New York State
Climate Action Council

February 26, 2021

Meeting 8

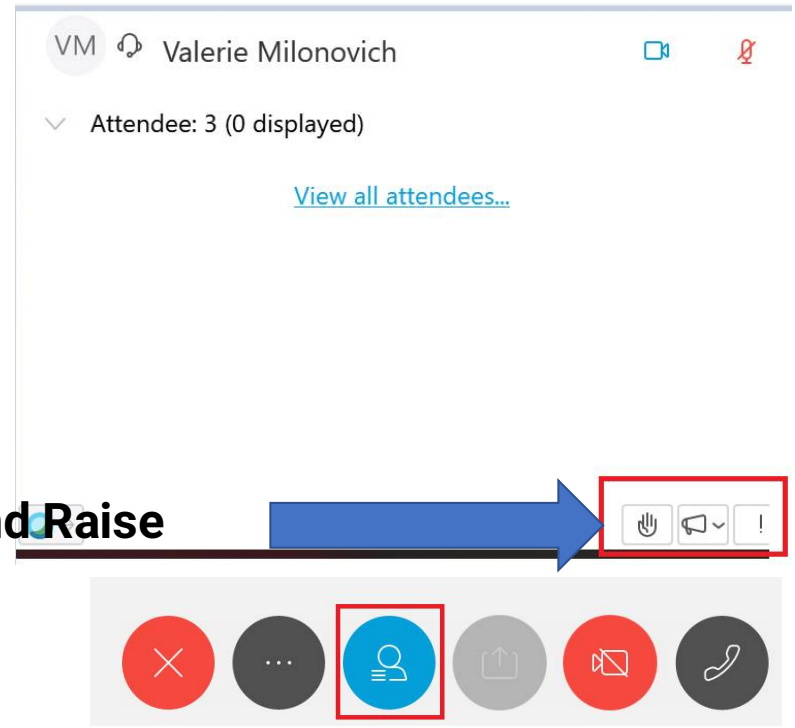
NEW YORK STATE OF OPPORTUNITY. | Climate Action Council

Meeting Procedures

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

- CAC 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 CAC members, in particular when speaking.
- In the event of a question or comment, please use the hand raise function (2nd visual). You can find the hand raise button by clicking the participant panel button (3rd visual). The co-chairs will call on members individually, at which time please unmute.
- If technical problems arise, please contact NYS.CAC@cadmusgroup.com.

You'll see when your microphone is muted



Agenda

- Welcome
- Consideration of January 19, 2021 Minutes
- Co-Chair Remarks and Reflections
- Electrification Presentation
- Discussion: Electrification
- Agency Updates
- Next Steps

Consideration of January 19, 2021 Minutes

Co-Chair Remarks and Reflections

$4 Million to Help NY Farms Address Climate Impacts

$4 million is being awarded through the Climate Resilient Farming Grant Program to help 80 farms across NY reduce emissions and prepare for climate-related extreme weather events.

- **Projects selected will reduce greenhouse gases by an estimated 90,000 metric tons of CO_2e per year (as much as eliminating nearly 20,000 cars from the road)**
- **County Soil and Water Conservation Districts were awarded the grants on behalf of farmers in one of the following project categories: agricultural waste storage cover and capture for methane reduction, on-farm water management, and soil health management systems**

Driving Community-Level Climate Action

NYPA Community Solar and Storage Program for Local Governments

> Assists local governments and state agencies in building at least 40 distributed solar systems, part of NYPA 2025 community solar target of 75 megawatts of renewable capacity that includes 15 megawatts of paired battery storage

Clean Energy Communities Leadership Round

> $17 million in funding and expanded high-impact actions, additional support for projects in disadvantaged communities

> Increases emissions reductions options for communities, provides access to additional grant opportunities

Community Heat Pump Systems Pilot Program

> Up to $15 million available through a new program to pilot the use of community thermal systems to reduce buildings' GHG emissions

> New Pilot Program will accept proposals to study, design and construct community thermal systems using heat pump technology & produce a best practices guidebook

New York Early Learnings from Texas

Planning Considerations

Grid Design

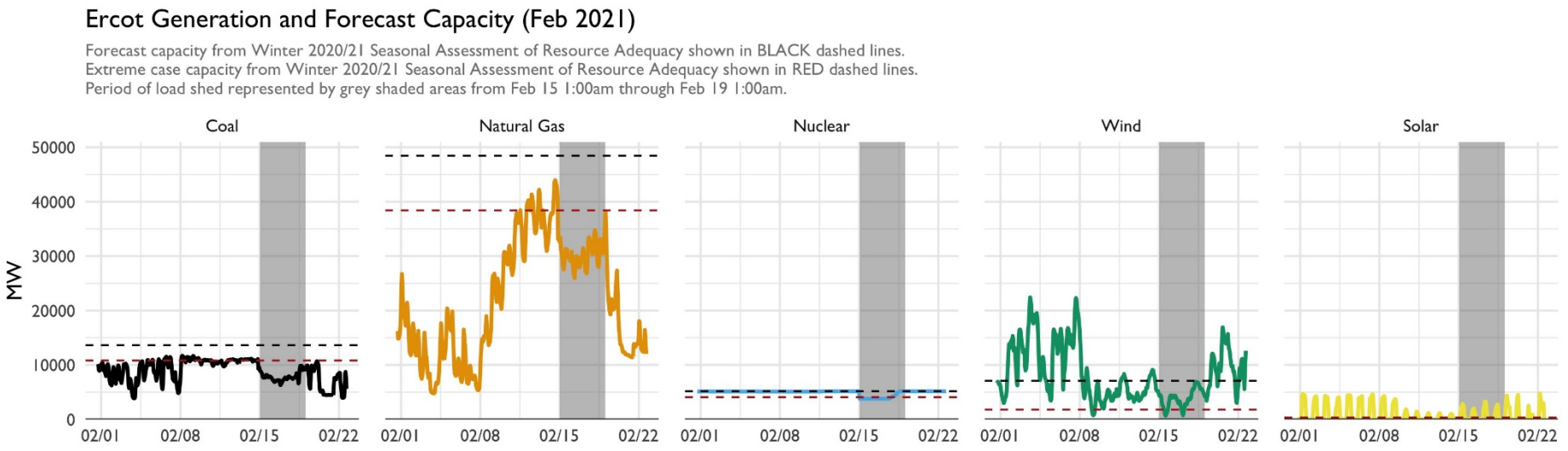
Electricity Markets

Consumer Impacts

Resilience

Additional Considerations

- **Impacts on Disadvantaged Communities**
- **Environmental Justice**
- **Grid Flexibility**
- **Innovation**



Source: EIA hourly generation data. ERCOT SARA report.
Chart by @bcshaffer

Electrification Presentation

Briefing on Transportation Electrification

Overview

- Transportation sector is a significant contributor of GHG emissions.
- Achieving the CLCPA's aggressive goals will require considerable migration from fossil fuels to Zero-Emission Vehicles.
- Electrification of transportation is critical to achieving those limits
- Economic and public health benefits
  - Reduce harmful co-pollutants, particularly in disadvantaged communities with higher levels of vehicular pollution
  - Price parity and total costs of ownership will level playing field for new/used ZEVs.
- Interpanel collaboration: Optimize the impact on the electricity grid and develop EV-ready building codes.
- Electrification is part of a suite of policies
  - Electrification alone will not achieve emission reductions goals.
  - Panel is also evaluating policies for public transportation use, smart growth strategies and transitional fuels.

Summary of Cadmus Technical Analysis for Transportation Electrification

www.Climate.ny.gov

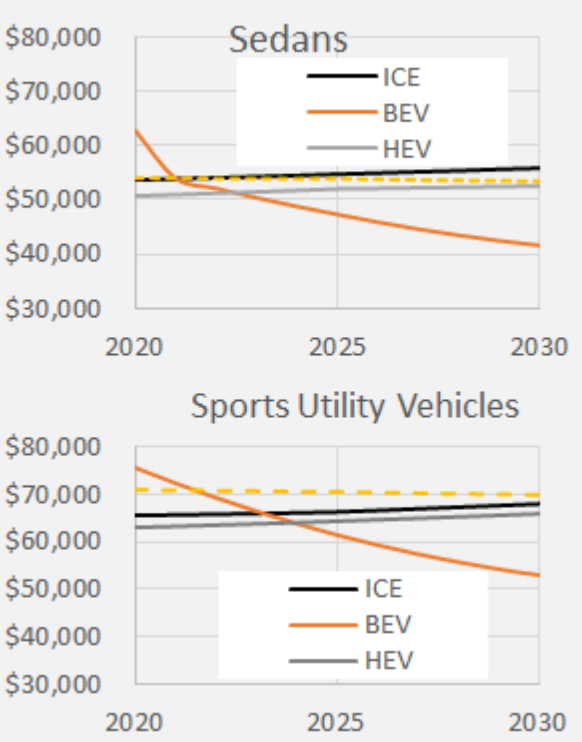
Costs of Electric Vehicles

- Price parity / Total Cost of Ownership (TCO) parity between EVs and gasoline vehicles expected this decade for light-duty vehicles
  - o TCO parity is contingent upon electricity prices and region of State; less favorable downstate

When is **Upfront** price parity?
- Sedans: 2027
- Pickup Trucks: 2027
- Crossovers: 2028
- SUVs: 2028
- Vans: 2028

When is **TCO** parity?
- Sedans: 2021
- Pickup Trucks: 2023
- Crossovers: 2023
- SUVs: 2024
- Vans: 2024

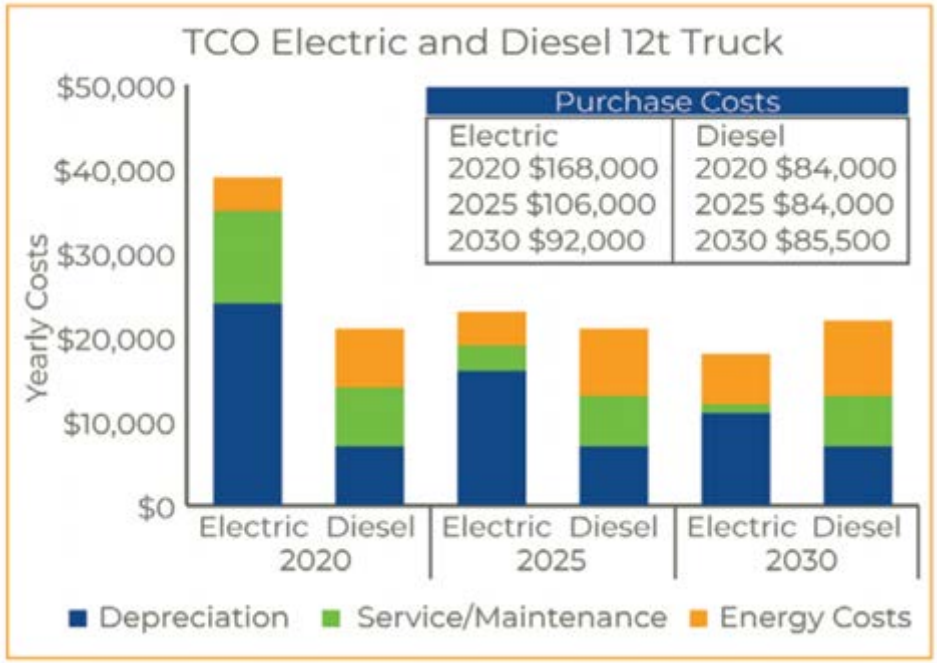
- Further work needs to be done to improve awareness among consumers and remove other non-price barriers to EV sales



Notes and Sources:
- *TCO estimates use average NYS electricity prices; TCO for BEVs may be less favorable in areas with higher electricity prices, like Zones J and K*
- *Battery pack costs from Kapoor et al. (2020). https://mackinstitute.wharton.upenn.edu/2020/electric-vehicle-battery-costs-decline/*
- *TCO estimates based on ICCT (2019) https://theicct.org/publications/update-US-2030-electric-vehicle-cost*

Costs of Medium/Heavy-Duty Vehicles

- Many medium- and heavy-duty vehicle categories will become cost competitive by 2030 (on TCO basis)
  - Significant savings on service/maintenance and fuel costs
  - TCO parity is contingent upon electricity prices and region of State; less favorable downstate
- Fleets may need support to make the shift to electric even at cost parity because of the risk associated with adopting new technologies.

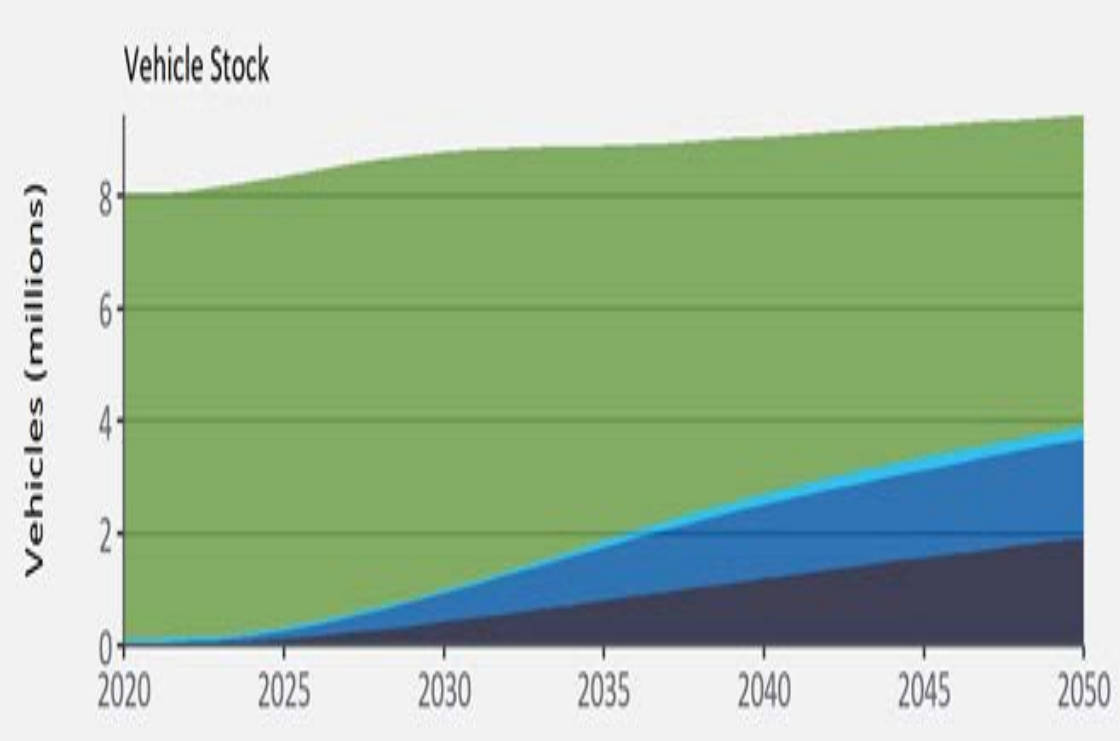


Source: CALSTART and FIER Automotive & Mobility (October 2020) https://globaldrivetozero.org/site/wp-content/uploads/2020/12/Moving-Zero-Emission-Freight-Toward-Commercialization.pdf

Light-Duty EV Sales

Without new policies and programs in place, new EV sales share grows from ~2% today to 24% by 2030 and 48% by 2050.

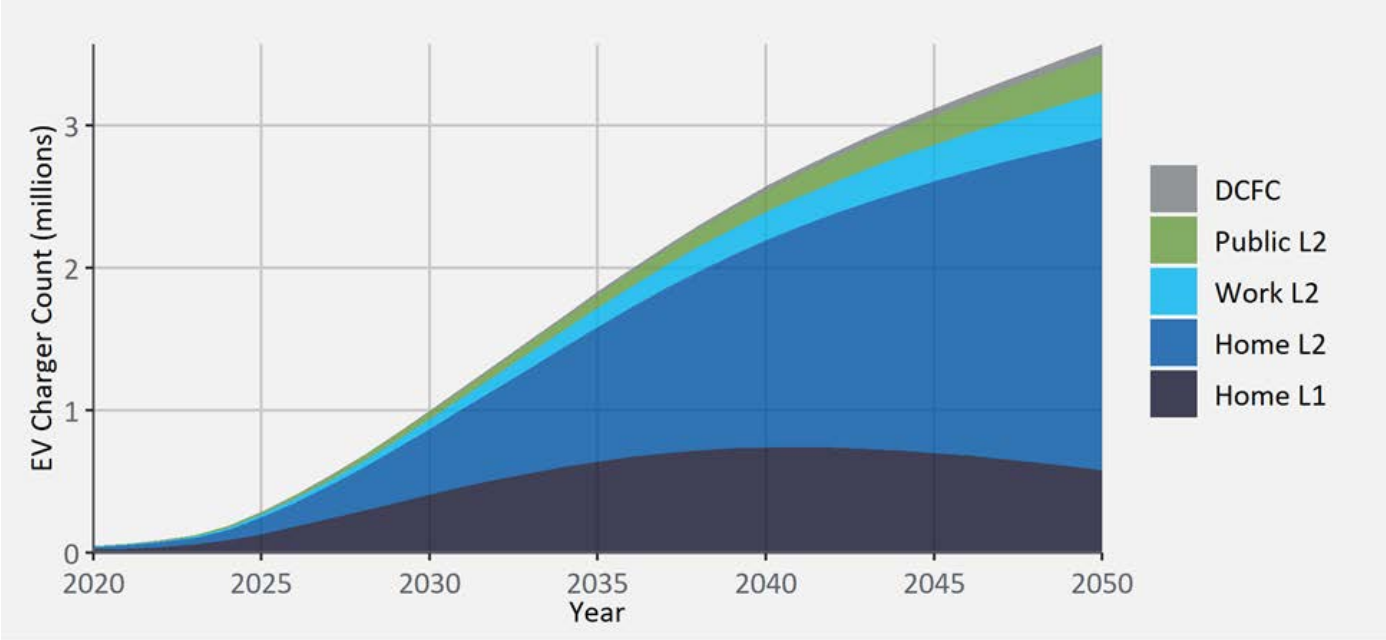
- *Pathways analysis suggests NYS needs to get to 60-70% EV sales by 2030, 100% by 2040 to meet CLCPA goals*



Source: Cadmus analysis using customized NY vehicle choice model

EV Charging Stations

Without new policies in place the number of public and workplace EV charging stations are expected to grow from about 6,000 today to over 130,000 by 2030 and over 700,000 by 2050

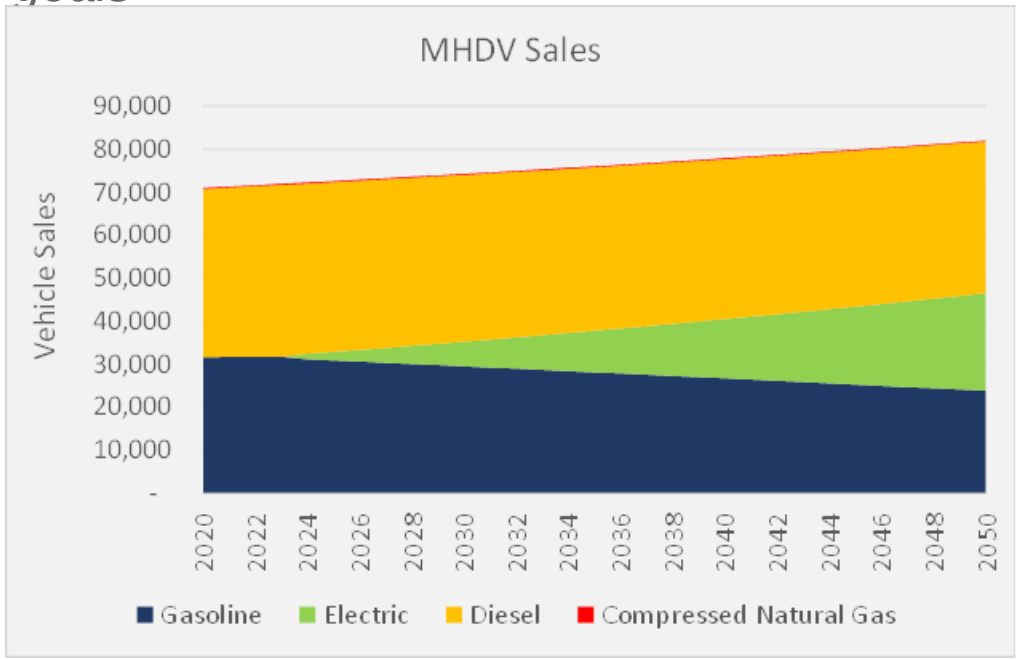


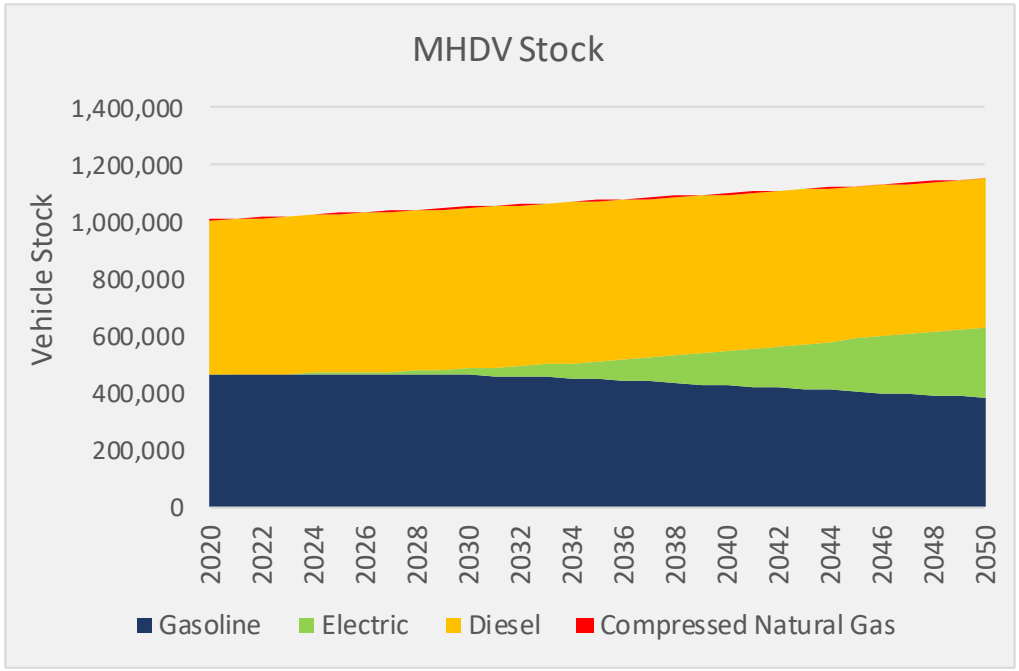
Source: Cadmus analysis using customized NY vehicle choice model

Medium/Heavy-Duty EV Sales

Without new policies and programs in place, new electric truck and bus sales share grows from less than 1% today to 7% by 2030 and 27% by 2050.

- *Pathways analysis suggests NYS needs to get to 35-50% EV sales by 2030, 90% by 2040 to meet CLCPA goals*





Source: Cadmus analysis using customized NY vehicle choice model

Load & Managed Charging

Managed charging priorities

1) System peak avoidance
2) Site-level demand management

Charging applications

1) Residential charging of light-duty vehicles (Level 1, Level 2)
2) Depot charging of medium- and heavy-duty fleet vehicles

Managed charging measures

Light-Duty Residential

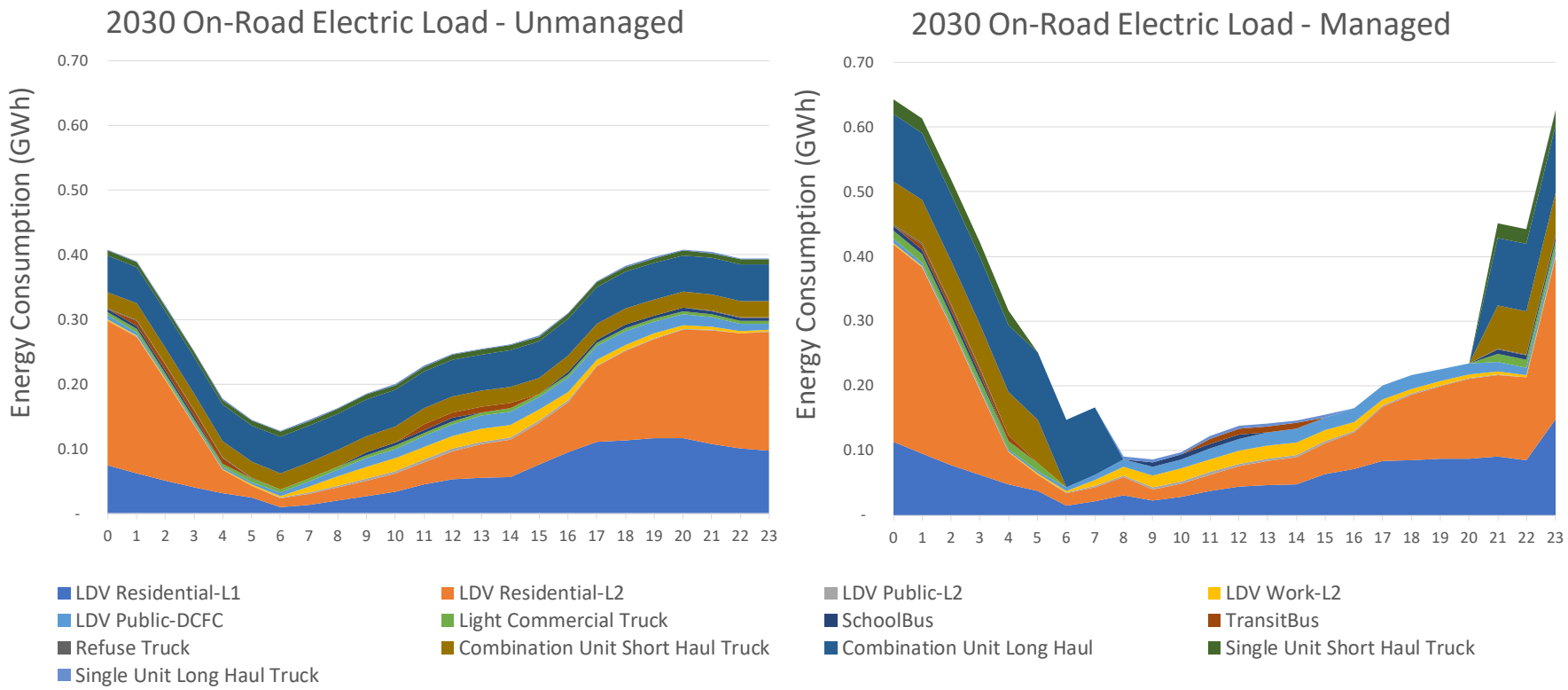
1) System peak avoidance (TOU)

Medium- & Heavy-Duty Fleets

1) System peak avoidance (TOU, Nighttime operations)
2) Site-level demand management (smart charging)

Load & Managed Charging

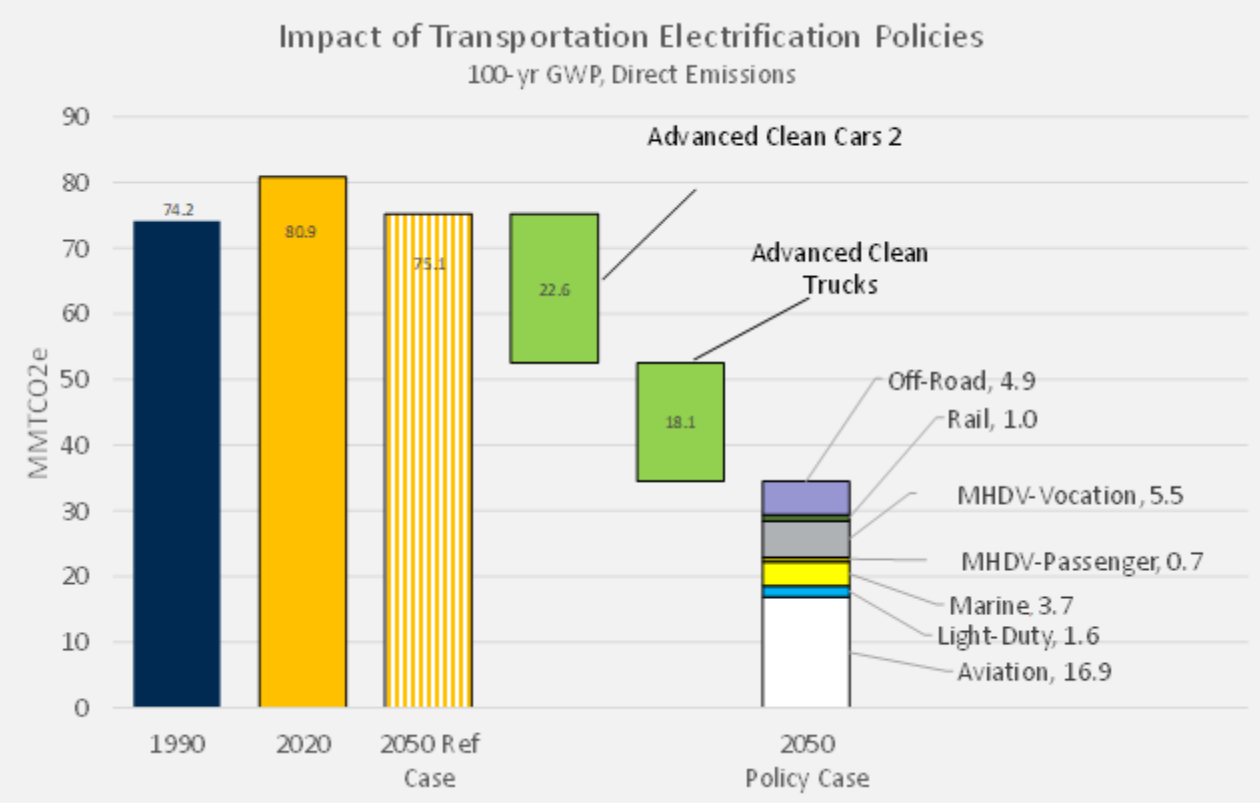
- Managed charging is critical for shifting charging to occur away from system peak hours, reducing the cost of electric grid upgrades



Source: Cadmus analysis using EVSE accounting tool

Policy Insights: ZEV Regulations

Regulations for 100% light duty ZEV sales by 2035 and increasing medium/heavy duty ZEV sales staring in 2025 reduce GHGs by ~55% relative to 2050 Reference Case levels



Insights:

- ACC2 has larger impact on GHG emissions than ACT
- **Emissions are ~34 MMT in 2050, compared to ~8 MMT estimated in Pathways**; ~1/2 of remaining emissions in 2050 are from aviation sector
- Some LDV emissions remain because not 100% of vehicles have turned over

Source: Cadmus analysis using NY-VISION tool

Policy Insights: ZEV Regulations

The two ZEV regulations are expected to significantly increase the number of EVs in 2030 and 2050

Scenario	Indicator	2025	2030	2050
Reference Case	BEV LDV Sales	38,177	74,710	174,272
	PHEV LDV Sales	52,727	90,262	144,538
	% of New Sales	14.9%	25.6%	45.9%
	EV Chargers Needed	*41,000*	*133,000*	*702,000*
ACC2 / ZEV Regulations Extension	BEV LDV Sales	108,113	270,804	541,660
	PHEV LDV Sales	3,953	25,470	0
	% of New Sales	20.7%	54.7%	100.0%
	EV Chargers Needed	*58,000*	*341,000*	*2,850,000*

Scenario	Indicator	2025	2030	2050
Reference Case	Electric MHDV Sales	2,337	6,811	27,949
	% of New Sales	3.0%	8.3%	28.6%
Advanced Clean Trucks	Electric MHDV Sales	6,952	31,344	92,282
	% of New Sales	8.9%	38.4%	95.6%

The ZEV Regulations scenario projects EV sales percentages for LDVs and MHDVs in 2025, 2030, and 2050 **very similar to the Pathways estimates**

Source: Cadmus analysis using NY-VISION tool

Transportation Advisory Panel Electrification Sub-Work Group Strategies Under Consideration

www.Climate.ny.gov

ZEV Sales Requirement for Passenger Vehicles

Draft Material

- **Possible Regulatory Standard**
  - Phased in requirement for manufacturers to transition to the sale of only zero emission vehicles
  - Consistent with other states, countries and GM commitment
  - Will save consumers money
- **Supporting Policies**
  - Consumer incentives
  - EV charging infrastructure
  - Consumer education/job training
  - Reduce EV sales barriers (direct EV sales, dealer incentives)

ZEV Sales Requirement for Trucks/Buses

Draft Material

- **Possible Regulatory Standard**
  - Phased-in requirement for manufacturers to sell zero emission trucks/buses
  - Consistent with regulations adopted or being developed in other states
- **Supporting Policies**
  - Financing strategies and incentives
  - EV charging infrastructure
  - Workforce development
  - Potential regulations targeting large fleets
  - Government procurement preferences
  - Policies being developed under multistate MOU

Incentives/Feebates

Draft Material

- **Possible Incentives**
  - Point-of-sale rebates until price parity is reached for light duty (mid-2020s)
  - Until total cost of ownership parity for trucks/buses (late 2020s) (assumes development of instruments to finance initial purchase price)
  - Enhanced incentives for LMI purchasers/deployment in disadvantaged communities; potentially used EVs also
  - Consider level of federal incentives
  - Funding source/mechanisms needed
- **Feebates – a potential option for funding incentives**
  - Mechanism used in Europe to fund light duty EV incentives with fees on purchase of fossil-fueled vehicles

Charging Infrastructure

Draft Material

- **Charging Station Investments**
  - Economics of building charging stations will continue to improve but support still needed for next 5-10 years while EV adoption increases
    - Private sector investment and financing becomes more attractive as more EVs are on the road
  - NYS is already investing nearly $1B through utilities, NYPA by 2025
  - Additional support needed to accompany rapid EV adoption
    - Targeted investment in multifamily building charging, fast charging, truck and bus charging
    - Clean fuels regulations treating electricity as a fuel can generate revenue to invest in charging stations

- **Optimized Charging**
  - Managed charging (including new technology and TOU rates) can help minimize both charging costs for drivers, and grid costs
  - Demand charges can make fast charging and fleet charging uneconomical. Alternative approaches can provide appropriate rate options.
- **EV Ready Building Codes** – coordinate with EE/H Panel

Climate Justice Strategies

Draft Material

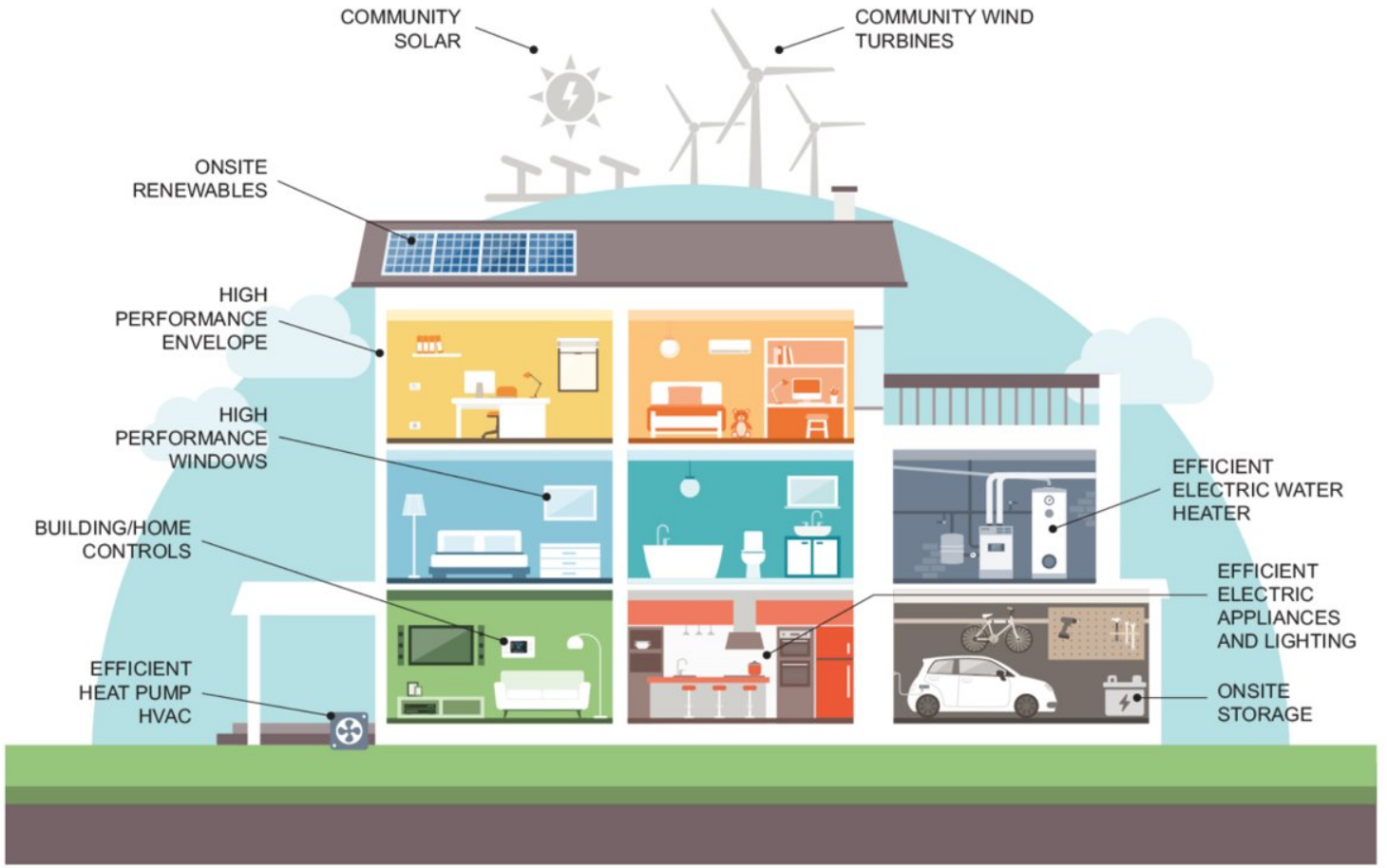
- **Electrification Goals**
  - Provide LMI consumers affordable access to money-saving EVs
  - Deploy clean trucks and buses in disadvantaged communities in order to provide substantial public health benefits
  - Ensure sufficient charging infrastructure in underserved areas, both rural and urban
- **Possible Strategies**
  - Higher incentives for new and used EVs for LMI purchasers
    - "On-the-hood" rebates, rebates for used EVs, targeted eligibility based on income
    - Incentives to support other modes like e-bikes
  - Target truck/bus incentives to disadvantaged communities (as being done with VW funding)
    - Consider green zone strategies, especially around ports & airports
  - Target charging infrastructure deployment/incentives to underserved areas
  - Support community ownership models and workforce development strategies

Energy Efficiency and Housing

Beneficial Building Electrification

What is Building Electrification?

Switching from burning fossil fuels to increasingly clean electricity for space heating, water heating, cooking, and other energy end-uses



Graphic source: New Buildings Institute (developed for NYSERDA)

Outline of Presentation

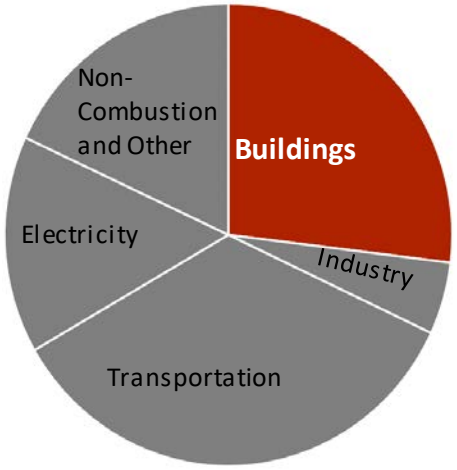
- **Summary of technical analysis**
- **Strategies under consideration for recommendation**
  - Regulations to phase out fossil fuel use in buildings, improve energy efficiency, enhance building resiliency
  - Managed, phased, and just transition from fossil gas to clean energy
  - Financing and incentives (priority on LMI/DACs)
  - Workforce development
  - Consumer education and confidence
  - R&D and demonstrations

Summary of Technical Analysis for Building Electrification

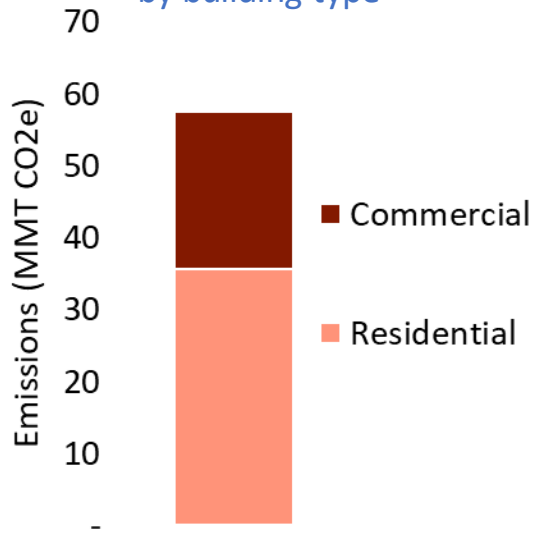
Emissions in our buildings today
E3 *Pathways* Buildings Sector

- The E3 Pathways report attributes onsite fossil fuel combustion as *direct* emissions from the buildings sector and electricity as *indirect* emissions accounted for in the electricity generation sector.
- Direct emissions in buildings are dominated by fossil-fuel combustion (mostly gas) for space heating and hot water – thus, electrification of space and water heating drive building sector decarbonization.
- Emissions accounting will be refined under the Climate Act accounting framework.

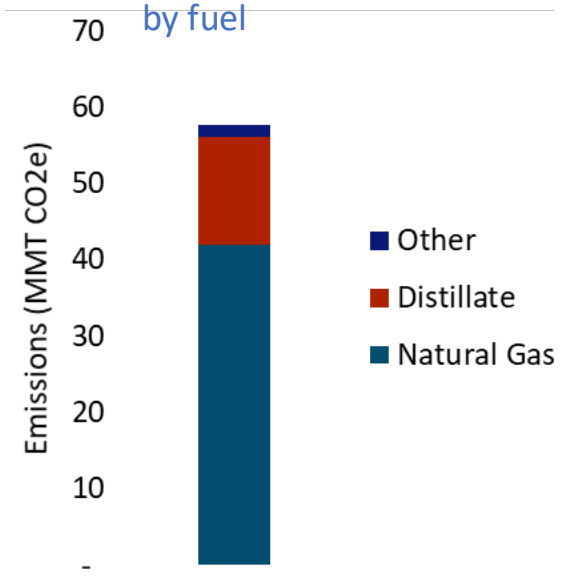
Economy-wide emissions in 2016



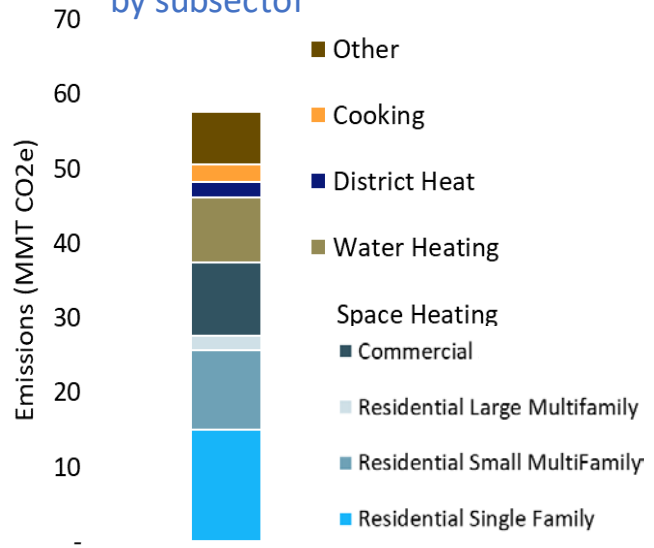
Buildings: direct emissions by building type



Buildings: direct emissions by fuel



Buildings: direct emissions by subsector



Electrification is a pillar of building decarbonization

The Energy Efficiency and Housing Advisory Panel's scope addresses three pillars of deep building decarbonization

Energy Efficiency and Conservation	Building Electrification and Low Carbon Fuels	Decarbonizing Electricity Supply
• Efficient building shell and weatherization measures • Behavioral conservation, operations and maintenance	• **Beneficial electrification of space heating, hot water heating, and appliances** • Cross-panel work on Bioenergy	• Site-based solar PV • Flexible building loads • Cross-panel work with Power Generation Advisory Panel
Codes and standards to reduce GHG emissions		
Cross-cutting consideration of embodied carbon and climate adaptation and resilience		

Solutions are available, with variation by building type

Technologies are commercially available

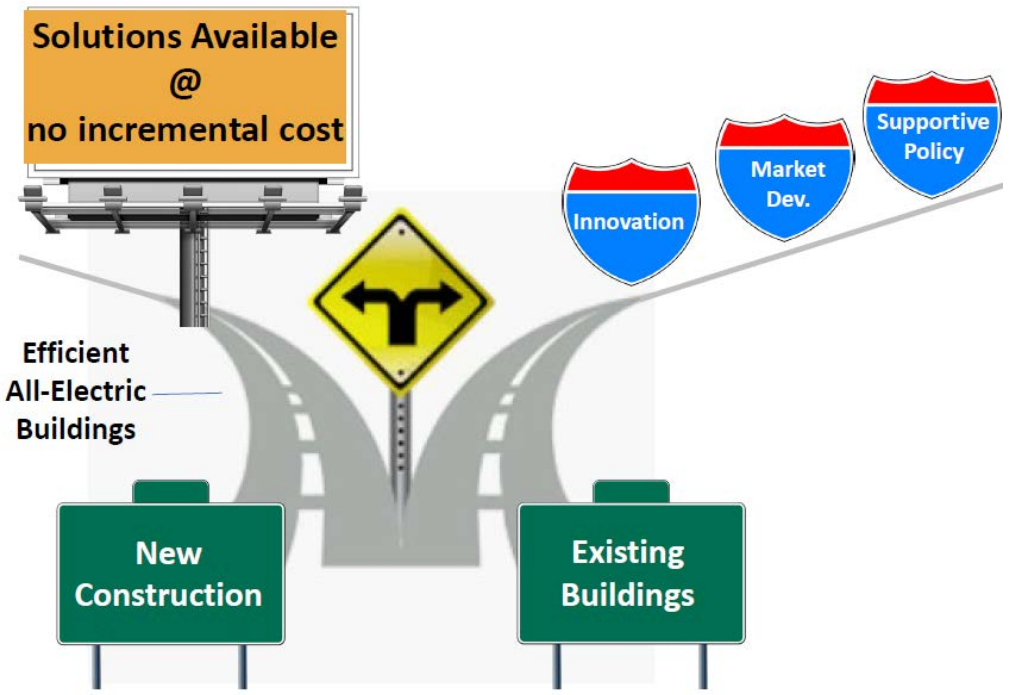
- Cold climate air-source heat pumps (ASHP), ground-source heat pumps (GSHP), or carbon-free community thermal loops for space heating/cooling
- Heat pump water heaters with storage tanks and demand-flexible controls
- Electric induction cooktops and heat pump dryers
- In widespread use in other regions globally (e.g. Asia, Europe, parts of Canada)

Harder-to-electrify cases include

- Super tall buildings
- Buildings heating with steam/district steam
- 100% of hot water needs in large multifamily

Disadvantaged communities and equity

- Retrofit- and electrification-readiness costs can be high (and uncertain) in buildings with deferred maintenance, outdated electrical service



Key areas for R&D and demonstrations

- Bring the best global/emerging solutions to NYS
- Cold climate performance in range of HP sizes
- Harder-to-electrify cases, community thermal loops
- Resiliency of all-electric buildings
- Transition to lower-GWP refrigerants

Preliminary findings: Key factors can bring the lifecycle cost of all-electric, efficient buildings to parity with natural gas heating and conventional building systems

Summary

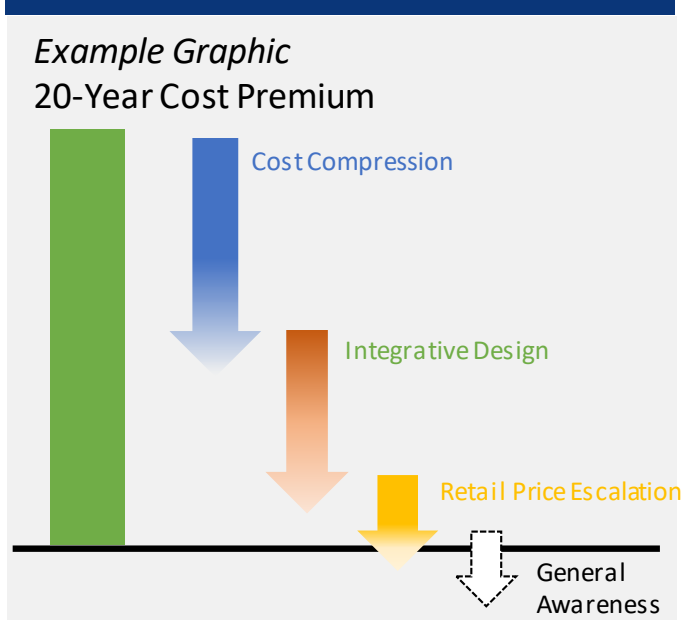
- Building decarbonization upgrades – including high-efficiency heat pumps, efficient shell, and induction cooking – **currently have a cost premium** compared to conventional fossil fuel systems.
- Improving cost effectiveness of building decarbonization upgrades for the customer involves addressing both **technology first cost and energy/operational lifecycle cost**.
- **There is no silver bullet.** It will require multiple strategies to reduce cost premium.

Cost Premiums

- The **low relative cost of gas compared to electricity is a major challenge**. Some building decarbonization measures result in higher annual energy costs than the natural gas comparison cases.
- **The average 20-year cost premium equates to 1-5% of total building cost** for all-electric new construction with a code-compliant shell and 2-15% for all-electric new construction with a passive house-inspired shell. Varies per typology, vintage and climate zone.
- **Cost compression** could provide 15-55% reduction in upfront cost. **Integrative design** in new construction could reduce costs by up to 50%.

Cost Reduction Potential

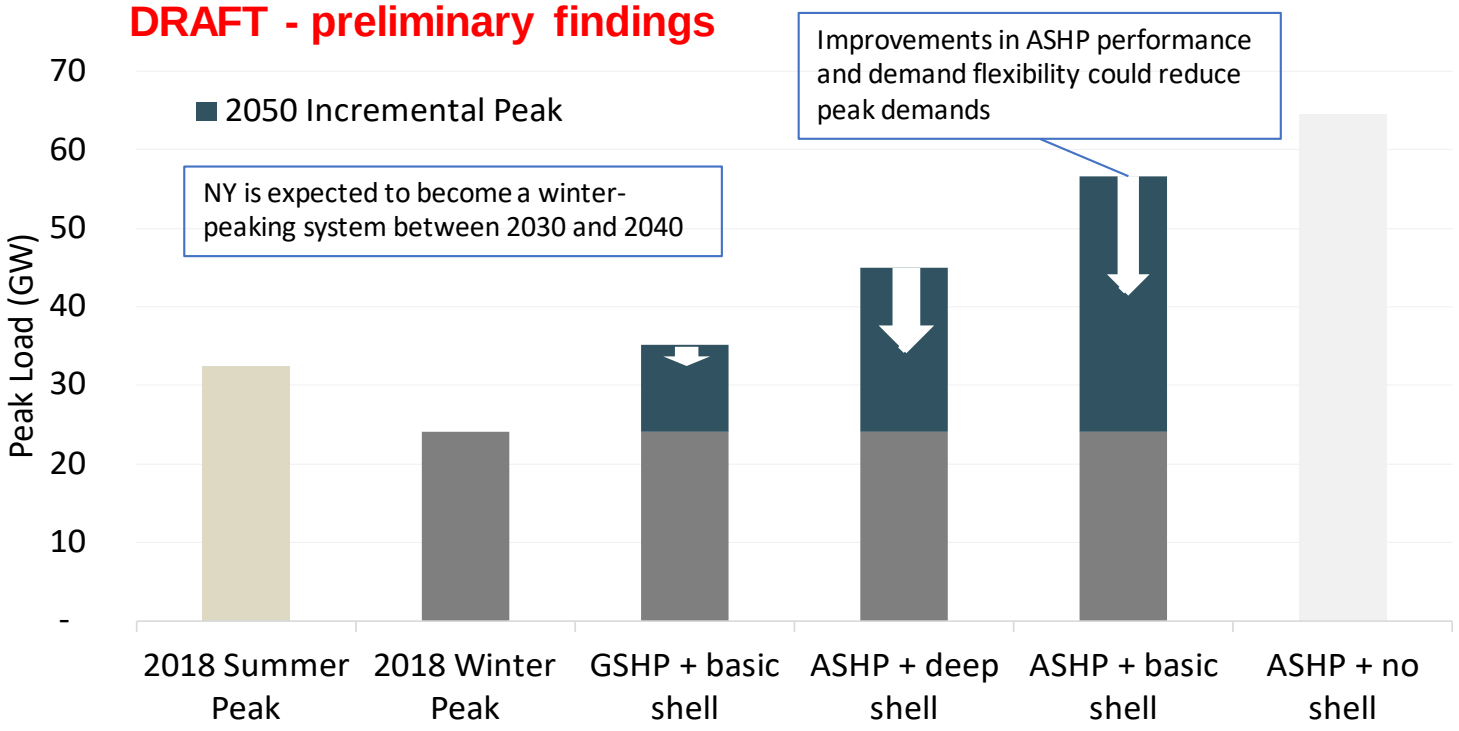
Example Graphic



Source: "Preliminary Findings" slides are adapted from a presentation to the Energy Efficiency and Housing Panel on "Building Decarbonization Policies: Preliminary Findings on Impacts and Costs," produced by Rocky Mountain Institute, E3, Arup, New Buildings Institute, NYSERDA (Feb. 10, 2021)

Preliminary findings: Electrification will add new winter demands to NY's electricity system. The magnitude of increase in the grid peak depends on what measures are implemented in buildings.

2050 NY Electric Building Heating Peak Demand Scenarios



- Analysis explores impact of air source and ground source heat pumps and shell measures on NY's electric system. In practice, a mix of technology adoption will occur.
- Electrification without shell measures is projected to result in an undesirably high level of peak increase.
- Basic shell measures (together with demand-side interventions like flexible loads, and improvements in heat pump performance) achieve a substantial reduction.
- Further reduction of peak demand could be achieved through either GSHP instead of ASHP or deep instead of basic shell, but those options should be weighed against higher measure costs

Notes:

1. ASHPs modelled are assumed to be "cold climate" heat pumps, with a system coefficient of performance (COP) of 1.75 during the coldest hour modelled. The white arrows show the reduced peak demand impacts if COPs increase to 2.5 in the coldest hour and 2 GW of dependable space- and water-heating load flexibility is available. The US DOE Building Technologies Office has set a target of ASHPs achieving a COP of 3 at -13F.
2. Deep shell scenario assumes single family buildings upgraded to a code compliant building shell and multifamily and commercial buildings upgraded to a Passive House inspired shell.

Strategies Under Consideration for Recommendation

Approach to recommendations to advance building electrification and efficiency at scale

- **Address new construction and retrofits for single family housing, multifamily housing and commercial and institutional buildings**, with attention to:
  - **Practicality**: Identify and mitigate implementation challenges for owners and building operators, including costs/benefits
  - **Equity and affordability**: Identify and mitigate any potential negative impacts on tenants, low- to moderate-income (LMI) households, and disadvantaged communities (DACs), with attention to affordability
  - **Minimizing costs**: Identify ways to make building decarbonization upgrades cheaper and cost competitive
  - **Expanding solutions**: Identify ways to bring better technologies and solutions to NYS
  - **Benefits**: Identify both energy and non-energy benefits including health, comfort, and productivity
- Address key enabling policies, incl. **workforce development, consumer education,** and **affordability**
- Consider implementation, with attention to feasibility, commercial availability, and equity

Possible Mitigation Strategies

Draft Material

Potential regulations to phase out fossil fuel use in buildings, improve energy efficiency, enhance building resiliency

- **More efficient State Energy Code**, as soon as possible
- Code requirements for **solar PV and grid interactivity of electric appliances** (e.g. batteries, hot water heaters), where feasible in new construction
- **Phased electrification of construction code**
- **Phased electrification of gas/oil replacements of heating/hot water equipment**
- **Phased electrification of gas replacements for cooking and dryers at end of useful life and transition to electric**

Planning for a managed, phased, and just transition from reliance on fossil gas to clean energy

- **Undertake a planning study and process** to examine the regulatory, legislative, and other policy changes needed…
- Develop a **comprehensive equity strategy** and equitable **transition plan for the gas industry workforce**
- Analysis of **grid- and building-readiness for electrification**
- **Set standards for what can be advertised as "clean" and phase out gas subsidies** (e.g. "100-foot rule," phase-out rebates for gas equipment)
- **Minimize BAU utility investments in gas delivery infrastructure** and adopt climate-aligned depreciation rates
- Prioritize investments in the reliability, resilience, and affordability of the NYS electric grid

Possible Enabling Initiatives: Low-cost financing and incentives for energy efficiency, electrification, and related improvements in buildings

Draft Material

Potential mechanisms for residential, commercial, and institutional building owners to gain access to low-cost capital to fund decarbonization upgrades
Enable **greater access to low-cost financing products**, including for LMI homeowners and DACs
Provide a **revolving loan fund for building decarbonization**: e.g. enable public requirements coupled with low-cost capital
Expand the use of **energy performance contracting** for State, municipal, and K-12 school building upgrades

Potential incentives that speed uptake and help to transform the market, with focus on enabling uptake in LMI, DACs, and affordable housing
Direct cash incentives for electrification and energy efficiency, with **priority on LMI households and DACs**
Direct cash incentives for electrical service upgrades
Create a **"Retrofit and Electrification Readiness Program" for LMI households, DACs, and affordable housing** to cover costs of needed non-energy building improvements

Possible Enabling Initiatives: Workforce development, consumer demand, and solution innovation

Draft Material

Workforce development

Scale up training for incumbent and new clean energy workers, adjacent industries, code officials/ inspectors – and **prioritize DACs, low-income residents and other priority populations for training and job placement**

Building decarbonization curricula and career services in State-funded education (K-12, technical, universities)

Potentially require **continuing education on building decarb. as part of licensing** for trades, contractors, building operations and maintenance, architects, engineers, real estate professionals

Consumer education and tech. assistance

Scale up multilingual consumer education efforts, **strategic partnerships** to drive outreach, and **technical assistance/resources** for decision-makers

Target education/tech. assistance resources within DACs with a focus on efforts led by orgs. in those communities

R&D, demonstrations, and case studies…

… for **resilient and all-electric buildings**, incl. solution transfer from global markets to NYS

… for **lower global warming potential (GWP) refrigerants and refrigerant leakage detection** and reduction strategies

Power Generation

Power Generation Advisory Panel Considerations

Electrifying buildings and transportation is crucial to meeting CLCPA goals.

Principles

> Reliability
> Equity
> Affordability
> Zero-emission
> Timely

Approach to Electrification Must…

> Minimize the system costs of electrification and balance the behind-the-meter costs with grid-side costs, with both bulk and local solutions
> Optimize the deployment and operation of resources – locationally and for flexibility – through storage, managed load, and clean dispatchable generation
> Look to utilities, DER providers, and bulk providers for this – as makes most sense and with steady and improvement and rules
> Provide for improved holistic planning of the electric system and across energy systems to accommodate significant changes in characteristics of generation and significant changes in load due to electrification
> Pay heightened attention to resilience and reliability as the energy system becomes more electric
> Support solutions in technologies, regulation, markets, and systems management and oversight

Discussion: Electrification

Agency Updates

Annual Emissions Inventory Report

CLCPA requires DEC, in coordination with NYSERDA, to publish annual emissions inventory reports

- **Using 20 year GWP and inclusive of upstream emissions from fossil fuels**
- **First inventory of most recent data due on January 1, 2022, updated annually**
- **Virtual public hearings on methodology have been scheduled**
- **Written comments or feedback may be provided at any time to** climate.regs@dec.ny.gov

Public hearing	Date
Annual NYS GHG Emissions Inventory Overview	March 22, 2021
Stakeholder conference – Oil and Gas Emissions Accounting	March 26, 2021
Stakeholder conference – Net Emissions Accounting	March 29, 2021

More information, including meeting details and instructions for joining will be posted on https://www.dec.ny.gov/energy/99223.html

Next Steps

Chair Rhodes: Thank you, and Farewell!!