Energy Efficiency & Housing Advisory Panel

October 16, 2020

Meeting 3

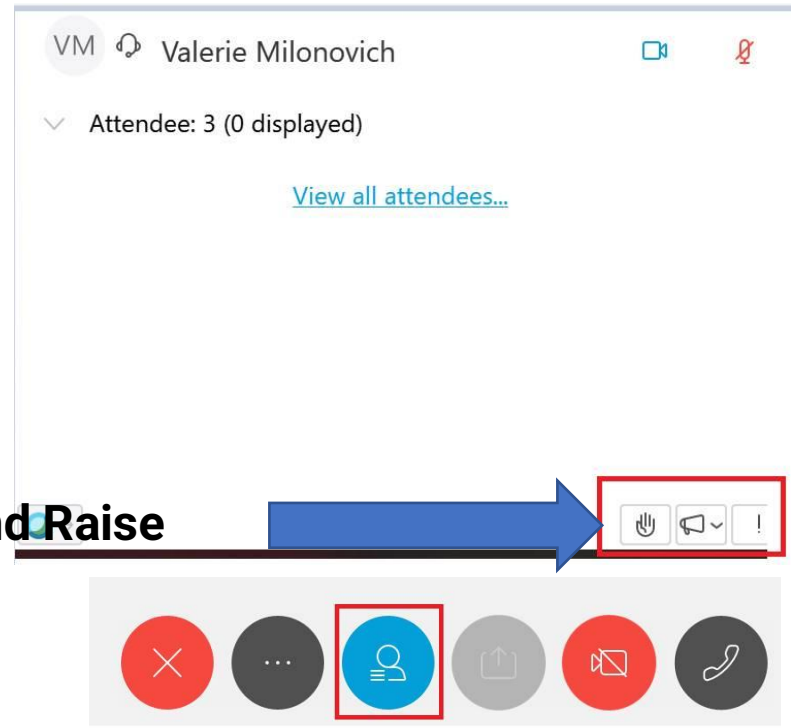
NEW YORK STATE OF OPPORTUNITY. | Climate Action Council

Meeting Procedures

Before beginning, a few reminders to ensure a smooth discussion:

- Panel members should be on mute if not speaking.
  - If using phone for audio, please tap the phone mute button.
  - If using computer for audio, please click the mute button on the computer screen (1st visual).
- Video is encouraged for Panel members, in particular when speaking.
- In the event of a question or comment, please use the hand raise function (2nd visual). You can get to the hand raise button by clicking the participant panel button (3rd visual). The chair will call on members individually, at which time please unmute.
- If technical problems arise, please contact Toyce.Francis@nyshcr.org or Giovanni.Possumato@its.ny.gov

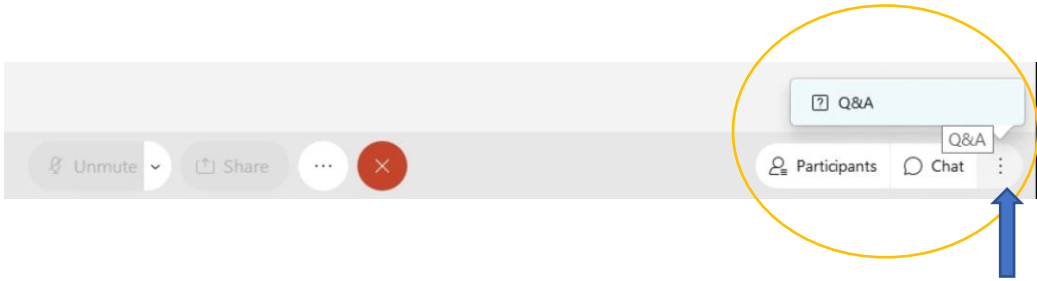
You'll see when your microphone is muted



Procedure for Public Input

The Advisory Panel welcomes public comments and questions both during and in between its meetings

> To submit feedback to Panel Members and agency staff during the meeting, members of the public can use the WebEx Q&A function located in the right bottom corner.
  - Comments and questions submitted through WebEx will be aggregated and submitted to panel members to be included in deliberations.



> To submit feedback between Advisory Panel meetings, please email eehpanel@nyserda.ny.gov

Meeting Objective and Agenda

Objective: Align on refined scope and advance the work of the EE&H Panel.

Agenda:

- Welcome and Objectives (3:00 to 3:05 PM)
- CAC and Panel Feedback Incorporated into the Work Plan (3:05 – 3:20 PM)
  - CAC Recap from October 8th meeting
  - Feedback incorporated into scope (edits shown in red on slides 7-8)
  - Guidance on Panel recommendations to the CAC
- Subgroup Report Outs: (3:20 – 4:20 PM)
  - Residential, Single Family (3:20 – 3:30)
  - Residential, Multifamily (3:30 – 3:40)
  - Commercial and Institutional (3:40 – 3:50)
  - Discussion of cross-cutting themes, input, advancing the work (3:50 – 4:20)
- Carbon Neutral Buildings Roadmap Presentation (4:20 – 4:50 PM)
- Next Steps (4:50 – 5:00 PM)

CAC and Panel Feedback Incorporated into the Work Plan

CAC October 8th Meeting Highlights

All Advisory Panels presented their scope and work plans to the Council

> CAC feedback for EE&H:

- Pay attention to cost implications for homeowners and businesses
- Examine changes in codes and standards to reduce GHG emissions (i.e., more broadly than efficiency)
- Push for high efficiency in all new construction; consider banning fossil fuels for heating in new construction and eliminating subsidies for new gas connections
- Cross-panel attention is needed to address mitigation of methane leakage in the gas system

Resources

> The Department of Public Service and the New York ISO presented to the CAC. These presentations are available on the Meetings and Materials page of climate.ny.gov as potential background resources for this Panel to consider:

- NYS Electric System Presentation (DPS)
- Planning for a Grid Transition Presentation (NYISO)

EE&H Advisory Panel Scope

The Panel will focus on inducing the investments in buildings that are needed to help achieve the CLCPA statewide emissions reductions targets, across the below three pillars of deep decarbonization in buildings. The Panel will develop buildings sector-focused recommendations for emission-reducing policies and actions to achieve approximately 31-39%* emission reduction in buildings by 2030 (and 85-93%* emission reduction by 2050), from 2016 levels. (*subject to refinement under new CLCPA accounting framework)

Energy Efficiency and Conservation	+ Building Electrification and Low Carbon Fuels	+ Decarbonizing Electricity Supply
• **High adoption rates of efficient building shell and weatherization measures** • **Behavioral conservation, operations and maintenance (O&M), and smart devices**	• **Electrification of space heating (e.g., cold climate air source heat pumps, ground source heat pumps)** • **Electrification of domestic hot water** • Cross-panel work on Bioenergy	• **Flexible building loads improves grid management** • **Site-based solar PV** • Cross-panel work with Power Generation, as zero-emissions electricity reduces indirect emissions of electrified heat and hot water
• **Codes and standards to reduce GHG emissions** • Cross-panel work on codes		
Cross-cutting consideration of embodied carbon and climate adaptation and resilience		

EE&H Advisory Panel Scope (cont'd)

The Panel will work to define the priority policies to induce investments in building efficiency and electrification at scale and present a list of recommendations for policies, programs, or actions, for consideration by the Climate Action Council for inclusion in the Scoping Plan. Recommendations will:

- Address policies to advance low-carbon new construction and retrofits for single family housing, multifamily housing and commercial and institutional buildings, as well as key enabling policies such as workforce development and affordability
  - Identify & mitigate implementation challenges for owners and building operators, including costs/benefits
  - Identify & mitigate any potential negative impacts on tenants and disadvantaged communities, with attention to affordability
  - Identify both energy and non-energy benefits including health, comfort, and productivity
- Identify measures to make low-carbon projects cheaper and cost competitive
- Quantitatively or qualitatively assess the number of buildings impacted by building type and associated emissions reduction, public health benefits, economic benefits, and known implementation costs
- Describe the implementation strategy, with attention to feasibility, commercial availability, and equity
- Address methods and metrics for evaluating building performance
- Reflect external input as well as collaboration with: Power Generation, Land Use and Local Government, Agriculture/Forestry, Just Transition Working Group, Climate Justice Working Group and EJ Advisory Group

Guidance on Advisory Panel Recommendations to the CAC

Advisory Panel Recommendations Guidance

Scope

- **Mitigation strategies:** actions that directly reduce emissions and contribute to the achievement of the greenhouse gas emission limits

- **Enabling initiatives:** actions without direct emissions benefit that enable/magnify the mitigation strategies, enhance climate justice and/or just transition, or that create sequestration or removals needed to achieve net zero
  - Examples of such initiatives include outreach, education, and awareness; capacity building; workforce development; and research and development

- **Adaptation and resilience strategies:** actions to protect communities from the adverse effects of climate change

Advisory Panel Recommendations Guidance

Parameters

- Recommendations can be policies, regulations, incentives, new programs, modifications to existing programs, planning or research and development activities.
- All recommendations must consider measures to reduce emissions of GHGs and other pollutants in disadvantaged communities as well as comply with the CLCPA mandate of no less than 35% overall benefits of clean energy investments to disadvantaged communities
- Recommendations may be informed by quantitative analysis or qualitative assessments
  - *Estimated scale of GHG emissions reductions*
  - *To the extent feasible, knowable range of policy and resource costs*
  - *Our Work Plan suggests that other benefits/impacts (e.g., health, comfort/productivity) will be characterized more qualitatively as "high/medium/low" impact*
- Recommendations will include actionable steps for implementation
- Cross-sector recommendations will be advanced only after consultation with the appropriate Panels

Subgroup Meeting Report Outs

Residential (1-4 Units) Sector Overview

1. Action Items

- Identify relevant research, case studies, expert consultation that can inform recommendations and analysis
- Advance development of recommendations specific to single family housing
- Prioritize mitigation strategies and detailed actions for CAC consideration and CJWG review

2. What is Residential?

- Diversity in Building Stock Typology
  - Building ownership structure
  - Market rate v.s. Affordable housing
- Existing market systems processes
  - Economic
  - Supply and distribution
  - Housing (historical impact – redlining, flood zones, etc.)
- Timeline
  - What can we gather in the exiting timeline to get to goal

Resi. (1-4 Units) Sector Overview

3. Questions in sessions

- Who leads market on Theory (Policy) and Practice?
  - How can we create a dynamic flow between ideas & action from industry leaders
- How can CLCPA prioritize recommendations that supports existing ecosystems
- How are we mindful of the relationship of built environment with financing, contracting, and other subsectors that influences the residential decision-making process

Resi. (1-4 Units) Sector Overview

Sector Profile:

- Units: 5.1M total
  - ~2M LMI units
- Age:
  - 40% built before 1950
  - 36% built between 1951 and 1980
  - 24% built after 1980
- Energy Consumption:
  - 592 TBtu of energy consumption annually (22% of NYS total)

Sector Energy-Use Profile:

- Nearly 70% of homes built prior to 1970
- 65% heat with natural gas, 23% with oil or propane
- 48% use furnaces, 43% use boilers
- 90% use air conditioning
- 11% have smart thermostats
- At least 22% have under-insulated exterior walls & roof
- Average air leakage is 12 ACH50 (Passive House standard requires 0.6 ACH50 max)

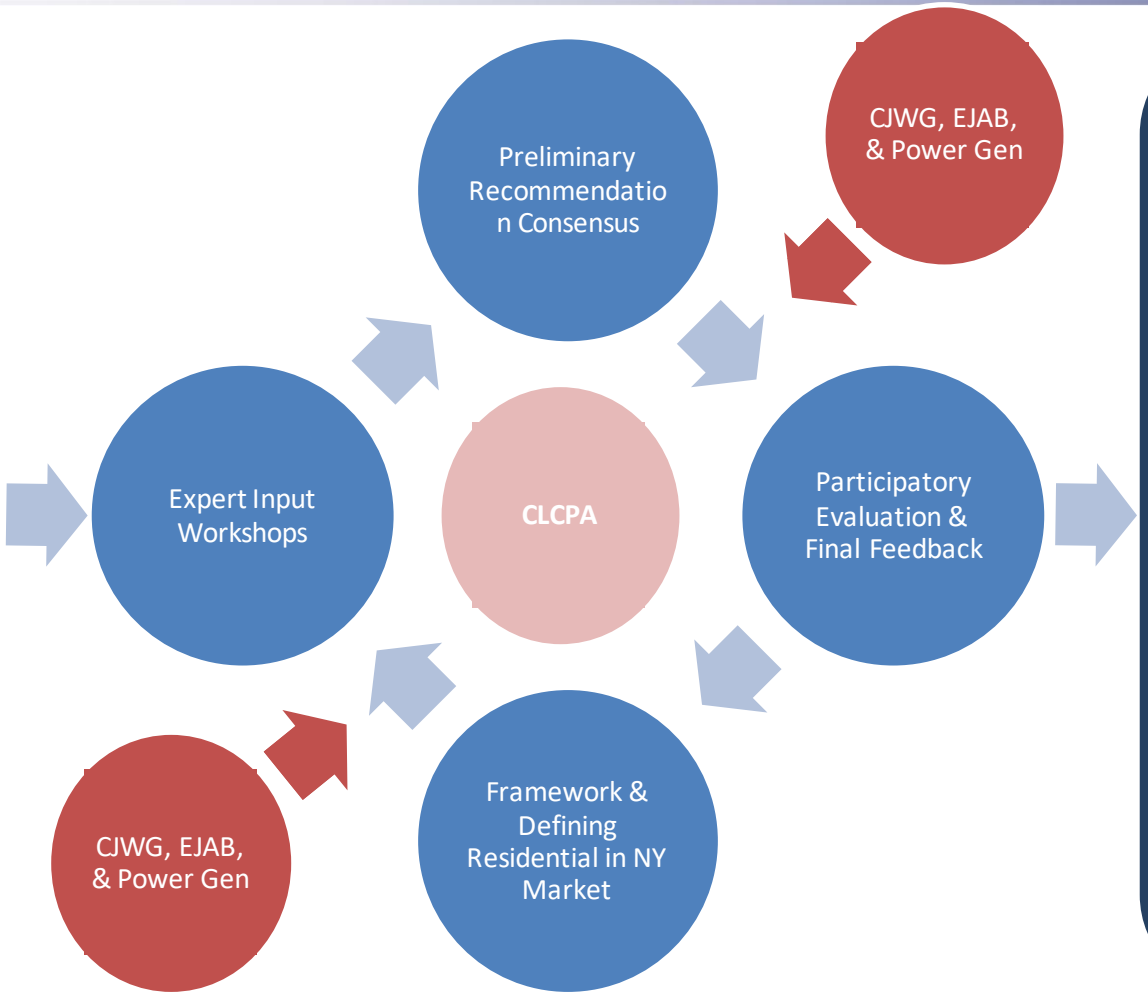
Sources: NYSERDA's Residential Baseline Study (2015), LMI Census Population Analysis tool (2017), and Residential Building Stock Assessment and Potential Study (2019)

Resi. (1-4 Units) Creative Problem Solving through Policy x Practice

Organizations to participate in Workshops

1. Housing (non-energy)
2. Contractors (non-energy)
3. Contractors (energy)
4. Energy & Environmental Justice Organizations (advocacy)
5. Health*

Email for additional info: EEHPanel@nyserda.ny.gov



Resi Sub Com. Goals

1. Gather input from Council
2. Assess and finalize mitigation strategies and detailed actions
3. Finalize recommendations to advance to CAC
4. Complete recommendations template for each

Resi. (1-4 Units) Barriers & Foundational Resources

Barriers

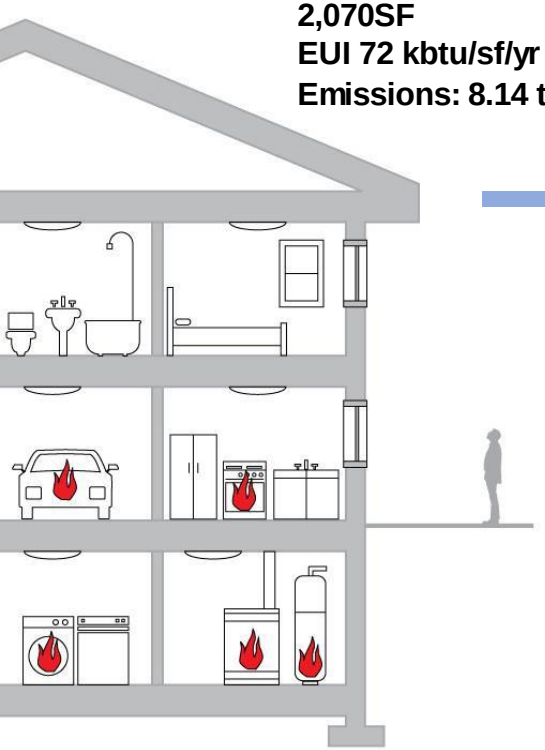
- Ensuring solutions for diverse ownership structures, building typology
- Energy code definitions of resi
- Split incentive
- Market fragmentation (Energy vs.. Housing vs.. Real Estate)
- Distribution & supply chain
- Universal awareness/consciousness not standard
- Lack of market signals
- Upfront cost
- Historical importance of market (Redlining, climate disaster)

Foundational Resources

- Expert townhall sessions
- Carbon-Neutral Roadmap
- New Efficiency New York
- NYSERDA HVAC Rountables
- NYSERDA Residential Building Stock Assessment Summary
- More, email: EEHPanel@nyserda.ny.gov

Preliminary mitigation suggestions provided to team

Existing home
1950-1980 vintage
2,070SF
EUI 72 kbtu/sf/yr
Emissions: 8.14 tCO_2e/yr



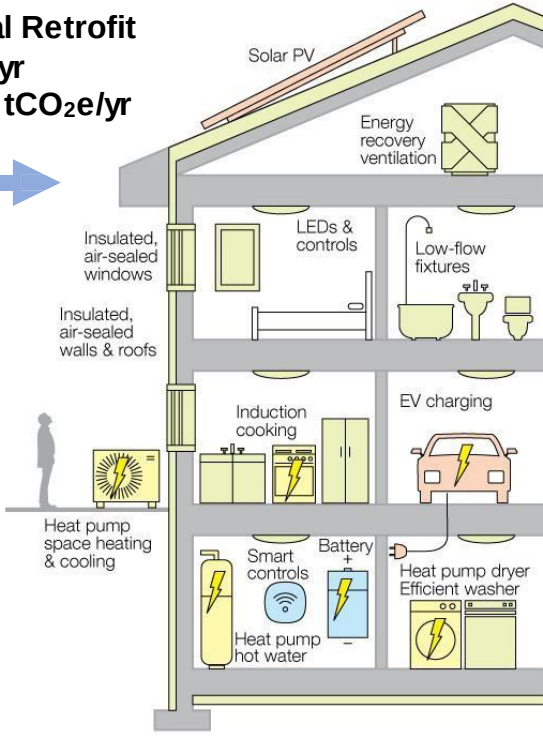
1. Energy Efficiency (Load Reduction)
- High-performance building envelopes
- Energy recovery ventilation
- Heating distribution
- LED lighting with occupancy controls
- Smart electric appliances, low-flow plumbing fixtures

2. Building Electrification
- ASHP (or GSHP) space heating
- Heat pump water heaters with storage tanks
- Electric induction cooktops and heat pump dryers

3. Advanced Controls
- Load flexibility and advanced grid-interactive controls

Distributed Energy Resources
- Solar PV integrated with battery
- EV charging
- Batteries and thermal storage

New Construction & Carbon Neutral Retrofit
EUI 38 kbtu/sf/yr
Emissions: 0.0 tCO_2e/yr



Residential: Multi Family

State of the Sector: Barriers and Challenges

- Housing Stock Physical Conditions and Variety of Building Types and their Geographies across the State
  - History of deferred maintenance; Building code enforcement, History of "replacing with same" systems
- Sources of Funding & Financing Incentives
- Supplier / Contractor / Occupant Awareness
  - Investor confidence and market signals; Outreach on conservation best practice
  - Educating trades around requirements and mandates
- Scale of need
  - Quantifying cost per unit; Disruption to tenants
  - Making the case that scale drives down cost but education and money are needed to get to scale

Mitigation Strategies

- Building Electrification – creating a common practice that all can adhere to
- Infrastructure Advancement – strong messaging about a cleaner grid in the future
- Messaging to Industry / Market Signaling / Public Awareness Campaign

Residential: Multi Family

Work Organization

> Address building typologies that fall under “multifamily”
> Affordable vs Market Rate Considerations – Scale should not be on the back of affordable housing
> New Construction vs Retrofit of Existing Buildings
> Cross-panel Collaboration

Outside Engagement

> NYSAFAH and other Property Owner and Management Trade Organizations
> Housing and environmental justice groups
> Building owners and Contractor/Builder Trade Groups
> Building Science Corporation
> NYCHA Representative
> Lois Arena and Marc Zuluaga, Steven Winter Assoc.
> William B Rose, University of Illinois – Buildings Research Institute

Residential: Multi Family

Foundational Resources

- The Economics of Biophilia. Terrapin Bright Green.
- Embodied Carbon in Construction Calculator (EC3) Tool
- Living Building Challenge. International Living Future Institute.
- Enterprise Green Communities Criteria (2020)
- Enterprise Strategies for Multifamily Building Resilience
- NYSERDA Carbon Neutral Buildings Roadmap
- NYC Climate Resiliency Design Guidelines
- EPA Energy Star Standards
- LEED Standards
- Passive House Standards
- DOE Standards

Commercial and Institutional

Foundational Resources

- Data on buildings by use, size, age, location
- Data on buildings by energy consumption and GHG emissions
- State of the market and current applicable codes
- Projections of where the market needs to go
- State of the technology
- State of the grid and NYISO markets

Additional Analysis & Cross-Collaborations

- Investment timing and planning
- Bringing technologies into the market
- Façade improvement impacts
- Costs!!!!!!!
- Risks (quantifiable)
- Power Supply Panel cross-engagement
- Land Use/Local Gov't cross-engagement
- Just Transition cross-engagement

Commercial and Institutional

Level-set on Barriers

- High capital costs with low energy-cost ROI
- Consideration of cost of inaction
- Feasibility constraints in retrofits (e.g. space availability, tenants)
- Technology not ready when reinvestments are incurred
- Lack of information
- Staff/O&M not properly trained

High-Potential Mitigation Strategies

- Proper subsidies to initiate early adopters
- Value the non-energy benefits
- Continuous commissioning
- Improve quality control
- Data availability in real time
- Training and education/workforce development
- Better enforcement of codes
- Strong signal to the market of phase-out of fossil fuel heat

C&I Subgroup Agenda for Future Work

Oct. 22	Oct. 29	Nov. 5	Nov. 12	Nov. 19	Nov26	Dec. 3	Dec. 10	Dec17
Electrification of heating & hot water Related grid impacts	Forecasts for the grid Forecasts for low-carbon fuels	Flexible loads, batteries, thermal storage, DERs, RTEM & grid management	Behavioral conservation, O&M Training and workforce development	Impacts of building shell retrofits and weatherization measures	HOLIDAY	Energy efficiency codes Emissions-based codes	Policies to recommend	…

Experts/Analysis: CNBR

Experts/Analysis: E3 and NYISO

Experts/Analysis: TBD

Experts/Analysis: TBD

Experts/Analysis: TBD

X-Collaboration: Summary items for Power Generation Panel

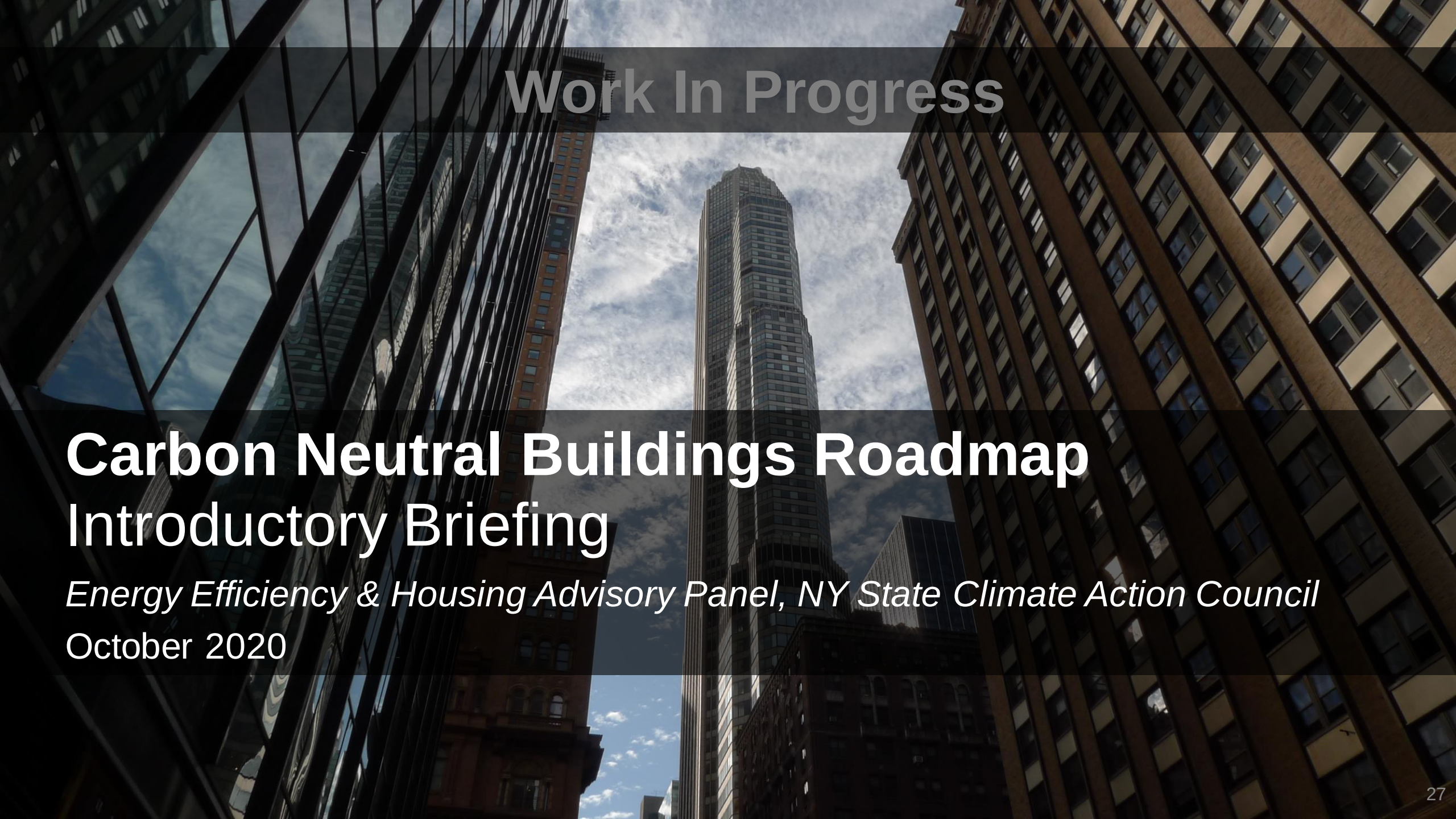
X-Collaboration: Summary items for Just Transition Panel

X-Collaboration: Summary items for Land Use/Local Govt Panel

Subgroup - Crosscutting themes discussion

Notes

Carbon Neutral Buildings Roadmap



Work In Progress

Carbon Neutral Buildings Roadmap

Introductory Briefing

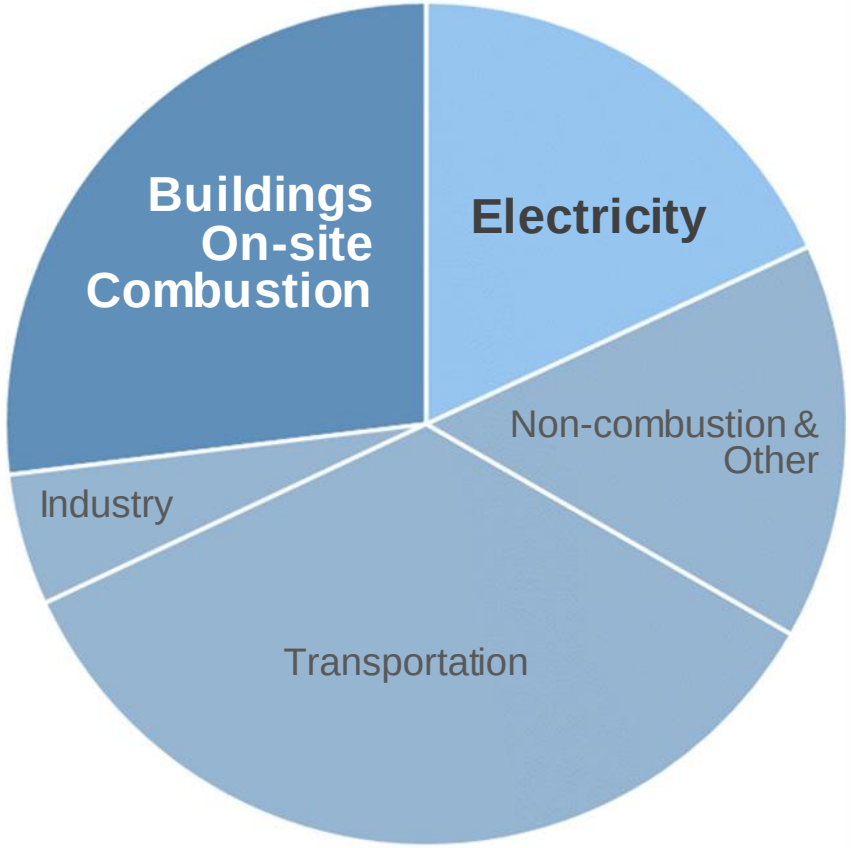
Energy Efficiency & Housing Advisory Panel, NY State Climate Action Council

October 2020

CLCPA & BUILDINGS

Buildings' electricity use & on-site fossil fuel combustion represent 40%+ of NYS GHG emissions

- **Buildings are a key driver of fossil fuel consumption**
  - CLCPA goals unattainable if the existing thermal load of buildings remains unchanged
  - Unmanaged electrification risks a substantially higher winter peak over the current grid peak
    - Solutions: efficiency, on-site renewables, storage/load flexibility
- **Electrification & decarbonization provide co-benefits:**
  - Health & safety (improved indoor air quality)
  - Increased productivity
  - Comfort
  - Aesthetics
  - Lower maintenance costs and improved operating income
- **Decarbonization projects lead to jobs, innovation, and economic development**
- **Climate Justice, resiliency, & clean energy affordability are critical**



NYS Economy-wide emissions today

BUILDINGS ROADMAPS

CARBON NEUTRAL BUILDINGS ROADMAP	BUILDING ELECTRIFICATION ROADMAP
Scope: A living strategy document that provides a suite of policy options & paths to achieve a carbon neutral building stock in NYS by 2050 ▪ Action plan for technical & market decarbonization for the 4 focus typologies over the next 5-10 years	**Scope:** 10-year strategy outlining market development milestones, public policies, and investments
Technology Focus: Range of high-performance technologies for electrification of thermal loads, thermal performance of building envelopes, grid interactivity, energy storage, and on-site clean energy generation	**Technology Focus:** Heat pumps for electrifying space and water heating in buildings, with some attention to advanced controls and cooking/dryers
Release: Coordinated release expected in 2021	
Target Audience: Climate Action Council (CAC) and other state/local gov't agencies; clean energy program administrators (NYS utilities, NYSERDA); other policy audiences and entities essential to market transformation; and market actors including manufacturers, distributors, trade associations / labor unions	

COMPONENTS OF THE ROADMAP

METHODOLOGY

Market Capability Assessment

- Energy/Emissions Modeling by typology: measures, measure packages, cost, payback
- Modeling future Cost & Adoption trajectories for key technologies
- Grid impacts study builds on E3's Pathways analysis
- Learnings from NYSERDA program initiatives
- Outreach to industry actors, researchers, and program admins & policymakers elsewhere

Stakeholder Engagement

Policy Impact Analysis (underway)

CARBON NEUTRAL BUILDINGS ROADMAP RESEARCH SCOPE

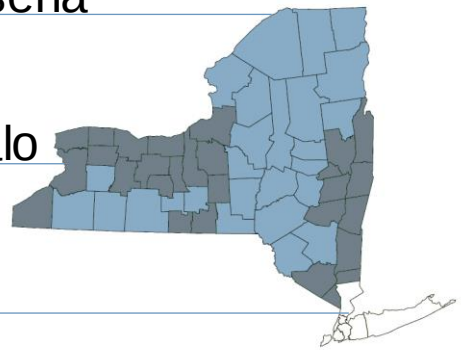
3 VINTAGES studied

- Pre-1980
- Post-1980
- New Construction

Across New York State

3 CLIMATE ZONES

- CZ 6A – Massena
- CZ 5A – Buffalo
- CZ 4A – NYC



New Construction & Retrofit

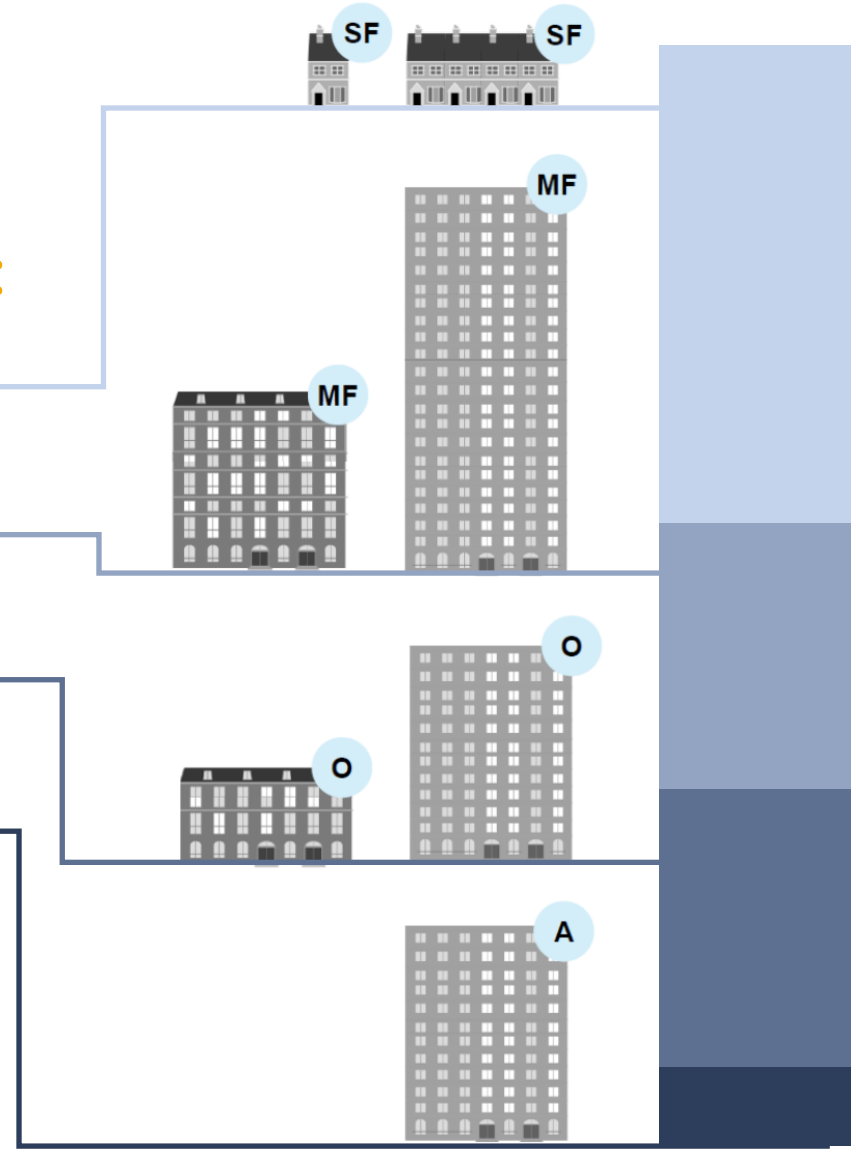
Typologies examined:

Single Family & 2-4 Family

Multifamily low- & mid-rise

Office low- & mid-rise

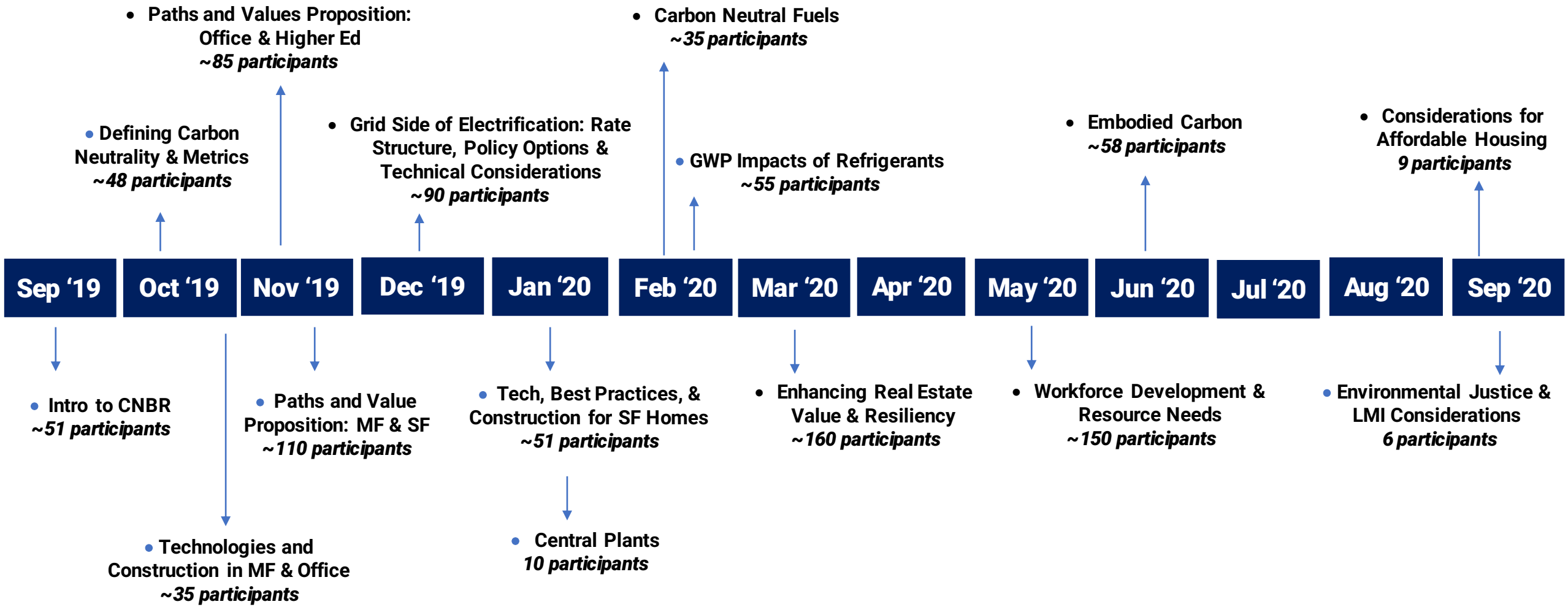
Higher Education



PRELIMINARY FINDINGS: INDUSTRY OUTREACH

- Local Law 97 (NYC) has caught the attention of manufacturers
- Manufacturers cited strong, phased policies as the most effective way to increase adoption of high-performance products
- All-electric systems are still in the very early stages of adoption
- Cost compression potential varies widely by technology

ROADMAP STAKEHOLDER INPUT SESSIONS TO DATE



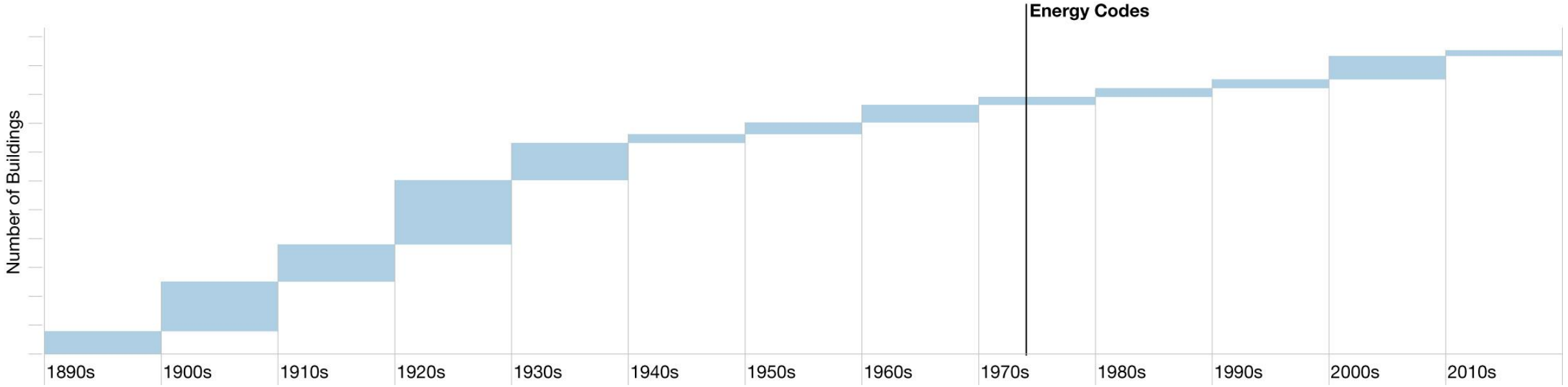
OUR BUILDINGS TODAY

70% of NYS buildings pre-date the first energy codes

- 5.8M existing dwelling units built before energy codes
- 80%+ of the building stock in 2050 is already built today.

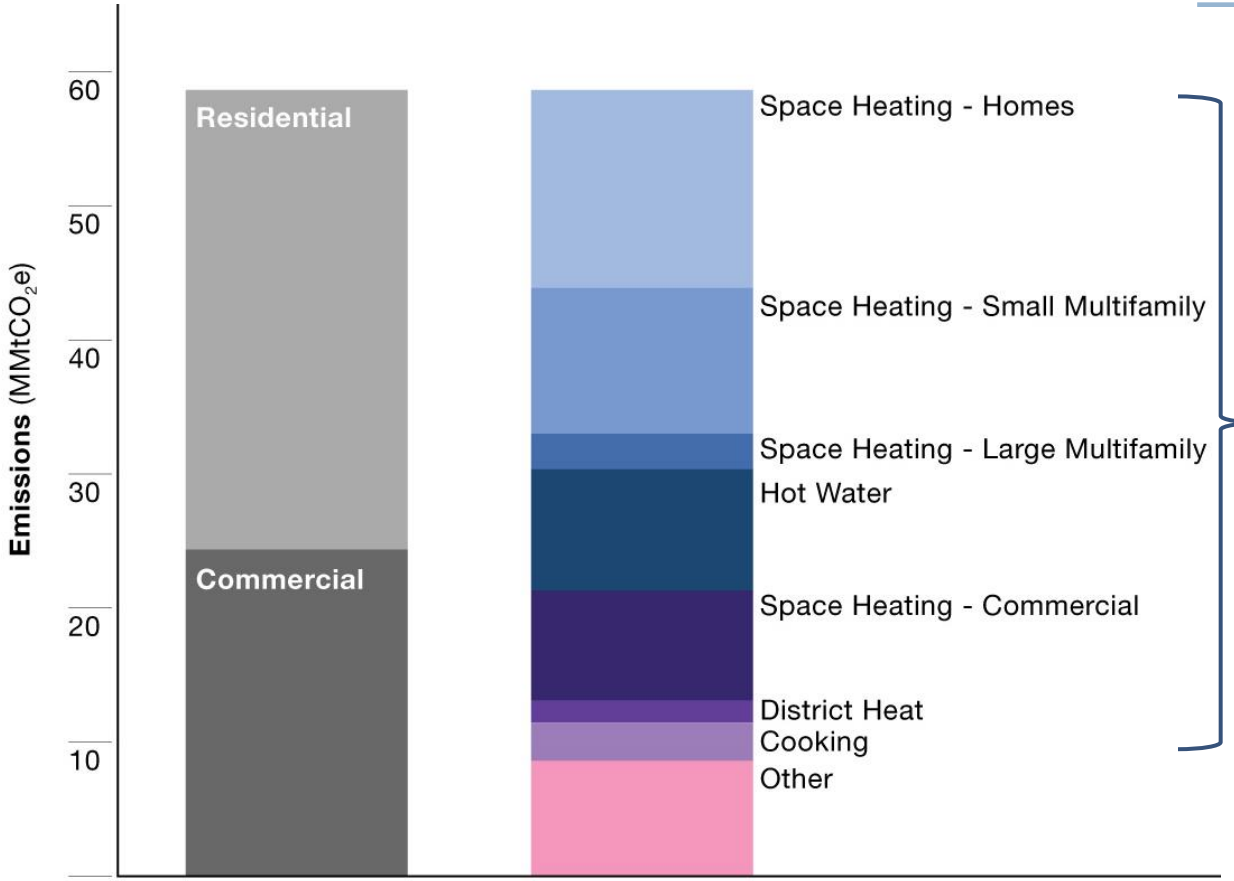
Retrofits are the biggest piece of the decarbonization challenge, with many older affordable housing units

Number of buildings constructed in New York State by decade:

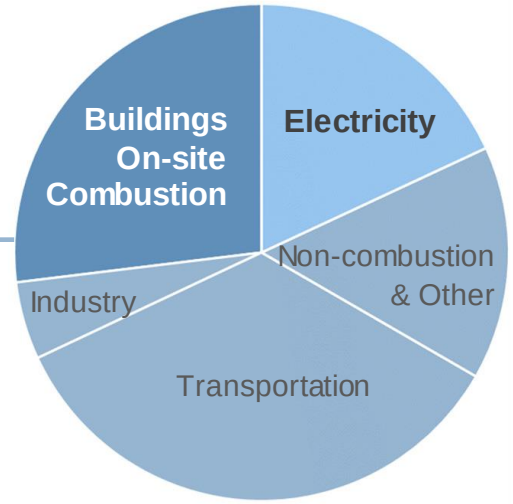


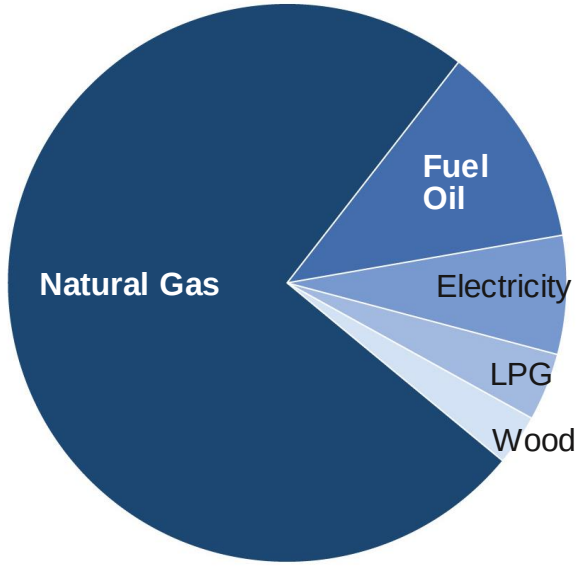
OUR BUILDINGS TODAY – E3 Pathways *Buildings* Sector

The E3 Pathways report attributes on-site fossil fuel combustion as *direct* emissions from the buildings sector and electricity as *indirect* emissions attributed to utility electricity generation.



Economy-wide emissions today





Direct emissions from buildings are dominated by fossil-fuel combustion (mostly gas) for space heating and hot water

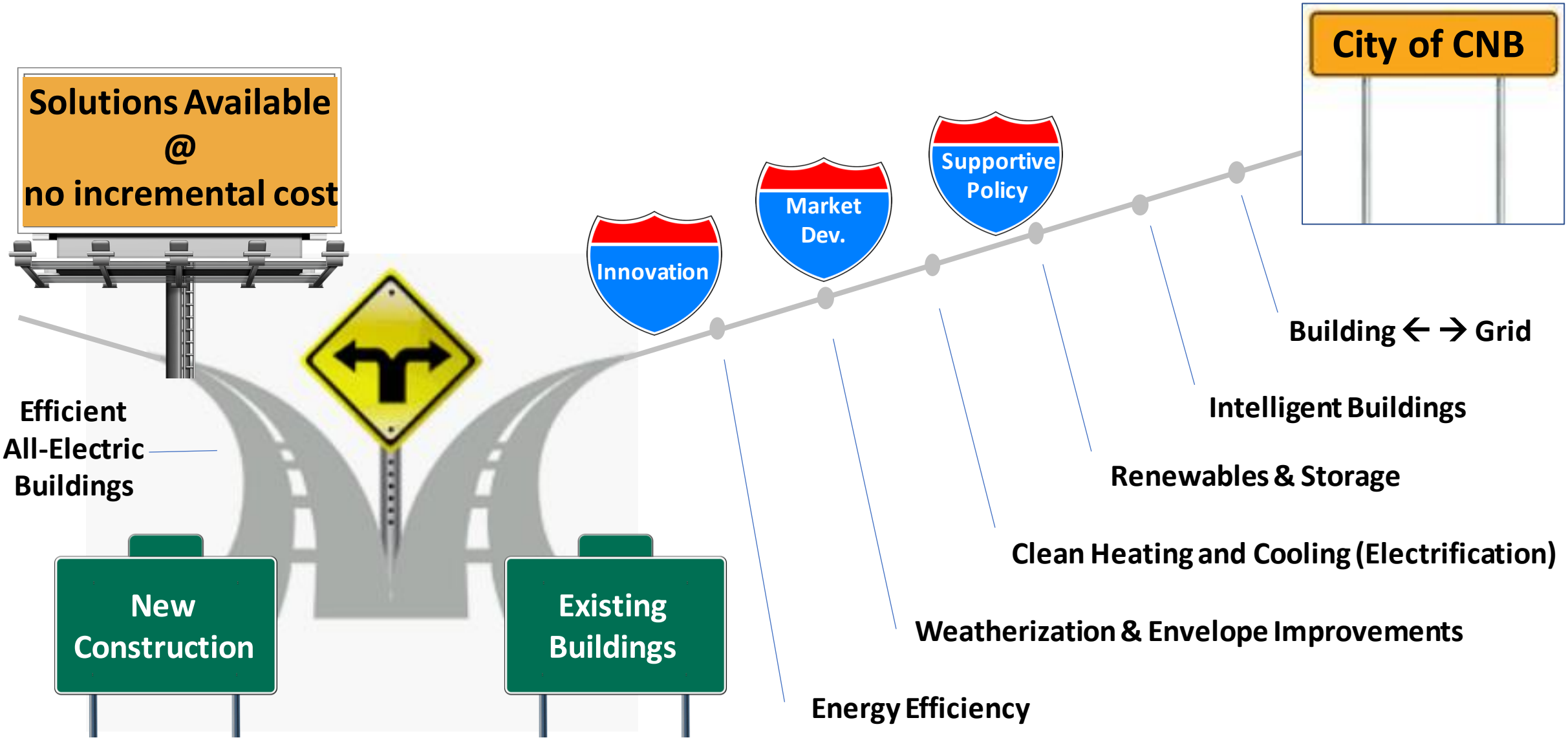
What is a Carbon Neutral Building?

- **Energy Efficient + High Performing Thermal Shell**
- **Building System Electrification + Clean Electricity**
  - 70% renewable grid by 2030; 100% clean by 2040
  - On-site Solar PV or other Distributed Energy Resources (DERs)
- **Load Management & Grid-Responsive**

CARBON NEUTRAL BUILDINGS - The General Solution Set

Energy Efficiency (Load Reduction)	▪ 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

HOW CLOSE ARE WE?



POLICY OPTIONS UNDER ANALYSIS

Accelerate the Market

- **Bringing Scale**
  - Community programs
  - State procurement influence
  - State lead by example
  - Incubator funding
  - Training and contractor support
- **Market Information**
  - Benchmarking/Home Energy Ratings
  - Labeling/ Disclosure
  - Embodied carbon disclosure
- **Financing, Incentives**
  - Energy Performance Contracts (EPCs)
  - Tariff-based Financing
  - Incentives for early adopters (phasing out over time) & LMI
  - Expanded Commercial Property-Assessed Clean Energy (PACE)
- **Utility Regulation**
  - Time of Use (TOU) Rates
  - Revise Depreciation/Address 100' Rule
  - Utilities bills paid by end-users

Clear Market Signal

- **Codes and Standards**
  - Net-zero code for new buildings
  - Advanced appliance standards
  - Grid Interactive Efficient Buildings (GEB) Standards
- **Mandates**
  - Required Retrofits at Point of Sale
  - Building Performance Standards
  - Preclude Fossil Fuel Appliance Replacements

Cross-cutting Attention to Supporting Building Decarbonization in Disadvantaged Communities

VALUING THE CO-BENEFITS OF BUILDING DECARBONIZATION

Health & Safety	• Decreased hospitalizations and healthcare costs from asthma and other respiratory illnesses triggered by mold, dust, and airborne pollutants. • Reduced energy burden lowers utility bill payment anxiety • Improved resiliency and protection of equipment and occupants
Increased Productivity	• Higher cognitive performance and test scores • Decreased illness-related absenteeism
Comfort	• Improved thermal comfort • Reduced noise infiltration from outdoors • Overall occupant satisfaction
Lower maintenance $ & increased operating income	• Decreased tenant turnover and higher rate of on-time rent payments • Fewer maintenance calls related to thermal discomfort • Increased longevity of components/systems • DERs lead to improved resiliency and reliability

NEXT STEPS

- Briefings & ongoing support to Energy Efficiency & Housing Advisory Panel and sub-working groups
- Support to Climate Action Council & other Advisory Panels as requested/needed
- Ongoing Research
- Public Engagement & Comment Period
- Plan for 2021 publication, implementation & outreach campaign

NYSERDA PROGRAMS DRIVING CARBON NEUTRALITY

- **Innovation Challenges**
  - NextGen HVAC: Cold Climate Heat Pumps, Thermal Storage, District Thermal, Low Global Warming Potential Refrigerants, integrated mechanical systems
  - Building Envelope Industrialization
  - Intelligent Buildings
- **Multifamily & Commercial Office Playbooks**
- **Buildings of Excellence**
- **NYS Clean Heat – Market Development Support for Building Electrification**
- **Workforce Development Initiative**
  - $175 million to meet emerging job demand including new 'Future of Work Centers' in underserved communities.

→ **Minimum 35% of NYSERDA Market Development program funding: LMI & Disadvantaged Communities**

Q+A

Next Steps

Next Steps

- Subgroups continue to meet to advance the work
- Panel meetings scheduled for remainder of 2020:
  - October 29, 1-3pm
  - November 18, 3-5pm
  - December 9, 3-5pm

- For awareness – CAC meetings scheduled for:
  - November 24, 2020
  - December 15, 2020
  - January 19, 2021
  - February 17, 2021
  - April 12, 2021