Zero Net Carbon Building Zoning

Virtual Public Meeting

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September 30, 2020

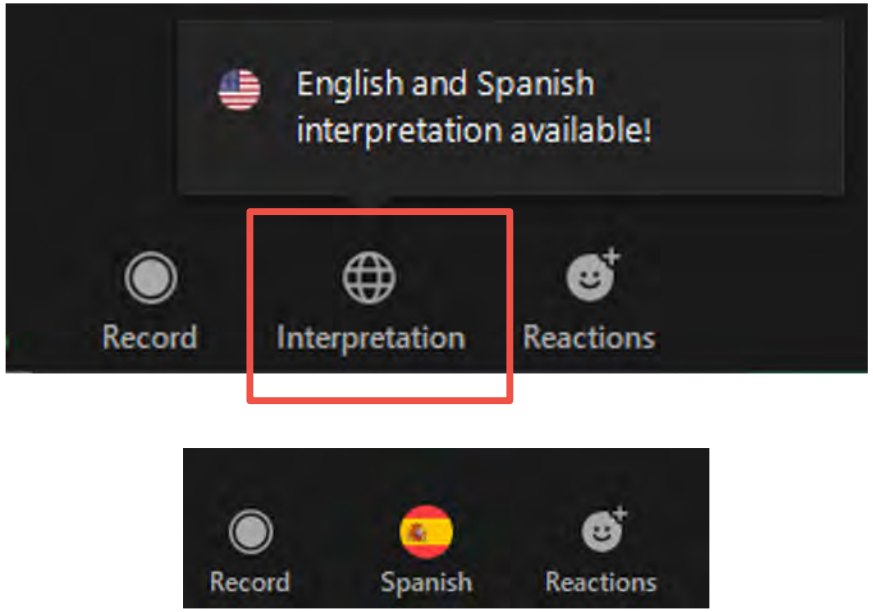
Zoom Meeting Guidance

Instrucciones de reunión Zoom

Spanish interpretation is available for this meeting. Please select your preferred language option at the bottom of the screen by clicking on the globe symbol.

NOTE:
EVERYONE MUST SELECT A LANGUAGE.

Hay interpretación al español disponible para esta reunión. Seleccione la opción de idioma que prefiera en la parte inferior de la pantalla haciendo clic en el símbolo del globo.



Select Spanish or English

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WELCOME & PROTOCOLS

***Richard McGuinness**, Deputy Director*
Boston Planning & Development Agency
Richard.McGuinness@boston.gov
www.bostonplans.org/ZNCBuildingZoning

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Objectives

Zero Net Carbon Building Zoning Initiative

To update existing Article 37 Green Building Zoning policy and to develop new zoning to fully mitigate new building carbon emissions.

Public Meeting

Introduce ZNC Building Zoning framework, process, engagement, and schedule.

Share current ZNC and high performance building best practices and define:

- Low Carbon Buildings
- On-site Renewable Energy
- Renewable Energy Procurement

Engage participants and plan for next steps

Agenda

6:05 - 6:10 PM: Welcome and Meeting Protocols

6:10 - 6:15 PM: Carbon Free Boston, Climate Action Plan, and Building Energy Reporting & Disclosure Ordinance

6:15 - 6:20 PM: Zero Net Carbon Building Zoning Initiative

6:20 - 6:55 PM: ZNC Buildings and Focus Areas

- Low Carbon Buildings
- On-site Renewable Energy
- Renewable Energy Procurement

6:55 - 7:25 PM: Questions & Answers

7:25 - 7:30 PM: Next Steps

BPDA's COVID-19 Response

- When Mayor Walsh declared a public health emergency in mid-March, the BPDA paused the public review process for all development projects and planning initiatives. The BPDA has postponed all BPDA-hosted in-person public meetings regarding Article 80 development projects and planning studies until further notice.
- After months of work by an interagency working group and with support from local community groups and elected officials, the BPDA has begun to resume public meetings virtually for planning studies and Article 80 development projects.
- The interagency working group consisted of City and BPDA employees across departments and met regularly to develop best practices and test appropriate digital tools to host wide-ranging, engaging, and inclusive conversations with communities.

Zoom Meeting Guidance

Instrucciones de reunión Zoom

- Help us ensure that this conversation is a pleasant experience for all.
- Participant mics will be muted during the presentation to avoid background noise. Participant video will be off during the meeting.
- Attendees can submit questions via the Q&A feature throughout the meeting or by the Raise Hand feature during the discussion segment.
- Please be respectful of each other's time.
- We ask participants to limit their questions so that all may participate in the discussion. Please wait until all attendees have had the opportunity to ask a question before asking a second question.
- You can always set up a conversation with John Dalzell, AIA, LEED Fellow at John.Dalzell@Boston.gov for further discussion.

Zoom Meeting Guidance

Instrucciones de reunión Zoom

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 comments.

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

Para escuchar la sesión en español, por favor utilice el canal en español

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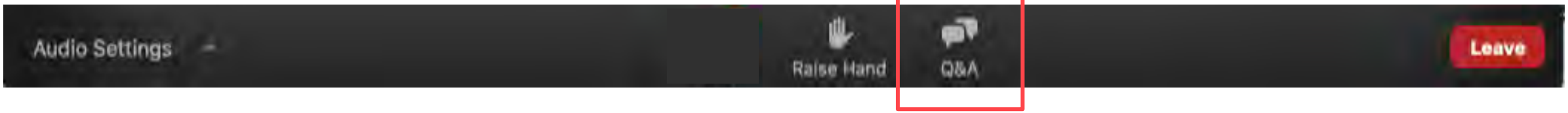
Zoom Meeting Guidance

Instrucciones de reunión Zoom

- Presentation followed by Q & A discussion and comments.
- Please utilize the Q&A feature to post questions and comments.



- If you have a **clarifying** question about something in the presentation, we will do our best to answer it while the presentation is in progress.
- Please utilize the “Raise Hand” feature if you would like to ask a question or comment verbally. We will call on as many participants as possible.

Zoom Meeting Guidance

Instrucciones de reunión Zoom

Here are some tips on using Zoom.

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

Clicking on these symbols activates different features:

Mute/unmute (you will remain muted until a host gives you access)

Q&A to ask questions throughout the presentation

Turn video on/off (your video will remain off until a host gives you access)

Raise hand to ask for audio/video permission at the end of presentation

Para escuchar la sesión en español, por favor utilice el canal en español

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ZNC Building 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.

CARBON FREE BOSTON, 2019 CLIMATE ACTION PLAN UPDATE, & BERDO UPDATE

Kat Eshel & Alison Brizius
City of Boston Environment Department
katherine.eshel@boston.gov
alison.brizius@boston.gov

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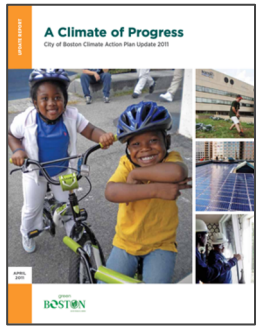
RESILIENT BOSTON HARBOR

A HISTORY OF CLIMATE PLANNING AND ACTION

2007: ***80x50***
First Climate Action Plan,
Article 37 inserted into the Zoning Code

2011
Update #1

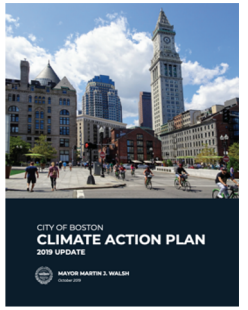


2014
Update #2

2016
Climate Ready Boston

2018
Resilient Harbor Vision

2019
Update #3



- Climate action
- Adaptation
- Mitigation

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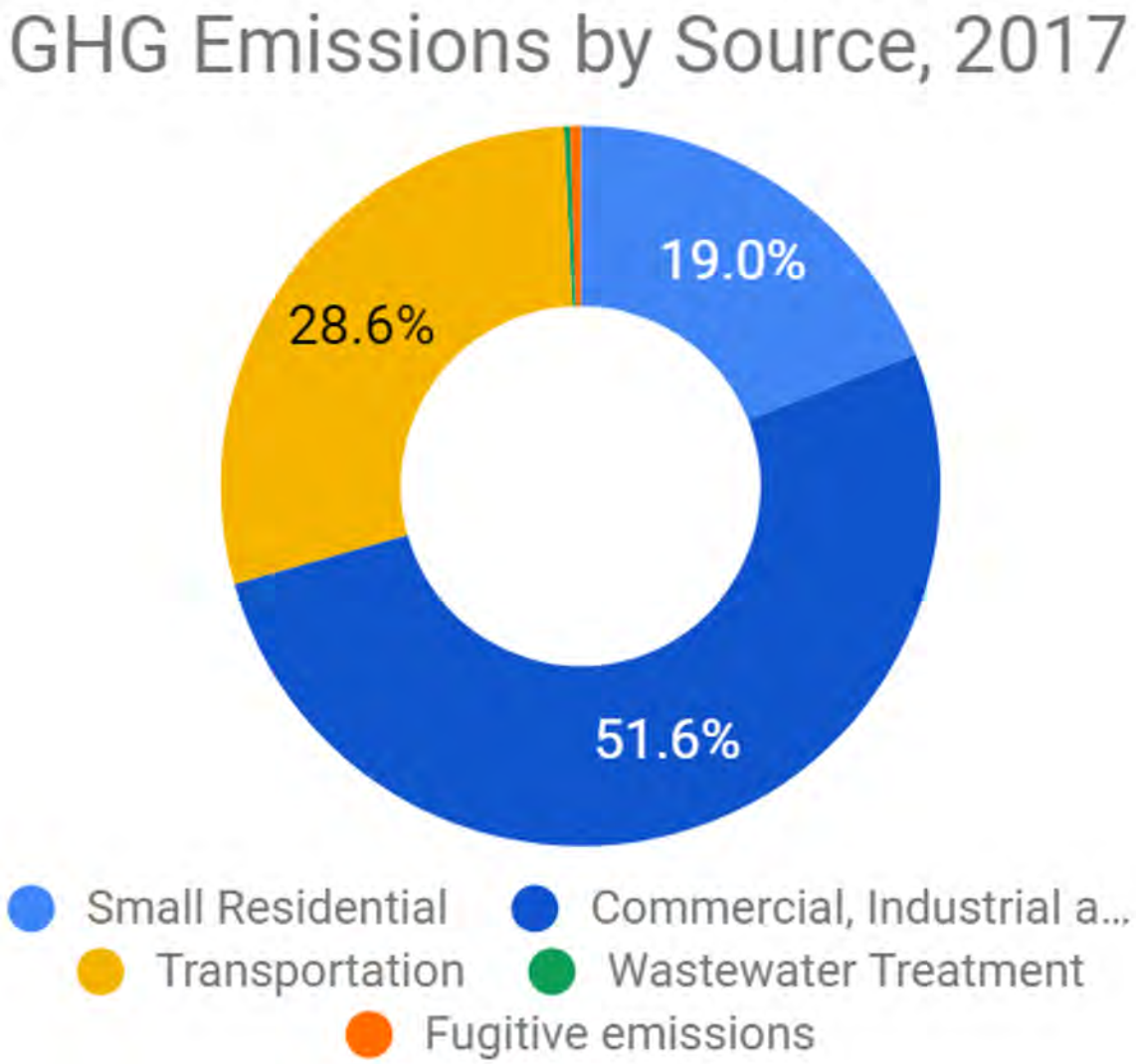
BOSTON'S CARBON FOOTPRINT

Boston's emissions have decreased by approximately 20% since 2005, but we are not on track to achieve our long-term goals.

Buildings represent 70% of Boston's emissions.

To reach carbon neutrality, we need to accelerate carbon reductions and decarbonize Boston's building sector.



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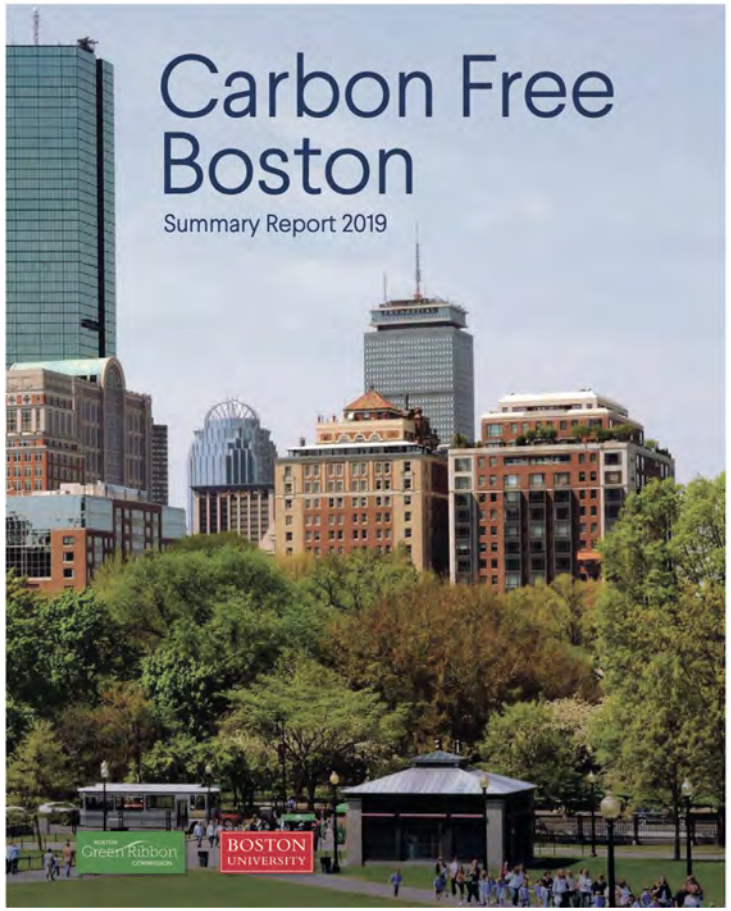
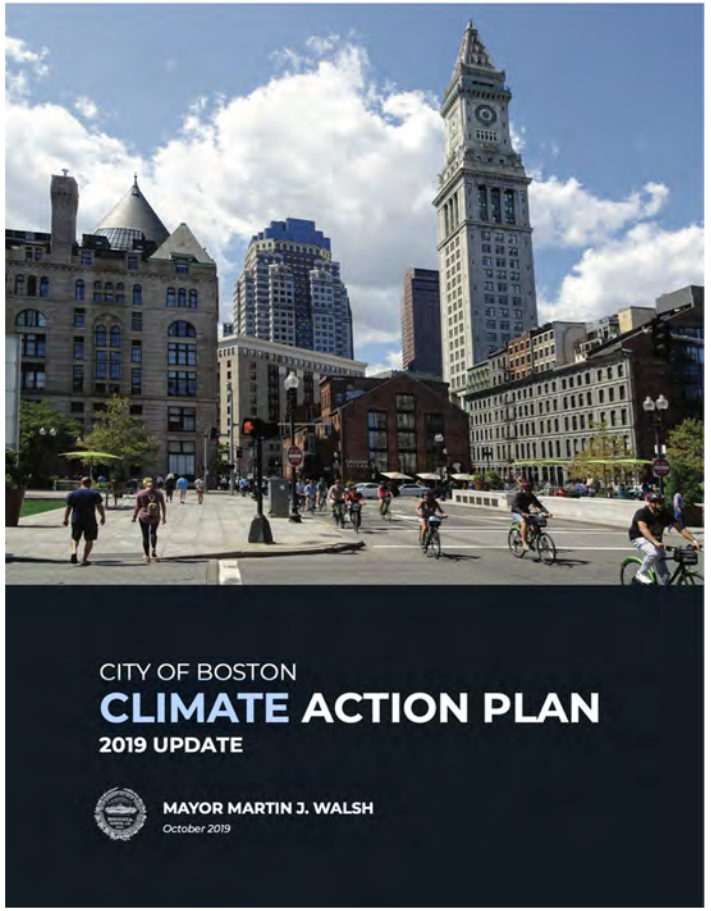
Understanding what it takes to get to carbon neutrality...



... to inform the 2019 Climate Action Plan update



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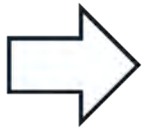
WHAT DOES IT TAKE TO GET TO CARBON NEUTRALITY?

Boston needs to pursue 3 strategies **simultaneously**:



Reduce demand for energy by increasing **efficiency**;

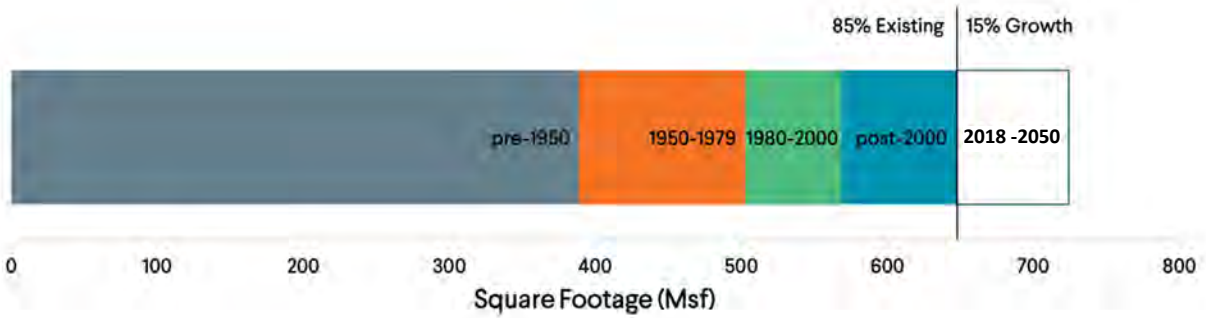
Convert nearly everything that runs on fossil fuels to run on **electricity**;

Buy **100% clean energy**.

Carbon neutrality can be achieved with the technologies of today and is essential to a healthy, thriving and resilient Boston.

CARBON FREE BOSTON TECHNICAL ANALYSIS

Boston's building stock is old.



- ½ of existing floor space was built before 1950.
- 85% of floor space that will exist in 2050 has already been built.

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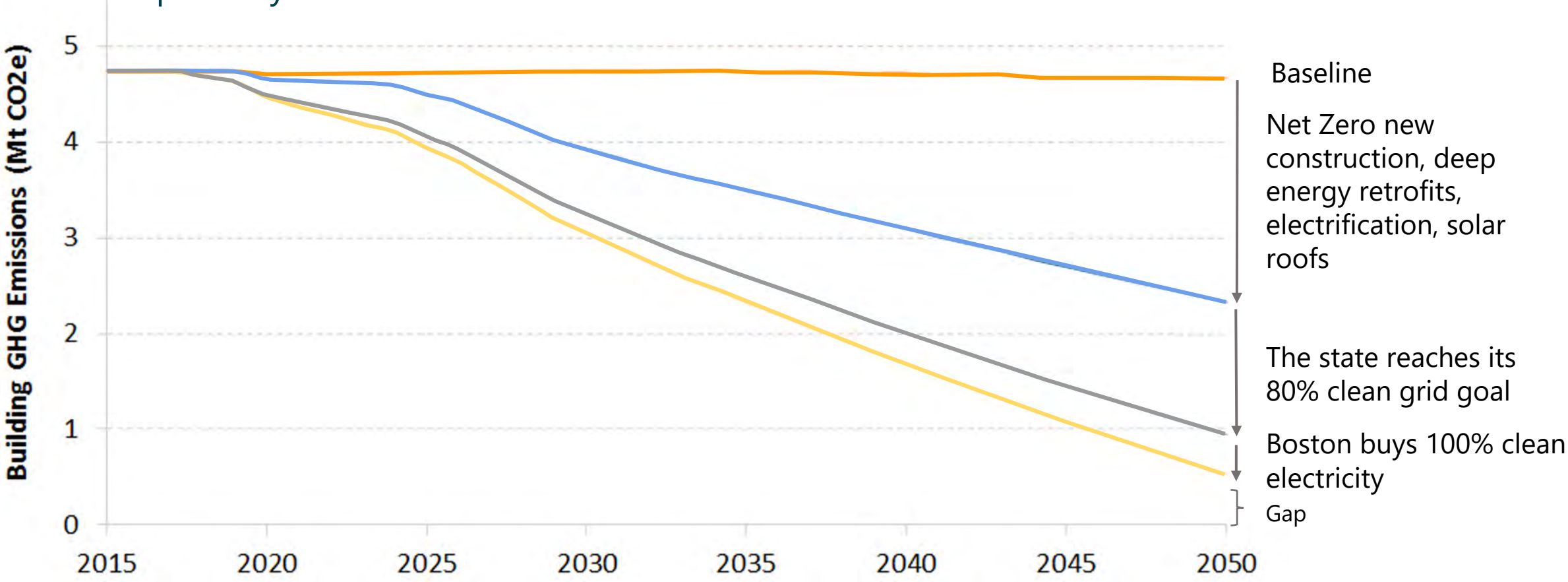
DECARBONIZING THE BUILDING SECTOR

Potential pathway to 2050:



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CARBON FREE BOSTON
BUILDING SECTOR TAKEAWAYS

What the analysis tells us:

- Any new building that is not carbon-neutral (“zero net carbon”) will have to be retrofit.
- Acting sooner is cheaper.
- Pairing retrofits and electrification is key to success. Whole building approaches are more cost-effective than individual energy conservation measures.
- Retrofits can pay for themselves over their lifetime.

Full technical report available online.

NEW BUILDINGS & MAJOR RENOVATIONS

1 CONSTRUCT NEW MUNICIPAL BUILDINGS TO A ZERO NET CARBON STANDARD **B**

2 ADOPT A ZERO NET CARBON STANDARD FOR CITY-FUNDED AFFORDABLE HOUSING IN BOSTON **B**

3 STRENGTHEN GREEN BUILDING ZONING REQUIREMENTS TO A ZERO NET CARBON STANDARD

EXISTING BUILDINGS

4 INVEST IN ENERGY EFFICIENCY AND RENEWABLE ENERGY GENERATION IN MUNICIPAL BUILDINGS **B**

5 DEVELOP A CARBON EMISSIONS PERFORMANCE STANDARD TO DECARBONIZE EXISTING LARGE BUILDINGS

ENABLING STRATEGIES

6 EXPAND WORKFORCE DEVELOPMENT PROGRAMS FOR BUILDING DECARBONIZATION

7 ADVOCATE FOR STATE BUILDING POLICIES THAT ALIGN WITH CARBON NEUTRALITY BY 2050

3 | STRENGTHEN GREEN BUILDING ZONING REQUIREMENTS TO A ZERO NET CARBON STANDARD

Art. 37 within Art. 80 review

- LEED-certifiable
- Resiliency checklist
- Carbon Neutral Building Assessment
- Integration with Smart Utilities

Steps to adopt a ZNC standard:

- Engage consultants for technical analysis of standards and phasing
- Launch stakeholder engagement process

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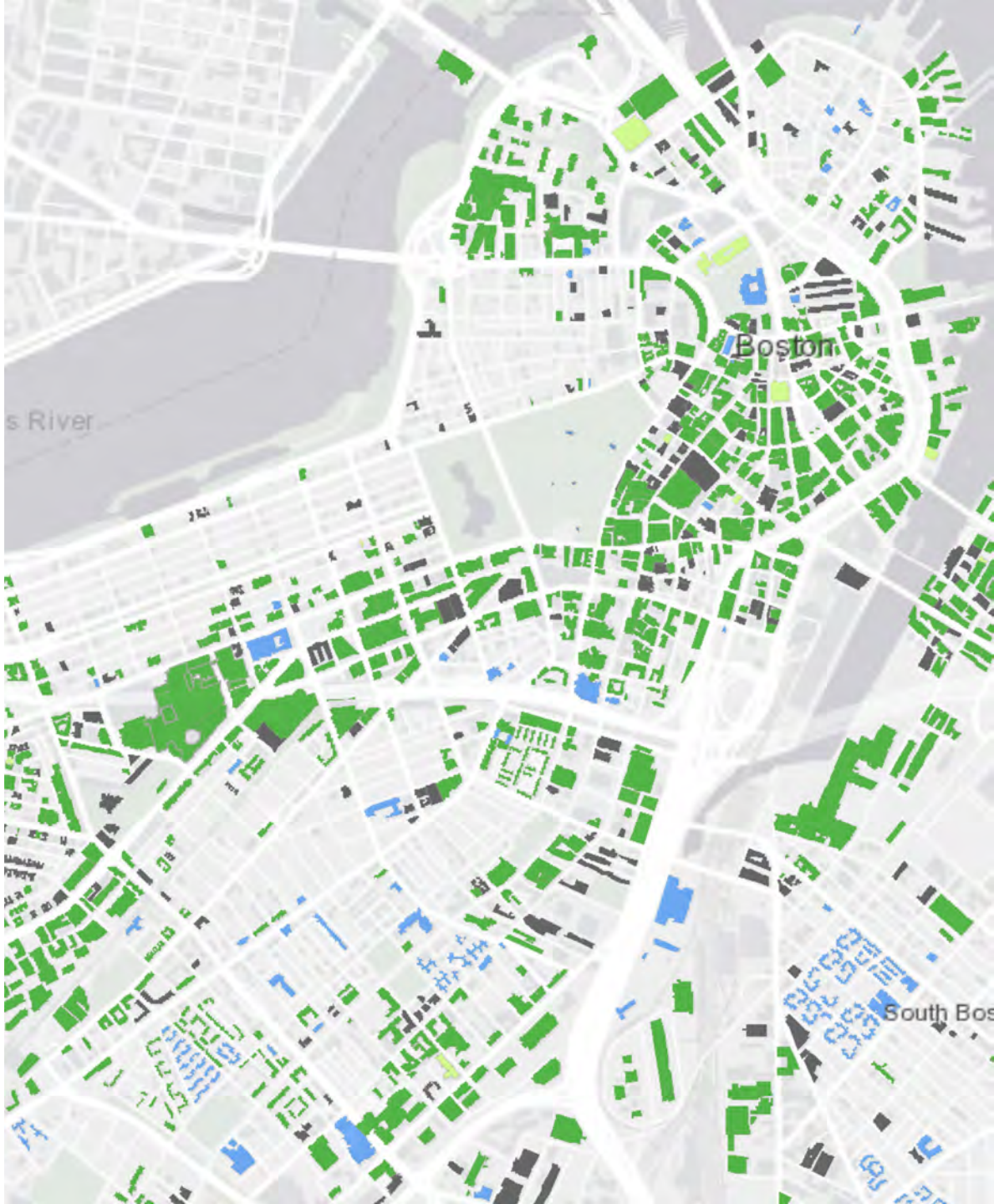
5 DEVELOP A CARBON EMISSIONS PERFORMANCE STANDARD TO DECARBONIZE EXISTING LARGE BUILDINGS

Current policy: Building Energy Reporting and Disclosure Ordinance

Goal: develop a carbon emissions performance standard

- Develop specific targets for different building types
- Evaluate covering more buildings
- Develop new support programs
- Pilot deep energy retrofits



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ZERO NET CARBON BUILDING ZONING INITIATIVE

John Dalzell, AIA, LEED Fellow

Boston Planning & Development Agency

John.Dalzell@boston.gov

bostonplans.org/ZNCBuildingZoning

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ZNC Building Zoning

POLICY FRAMEWORK

Low Carbon Building
Establish Emission Targets

On-site Renewable Energy
On-site Energy Generation Standard

Renewable Energy Procurement
Determine Options & Reporting

Bunker Hill Housing – Building F
Proposed design modeled performance (271,844 SF, EUI 19.1, Solar PV 81.9 kW = 104,500 kWh/yr)
Building CO_2e = 1.48 (kg/sf/yr) emission
Solar CO_2e = 0.12 (kg/sf/yr) reduction

Building	445. tons / yr
On-site RE	36. tons / yr (less)
RE Procure	409. tons / yr (less)
ZNCarbon	0.

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ZNC Building Zoning Initiative

PUBLIC PROCESS AND SCHEDULE - 2020 - 2021

- Outreach – August and September
- Public Meeting #1 – September 30th
- Stakeholder and Public Engagement – October and onward
- Technical Advisory Groups – October and onward
- Public Meeting #2 – late winter / early spring
- Public Regulatory Meetings – spring 2021

TEAM

- Thornton Tomasetti
- Cadmus Group / SolSmart
- Architecture 2030
- City / BPDA Staff

LOW CARBON BUILDINGS

***Alejandra Menchaca**, PhD, LEED AP, WELL AP*
Vice President, Sustainability
Thornton Tomasetti
AMenchaca@thorntontomasetti.com
www.ThorntonTomasetti.com

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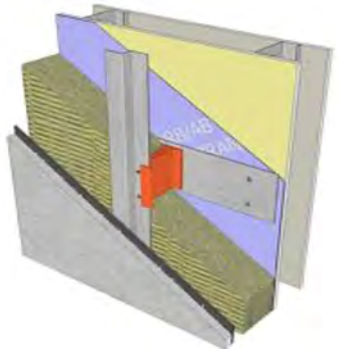
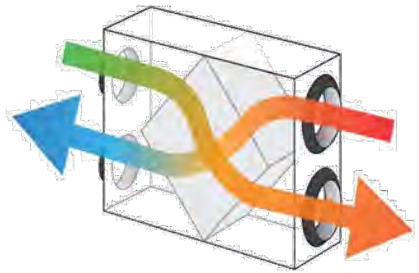
Low Carbon Buildings

- What are they?
- Are they a realistic goal for Boston?
- How to design them cost-effectively?

Path to Low Carbon

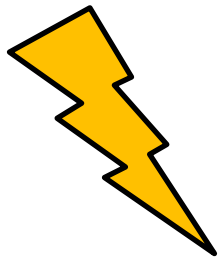




Low Load Envelope

High Performance HVAC

All Electric



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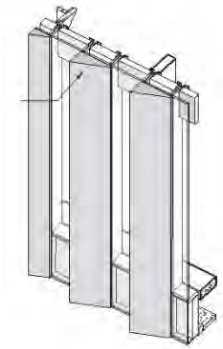
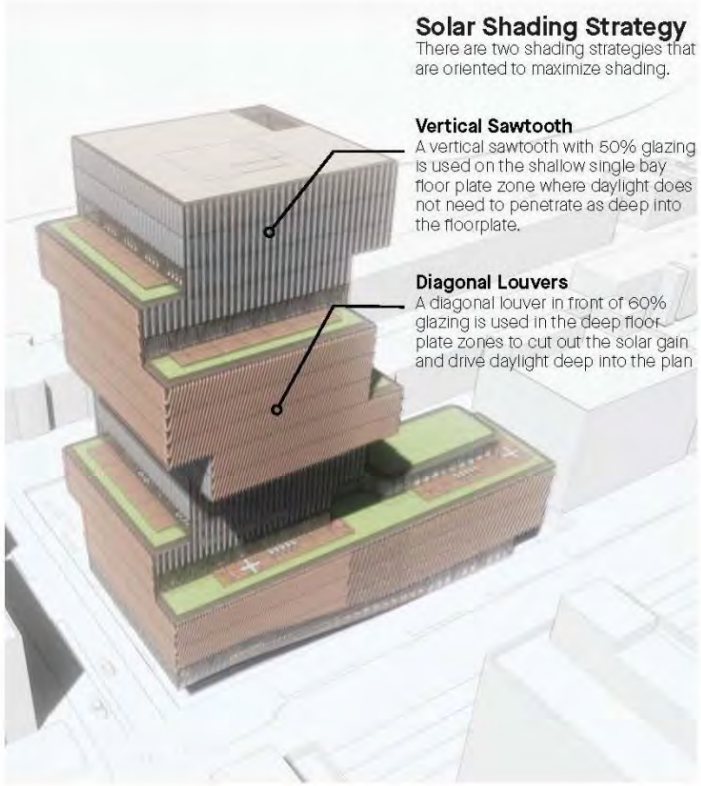
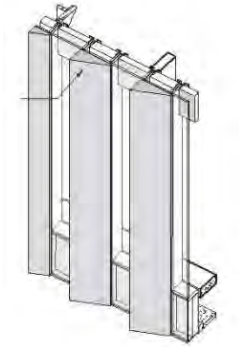
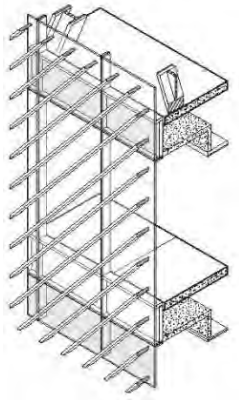
BU Data Sciences Building

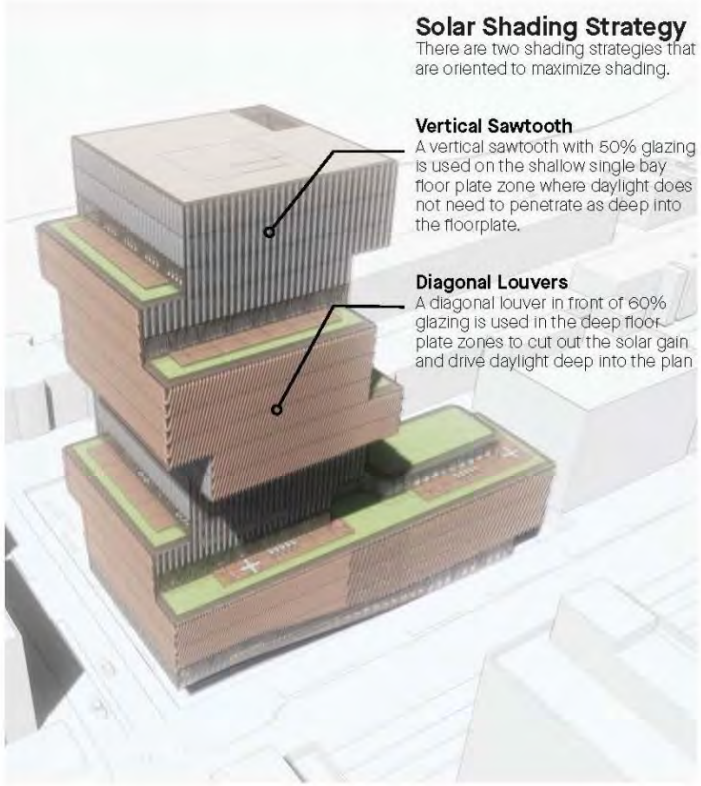


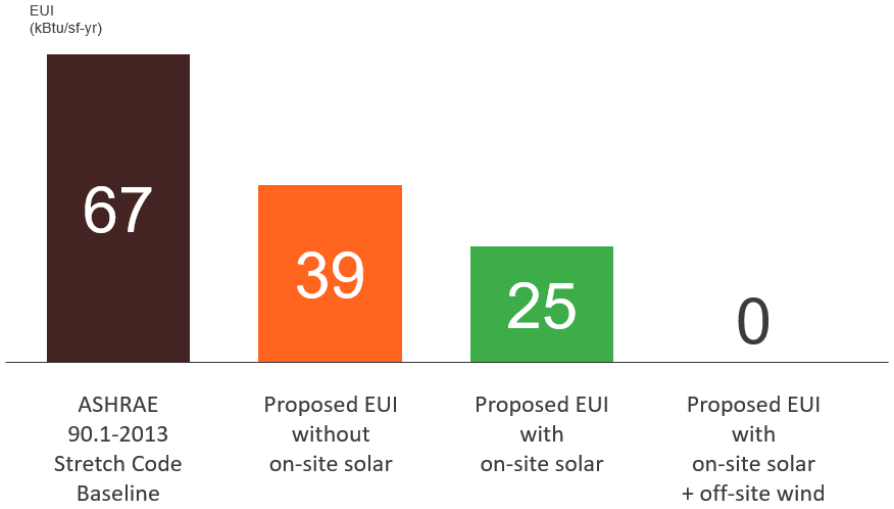


BU Data Sciences Building









Construction Cost Premium
< 1%

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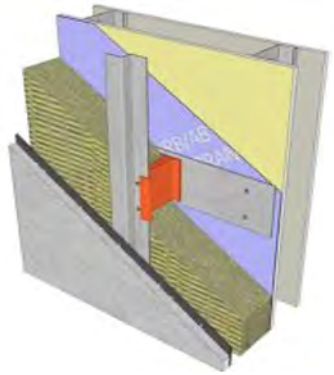
Path to Low Carbon



Low Load Envelope

High Performance HVAC

All Electric

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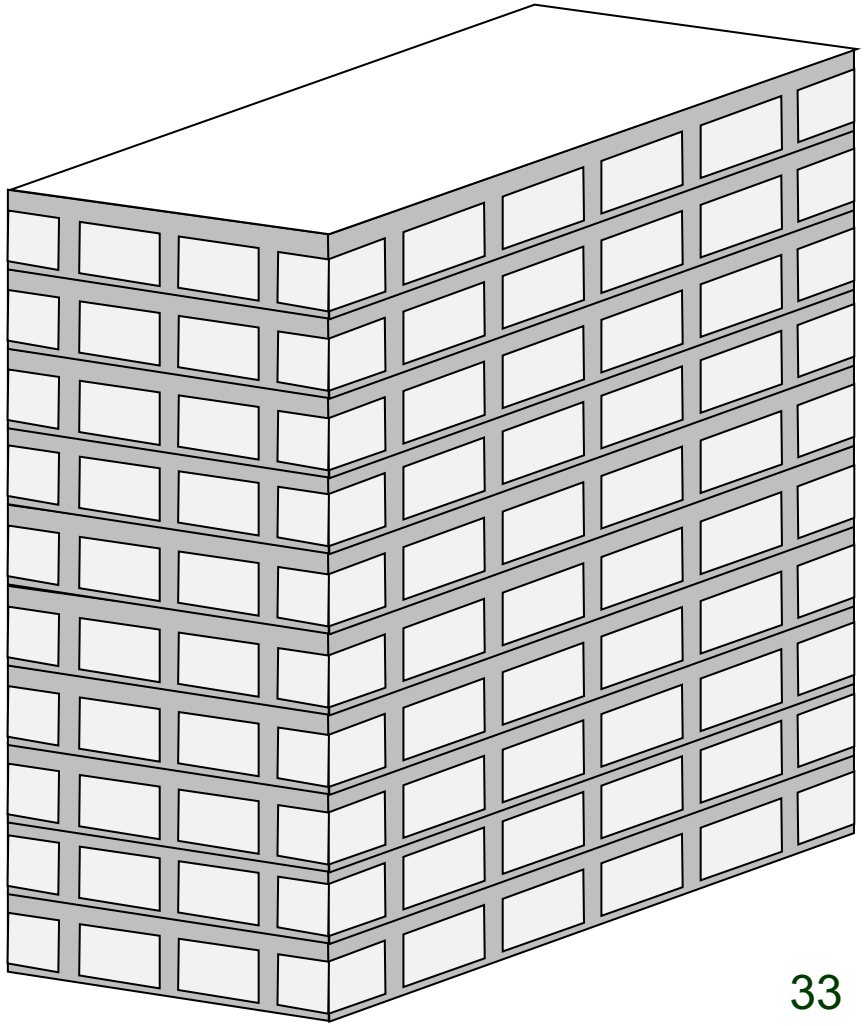
Low Load Envelope

Area Weighted “UA”

$$UA = \frac{U_{window} * A_{window} + U_{roof} * A_{roof} + U_{wall} * A_{wall} + \ldots}{A_{envelop}}$$



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Low Load Envelope

Area Weighted "UA"

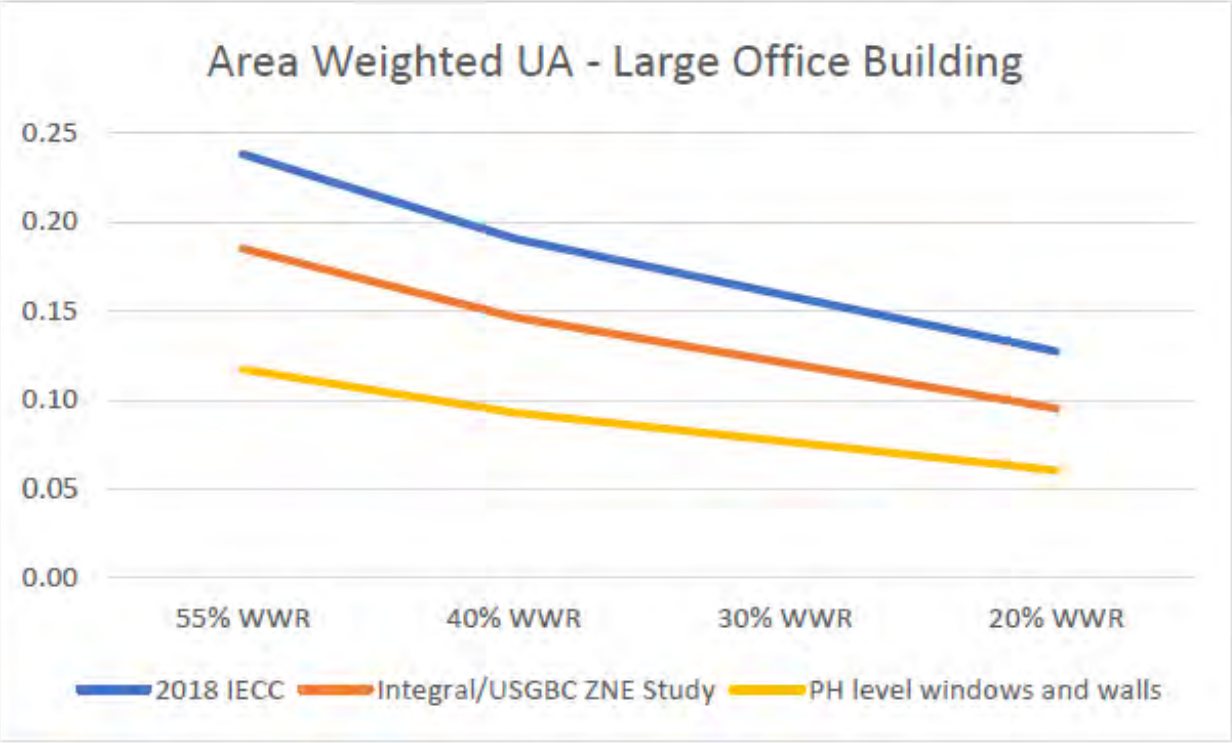

Figure 4: Large Office UA Comparison

New Buildings Institute, *"Building Performance Targets and Building Prototype Profiles for Boston - DRAFT", Feb 2020*

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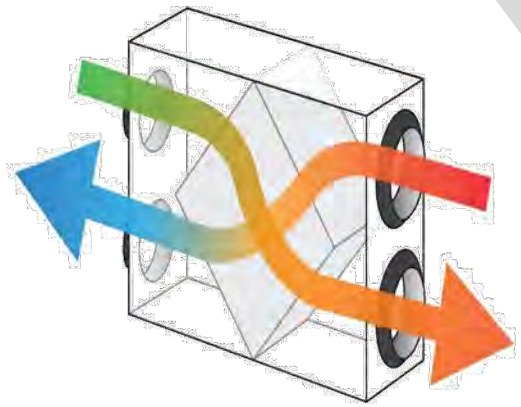
Path to Low Carbon



Low Load Envelope

High Performance HVAC

All Electric

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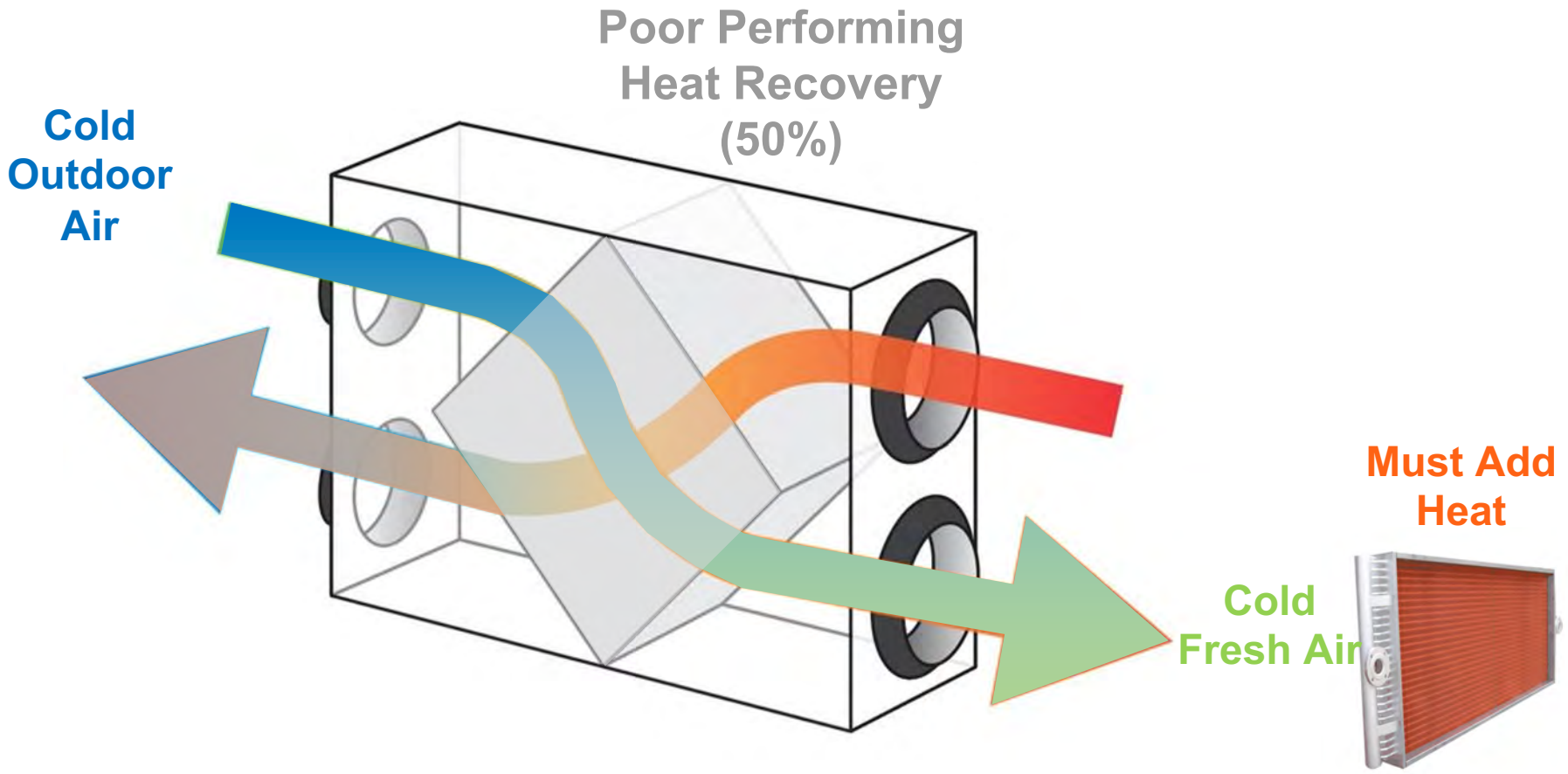
High Performance HVAC

High Efficiency Energy Recovery



New Buildings Institute, *"Building Performance Targets and Building Prototype Profiles for Boston - DRAFT", Feb 2020*

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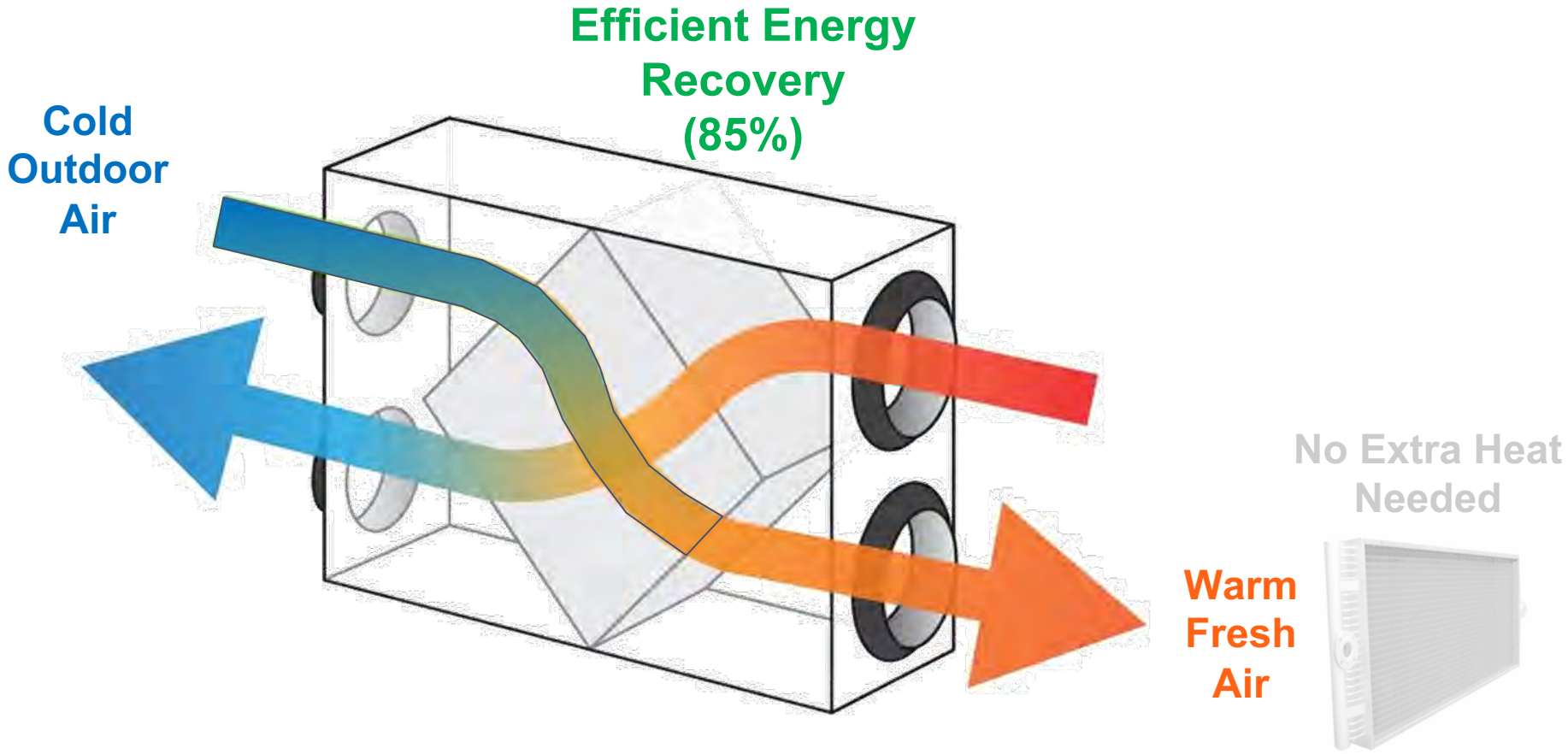
High Performance HVAC

High Efficiency Energy Recovery



New Buildings Institute, *"Building Performance Targets and Building Prototype Profiles for Boston - DRAFT", Feb 2020*

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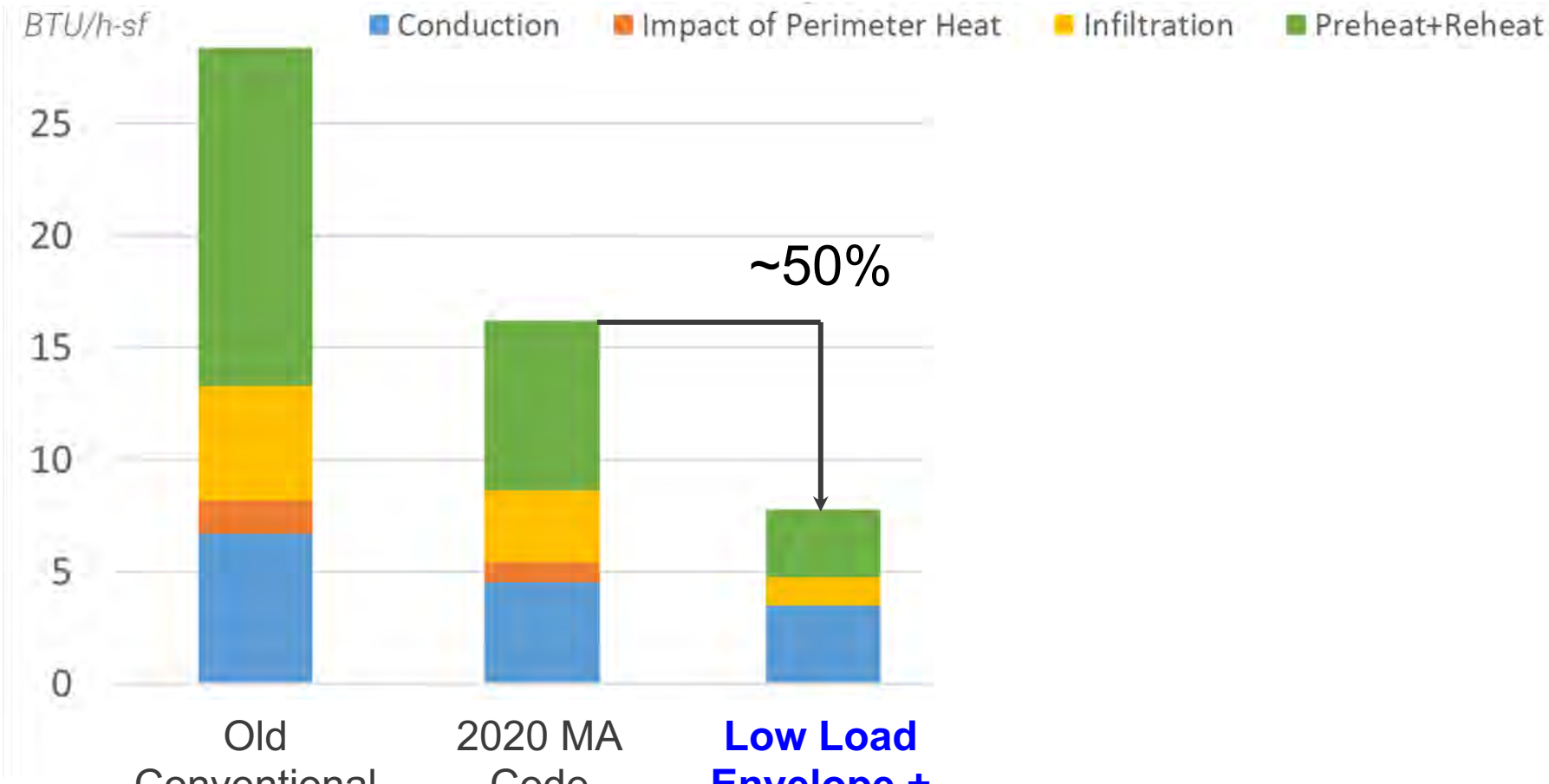
Low Load Buildings



*Varies by building type.

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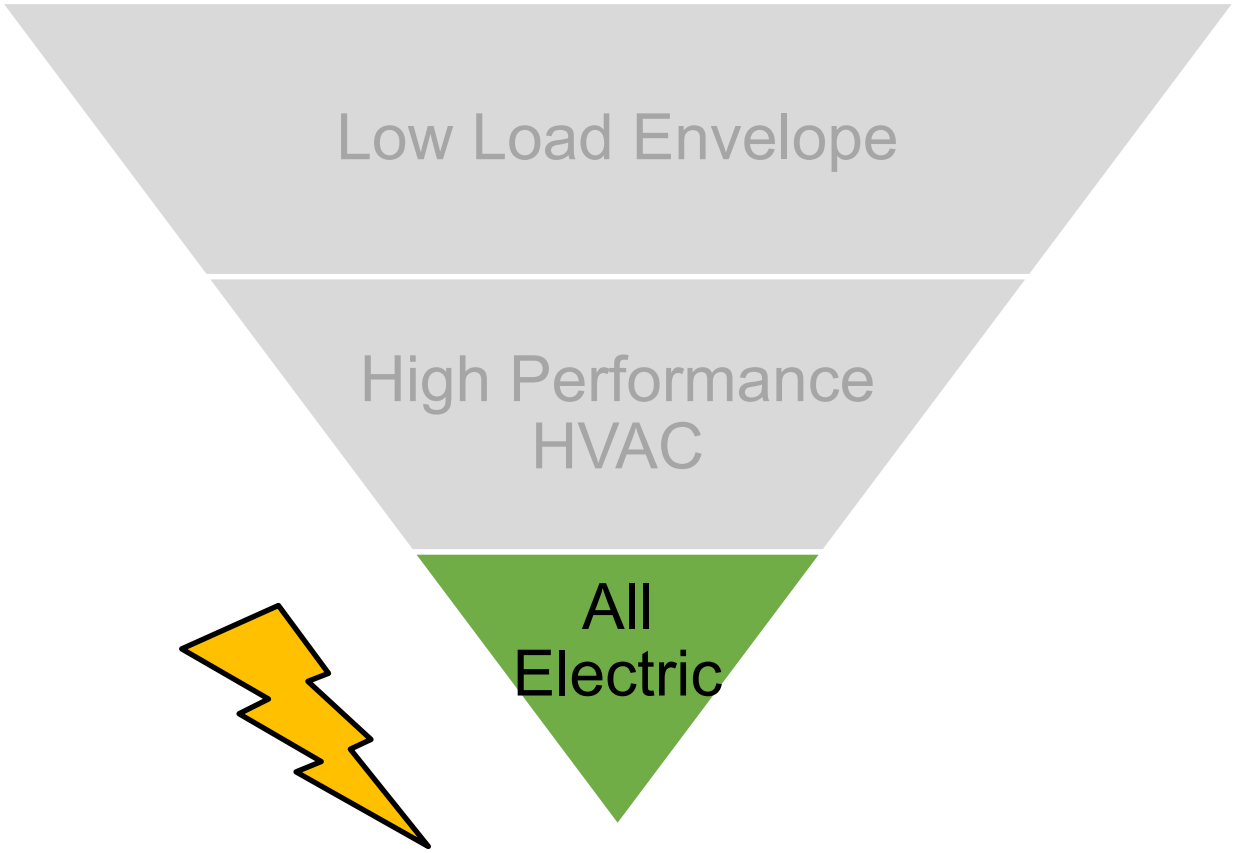
Path to Low Carbon



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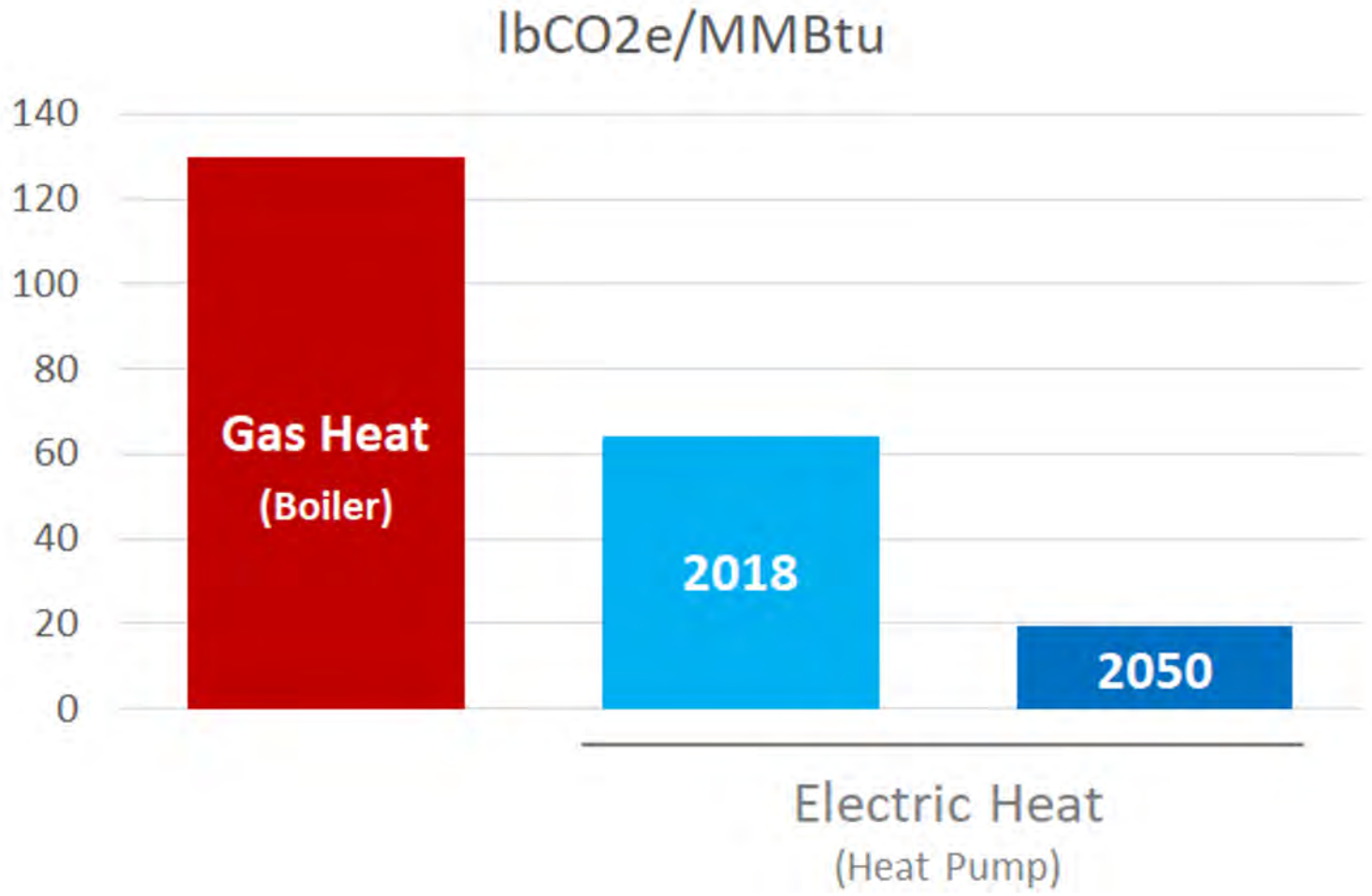
Gas vs. Electric heating: CO2e emissions



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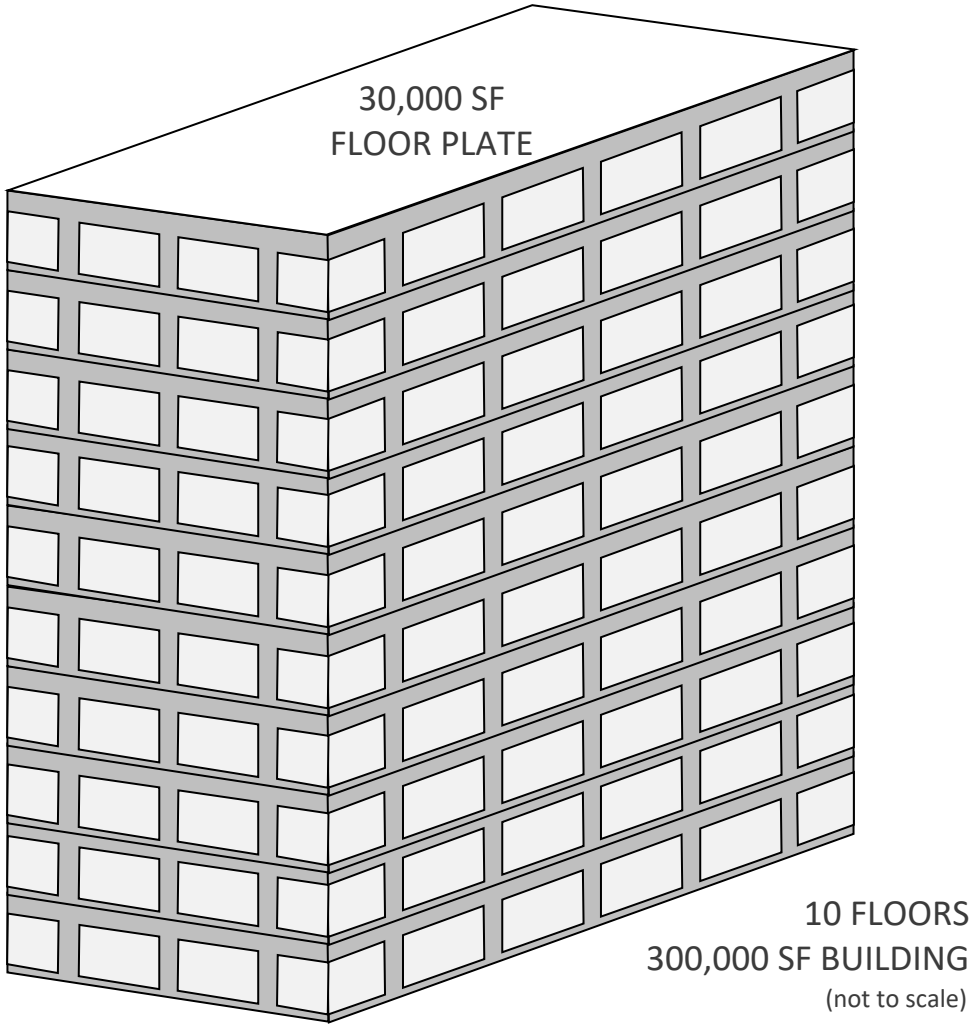
Very Expensive Path to All-Electric

Capacity Required for Heating

Old Conventional

Heating Load: 28 btu/sf



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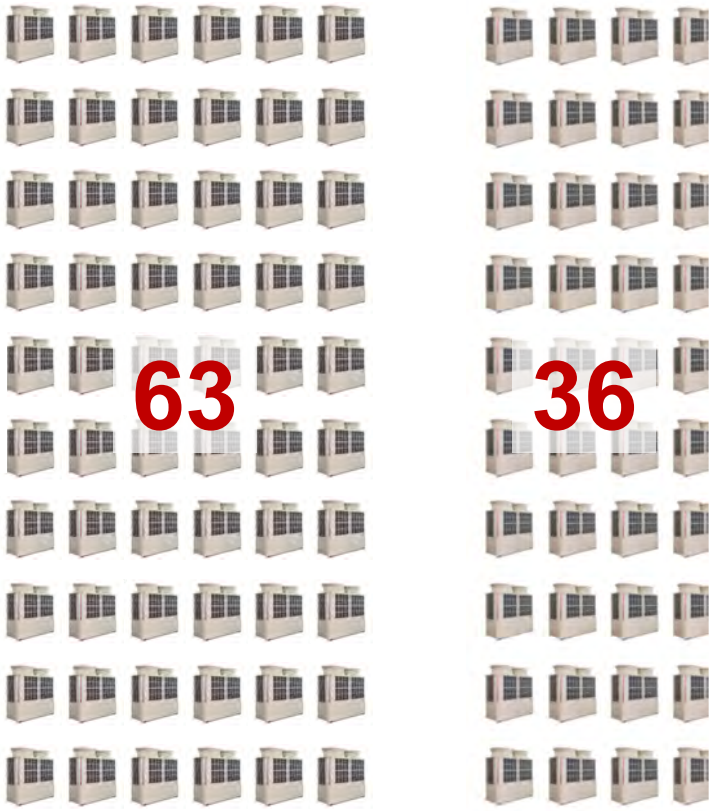
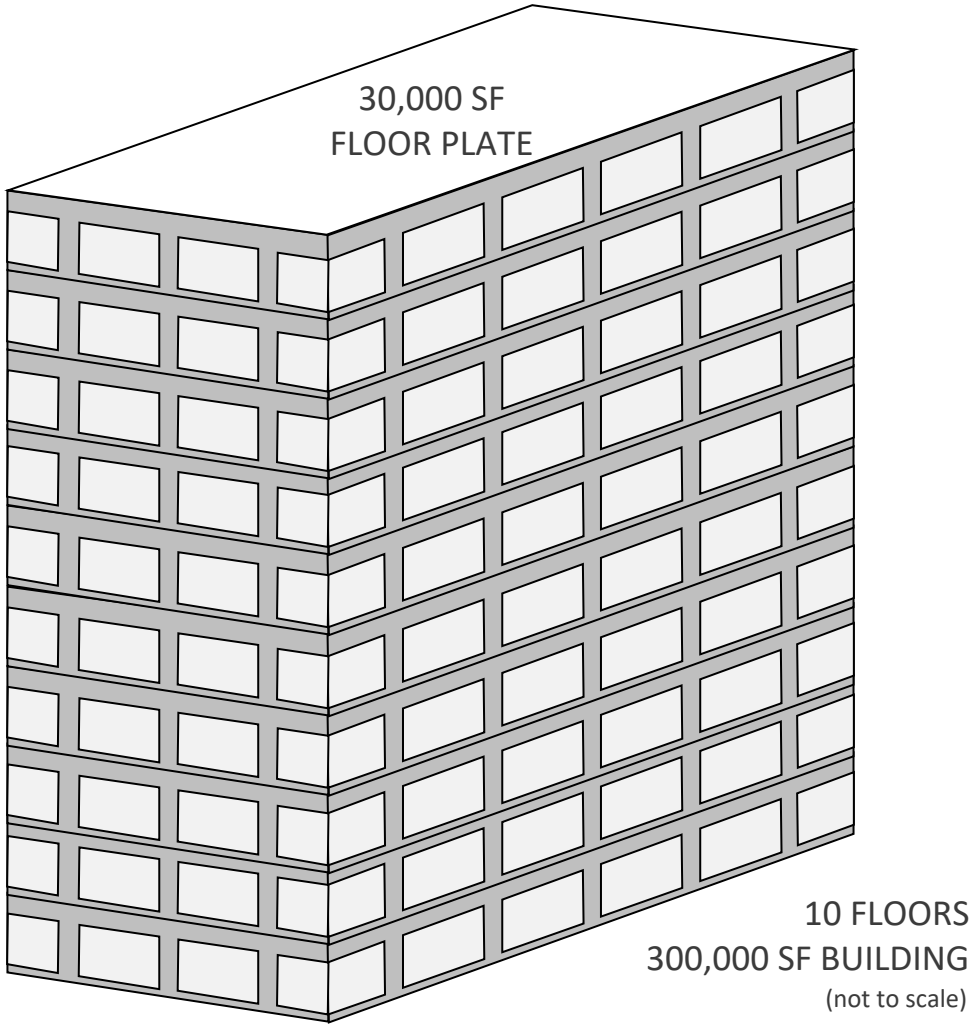
Expensive Path to All-Electric

Capacity Required for Heating



	Old Conventional	2020 MA Code
Heating Load:	28 btu/sf	16 btu/sf



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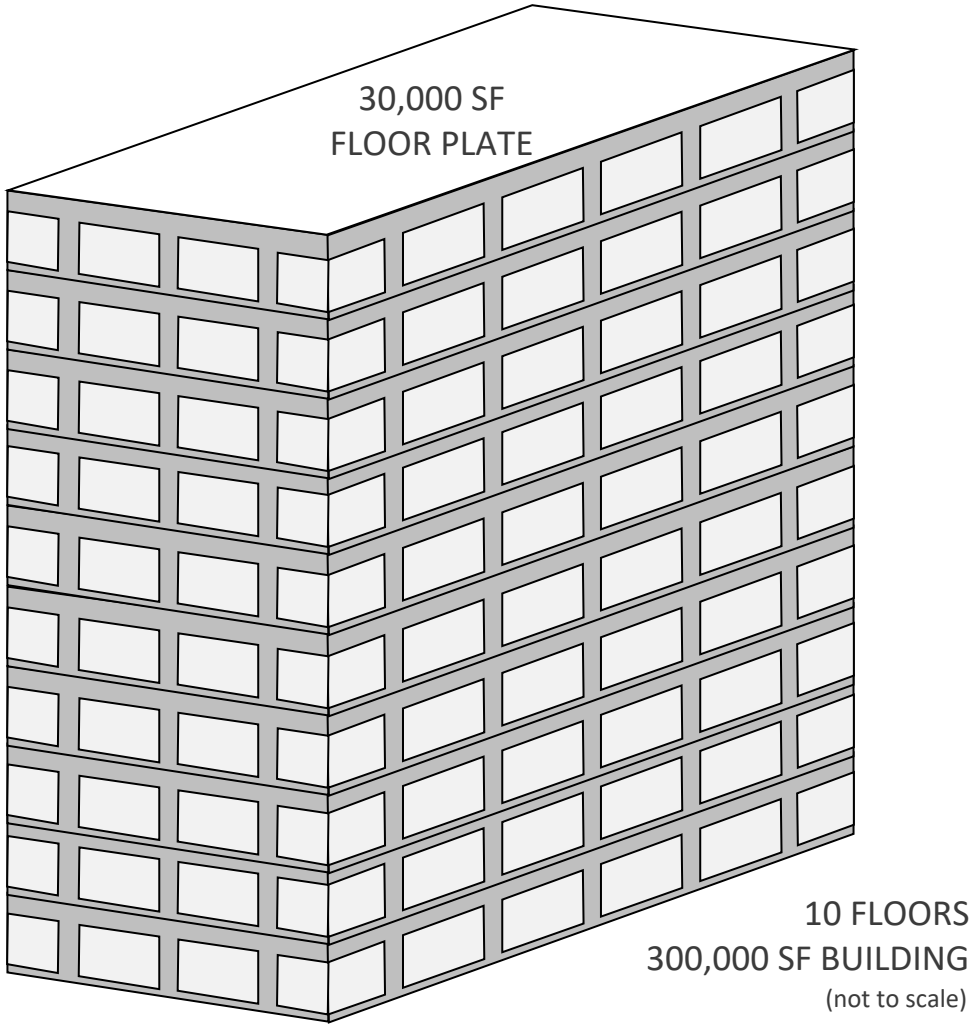
Cost-Effective Path to All-Electric

Capacity Required for Heating

	Old Conventional	2020 MA Code	**Low Load**
Heating Load:	28 btu/sf	16 btu/sf	8 btu/sf



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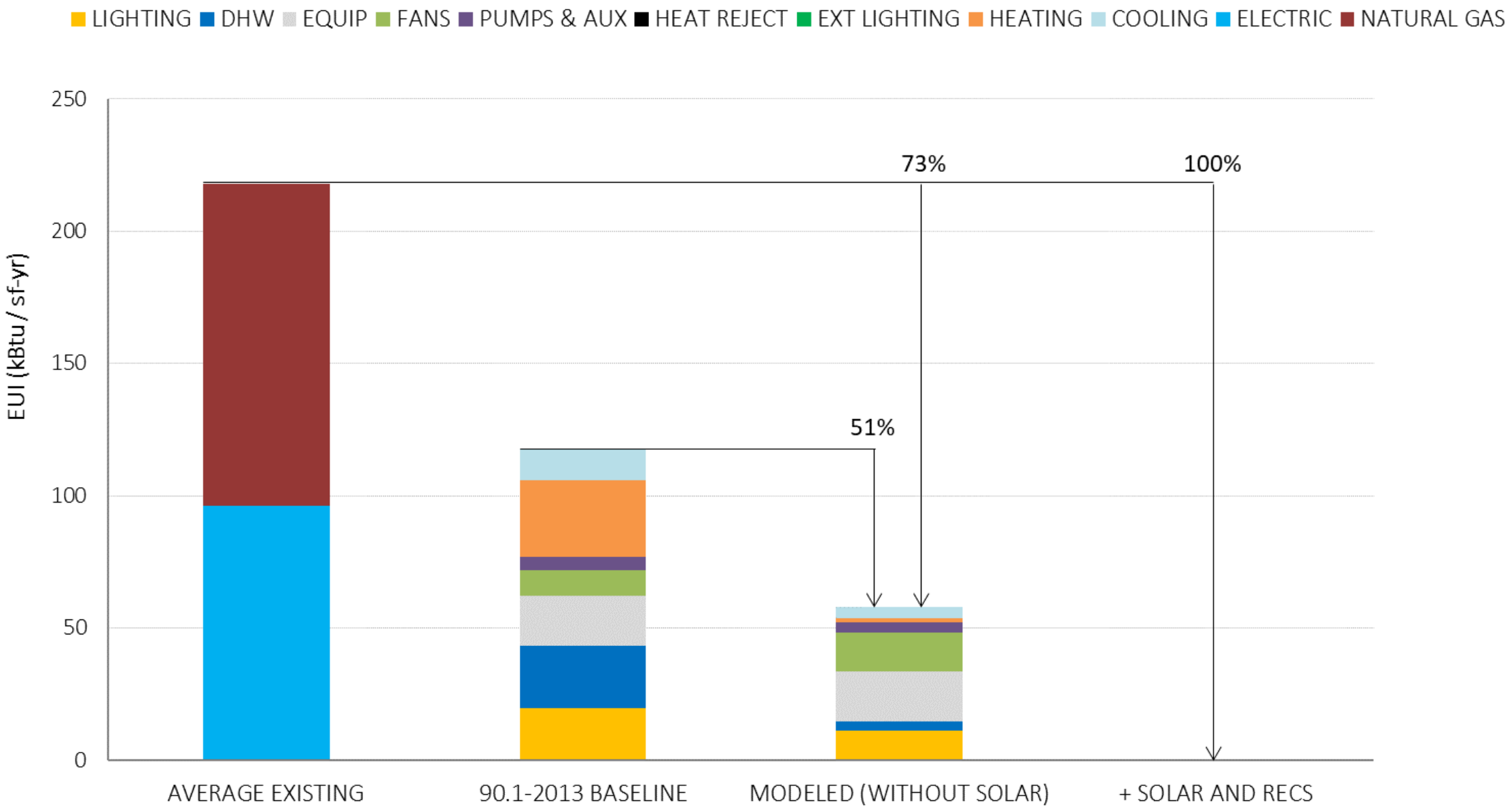
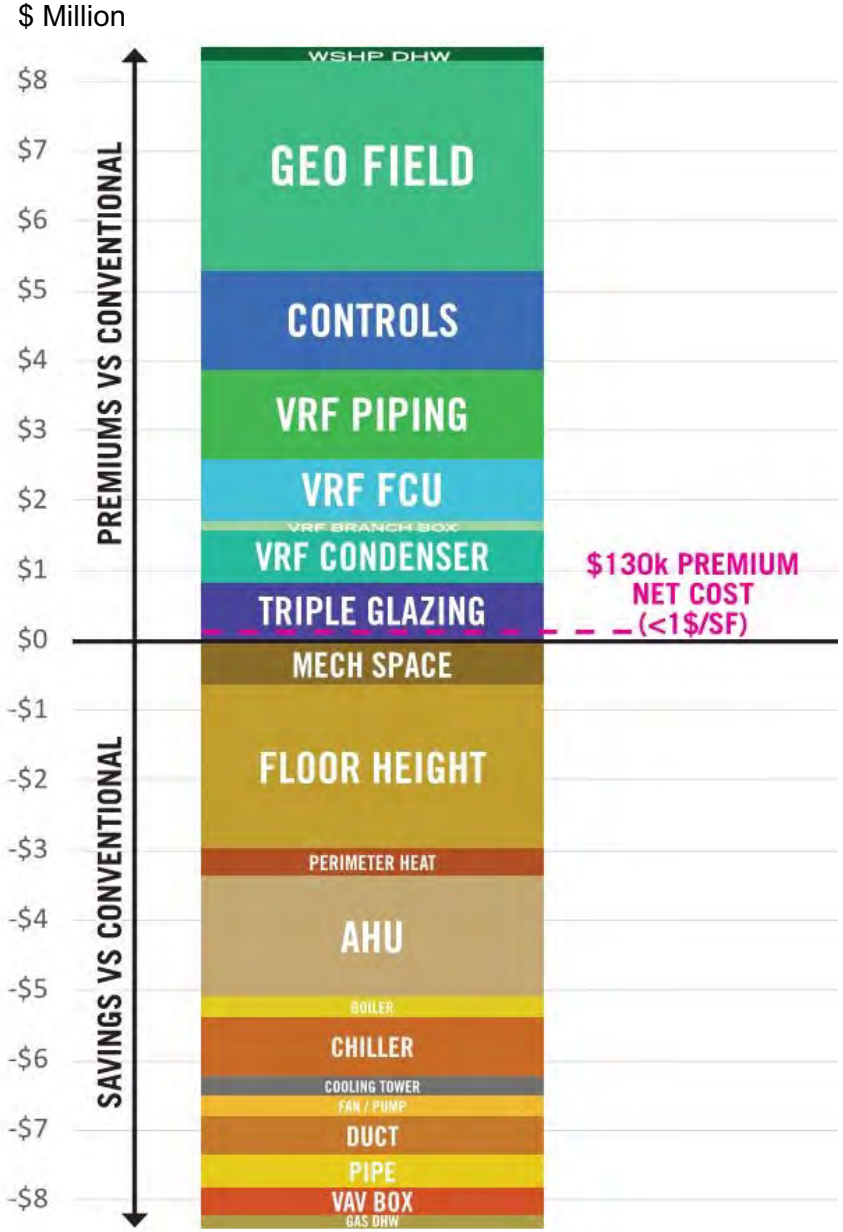
Case Study: Chelsea Soldiers' Home

- 30% Window-to-Wall Ratio
- Triple pane glass
- Highly insulated envelope
- Ground Source Heat Pump + VRF
- Dual heat wheel

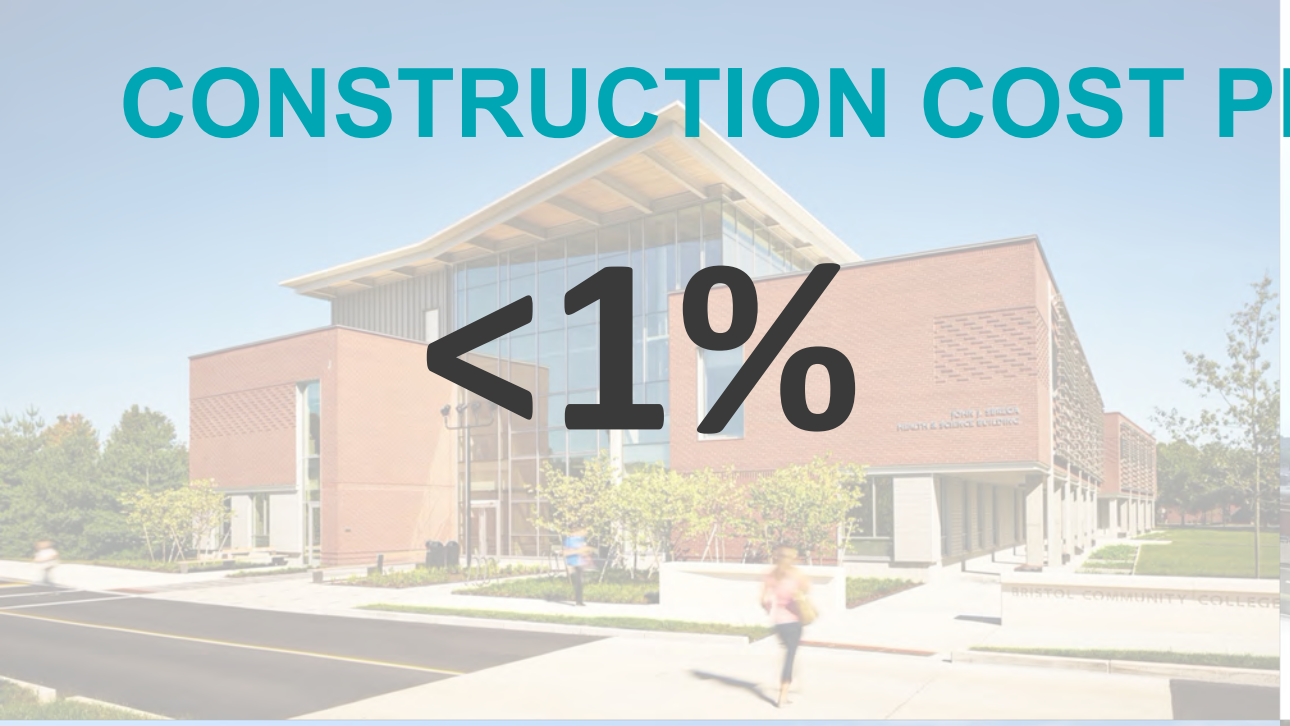
Chelsea Soldiers' Home Energy



ZNE Net Construction Cost



CONSTRUCTION COST PREMIUM



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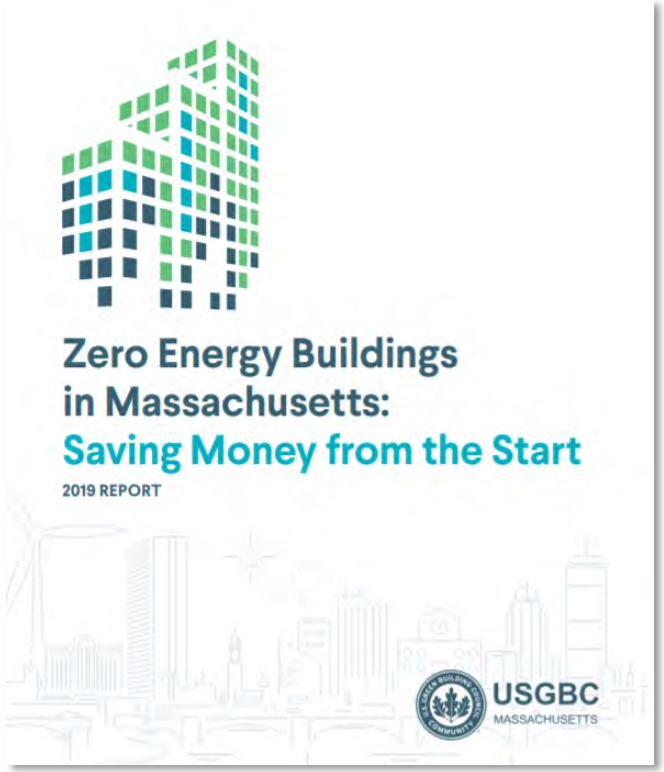
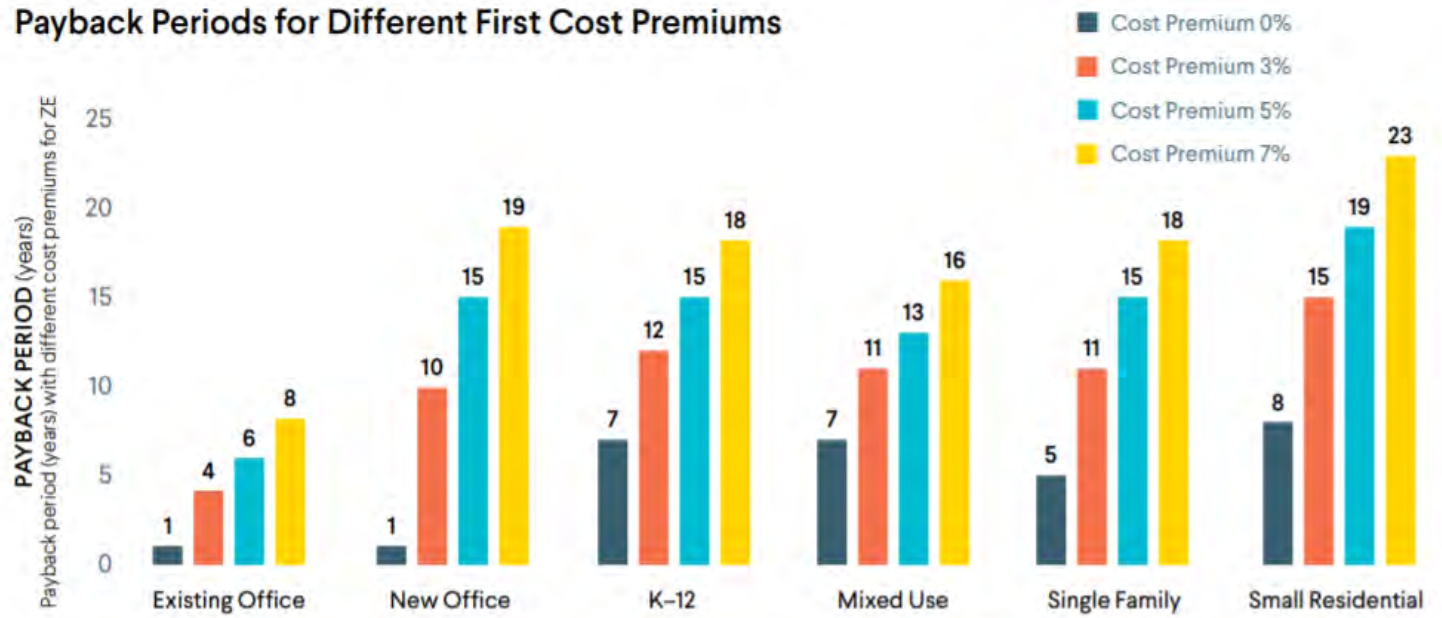
Cost-Effective Net Zero Buildings





https://builtenvironmentplus.org/wp-content/uploads/2019/09/ZeroEnergyBldgMA2019.pdf

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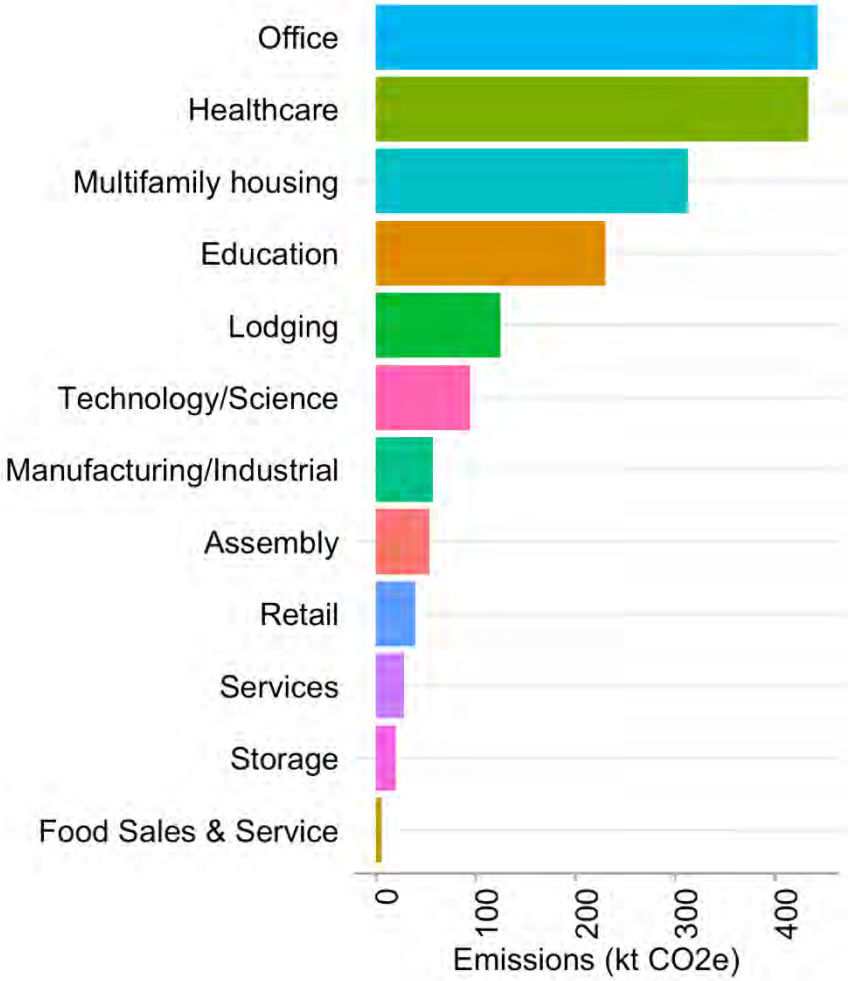
Striving for a ZNC Built Environment in Boston

Carbon Emissions of Boston Buildings <50,000 sf



Goal:
Identify aggressive yet achievable targets for Boston's most common building typologies.

Source: Building Energy Reporting and Disclosure Ordinance (BERDO)

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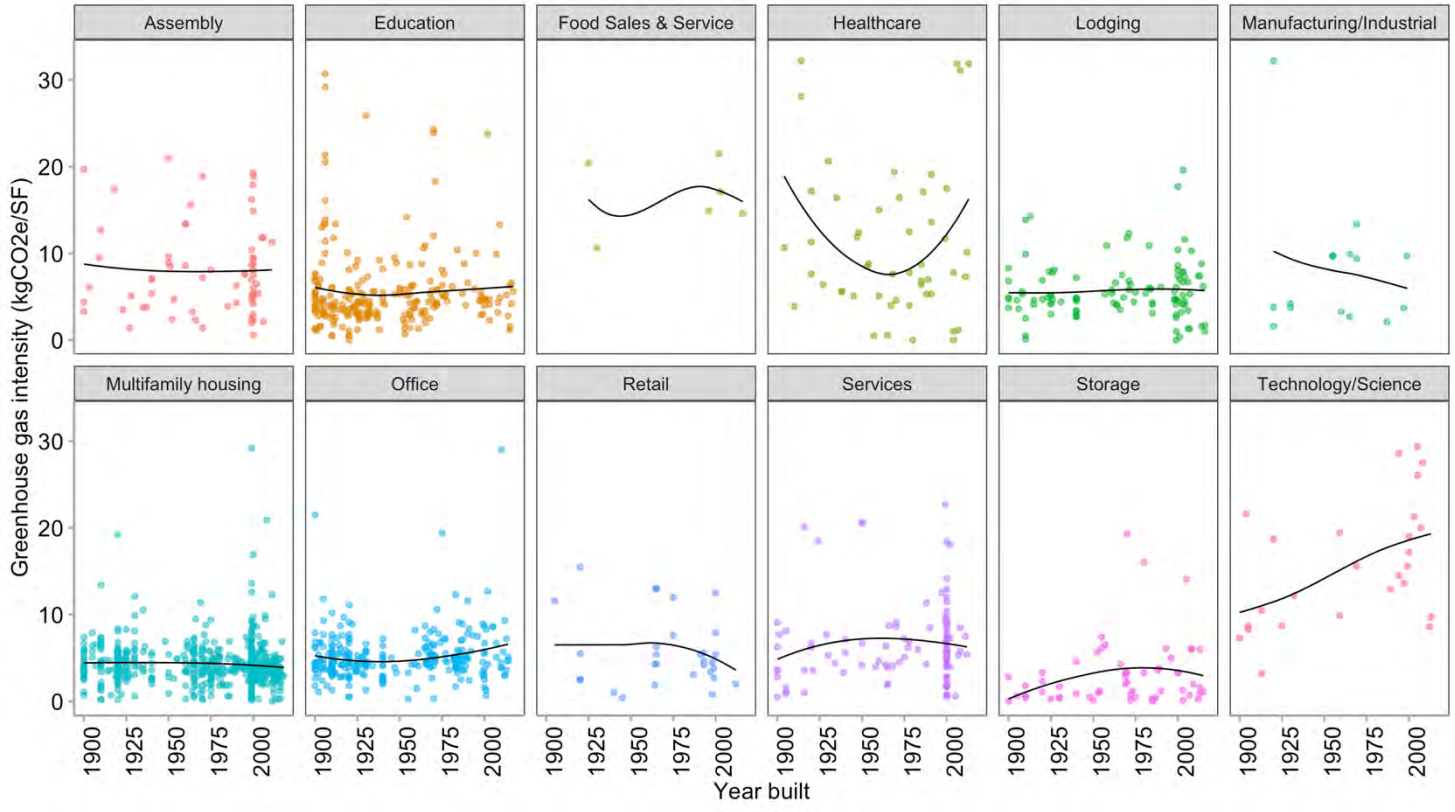
A Data-Driven Process

Carbon Emissions of Boston Buildings <50,000 sf over time



Goal:
Use and understand available data for existing buildings to assess and determine the most achievable targets.

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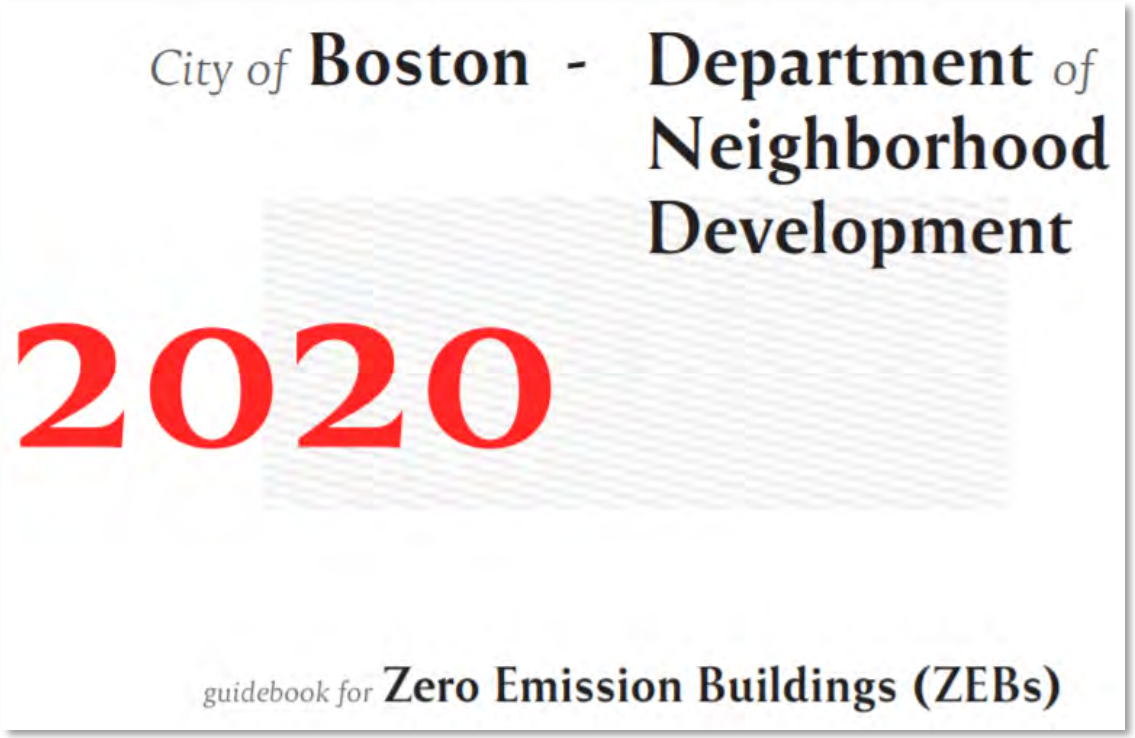
Low Carbon Buildings: Reference Documents



Goal:

Incorporate methods proposed in recently-issued studies and guidelines.

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ON-SITE RENEWABLE ENERGY

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Boston – SolSmart

Through SolSmart designation, Boston is recognized for its efforts to reduce local barriers to solar energy and is eligible for technical assistance to foster the growth of stronger solar market.

Photo by Roman Piaskoski, NREL 07172

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On-Site Renewable Energy

Net Zero buildings integrate **on-site** renewable energy as much as possible and procure off-site renewable energy as necessary.

On-site renewable energy is located on:

- the building,
- the property upon which the building is located,
- a property that shares a boundary with and is under the same ownership or control as the property on which the building is located, or
- a property that is under the same ownership or control as the property on which the building is located and is separated only by a public right-of-way on which the building is located.

Benefits of Local Generation

- Emission reductions
- Public health
- Job creation
- Grid management
- Resilience

E+ 232 Highland, Credit: Studio G Architects

Optimizing On-Site Generation

Integrate on-site generation **early in design** and make choices to **maximize** solar opportunities.

Photo by Atlantis Energy, NREL 13999

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Limitations and Innovation

Through this process, will need to consider:

- Technical limitations of space, access, shading, etc.;
- Incentives and regulations;
- Financial feasibility and market conditions;
- How to encourage and accommodate innovation.

Rendering of initial GE Headquarters, Credit: Gensler

Renewable Energy Procurement

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Architecture 2030

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Renewable Energy Procurement

The purchasing of energy and/or its environmental attributes from off-site renewable energy systems.

“Off-site” renewable energy is anything that is not considered “on-site”.

Renewable Energy Procurement:

Potential Minimum Requirements

- Generation Source
- Durability
- Renewable Energy Certificates

Renewable Energy Procurement:

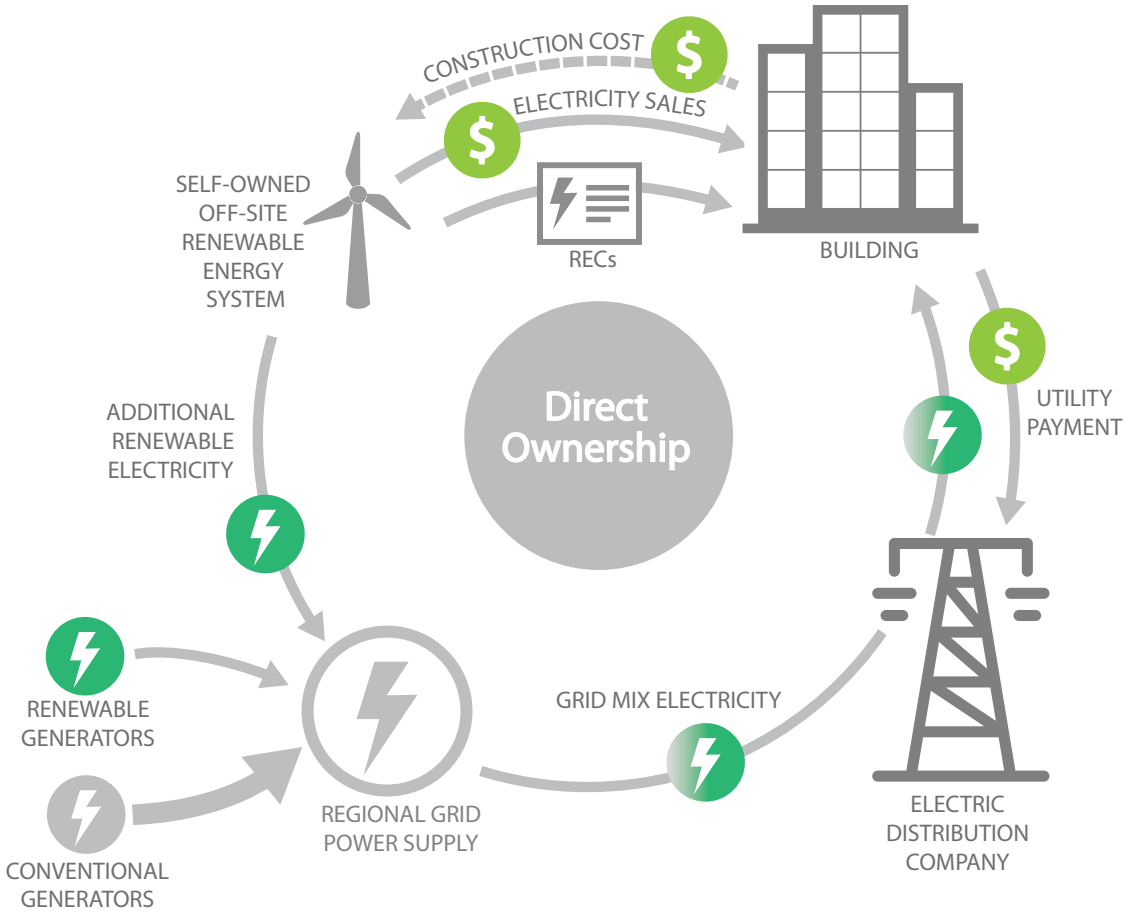
Classification Criteria

- Impact
- Proximity
- Electricity Credit
- Grid Management
- Environmental Impact
- Inspirational/Educational Value
- Incremental Acquisition
- Permanent Financing

Renewable Energy Procurement

- Direct Ownership (includes portfolios and campuses)
- Community Renewables
- Virtual Power Purchase Agreements (PPAs)
- Utility Renewable Energy Contract
- Green Retail Tariffs / Green Pricing
- Renewable Energy Investment Fund
- Unbundled Renewable Energy Certificates (RECs)

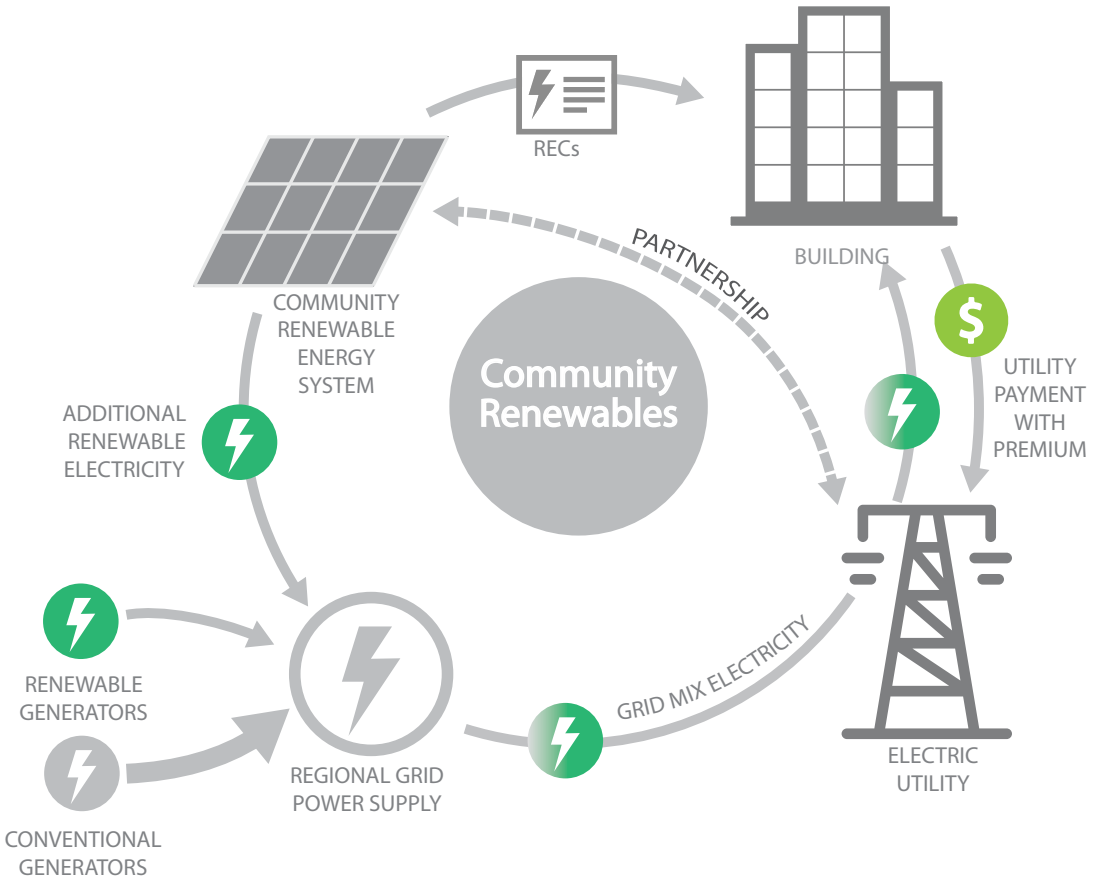
Direct Ownership



Issues:

- The RECs and environmental benefits need to be allocated to specific buildings in a fair and equitable manner.
- A forward contract is needed to assure that the RECs will continue to accrue to the specific buildings in the event that the renewable energy system is sold to a third party.

Community Renewables



Issues:

- Purchase cannot exceed building electricity use.
- RECs are often not provided to the building owner.
- It's easy to opt out of the commitment.

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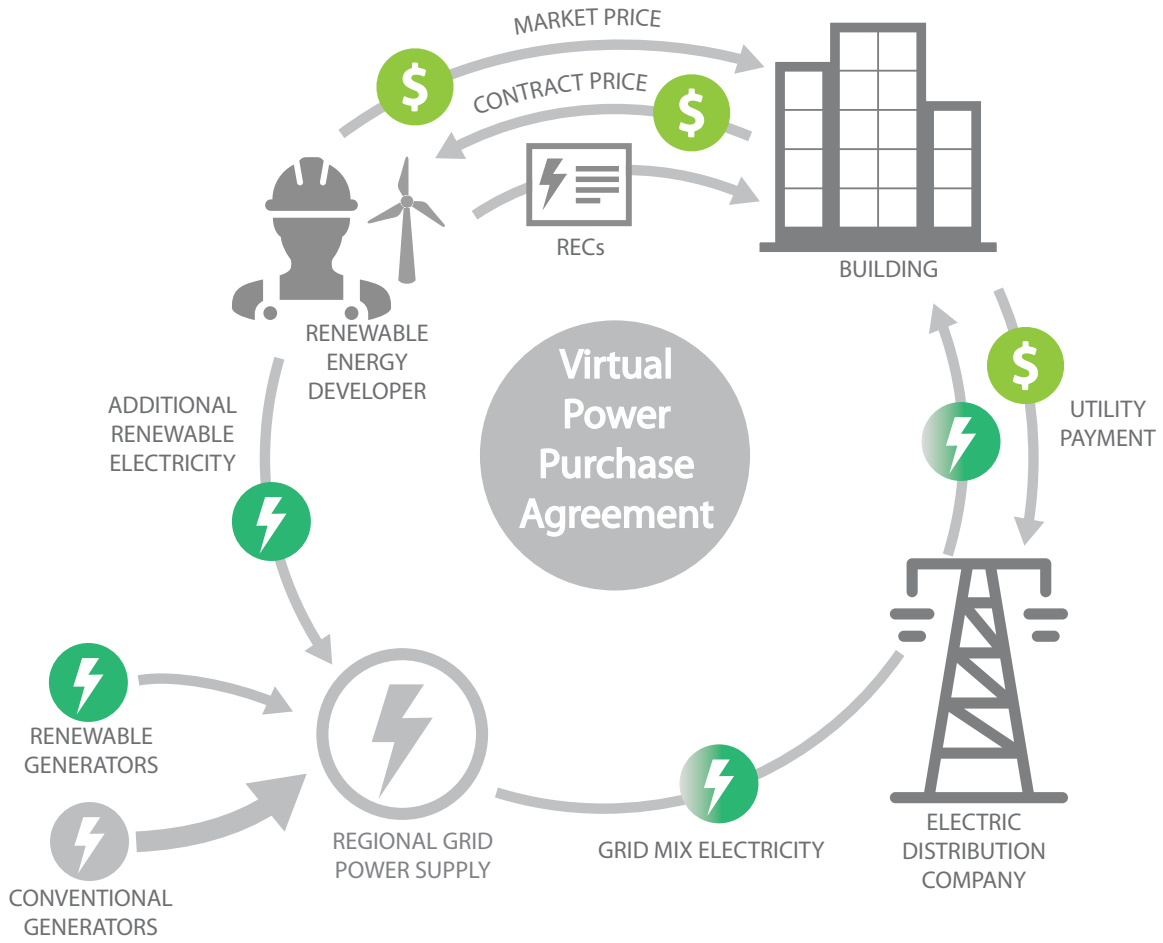
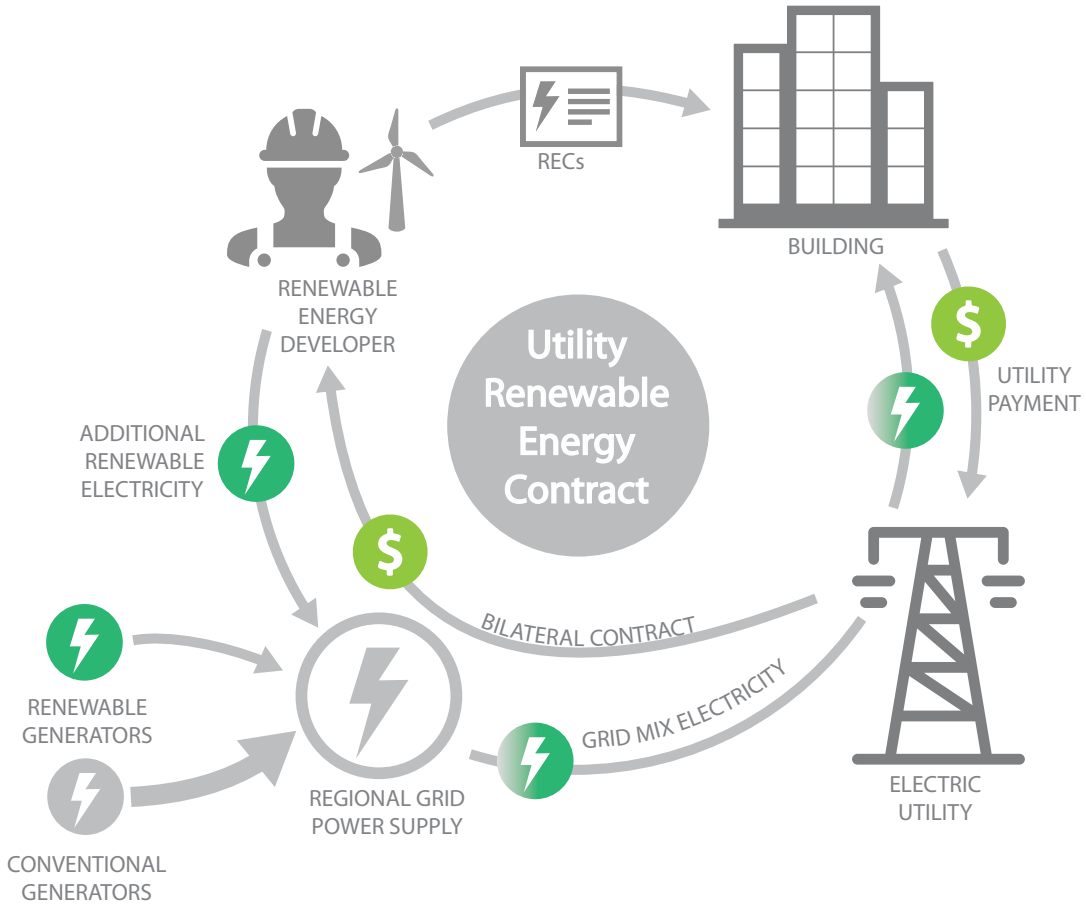
Virtual Power Purchase Agreement (VPPA)



Issues:

- Available only to large customers with an excellent credit rating.
- Large purchases are required, generally 5 MW for solar and 10 MW for wind.
- Renewable energy generators are sometimes located far from the building load they are offsetting.
- The RECs and environmental benefits need to be allocated to specific buildings in a fair and equitable manner.

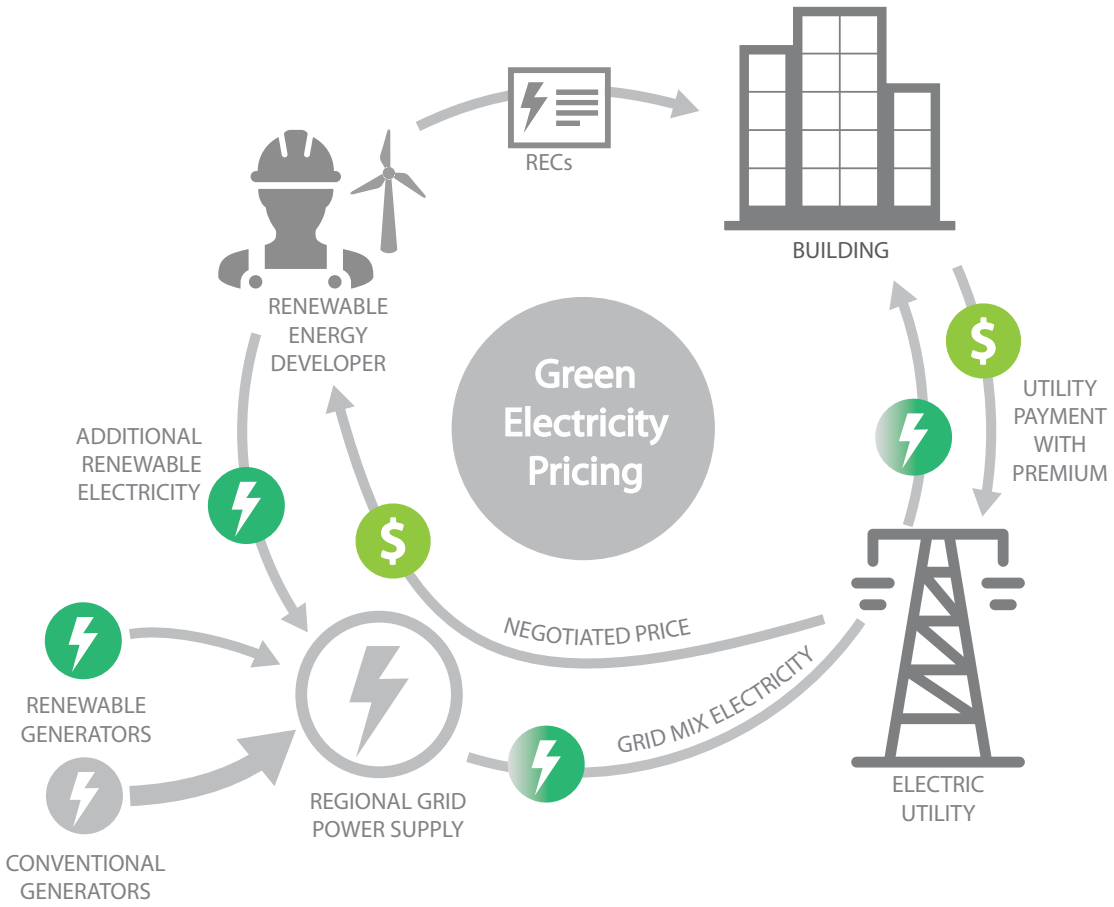
Utility Renewable Energy Contract



Issues:

- Available only to large customers.
- Some programs are backed by the purchase of unbundled RECs.

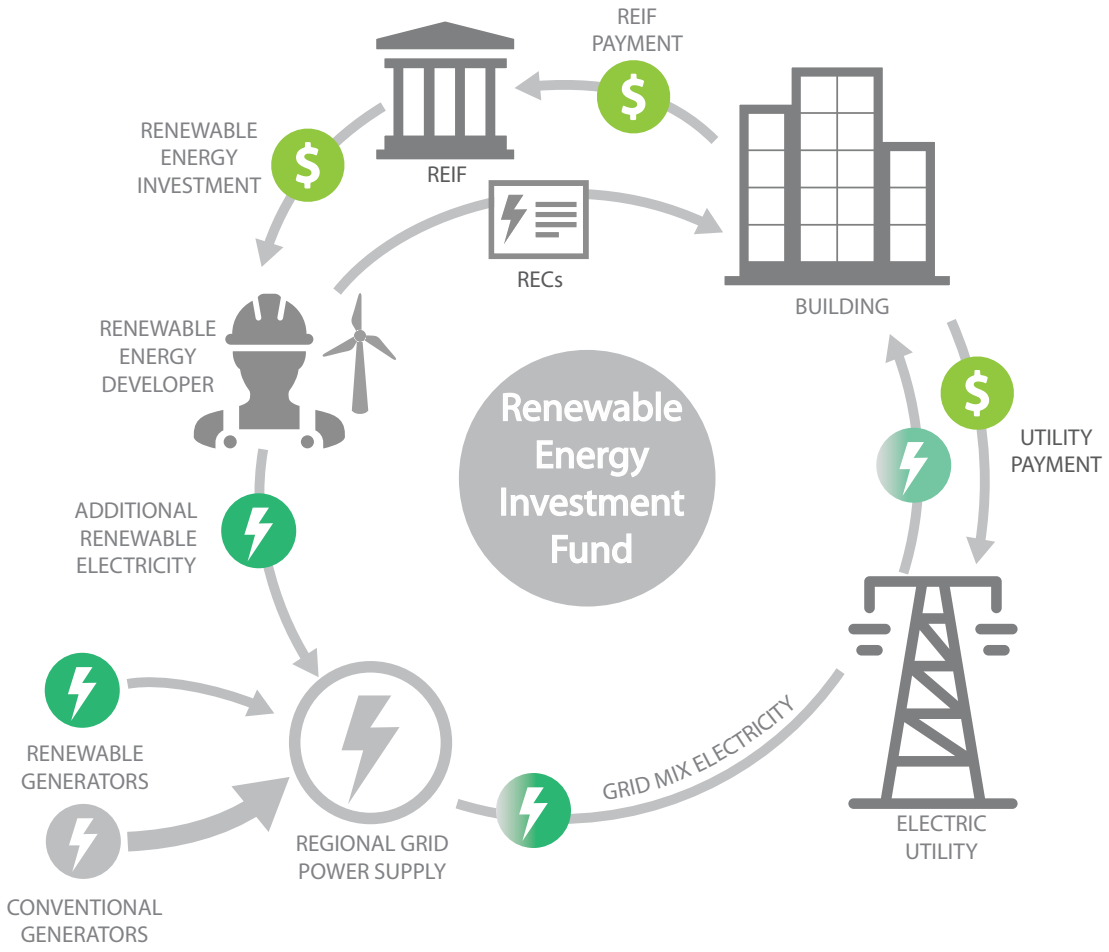
Green Electricity Pricing



Issues:

- Purchase cannot exceed building electricity use.
- It's easy to opt out of the commitment.
- Renewable energy generators backing the claim may not be new and not always carbon free, e.g. biomass.
- Offerings are sometimes based on the purchase of unbundled RECs.

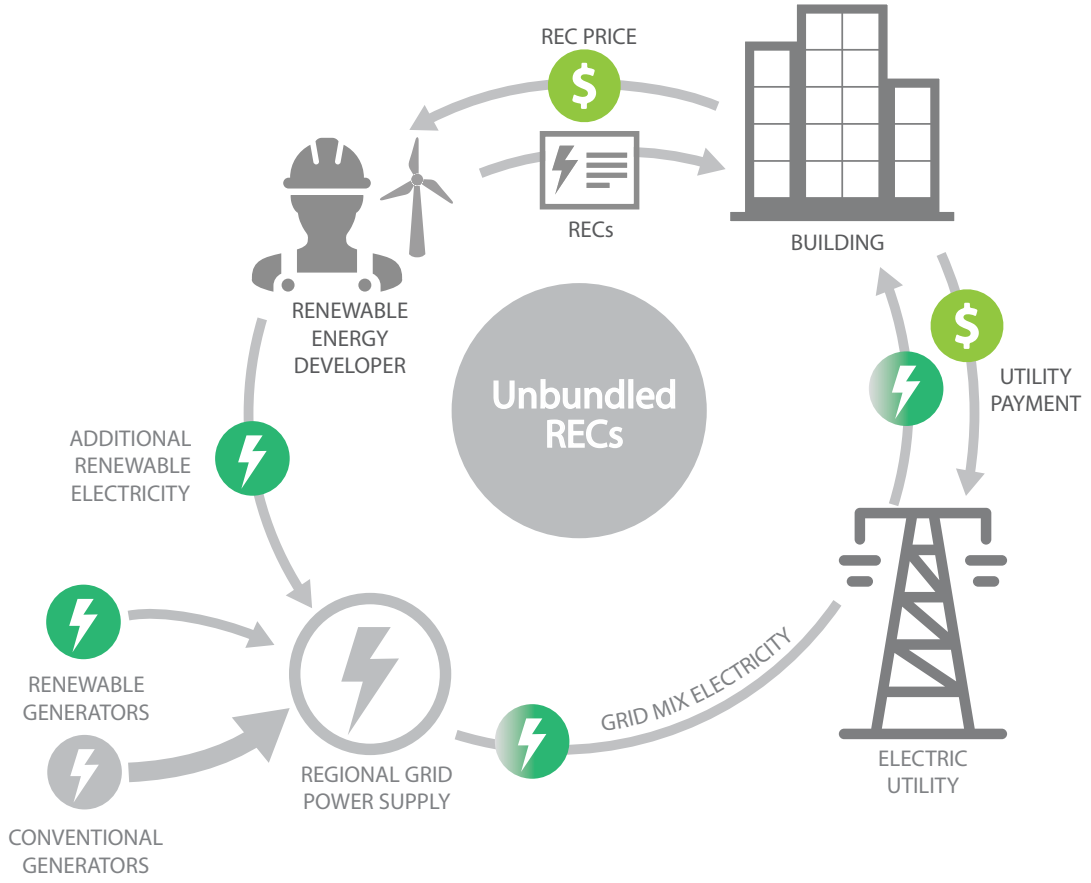
Renewable Energy Investment Fund



Issues:

- Similar to community solar, virtual PPAs or unbundled RECs, depending on how the revenue is invested.

Unbundled Renewable Energy Certificates



Issues:

- Prices for RECs with no restrictions are quite inexpensive, calling to question their effectiveness in achieving additionality.
- Durability requires a forward contract for long-term purchase.
- Renewable energy generators backing the claim may not be new and not always carbon free, e.g. biomass.

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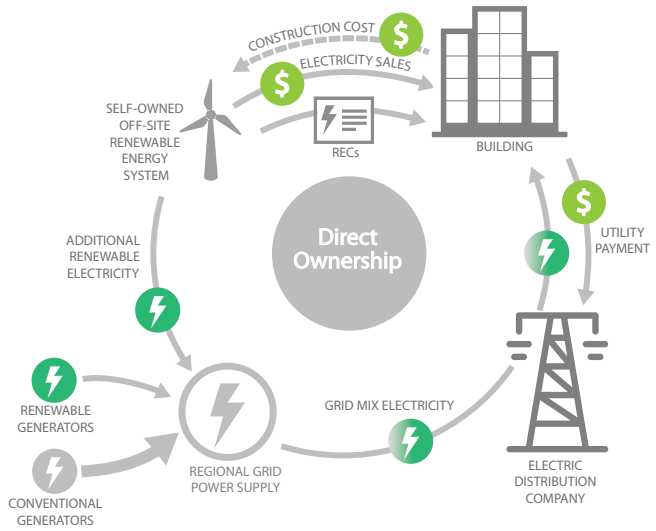
Renewable Energy Procurement



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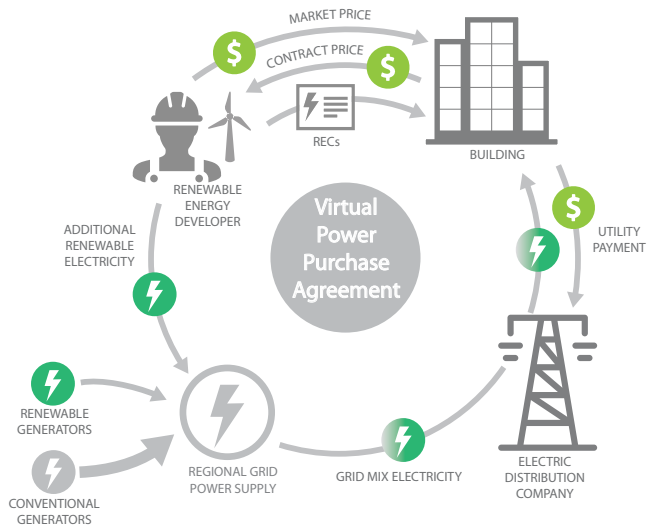

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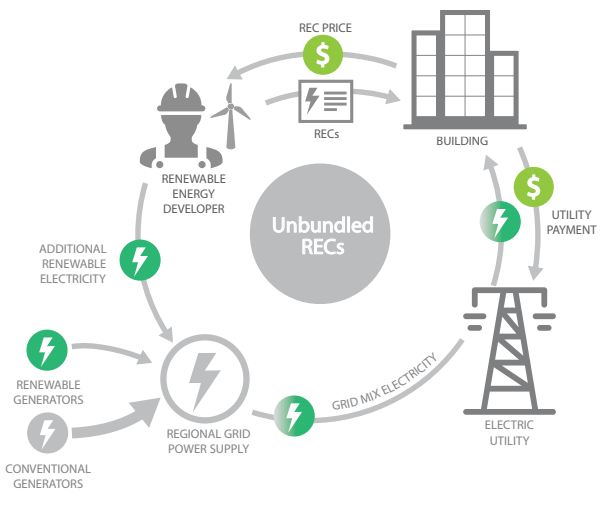

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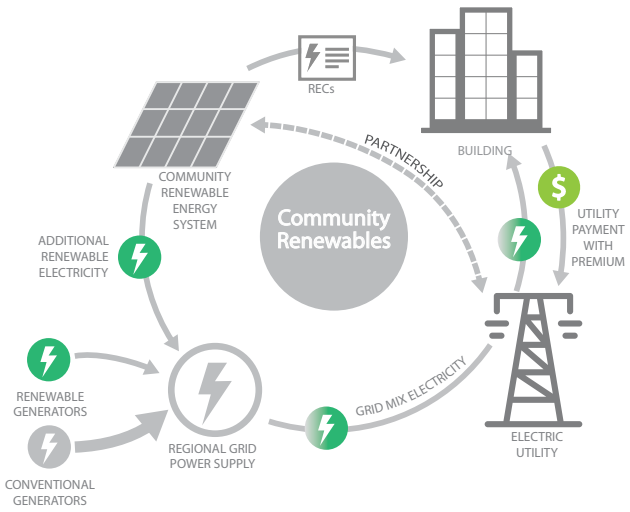

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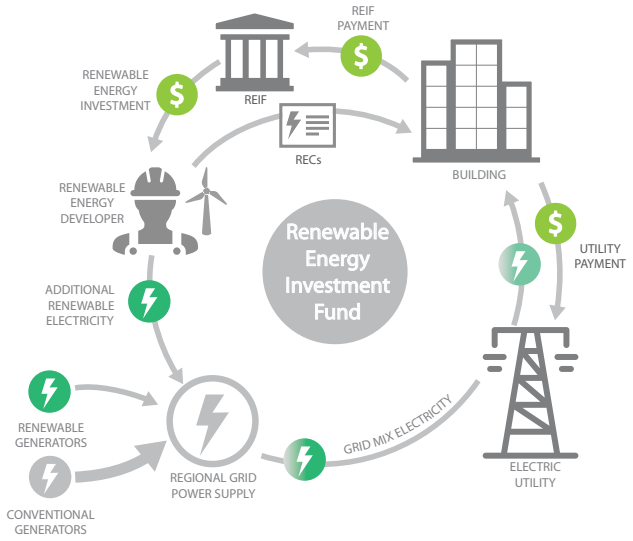

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Question & Answers

- There are many participants joining tonight's virtual public meeting.
- We respectfully ask that meeting attendees utilize the Q&A feature to post questions and comments.

- Please utilize the "Raise Hand" if you would like to ask a question or comment verbally. We will call on as many participants as possible.

NEXT STEPS

Public and Stakeholder Engagement

We would like to participate in your Organization and Association Meetings.
Please contact us!

Technical Advisory Groups

We are seeking TAG members with focus area specific expertise.
Please send us recommendations!

- Low Carbon Buildings
- On-site Renewable Energy
- Renewable Energy Procurement

Open Houses, Office Hours, and Updates

We will be hosting additional engagements and posting updates.
Please be sure to sign up on our contact list!

END

Thank you!

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