NOVEMBER 18, 2020

ZNC - Low Carbon Building TAG

Boston Planning & Development Agency

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Thornton Tomasetti

Zoom Meeting Guidance

The BPDA will record this meeting and post it on BPDA's Zero Net Carbon Building Zoning webpage. The recording will include the presentations, discussions and a transcript of Q&A / Chat comments.

It is possible that participants may be recording this meeting as well.
If you prefer not to be recorded during the meeting, please turn off your microphone and camera.

Zoom Meeting Guidance

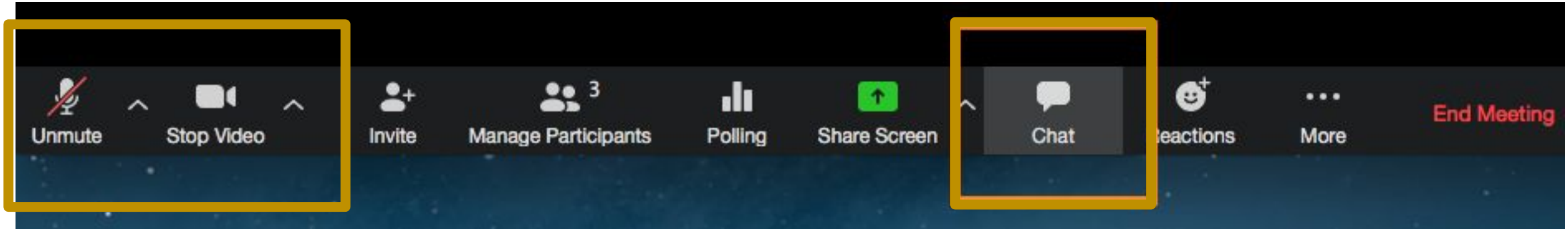
- Help us ensure that this conversation is a pleasant experience for all.
- Please mute your mics during the presentation to avoid background noise.
- It's great to see you! Participant video can be on during the meeting.
- **Use the Chat** feature for questions and comments during the presentation.
- Use the Raise Hand feature during the discussion segment.
- Please be respectful of each other's time.

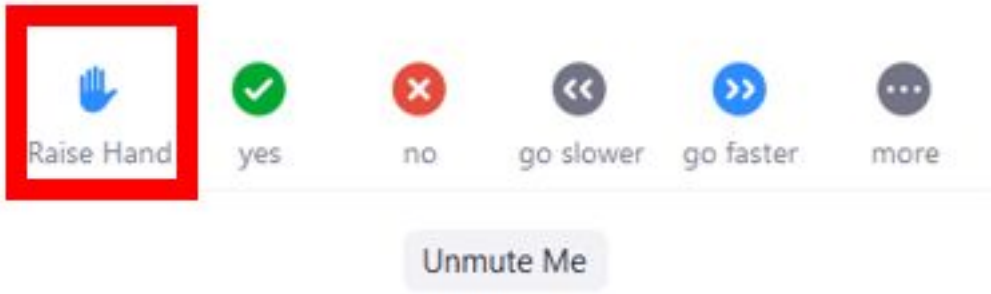
- As always please feel free to reach out to me directly!
  John Dalzell, AIA, LEED Fellow at John.Dalzell@Boston.gov

Zoom Tips

Your controls should be available at the bottom of the screen.

Clicking on these symbols activates different features:





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COVID-19 Resources

Stay up-to-date with COVID-19 related announcements, City of Boston reopening plans, and resources for you and your community at:

boston.gov/coronavirus

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AGENDA

1. Introductions (5 min)
2. Process (5 min)
3. Precedents (10 min)
4. Pathways (15 min)
5. Discussion (50 min)
6. Next Steps (5 min)

AGENDA

1. Introductions
2. Process
3. Precedents
4. Pathways
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6. Next Steps

INTRODUCTIONS

CONSULTING AND CITY TEAM

Alejandra Menchaca, Ph.D., LEED AP, WELL AP
Vice President, Thornton Tomasetti

Colin Schless, CPHC, LEED AP BD+C
Vice President, Thornton Tomasetti

Jacob Knowles
Associate Principal BR+A Consulting Engineers

Vincent Martinez
Chief Operating Officer, Architecture 2030

Debra Perry
Senior Associate, Cadmus Group

John Dalzell, AIA, LEED Fellow
Sr. Architect Sustainable Development, BPDA

Richard McGuinness
Deputy Director, BPDA

Chris Busch, AICP
Assist Deputy Director, BPDA

Kathleen Pedersen
Sr. Land Use Planner / Sustainability Specialist, BPDA

Alison Brizius
Director of Climate and Environmental Planning
City of Boston

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ZNC BUILDING ZONING UPDATE

Boston Carbon Neutral 2050 – Climate Action Plan

"Strengthen Article 37 Green Building Zoning requirements to a zero net carbon standard"

Policy Framework

Zero = Bldg Emissions – On-site and Procured Renewable Energy

Low Carbon Buildings ***(this TAG)***
Establish Emission Targets and Pathways

On-site Renewable Energy
On-site Energy Generation Standard

Renewable Energy Procurement
Determine Options & Reporting

TAG GOALS

Low Carbon Building TAG

Establish Emission Targets and Pathways:

- Establishing means for prioritizing low carbon building performance
- Identify pathways for small (20,000sf+) and large buildings and all use typologies
- Reward innovation and high performance

Key Considerations

- Focus on carbon and emissions reduction – Carbon Emission Intensity (CEI)
- Align with industry best practices, utility incentives, and market drivers
- Compliance process efficiency (leverage familiar third-party frameworks)
- Compatible with upcoming BERDO v2 emissions performance standards

PROCESS

TAG Meetings

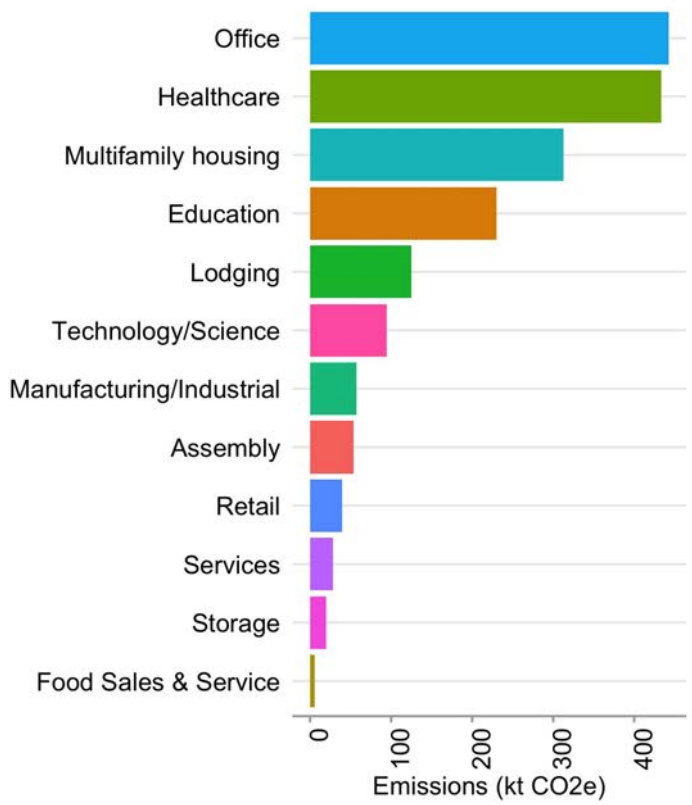
- **Meeting 1 (today)** - Framework and Pathways
- **Meeting 2** - Emissions Targets
- **Meeting 3** - Practice Transformation and Regulations
- **Meeting 4** – Finalizing Recommendations

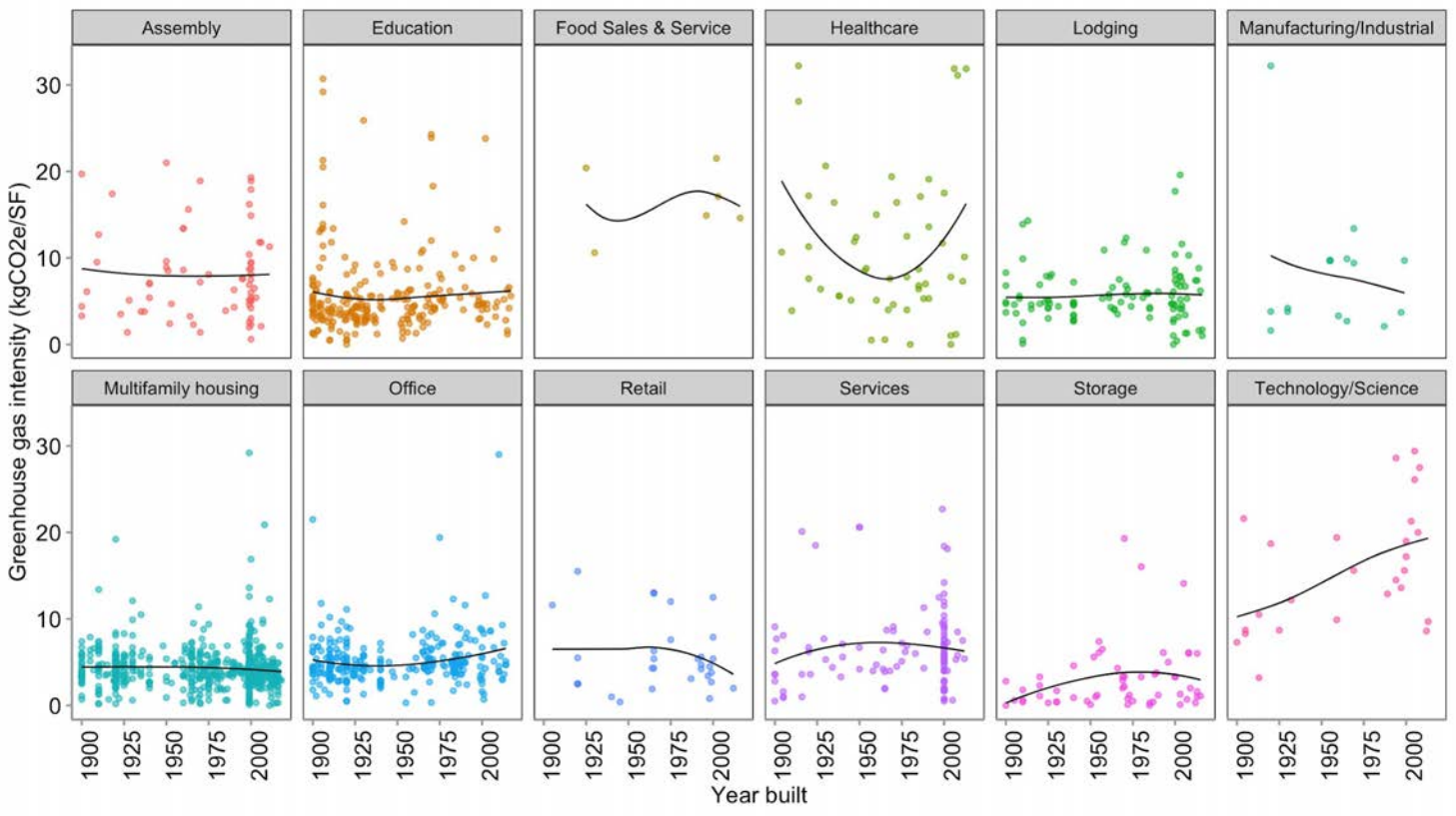
Today's Meeting Outcomes:

- **Recommendations for potential compliance pathways**
- **Metrics: Carbon Emission Intensity**

CITY'S BUILDINGS CARBON PROFILE

Carbon Emissions of Boston Buildings <50,000 sf





Source: BRDO, Synapse

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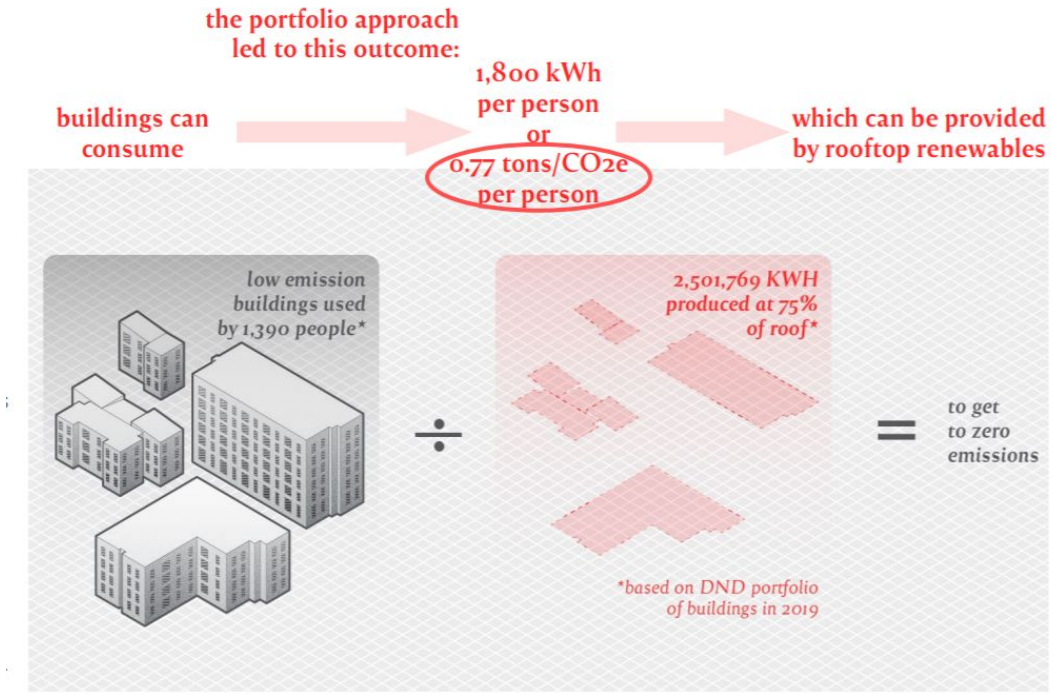
PRECEDENTS

City of Boston Precedents



DND Guidebook for Zero Emission Buildings

- Carbon emissions per person used as metric to achieve ZEB.
- Buildings of different scales have different requirements to contribute to a collective achievement of ZNC for the City.

PRECEDENTS

City of Boston Precedents

NBI Building Performance Targets and Building Prototype Profiles for Boston

- Proposes EUI/CEI targets for seven building typologies
- Recognizes challenges in the impact of certain model inputs (e.g., occupancy profiles) on predicted EUI/CEI.

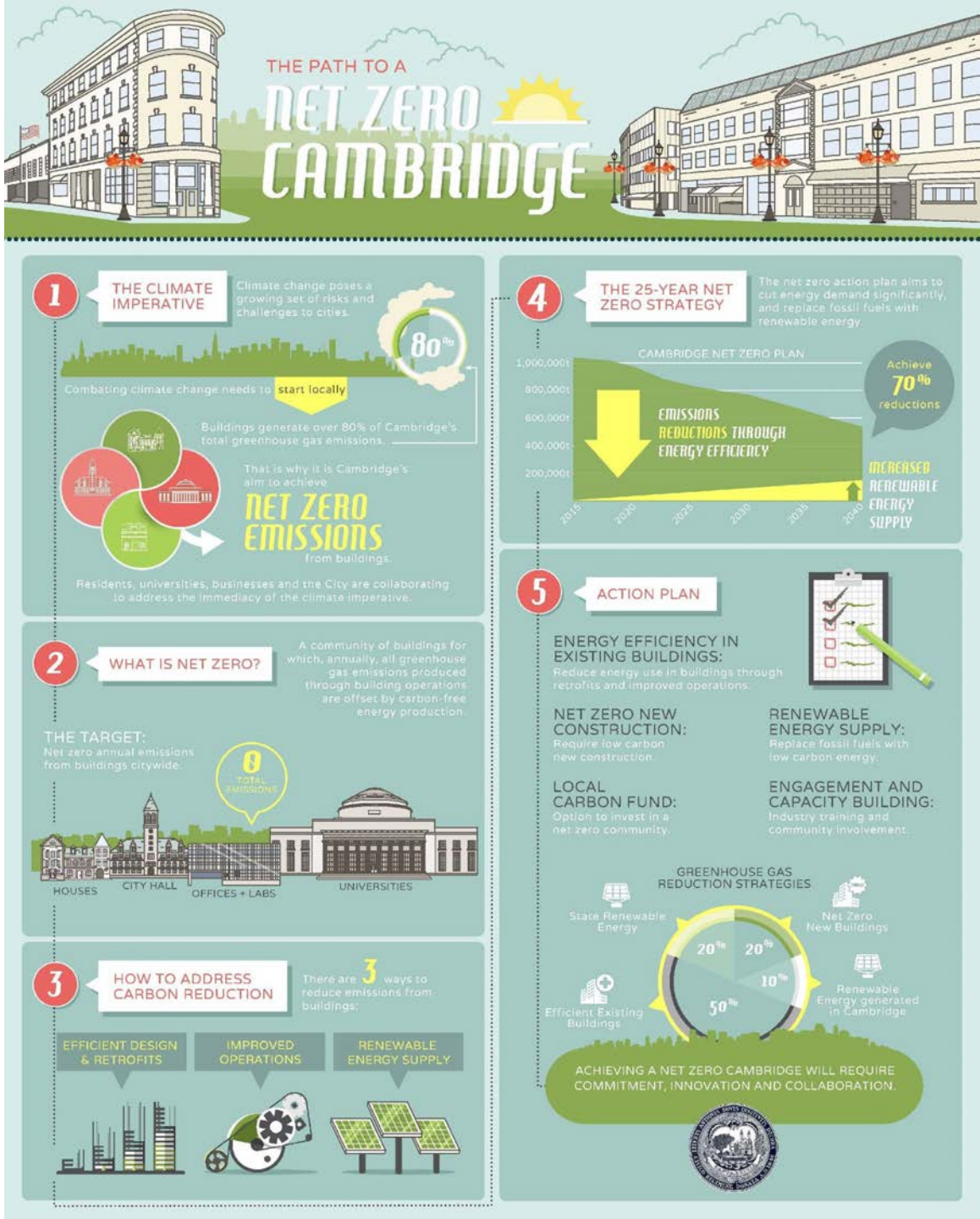
2: Recommended whole-building Zero Energy Ready performance targets for Boston

Building Type	MA Code Performance [kBtu/sf/yr]	Performance Target [kBtu/sf/yr]	Percent energy reduction to target
20-story High-Rise Apartment	52	31	40%
Secondary School	35	24	31%
Medium Office	33	25	24%
Large Office[6]	70	34	51%
Large Hotel	84	78	7%
Physical Laboratory	-	80	-
Chem/Bio Laboratory	-	140	-

PRECEDENTS

Local Precedents

- **Somerville**
  - All electric
  - ILFI Zero Carbon (all electric, offset all energy from renewables and buy offsets for EC) or PH
- **Cambridge:** Net Zero Action Plan
- **Brookline:** Zero Emissions by 2050



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PRECEDENTS

Performance Targets

- **Seattle Code**: EUI targets by archetype + accompanying fee if not compliant
- **NYC Local Law 97**: carbon emissions intensity limits by archetypes for existing buildings + fee if not compliant

NYC

Carbon Emissions Per Building Type

		Carbon Limit (kgCO2e/sf)	
Occupancy Group	**Space Use**	**2024-2029**	**2030-2034**
B – Ambulatory Health	Medical Office	23.81	11.93
M – Mercantile	Retail	11.81	4.3
A – Assembly	Assembly	10.74	4.2
R1 – Hotel	Hotel	9.87	5.26
B – Business	Office	8.46	4.53
E – Educational	School	7.58	3.44
R2 – Residential	Multifamily Housing	6.75	4.07
F – Factory	Factory	5.74	1.67
S – Storage	Storage / Warehouse	4.26	1.1

Seattle

C401.3.2 Energy use targets. Buildings, including their initial tenant improvements, using the Target Performance Path shall be designed to use less energy than the weighted sum of the following energy use targets, as demonstrated by *approved* energy modeling. Energy use targets are expressed in terms of thousand BTU per square foot of *conditioned floor area* per year (kBTU/ft^2/yr).

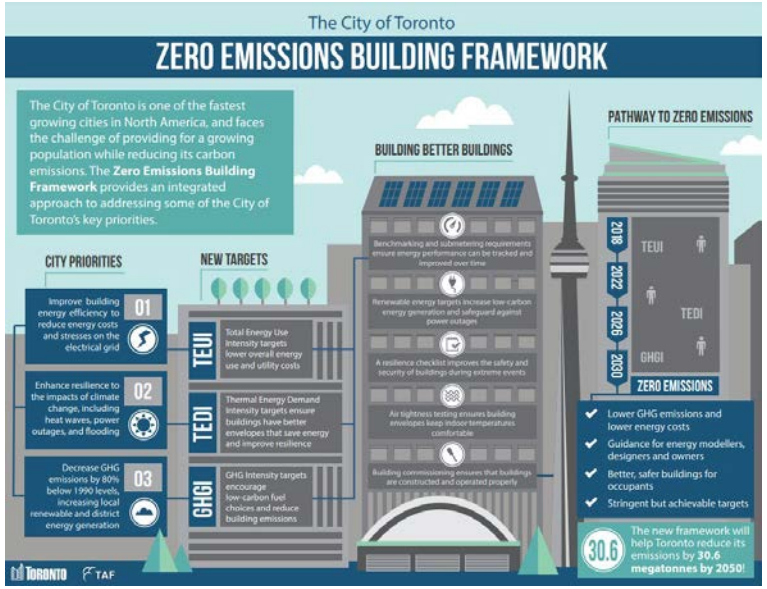
1. Group B office: 40 kBTU/ ft^2/yr
2. Group B medical office: 50 kBTU/ ft^2/yr
3. Group R-2 multi-family: 35 kBTU/ ft^2/yr
4. Group S-1 & S-2 warehouse: 25 kBTU/ ft^2/yr
5. Group E school: 45 kBTU/ ft^2/yr
6. Group M retail: 60 kBTU/ ft^2/yr
7. Group I-2 hospital: 150 kBTU/ ft^2/yr

PRECEDENTS

Performance Targets

- **Toronto Zero Emissions Buildings Framework**: set of targets for 5 most common archetypes
  - TEUI (Total Energy Use Intensity)
  - TEDI (Thermal Energy Demand Intensity)
  - GHGI (GHG Intensity)

- **London Energy Transformation Initiative**| EUI & Carbon targets by archetype



London – LETI Design Guide

Whole life carbon = Operational carbon + Embodied carbon

PRECEDENTS

Green Building Standards

- **San Francisco**: Exceptions to LEED Platinum, GreenPoint Rated, LBC Cert or Petal or ILFI NZE, Passive House or EnerPHIT
- **Denver**: Passive House Certification as compliance path
- **Vancouver**: Actively promotes Passive House, and provides PHIUS toolkit + training to city staff
- **Brussels, Belgium**: All new buildings and retrofits are required to be designed to PH standards
- **Portland, ME**: New Green Deal requires projects to first attempt traditional path, but offers exemptions with conflict / hardship with LEED, Passive House, LBC, or Green Globes projects as basis *[as of November 2020]*

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POSSIBLE PATHWAYS

All are expressions of exemplary building performance and based on industry standards for high-performance building practices:

1. Percent Carbon Reduction - savings from baseline
2. Carbon Performance Targets – Carbon Emission Intensity (“CEI”) by archetype
3. Prescriptive Load Reduction - building and system design standards based on predicted CEI
4. Third Party Certification - exception for high performance building certification

POSSIBLE PATHWAYS

1. Percent Carbon Reduction - savings from baseline

Percent carbon reduction compared to energy model baseline (similar to stretch-code and LEED process, but based on carbon)

- All building typologies
- Refers to 3rd party energy modeling to prove reduction, such as minimum LEED Optimize Energy Performance points through Alternative Performance Metric.
- **Compliance**: Carbon Emissions comparison between ASHRAE Baseline and Proposed Design energy models.

POSSIBLE PATHWAYS

2. Carbon Performance Targets - Carbon Emission Intensity (“CEI”) by archetype

Carbon emissions per square foot based on an energy model; must be below a pre-defined threshold.

- Applicable common building typologies
- Aligned with utilities’ requirements
- **Compliance**: Carbon Emissions for Proposed Design energy model

POSSIBLE PATHWAYS

3. Prescriptive Load Reduction – building and system design standards based on predicted CEI

List of prescriptive efficiency measures, must comply with all applicable requirements to follow this path.

- Applicable to all building typologies
- Focused on peak load reduction:
    - High performance envelope (including air tightness)
    - Heat recovery efficiency
- Straightforward / affordable for small buildings (particularly 20,000 sf – 50,000 sf)
- **Compliance**: documentation that all prescriptive requirements are being met.

POSSIBLE PATHWAYS

4. Third Party Certification - exception for high performance building certification

Building pursuing exceptional levels of low carbon building certification.

- Applicable to some building typologies
- For example: Passive House / EnerPHIT certification, LEED ZE/ZC
- **Compliance**: pre-certification checklist

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POSSIBLE PATHWAYS - DISCUSSION

1. Percent Carbon Reduction - savings from baseline

Percent carbon reduction compared to energy model baseline (similar to stretch-code and LEED process, but based on carbon)

Strengths

- *Aligned with industry practice (stretch code / LEED), fewer models is better, minimize adding separate requirements*
- *Aligned with goal of reducing carbon compared to standard practice / code*
- *Useful for existing buildings that may retain old envelope components*

Weaknesses

- *"Black box" energy model risk / could be "gamed"*
- *Will require customization of % reduction thresholds for different building types*
- *Would need to address HERS rating for multi-family, particularly for those not required to meet Stretch Code and using HERS for LEED*

- Focus on regulating carbon
- Aligned with utility incentive and industry practice process, market-friendly
- Simple to review (ideally rely on third party frameworks)
- Compatible with upcoming BERDO emissions performance standard

POSSIBLE PATHWAYS - DISCUSSION

2. Carbon Performance Targets - ("CUI") by archetype

Carbon emissions per square foot based on an energy model; must be below a pre-defined threshold.

Strengths

- *Aligned with carbon reduction goal*
- *Addresses a large % of buildings in Boston*
- *Potential to define "targets" in addition to minimum "requirements"*

Weaknesses

- *May not address some of the important high emission building types in Boston*
- *"Black box" energy model risk / could be "gamed", therefore would have to regulate model inputs, which would likely result in additional energy modeling effort to model Boston standard vs. actual anticipated*

- Focus on regulating carbon
- Aligned with utility incentive and industry practice process, market-friendly
- Simple to review (ideally rely on third party frameworks)
- Compatible with upcoming BERDO emissions performance standard

POSSIBLE PATHWAYS - DISCUSSION

3. Prescriptive Load Reduction

List of prescriptive efficiency measures, must comply with all applicable requirements to follow this path.

Strengths

- *Simple process for projects, particularly valuable for smaller buildings*
- *Could be specific about eliminating fossil fuels? By having multiple paths, may avoid conflict with AG ruling.*

Weaknesses

- *Need to address multiple aspects to avoid missing key items that would result in shortfall (thermal bridging, air leakage, etc.)*
- *Is there proof that prescriptive measures consistently achieve emissions reduction?*

- Focus on regulating carbon
- Aligned with utility incentive and industry practice process, market-friendly
- Simple to review (ideally rely on third party frameworks)
- Compatible with upcoming BRDO emissions performance standard

POSSIBLE PATHWAYS - DISCUSSION

4. Third Party Certification - exception for high performance building certification

Building pursuing exceptional levels of low carbon building certification.

Strengths

- *Simple to review for City*
- *Well established means of regulating building performance, with standards maintained by others (not City)*

Weaknesses

- *Need to limit the acceptable third party certification standards to avoid standards that do not reduce building emissions sufficiently (before renewable energy is applied)*
- *Requires a means of aligning with City standards for other pathways / BERDO emissions metric*

- Focus on regulating carbon
- Aligned with utility incentive and industry practice process, market-friendly
- Simple to review (ideally rely on third party frameworks)
- Compatible with upcoming BERDO emissions performance standard

ZNC Zoning - Low Carbon Buildings TAG Meeting #1 - November 18, 20202 - Chat Notes - as recorded in order of posting:

- Shirine: Are these cities' targets for new construction or do they include adaptive reuse?
- John Dalzell: This is a link to our ZNC Building Zoning webpage Document Center including the DND Guide Book for ZEB: http://www.bostonplans.org/document-center?program=113
- John Dalzell: @ Shirine - there are both new construction and existing building carbon targets and policies emerging in municipalities.
- Shirine: Does pathway 3 include embodied carbon?
- Chris Schaffner - The Green Engineer, Inc.: In case you missed it USGBC announced a LEED Zero Energy for design phase.
- Lauren Baumann: Will the focus on an overarching Green Building certification (LEED) be converted to an exclusive carbon focus, or is it in addition to this baseline?
- Kate Bubriski: is the intent to only have one pathway or more than one pathway options for projects to choose from?
- Alejandra Menchaca, Thornton Tomasetti (she/her): Kate - more than one for sure. Potentially all four. Of course, the more pathways, the more we need to focus on make sure they're compatible.
- julie klump: The strength of this path will depend on the actual modeling software for new construction. Rehab projects will have data
- Kate Bubriski: A weakness is that baselines can often be not what we would actually ever build.
- John Dalzell: Thanks Chris - good comment on LEED Zero Energy. It has the potential to better fit municipal permitting processes.
- julie klump: What about allowing PH as an alternative path.
- Colin Schless TT: Hi Julie- we are considering PH precertification as an acceptable path for #4
- julie klump: That is awesome. So much cleaner and actionable than a prescriptive pathway.

- Samira A (enviENERGY): Is there a building area threshold for this pathway?
- julie klump: Modeling is key. So is diagnostic testing and final testing.
- Rebecca Hatchadorian Arup: Have you looked at setting the % reduction on scope 1 emissions only?
- Lauren Baumann: Is that true for new construction? This graph is existing buildings
- Alejandra Menchaca, Thornton Tomasetti (she/her): @Lauren - existing, but this process is looking at trends as well. Which is why we consider that labs, for instance, while not a big emitter to date, we expect them to rise up in terms of overall carbon intensity.
- Chris Schaffner - The Green Engineer, Inc.: This would work well if the target was set as zero!
- John Dalzell: Great commit Chris! Zero is the target; we need to make sure the building efficiency is good.
- Vincent Martinez, COO, Architecture 2030 (he/him/his): Just to note if renewable energy is not considered than a zero emissions target is not possible
- Chris Schaffner - The Green Engineer, Inc.: Unless we expected a lot of cold dark shells
- Rebecca Hatchadorian Arup: that also applies to density of space use will increase the EUI or CUI, e.g. smaller residential units or more occupants/sf in an office
- Lauren Baumann: Does this pathway create potential code conflicts?
- John Dalzell: Thanks Vincent - Low Carbon Buildings are just one of the three elements for achieving ZNC. On-site and Procured Renewable Energy matter!
- Peter Zmuidzinas: Yes for small projects
- Vincent Martinez, COO, Architecture 2030 (he/him/his): Yes, very important to have a prescriptive path.
- Kristen Fritsch: Prescriptive Path feels like a back-up path for small projects or projects that don't fall as easily into another path.

- Chris Schaffner - The Green Engineer, Inc.: Yes, if you it means you can also comply with code this way. If I have to model anyway, I might as well follow the other paths.
- Chris Schaffner - The Green Engineer, Inc.: Good luck with that - Brookline tried
- Vincent Martinez, COO, Architecture 2030 (he/him/his): Yes. I agree with Shirine's comment
- Matthew Fickett: My main concern as a lab planner is that much of the potential carbon reduction in labs comes from a reduction in quantity, not an improvement of quality, of major carbon uses (e.g. clean rooms or fume hoods). A prescriptive path which mandates high-efficiency but doesn't mandate or reward reduction in use quantity doesn't address this - unless I have missed something about it.
- Lauren Baumann: Be sure to pair any prescriptive requirements around electrification with very high performance building energy load reduction requirements to ensure that there are not adverse impacts around operating cost
- Chris Schaffner - The Green Engineer, Inc.: …and electric demand profile
- Norm Lamonde: YES - I think there should be a prescriptive path option available. I also think there needs to be a focus on connecting the Article 37 for new bldgs. with BEDO. For example: All new building application process should be required to understand what their "exposure" is when considering future BERDO compliance. Just thinking here, If EUI is the measure, should new buildings have a more stringent EUI requirements day 1 at building completion compared to the EUI for an existing building of the same typology.
- Lauren Baumann: Re: Prescriptive requirements, if this is one pathway where others are available I think it works well. I would not want prescriptive requirements to take away a sophisticated design team's ability to be creative and accommodate unique conditions of large projects.
- Chris Schaffner - The Green Engineer, Inc.: LEED Zero requires overall LEED Cert plus zero energy via renewables. The floor on energy is just the LEED Prereq, which is basically 90.1-2016. So not really a strong efficiency standard.
- John Dalzell: Great points Norm! We need for the projects to understand and interface with BERDO which anticipates utilizing a CEI metric.
- Alejandra Menchaca, Thornton Tomasetti (she/her): Thanks Chris, that has been our impression too.

- Chris Schaffner - The Green Engineer, Inc.: Doesn’t PH still favor fossil fuels, since it is based on source energy?
- Vincent Martinez, COO, Architecture 2030 (he/him/his): I agree with Lauren about needing both performance pathways in addition to prescriptive
- Norm Lamonde: Maybe a prescriptive path is only available for building of certain typologies and/or up to a certain SF limit (ie: smaller buildings)
- Colin Schless TT: Hi Chris- PHIUS 2021 plans to use different source energy factors that focus on future grid emissions. The specific factors aren't finalized yet but the intention is to address this
- Rebecca Hatchadorian Arup: Were Living Building Challenge/ILFI certifications not considered because of the operational aspect? Couldn't you allow it coupled with heavy fines if the Zero Carbon certification isn't achieved. There is precedent for this too.
- Chris Schaffner - The Green Engineer, Inc.: Yes Rebecca - like Somerville
- Norm Lamonde: I think it would be good to take a hypothetical building for a test drive to demonstrate the impacts of the different pathways. May be a good idea but could be a lot of work. However, there will be a lot of questions from the marketplace around this question and may be worthwhile to do.
- Chris Schaffner - The Green Engineer, Inc.: Somerville is using the ILFI Zero Carbon standard. But it has an efficiency loophole - 25% better than 90.1-2010.
- Kristen Fritsch: Agree, that even though ILFI relies on post construction performance, it seems like it should remain an option for 3rd party certifications.
- Alejandra Menchaca, Thornton Tomasetti (she/her): @Norm, we don't see these as necessarily equivalent. We envision "easy" submission pathways as being stricter than pathways that are more intricate. But you're correct that the more pathways the more we need to be very careful of any loopholes
- Rebecca Hatchadorian Arup: Our energy/stretch code will solve the efficiency issue ILFI doesn't solve.
- Norm Lamonde: Great Job everyone and appreciate the collaborative effort by all engaged.
- **END**

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NEXT STEPS

- Follow up Survey – Pathways and Metrics
- Incorporate TAG feedback
- Develop compliance path structure
- Prepare thresholds for each pathway
- Re-visit with TAG on Meeting 2

ZNC ZONING MATERIALS AND CONTACTS

For information, materials, updates and submitting comments, please visit the "Zero Net Carbon Building Zoning Initiative" webpage: bostonplans.org/ZNCBuildingZoning

- Comments may be submitted directly from project webpage or emailed to John.Dalzell@Boston.gov
- Meeting presentations and recording will be uploaded to the project webpage in the next two days.

THANK YOU