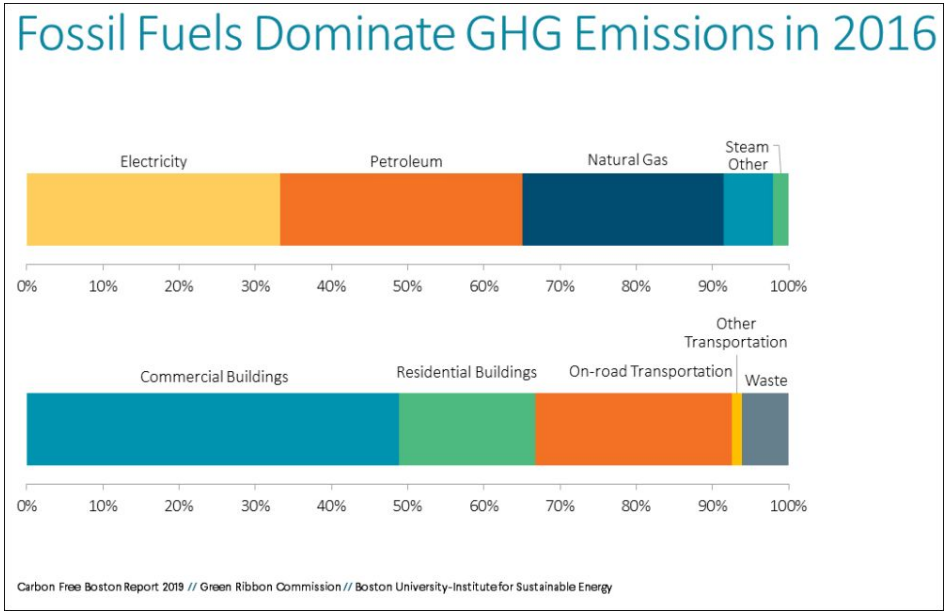
Boston, your buildings need our help.



Buildings account for >2/3 of Boston's emissions.

Technologies exist to transform Boston's buildings with deep energy retrofits, but reality is far more challenging.

Building envelope retrofits are expensive, messy, invasive and SLOW. At our current pace, we won't retrofit low-income households until 2200.

Scalable deep energy retrofits require a disruptive change in building technologies.

IoT, Technology & Innovation, meet legacy building practices

Without the envelope, there is literally no building.

Envelope upgrades have not changed >100 years and rely on materials with high embodied carbon.

Each building in Boston is a snowflake. This sounds cute, but it's really BAD for deep energy retrofits!

Boston must meet this challenge with modern technologies: *automation, digitization and manufacturing*.

Electrification = heat pumps = working fluids

Project Drawdown listed Refrigerant Management as #1.

Don't replace emissions from fuel-driven equipment with, far more potent, refrigerant leaks.

Boston must electrify everything and deploy high performance heat pumps, but it's not enough.

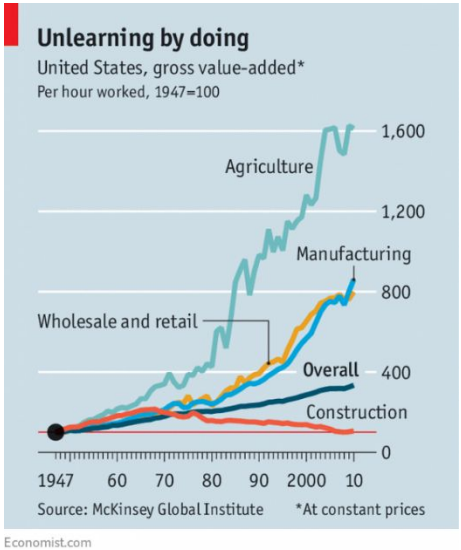
How do we prepare Boston's buildings for non-vapor compression equipment?

Boston's buildings are beautiful AND inspiring AND they can drive economic growth.

Local, non-exportable clean energy jobs

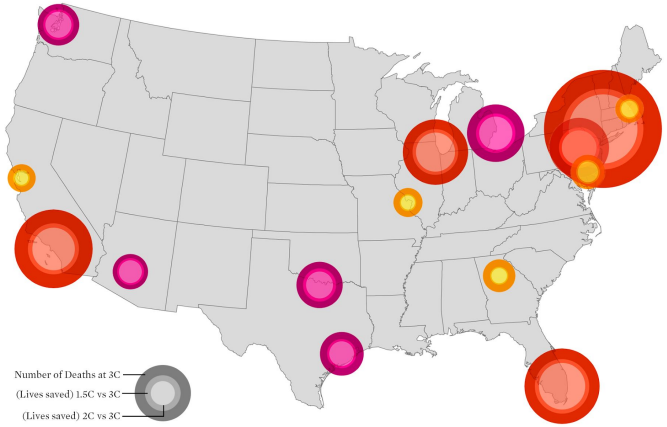
Improve resilience

Increase construction productivity



We spend more than 90% of our time in buildings

Meeting The Paris Agreement's Temperature Goal Avoids Substantial Heat-Related Mortality In U.S. Cities



Per 1 in 30-Year Extreme Heat Event

Per City	New York	Los Angeles	Miami	Chicago	Philadelphia
Number of Deaths at 3C	5,798	2,561	2,359	1,781	1,484
(Lives saved) 1.5C vs 3C	2,716	1,085	1,235	875	684
(Lives saved) 2C vs 3C	1,980	759	894	636	500

	Detroit	Dallas	Houston	Seattle	Phoenix
Number of Deaths at 3C	1,372	901	792	725	526
(Lives saved) 1.5C vs 3C	640	455	352	384	300
(Lives saved) 2C vs 3C	462	306	254	279	216

	Washington DC	Atlanta	St. Louis	Boston	San Francisco
Number of Deaths at 3C	486	446	351	330	328
(Lives saved) 1.5C vs 3C	235	134	117	158	114
(Lives saved) 2C vs 3C	174	100	82	115	75

Numbers are estimated midpoints of modelled ranges. Projections assume current population and adaptation investments.
Adapted from Lo et al 2019, Science Advances.
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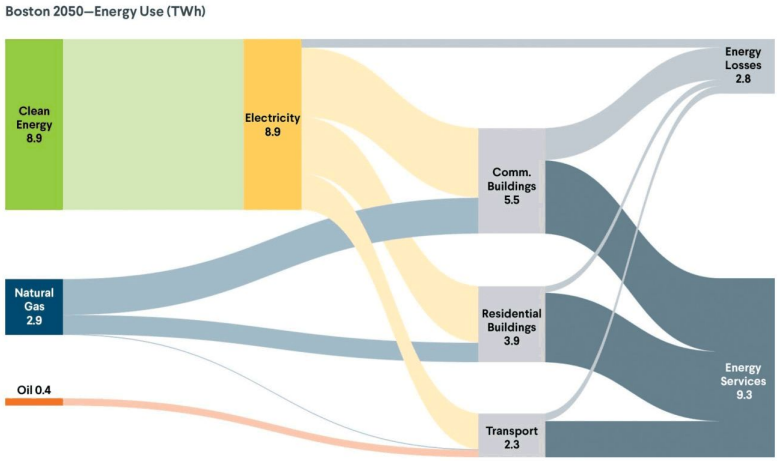
Source: University of Washington



Source: Carbon Free Boston

To achieve a Carbon Free Boston by 2050, regarding IoT, Tech & Innovation, the most critical obstacle to winning is universal access to affordable, desirable deep energy retrofits of residential & commercial buildings.