

Leading by Example Executive Order 594

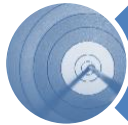
New Construction and Existing Facilities

June 10, 2021

LBE Executive Order 594



- ❖ Signed by Governor Baker on Earth Day
- ❖ Effective date: July 1, 2021
- ❖ Supersedes LBE Executive Order 484



Interim and long-term targets



New construction standard



Decarbonization of existing buildings



Fleet electrification and EV charging



Renewables, other sustainability directives, and more

State Entities Covered by EO 594

EO 594 applies to all “**executive branch agencies and all public institutions of higher education.**”

Section 5: Vehicle Efficiency and Fossil Fuel Reduction requirements “**apply to all vehicles owned or leased and operated by agencies subject to this Order, as well as to all non-revenue vehicles under the jurisdiction of the MBTA.**”



Key Elements of EO 594



- ☐ GHG goals specifically for fossil fuel emissions
- ☐ EV goals and acquisition requirements
- ☐ Mass. LEED Plus 2.0 for new construction
- ☐ Existing building decarbonization focus
- ☐ Emissions in capital and master plans
- ☐ Minimum biofuel requirements
- ☐ Deployment of new renewable resources
- ☐ Energy storage, and resilience planning
- ☐ Other sustainability strategies

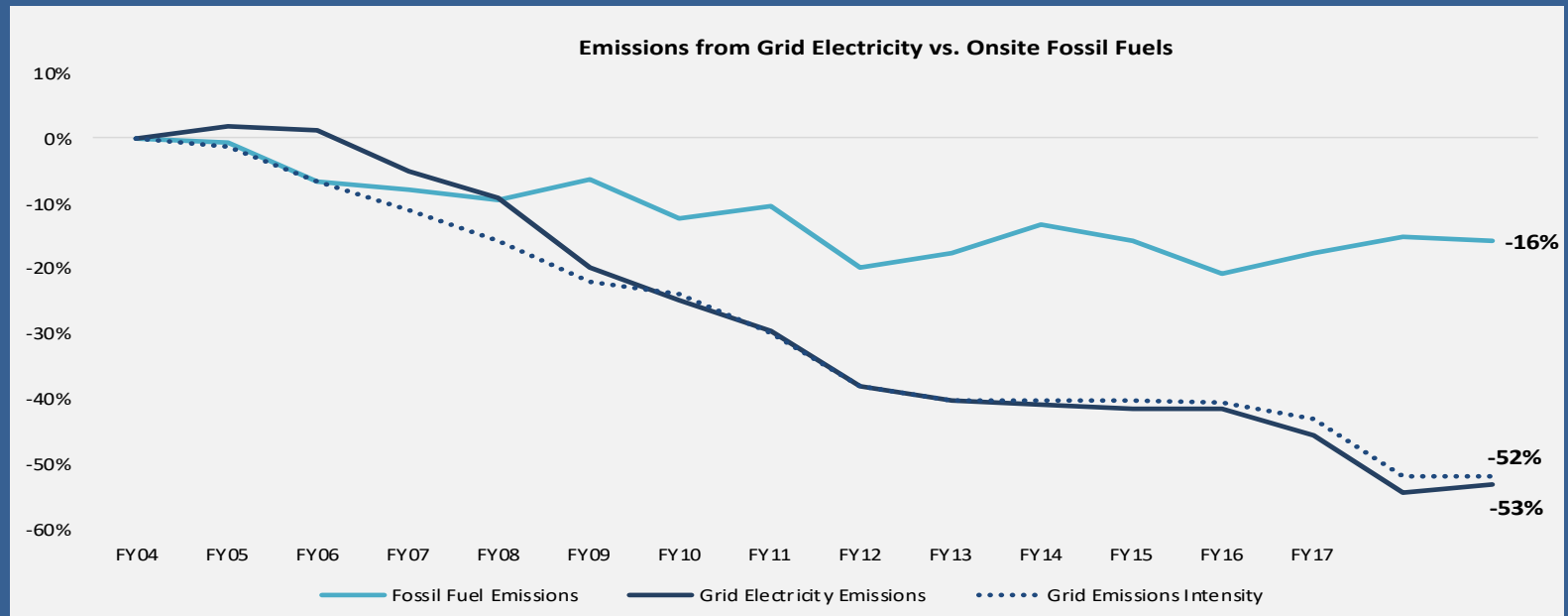


Summary of EO 594 Targets

Objective	2025	2030	2040	2050
↓ emissions from onsite fossil fuels	-20%	-35%	-60%	-95%
% of state fleet as zero-emission	5%	20%	75%	100%
↓ fuel oil consumption	-90%	-95%	TBD	TBD
↓ site Energy Use Intensity (EUI)	-20%	-25%	TBD	TBD
total # of EV charging stations	350	500	TBD	TBD

Focus on Fossil Fuel Emissions

- ❖ 75% of current state government emissions reductions can be attributed to changes in the grid emissions intensity
- ❖ Fossil fuel emissions are most challenging to address, under the direct control of state action, and constitute the majority (and growing) portion of emissions within the state portfolio



A Challenging LBE Portfolio

Targets largely set to ramp-up over time with significantly more progress expected post-2030

GHG Emissions	Large facilities, central power plants complex distribution systems, 24/7 operations, variable building age, lots of newer equipment
Zero Emission Vehicles	State fleet mostly comprised of pickup trucks and vans with slow vehicle turnover
Planning	Long-term horizon for budget and capital planning

Guidelines for State Buildings

- Executive Order 594 directs LBE and DCAMM to create guidance
- Expect to post draft new construction guideline for stakeholder comments in coming weeks
- Existing buildings guideline tentatively slated to be released in early fall

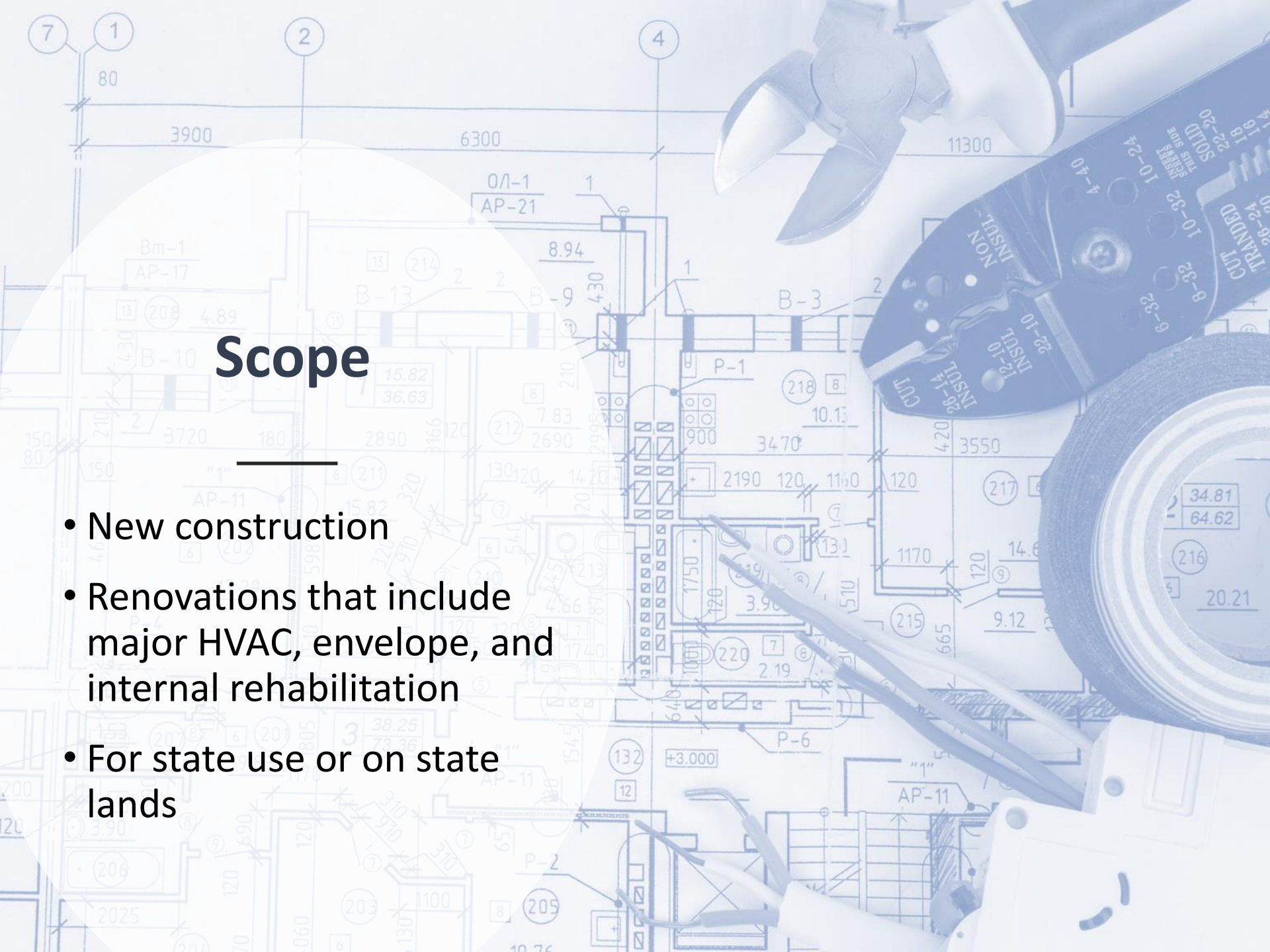


DRAFT Preliminary
considerations/guidance

Massachusetts LEED Plus 2.0 Standard

New Construction and Substantial Renovations





Scope

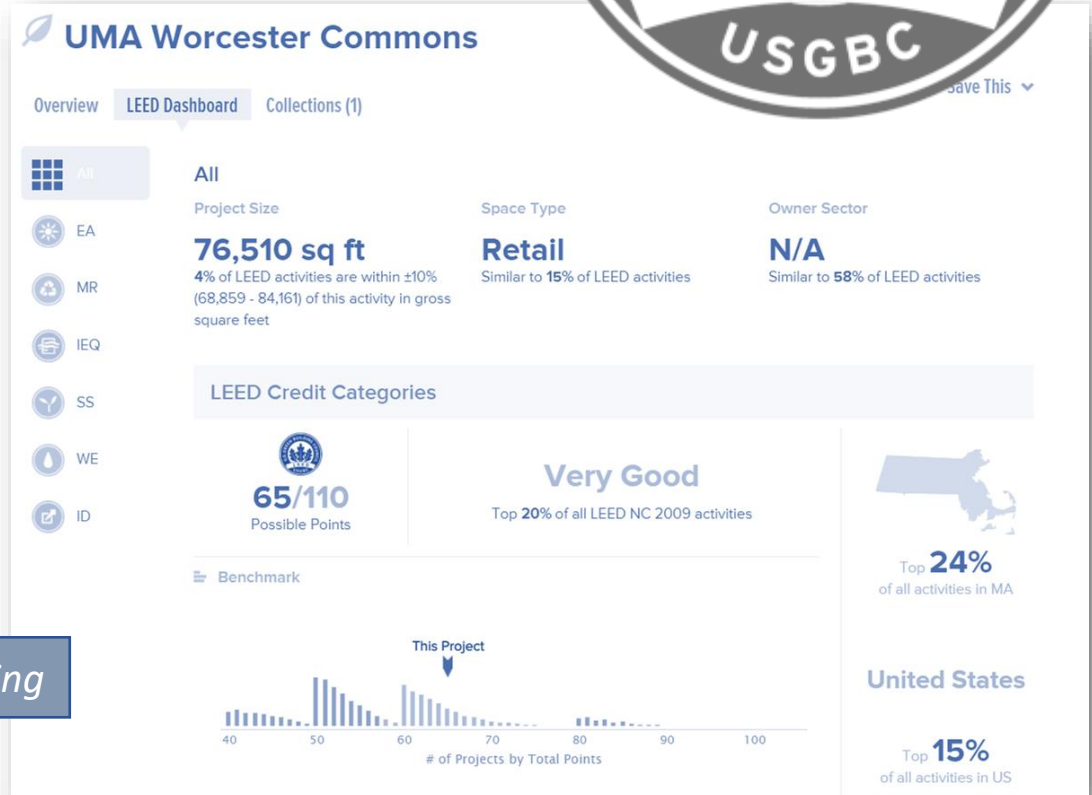
- New construction
- Renovations that include major HVAC, envelope, and internal rehabilitation
- For state use or on state lands

1a. LEED Certification

Certify buildings to the **Silver Level or higher** of the most recent version of LEED Standard.



95th state LEED building



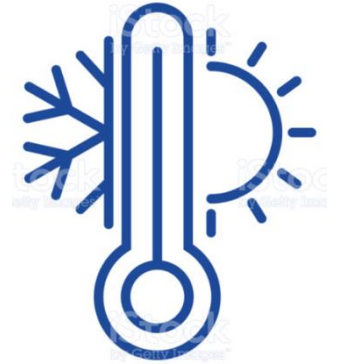
1b. EUI Reduction (→ Specialized Stretch Energy Code)

In accordance with *An Act creating a next-generation roadmap for Massachusetts climate policy*, DOER will develop and adopt a municipal opt-in specialized stretch energy code by the end of 2022 that will be an appendix to the MA building code.

Upon its promulgation, the
Specialized Stretch Energy Code
will replace this EUI requirement.

2. Space Heating and Cooling

- Prioritize electrified/non-combustion solutions that meet APS specs (air- and ground-source heat pumps, solar thermal)
- When not feasible, seek other APS compliant tech (woody biomass systems, biofuel, biogas systems, compost heat exchange)



3. Water Heating



- Efficient electric heat pump water heaters (ENERGY STAR®)
- Geothermal systems (APS equipment requirements)
- Solar thermal (OG-100 rated solar thermal collectors)
- High-efficiency electric point of use water heaters

4. EUI Target-Setting

- Establish early in design process
- Base on achieved EUI ratings of other projects that are similar in type, size, and end use in the same or similar climate zone

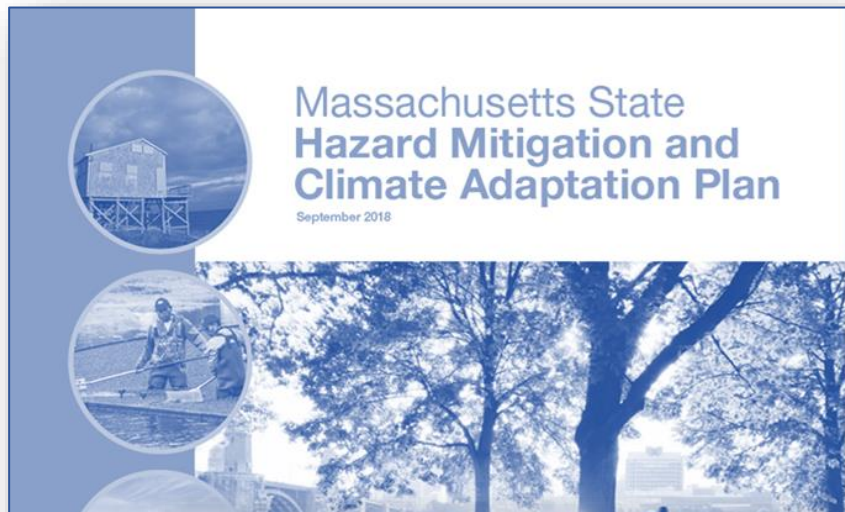
5. Onsite Renewables

- Install renewable technologies during or right after construction
- Emphasis on solar PV
- When not technically or fiscally feasible for project, must make solar-ready
- Follow EPA best practices for making renewable energy claims



6. Climate Resilience

Incorporate long-term climate resiliency into design and siting decisions.



Resilience Program

Discover what the Division of Capital Asset Management and Maintenance (DCAMM) is doing to reduce the vulnerability of our facilities to climate change and build greater resilience against the risks to our agency and the public.

Addressing the escalating impacts of climate change is critical to maintaining the health and wellbeing of employees and the public. DCAMM is working to implement solutions that protect buildings and ensure the stability of services and operations. These efforts fulfill the agency's mission and will prepare DCAMM to confront issues impacting the design, construction and operation of buildings and properties throughout Massachusetts.



CLIMATE RESILIENCE DESIGN STANDARDS TOOL



7. Electric Vehicle Charging Infrastructure

For all **new or fully reconstructed** parking areas:

- ☐ ≤ 25 spaces = 1+ EV charging port
- ☐ > 25 spaces = 2+ EV charging ports



- May be public, employee, or fleet charging stations
- Level 1 or 2 chargers, but may vary by site needs
- Adhere to any state and federal requirements

Substantial Renovations and Smaller Buildings

Mass. LEED Plus 2.0 requirements apply to substantial renovations that are similar to new construction.

Major heating, ventilation, and air conditioning (HVAC) renovation; significant envelope modifications; and extensive interior rehabilitation

All building projects under 20,000 square feet must meet the Mass. LEED Plus 2.0 requirements except LEED certification.

Maximize GHG Emissions Reductions

- ❖ Strive to achieve zero net energy
- ❖ Implement energy storage
- ❖ Access to public transportation and alternative modes of transportation
- ❖ Reduce embodied carbon contained in building materials



Maximize GHG Emissions Reductions

❖ Strive to achieve zero net energy →

❖ Optimize efficiency and maximize energy from renewable resources

❖ Implement energy storage →

❖ Target sites with significant energy demand and costs

❖ Access to public transportation and alternative modes of transportation →

❖ When selecting new sites, access should be key part of evaluation

❖ Reduce embodied carbon contained in building materials →

❖ Target most carbon-intensive materials first and seek substitutions (e.g., concrete)

Existing Buildings

Projects that Affect Energy Use

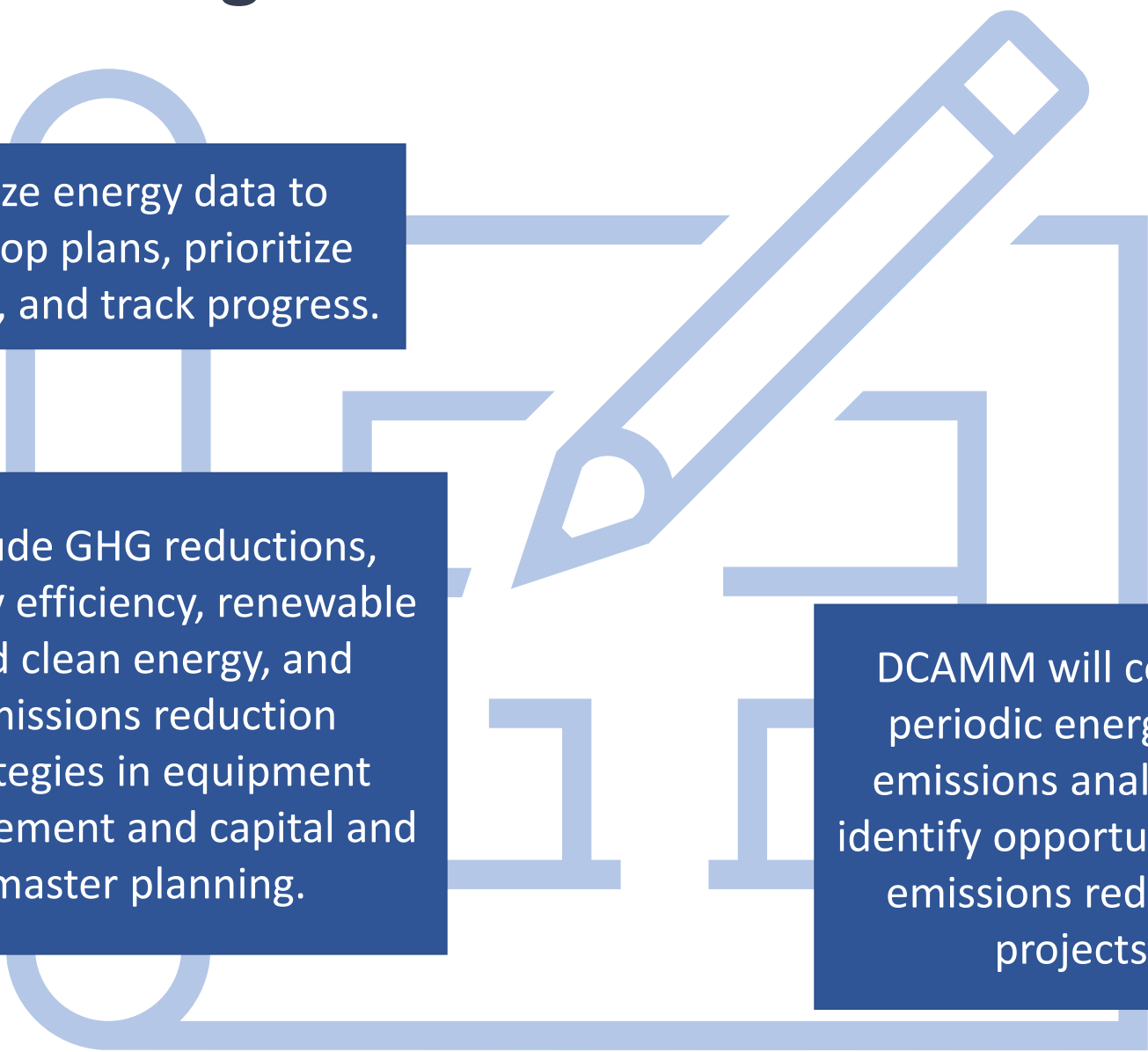


Directives

When planning for, designing, and deploying projects that affect energy use, agencies must prioritize...

1. Substantial reduction or elimination of emissions from onsite fossil fuels
2. Optimized building performance through efficient operations
3. Participation in all available energy efficiency and clean energy incentive and rebate programs
4. Regular monitoring of building energy performance
5. Installation of highest efficiency equipment
6. Incorporation of energy performance into leasing decisions

A. Planning



Utilize energy data to develop plans, prioritize efforts, and track progress.

Include GHG reductions, energy efficiency, renewable and clean energy, and emissions reduction strategies in equipment replacement and capital and master planning.

DCAMM will conduct periodic energy and emissions analyses to identify opportunities for emissions reduction projects.

B. Renovations & Comprehensive Energy Projects

All comprehensive energy projects, including those that address district energy systems, and building renovations where electrical, heating, ventilation, or air conditioning infrastructure are included in the project scope, must:

- ✓ Include a design option for low- or zero-carbon fuels or alternative electricity technologies for thermal energy (or develop and incorporate plans to facilitate future transition)
- ✓ Evaluate and implement building envelope upgrades
- ✓ Establish and adhere to a low target site EUI
- ✓ Install renewable energy and energy storage or design for future incorporation
- ✓ Maximize resilient design



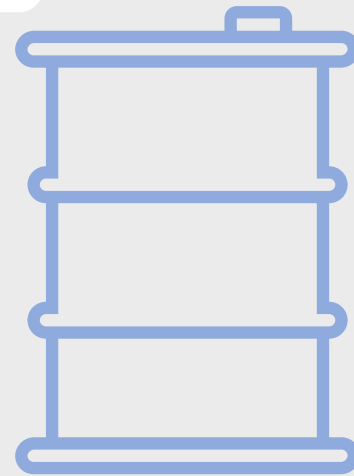
C. Operations

- Track energy performance of existing facilities/sites
- Take concrete steps to reduce building energy use through operational efficiencies
- DCAMM and MAFMA to provide regular training and professional development opportunities

D. Heating Oil

- As of July 1, 2021, agencies using heating oil must purchase at least a B10 biofuel blend

- B100 portion of fuel must meet APS requirements



Agencies may be exempt from this requirement if biofuels are not readily available or are cost prohibitive, or if a specific performance constraint is identified.

E. Leasing

DCAMM and others responsible for new leases for agency use must employ the specified selection criteria that address aspects such as:

- Energy code compliance
- Environmental certifications
- Energy disclosure ordinances
- State recycling requirements
- Access to electric vehicle charging stations
- Public transportation, pedestrian, and cyclist accessibility





**DCAMM is
Taking Action to
Meet State
Goals**



CLIMATE ACTION

DCAMM New Buildings & Substantial Renovations



LEED	✓ Silver or Better
Energy Efficiency	✓ EUI: 20% better than code ✓ Best-in-class
Space Heating & Cooling, Hot Water	✓ Efficient electric or renewable thermal technologies
Renewable Energy	✓ Solar ready ✓ Maximize on-site renewables
Resilience	✓ Incorporate resilience
EV Chargers	✓ EV chargers and EV-ready
Other	✓ Where possible: ✓ Zero-net target, Energy storage, Reduce embodied carbon, Site Near transit





Build for the Future

- **Make Efficiency the First Fuel**
- **Build Net Zero Buildings**
- **Select Clean Fuels**
- **Build Resilient Buildings**



MassBay CC Health Sciences
Target EUI = 30
High Performance Building Envelope



Meeting Goals: High Efficiency



Lowell Justice Center



Mass Bay Community College



Chelsea Soldiers' Home



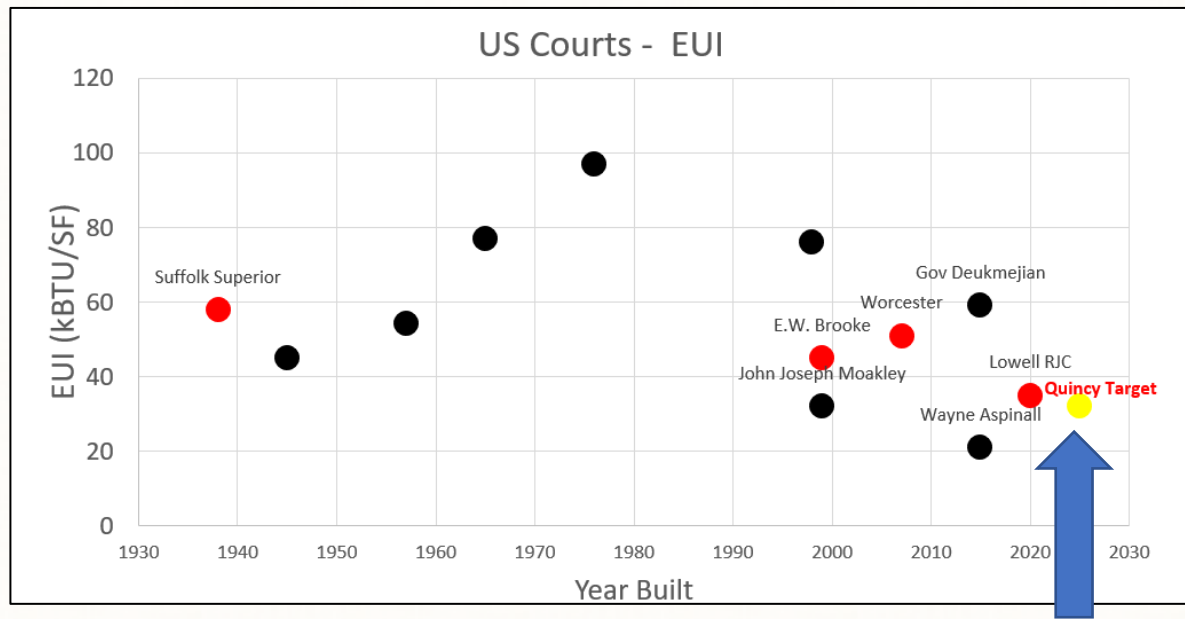
Bristol Community College Allied Health Center

Best-in-class energy efficiency is already a standard in DCAMM new buildings, renovations, and utility infrastructure projects.

Projects In Planning and Construction	<u>EUI</u>
• Bunker Hill CC Student Success Ctr	29
• Cape Cod Community College Science	56
• Chelsea Soldiers' Home	55
• DUA Brockton	44
• Facilities Maintenance Building	29
• Mass Bay CC Health Science Center	28
• Westfield State Parenzo Hall	29
Completed	
• Bristol CC Allied Health Center	50
• Fish and Wildlife Field Headquarters	25
• Lowell Justice Center	35

Accelerate Progress

- Best in Class EUI
- No Fossil Fuels
- Electric Basis of Design
- Reduce Embodied Carbon
- Certification: LEED Silver or better



Meeting Goals: Low Carbon Fuels

Solar, Wind, Geothermal, Heat Pumps, and Biomass offer low carbon solutions and operational savings.



Solar installations generate 27 MW a year at state facilities.

Solar at Natick Readiness Center saves \$33,000 year.



Ground source energy is in place at 11 state sites.

Chelsea Soldiers' Home uses ground source heat pumps for heating and cooling as well as solar PV.



Biomass is used at 9 state sites.

Biomass boilers at DYS Connelly are the lowest carbon solution for this site over a 30 year life.



Power purchase agreements (PPA) provide 3rd party ownership and maintenance of solar.

BCC's hosted solar parking lot canopy is one of the largest in New England and is a PPA.



Requirements for Renovations

- Energy Efficiency**
 - Evaluate building envelope
 - Upgrade envelope where feasible
 - Target a low target EUI

- Space Heating & Cooling**
 - Evaluate low carbon solutions for thermal energy

- Domestic Hot Water**
 - Facilitate low- or zero-carbon fuels

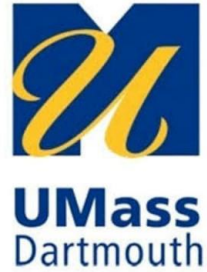
- Renewable Energy**
 - Where appropriate

- Resilience**
 - Maximize resilient design





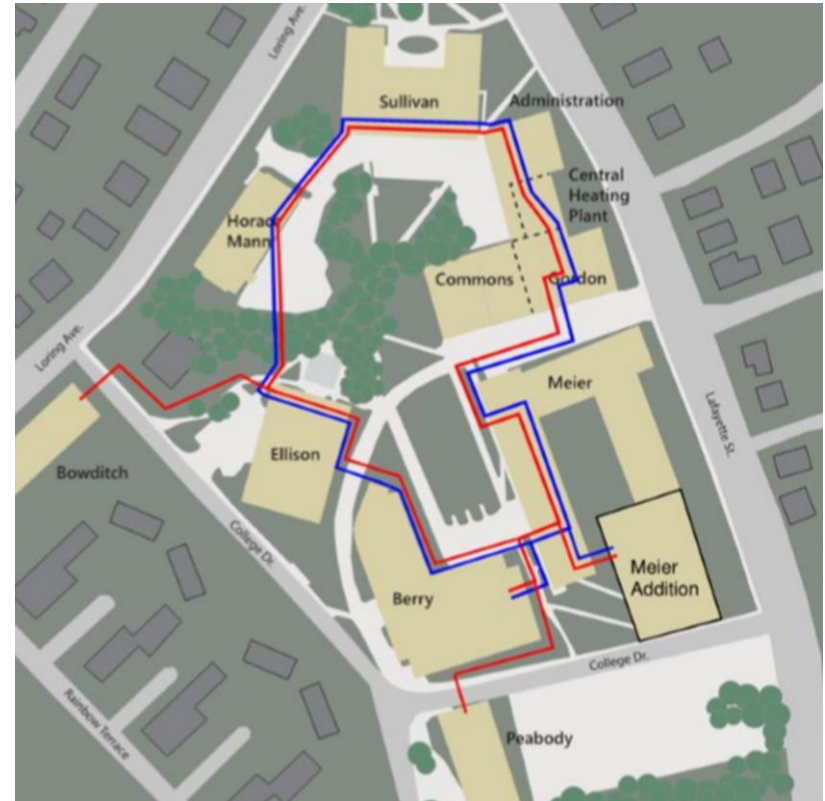
Decarbonization Studies - Underway



CLIMATE ACTION

Challenges with Existing Facilities

- Central plants serving multiple buildings
- Natural gas systems: new
- Infrastructure and building envelopes
- Need to ready the buildings



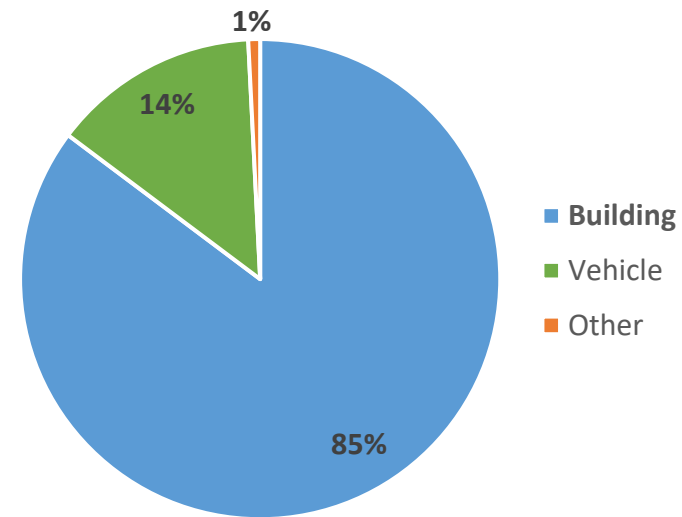
Implementation

Thoughts about EO 594 Mobilization, Q&A

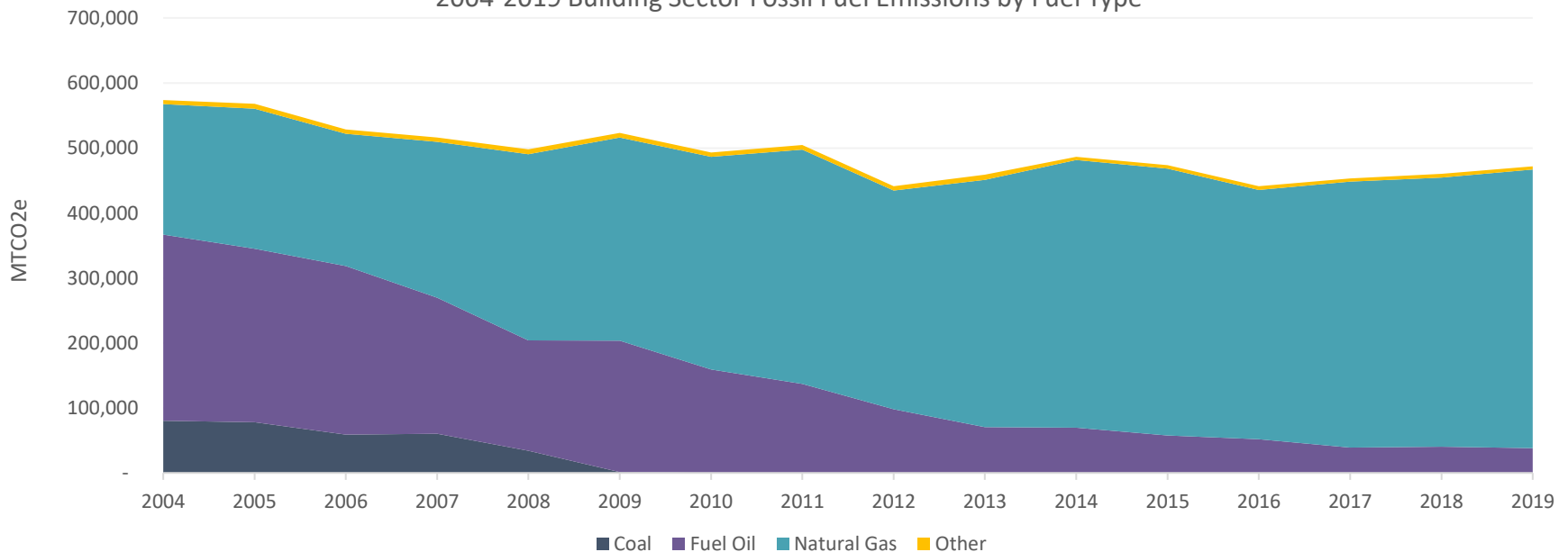
Emissions from State Buildings

- State building sector emissions comprise 85% of total portfolio emissions from fossil fuels
- In the building sector, natural gas comprises over 90% of onsite fossil fuel emissions

FY19 Fossil Fuel Emissions by Sector

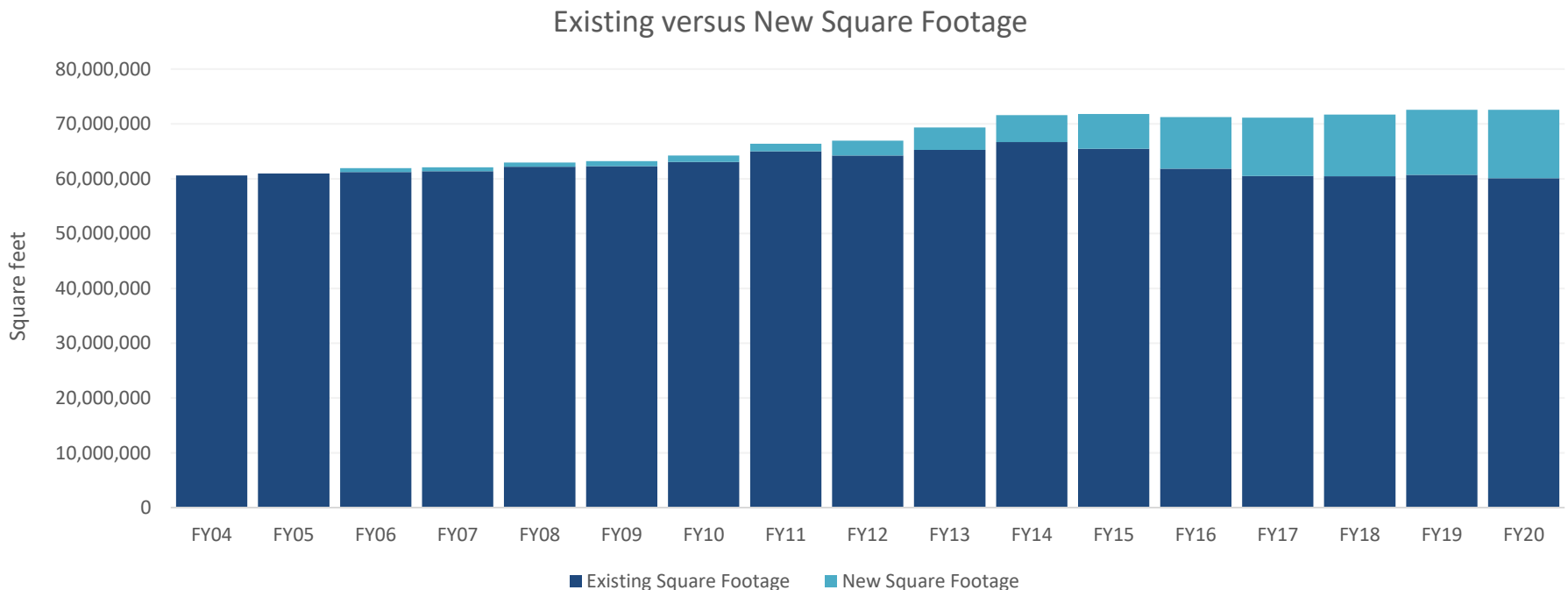


2004-2019 Building Sector Fossil Fuel Emissions by Fuel Type



Existing Buildings Matter!

- Relative to 2004:
 - 83% of portfolio building square footage is in existing buildings
 - 12.5M square feet are new, compared to 60M square feet of existing
- Annual new construction has averaged between 600,000- 1M square feet but likely to be less new construction in coming years



Decarbonization: Things to Consider

- Decarbonization will not all happen at once
- Do no harm (e.g., avoid creating new 30-year dependence on fossil fuels)
- Reasonable risks are appropriate
- Think incremental investment, not costs
- Don't reinvent the wheel – learn from peers
- Take advantage of existing – and keep an eye out for future – incentives and resources

Other Thoughts on Meeting EO Targets

Effort	Goal
Decarbonization planning	☐ Incorporate emissions reduction into capital and master plan development ☐ What are the emissions impacts of our project and how can we mitigate them?
Building electrification	☐ Avoid any new fossil fuel systems in new buildings and wherever possible ☐ Prioritize air- and ground-source heat pumps for partial or full electrification in existing buildings
Fuel switching	☐ If electrification not appropriate or feasible, explore alternative decarbonization strategies for certain facilities ☐ Include modern wood heating, solar thermal, liquid biofuels
Energy efficiency	☐ Reduce fossil fuel use as much as possible ☐ Focus on envelope performance and air infiltration, then on replacing inefficient equipment ☐ Consider operational adjustments or ways to implement seasonal/ permanent space optimization strategies

Q&A

Questions?

Thoughts?

Advice for LBE?

Needs?

Summary: Requirements for New & Substantial Renovations

LEED Certification

Silver or Better

Energy Efficiency

EUI: 20% better than code
Best-in-class
Requirement will be replaced by
Stretch Code, once adopted

Space Heating & Cooling

Efficient electric or renewable
thermal technologies

Domestic Hot Water

Renewable Energy

Solar ready
Maximize on-site renewables

Resilience

Incorporate resilience

EV Chargers

EV chargers and EV-ready spaces
will be required: the quantity will
depend on number of spaces

Other

Exemption provision exists
Where possible: Zero-net target,
Energy storage, Reduce embodied
carbon, Site Near transit

Summary: Requirements for Renovations

Energy Efficiency

Evaluate building envelope
Upgrade envelope where feasible
Establish a low target EUI & take steps to meet it

Space Heating & Cooling

Design teams will evaluate low carbon solutions for thermal energy

Domestic Hot Water

Designs will facilitate the future transition to low- or zero-carbon fuels

Renewable Energy

Where appropriate, design and install renewable energy, energy storage, and related infrastructure

Resilience

Maximize resilient design

Summary: Requirements for Existing Buildings

Energy Efficiency

- Participate in all incentive programs
- Operate efficiently
- Install highest efficiency equipment

Space Heating & Cooling

- Reduce or eliminate emissions from onsite fossil fuels where possible

Domestic Hot Water

- Eliminate heating oil
- Use 10% biodiesel where oil remains

Other

- Monitor building energy performance
- MAFMA will offer regular training and professional development for agencies