

Welcome to the waiting room. We'll begin shortly.

A yellow-green rectangular graphic with a background of overlapping, semi-transparent chevron shapes pointing to the right. The text is white and positioned on the left side of the graphic.

ne  
ep

READY, SET, SCALE.

**Nexus of Codes and  
Building Performance  
Standards**

FEBRUARY 22 | 11 AM EST

Reminder: Today's webinar will be recorded and a copy will be emailed to you.



# Welcome



**Arah Schuur**  
**Executive Director**



# Overview



Cornelia Wu  
Building Policy Manager

## Things to Note

- This webinar is being recorded
- In NEEP's ongoing effort to improve accessibility to both our work and events, we have enabled the closed captioning, the control to disable this feature is located in the lower right corner
- The slides and recording will be sent to all
- All lines will remain on mute—please type in your questions at any time
- Chat will be available for comments, discussion, and collaboration

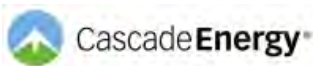
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# Funders



# Allies Network



# State Partners



## Connecticut

**State Partners:** CT DEEP, CT Energy Efficiency Board, Eversource Energy, United Illuminating Company, Southern Connecticut Gas and Connecticut Natural Gas

Partners in 2017/2018/2019/2020/2021

## District of Columbia

**State Partners:** Department of Energy and Environment and DC Sustainable Energy Utility

Partners in 2017/2019/2020/2021

## Massachusetts

**State Partners:** Massachusetts Department of Energy Resources

Partners in 2019/2020/2021

## New Hampshire

**State Partners:** NH Office of Strategic Initiatives, NH Public Utilities Commission, Eversource Energy, NH Electric Coop, Unitil and Liberty Utilities

Partners in 2017/2018/2019/2020

## New York

**State Partners:** NYSERDA

Partners in 2017/2018/2019/2020/2021

## Rhode Island

**State Partners:** RI Office of Energy Resources, National Grid RI, RI Department and Education and RI Energy Efficiency & Resource Management Council

Partners in 2017/2018/2019/2020/2021

## Vermont

**State Partners:** Efficiency Vermont

Partners in 2017/2018/2019/2020/2021

## West Virginia

**State Partners:** West Virginia Office of Energy

Partners in 2020/2021



# Why are Building Performance Standards Important?



Buildings account for

- 39% of U.S. energy use
- 31% of U.S. greenhouse gas emissions
  
- In 2050, about 44% of the commercial buildings and 67% of residential buildings will have been built in 2019 or earlier
  
- The current rate of retrofit is too slow

# Energy Codes and Building Performance Standards



- Energy codes apply to new buildings and major renovations
- Building Performance Standards (BPS) apply to existing buildings
  - In many cases for larger buildings
- The codes and building performance standards are often developed independently of each other.
  - Codes on the national level, BPS on state or muni level

# Building Performance Standards Implementation



- Model Federal BPS
- States and muni creation of BPS
- Equity and affordability are important
- Education, technical, financial assistance to building owners and managers
- Training should be provided to students and contractors to create a diverse workforce
- Information to building occupants

# The Nexus of Energy Codes and Building Performance Standards



- As soon as a new building is built, it becomes an existing building, and is subject to BPS
- However, energy codes and BPS are developed separately, and are not aligned
- A building can be built to meet energy code, but might not be in a good position to meet BPS requirements
  - Alignment is needed between code and BPS



# Building Performance Standards Technical Assistance & Resources from DOE



Harry Bergmann – U.S. Department of Energy

# National BPS Coalition



U.S. DEPARTMENT OF  
**ENERGY**



Announced by President Biden on January 21, 2022 the National BPS Coalition includes 33 state and local governments, covering nearly 20% of the nation's building footprint and over 22% of the population, that committed to passing building performance legislation or regulation by Earth Day 2024.



Administration

BRIEFING ROOM

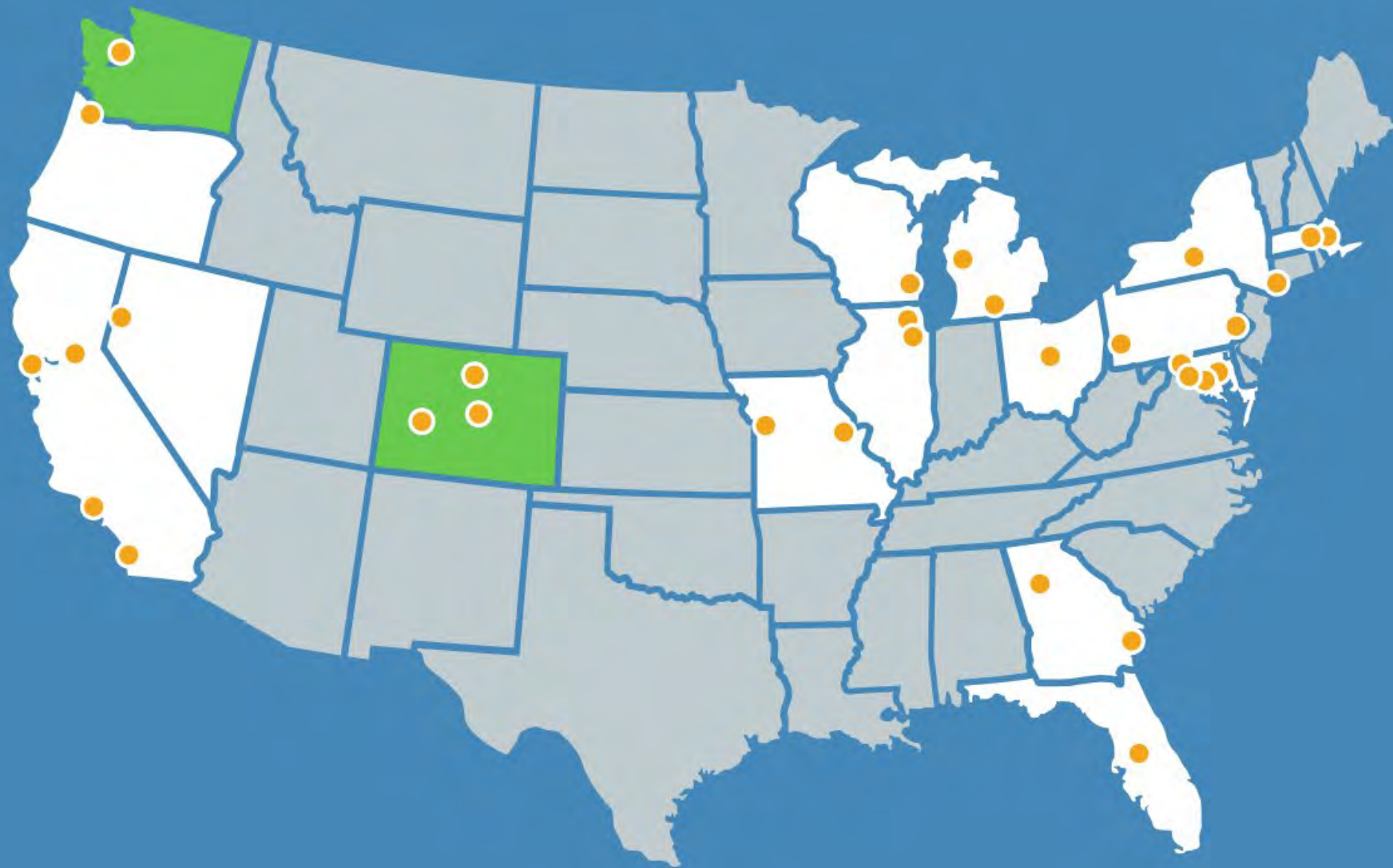
## FACT SHEET: Biden-Harris Administration Launches Coalition of States and Local Governments to Strengthen Building Performance Standards

JANUARY 21, 2022 • STATEMENTS AND RELEASES

# National BPS Coalition Members



U.S. DEPARTMENT OF  
**ENERGY**



# National BPS Coalition Core Components



U.S. DEPARTMENT OF  
**ENERGY**



- Federal Technical Assistance & Support
- Centering equitable outcomes & stakeholder engagement
- Workforce development & job creation
- Complement existing efforts like Energy Efficiency Conservation Block Grants & DOE's State Energy Program
- Embed expertise on equity and environmental justice into the national labs



# DOE's Role



U.S. DEPARTMENT OF  
**ENERGY**



- DOE has an established role in building energy codes through technical assistance and analysis support.
- The technical assistance provided by the DOE Building Energy Codes Program will continue and expand to include TA for Building Performance Standards.
- Goal: scalable replicable analyses to be leveraged by interested jurisdictions to support goal and target setting, implementation strategies, etc.
- Support: an easily accessible resource library, case studies, and support through 3<sup>rd</sup> party organizations and partners for implementation.

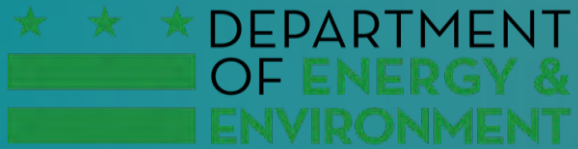
# BPS & New Construction Codes



U.S. DEPARTMENT OF  
**ENERGY**



- New Construction vs. Existing Building requirements – how to ensure they are aligned?
- Key questions
  - Cost effectiveness – are codes and BPSs pushing in the same direction?
  - Ensuring prescriptive compliance pathways for NC finished close to the end of a BPS compliance period
  - Aligned performance targets
    - Energy vs. Emissions, performance thresholds, etc.
- Additional considerations:
  - How does this enable a lifecycle approach to building decarbonization?
  - How to ensure equitable outcomes under both NC & EB policies and programs?
  - How to align benefits of new NC codes and BPSs with public health, EJ outcomes?



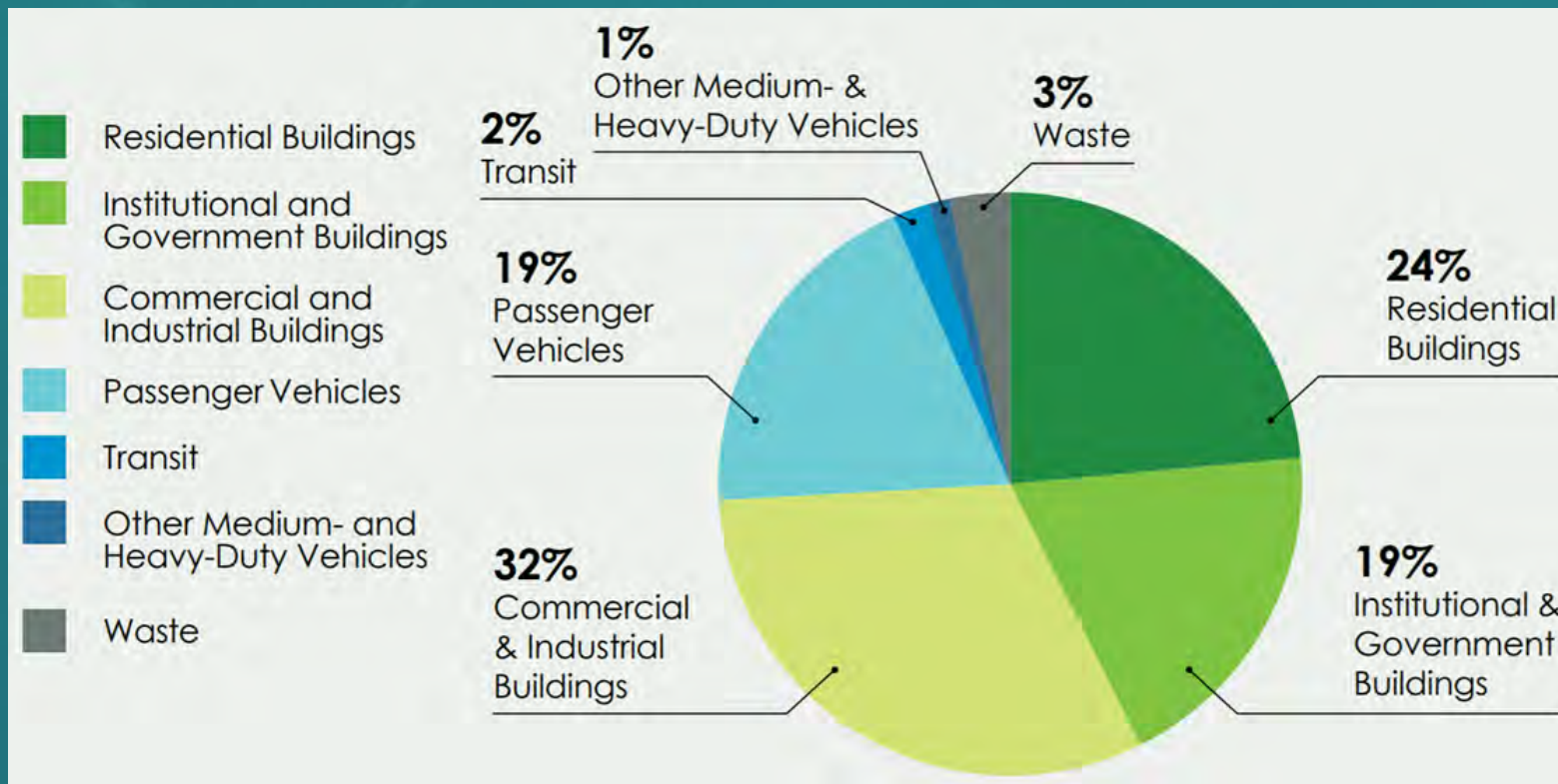
# DC's Building Energy Performance & Codes

We're going to quickly examine the District's Building Energy Performance Standards (BEPS) and D.C. Energy Conservation Code through the lenses of policy and program application.

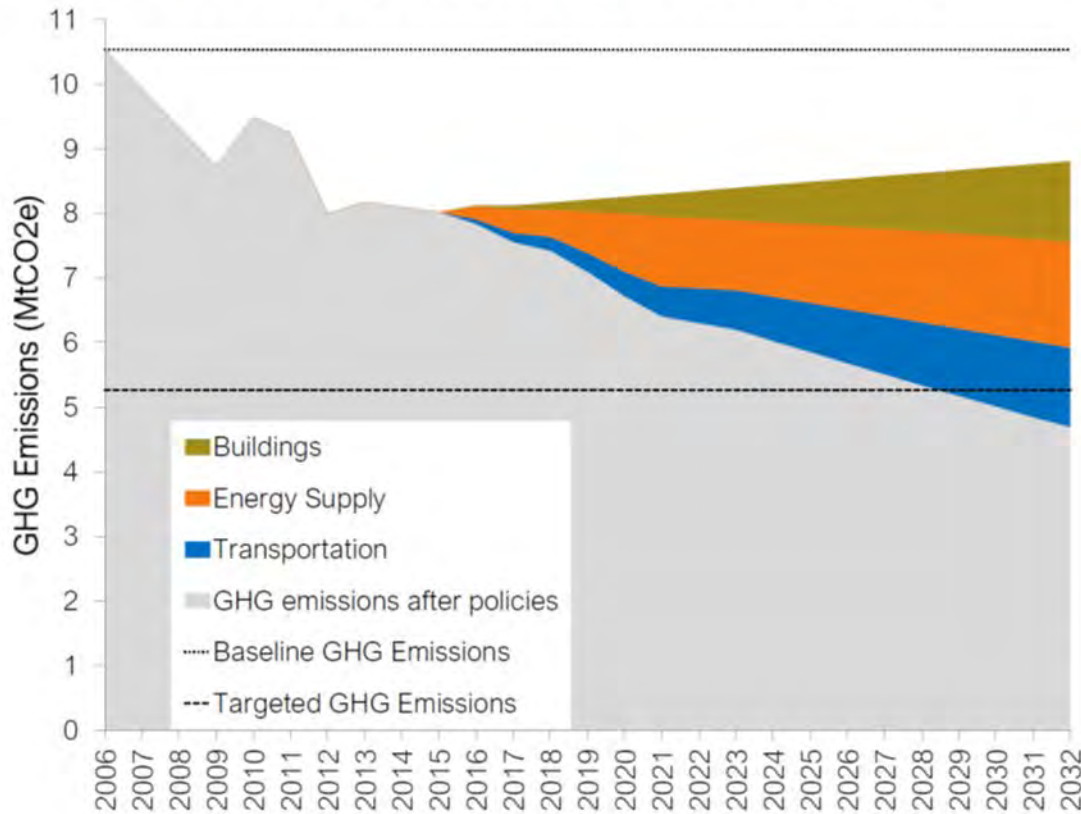
- The BEPS program is an **outcome-based** standard for existing buildings, whereas the energy code is a **design & construction standard** for new construction or existing buildings undertaking a renovation
- Each are enforced in different ways by different agencies at different points in the lifetime of a building
- Both are critical to the District achieving its short and long-term carbon goals.

# Energy Use and Emissions in DC

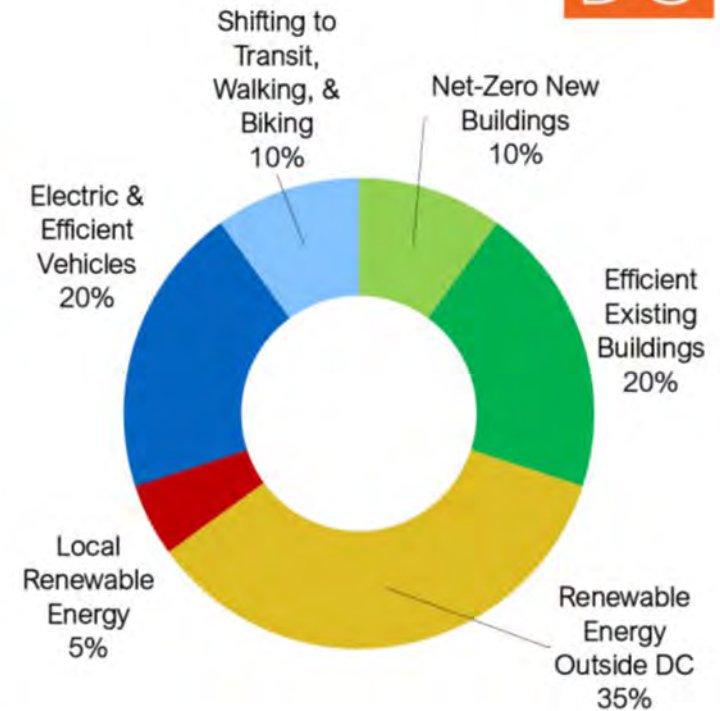
## MODELED PROPORTION OF GHG EMISSIONS BY SECTOR



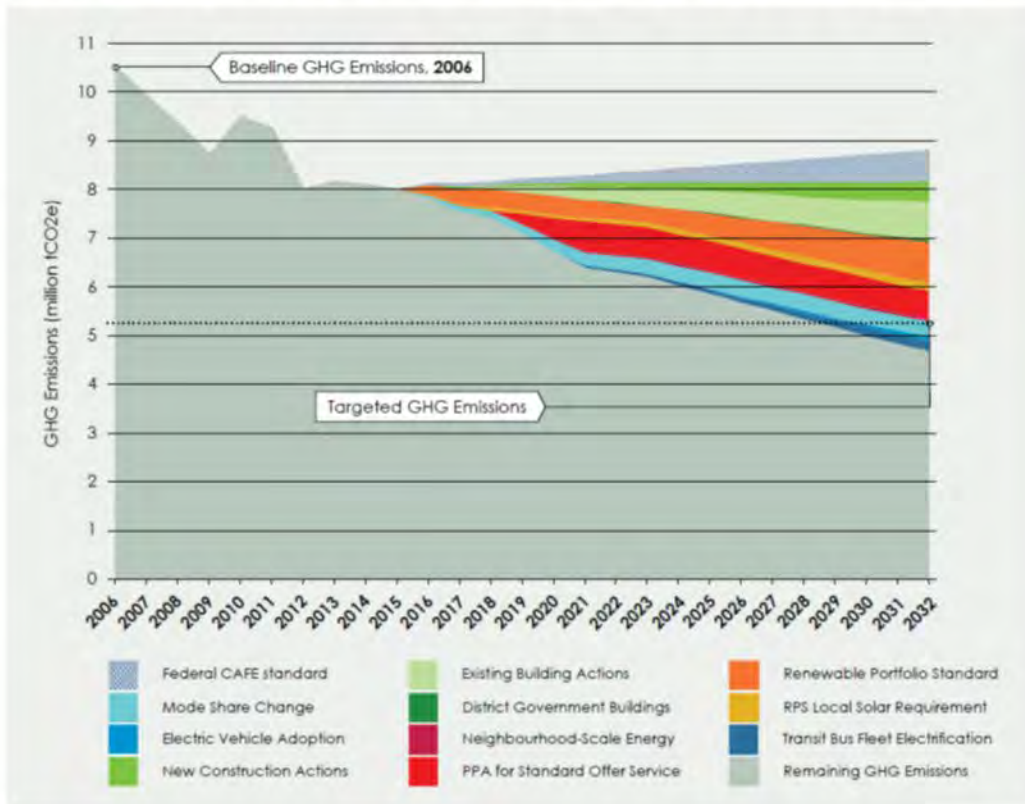
## ESTIMATED CEDC GHG SAVINGS BY SECTOR



## RELATIVE IMPACT OF ACTION AREAS



# ESTIMATED GHG SAVINGS



CEDC Plan Action Area	Percent GHGs Reduced from Total 2032 BAU	Addressed in CEDC ACT
Federal Fuel Economy Standards	7.1%	CAFE
New Construction Policies	4.6%	codes
Existing Building Policies	9.0%	✓
District Government Buildings	0.5%	✓
Renewable Portfolio Standard	9.5%	✓
RPS Local Solar Requirement	1.9%	✓
PPA for Standard Offer Service	6.6%	PSC
Neighborhood-Scale Energy	0.6%	
Mode Share Change	3.6%	moveDC
Electric Vehicle Adoption	0.9%	✓
Transit Bus Fleet Electrification	2.6%	✓
<b>Total GHGs Avoided vs. 2032 BAU</b>	<b>47.0%</b>	✓
<b>Total GHGs Reduced vs. 2006 Baseline</b>	<b>55.7%</b>	

### Site Energy Savings (GBTU)

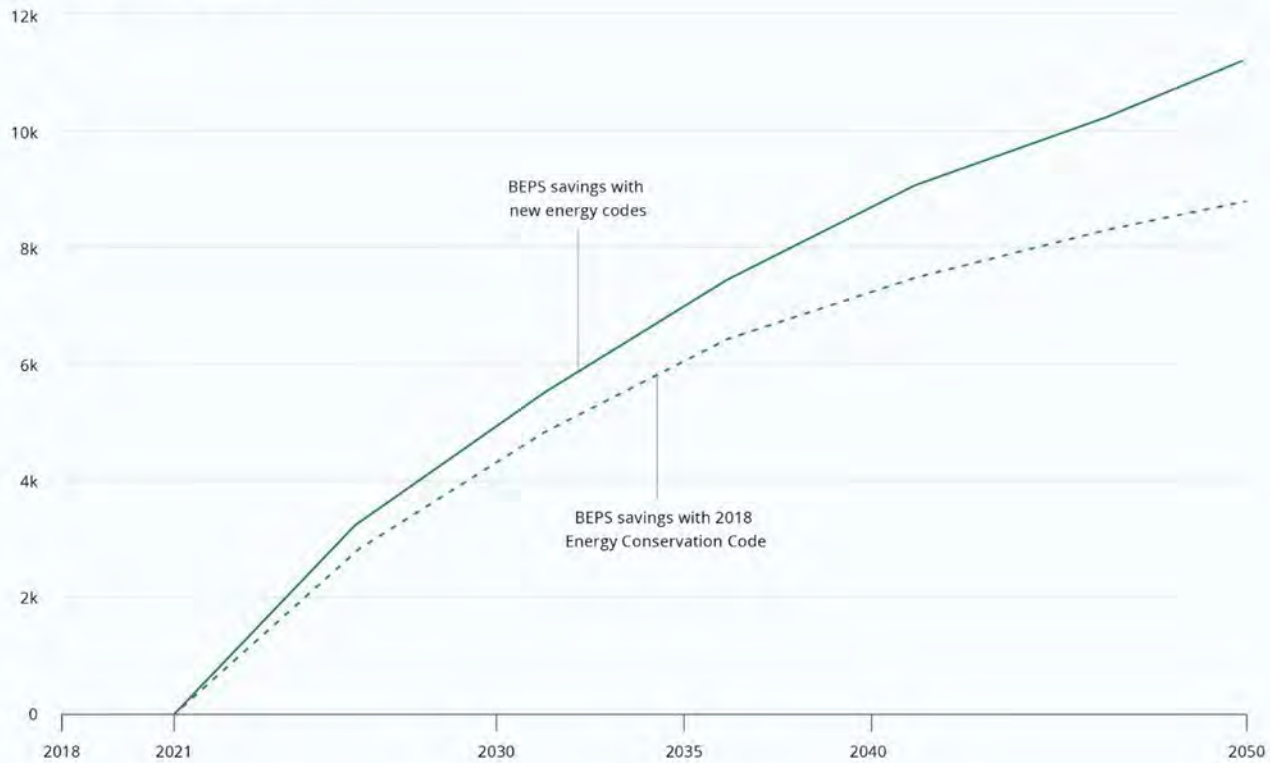
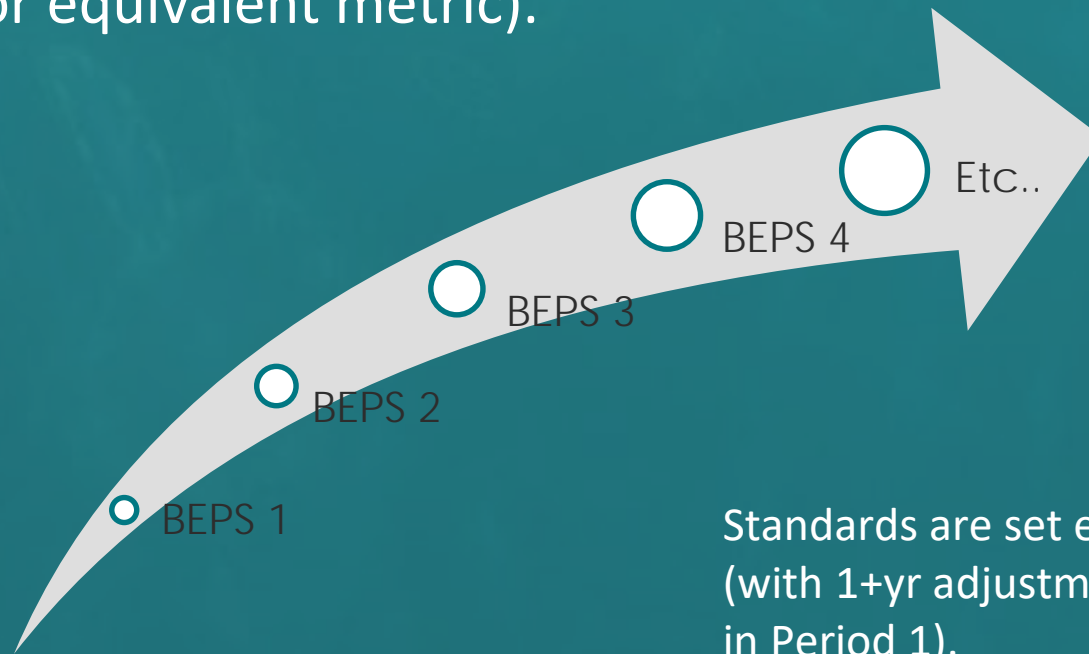


Figure 12 Site Energy Savings from BEPS



# Building Energy Performance Standard 101

**Clean Energy DC Omnibus Amendment Act of 2018** requires an establishment of a minimum threshold for energy performance that will be “no lower than” the local median ENERGY STAR score by property type (or equivalent metric).



# BEPS Applicability

As the benchmarking requirements ratchet down in square footage over time, the buildings will be required to meet the BEPS in the following periods until all buildings 10,000 sq. ft. and over are following the performance standards.

## BEPS 1:

Private buildings >50,000 sq. ft.  
and DC-owned >10,000 sq. ft.

## BEPS 2:

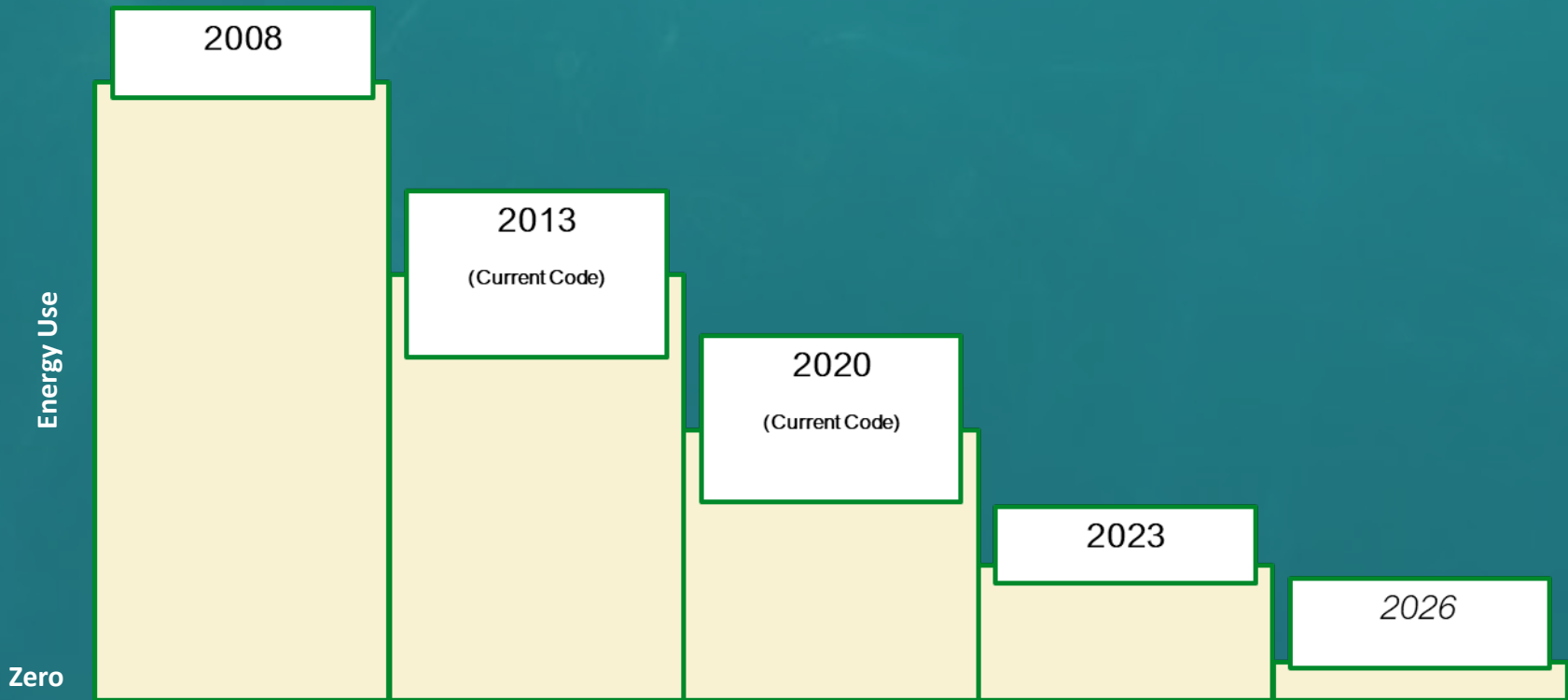
Private buildings >25,000 sq. ft.  
and DC-owned >10,000 sq. ft.

## BEPS 3:

Private buildings and  
DC-owned >10,000 sq. ft.



# The District on the Path to NZE Building



# Harmonizing BEPs & Codes

## Policy

- The energy code and BEPS complement & accelerate each other
- Without both, our GHG 2050 target will be out of reach
- Requires interagency coordination on policy and enforcement
- Together the policies mandate accountability from building industry professionals and steer strategy towards long-term thinking

## Program Design

- Each are enforced by different agencies in different ways
- These pose different types of risk to owners, altering decision-making
- Energy codes have a different weight when the building has to perform after occupancy
- Requires policy to be harmonized

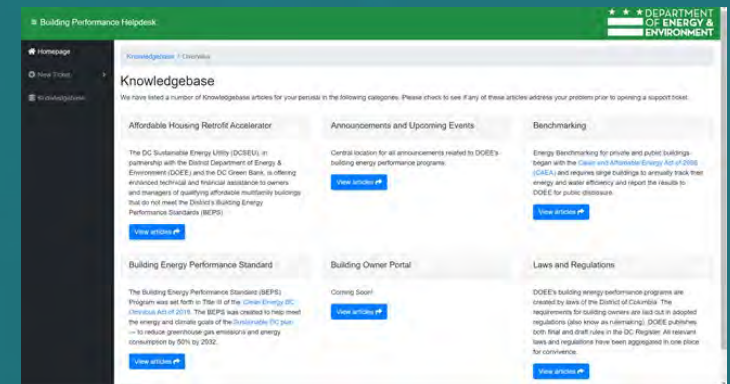
# BEPs Milestones

## ✓ Regulations

- ✓ BEPS Compliance Framework Regulations Published (Nov. 2021)
- ✓ BEPS Standards Regulations published (Jan. 2021)
- ✓ Energy Benchmarking Regulations Published (Oct. 2021)
- ✓ BEPS Guidebook (estimated Jan. 2022)
- ✓ BEPS Cost-Benefit Analysis Study (estimated Jan. 2022)

## ✓ Technical Support Tools

- ✓ New Energy Benchmarking Visualization Tool launched (Sept. 2021)
- ✓ BEPS Knowledgebase launched (Oct. 2021)
- ✓ BEPS Online Portal launched (Oct. 2021)
- ✓ New BEPS/Benchmarking Helpdesk launched (Oct. 2021)



# Affordable Housing Retrofit Accelerator (AHRA)



- Financial and technical resources to improve existing building energy efficiency
- Help building owners comply with the Building Energy Performance Standards (BEPS)



# Questions?



## Dave Epley

Associate Director

Data & Benchmarking Division

Energy Administration

[David.epley@dc.gov](mailto:David.epley@dc.gov)



# John Dalzell - BPDA



# ZNC and Article 37 Updates

- Establish a ZNC Building Emissions Performance Standard for New Construction
- Lower Applicability Threshold to > 20k SF
- Increase to LEED Gold minimum
- Align with BERDO Standards & Reporting
- Update Review Process

## **Boston University Center for Computing & Data Sciences**

- CEI = 2.9 kg CO<sub>2</sub>e/sf/yr
- Solar PV 964 kWh (campus)
- 100% Renewable Energy Purchase

# Current Article 37 & CNBA

- Comprehensive sustainable development review and building standards
- LEED Gold typical / Certified is minimum
- Carbon Neutral Building Assessment (CNBA) requires analysis of low & zero carbon building strategies including:
  - Building Enclosure - high performance
  - Building Systems - all efficient electric
  - On-site Renewable Energy - solar PV
  - Renewable Energy Procurement - CCE

## Net Zero Carbon Office / Life Science Building Hybrid Electric Design

- 93% Reduction in Fossil Fuel Use
  - 53% Energy Savings
- LEED Gold / 60 Points

# ZNC Policy Framework

## Prioritized Practices:

- 1. Low Carbon Building**  
Establish Building Emission Targets
- 2. On-site Renewable Energy**  
Set Minimum Generation Standards
- 3. Renewable Energy Procurement**  
Determine Acceptable Options

*Plus*

- 4. Embodied Carbon**  
Identify Actions & Introduce Practice Standards

## **E+ Highland St Studio G Architects**

- Net Energy Positive Performance
- Deep affordable coop housing
- LEED Platinum
- On-site Renewable Energy (solar PV)

# ZNC Buildings

## BU Center for Computing & Data Sciences

Modeled performance:

316,000 sf

- EUI = 39 kBtu/sf/yr
- CEI = 2.9 kg CO<sub>2</sub>e/sf/yr
- Solar PV 964 kWh (campus)
- 100% Renewable Energy

Purchase

3

**CO<sub>2</sub>e Emissions** (tons/yr)

5

Building 1,090.

On-site RE 278. (less)

RE Procure 812. (less)

Zero Net 0.

# ZNC Buildings

(ready - Low Carbon & Installed PV)

## Bunker Hill

## Housing

## Building F

Modeled performance:

271,844 sf

- EUI 19.1 kBtu/sf/yr
- CEI 1.48 kg CO<sub>2</sub>e/sf/yr
- Solar PV 81.9 kW

### CO<sub>2</sub>e Emissions (tons/yr)

Building	445.	3
On-site RE	36. (less)	6
<u>RE Procure</u>	<u>409. (less)</u>	
Zero Net	0.	

# ZNC Building Zoning & BERDO Policy

- Both establish annual net building carbon emission standards.
- “Net” includes building emissions less on-site renewable energy generation and renewable energy procurement (and ACP for fossil fuel uses).
- Compliance for both is “annual” and ZNC reporting will be through BERDO.

## ZNC Building Zoning (*in development*)

- New Construction Standard will be net emissions = 0 kg CO<sub>2</sub>e / sf-yr.
- Prioritizes Low Carbon Buildings and On-site Renewable Energy.

## BERDO (*enacted*)

- Existing Building Standard (decrease over time) 2050 = 0 kg CO<sub>2</sub>e / sf-yr.

*In short, ZNC Building Zoning will require new construction buildings to meet the 2050 BERDO standard of zero carbon emissions on day one of occupancy.*

# LOW CARBON BUILDINGS TAG Recommendations

- Establish building carbon emissions targets.
- Establish ZNC Advisor Group to review and update targets (non-zoning).



boston planning &  
development agency

Thornton Tomasetti

BRA+

# Low Carbon Building Targets - Pathway Options

## Low Carbon Emitting Building - Percentile Emission Targets

Projects must meet a **40% carbon emissions reduction target** compared to modeled performance (ASHRAE 90.1-2013 baseline\* for all buildings typologies).

Except:

1. Licensed healthcare facilities that are not medical office buildings, which should meet a **30% carbon emissions reduction target**.
2. Residential buildings that do NOT trigger stretch code AND the total area of any non-residential program is less than 40,000 GSF and does not exceed 50% of total GSF - these building must meet a **HERS score 38 or lower**.
3. Buildings committed to achieving Passive House certification via PHIUS+ or PHI.

Note: Calculations should be performed using 2035 Grid Electricity carbon emission factors.

\*Project teams may opt to use the Massachusetts stretch code baseline (ASHRAE Standard 90.1-2013 with MA amendments, including additional efficiency packages)



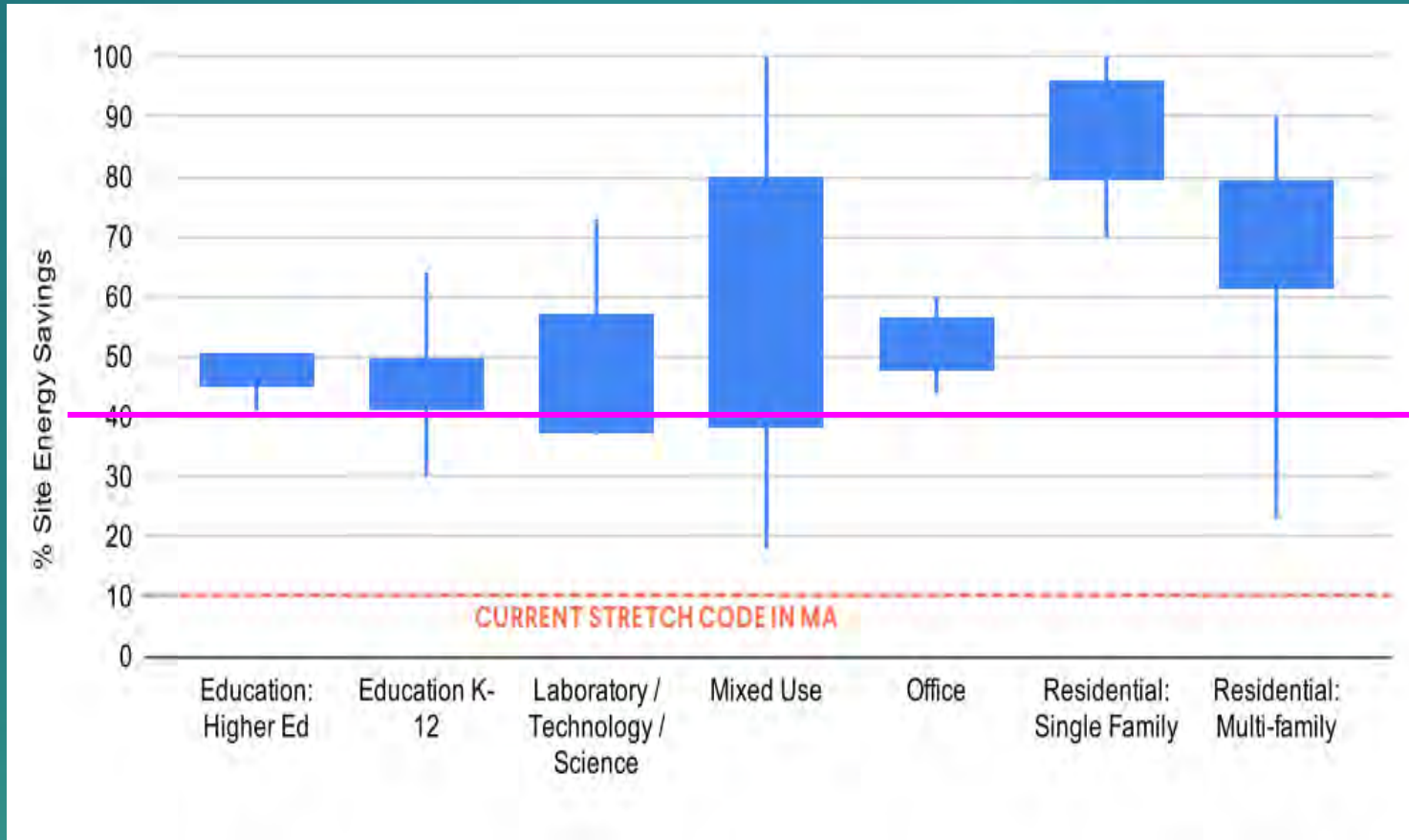
# Low Carbon Building Targets - Pathway Options

## Low Carbon Emitting Building - Carbon Emission Intensity (CEI) Targets

Building Typology	CEI Targets [kg CO <sub>2</sub> e/sf] Recommended	All electric site EUI [kBtu/sf-yr] (for reference only)
Office	1.6	30
College / University Office	1.6	30
K-12 School	1.3	25
Hotel	1.9	35
Residence Hall	1.6	30
Low Density Multifamily	1.1	20
High Density Multifamily	1.6	30
Dry Lab	4.3	80
Wet Lab	6.4	120
Hospital	7.4	139

- Targets are calculated using predicted 2035 carbon emission factors for electricity of 52 kg/MMBtu and current carbon emission factors as published by BERDO.
- Projects that are composed of more than one listed building typology should use a target based on area weighted average.
- Projects with unique conditions (e.g. schedules, loads, etc.) meeting the 40% carbon emissions reduction but not meeting the CEI target should have an opportunity to make a case for an adjusted value.

# Carbon Reduction Analysis

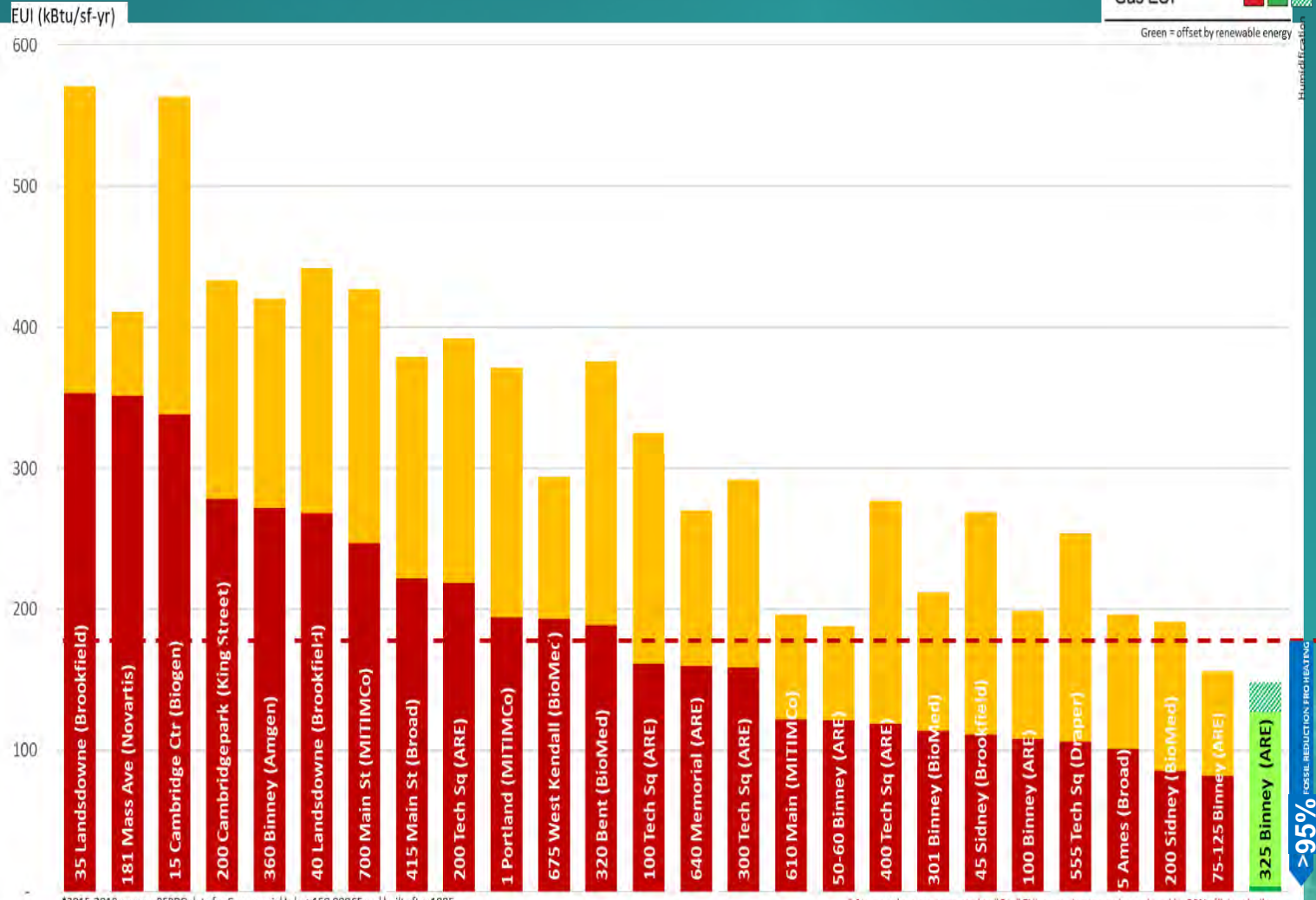
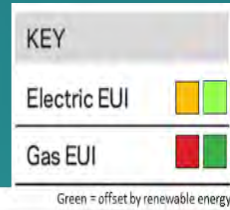


40  
%

Source: Built Environment Plus - Massachusetts is Ready for Net Zero 2021 report

# Carbon Reduction Analysis

## Building Energy Use Intensity (EUI)\*



\*2015-2019 average BERDO data for Commercial Labs >150,000SF and built after 1985.

\* Steam values are converted to "Gas" EUI, assuming steam is produced by 80% efficient boilers.

**>95%** FOSSIL FUEL REDUCTION FROM HEATING

# NET ZERO BUILDINGS



# Next Ready, Set, Scale Webinar



READY, SET, SCALE.

## Community Representation: Committees that Center Equity

MARCH 22 | 11 AM EST