

Massachusetts is Ready for Net Zero

SPRING 2023 UPDATE

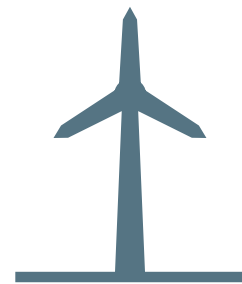
NET ZERO - 15.1 Million GSF



**ENERGY
EFFICIENCY**



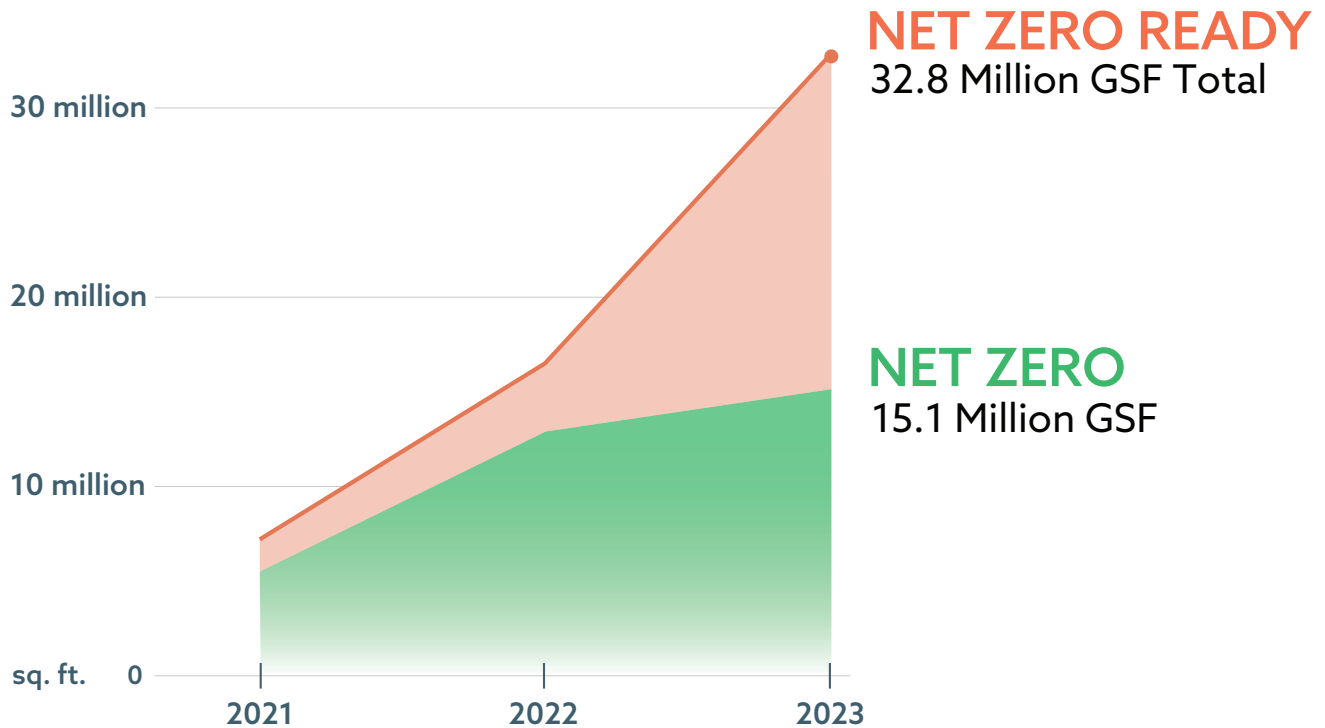
**MINIMIZE
FOSSIL FUEL**



**ON + OFFSITE
RENEWABLE ENERGY**

NET ZERO READY - 32.8 Million GSF

What's this all about?



Since 2021, Built Environment Plus has been actively asking the Massachusetts building community for data on what's happening around Net Zero buildings. We want to take an ongoing pulse on:

- 1. How many Net Zero projects exist or are in development in and around Massachusetts.**
- 2. Does it cost more to build these projects?**
- 3. What building types are achieving Net Zero?**
- 4. Who is bringing these projects to reality?**
- 5. How are they getting it done?**

Continued data collection since 2021 increased the total of Net Zero or Net Zero Ready Projects included in the analysis from 7.2 million GSF to 32.8 million GSF. This represents a 355% increase in known square footage in just 2 years. It is clear from this analysis that Massachusetts is more than ready for Net Zero.

The Bottom Line

- 1. The Net Zero and Net Zero Ready building stock exceeds 32.8 million square feet and is growing at an exponential rate in the Commonwealth today.**
- 2. Of the 7 million GSF with reported cost data, 81% reported <1% construction cost premium to achieve Net Zero Ready.***
- 3. Multi-family and affordable housing's combined 11 Million GSF are leading the way for Net Zero development in Massachusetts, employing heat pumps and on-site renewables to reach their Net Zero targets. Lab / Tech / Science grew substantially in 2023 to 9.3 Million GSF, making up the majority of the found Net Zero Ready space.**
- 4. Affordable Housing makes up 44% of all residential Net Zero and Net Zero Ready square footage.**
- 5. All projects rely on heat pumps as the primary source of heat. The majority of building types utilize air-source heat pumps, with the exception of K-12 and Higher Ed which more often use ground-source heat pumps. Net Zero buildings also procure on-site and/or off-site renewable energy to offset 100% of consumption on a net annual basis.**
- 6. 13.5 million GSF reported the use of electricity for domestic hot water.**
- 7. The list of companies working on these Net Zero projects has grown substantially in the past 2 years, with a 140% increase to 320 companies working to make Net Zero buildings the standard in MA.**

To be listed as Net Zero Ready in this database, buildings must be:

- Located In Massachusetts
- Highly Energy Efficient (25% total energy reduction vs. the ASHRAE 90.1 baseline)
- All electric for building heating operation**

To be listed as Net Zero, buildings must meet the Net Zero Ready criteria and:

- Procure renewable energy from on-site and/or off-site equal to 100% of the site energy consumption on a net annual basis.

We know there are additional Net Zero Buildings in Massachusetts, and for the projects we do have, the data is not 100% complete. We intend to update this ongoing document as we gather more information.

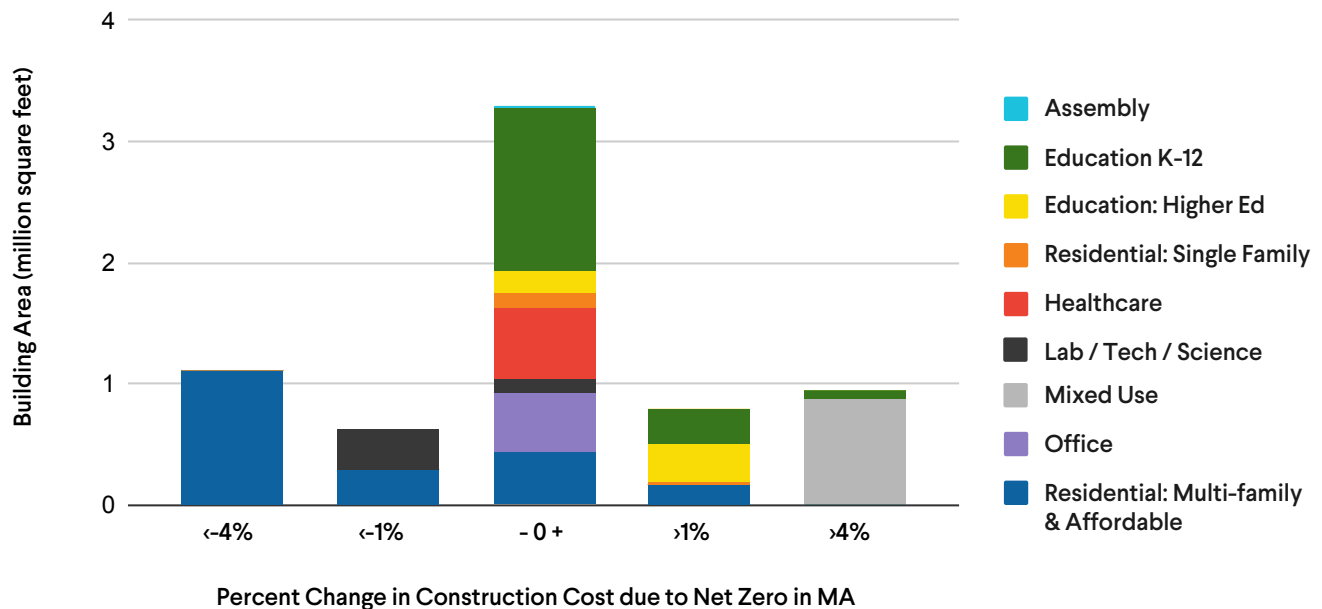
* 21% of the project GSF and 55% of submissions shared cost difference for Net Zero. Of those, 81% of them reported <1% construction cost premium.

** All electric for building heating operation means that electricity is used for heating during "normal operation" when systems are operating as intended and ambient temperature is above the ASHRAE 99% design condition. Special use buildings such as health care facilities and laboratories are given more leeway and may be included if the building relies primarily on heat pumps for building heating and through efficiency and electrification achieve >90% fossil fuel reduction vs. the ASHRAE 90.1 baseline

HOW MUCH DOES IT COST TO BUILD NET ZERO READY?

*7 MILLION GSF OR 150 PROJECTS REPORTED ON % COST DIFFERENCE

NOT MUCH!



Net Zero Ready buildings are being built at the same cost as conventional buildings. Of the 7 million GSF with reported cost data, 81% of Net Zero Ready buildings have less than a 1% construction cost premium.* This is consistent across all building types and sizes, including high-rise buildings that are hundreds of thousands of square feet.

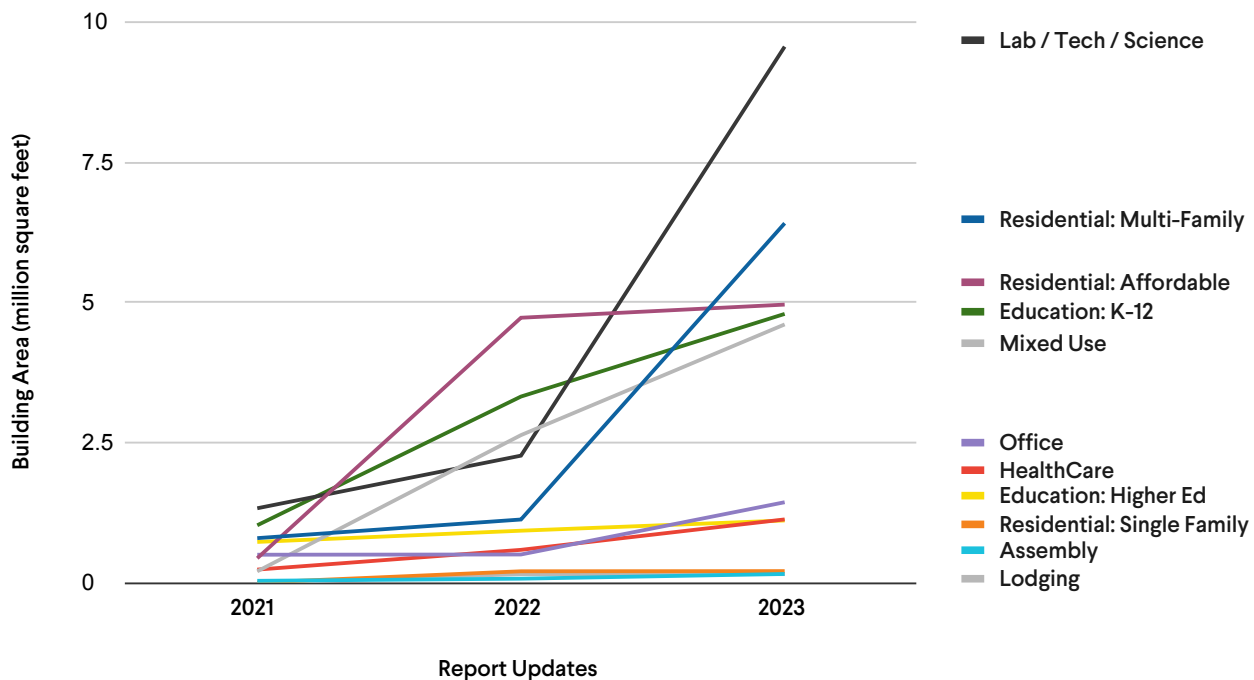
FEAR: Net Zero is expensive.

REALITY: Of submissions reporting on cost data, Net Zero buildings often carry little to no added construction cost and significantly reduce operating cost. This means that Net Zero buildings typically have lower total cost of ownership than conventional buildings. The financial case is even more compelling when construction is financed via loans or bonds; in this scenario the operating savings more than offsets the loan payment premiums. This results in positive cash-flow from day one.

*21% of the project GSF and 55% of submissions shared cost difference for Net Zero. Of those, 81% of them reported <1% construction cost premium.

WHAT BUILDING TYPES ARE ACHIEVING NET ZERO READY?

MANY TYPES!



Of the 32.8+ Million GSF of Net Zero Ready building area found after 2 years, 29% is Lab/Tech/Science, 19% is Residential: Multi-Family, 15% is Residential: Affordable, 14% is Education: k-12, and 14% is Mixed Use. The other typologies together make up the remaining 9% of GSF.

FEAR: Laboratory, technology, and life science buildings will be too technically challenging to achieve.

REALITY: Totalling 9.3 Million GSF, lab/tech/science make up the majority of the found Net Zero Ready space. Through making these projects, high-performance building professionals have shown they have the knowledge and technology to make it possible.

FEAR: Net Zero multi-family and affordable housing will not be feasible as it is too cost prohibitive.

REALITY: Multi-family and affordable projects are leading the way for Net Zero development in Massachusetts. Totalling 11 Million GSF, they represent a greater total GSF than lab/tech/science. It is clear that these projects are not just possible; they are the most thriving typology.

NET ZERO READY DATABASE SNAPSHOT

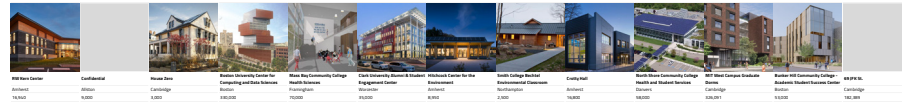
32.8 Million GSF found by BE+ in Massachusetts.

Assembly



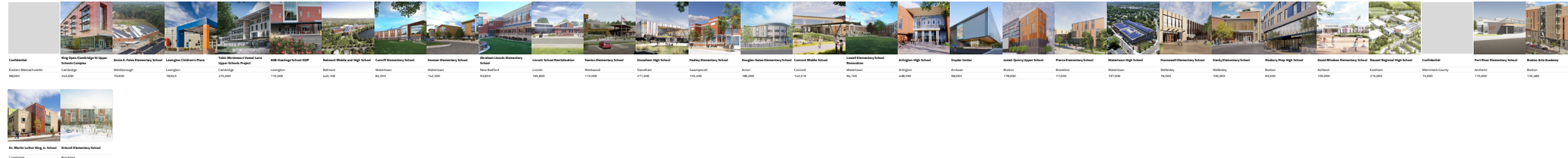
157,899 GSF

Education: Higher Ed



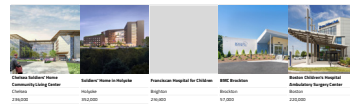
1,111,670 GSF

Education: K-12



4,449,413 GSF

Healthcare



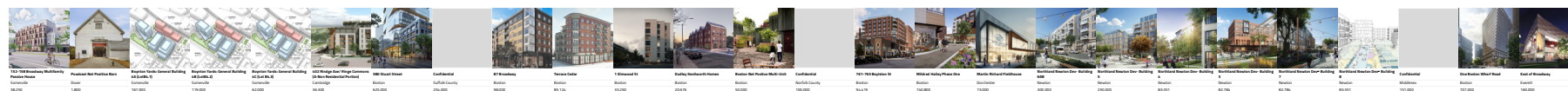
1,130,500 GSF

Lab / Tech / Science



9,279,578 GSF

Mixed Use



4,498,889 GSF

Lodging



155,00 GSF

Office



505,200 GSF

Residential: Affordable



4,974,365 GSF

Residential: Single Family

209,065 GSF

Residential: Multi-Family



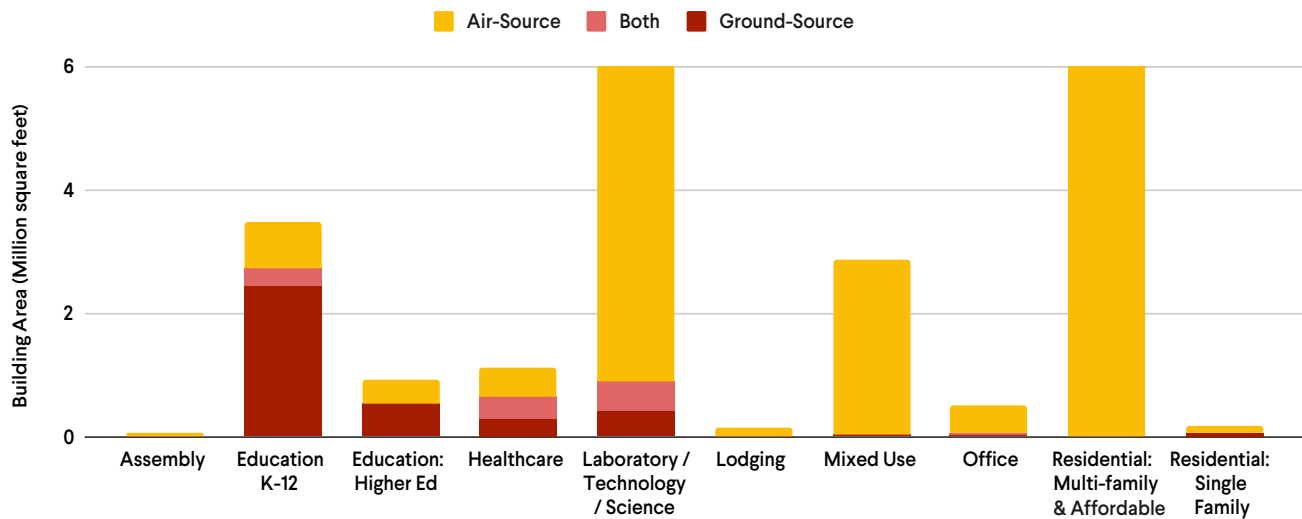
6,056,655 GSF



HOW ARE BUILDINGS USING ELECTRICITY FOR HEATING?

*24.9 MILLION GSF REPORTED ON HEAT PUMP TYPE

GROUND AND AIR-SOURCE HEAT PUMPS!



24.9+ million square feet of buildings reported using heat pumps as the primary heating source. This spans all building types and sizes reported, including high-rise buildings that are hundreds of thousands of square feet.

FEAR: Net Zero buildings must be 100% electric with no exceptions.

REALITY: Net Zero standards promote electrification, but allow flexibility for fossil fuel use where appropriate. Examples include: back-up systems, lab buildings, healthcare facilities, commercial kitchens, large domestic hot water systems, and others.

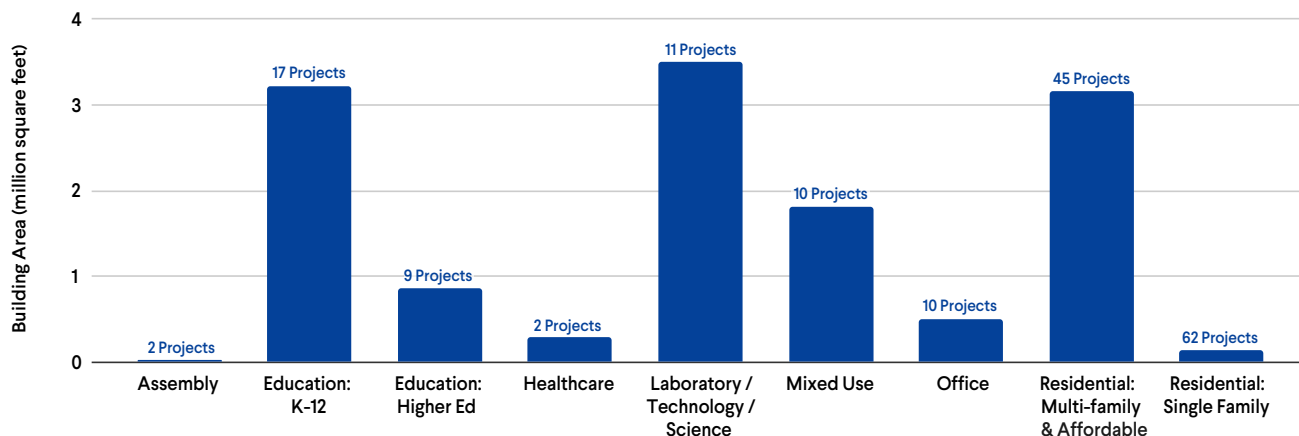
FEAR: The electric grid can't support electric buildings.

REALITY: New Net Zero buildings often have lower peak electric demand than their peers.

ARE BUILDINGS USING ELECTRICITY FOR DOMESTIC HOT WATER?

*13.5 MILLION GSF REPORTED ELECTRIC DHW

YES, MANY!



13.5+ million square feet of buildings reported using electricity as their domestic water heating source.

FEAR: Electrification of domestic hot water is not possible for some high-energy building types, such as labs and healthcare.

REALITY: Electrification of domestic hot water is possible for high-energy building types.

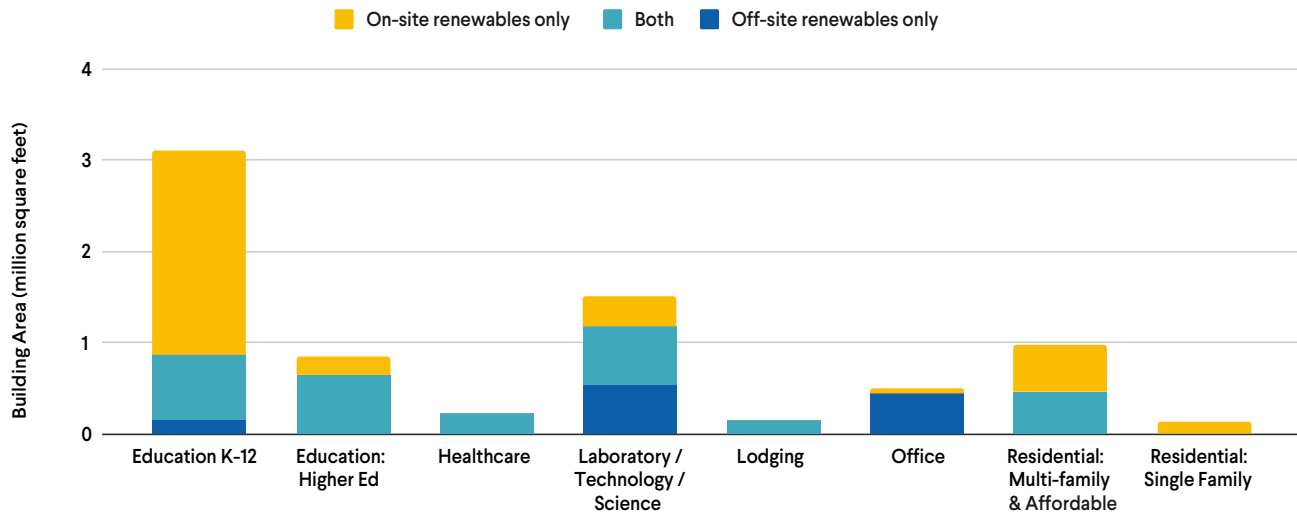
FEAR: Electrification of domestic hot water is not possible for multi-family buildings.

REALITY: Electrification of domestic hot water is possible for multi-family buildings.

HOW ARE BUILDINGS ACHIEVING NET ZERO?

*12 MILLION GSF REPORTED ON RENEWABLES

ON-SITE AND OFF-SITE RENEWABLE ENERGY!



Of the 32.8+ million GSF of Net Zero Ready buildings, 15.1 million GSF anticipate achieving Net Zero energy. Net Zero buildings procure on-site and/or off-site renewable energy to offset 100% of annual consumption.

FEAR: Net Zero buildings must produce all energy on-site.

REALITY: Net Zero buildings can procure renewable energy from off-site.

FEAR: Renewable electricity costs more than grid electricity.

REALITY: There are many procurement methods for renewable energy. Some marginally increase cost. Others cost less, such as: power purchase agreements and virtual power purchase agreements.

The 318 Companies Working on these Projects: Sorted by total associated GSF

86 OWNERS:

Boston Housing Authority
 Alexandria Real Estate
 Marcus Partners
 Gate Residential Properties
 City of Cambridge
 Skanska
 Preservation of Affordable Housing (POAH)
 Somerville Community Corporation (SCC)
 Somerville Housing Authority (SHA)
 Town of Belmont
 Midwood Investment & Development
 City of Arlington
 Holyoke Soldiers' Home
 DLJ Real Estate Capital Partner
 Leggat McCall Properties
 University of Massachusetts Medical School
 Boston University
 MIT
 Chelsea Soliders' Home
 City of Watertown
 Boston Properties
 Town of Stoneham
 Town of Acton
 Trinity Financial
 Town of Lincoln
 Samuels & Associates P-12 Property LLC
 Town of Swampscott
 The Community Builders
 Concord, MA
 Just-A-Start Corporation
 Town of Lexington
 The Neighborhood Developers
 Town of Westwood
 NeighborWorks Housing Solutions
 Homeowner's Rehab, Inc.

Phillips Academy
 Broadway & A St LLC
 City of New Bedford
 New Bedford Public Schools
 Now Communities, LLC
 Urban Edge
 Westborough Public Schools
 Massbay Community College
 Capstone Communities LLC
 Hope Real Estate Enterprises LLC
 Allied Health
 North Shore Community College
 Hawkins St Union Square LLC
 Bunker Hill Community College
 DCAMM
 Beacon Communities
 Bristol Community College
 Commonwealth of Massachusetts
 Traggorth Companies
 Barlett Lot D Preservation Associates
 Cape Cod Community College
 Broadway Investments Realty, LLC
 Fred Gordon
 NSCDC
 Clark University
 Tlee Development
 Scott Webster & Elmwood Street Reality Trust
 Rees Larkin Development
 Cambridge Housing Authority
 MassDevelopment
 PT RED
 Woods Hole Research Center Corporation
 Town of Eastham
 Hampshire College
 University of Massachusetts Amherst
 E3 Development
 213 Harvard Street Condominium Trust

Mass Audubon
 Hitchcock Center for the Environment
 Z Capital Investments
 MA Dept. of Conservation & Recreation
 Zero Energy Modular Affordable Housing Initiative (ZE-MAHI)
 Marcella 120 LLC
 Chunggha Cha
 Brian Butler
 Harvard University
 Smith College
 Ryan Bushey
 Elizabeth Meek
 Pioneer Valley Habitat for Humanity
 Deborah Frieze

(All Individual Homeowners are excluded from this list)

The 318 Companies Working on these Projects: Sorted by total associated GSF

91 ARCHITECTS:

Stantec	Dore & Whittier	Peter Stevens
Elkus Manfredi Architects	Studio G Architects	Coldham & Hartman Architects
SGA	Stefanov Architects Inc.	Brian Butler
Payette	Mount Vernon Group Architects	Snøhetta
CBT	Bruner/Cott	Hutker Architects
RISE Together	Architerra Inc.	R. Carter Scott
DREAM Collaborative	RODE	John Livermore
Perkins & Will	DiMella Shaffer	Ryan Bushey
NBBJ	Oudens Ello Architecture	Peter Brooks
Studio Gang	Union Studios	Elizabeth Meek
Henning Larsen	Sebastian Mariscal Studios	Peter Kane
ICON Architecture, Inc	Elton Hampton	Edy Ambroz
Ellenzweig	Fred Gordon	Matt Coffey
Utile	New Atlantic Development	Mary Kraus
Perkins Eastman	JPND	Next Phase Studios
Gate Residential Properties	Placetaylor	
Jacobs Consultants, Inc.	Rees Larkin Development	
Adrian Smith + Gordon Gill Architecture	NOW Communities, LLC	
HMFH Architects	Brown Lindquist Fenuccio & Raber Architects Inc.	
Arrowstreet	MassDevelopment	
Architectural Resources Cambridge	Tlee Development	
ZGF	Hampdentailor LLC	
CUBE 3	William McDonough + Partners	
KPMB	ZeroEnergy Design	
Kieran Timberlake	Miller Pollin Architecture	
isgenuity	designLAB Architects	
Flansburgh	Interface Studios	
Ai3 Architects	Urbanica Design	
SMMA	Maple Hill Architects	
William Rawn Associates	Maryann Thompson Architects	
Madison Park CDC	Scott Payette Architects	
Jonathan Levi Architects	David Miller	
Lavallee Brensinger	Steven Baczek	
Davis Square Architects, Inc.	Rachel Stevens	
West Work	SimpleCity Studio	
Wilson Butler	Ben Nickerson	
Sasaki	Kraus Fitch Architects	
DiNisco Design, Inc.	MacLay Architects	

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29 ENERGY CONSULTANTS:

BR+A
Thornton Tomasetti
enviENERGY Studio
The Green Engineer
New Ecology
AHA Consulting Engineers Inc
Steven Winter Associates
Atelier Ten
Petersen Engineering
Vanderweil Engineers
AKF Group
Soden Environmental
WSP
Building Evolution Corp
Marc Rosenbaum
CLEAResult
Integrated Environmental Solutions
Sayo Okada
Northern Power Systems
Transsolar, Inc.
Building Science Corporation
Andelman Lelek
Linnaea Solutions
Conservation Services Group
Michael Duclos
VEIC
Solar Design Associates
Daniel Roy
Sean Welch

47 MEP ENGINEERS:

BR+A
Petersen Engineering
Vanderweil Engineers
Cosentini Associates
Garcia, Galuska & DeSousa
WSP
AHA Consulting Engineers Inc
Arup
Skanska
BLW Engineers
Wozny Barbar
Rist Frost Schumway
BALA Consulting Engineers, Inc.
VAV International, Inc.
Consulting Engineering Services
Norian Siani, Inc
Simpson Gumpertz & Heger
RFS Engineering
LVR Corp.
Places Associates
RW Sullivan Engineering
ZeroEnergy Design
Buro Happold
Merrill Engineers and Land Surveyors
Ripcord Engineering Inc
CMTA
StudioNYL
Van Zelm
Zade Associates LLC
Griffith & Vary, Inc.
Kohler & Lewis Engineering
2RW Consulting Engineers
Bensonwood
Engineering Design Build
AKF Group
Allen & Major Associates
RSE Associates
Stamski and McNary

Drew Gillett
Adam Kohler
Ryan Hellwig
McBrie, LLC
David Fink
Marc Rosenbaum
South Mountain Company
Ben Brungraber
Center for Ecological Technology

The 318 Companies Working on these Projects: Sorted by total associated GSF

65 BUILDERS:

Bald Hill Builders	Tlee Development
RISE Together	Hampdentailor LLC
Cranshaw Construction	Columbia Construction Co.
Brait Builders	Transformations, Inc.
Callahan Construction Managers	Lee Kennedy
Suffolk	Walsh Brothers
New England Development	Pioneer Valley Habitat for Humanity
Gilbane Building Company	One Way Development
Erland	Chapman Construction
Bond Brothers	Marcella 120 LLC
Moriarty	Sandcastle Construction
Consigli Construction Co.	Boston Green Building
Southern Middlesex Industries	Brian Butler
W. T. Rich	Decumanus Green Builders
Gate Residential Properties	Synergy Construction
Madison Park CDC	Holden Builders
TR White Company, Inc.	Farley Pedler
Delphi Construction Inc.	Richard Jenson
WS Development	Pat DeLeeuw
Skanska	Edy Ambroz
Shawmut Construction	Caleb Ewing
Related Beal	Bill Hallaren
Haycon	Ryan Bushey
Turner Construction Co.	Dellbrook JKS
NEI General Contracting	Dunhill Companies
Sean Ford	Karston Construction
McNamara Salvia	Pascal Albanese
Hawkins St Union Square LLC	
The Community Builders	
NOW Communities, LLC	
Groom Construction	
NPS Contractors	
Stack + Co	
Wright Builders	
New Atlantic Development	
JPNDC	
MassDevelopment	
GFC Development	

This report is still continuing to grow...

For questions related to this report, please reach out to netzero@builtenvironmentplus.org

To learn more about Built Environment Plus check out our website <https://builtenvironmentplus.org/> and to check for updates to this report visit <https://builtenvironmentplus.org/road-to-net-zero/>

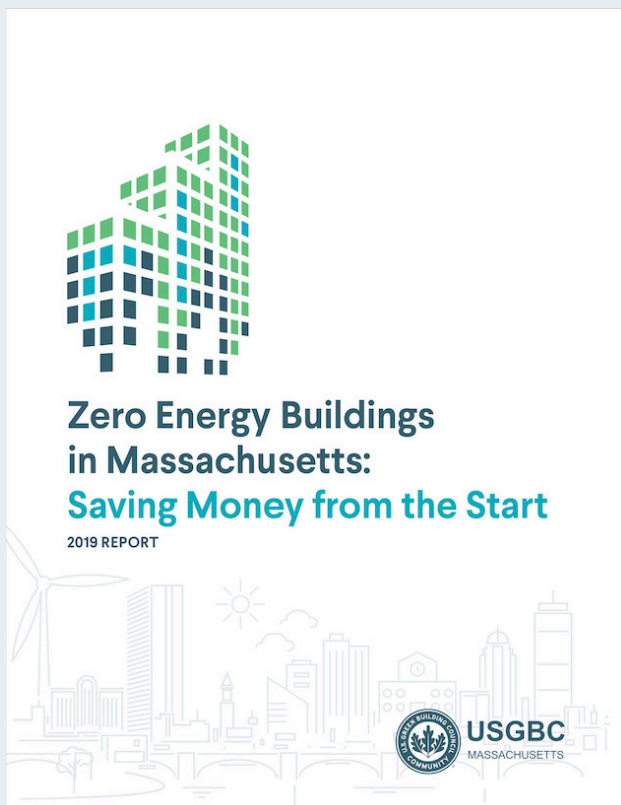
We are continuing to add to the database. Use [this form](#) to contribute additional projects or contact the email address above to request a spreadsheet.

This report focuses on operational carbon and is only part of the equation. Learn more about the importance of embodied carbon by participating in the MassCEC [Embodied Carbon Reduction Challenge](#).

Thank you to the many people and organizations who contributed to this effort, especially the Boston Society for Architecture. The building community united to provide this data swiftly, and have proven very committed to our ongoing collection efforts!



Driving Sustainable and Regenerative Design, Construction, and Operations of the Built Environment.



Our 2019 Cost Report that Started it All.

Our report, Zero Energy Buildings in MA: Saving Money from the Start, assessed in 2019, zero energy (ZE) upfront building costs, model performance, and life-cycle costs in Massachusetts. With buildings being a major source of greenhouse gas emissions, scientists, advocates, and local leaders are working to curb emissions and reduce energy use in the built environment by both retrofitting existing buildings and constructing new buildings to achieve Zero Energy Standards. While stakeholders and decision makers frequently cite high costs as the primary barrier to ZE buildings, we and report lead Integral Group found that many types of ZE buildings can be built with no added upfront cost and some commercial buildings can see return on investment in as little as one year.

[READ IT HERE](#)