



Pushing the (Energy Code) Envelope in New York

Leveraging deep efficiency to unlock building decarbonization

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Agenda

1. New York State energy goals overview
2. Carbon Neutral Buildings Roadmap
3. Electrification of thermal loads and the case of deep efficiency
4. Codes and Stretch Code



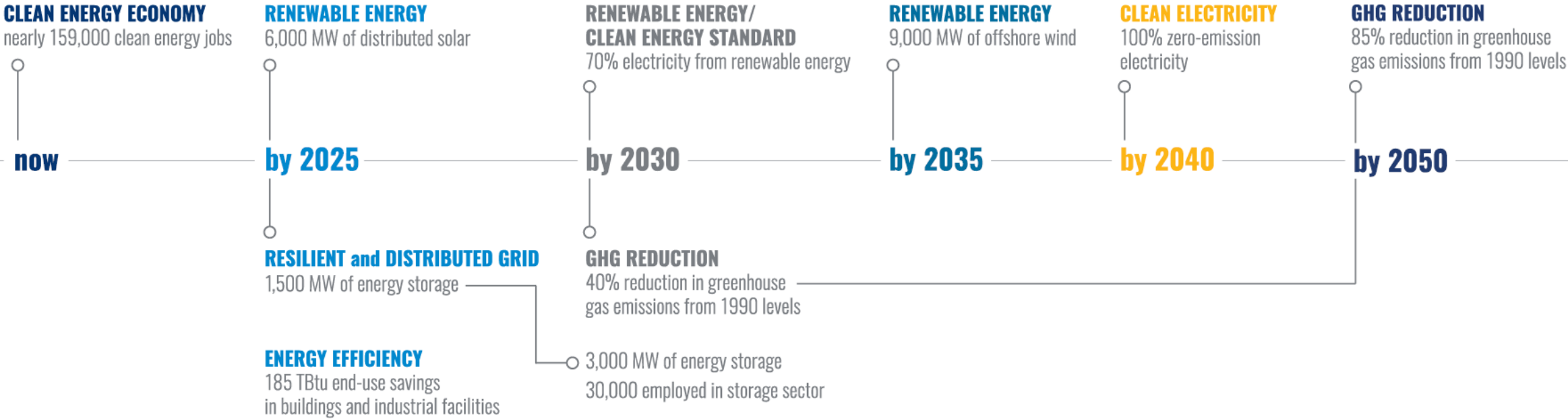
Climate Leadership and Community Protection Act

- Committed to the most aggressive clean energy and climate agenda in the country
- Climate Leadership and Community Protection Act (Climate Act) goals empower every New Yorker to fight climate change at home, at work, and in their communities
- Climate Act goals look to reduce carbon emissions by 85% by 2050 across sectors.
- Buildings contribute ~30% of total direct carbon emissions.



Clean Energy/Carbon Reduction Targets

New York State Clean Energy Goals



2022 State of the State Climate Agenda (buildings)

- 2 million climate friendly homes
 - Commits to 1 million efficient and electric homes and 1 million electrification-ready homes by 2030 (Action plan in 2022)
- Building Codes Legislation
 - Zero on-site GHG emissions for new construction no later than 2027
- Appliance Standards and Benchmarking
 - Upgrades New York's appliance efficiency standards
 - Mandates energy benchmarking for large buildings



Climate Neutral Buildings Roadmap Scope

- A common definition and understanding of carbon neutral buildings
- Studies to showcase construction practices and technologies useable today, and the potential for technology cost reductions
- Modeled solutions focused on building electrification and grid implications
- Explains the business case for carbon neutrality
- Recommends policy solutions to ratchet down emissions and reduce cost

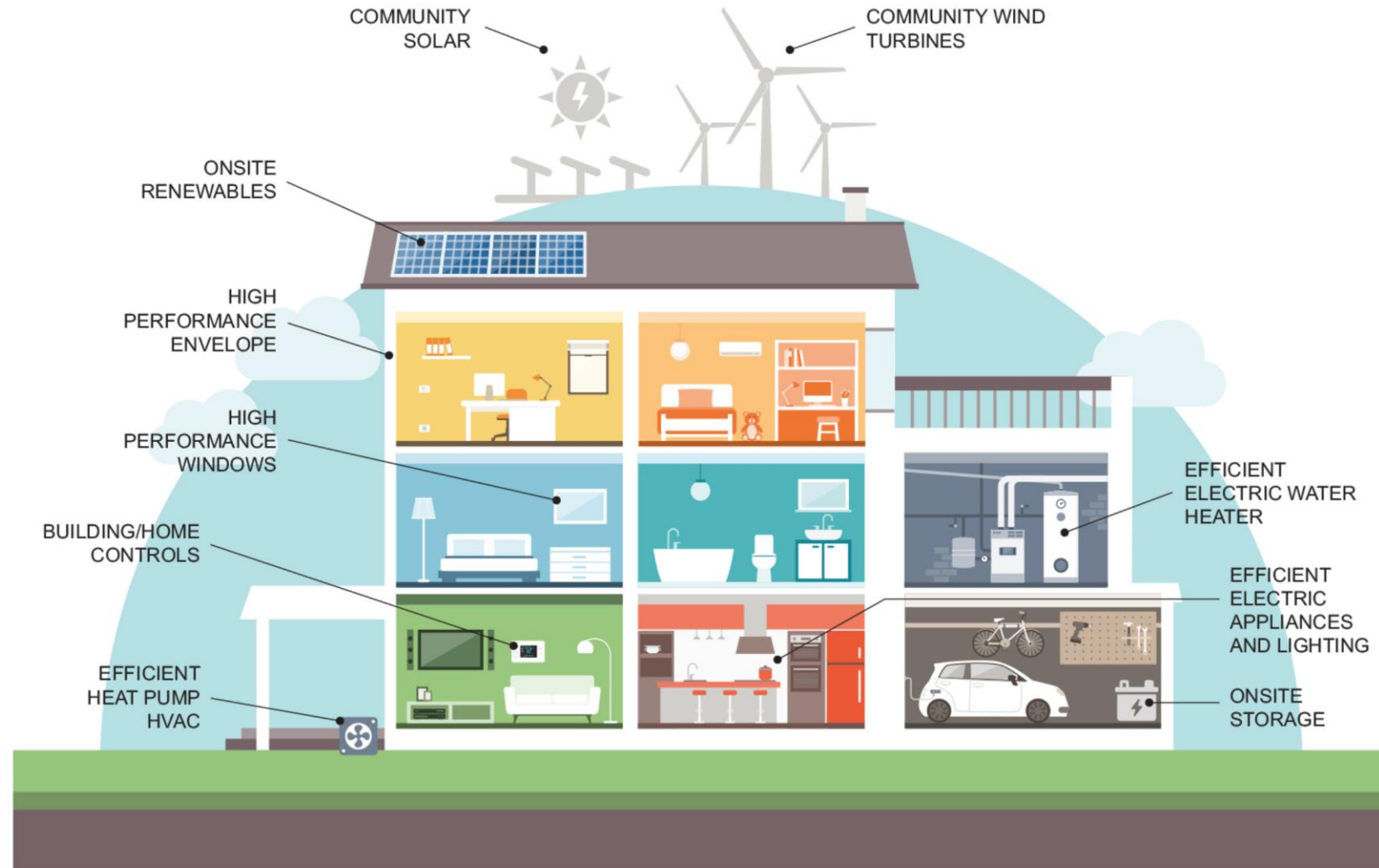


Working Definition

“A carbon neutral building is one where the design, construction, and operations do not contribute to emissions of greenhouse gases that cause climate change”

Attributes of a carbon neutral building

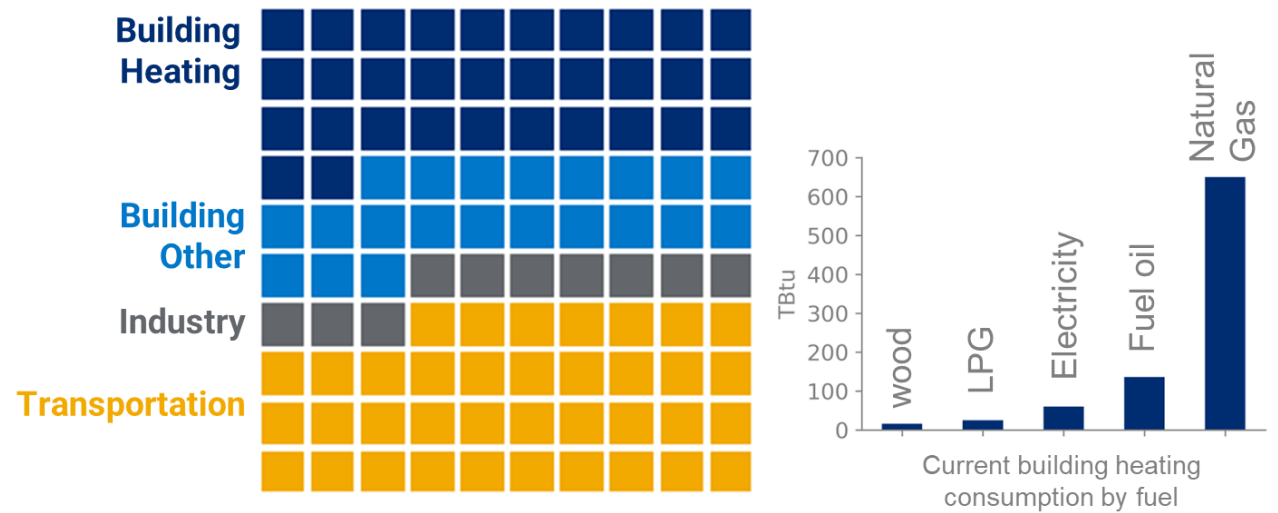
1. Maximizes energy efficiency
2. No fossil fuel combustion for building energy services (all-electric end uses)
3. Produces or procures zero-emission electricity
4. Designed with flexible loads and/or storage that can respond to grid conditions
5. Features resiliency measures that protect building occupants
6. Designed with attention to embodied carbon and refrigerants



Source: NYSERDA

Electrification of heating loads

- Building heating demands are the second largest source of energy consumption in NYS. Only the transportation sector uses more energy.
- Electrification is a core strategy to decarbonize building heating.



New York Final Energy Demands Today, total equals 2.7 quadrillion Btu.

Technology solutions for carbon neutrality

Load Reduction Strategies

- High-performance building envelopes
- Energy recovery ventilation to optimize heating/cooling demand
- LED lighting with occupancy controls
- Smart electric appliances, minimized embodied carbon in construction materials

Building Electrification

- Cold climate air-source heat pumps (ASHP) or ground-source heat pumps (GSHP) for space heating and cooling
- Carbon-free thermal loops in campuses
- Heat pump water heaters with storage tanks and demand-flexible controls
- Electric induction cooktops and heat pump dryers
- Up-to-date electrical capacity and service

Advanced Controls

- Load flexibility and advanced controls of hot water, HVAC, and smart appliances

Distributed Energy Resources

- Solar PV integrated with battery
- Bi-directional Electric Vehicle (EV) charging equipment
- Batteries and thermal storage

Priority technologies

Load Reduction Strategies

Air Sealing

High Performance Insulation

Thermal Breaks

High performance fenestration

Energy Recovery Ventilators

Prefabricated Panelized Solutions

Efficient Lighting

Smart Electric Appliances

Building Electrification Technologies

Heat Pumps (Air-Source Heat Pumps, Ground-Source Heat Pumps)

Variable Refrigerant Flow Systems

Heat Pump Water Heaters

Integrated Mechanical Solutions

Induction Cooktops

Advanced Controls

Smart Controls

Smart Devices and Sensors

Metering and Controls Best Practices

Distributed Energy Resources (DER)

Electrical Batteries

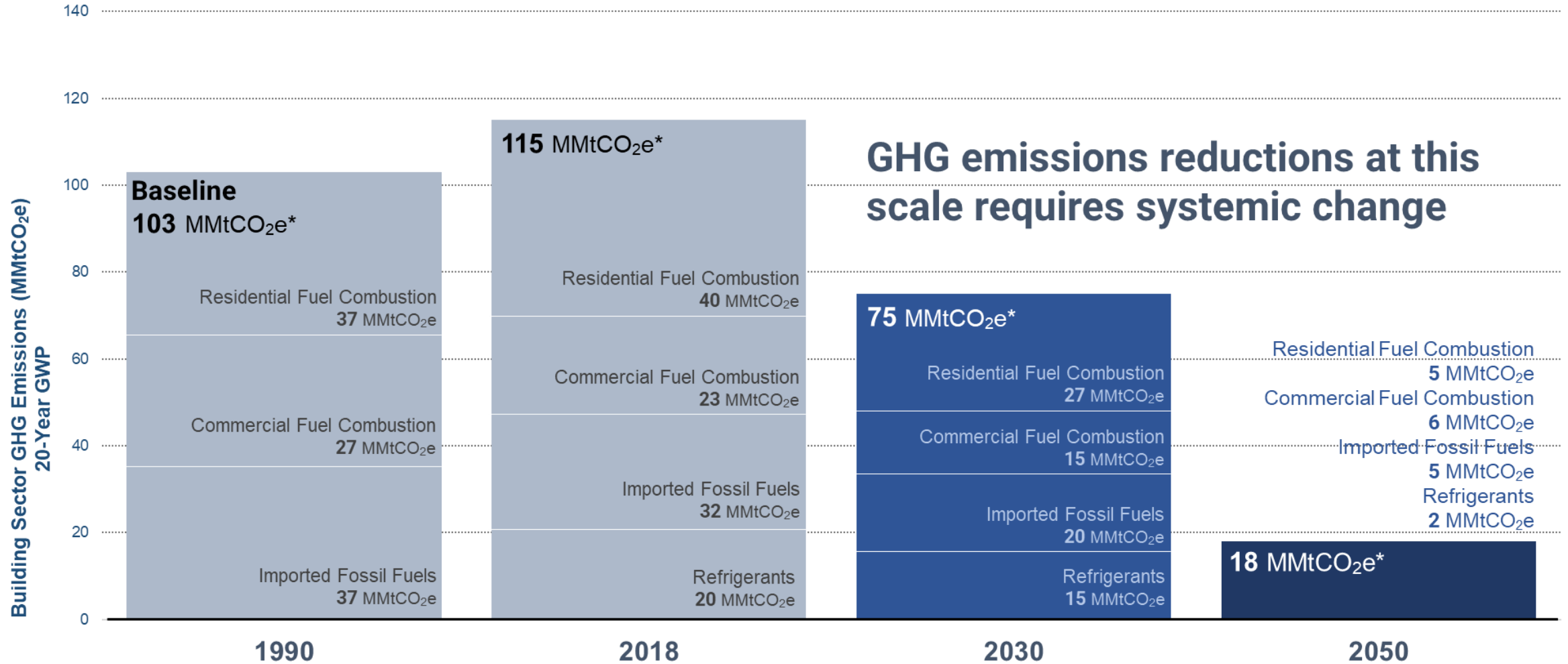
Thermal Storage

Photovoltaic Systems

Solar Thermal

Energy efficient lighting and energy-efficient appliances have a large amount of market share so while they are important for carbon neutrality, they will not be a major focus for RD&D.

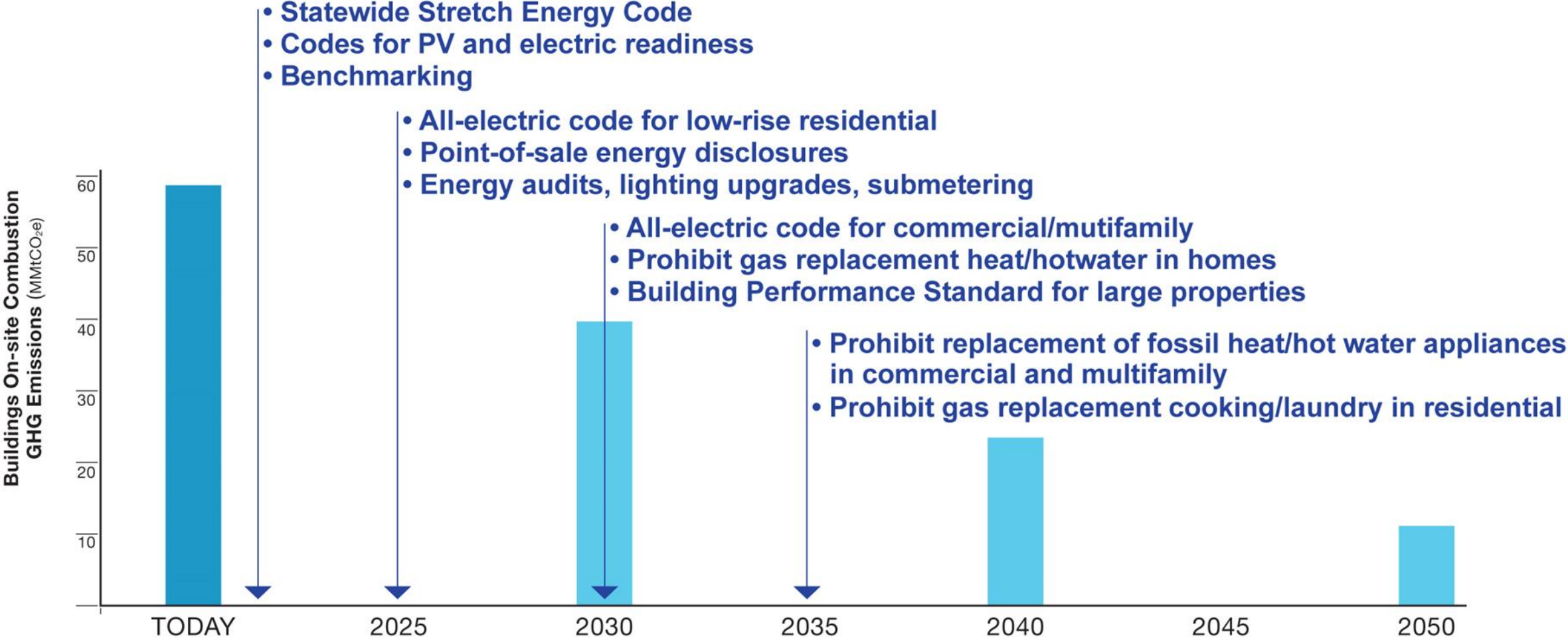
Putting it all together



* million metric tons carbon dioxide equivalent

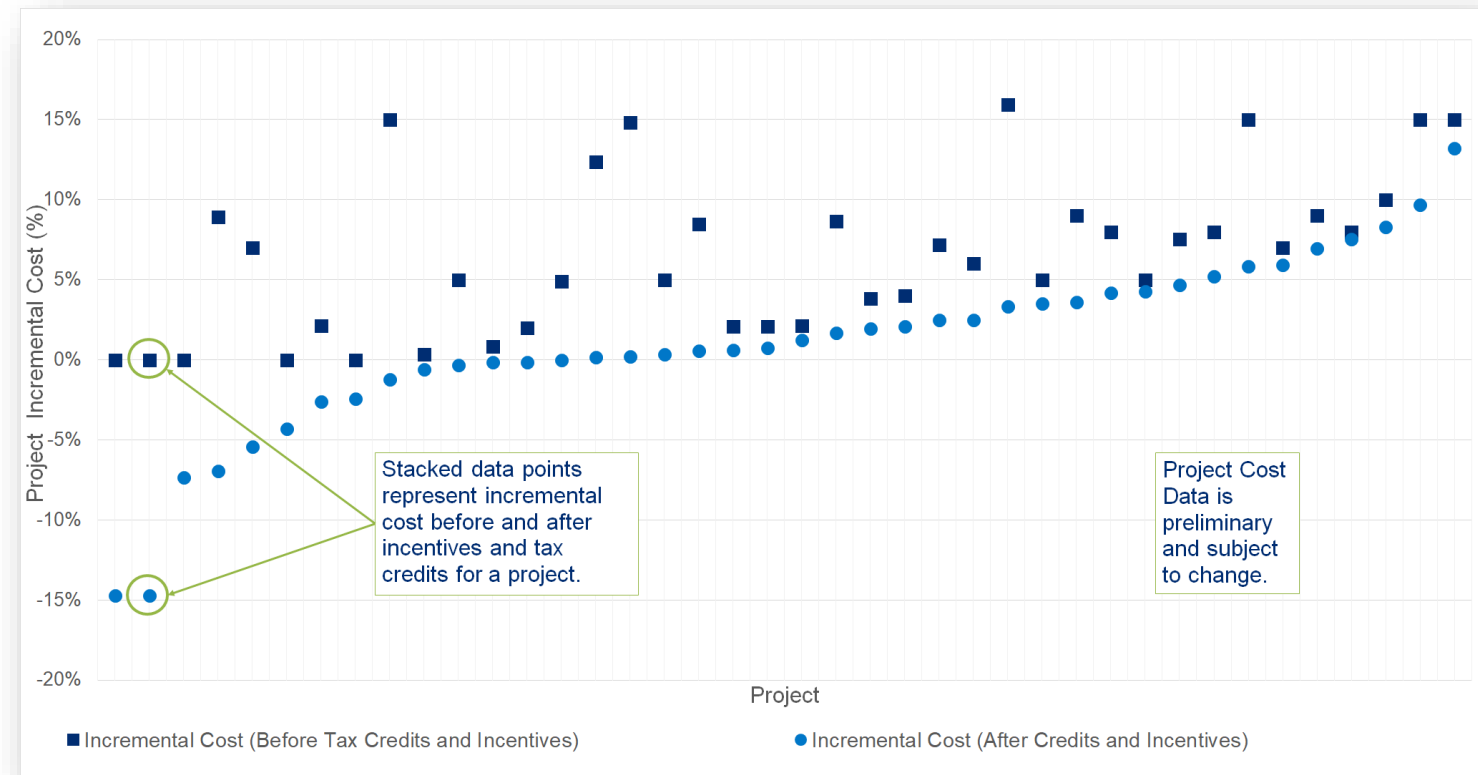
Draft values subject to public review process for annual emissions accounting

Codes and Policy adoption timeframe



What exists is possible – Buildings of Excellence

- Actual projects show design and construction teams are exceeding modeled and predicted results, with first cost premium after incentives and tax credits averaging 2%.
- Nearly half of which are PHIUS projects

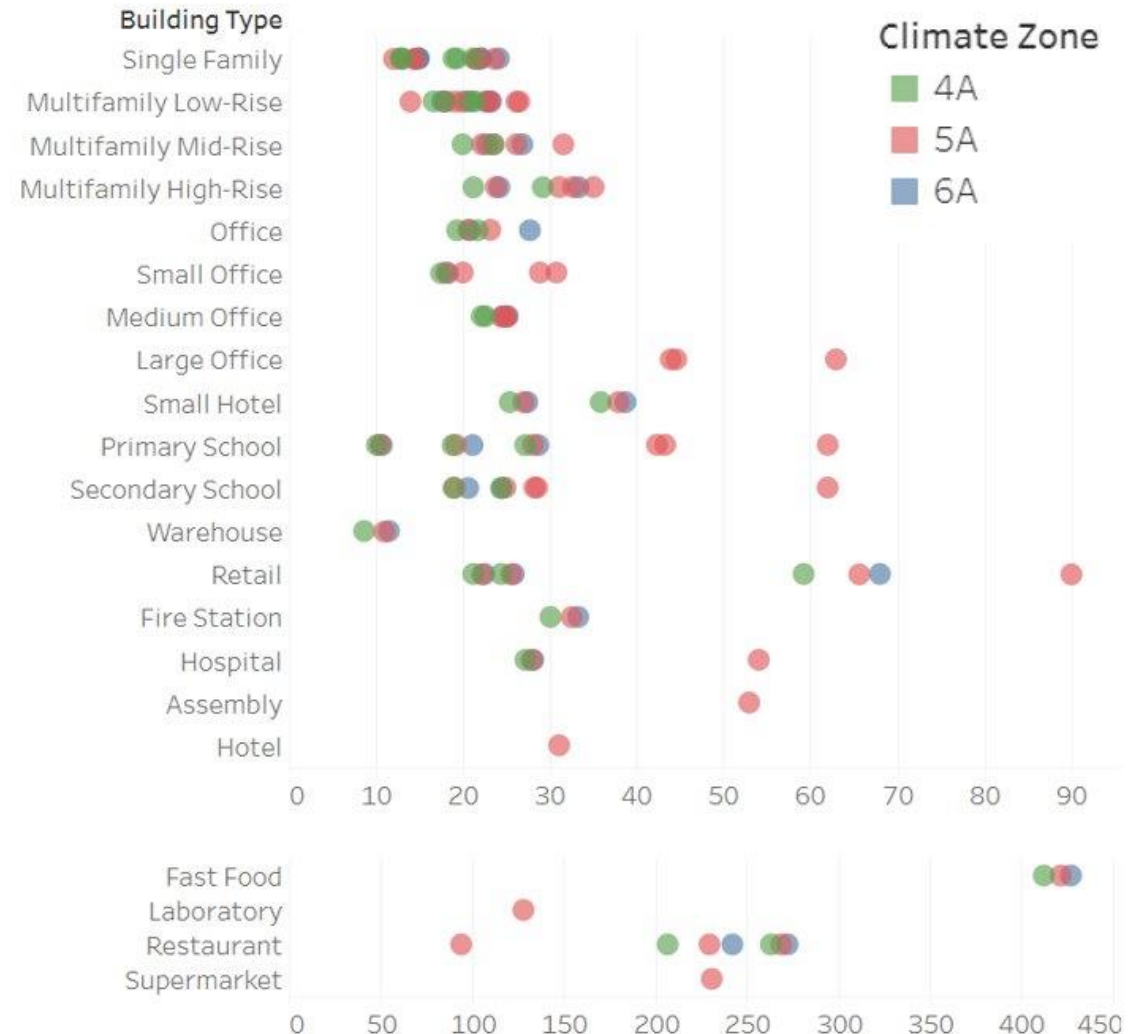


Advanced code: Target setting

Targets based on a variety of data source including:

- NY Roadmap Policy Cycle Charts (2021)
- AEDG Zero Energy (2019)
- Toronto Zero Emissions Buildings Framework Report (2017)
- NBI Zero Energy Ready Targets White Paper (2019)
- NREL Technical Feasibility Report for Schools (2016)
- ASHRAE 1651-RP, Max Tech Targets (2015)
- ARUP Technical Feasibility of Zero Net Energy Buildings in California (2012)
- Built to Perform: Pathway to Zero Carbon Ready Code (2018)
- **PNNL Passive House Modeling (PHIUS, 2019)**
- Washington State Commercial Energy Code Technical Roadmap Report (2020)
- **Massachusetts DOER Modeling Analysis (2021)**
- **Massachusetts DOER Modeling Analysis (2021)**
- **Based on measured and modeled ZE buildings (GTZ database)**
- Based on HERS dataset

Reference Zero Energy Ready and Passive House Site EUI Targets for New York State and Associated Climate Zones



Advanced code: Target setting

Building Type	2023 NYStretch (2004 interp.) Site EUI (kBtu/sf-yr)	Zero Energy Ready 4A Site EUI (kBtu/sf-yr)	Zero Energy Ready 5A Site EUI (kBtu/sf-yr)	Zero Energy Ready 6A Site EUI (kBtu/sf-yr)
High-Rise Apartment	37	27	29	32
Large Hotel	77	73	74	76
Large Office	50	31	38	32
Mid-Rise Apartment	32	25	27	29
Outpatient Healthcare	91	64	66	68
Secondary School	37	24	24	24
Stand-Alone Retail	41	28	29	32
Warehouse	14	9	10	12

Building Type	2023 NYStretch (All-Electric) Site EUI (kBtu/sf-yr)	Zero Energy Ready 4A Site EUI (kBtu/sf-yr)	Zero Energy Ready 5A Site EUI (kBtu/sf-yr)	Zero Energy Ready 6A Site EUI (kBtu/sf-yr)
Single Family	20.8	15	16	18
Multifamily Low-Rise	23.9	20	21	22

Advanced code: 2023 NYStretch update

- Thermal envelope prioritized
 - High efficiency wall assemblies
 - Thermal bridging addressed
 - Reduced infiltration
- Electrification incentivized
 - Heat pump baseline
 - No additional efficiency credits for gas HVAC and hot water heating equipment
- Electric readiness for most other applications of gas equipment



Passive House Compliance in NYStretch 2023

- Commercial: Multifamily projects 7 stories and above that achieve PHI/PHIUS certification don't have to comply with the additional energy efficiency credit requirements
- Residential: Projects that achieve PHI/PHIUS certification don't have to comply with additional efficiency requirement of R407.1




*Cooper Park Commons – Building 2
Imagery Credit: Architecture Outfit and Magnusson
Architecture and Planning*

If upstate can do it....


Forbes



REAL ESTATE




Upstate New York Becoming Bastion Of Passive House Design


Jeffrey Steele Contributor 

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River Architects-designed Seminary Hills Cidery, one of the Passive House designs on display in ... [\[+\]](#) © BRAD



IDEAs Z2 Design Facility, San Jose (Credit: David Wakely)

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Thanks?

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