Building Resilience: A Community Perspective on Energy Codes

Presentation by the Metropolitan Area Planning Council (MAPC)

at the U.S. Department of Energy
2019 National Energy Codes Conference

May 30, 2019
The MAPC Region

- 101 municipalities
- 1,440 square miles
- Nearly 3.2 million residents
- 1.8 million jobs

(2010 Census)

MAPC
METROPOLITAN AREA PLANNING COUNCIL

101 municipalities
1,440 square miles
Nearly 3.2 million residents
1.8 million jobs
(2010 Census)
1) Regional Clean Energy Projects

- Green Municipal Aggregation
- Municipal and Community Solar
- LED Streetlight Retrofit Program
- Solar Hot Water
- Green Mobility Program
- ESCO Procurement
- Energy Resiliency
- Community energy data, baselining, planning, and strategizing
- Connecting municipalities with incentives + plug-and-play programs
- Net Zero planning, guidance, and education
- Storage, microgrids, and district energy

2) Clean Energy Planning

- Community energy data, baselining, planning, and strategizing
- Connecting municipalities with incentives + plug-and-play programs
- Net Zero planning, guidance, and education
- Storage, microgrids, and district energy

3) Clean Energy Technical Assistance

- Peak Demand Management
- Green Communities
- Methane Leaks
- Data Analysis
- Permitting and Zoning
- State and Local Policy
- Building Codes
- Grant Writing
Urgency of Now

2018 was 4th hottest year on record for the globe

The U.S. experienced 14 billion-dollar weather and climate disasters

February 6, 2019 —

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

U.S. 2018 Billion-Dollar Weather and Climate Disasters

This map denotes the approximate location for each of the 14 separate billion-dollar weather and climate disasters that impacted the United States during 2018.
Collins Cove, Salem during Winter Storm Grayson, January 2018
Photo by Matt Almeida. Source: Patch

Woodman’s of Essex during Winter Storm Riley, March 2018.
Source: Woodman’s of Essex

Urgency of Now
Holistic Planning

Multi-Benefit Outcomes

- Energy
- Resiliency
- Economic
- Environmental
- Public Health
- Equity
- Livability

Bringing Net Zero to 101 Cities and Towns and Beyond
Multi-Benefit Buildings

How the Energy Code Improves a Home

- **Ceiling Insulation**: Installing adequate insulation properly reduces heat transfer and prevents destructive ice-damming in the winter.
- **Thermal Barrier**: Installing adequate insulation on all sides of the home improves occupant comfort and reduces the heating and cooling load.
- **Air Barrier**: Sealing cracks and penetrations prevents unwanted air movement and improves indoor air quality by reducing contaminants in the living environment.
- **Efficient Lighting**: Installing LEDs or CFLs dramatically lowers electricity usage and reduces unwanted heat in the home.
- **Duct Sealing**: Sealing all components of the HVAC system, and testing to verify, improves indoor air quality, system efficiency, and increases occupant comfort by ensuring air is evenly distributed to all rooms in the home.
- **Efficient Windows**: It is critical that windows be well insulated and well-sealed to prevent unwanted heat transfer and moisture infiltration.
- **Mechanical Ventilation**: Installing a dedicated exhaust, supply or balanced ventilation system improves indoor air quality by guaranteeing source-controlled fresh air is being supplied to the home.

Created by MEEA (Midwest Energy Efficiency Alliance)
# How Can We Improve Buildings?

## Higher Performing Buildings

|-----------------------------------------------|---------------------------|---------------------|------------------|

*Source: Metropolitan Area Planning Council*
There are four main ways that Massachusetts municipalities can impact building regulations:

**VOTE**
- International Energy Conservation Code (IECC)

**COMMENT**
- Base Code (MA Building Code CMR 780)
- Stretch Energy Code (780 CMR Ch. 15 AA)

**ADOPT**
- Stretch Energy Code (780 CMR Ch. 15 AA)

**ENFORCE**
- Zoning and other local ordinances
- Base Code (MA Building Code CMR 780)
- Stretch Energy Code (780 CMR Ch. 15 AA)
MARCH 26, 2018

MOVER: Ellen Tohn

MOTION – 2018 ATM

ARTICLE 22: RESOLUTION: ENERGY AND CARBON SAVINGS IN MUNICIPAL BUILDING CONSTRUCTION

I MOVE YOU SIR:

MOVED:

Whereas Wayland was recognized as a Massachusetts Green Community in 2011 and has a commitment to reduce municipal carbon-based energy use and encourage reduction of residential and commercial carbon-based fuel use.

Whereas, Wayland recognizes that global warming is a threat to our world, impacting the ability of current and future generations to lead healthy, productive and enriching lives.

Whereas, buildings can be designed to reduce their energy and carbon use, lower their lifetime energy operating costs, and improve their energy resiliency by incorporating cost effective energy efficient design, building system controls, and on-site renewable energy generation and energy storage.

Whereas, our municipal buildings are a significant contributor to municipal carbon-based energy costs. New construction and substantial renovation of municipal buildings are significant expenditures and create structures that will endure for decades.

Therefore, be it resolved that Wayland shall seek cost-effective design and construction of all new municipal building construction and substantial renovation projects to minimize carbon-based energy use through cost-effective energy efficient design, building system controls, and on-site renewable energy generation and energy storage.
To adopt and fully integrate the latest International Energy Conservation Code as part of the state building code, together with any more stringent energy-efficiency provisions that the board, in consultation with the Department of Energy Resources, concludes are warranted.
BE IT FURTHER RESOLVED, The U.S. Conference of Mayors urges mayors from around the nation to work in conjunction with NGOs and other broad-based organizations promoting greater building efficiency to unite and maximize local government support for putting America’s Model Building Energy Code, the IECC, on a glide path of steady progress toward net zero building construction by 2050.
### IECC for Cities and Towns

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who Develops America’s Building Energy Code (the IECC)?</td>
<td>Local and State Officials from Across America!</td>
</tr>
<tr>
<td>Who Enacts Building Energy Codes?</td>
<td>State &amp; Local Governments</td>
</tr>
<tr>
<td>Who Enforces Building Energy Codes?</td>
<td>Mostly Local Governments</td>
</tr>
</tbody>
</table>
Adding Resiliency to the Code

Areas of Opportunity

Several areas of opportunity were identified during the three stakeholder convenings for both adaptation and mitigation. Many of these suggestions are captured in the pathways section above. The following opportunities generated some consensus among different stakeholder groups:

Flood-resistant construction

The need to address sea level rise and other flood-related climate impacts in codes was noted by a number of participants. Recommendations included:

- Establishing a design flood elevation in the code with varying freeboard requirements based on local geographic risk;
- Using updated maps with forward-looking data rather than relying on FEMA FIRMs; and
- Establishing a consistent practice for elevating critical equipment above future flood levels and addressing the use of temporary flood barriers.

Municipal officials had mixed views on the accuracy of existing FEMA FIRMs for current conditions and there was a recognition that some cities and towns may have more accurate FEMA maps than others. However, there was general agreement that FEMA maps are not ideal long-term planning tools because they do not account for future conditions like sea level rise.

Participants also noted that the code currently does consider the design life of a structure, but this factor could be used to vary freeboard requirements in addition to geographic risk.

Building performance

In each of the three convenings, participants discussed the need to address building performance. Disclosure requirements and recommissioning were widely supported. There was general consensus that in many cases, buildings are not being operated as intended, which decreases their effectiveness and could also present air quality health risks. There was some debate about how best to approach this issue and concern about the feasibility of code compliance and enforcement if commissioning requirements were more stringent. One recommendation was to revise the code to require that commercial projects be recommissioned at least every five years. Participants noted that this would interface with building disclosure ordinances passed at the local level.

There was also a recommendation for Massachusetts to require owners to submit a maintenance plan and schedule to complement the recommissioning process. However, this
Two hundred fifty (250) municipalities have adopted the Board of Building Regulations and Standards (BBRS) Stretch Code, as of November 27, 2018.
What a Tiered Stretch Code Could Look Like:

1. Updated stretch code based on current I-Codes. (The current stretch code is based on the 2016 ICC and 2013 ASHRAE.)

2. A pathway based on Passive House and other standards that municipalities could adopt to go beyond the requirements of the stretch code and achieve higher efficiency (i.e. 15% more efficient as opposed to 10%).

3. A Net Zero Stretch Code option adopting Appendix G or a pathway from another state.
SUSTAINABILITY: It Doesn’t Cost the Earth!

Comfy!

Energy-efficient buildings
Allows residents to live in place longer, reduces annual energy spending, and reduces overall net emissions. Can help vulnerable populations avoid dangerous and occasionally life-threatening situations in which weather and economics present a dual threat.

District energy systems
Underground system pipes heat water, or chilled water to buildings from nearby energy source and reduces peak power demand through thermal energy storage.

Microgrids
May disconnect from grid during power outage, maintaining power supply; allows facilities receiving backup power to double as shelter for displaced residents; reduces overall net emissions, and potentially increase cost savings.

Combined heat & power
Provides backup power, allows facilities receiving backup power to double as shelter for displaced residents, reduces overall net emissions, and potentially increases cost savings.

Green infrastructure
Reduces localized flooding due to storms, energy demand, and urban heat island effect in cities.

Utility energy efficiency programs
Increases reliability, and reduces utility costs.

Transit-oriented development
Increases economic development opportunities, provides transportation cost savings and reduces impacts of price volatility; and may improve air quality.

Cool roofs & surfaces
Reflective and light-colored surfaces reduce urban heat islands effect, electricity demand, and overall net emissions.

Co-Benefits for All

Green building made simple
Combine beauty, innovation, site, community, natural materials, waste management, resilience, durability, clean air, daylighting and water conservation. Next, just choose your energy savings!

©2015 Homesol Building Solutions Inc

View the Full Report at http://aceee.org/research-report/u1508
Thank you!

Cammy Peterson
Director of Clean Energy
Metropolitan Area Planning Council
Boston, Massachusetts

cpeterson@mapc.org

617.933.0791