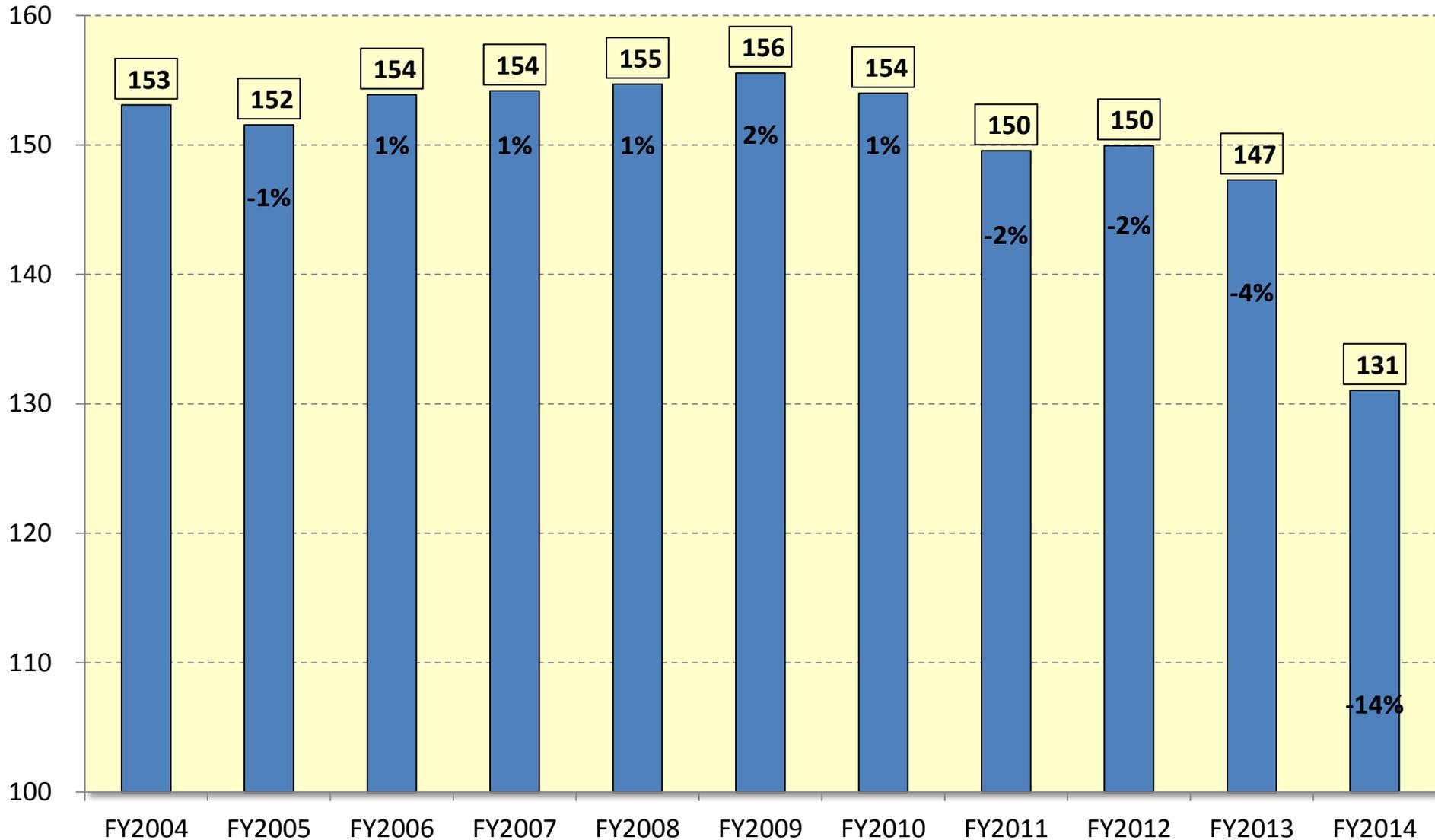
On-site generation from solar, wind, hydro, anaerobic digestion and NG CHP



- Renewable Energy Credits (additional)
- Total CHP generation
- Renewable Energy (Solar, Wind, AD, Hydro)
- total electricity consumption
- LBE RE Target for FY2020

Energy Reduction Progress

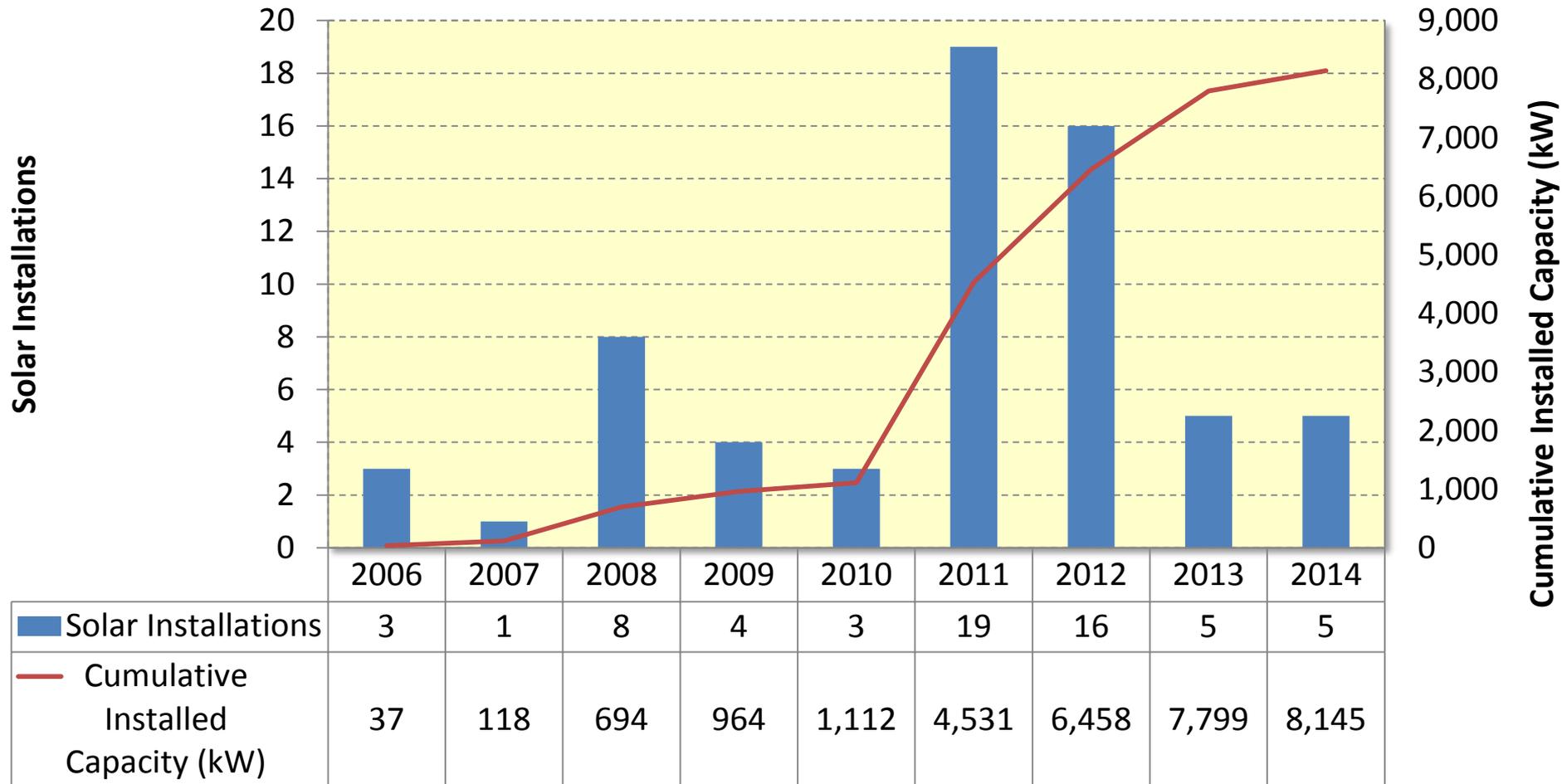
➤ 14% weather normalized EUI reduction 2004-2014



LBE Solar Progress

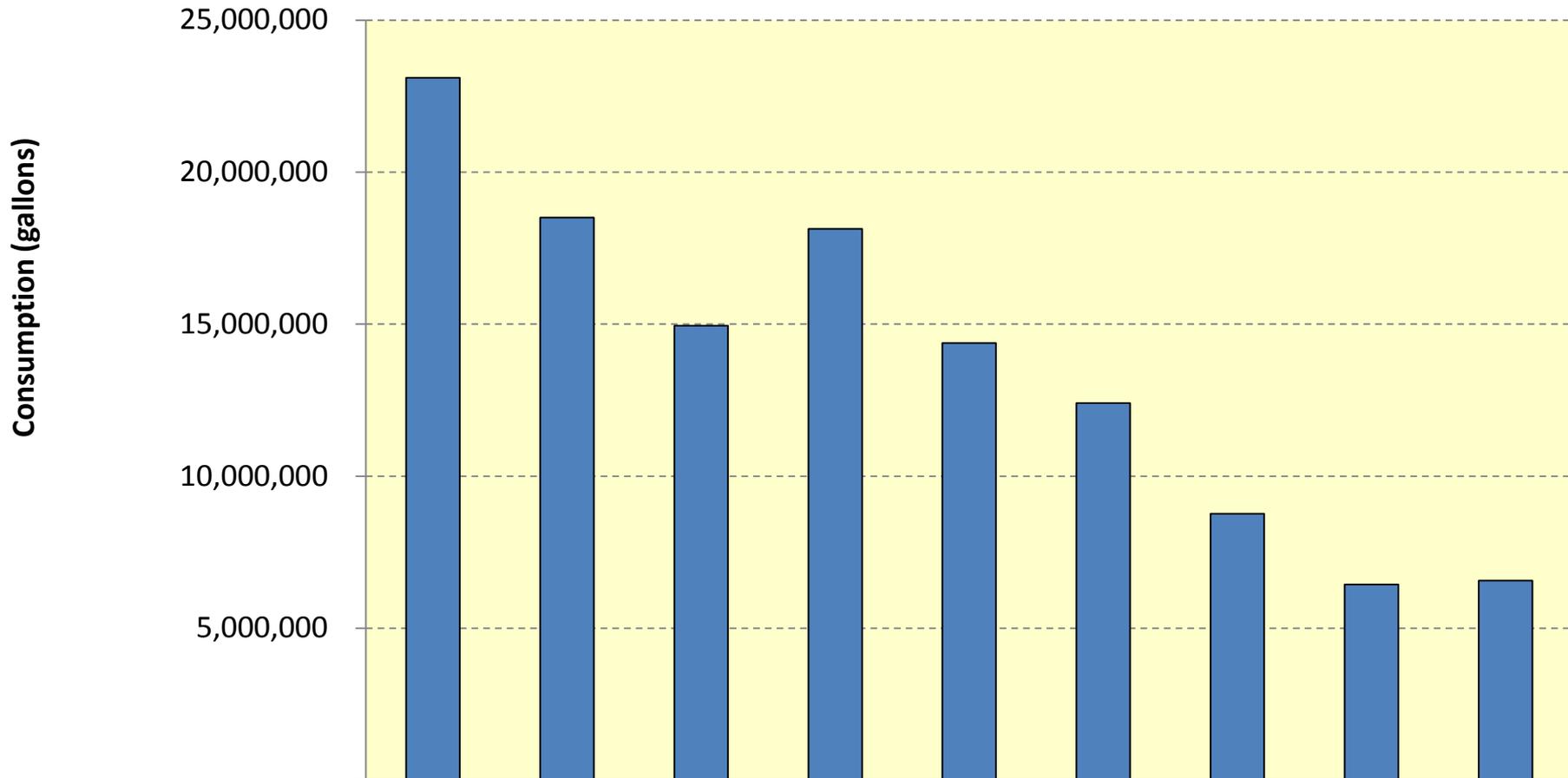
Over 8 MW of solar PV installed (up from <100 kW in 2006)
 additional 5+ MW to be online in 2015

Solar PV installations FY06-FY14



LBE Heating Oil Reduction Progress

Heating Oil Consumption from FY06 to FY14

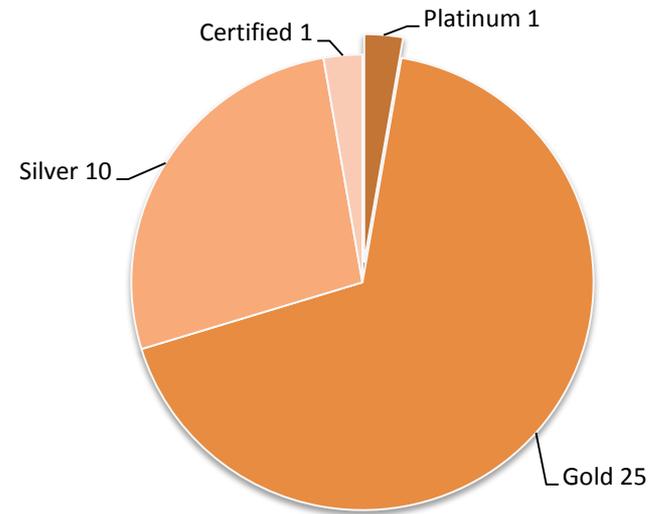


■ Total Gallons of Heating Oil	23,103,9	18,504,6	14,949,7	18,131,5	14,377,9	12,402,7	8,763,80	6,438,64	6,563,17
% Change from FY06	0%	-20%	-35%	-22%	-38%	-46%	-62%	-72%	-72%

Fiscal Year

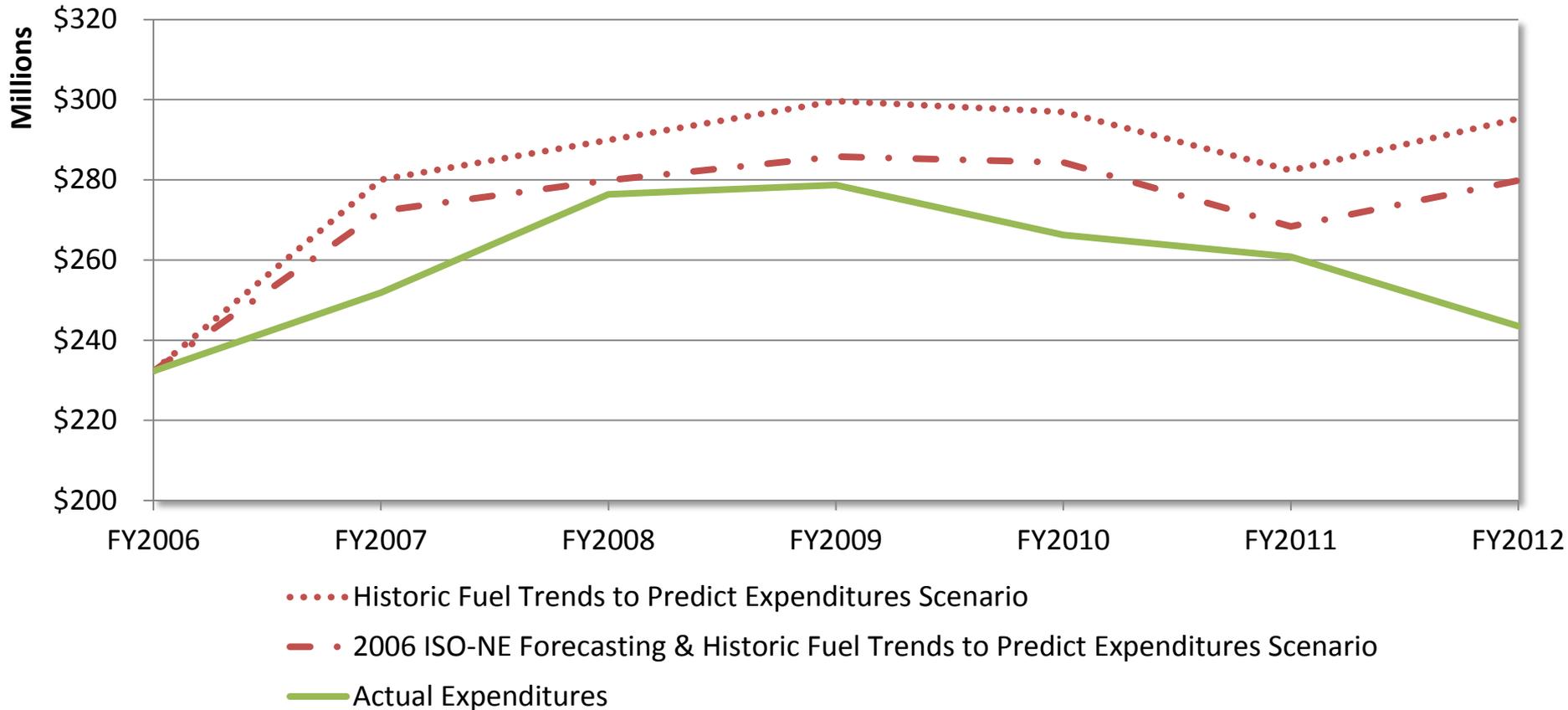
LBE New Construction Progress

- 37 LEED certified buildings
- 2 zero net energy designed buildings constructed
- Other ZNEBS in design and construction



LBE Avoided Costs

Actual Energy Cost vs Business as Usual from LBE Baseline-FY12



**Avoided costs of \$93+ million
2006-2012**



Massachusetts Department
of Energy Resources

Progress Report

Released Fall 2014



www.mass.gov/eea/leadingbyexample

Creating A Cleaner Energy Future For the Commonwealth

DER
Massachusetts Department
of Energy Resources

Moving Forward

Creating A Cleaner Energy Future For the Commonwealth



Massachusetts Department
of Energy Resources

Building Energy Intelligence

Targets

- New contract in development with DCAMM
- Continue to reduce energy use/costs using data
- New approaches planned that result in value at lower costs
- Target real time meter data, BMS information to drive results



Solar Canopies

- Install multi- MW of new capacity at diverse range of state sites
- Reduce costs and emissions
- Shelter cars, reduce auto fuel use, reduce lot maintenance costs



Fleet Fuel Efficiency



- Draft fuel efficiency standards
- Minimum MPG for cars and trucks/vans
- Minimum electric vehicle requirements
- Minimum AFV/hybrid requirements

Renewable Thermal

- Initiate feasibility studies to target institutions using significant amounts of oil
- Continue to work with smaller sites to expand use of thermal technologies
- Biomass, heat pumps, solar thermal, CHP all eligible
- Must meet efficiency and emissions criteria



Pathway to Zero

Funding & Eligibility Overview

1. \$3.0M to support residential and commercial ZNEB projects through feasibility studies, integrated design, and construction funding.
 - \$30k feasibility studies
 - \$50k integrated design
 - \$10k - \$500k construction funding
2. \$0.5M to support public awareness, workforce development, efforts to develop and standardize best practices, and DOER resources.

Proposals & Awards

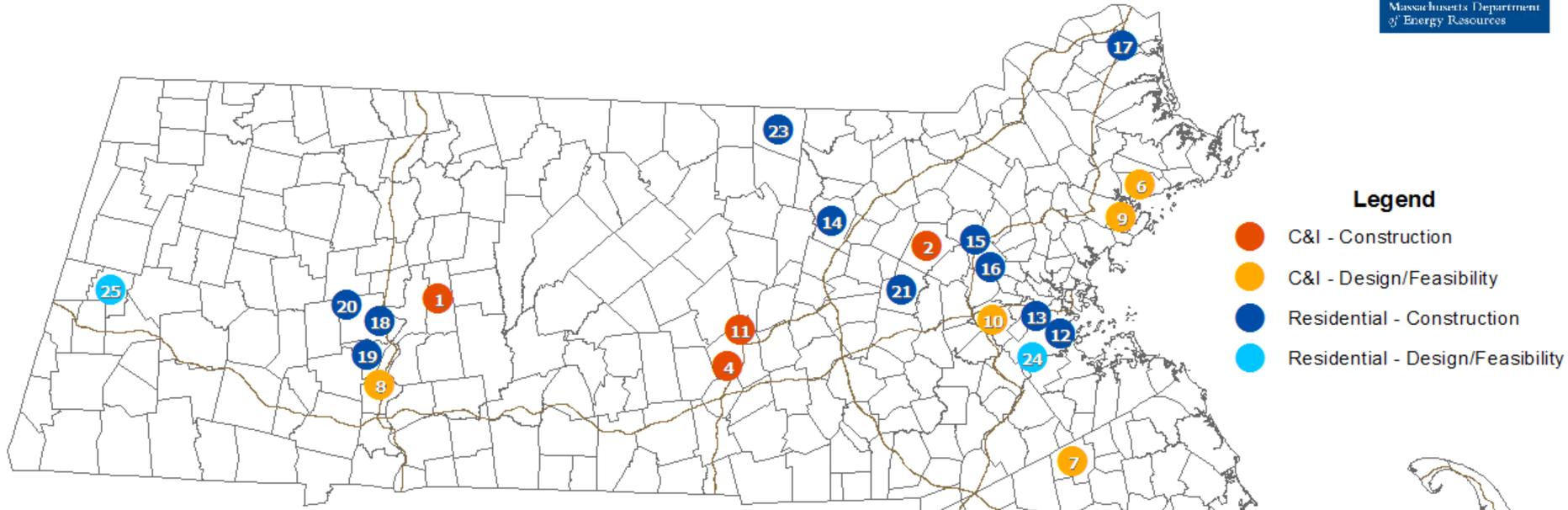
Applications (42 totaling \$7.6 million)

Awards (25 totaling \$3.0 million)

- C&I: 11 projects – \$1,462,894 (~1 million sq ft)
- Multi Family: 9 projects – \$1,312,000 (243 units)
- Single Family: 5 projects – \$180,000 (21 homes)



Pathways to Zero Grant Program



Legend

- C&I - Construction
- C&I - Design/Feasibility
- Residential - Construction
- Residential - Design/Feasibility

ID	Location	Amount	Building Type	Project Name & Applicant
1	Amherst	\$ 330,000	Commercial & Institutional	Hitchcock Center for the Environment
2	Concord	\$ 130,850	Commercial & Institutional	Walden Pond Visitors Center MA DCR
3	Fall River	\$ 408,394	Commercial & Institutional	Bristol Community College Technology & Learning Center
4	Worcester	\$ 350,000	Commercial & Institutional	Clark University Main Street Development
5	West Barnstable	\$ 30,000	Commercial & Institutional	Cape Cod Community College Science Innovation Center (Payette)
6	Beverly	\$ 24,500	Commercial & Institutional	Endicott Zero Net Energy Residence Hall
7	Brockton	\$ 30,000	Commercial & Institutional	Massasoit Community College Health & Science Building (Payette)
8	Holyoke	\$ 30,000	Commercial & Institutional	DCAMM Holyoke Community College 1970s Concrete Building
9	Salem	\$ 30,000	Commercial & Institutional	Salem State University Meier Hall Science Lab (Payette)
10	Newton	\$ 50,000	Commercial & Institutional	City of Newton - Zervas Elementary School
11	Worcester	\$ 50,000	Commercial & Institutional	City of Worcester - Nelson Place Elementary
12	Roxbury	\$ 40,000	Residential - Multi-Family	Boston Energy Positive Highland Street (Transformations Inc)
13	Mission Hill	\$ 388,000	Residential - Multi-Family	Boston Energy Positive Terrace St. Project (Sebastian Mariscal Studio)
14	Harvard	\$ 160,000	Residential - Multi-Family	Pine Hill Village (Transformations Inc)
15	Lexington	\$ 30,000	Residential - Multi-Family	LexHAB Fairview Avenue (Transformations Inc)
16	Lexington	\$ 52,000	Residential - Multi-Family	LexHAB Lowell Street (Transformations Inc)
17	Newburyport	\$ 426,000	Residential - Multi-Family	Hillside Center for Sustainable Living (Hall and Moskow)
18	Northampton	\$ 136,000	Residential - Multi-Family	Northampton EcoVillage Duplex Homes (Transformations Inc)
19	Easthampton	\$ 24,000	Residential - Single Family	Pioneer Valley Habitat For Humanity - East Street Initiative
20	Northampton	\$ 20,000	Residential - Single Family	Laurel Street (Transformations Inc)
21	Sudbury	\$ 30,000	Residential - Single Family	Sudbury Housing Trust (Transformations Inc)
22	Vineyard Haven	\$ 12,000	Residential - Single Family	Martha's Vineyard Holland Passive House
23	Townsend	\$ 94,000	Residential - Single Family	Coppersmith Way Development (Transformations Inc)
24	Dorchester	\$ 30,000	Residential - Multi-Family	Codman Sq. Neighborhood Development Corp - Church Lots Project
25	Lenox	\$ 50,000	Residential - Multi-Family	Sawmill Brook (Transformations Inc)

Ex1 - Walden Pond Visitor Center (Concord)



Ex2 – Bristol Community College (Fall River)



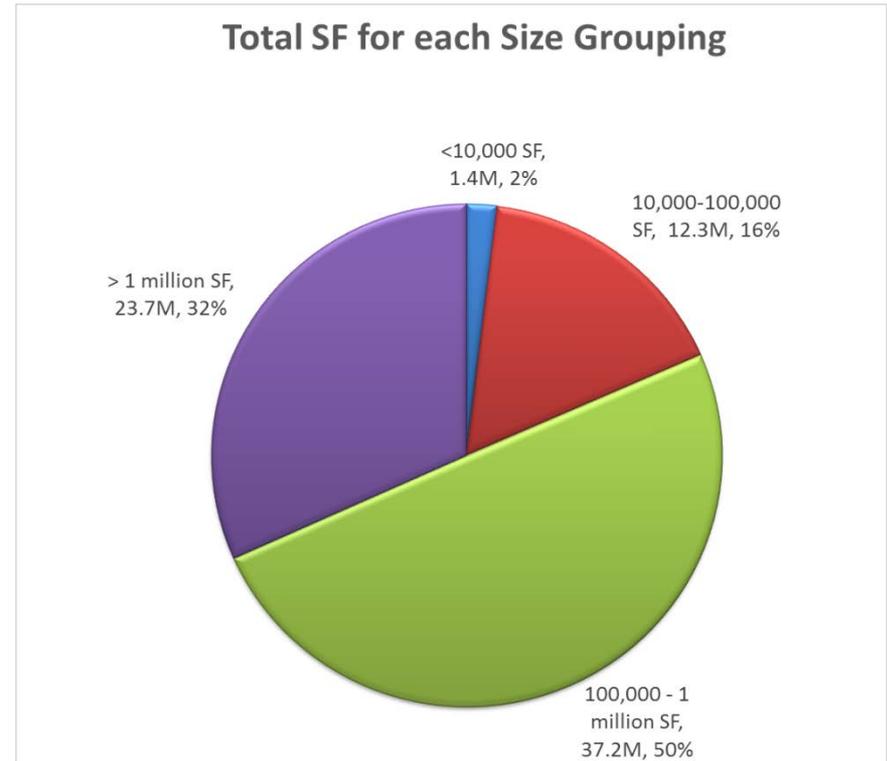
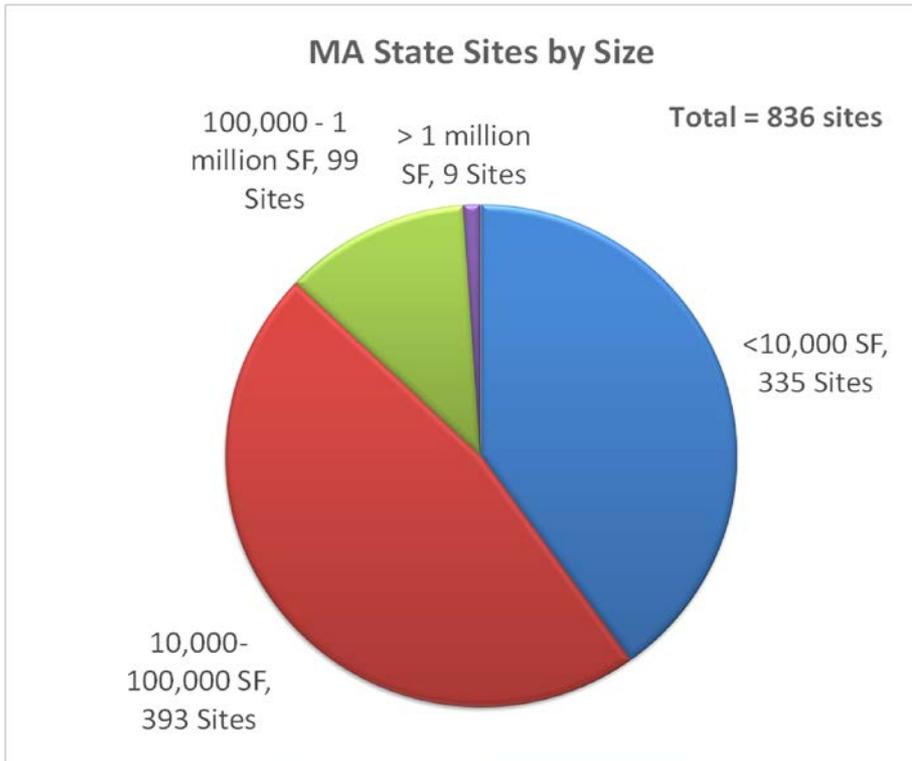
DOER

Massachusetts Department
of Energy Resources

DCAMM

- **New construction**
- **Existing buildings**
- **Operations & maintenance**

Jenna Ide, DCAMM

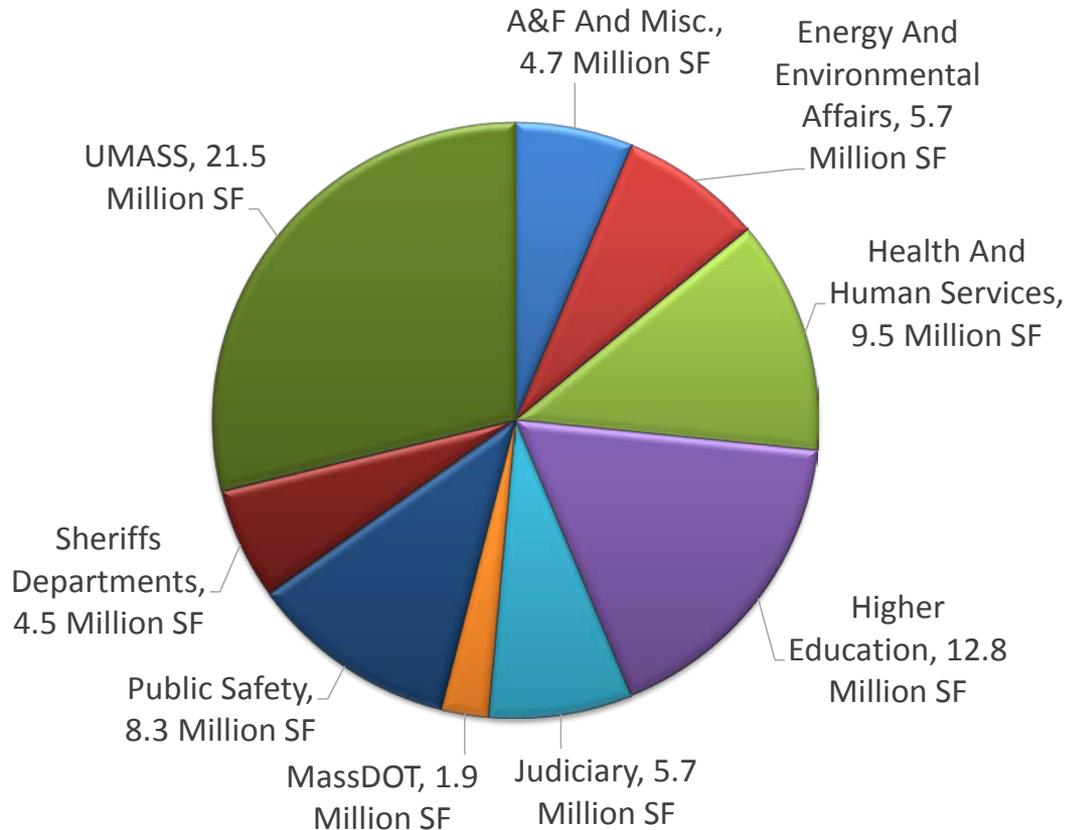


Commonwealth's facilities portfolio:

- 80 million gross square feet of space
- Over 6300 structures on 276 campuses containing multiple buildings
- Located on over 13,000 real estate parcels

Estimated annual energy costs of \$240 million

Square Footage by Program Area



Zero Net Energy Buildings



Division of Fisheries and Wildlife HQ
Westborough, MA



**North Shore Community College Health
and Student Services Building**
Danvers, MA

Not shown in design/construction (Lowell Trial Court, Bristol CC)

Going Deeper

- All new HE facilities have a goal of LEED silver
 - Most projects certifying LEED Gold
- Several new projects targeting higher than 20% above code
- Envelope commissioning
- Energy dashboards in development for UMass Amherst and UMass Boston
 - See link to dashboard - <http://bedashboard.com/kiosk/home/campus/46>
- Measurement & verification implemented on UMass Amherst projects



Electrical and Lighting Design

Objectives:
To reduce overall energy use and lighting power density by implementing efficient lighting design and centralized lighting control systems to reduce the watts per square foot to 15% below the Massachusetts State Building Code in all areas of the building.

Methods used at LSL:

- **High Efficiency Light Fixtures** (direct and indirect fixtures) provide good ambient light without glare, and are strategically placed to illuminate only the intended object, reducing overall light pollution.
- **Occupancy Sensor Lighting Controls** turn off lights automatically when rooms or areas are vacated.
- **Dimming and Staged Type Ballasts** have daylighting controls that detect the quantity of daylight entering the building and adjust artificial light accordingly, by limiting the amount of electrical current either in steps (staged) or progressively (dimming.) Daylight control is incorporated throughout the perimeter zones and minimizes artificial lighting when natural daylight is available.
- Light shelves along the west windows allow **deep penetration of indirect daylight** into the building by reflecting light onto the ceiling, floors and background spaces.

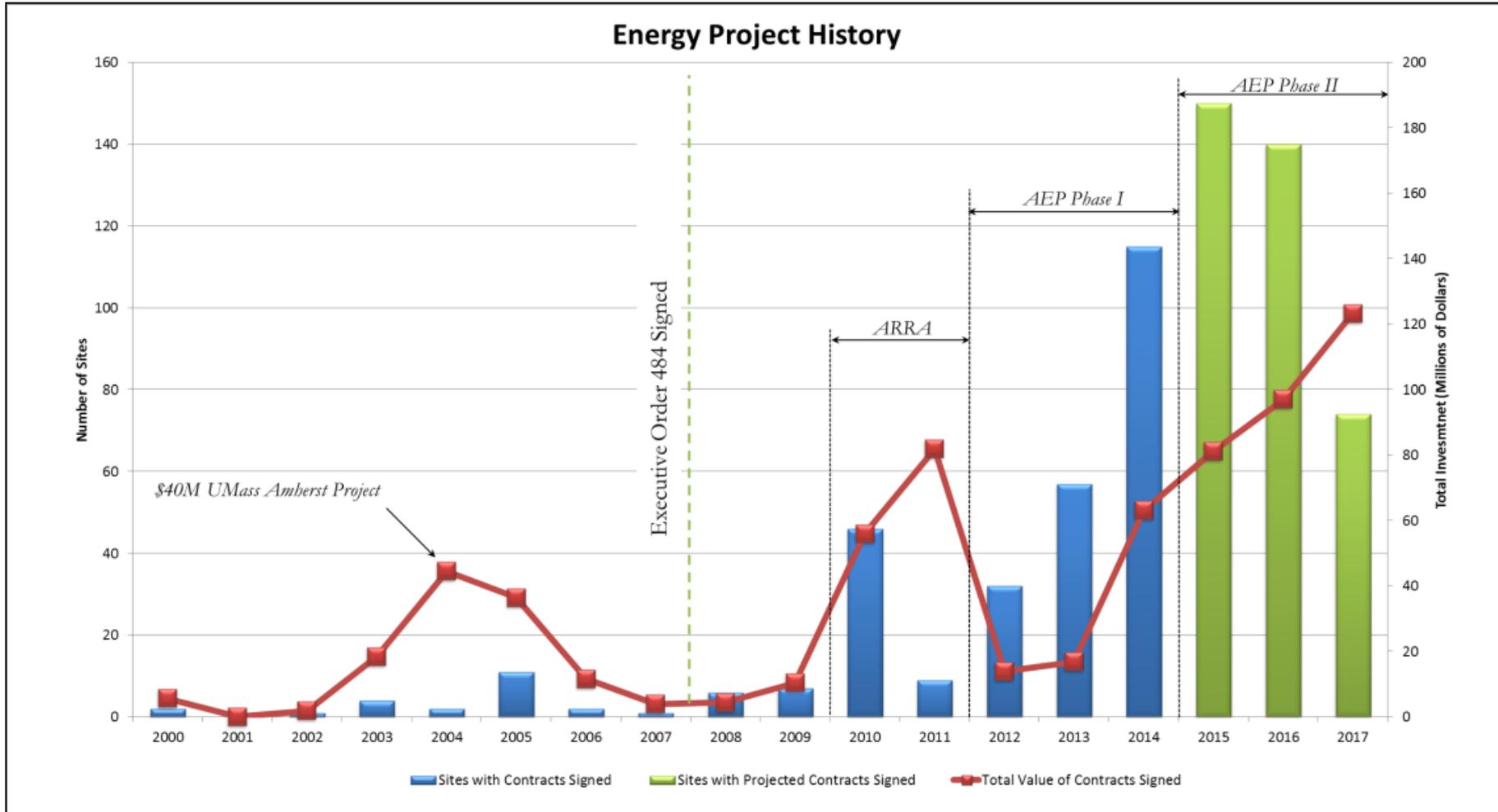
Click Green Education Button to See More

Lessons

- Coordination of innovative technologies harder than thought (i.e. GSHP, solar, etc.)
- Commissioning requires planning, strong collaboration & adequate funding
- New buildings not always operating as designed; some operating better than designed
- Confusion over current EO 484 requirements and energy modeling
- Need to provide greater clarity to designers over what is in scope of services



Tremendous acceleration of DCAMM's energy retrofit program



TZNE 2013 Retrofit Charrette

74 participants across multiple disciplines



**TZNE Retrofit Report
Includes Just Do Its
("JDIs")**

TZNE Pilot Sites

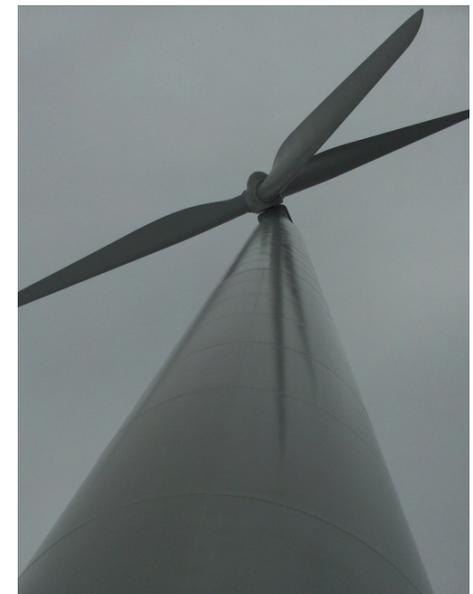
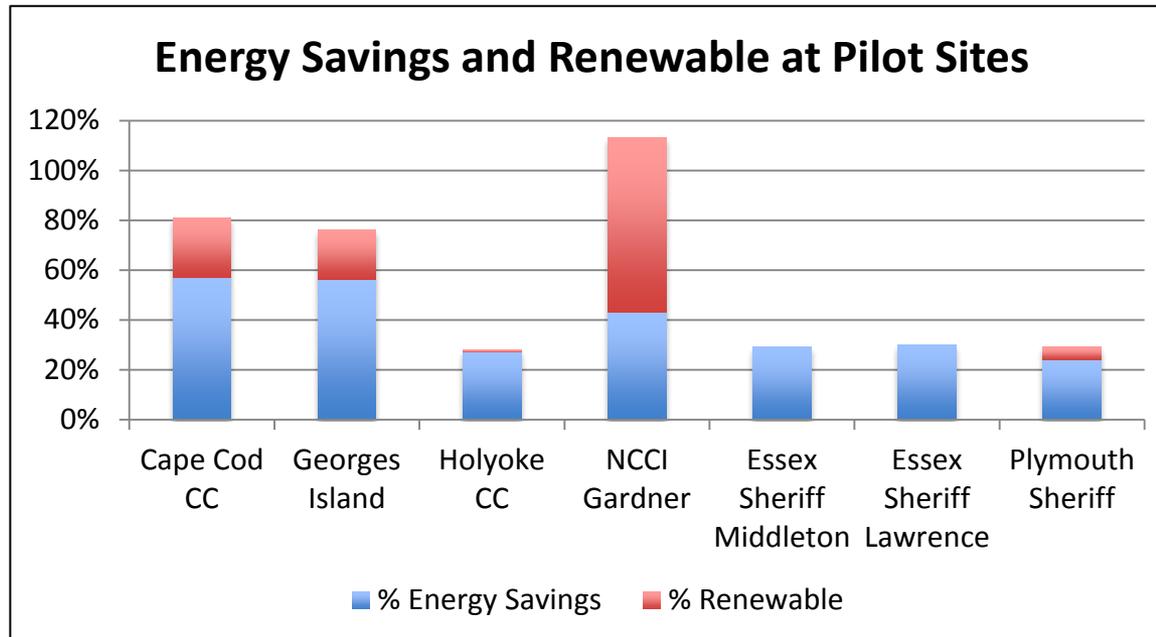
1. Cape Cod Community College
2. Holyoke Community College
3. Greenfield Community College
4. Plymouth Country Correctional
5. Essex Sheriff's Department
(Lawrence and Middleton)
6. DCR Georges Island
7. Lancaster Complex
8. North Central Correctional Institute
9. Soldiers' Home Chelsea

"Just Do It" Actions

1. Assign The Right Team
(Right Team and Right Size)
2. Define ZNE Goals and Align with
Existing Conditions
3. Get Buy In At ALL levels
4. Establish Integrated Processes
5. Incorporate Innovative Solutions
6. Right Timing of Retrofits
(with Deferred Maintenance)
7. Manage Post-Project Operations

Progress

- Significant number of innovative and deep energy measures
- Several projects identifying 40-85% energy reduction
- Leverage grid operator programs to get higher savings
- Towards Zero Net Energy (TZNE) template SOW for designers



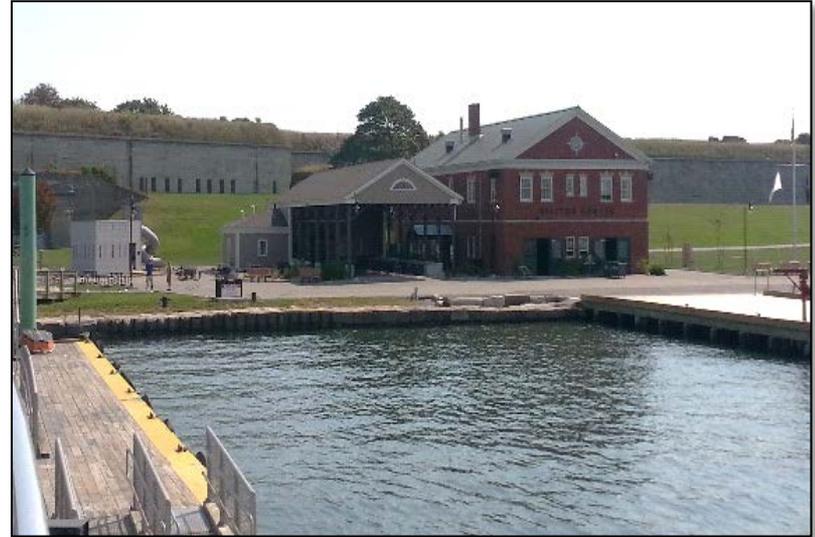
Progress

- Occupant Engagement:
 - Developed an interactive Sustainability Dashboard at Holyoke CC
 - Facebook pages, outreach kits, student involvement
- Post-Construction
 - 87% of sq. ft. of utility accounts mapped to sites
 - Pilot M&V of NCCI Gardner – more to follow
- Training and maintenance included in all projects



Lessons Learned

- Paradigm shift between energy retrofit projects and TZNE programs
- Getting right team is different for every project
- Just Do Its are not things one can always just do
- Can't do it all at once - phasing



Opportunities Going Forward

- Further integrate team processes
 - Retrofit projects (E-Team)
 - New construction projects (OPDC)
 - DOER and facility related programs
- Find and standardize best practices
- Update financial payback approach - LCCA to include more robust model of savings
- Overcome financial barriers and barriers to onsite renewables
- More operations and maintenance training for facility personnel on increasingly sophisticated systems



EO 543 [Implementing IFM in the Commonwealth]

The Integrated Facilities Management (IFM) initiative improves the management of state-owned facilities using a collaborative, shared services model.

- Signed in July 2012
- Directs a **shared services approach**
- Drives **greater customer satisfaction** (client agencies & public)
- Requires all Agencies to **use a common technology** for real estate information services, and to maintain and update this technology with current and accurate information



Facility Management and Maintenance Standards (FMMS)

Benchmark for management

- Proposed baseline standards for all state-owned facilities
- Represent current best practices

Some relevant standards

- Grounds and Landscape Maintenance
- Solid Waste Management
- Emergency Management
- **Energy Management and Sustainability**



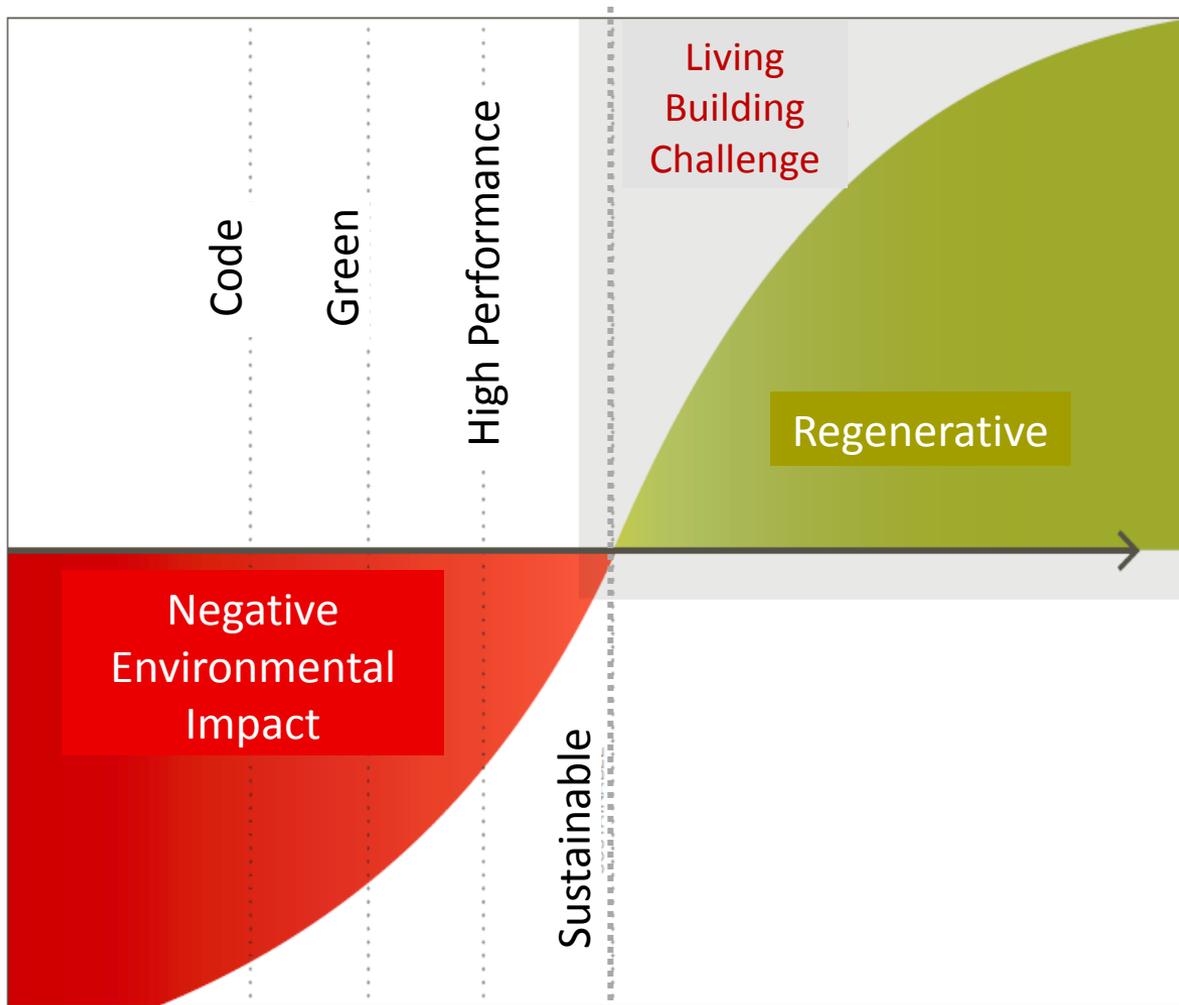
- Implement **Grounds and Landscape programs** that encourage native species, water conservation
- Use **Environmentally Preferable Products** wherever possible
- Comply with **Waste Bans** – construction, wood, recyclable materials, & now food
- Ensure all equipment and appliances comply with **ENERGY STAR**
- Review and utilize **real-time energy data**, if available
- Enroll in, and meet requirements for participation in the ISO New England (ISO-NE) **Demand Response Program**



Other Policies and Programs

Kevin Bernier, Fort Hill Companies

VISION: Path to a Regenerative Future.



Transformational

Advanced measure of sustainability

- 7 petals
- 20 imperatives such as:
 - Net positive energy*
 - Net positive water
 - Car free living
 - Biophilia

**separate certification available for Net Zero Energy*

Architecture 2030 Challenge (issued in 2007)



VISION: Rapidly transform the built environment from the major contributor of GHG emissions to a central part of the solution to the climate crisis.

NEW CONSTRUCTION

- Designed to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 70% below the regional (or country) average/median for building type.

EXISTING BUILDINGS

- An equal amount of existing building area renovated annually to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 70% of the regional (or country) average/median for building type.

FOSSIL FUEL REDUCTION STANDARDS (for all new buildings and major renovations)

- 80% in 2020
- 90% in 2025
- **CARBON-NEUTRAL IN 2030** (*using no fossil fuel GHG emitting energy*)



VISION: Zero Net Energy

NEW CONSTRUCTION

100% of new residential construction will be ZNE *or equivalent to ZNE* by 2020

100% of new commercial construction will be ZNE *or equivalent to ZNE* by 2030

EXISTING BUILDINGS

50% of existing buildings will be equivalent to ZNE buildings by 2030



Comprehensive Building Solutions

- Utility financial incentives
- Plug-in controls
- Lighting revolution



VISION:

Reduce GHG emissions by 40% over next decade

(Scope 1, 2 & 3)



PRIORITIES

- Reduce EUI by 2.5% annually between 2015-2025
- Increase renewable electric energy to 30%
- Reduce potable water consumption by 36%

Net Zero Energy New Construction (by 2030)

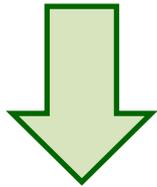
- where feasible, Net Zero Water or Waste

Existing Buildings (by 2025)

- 15% SQFT comply with revised Guiding Principles
- % be NZE, Water or Waste



VISION: Achieve **net zero emissions** from buildings in Cambridge.



ACTION PLAN:

Achieve **70% reduction in annual emissions in 25 years (2040).**

ENERGY EFFICIENCY IN EXISTING BUILDINGS

Reduce energy use in buildings through retrofits and improved operations

NET ZERO NEW CONSTRUCTION

Require low carbon new construction

RENEWABLE ENERGY SUPPLY

Replace fossil fuels with low carbon energy

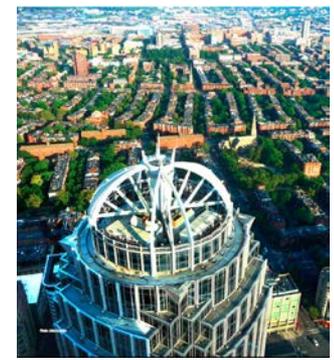
LOCAL CARBON FUND

Options to invest in a net zero community

ENGAGEMENT AND CAPACITY BUILDING

Industry training and community involvement

Resiliency is defined as the ability to recover from or adjust easily to misfortune or change.



stronger buildings



essential safety



backup power



better planning



Current Activities

A number of agencies are partnering to share resources, plan and implement solutions to climate adaptation challenges across the Commonwealth.

2008

- Global Warming Solutions Act enacted

2011

- Climate change Adaptation Committee releases report highlighting necessary steps to integrate adaptation planning

2013

- MEMA and DCR partner to update State Hazard Mitigation Plan

2014

- DCAMM establishes resilience workgroup and begins discussions with MEMA

2015

- DCAMM and MEMA are exploring a partnership to assess, prioritize and implement projects at agency facilities using DCAMM House Doctors.

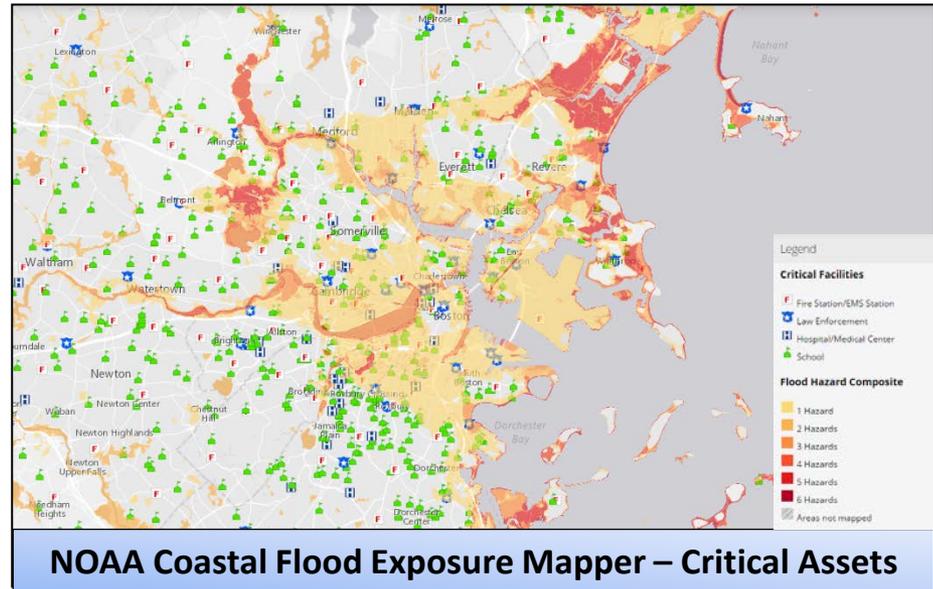


Image: Charles Krupa/Associated Press



Image: Washington Post

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Purpose

1. Refine and prioritize actions needed to achieve this vision
2. Develop a roadmap to achieve vision

- How do we organize the actions defined in these Phase I Charrettes?
- How do we achieve the vision?
- Are the right people engaged, or are others needed?
- How do we address barriers?
- How do we measure success?

- What worked today?
- What would you improve?
- What are your key takeaways?

- Survey – from Eventbrite

Please provide feedback

- Next Visioning charrette in Greenfield, June 11th

Contact Stephen White to participate

- July Working charrette

Contact Stephen White if interested

- Will post presentation to website

THANK YOU!