Helping Massachusetts Municipalities Create a Cleaner Energy Future

COMMONWEALTH OF MASSACHUSETTS

Charles Baker, Governor
Kathleen Theoharides, Secretary
Patrick Woodcock, Commissioner

Green Communities Division Webinar

April 9, 2020

PassiveHouse Primer

Presented by: Paul Ormond, DOER Energy Engineer

Green Communities Division - Programs & Resources for Municipalities

- Green Communities Designation and Grant Program
- MassEnergyInsight energy tracking and analysis tool
- Municipal Energy Technical Assistance
- Website filled with tools & resources www.mass.gov/orgs/green-communities-division
- Email updates via e-blasts – Sign up by sending an email to: join-ene-greencommunities@listserv.state.ma.us

Green Communities Regional Coordinators

- Regional Coordinators act as direct liaisons with cities and towns on energy efficiency and renewable energy activities
- Located at each of the DEP Regional Offices:

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413-755-2232

NERO – WILMINGTON: Neal Duffy
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Helping Massachusetts Municipalities Create A Greener Energy Future

Upcoming Events

- **May 1:** Competitive Grant deadline
- **May 20 & June 9:** Heat Pump/VRF training – *either in-person or online*

Helping Massachusetts Municipalities Create a Clean, Affordable, and Resilient Energy Future

Recording & Presentation

- The webinar is being recorded and will be available on our website in approximately 48 hours at: www.mass.gov/orgs/green-communities-division-massdoer
- Click on the camera icon top right of your screen to save any slides for future reference
- Use the Q & A icon on your screen to type in questions

Passivehouse

what is it and why it’s important

Poll Question #1

We would like to get a sense of who is tuning in. Are you a:

Architect

Energy professional

Facilities staff

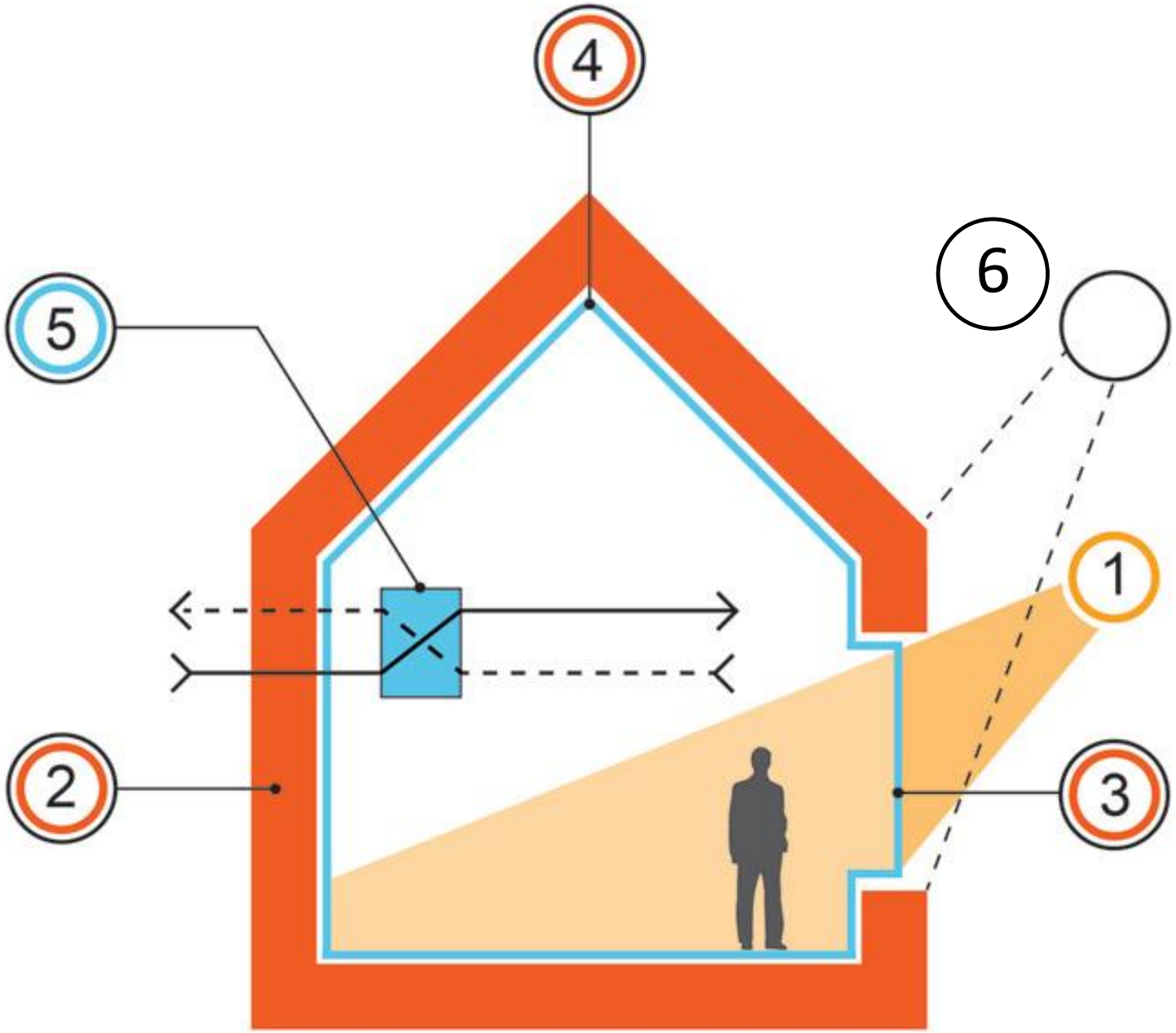
Municipal or school employee

Municipal volunteer

Other

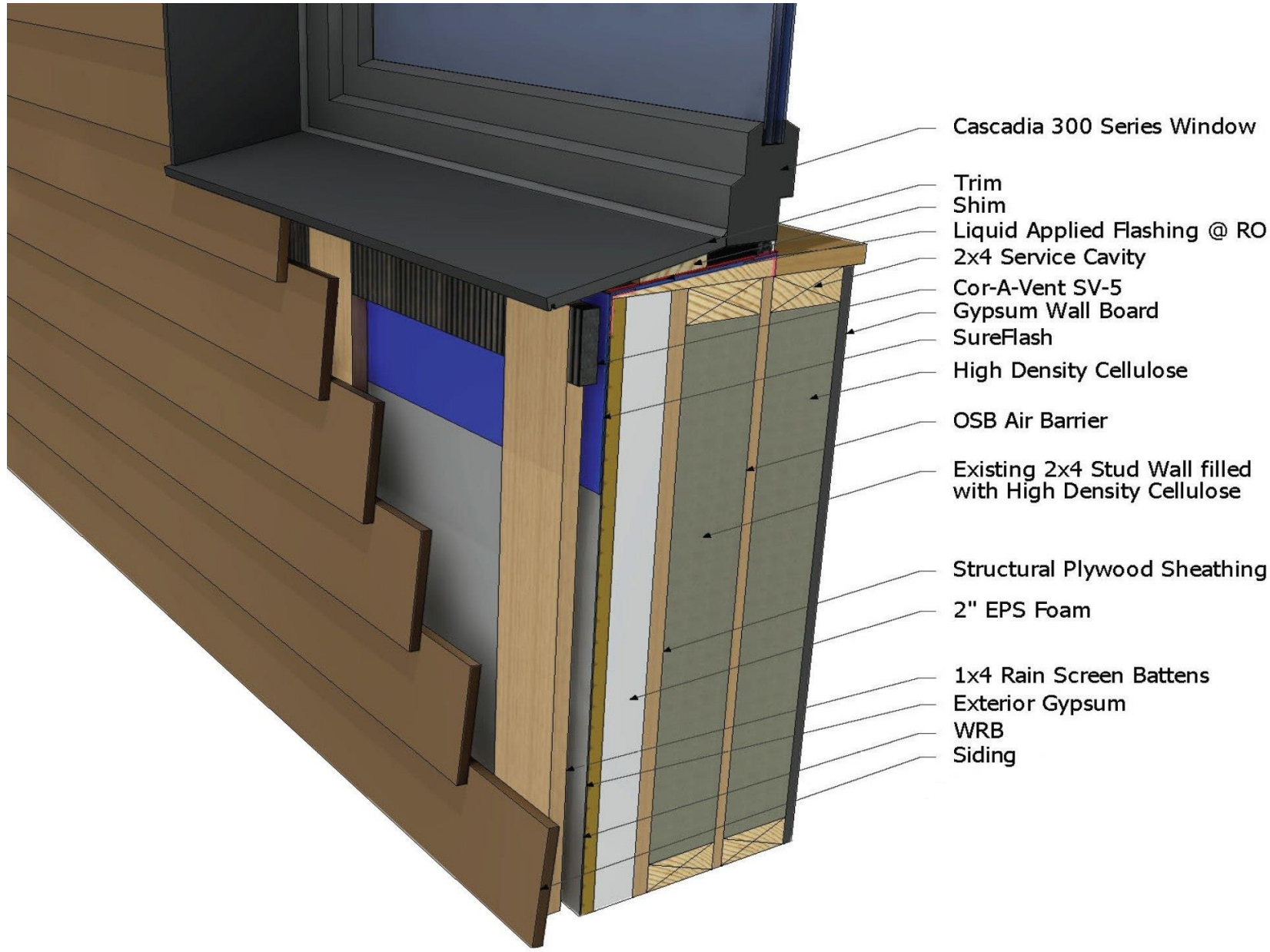
Can You Find the Passive House?

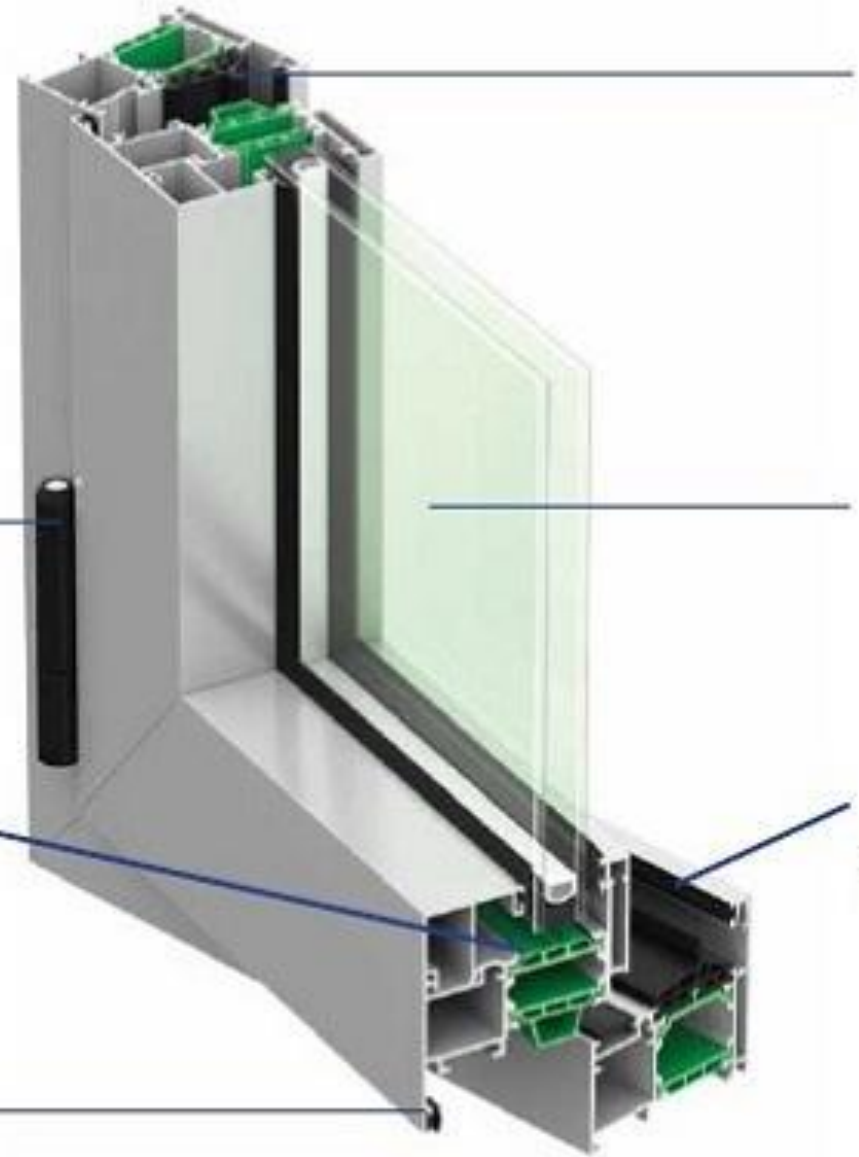
Can You Find the Passive House?



1. Solar gain
2. Envelope
3. Windows
4. Infiltration
5. Energy recovery
6. External Shading


ZIPsystem
ZIP
DOW


Cascadia 300 Series Window
Trim
Shim
Liquid Applied Flashing @ RO
2x4 Service Cavity
Cor-A-Vent SV-5
Gypsum Wall Board
SureFlash
High Density Cellulose
OSB Air Barrier
Existing 2x4 Stud Wall filled with High Density Cellulose
Structural Plywood Sheathing
2" EPS Foam
1x4 Rain Screen Battens
Exterior Gypsum
WRB
Siding



Central gasket made from EPDM guarantees water and air tightness

Strong hinge for optimal performance

Up to 32mm double glazing

Thermal break system of 34mm extra wide insulating thermal strips

Inner gasket providing secondary seal

Overlap gasket made from EPDM, for wind protection and water penetration

Passivehouse simplifies

PH: Important for Emissions Reduction

Less energy

Smaller peak loads

Easier electrification

Increased resilience

Improved comfort

All Buildings can be Passivehouse

Montessori School
Hollis, NH

Stone Fruit Farm
Westport, MA

170-Bed Dormitory
Wheaton College

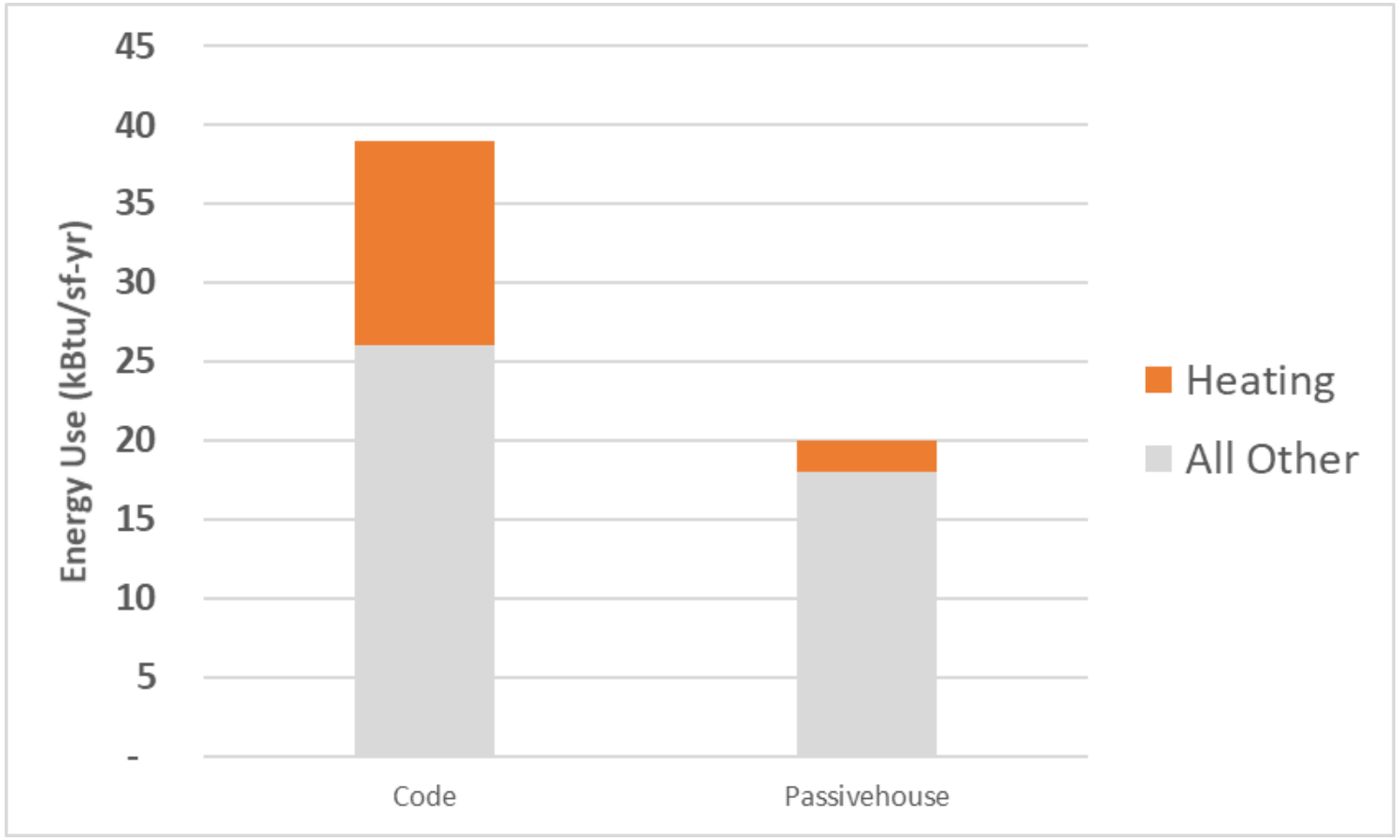
Carnegie Library
Pittsburgh, PA

268,000-sf Office Building
Chicago, IL

Lake Star Manufacturing Center
Colombo, Sri Lanka

Brussel, Belgium:
All buildings (housing, office, service buildings or schools) are required to be Passivehouse Standard or better.

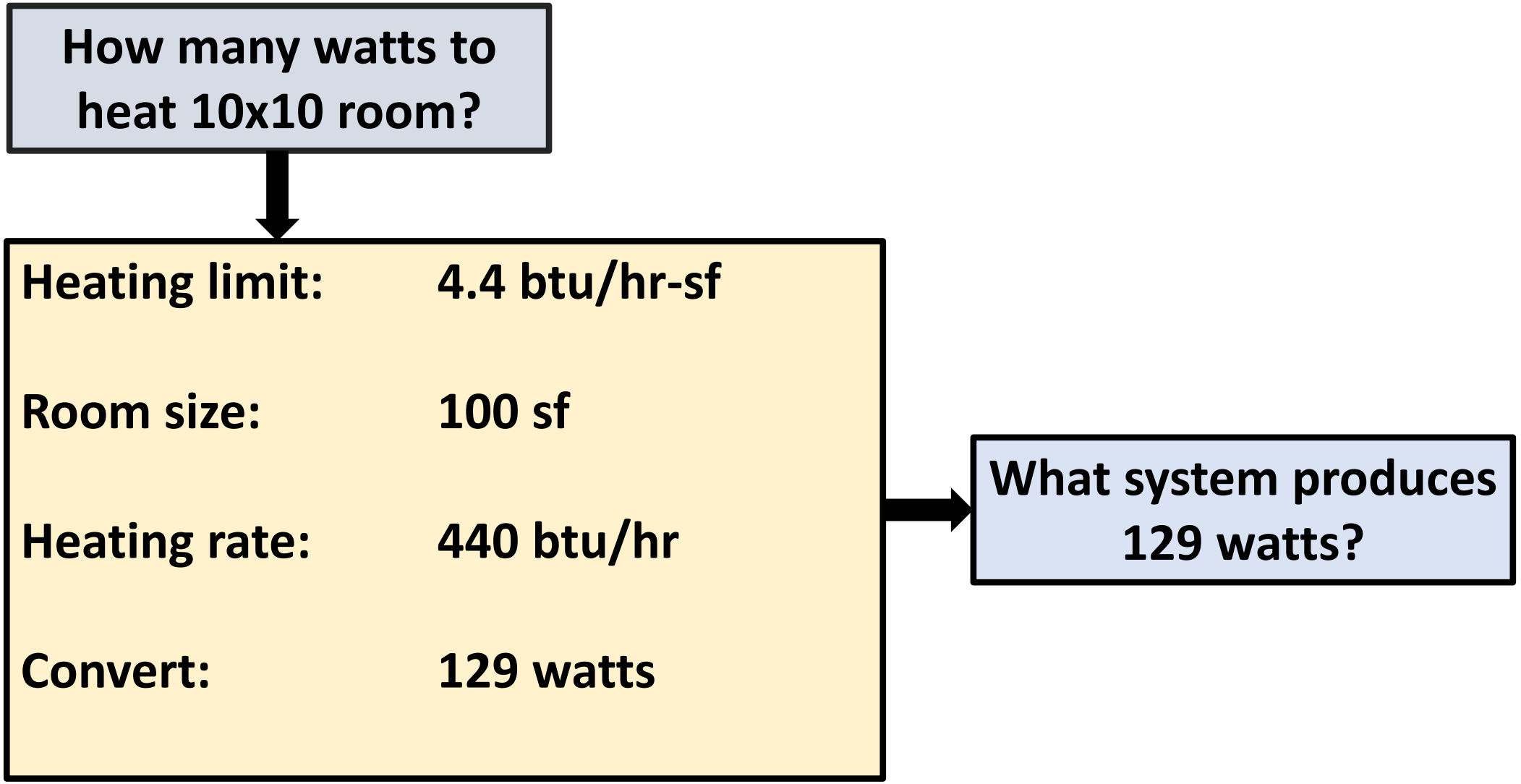
Superior Performance



50% less energy

85% less heating

Wicked small heating and cooling systems



20,500 watts

Woops! This would heat 200 of our 10x10 rooms

1,500 watts

Still x15 too big

1,000 watts

X10 too much

Photo Credit: wikimedia

1,000 watts

Also x10 too big

Photo Credit: wikimedia

100 watts

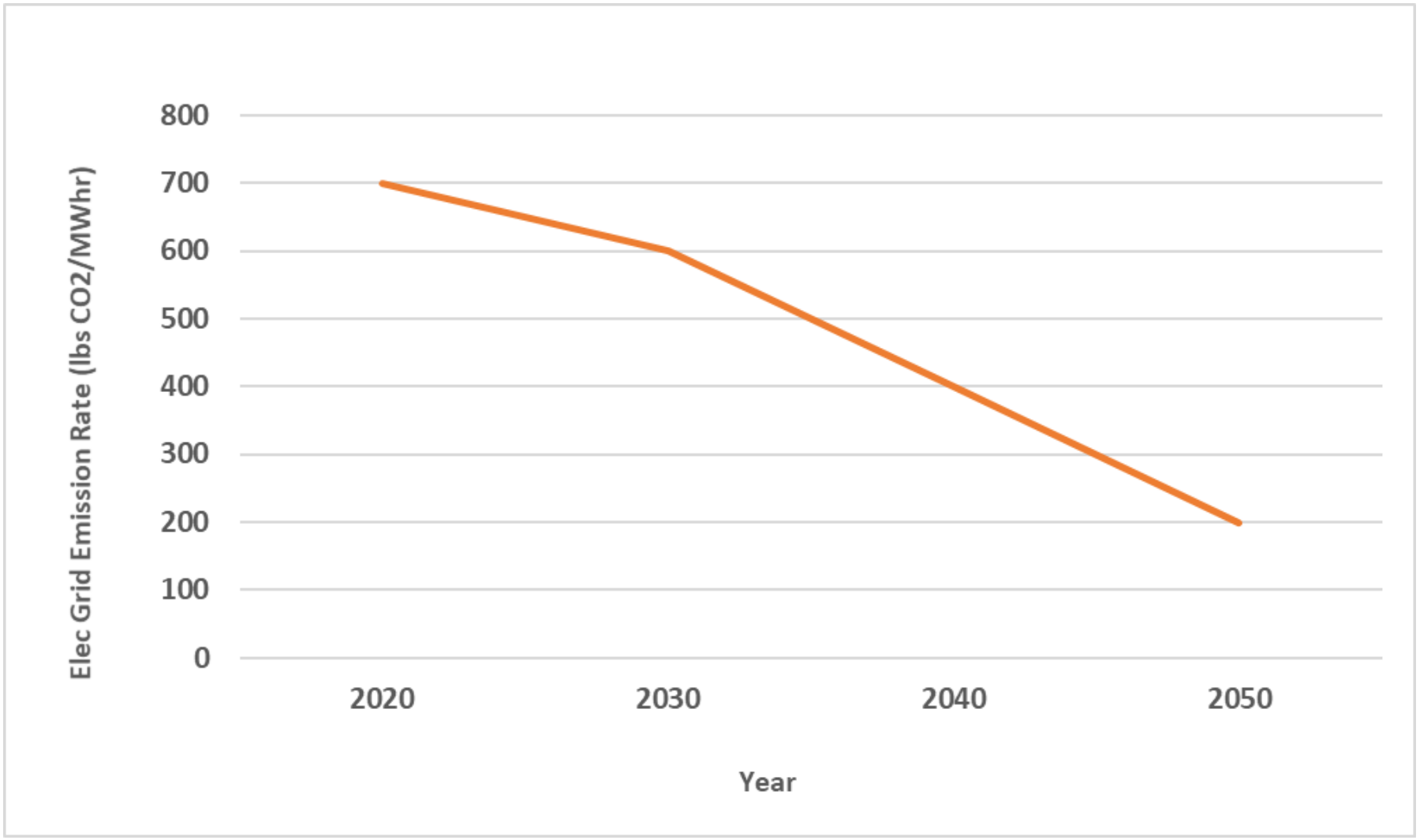
Perfect! Too bad they stopped making these…

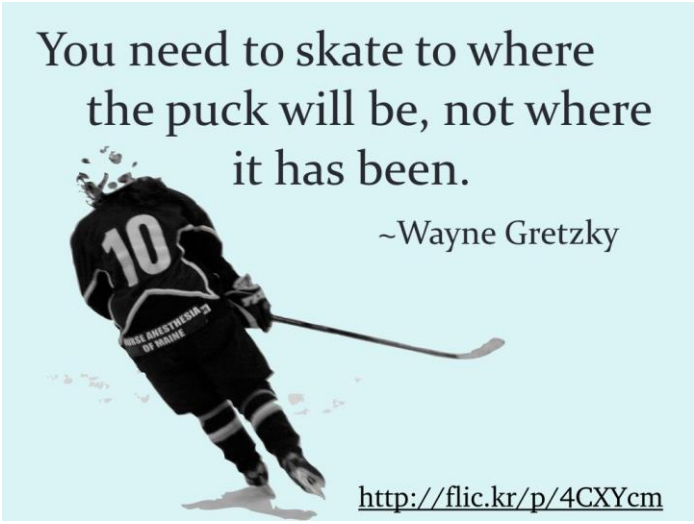
These 2000+ sf units:

- **Small heat pump**
- **No perimeter heating**
- **Simple distribution**

This 26-story tower:

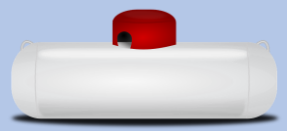
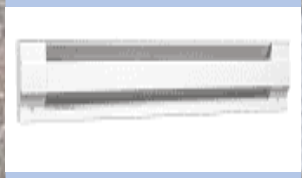
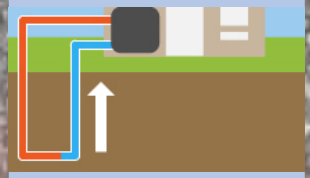
- **Just two 10 ton heat pumps per floor**
- **No perimeter heating**





Massachusetts electric grid emissions are declining significantly. By 2050, grid emissions will be less than 1/3 of what they are today.

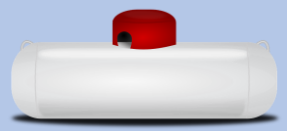
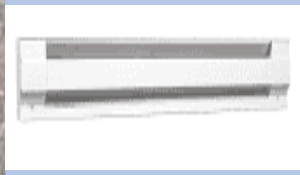
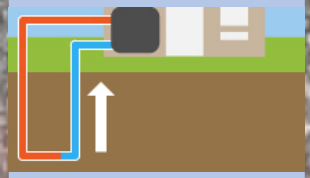
Therefore, a major emission reduction strategy is to swap from fossil fuel to efficient electric grid wherever possible.

OIL	PROPANE	GAS	ELECTRIC RESISTANCE	ELECTRIC COLD CLIMATE AIR SOURCE HEAT PUMP	ELECTRIC GROUND SOURCE HEAT PUMP
					

Pounds of emissions to deliver 1 MMBtu of heat into a space (in 2020)

170	145	120	205	65	45

45% Less

OIL	PROPANE	GAS	ELECTRIC RESISTANCE	ELECTRIC COLD CLIMATE AIR SOURCE HEAT PUMP	ELECTRIC GROUND SOURCE HEAT PUMP
					

Pounds of emissions to deliver 1 MMBtu of heat into a space (in 2050)

170	145	120	~~205~~ 59	~~65~~ 18	~~45~~ 13

85% Less

Poll Question #2

Is your municipality, school district or company planning a new construction project?

Yes

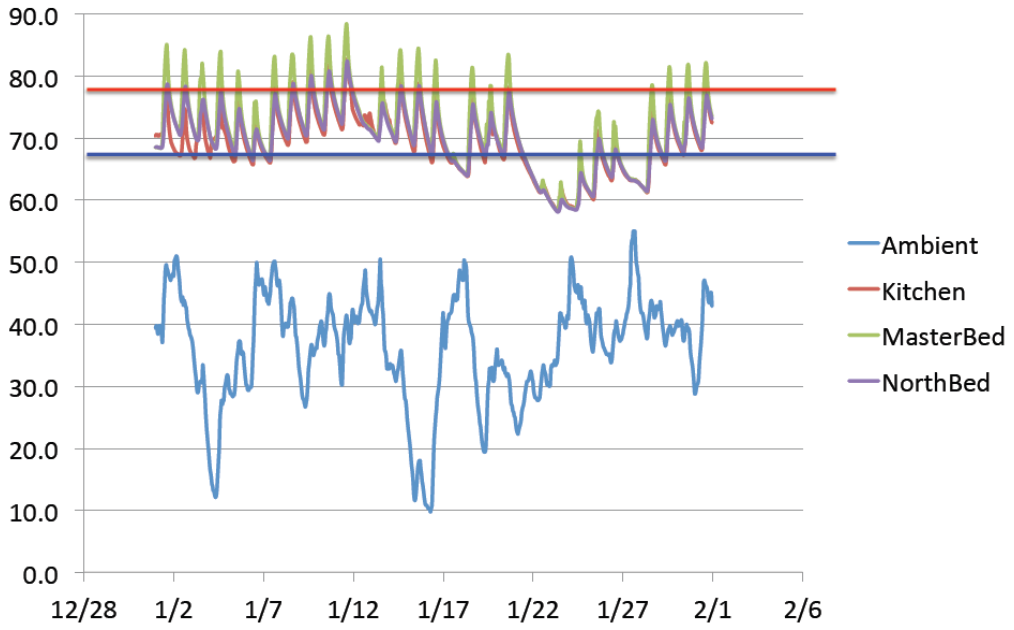
No, but we're thinking about it

No

Not sure

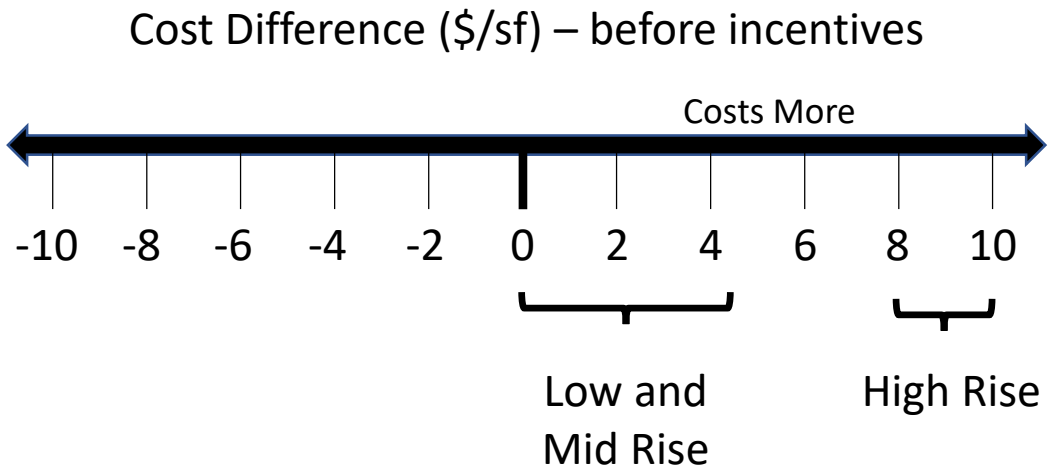
Falmouth Passive House

January, 2012, Falmouth MA



Passivehouse buildings will maintain internal temperature without mechanical space conditioning for long periods. The implication is that passivehosue can also be a demand side management strategy.

Does it cost more? Not necessarily



Example of Current Incentives – 900-sf dwelling units

	Incentive ($/unit)	Normalized ($/sf)
Alternative Energy Credits	$3,000	$3.33
MassSave	$3,250	$3.60
Total	**$6,250**	**$6.93**

4 stories or more; Passivehouse; cold climate ASHP space heating, AEC value of $20/MWhr


MORNINGSIDE
CROSSING


Rabot Dutilleul Construction

Does code allow it? Experimental?

There are over 60,000 passivehouse buildings built world-wide. Passivehouse has been recognized in Massachusetts building code for over 8 years.

Thank you!

Newton Northland,
Newton, MA

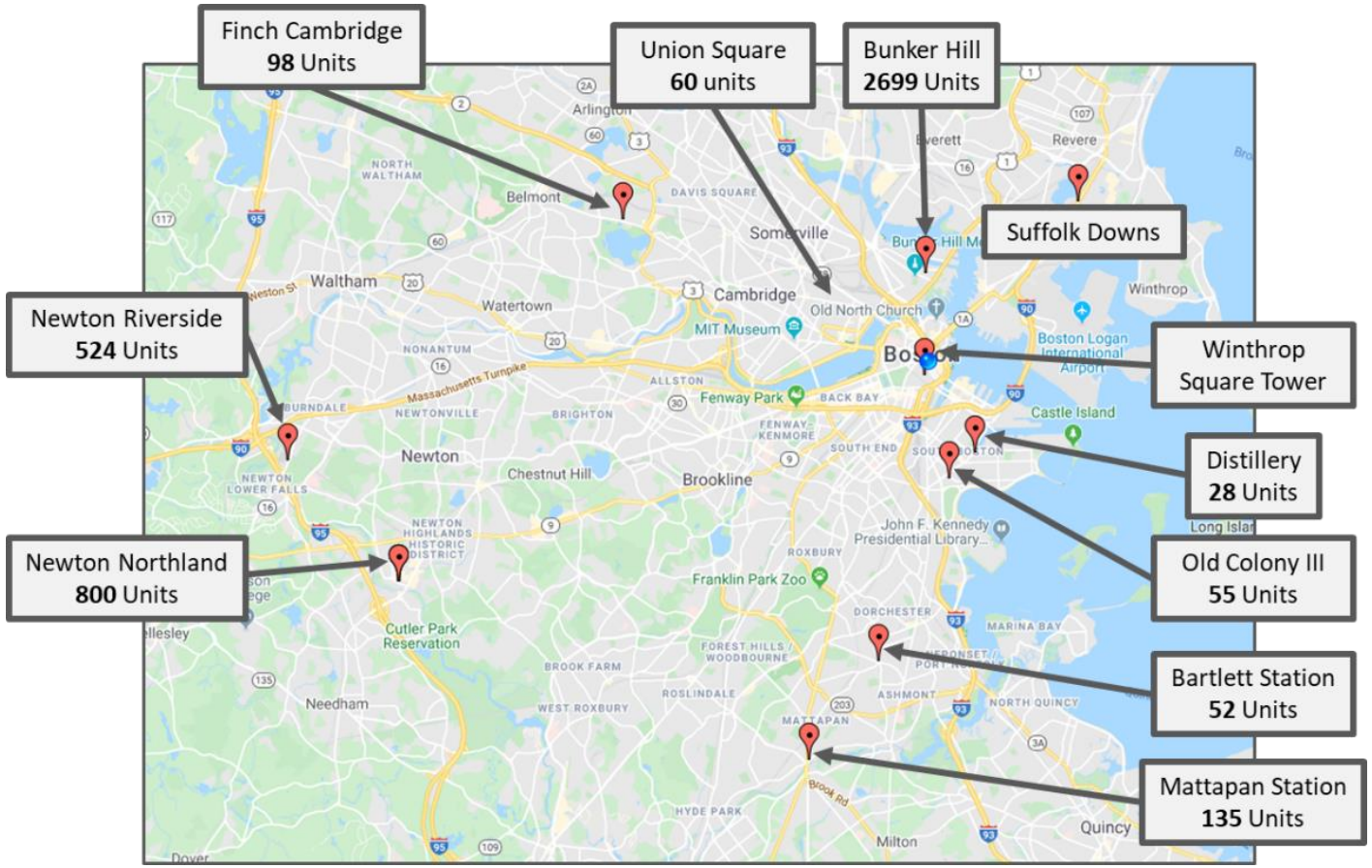
The Distillery
Boston, MA

Bunker Hill
Boston, MA

Winthrop Center
Boston, MA

Finch Cambridge
Cambridge, MA

Mattapan Station
Boston, MA



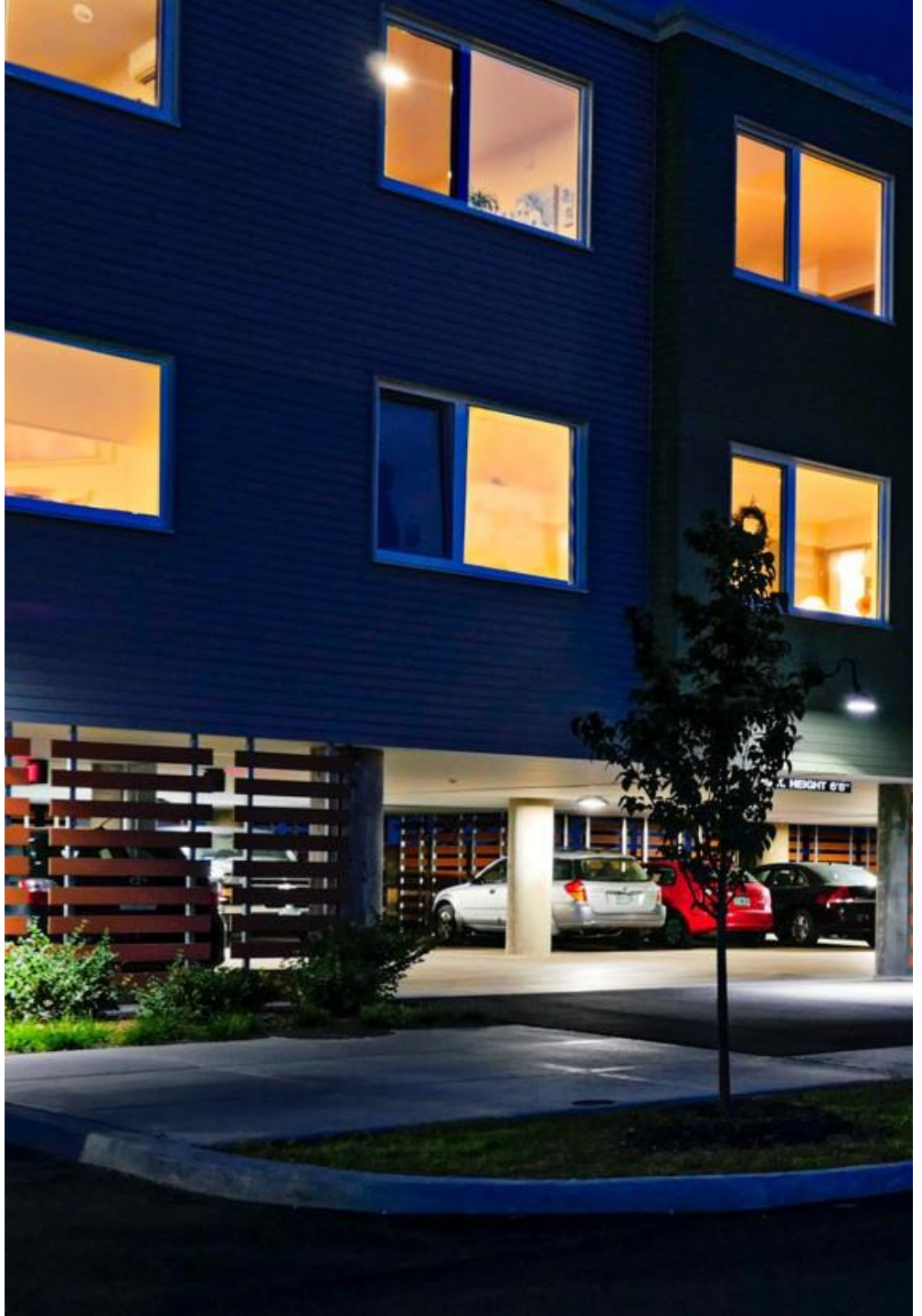
Project Examples (built)

ELM PLACE

Milton, VT

Completed: 2017
# of Units: 30
Total Floor Area: 27,690 s.f.
Architect: Duncan Wisniewski Architects
General Contractor: ReArch
CHPC: Chris West

Building Type: Affordable senior housing
Roof Insulation: R70. Spray foam + fiberglass
Wall Insulation: 2x6 stud wall with fiberglass + 4" exterior polyiso
Floor/Slab Insulation: Concrete over R40 foam
Doors/Windows: U-.128 Schuco uPVC tilt/turn
Heating/Cooling: Mitsubishi Hyper Heat
Ventilation: Daikin ERU Renuwaire HE 1.5X
Renewable Energy: 15kW PV
EUI: 20.2 kBTU/sf/yr
Special Features: Parking under livingspaces



VILLAGE CENTRE

Brewer, ME

Completed: 2016
# of Units: 48
Total Floor Area: 51,778 s.f.
Architect: CWS Architects
General Contractor: Wright-Ryan Construction
CHPC: Colin Schless
PH Consultant: Thornton Tomasetti

Building Type: Affordable housing
Roof Insulation: Polyisocyanurate foam (R-57)
Wall Insulation: 2x6 wood stud wall + 2x4 metal stud wall with spray cellulose (R-40)
Floor/Slab Insulation: 4" XPS under slab (R-20)
Doors/Windows: Unilux triple pane, U-0.18
Heating/Cooling: Electric baseboard (6 ft per unit), Natural gas boiler
Ventilation: Renewaire ERV (3:1)
Renewable Energy: Rooftop PV

GILFORD VILLAGE KNOLLS III

Gilford, NH

Completed: 2018
# of Units: 24
Total Floor Area: 20,571 s.f.
Developer: Laconia Area Community Land Trust
Architect: Stewart Associates Architects LLC
General Contractor: Martini Northern
CHPC: Michael Hindle, Mike Duclos
PH Consultant: GDS Associates

Building Type: Affordable senior housing
Roof Insulation: R-75
Wall Insulation: 2x8 with blown in fiberglass
Floor/Slab Insulation: 6" EPS
Doors/Windows: Yaro Economy
Heating/Cooling: Mitsubishi Mr. Slim 8:1
Ventilation:
Renewable Energy: 104.92-kilowatt rooftop solar array

BEACH GREEN NORTH

Far Rockaway, NY

Completed: 2017
# of Units: 101
Total Floor Area: 93,894 s.f.
Architect: Curtis + Ginsberg Architects LLP
General Contractor: The Bluestone Organization
CHPC: Lisa White
PH Consultants: De Nardis Engineering, LLC, Tectonic, GDSNY

Building Type: Affordable housing
Roof Insulation: Concrete + polyiso (R-40) **Wall Insulation:** ICF construction (R-24) **Floor/Slab Insulation:** Mineralwool + concrete (R-28)
Doors/Windows: Rehau 4500
Heating/Cooling: LG VRF
Ventilation: RenewAire EV90
Renewable Energy: 129.5 kW PV, 10 kW microturbine

DISTILLERY NORTH

South Boston, MA

Completed: 2017
# of Units: 28
Total Floor Area: 27,840 s.f.
Developer: Second Street Associates, LLC
Architect: ICON Architecture
General Contractor: Commodore Builders
CHPC: Mark Anstey

Building Type: Market-rate housing
Roof Insulation: Open web truss with cellulose + 2" EPS
Wall Insulation: 2x8" cellulose with 3" rockwool exterior insulation (R-37)
Floor/Slab Insulation:
Doors/Windows: R-7 triple paned, tilt turn
Heating/Cooling: Mitsubishi air source heat pumps in each unit; natural gas hot water
Ventilation: HRV 95% efficient
Renewable Energy: PV, near net zero
Special Features: LEED-H Midrise Platinum, Public café, a street-level commercial space, interior parking with EV charging stations

BAYSIDE ANCHOR

Portland, ME

Completed: 2017
# of Units: 45
Total Floor Area: 38,500 s.f.
Developer: Portland Housing Authority/Avesta Housing
Architect: Kaplan Thompson Architects
General Contractor: Wright-Ryan Construction
CHPC: Jesse Thompson

Building Type: Affordable + Market-Rate Housing
Roof Insulation: Polyiso (R-50)
Wall Insulation: Double stud wall with dense pack cellulose (R-34)
Floor/Slab Insulation: 3" EPS (R-16)
Doors/Windows: R-5, triple glazed
Heating/Cooling: Electric resistance baseboard
Ventilation: Renewaire 450 ERV ECM
Renewable Energy: 50 kW PV array
Special Features: Storm water collection, Community garden

TRACY COMMUNITY HOUSING

Lebanon, NH

Completed: TBD- Summer 2019
# of Units: 29
Total Floor Area: 27,000 s.f.
Developer: Twin Pines Housing
Architect: Maclay Architects
General Contractor: Estes &Gallup
CHPC: Chris West, Eco Houses of VT

Building Type: Affordable housing
Roof Insulation: R-60 11" polyiso
Wall Insulation: R-38 2x6 cellulose + 4" polyiso
Floor/Slab Insulation: R-20 5" rigid foam
Doors/Windows: U-0.22, (R-4.5) SHGC 0.41
Heating/Cooling: Mitsubishi air source heat pumps, electric hot water
Ventilation: Rooftop Daikin DPS007A
Renewable Energy: 180 kW PV
Special Features: Net zero