# Transportation Advisory Panel

## Meeting 1

September 17, 2020

www.Climate.ny.gov

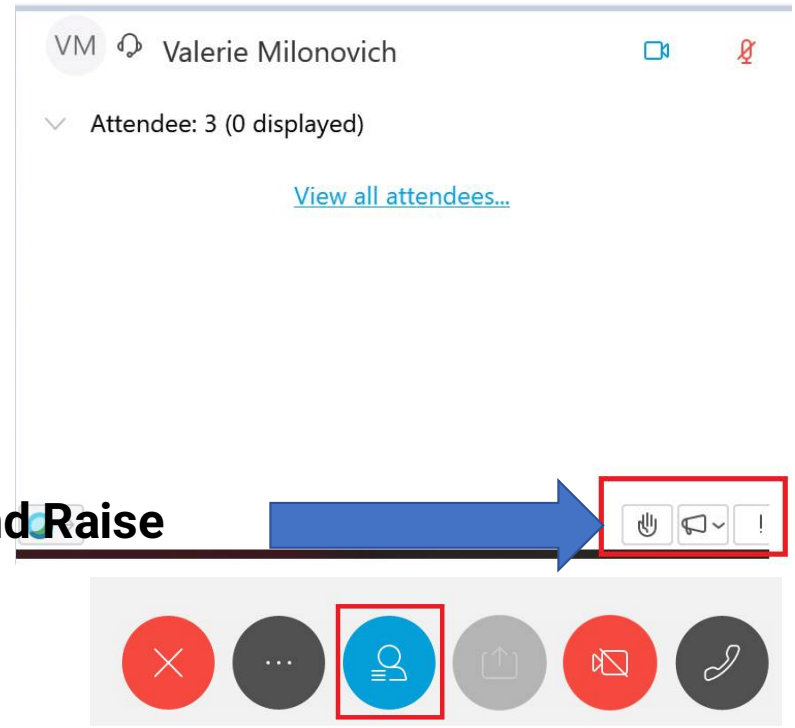
NEW YORK STATE OF OPPORTUNITY. | Climate Action Council

# 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 Andrea Linton at Andrea.Linton@dec.ny.gov or 518-402-8044.

You'll see when your microphone is muted



# Agenda

**Introductions (15 minutes)**

**Advisory Panel Objectives (15 minutes)**

**Pathways Presentation – E3 (45 minutes)**

**Panelist Expectations/Priorities (75 minutes)**

**Next Steps (15 minutes)**

# Panel Member Introductions

# Transportation Advisory Panel Members

**Marie Therese Dominguez, Chair**
NYSDOT

**Jared Snyder**
NYSDEC

Paul Allen, M. J. Bradley & Associates

Dimistris Assanis, Stony Brook University

Steve Finch, AAA Western & Central New York

Albert Gore III, Tesla

Kendra Hems, Trucking Association of New York

Elgie Holstein, Environmental Defense Fund

Renae Reynolds, New York City Environmental Justice Alliance

Porie Saikia-Eapen, Metropolitan Transit Authority

John Samuelsen, Transport Workers Union of America AFL-CIO

Nick Sifuentes, TriState Transportation Campaign

Kerene Tayloe, WE ACT for Environmental Justice

Julie Tighe, NYS League of Conservation Voters

Craig Turner, Buffalo Niagara International Trade Gateway Organization

Nancy Young, Airlines for America

Bob Zerrillo, New York Public Transit Association

# Advisory Panel Objectives

# Climate Leadership and Community Protection Act Targets Codified into Law

| Climate Leadership and Community Protection Act | |
|---|---|
| GHG Targets | 40 Percent by 2030<br>85 Percent by 2050 |
| Zero-Carbon Electricity Targets | 70 Percent by 2030<br>100 Percent by 2040 |
| Environmental Justice | Floor of 35 percent for benefit of disadvantaged communities |

# Advisory Panel Objectives

- Identify a range of emissions reductions, consistent with analysis, for the sector that contributes to achieving the statewide emission limits.
- Present a list of sector-based recommendations for emissions reducing policies, programs or actions, for consideration by the Climate Action Council for inclusion in the Scoping Plan.
- Evaluate the costs and benefits of recommended strategies, informed by the Value of Carbon established in accordance with Section 75-0113 of the CLCPA.

# Advisory Panel Objectives

- Identify measures to reduce greenhouse gas emissions and co-pollutants in disadvantaged communities.
- Include climate adaptation and resilience considerations.
- Consider approaches taken by different states and nations.
- Identify potential sources of funding necessary to implement the recommended policies.

# Advisory Panel Objectives

- Meet at least once per month and provide regular updates to the Council on the advancement of its work.
- Consult with the Climate Justice and Just Transition Working Groups to inform its recommendations for the Climate Action Council.
- Identify additional presentations by external subject matter experts/association briefings.
- Seek public input to inform the development of recommendations to the Council for consideration.
- Make available information regarding advisory panel public meetings and comment opportunities on the climate.ny.gov webpage.

# Pathways Presentation – E3

www.Climate.ny.gov

Energy+Environmental Economics

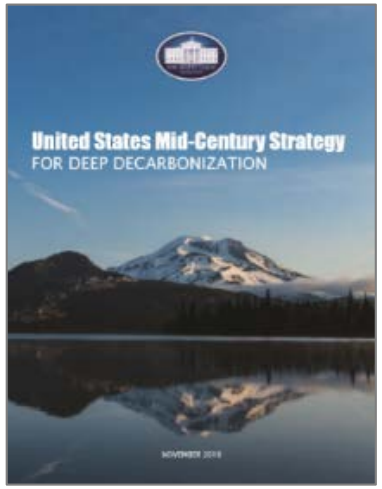
# New York State Decarbonization Pathways Analysis

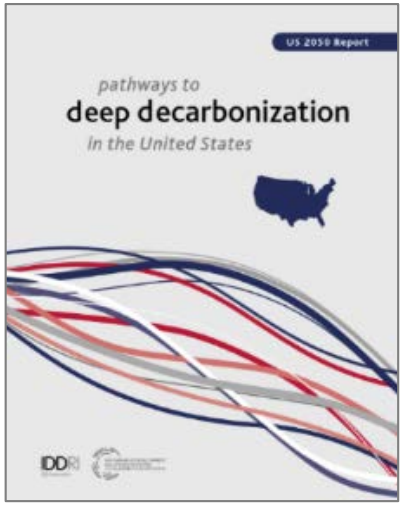
## Transportation Advisory Panel Discussion

September 17, 2020

# Analysis Overview

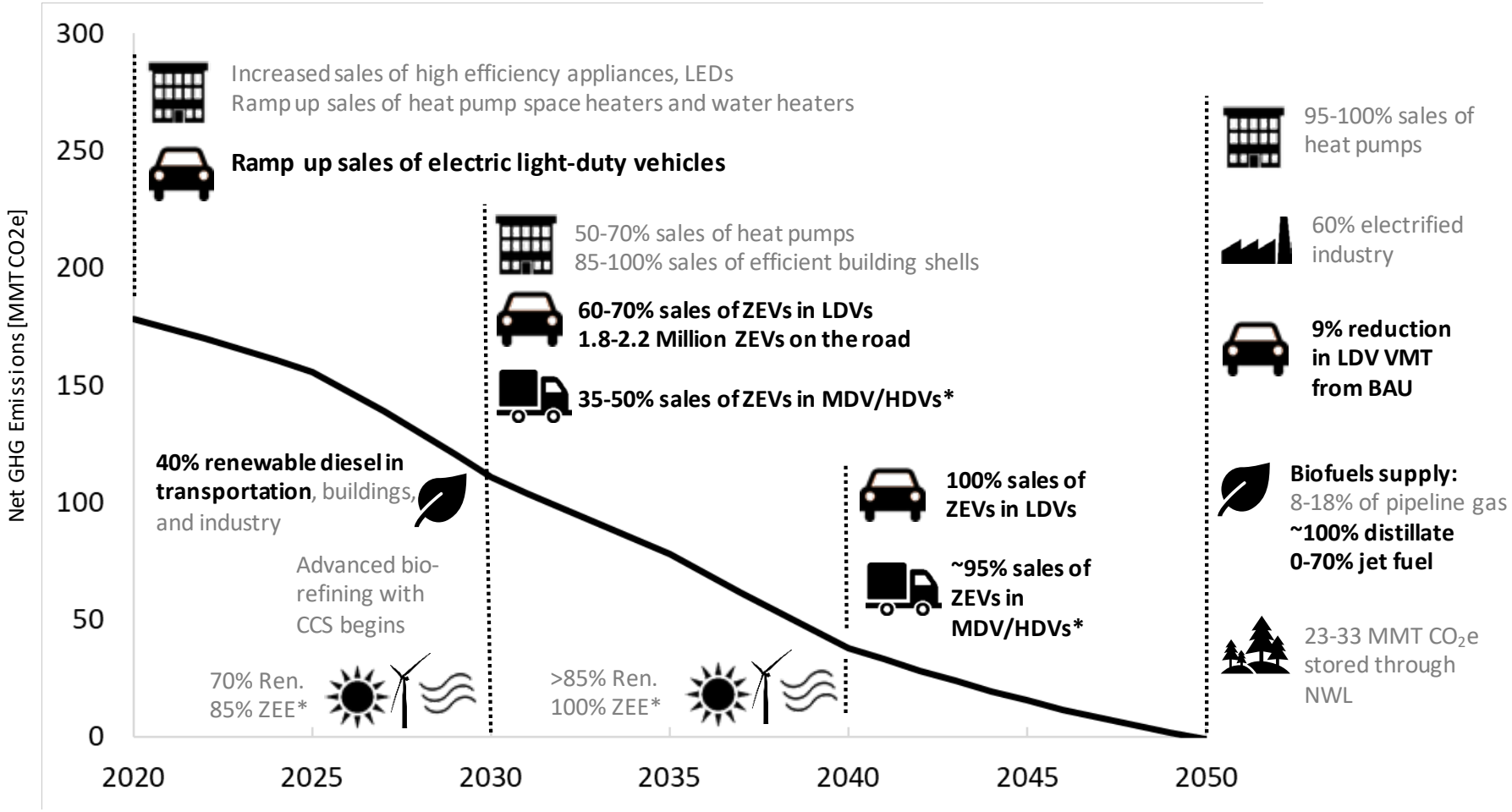
- NYSERDA engaged E3 to develop a strategic analysis of New York's decarbonization opportunities. This ongoing analytic work, initiated prior to the passage of the CLCPA, has modeled existing policies and explored additional actions needed to reach the State's 2030 and 2050 targets and provides a starting point to inform the work of the Climate Action Council
- E3 reviewed the literature on deep decarbonization and highly renewable energy systems and gained additional insights from discussions with leading subject matter experts
- Further work will be needed to fully incorporate GHG accounting requirements of the CLCPA and re-calibrate to DEC's forthcoming rulemaking establishing the statewide GHG emission limits




# Key Takeaways

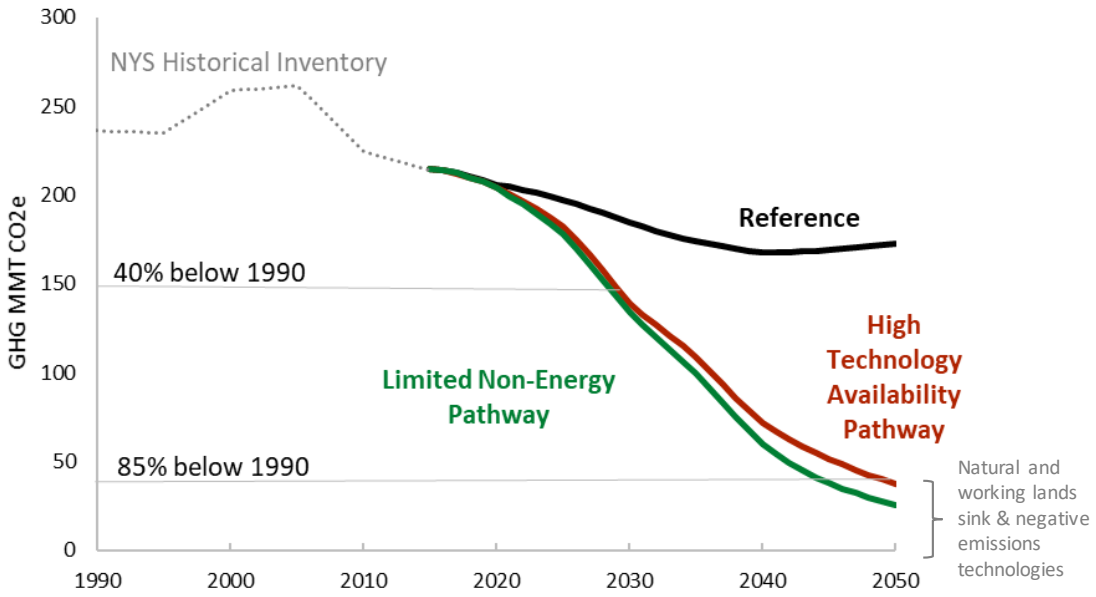
- Achievement of emissions reductions to meet state law requires action in all sectors
- A 30-year transition demands that action begin now




*Zero-Emissions Electricity (ZEE) includes wind, solar, large hydro, nuclear, CCS, and bioenergy; MDV includes buses

# Scenario Development

- Reference Case includes pre-CLCPA adopted policies & goals, including 50x30 Clean Energy Standard, 2025 and 2030 energy efficiency targets, zero-emission vehicle mandate
- Range of pathways designed to achieve CLCPA GHG targets that include CLCPA electric sector provisions (e.g., 70x30, 100x40, offshore wind & solar)




**+ Two "Starting Point" Pathways:**

- **High Technology Availability Pathway:** Emphasizes efficiency and electrification at "natural" end-of-life asset replacement schedule, while also utilizing advanced biofuels, carbon capture and storage (CCS), bioenergy with carbon capture and storage (BECCS), and a high natural and working lands (NWL) sink
- **Limited Non-Energy Pathway:** Accelerates electrification with more rapid ramp-up of new sales, along with early retirements of older fossil vehicles and building equipment. Additional fossil fuel displacement by advanced biofuels. Greater energy sector emission reductions in case of more limited non-energy reductions and NWL sink contribution

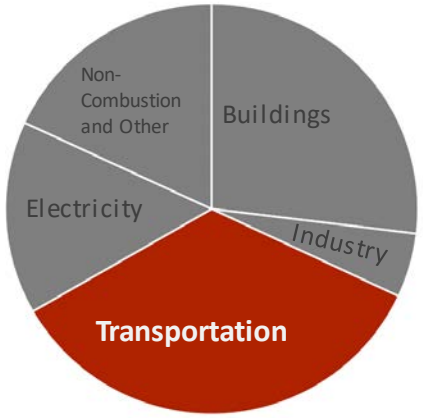
Energy+Environmental Economics

# Characterization of Transportation Sector

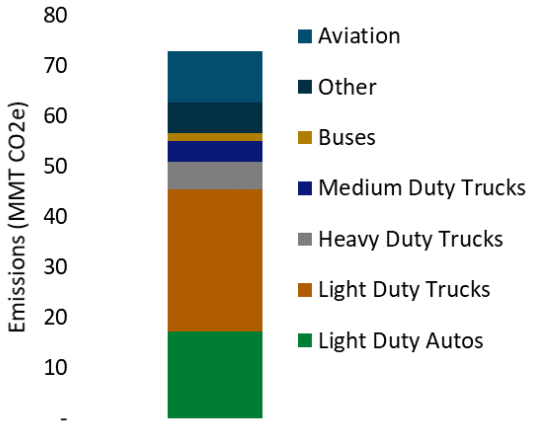
# Transportation Approach and Key Data Sources

- Majority of transportation emissions are from gasoline and diesel used in on-road transport (cars, trucks, and buses) with remainder from primarily diesel and jet fuel from non-road (aviation, shipping, rail, etc.)
  - Energy demand in on-road is further dominated primarily by light-duty vehicles
  - While VMT/capita is lower in the downstate region, significantly larger population and density means the downstate region still has a significant share of on-road energy demand
- CLCPA directs New York State to adopt a 20-year global warming potential and incorporate upstream emissions associated with fossil fuels into its GHG emissions accounting framework. Work to develop this emissions accounting framework is underway. Under this new emissions accounting framework, fossil fuel use, as well as all sources of short-lived climate pollutants, which include methane and HFCs, will carry a higher GHG impact on a tons of carbon dioxide equivalent basis than in the current accounting framework used in this analysis

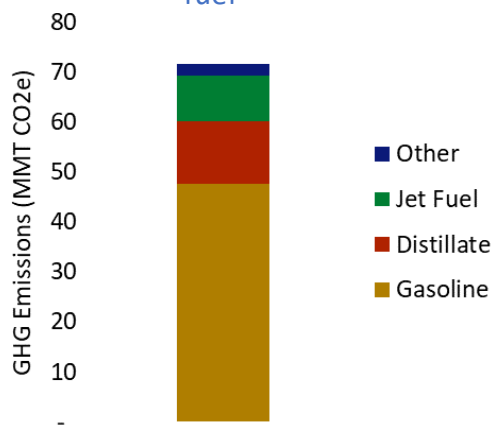
Economywide emissions in 2016




Transportation emissions by subsector




Transportation emissions by fuel



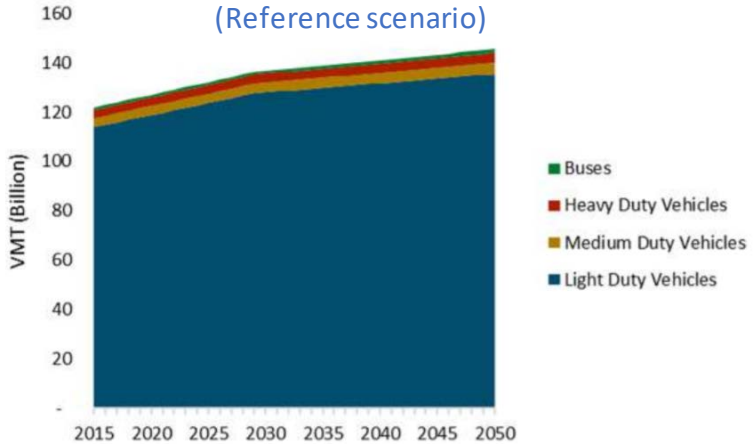

Notes: Emissions benchmarked to the NYSERDA GHG inventory; Energy demand benchmarked Patterns and Trends
Vehicle stock and VMT are drawn from data from NYSDOT, via NYSDEC
Construction and agricultural vehicles are included in Industry
Emissions associated with electricity consumption is tracked in the electricity generation sector

# Key Drivers

- Vehicle ownership and driving patterns drive energy use and emissions
  - The number of vehicles within the state is projected to grow with population, but vehicle-miles traveled (VMT) is projected to grow more quickly
- Fuel efficiency improvements, increased public transit, urbanization, and mode shifting to walking/biking are all factors which can reduce VMT and emissions
- As the economy continues to grow, demand for aviation, shipping, rail, and port energy use is projected to increase as well

| PATHWAYS vehicle category | Key growth driver |
|---|---|
| Light Duty Autos | E3 VMT forecast based on data from NYSDOT, NYSDEC, with modifications based on Annual Energy Outlook (AEO) data to account for reduced growth beyond 2030 |
| Light Duty Trucks | |
| Medium Duty Trucks | |
| Heavy Duty Trucks | |
| Buses | |
| Aviation | EIA AEO forecasts of transportation demands by fuel |
| Transportation Other* | |

VMT forecast by vehicle type
(Reference scenario)

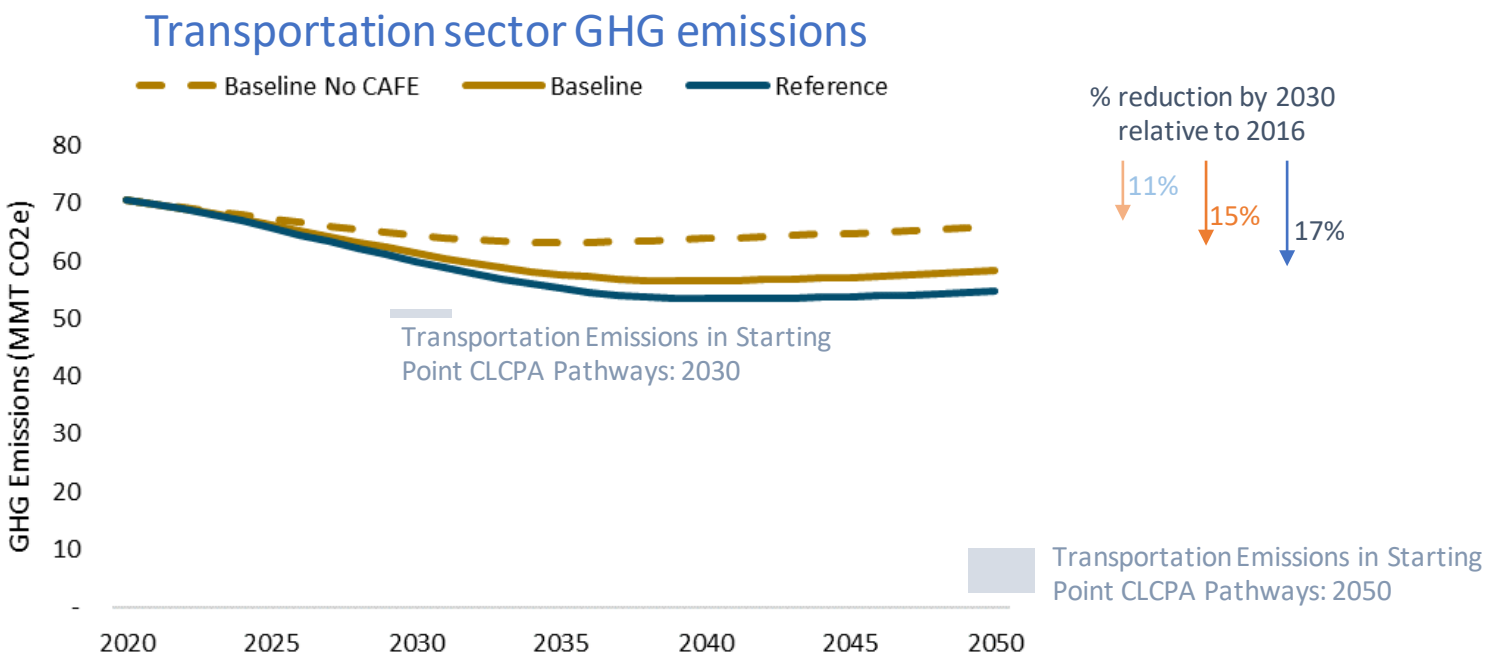



*Transportation Other includes other demand not captured in the stock rollover vehicle categorization, including motorcycles, shipping, recreational boats, and other on-road and non-road demand

VMT forecast benchmarked to NYSDOT through 2050 for MDV/HDV, through 2030 for LDV and through post-2030 growth rate was calibrated to the relationship between the population growth and VMT from the AEO

# Transportation Sector Emissions Over Time

- Baseline scenario represents a business as usual future, with no state decarbonization policies included
- Reference scenario includes state policies as of May 2019
  - Both scenarios include significant efficiency improvements due to CAFE standard extensions through 2026
  - Reference scenario includes light duty zero-emission vehicle adoption consistent with the ZEV MOU, which reduces gasoline consumption and increases electric load



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# Opportunities for Decarbonization

# Pillars of Deep Decarbonization in Transportation

**Energy Efficiency and Conservation**

- Device Efficiency
  - Fuel economy improvements for on-road vehicles (e.g. CAFE)
  - Fuel economy improvements in aviation and marine
  - Embedded efficiency in switching from ICEs to ZEVs
- Reductions in VMT/capita
  - Transit
  - Smart growth
  - Mode shifting (walking/biking)

**Switching to Low Carbon Fuels**

- Electrification
  - Light-duty vehicles
  - Intra-city and short-haul freight
  - Port operations
- Hydrogen Vehicles
  - Light-duty vehicles
  - Long-haul freight
- Bioenergy*
  - Renewable Diesel
  - Renewable Gasoline
  - Renewable Jet Kerosene
  - Renewable Natural gas

**Decarbonizing Electricity Supply**

- Reducing indirect emissions associated with electrification
- Flexible vehicle charging to improve operations of the grid

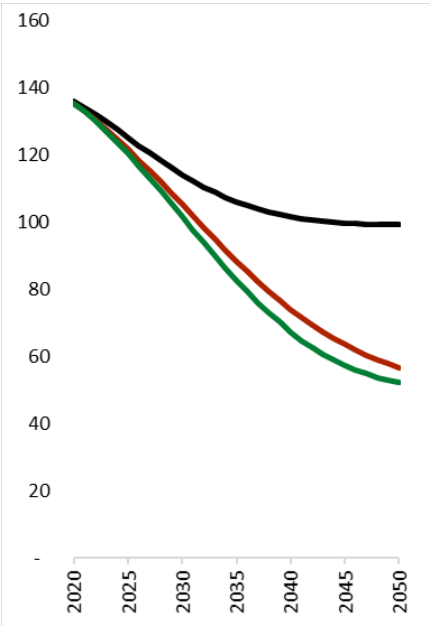
*Bioenergy feedstocks assumed to be carbon neutral

# Pillars of Carbon Neutrality

## Energy Efficiency and Conservation

[site energy consumed per person]

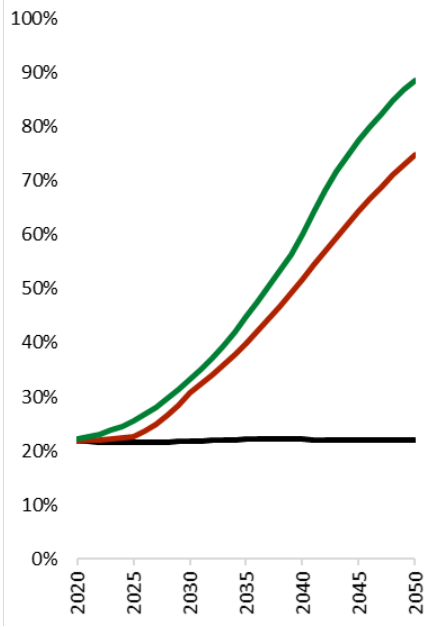
Unit: MMBTU/capita




## Switching to Low Carbon Fuels

[% site energy consumed as electricity, biofuels, hydrogen, synthetic fuels]

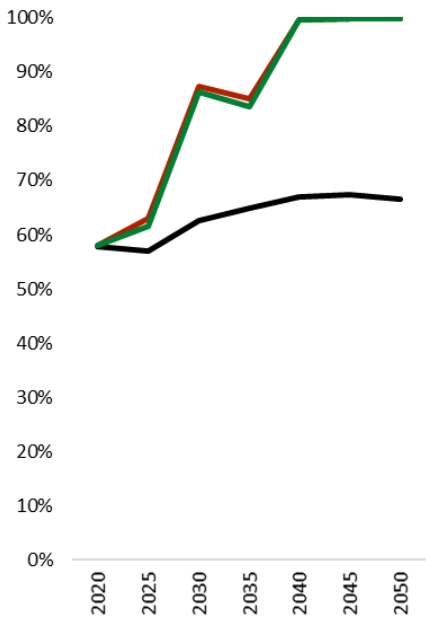
Unit: % site energy consumed




## Decarbonizing Electricity Supply

[% electricity supplied by wind, solar, hydro, nuclear, CCS, biofuels, hydrogen]

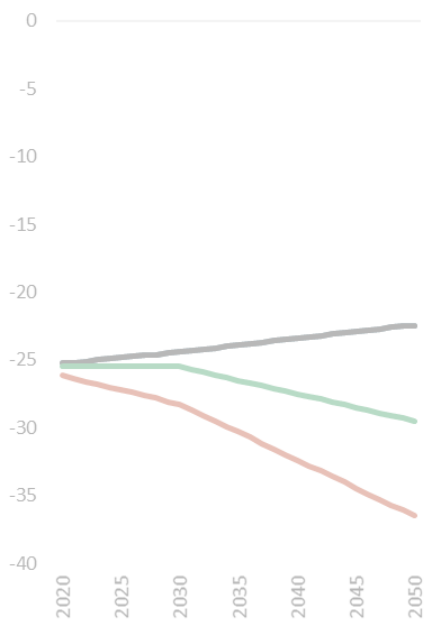
Unit: % electricity supplied




## Negative Emissions

[total emission reductions from net land use sink, BECCS, DAC]

Unit: MMT CO2e




Reference Case  High Technology Availability Pathway  Limited Non-Energy Pathway

# Opportunities for Decarbonization in Transportation

- Some decarbonization opportunities offer direct emissions reductions
  - Vehicle efficiency standards reduce fuel use, especially in the near to mid future
  - Smart growth, transit measures reduce total fuel consumption and shift towards more efficient devices (e.g., cars to subway)
  - Federal aviation efficiency and technology improvements (e.g., FAA CLEEN 2)
  - Zero-emission light-duty and medium-duty vehicles, and fuel switching for long-haul (hydrogen, renewable diesel)
  - Zero-emission port equipment for operations and to provide shore-to-ship power to reduce ship fuel consumption on site
- Some decarbonization opportunities interact with the rest of the energy system, and help system operate at low cost
  - Flexible vehicle charging helps reduce capital expenses required for the electricity sector

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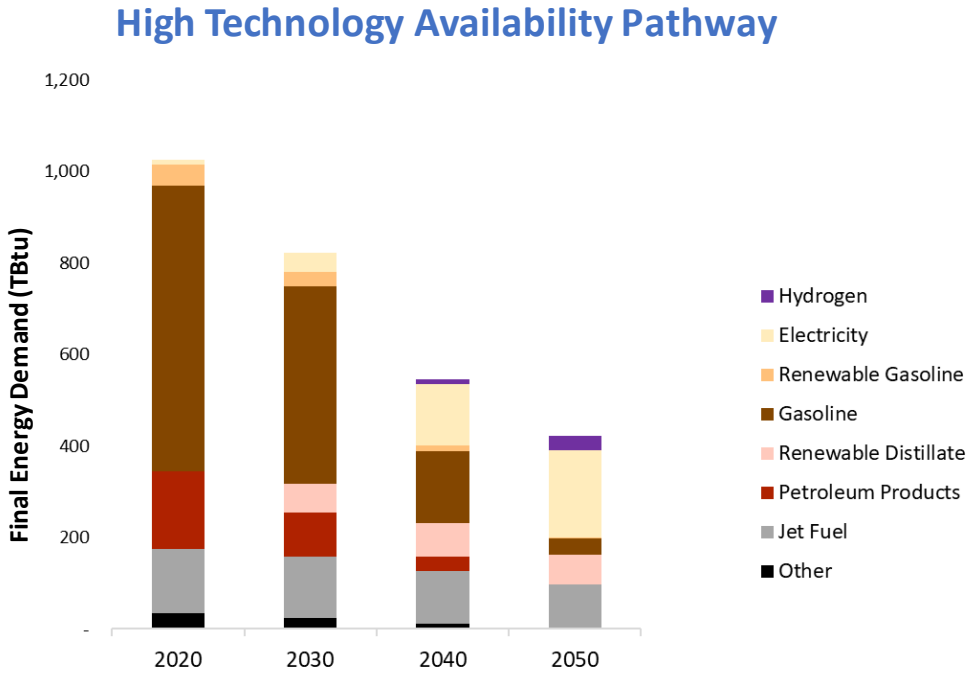
# Sectoral Findings

# Transportation

- Major shift to zero-emission vehicles across all vehicle classes
  - 60%-70% new light-duty vehicle sales, 35-50% medium- and heavy-duty vehicle sales by 2030, with increasing rates of adoption thereafter.
  - Mix of plug-in hybrid, battery electric, and hydrogen fuel cell vehicles, depending on vehicle class and duty cycle
  - Charging flexibility helps to maintain system-wide reliability
- Share of remaining combustible fuel use in medium- and heavy-duty fleets met by renewable fuels (*e.g.,* advanced biofuels or synthesized fuels)
- Energy use is reduced over time through increased vehicle efficiency and through substantial reductions in vehicle miles of travel through smart growth, transit, and other transportation demand management measures, including system-wide efficiency improvements
- Non-road transportation, such as marine, rail, and aviation, decarbonized through a combination of renewable fuel utilization, efficiency, and electrification

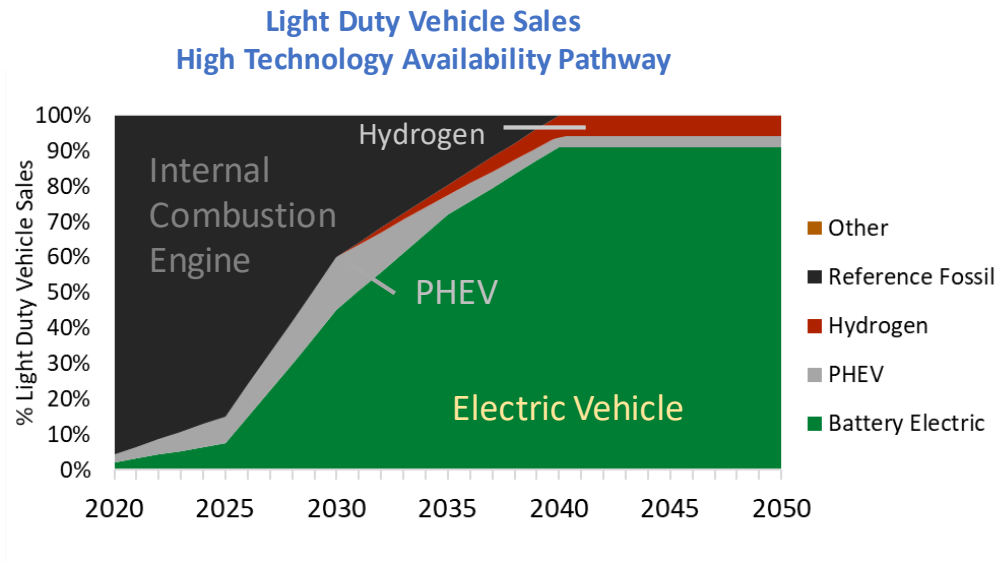


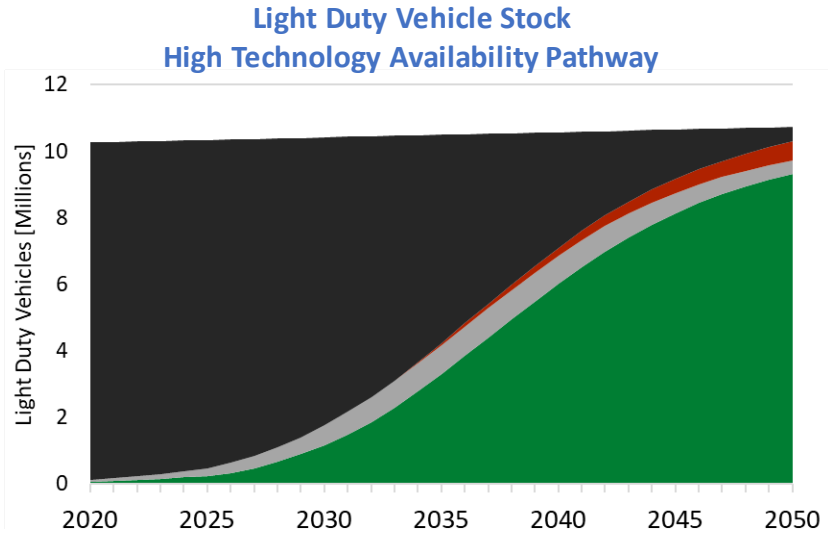

| Metric | 2030** | 2050** |
|---|---|---|
| Percent GHG emissions reduction* | 31%-33% | 86%-97% |
| Percent reduction in final energy demand* | 23%-24% | 63%-67% |

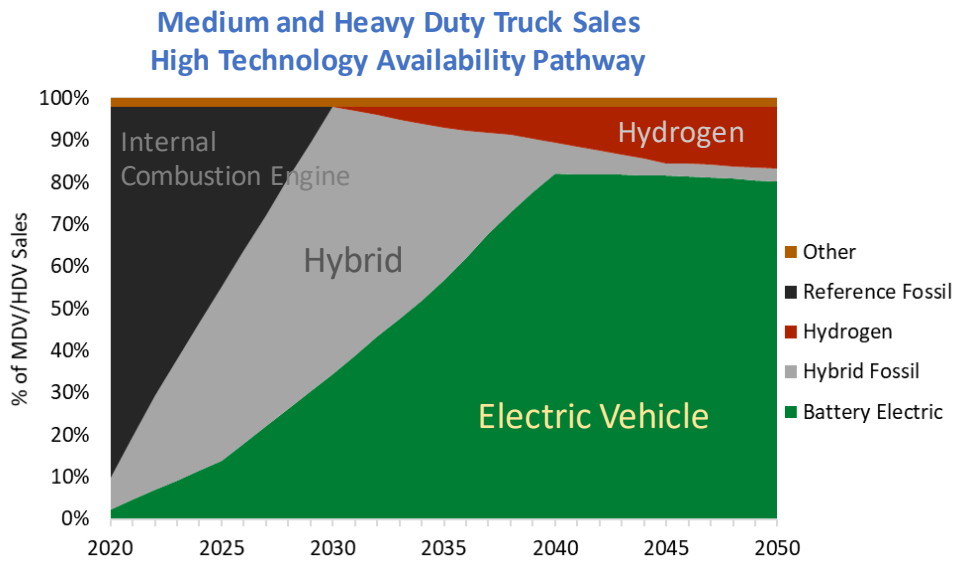
** Relative to 2016*

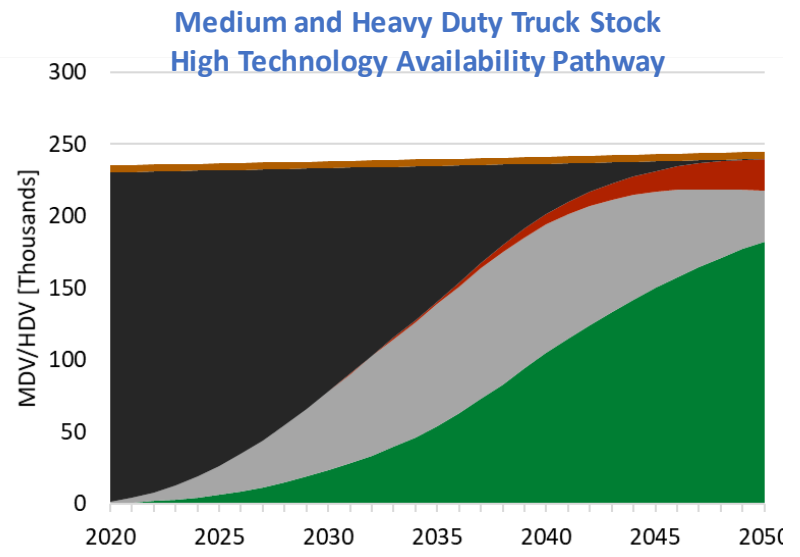
*** Range of values includes limited non-energy pathway*

# Timing of Vehicle Electrification



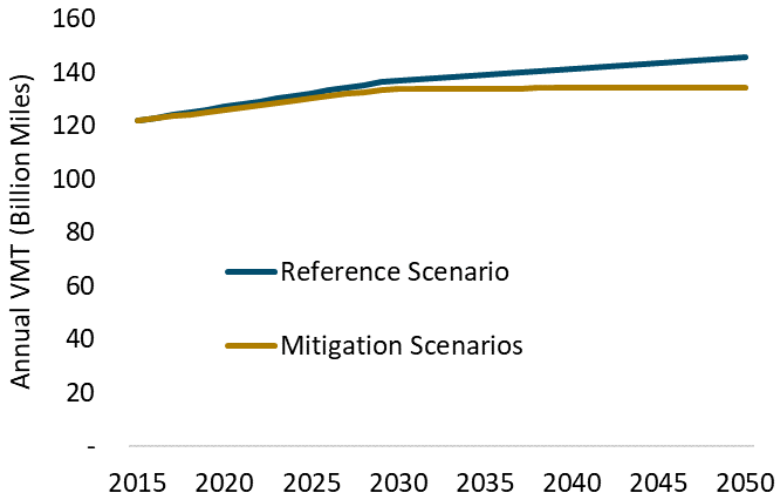



# VMT Reductions through Smart Growth, and Transit

- A variety of smart growth strategies and transportation mode-shifting measures reduce VMT and increase energy demand in transit modalities
  - These are based on analysis of various data sources, including USDOT Moving Cooler report, OneNYC report, data from Citi Bike and CEOs for Cities report
  - Strategies include expanded mass transit, increased density via land use planning, car sharing, mode shifting from cars to walking and biking
- Downstate region is currently more dense and has greater mass transit availability, with greater focus on reducing VMT through mode shifting (walking/biking); through densification and smart growth upstate region can achieve VMT reductions as well

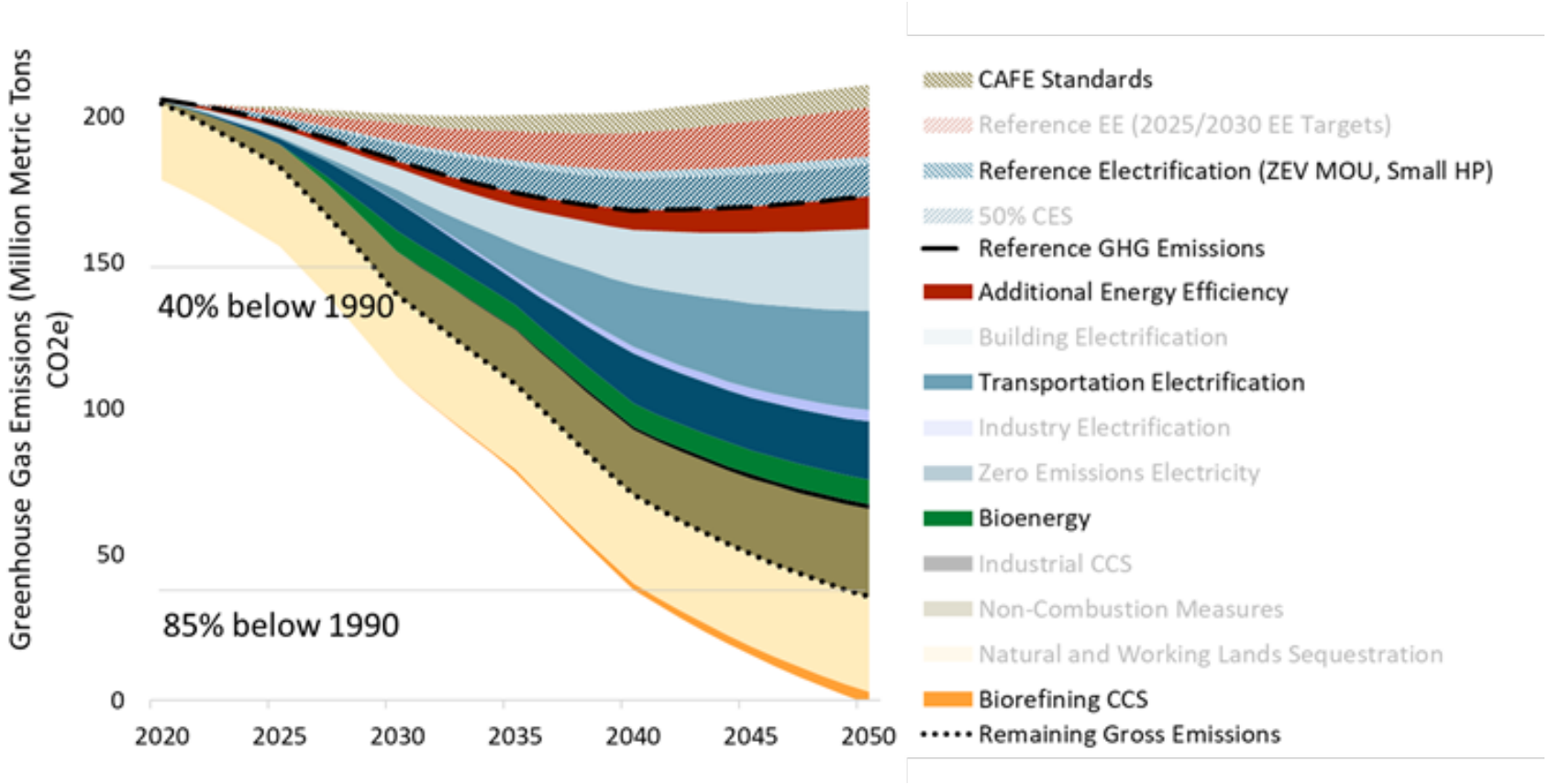
VMT reduction strategies included in PATHWAYS analysis

| Smart Growth Strategies (from USDOT Moving Cooler report) | Mode Shifting Strategies (from OneNYC report) |
|---|---|
| Density | Mass transit (bus and rail) |
| Diversity | Walking and biking |
| Design | |
| Destination Accessibility | |



# Emissions Reductions by Measure

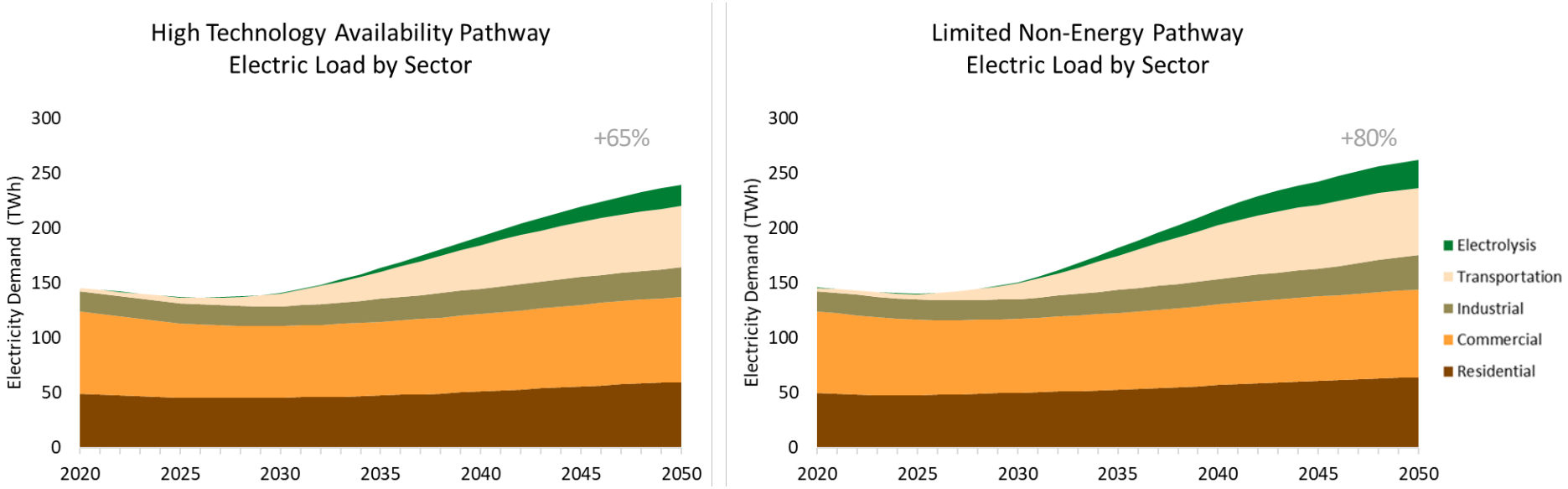
*High Technology Availability Pathway*




- Transportation measures make up significant portion of reductions to reach CLCPA goals

# Annual Electricity Demand

- Further decarbonization of the power sector only gets us a fraction of the way toward the economy-wide goal
- However, end-use electrification to eliminate GHG emissions drives increase in electric load
  - Analysis within range found in the literature, which project annual load increases ranging 20%-100% by midcentury
  - Range primarily reflects extent and timing of end-use electrification, with some studies assuming lower electrification and larger role for renewable gas and/or renewable transportation fuels



# Vehicle Charging Flexibility

- We assume that by 2050, 50% of light-duty EVs could charge flexibly and have access to chargers during the workday
  - This charging flexibility can reduce electric system costs
  - We have not modeled the ability for EVs to discharge back to the grid
- EV charging flexibility is based on electric system conditions, subject to driving demand and charger availability.
  - Driving demand is based on thousands of driving and charging trips in the region from NHTS

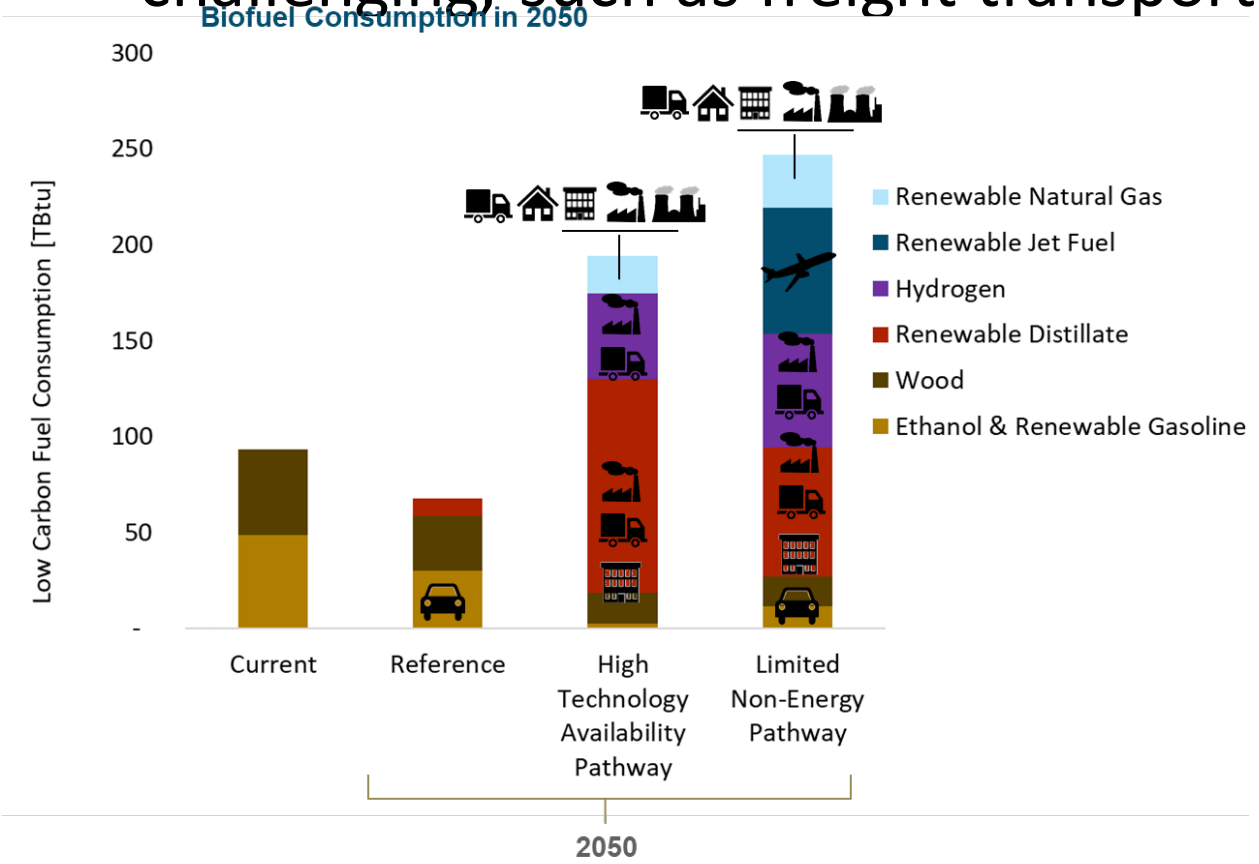
| Sector | End use category | 2030 - downstate (% flexible) | 2030 – upstate (% flexible) | 2050 - downstate (% flexible) | 2050 – upstate (% flexible) | Hours Shiftable Daily |
|---|---|---|---|---|---|---|
| Residential | Space Cooling | 10% | 10% | 60% | 60% | 3 |
| | Space Heating | 10% | 10% | 40% | 40% | 3 |
| | Water Heating | 10% | 10% | 40% | 40% | 3 |
| | Refrigerators | 20% | 20% | 60% | 60% | 2 |
| Commercial | Space Cooling | 20% | 20% | 60% | 60% | 3 |
| | Space Heating | 10% | 10% | 60% | 40% | 3 |
| | Water Heating | 10% | 10% | 60% | 40% | 3 |
| | Refrigeration | 20% | 20% | 60% | 60% | 2 |
| Transportation | LDV EVs | 25% | 25% | 50% | 50% | 12* |
| Other | Industry | 0% | 0% | 0% | 0% | 0 |
| | Electrolysis | 100% | 100% | 100% | 100% | 12* |
| | Direct Air Capture | 100% | 100% | 100% | 100% | 12* |

**Note:**

*This is a simplification for vehicle charging, electrolysis, and direct air capture. More details on the flexibility parameters and constraints of transportation, electrolysis, and direct air capture are provided in sections 7.6.3 and 7.6.4.

# Low-Carbon Fuels

- Advanced low-carbon liquid and gaseous fuels are key to decarbonizing sectors where electrification is challenging, such as freight transportation, aviation, and




+ **"Starting Point" pathways can achieve deep decarbonization using in-state feedstocks for advanced biofuels**

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# Next Steps

# Next Steps

- *Adding CLCPA GHG accounting viewpoint*
  - *Upstream emissions from imported fuels*
  - *20-year Global Warming Potential*
- *Review of performance and cost assumptions*
- *Incorporation of Panel input into integrated, economy-wide pathways analysis*

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# Questions?

# Panel Priorities To Inform Work Plan

# Elements of Work Plan

> Emission reduction goals for the sector

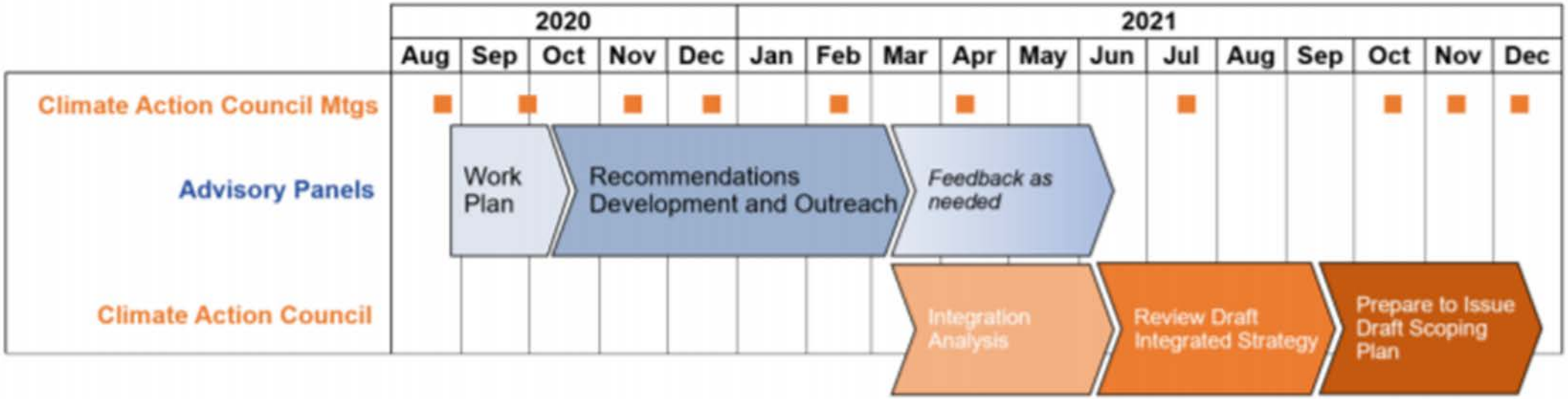
> Scope of Work

- Topics and issues
- Cross-sectoral issues and plans for cross-sectoral collaboration
- Plans for public meetings

> Timeline

# Timeline

- Cadence of meetings
- Climate Justice Working Group interaction
- Public meeting for stakeholder input



# Proposed Panel Timeline

| | October 2020 | November 2020 | December 2020 | January 2021 | February 2021 | March 2021 |
|---|---|---|---|---|---|---|
| **Milestones** | **Finalized Work Plan** | | **Briefing for CAC and CJWG on priority policies/ strategies** | | | **Final Recommendations to CAC** |
| **Meeting schedule** | | | | | | |
| **External Engagement** | Seek written input on priority policies/ strategies | Collaboration with outside experts | | Open public forum on priority policies/ strategies under consideration | | |
| **Meetings with CJWG and EJAP** | Seek written input on priority policies/ strategies | | | Seek input on priority policies/ strategies under consideration | | |
| **Briefings of Council** | Present Work Plan | Seek input on priority policies/strategies and progress towards Recommendations | | | Seek input from Council on progress | Present Recommendations |

# Discussion of Panel Priorities

> To inform workplan development

> Discussion will cover:

- Subject areas to explore to inform Scope of Work
- Engagement with experts, other panels/work groups and public

# Transportation Advisory Panel Members

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NYSDOT

**Jared Snyder**
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Nancy Young, Airlines for America

Bob Zerrillo, New York Public Transit Association

# Next Steps

*For Discussion*

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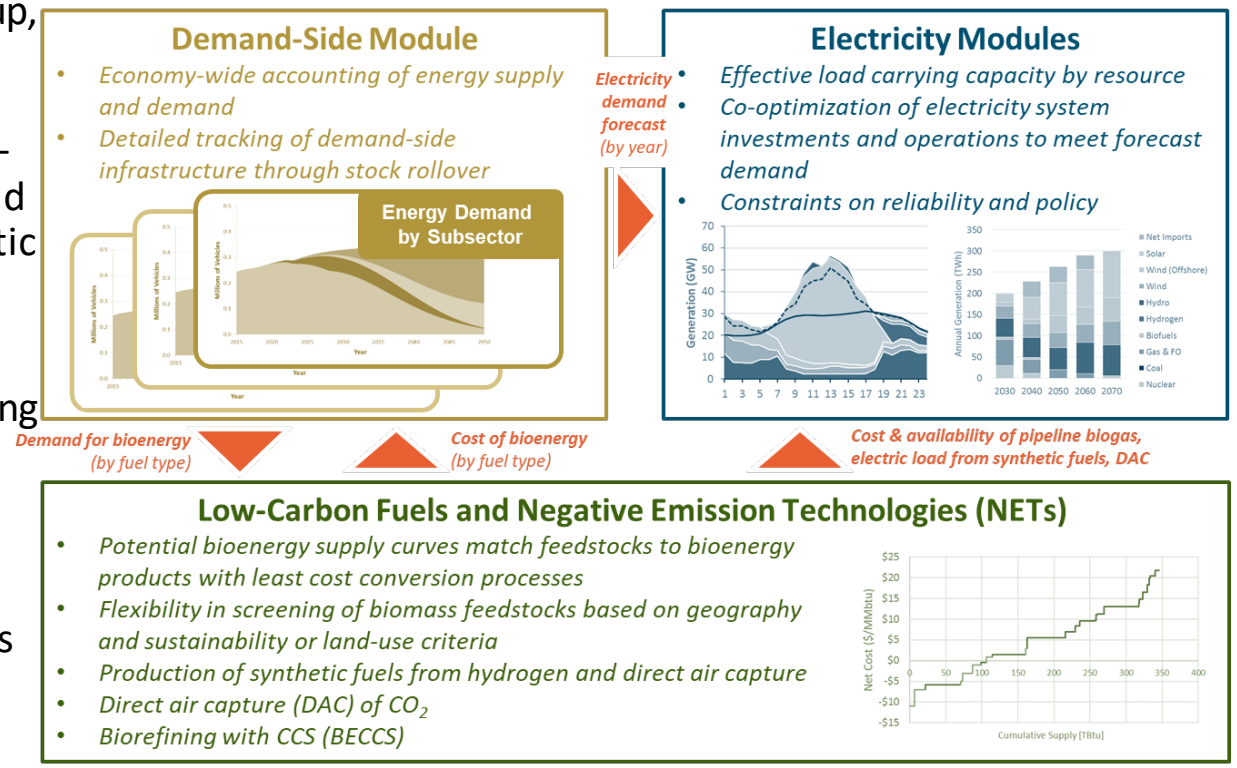
# Appendix

# Model Framework

- Pathways analysis uses bottom-up, user-defined scenarios to test "what if" questions—or "backcasting"—to compare long-term decarbonization options and allows for development of realistic & concrete GHG reduction roadmaps.
- Bottom-up stock rollover modeling approach (based on EIA Nat'l Energy Modeling System and NYS-specific inputs) validated with top-down benchmarking (NYS actuals and forecasts)




+ Model framework incorporates **interactions** between demand- and supply-side variables, with constraints and assumptions informed by existing analyses of resource availability, technology performance, and cost

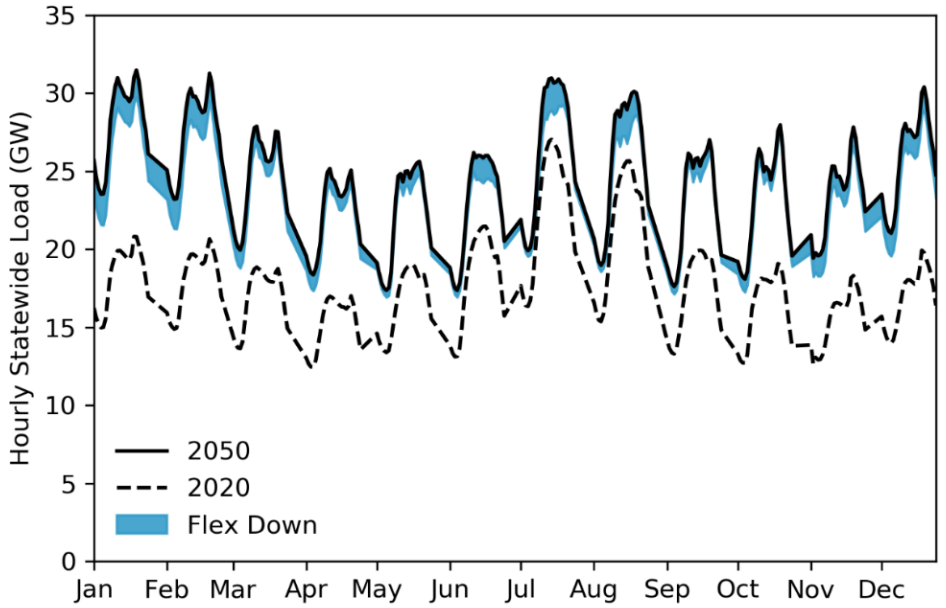
# Key Assumptions

| Sector | Strategy | Expressed as | Reference | High Technology Availability | Limited Non-Energy |
|---|---|---|---|---|---|
| Transportation | Corporate Average Fuel Economy (CAFE) Standards | LDV fuel economy | Extended 2021-2026 | *Same as Reference* | *Same as Reference* |
| | Smart Growth | LDV VMT reduction relative to Reference | None | 3% by 2030,<br>9% by 2050 | *Same as HTA* |
| | Aviation Efficiency | Efficiency increase relative to Reference | None | 10% by 2030,<br>40% by 2050 | *Same as HTA* |
| | Vehicle Electrification | ZEV sales share | LDA: 25% by 2025;<br>LDT: 8% by 2025;<br>MDV/Bus: 2% by 2050 | LDV: 60% by 2030, 100% by 2040;<br>Bus: 60% by 2030, 100% by 2040;<br>MDV/HDV: 35% by 2030; 95% by 2040 | LDV: 70% by 2030, 100% by 2035;<br>Bus: 70% by 2030, 100% by 2035;<br>MDV/HDV: 50% by 2030; 95% by 2040* |
| Zero Emissions Fuels | Bioenergy Availability | Feedstocks supply | Reference Projection (~70 TBtu) | In-state feedstocks (~150-200 TBtu) | *Same as HTA* |
| | Biofuels Blend | Share of conventional fuel use replaced with biofuels | 7% aggregate ethanol blend for gasoline, | 100% renewable gas in CNG vehicles by 2030,<br>40% renewable diesel by 2030,<br>~100% renewable diesel by 2050 | 100% renewable gas in CNG vehicles by 2030,<br>40% renewable diesel by 2030,<br>100% renewable diesel by 2050,<br>100% renewable gasoline by 2050,<br>68% renewable jet kerosene by 2050 |

* Annually retire up to 5% of existing stock early, beginning in 2040 and continuing through 2050 as needed

# Peak Electricity Demand

- NYS shifts from summer peak to winter peak around 2040, driven primarily by electrification of heating in buildings and EV battery use
- Flexibility in electric vehicles and building loads can significantly reduce peak demands and the need for new generation capacity
- Flexible loads can also serve a similar role to battery storage, shifting demand to times of high renewables output

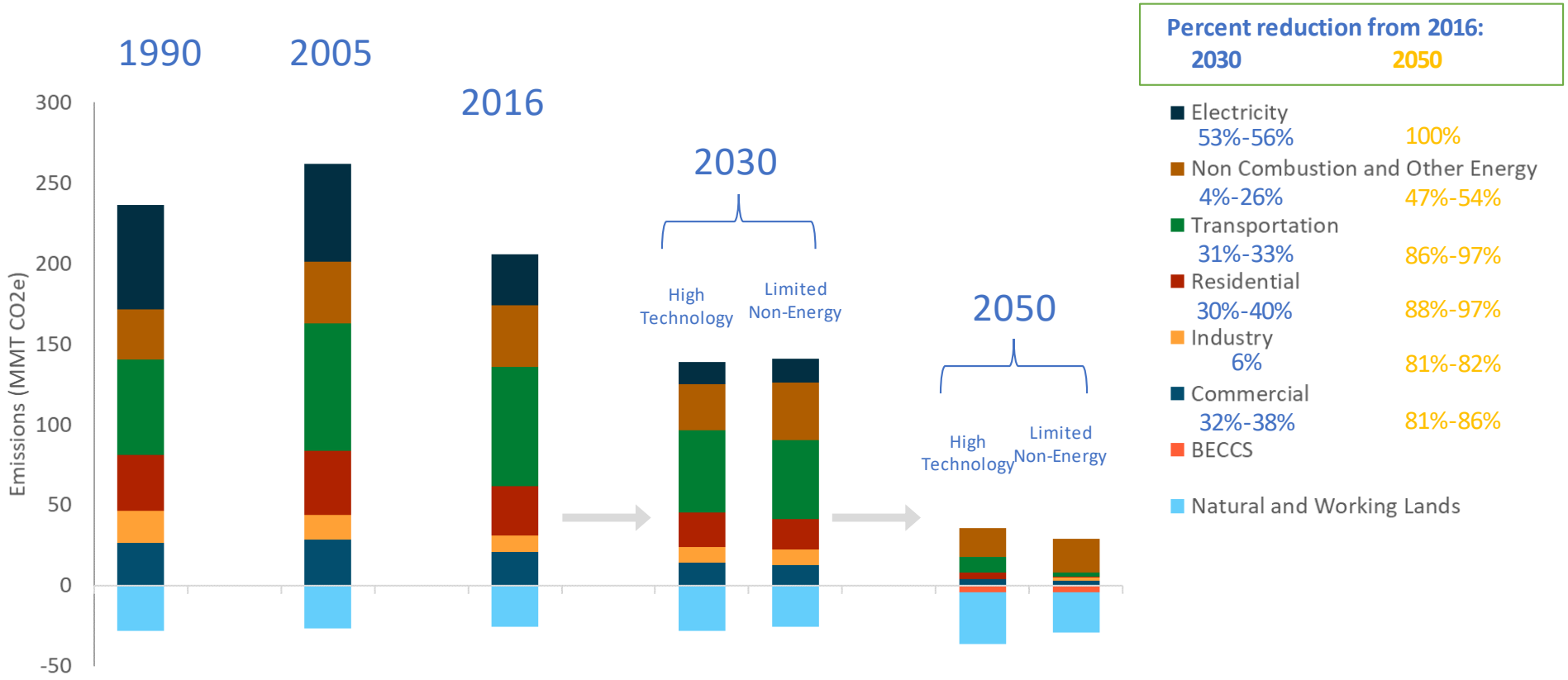



Note: the chart above contains a 24-hour set of hourly loads for each month, representing an approximate monthly average hourly load; as a result, the chart above will not capture seasonal peaks. The "flex down" area represents the portion of load that can be reduced in that hour and shifted to other times of day.

# Greenhouse Gas Emissions

## New York Net Greenhouse Gas Emissions for Selected Years by Scenario

*Note: CO2e calculations do not fully reflect methodology required by CLCPA*



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