

Transportation Advisory Panel

Meeting 7

January 21, 2021

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**Climate Action
Council**

Agenda

- Welcome/Introductions - Commissioner Dominguez/Jared Snyder
- Report out on Market Based Measures/Finance Roundtable – Paul Allen
- State of Transportation Electrification in NYS - Cadmus
- Report out from Panel sub-work groups – Panelists
- Open Panel discussion on Policy Recommendations – Julie Tighe & Others
- Next Steps - Commissioner Dominguez/Jared Snyder

Meeting Procedures

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

- Panel members should be on mute when not speaking
- Video is encouraged for Panel members, in particular when speaking
- We will not be muting individuals for this discussion; the chair will call on members individually, at which time please unmute
- If technical problems arise, please contact: Jesse.Way@cadmusgroup.com

Panel Member Roll Call

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Transportation Advisory Panel Members

**Marie Therese
Dominguez, Chair**
NYSDOT

Jared Snyder
NYSDEC

Paul Allen, M. J.
Bradley &
Associates

Dimitris Assanis,
Stony Brook
University

Steve Finch, AAA
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Albert Gore III, Tesla

Kendra Hems,
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Elgie Holstein,
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Rena Reynolds,
New York City
Environmental
Justice Alliance

Porie Saikia-Eapen,
Metropolitan Transit
Authority

John Samuelson,
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

Market Based Measures/Finance Roundtable Report Out & Discussion



CADMUS

Transportation Advisory Panel: *Clean Transportation Roadmap Update*

January 21, 2021

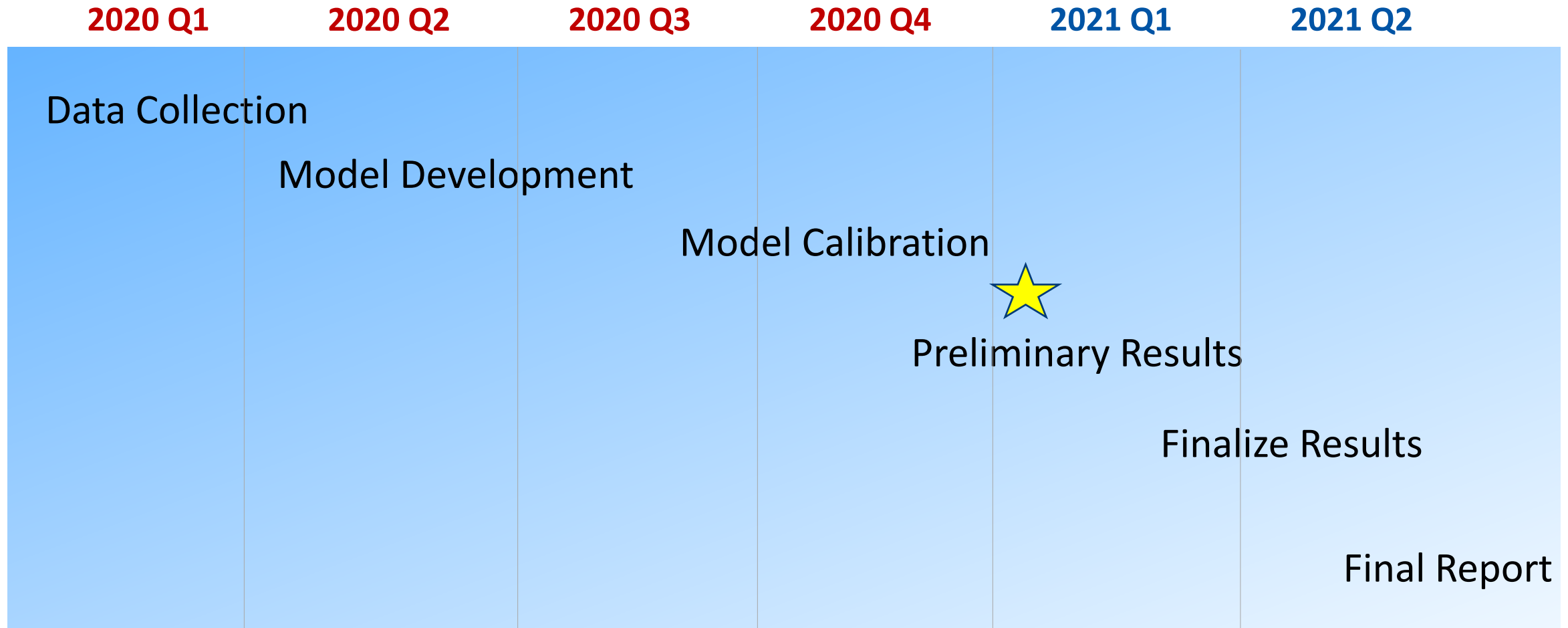


Agenda

- 1. Project Status**
2. State of Transportation Electrification in NYS
3. GHG Projections: Reference Case
4. Policy Insights

Status of NYS Clean Transportation Roadmap

Model calibration complete. Currently generating preliminary results.



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- 2. State of Transportation Electrification in NYS**
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State of TE | Barriers to Electrification

Barriers depend on vehicle type; generally higher for non-light-duty vehicles.

Barrier	Light-Duty Vehicles	Medium- Heavy-Duty Vehicles	Non-Road (Aviation, Marine, Rail, Off-Road)
Initial purchase price	Medium	High	High
Electrical infrastructure impacts	Medium	High	High
Reduction in payloads	--	Medium	Medium
Cost depreciation	Medium	Medium	Unknown
Insufficient model availability	Medium	High	High
Vehicle range anxiety	High	Medium	High
Residential charging access and infrastructure	Medium	--	--
Complex public charging access	Medium	Medium	Low
Awareness and education barriers	High	Medium	Medium
Lack of interoperability of equipment	Medium	Medium	Unknown
Cold weather	Low	Medium	Unknown
Stock turnover	Low	Medium	High
Long charge times	Medium	Medium	High
Battery recycling challenges	Low	Low	Low

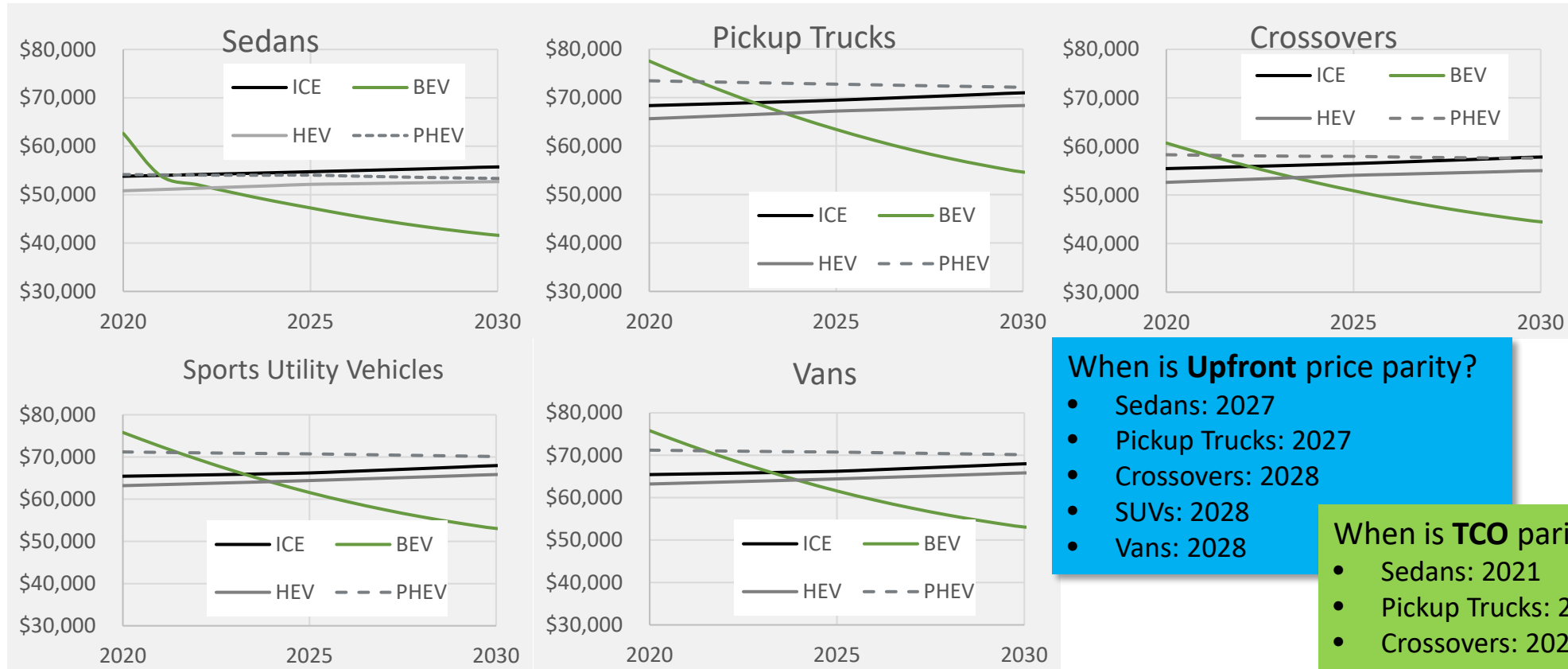
Source: Author analysis

Low / Medium / High refer to the difficulty of electrifying a given vehicle type based on level of complexity, cost, risk, etc.

State of TE | Costs of Electric Vehicles

Price parity / TCO parity between EVs and ICEVs expected this decade for light-duty vehicles.

Total Cost of Ownership



When is **Upfront** price parity?

- Sedans: 2027
- Pickup Trucks: 2027
- Crossovers: 2028
- SUVs: 2028
- Vans: 2028

When is **TCO** parity?

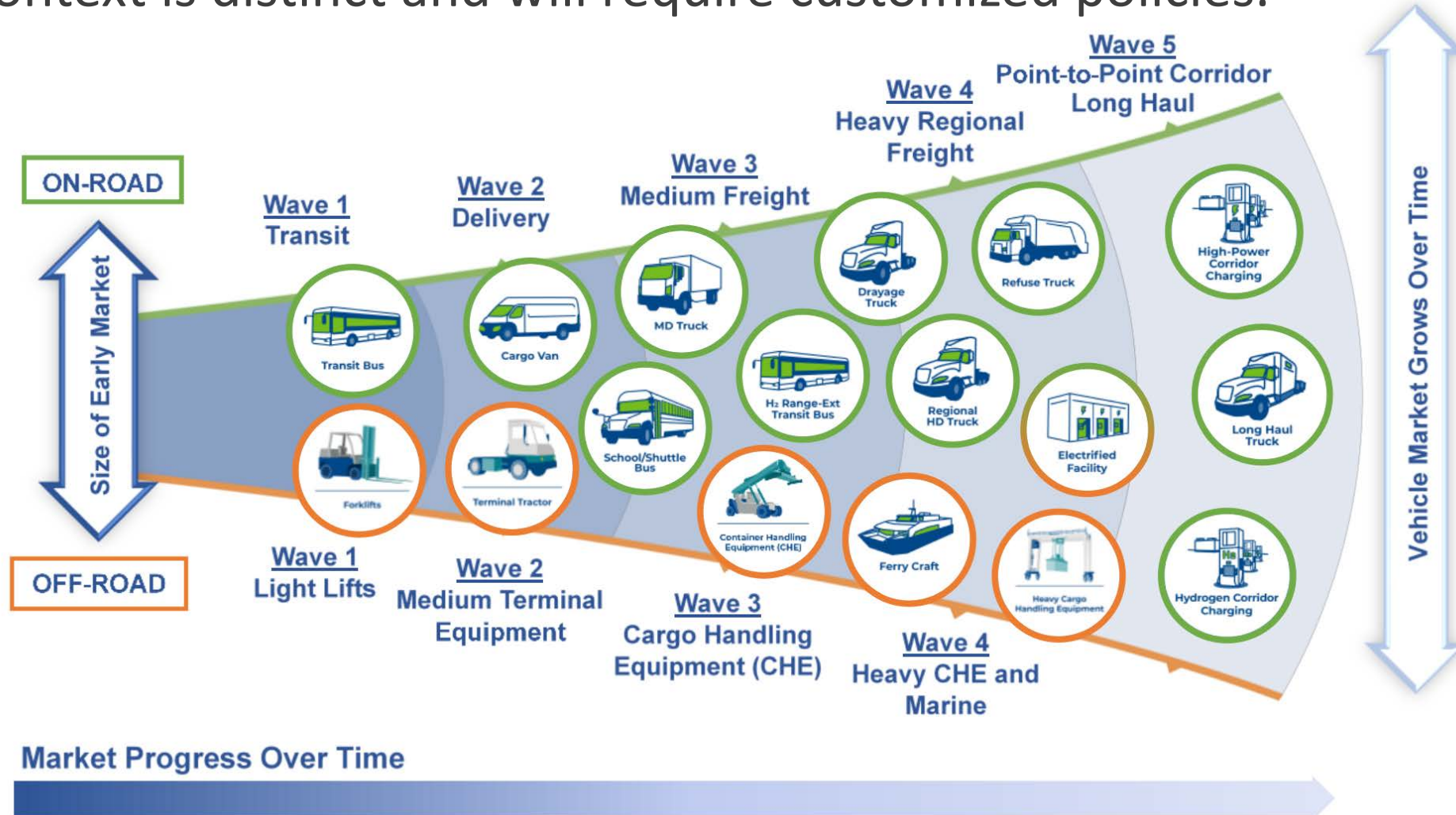
- Sedans: 2021
- Pickup Trucks: 2023
- Crossovers: 2023
- SUVs: 2024
- Vans: 2024

Sources:

- 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>

State of TE | MHDV and Off-Road Sub-sectors

MHDV context is distinct and will require customized policies.

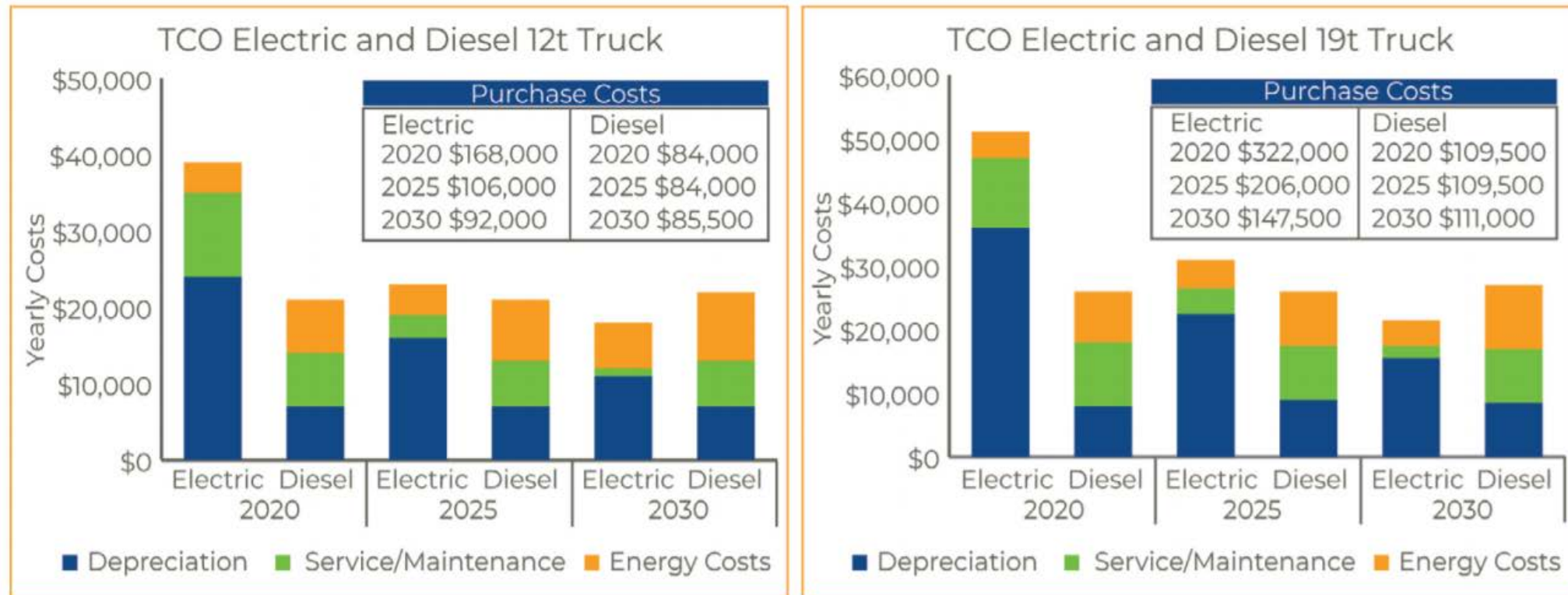


Source: CALSTART and FIER Automotive & Mobility (October 2020) <https://globaldrivetozero.org/site/wp-content/uploads/2020/12/Moving-Zero-Emission-Freight-Toward-Commercialization.pdf>

State of TE | MHDV and Off-Road Sub-sectors

Many MHDV categories will become cost competitive by 2030 (on TCO basis). Fleets will need support to make the shift to electric even at cost parity because of the risk associated with adopting new technologies.

Example TCO analysis of cargo trucks (left) and medium-duty trucks (right)



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

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2. State of Transportation Electrification in NYS
- 3. GHG Projections: Reference Case**
4. Policy Insights

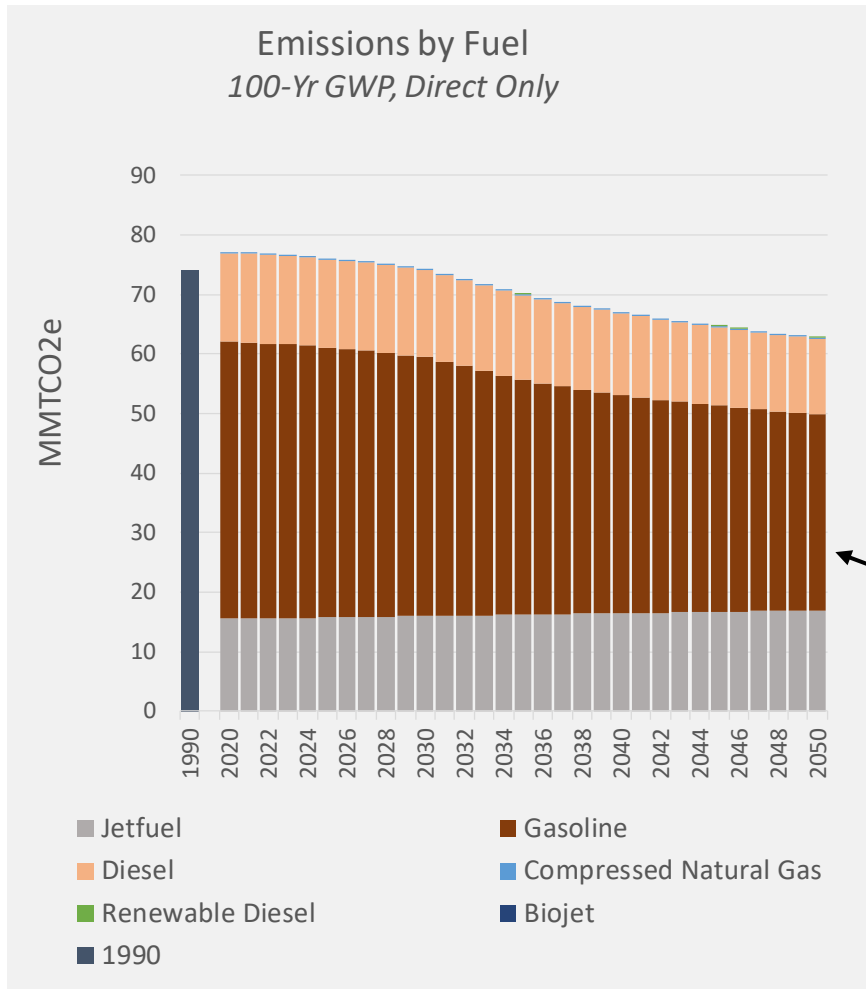
Reference Case | Narrative Description

Reference Case assumes continuation of current policies, programs, and market trends.

	Category	Description
Socioeconomic & Lifestyle	Urbanization/ De-urbanization	New York State does not change its level of urbanization.
	Economic Activity	The global economy grows at rates consistent with historical trends.
	Equity	Equity continues to be a central social issue.
	Consumer/Corporate/ Institutional Behavior	COVID-19 results in no long-term structural shifts. E-commerce continues to grow at rates consistent with historical trends.
Policies & Institutions	Population	Population grows according to Cornell University population projections.
	Federal Action	CA's Clean Air Act waiver is maintained. National fuel economy standards aligned with Obama-era standards.
	State Action	NYS EV incentives persist at same levels. No new transportation electrification policies are introduced beyond those that exist today.
Technological Change	Mobility Options	SAVs do not gain traction. Micro-mobility (such as e-scooters) grows slowly over time.
	Energy Supply & Delivery	EV battery costs decline consistent with historical trends. Fuel prices stay at approximately today's levels.

Reference Case | Transportation GHG Emissions

In Reference Case, GHG emissions decline by -0.5% per year relative to today / 1990 levels. Future GHG reductions driven by light-duty vehicles.

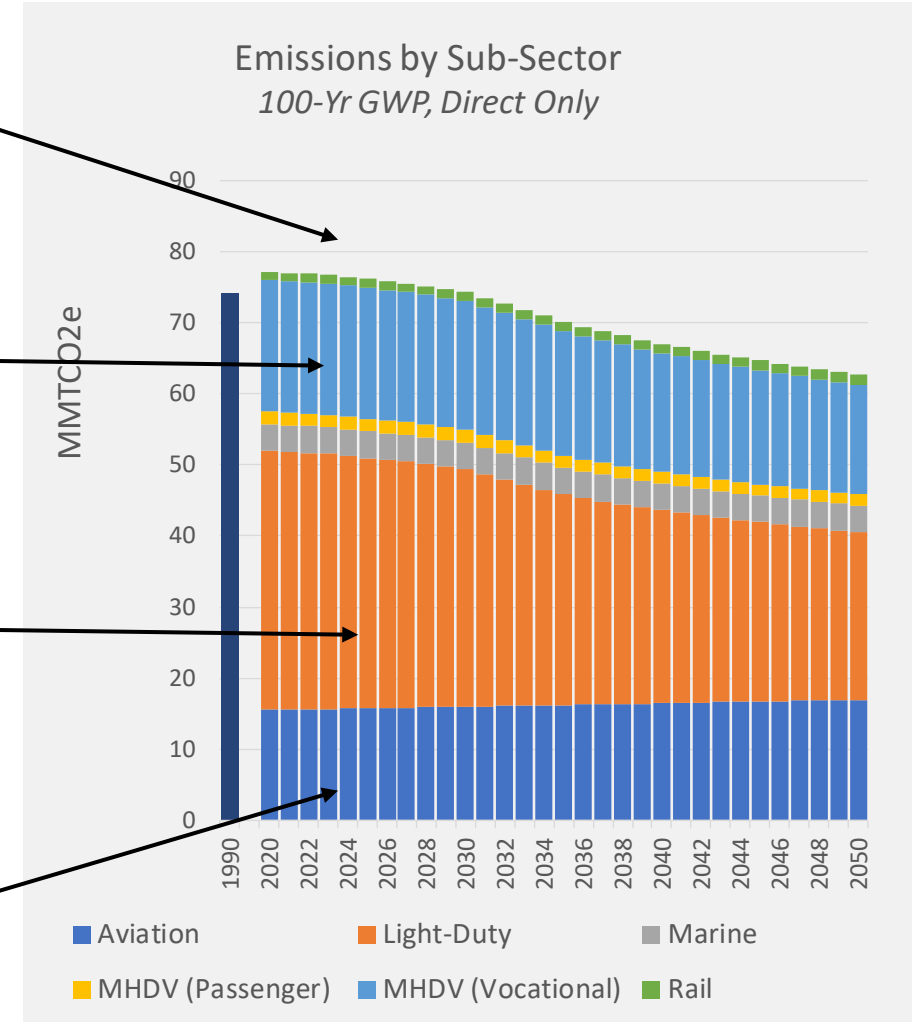


Insight: Emissions are relatively flat through 2030 then decline slowly to 2050.

Insight: MHDV emissions have largest growth

Insight: Emission reductions greatest in gasoline / LDVs

Insight: Aviation emissions increase due to demand increases



*Figure only shows direct emissions (i.e., electricity not included)
Source: Cadmus analysis with NY-VISION tool

Reference Case | Light-Duty Vehicles

Fuel economy improvement and shift to EVs has larger impact on GHG emissions than VMT increases.

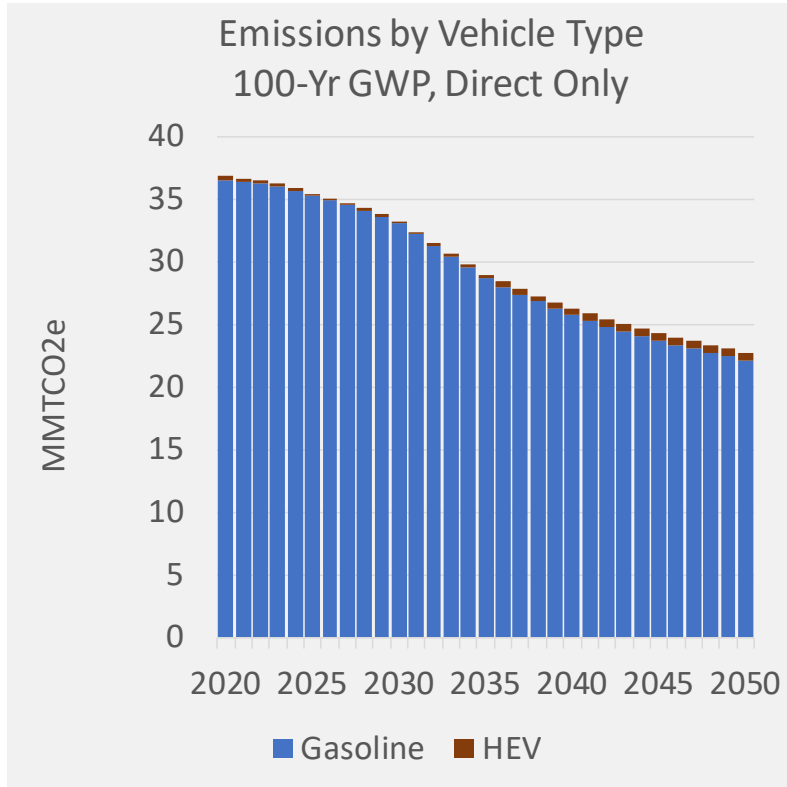
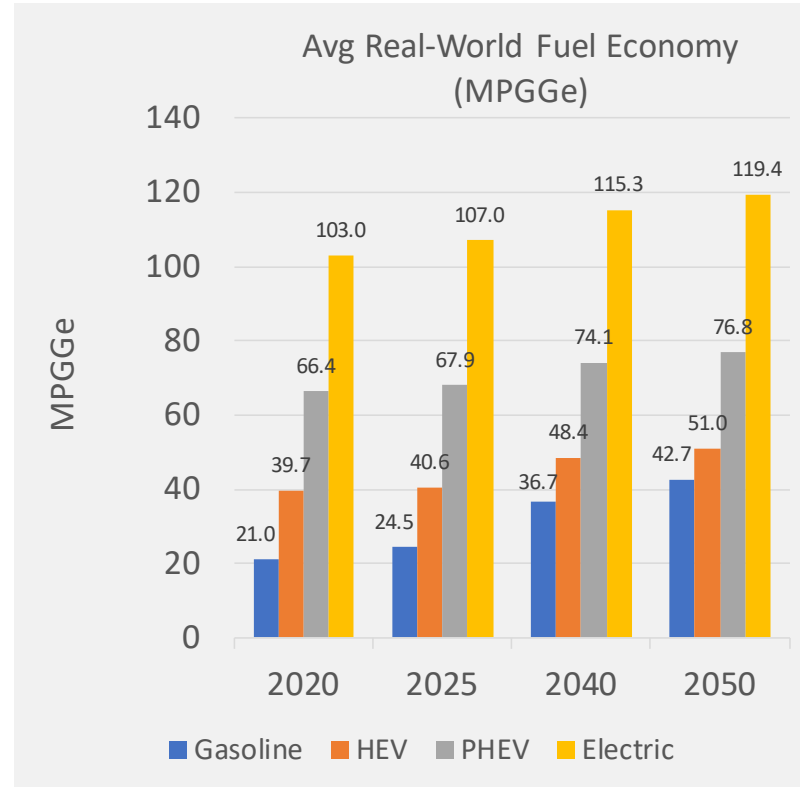
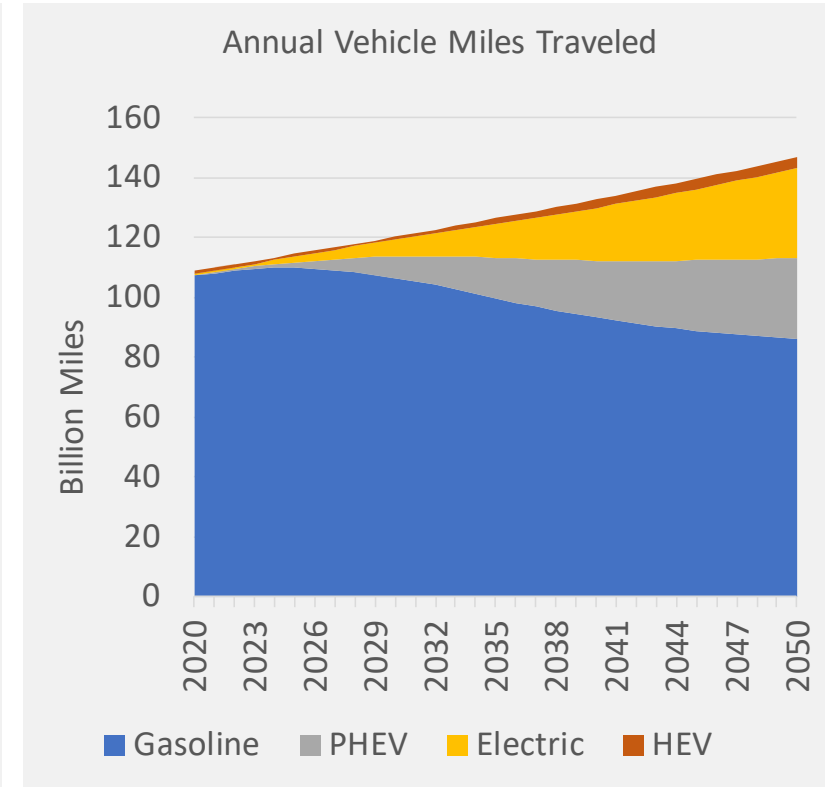


Figure only shows direct emissions (i.e., electricity not included)
Source: Cadmus analysis with NY-VISION tool



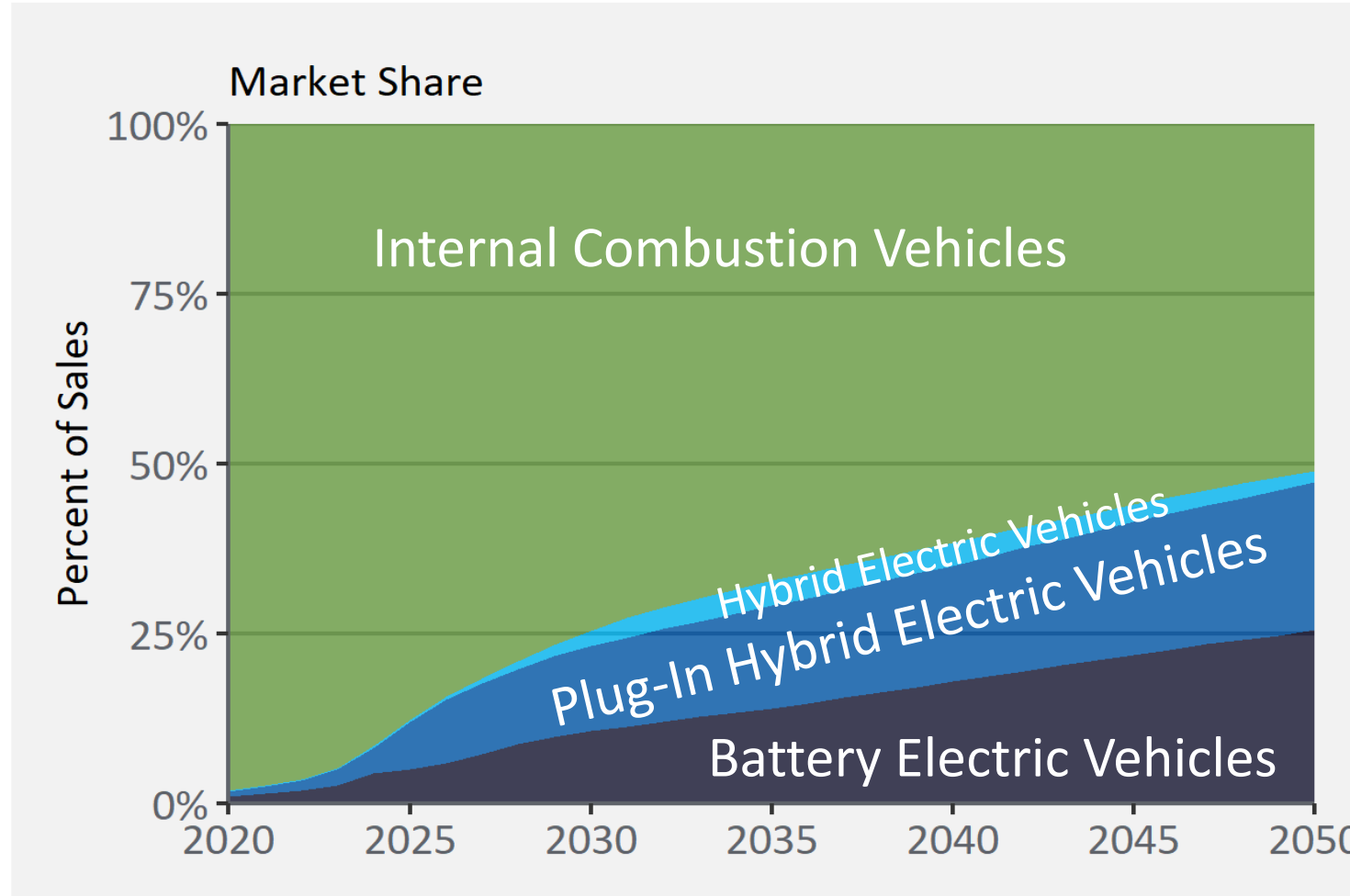
Source: Cadmus analysis of MOVES model and AFLEET tool



Source: Cadmus analysis of VE-State model

Reference Case | Light-Duty EV Sales

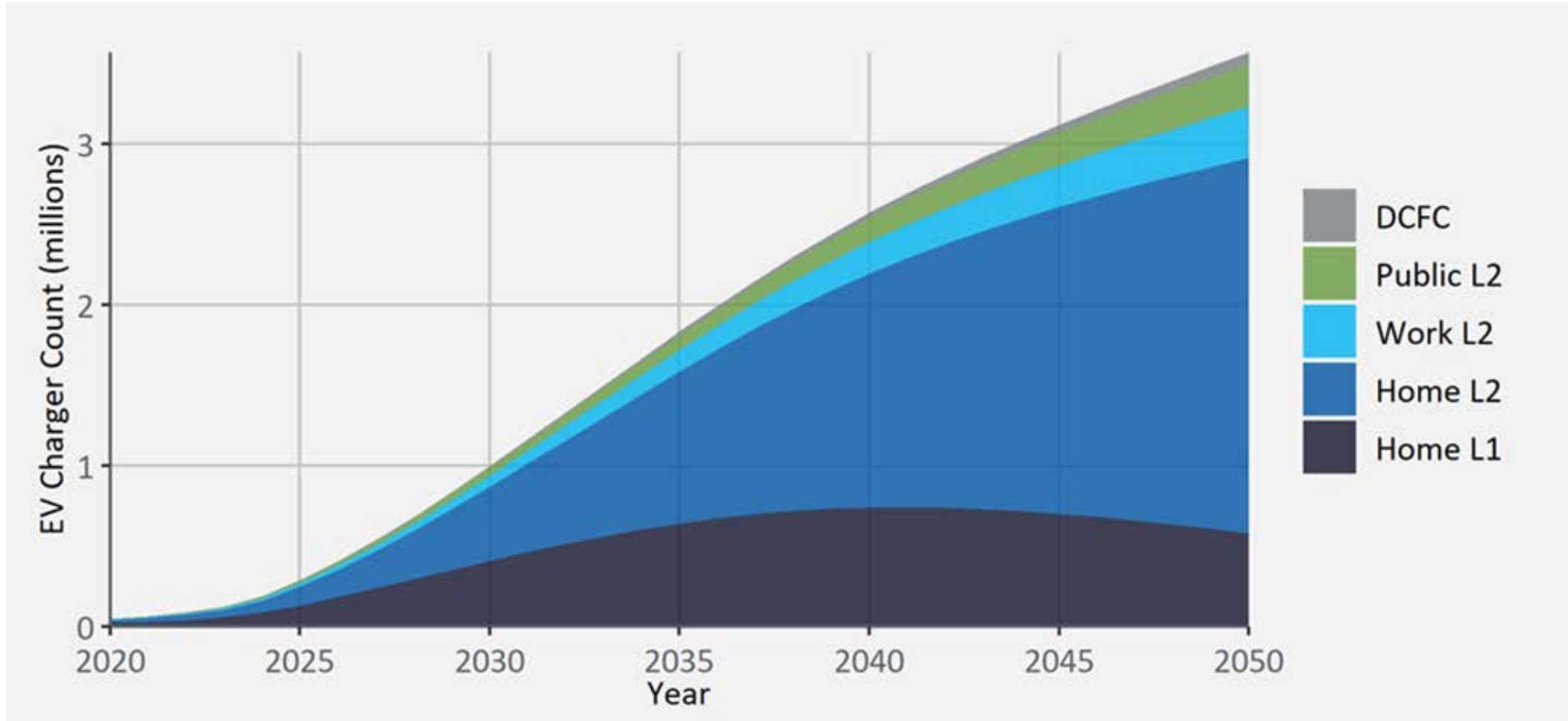
BEV+PHEV new sales share grows from ~2% today to 24% by 2030 and 48% by 2050. Growth to 2025 aligned with ZEV Mandate. After 2025, growth driven by battery cost reductions



Source: Cadmus analysis using customized NY vehicle choice model

Reference Case | EVSE Projections

Even in a Reference Case, residential charging plugs grow to nearly 3 million by 2050; public charging plugs grows to nearly 1 million.

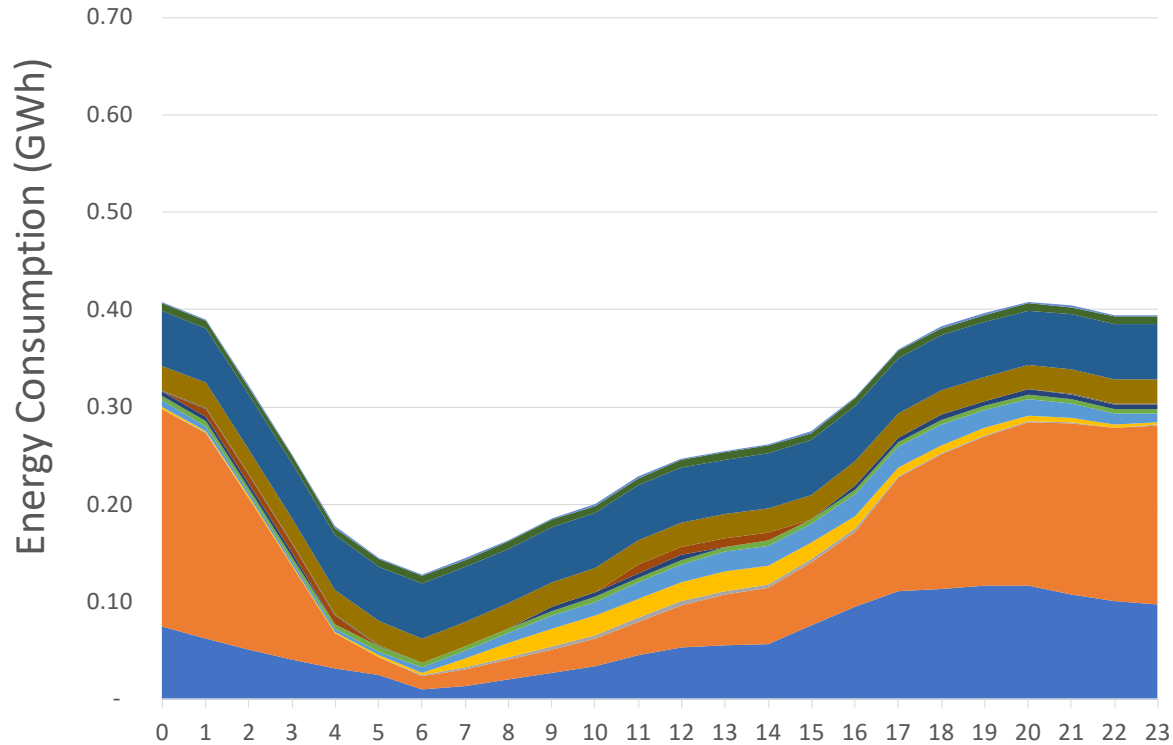


Source: Cadmus analysis using EVSE accounting tool

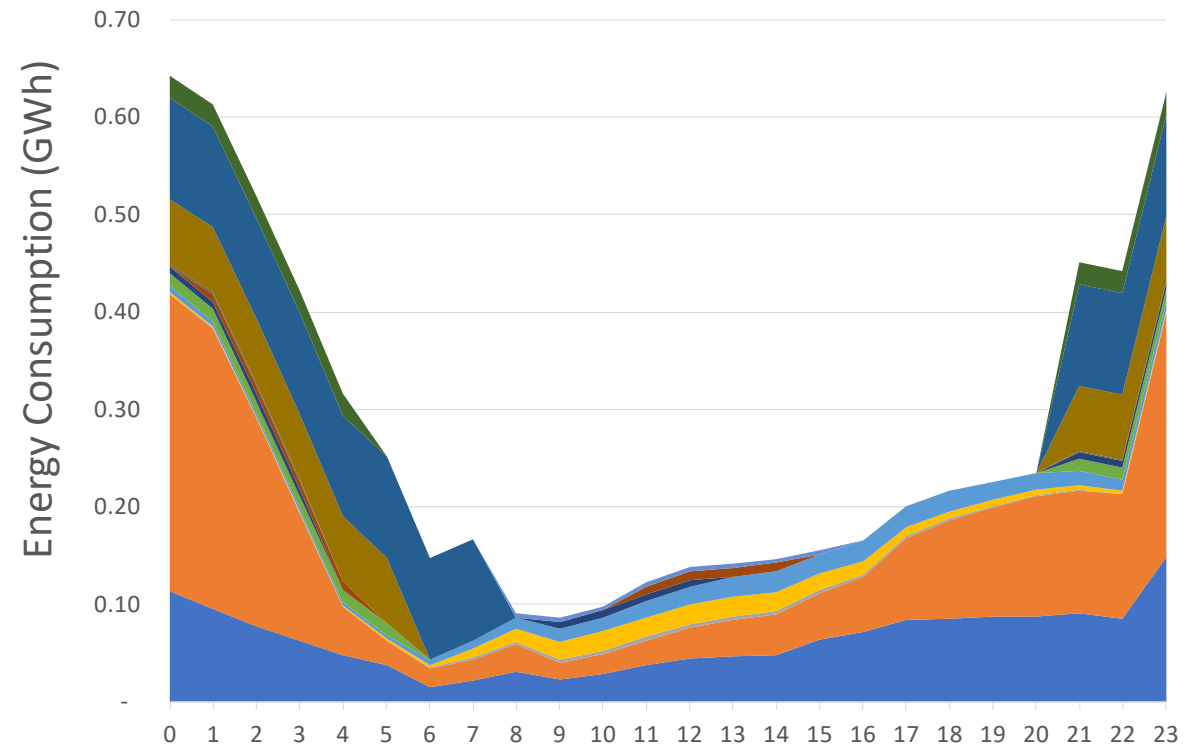
Reference Case | Load Profiles for Un/managed Charging

Unmanaged charging for all on-road vehicles results in high peaks

2030 On-Road Electric Load - Unmanaged



2030 On-Road Electric Load - Managed

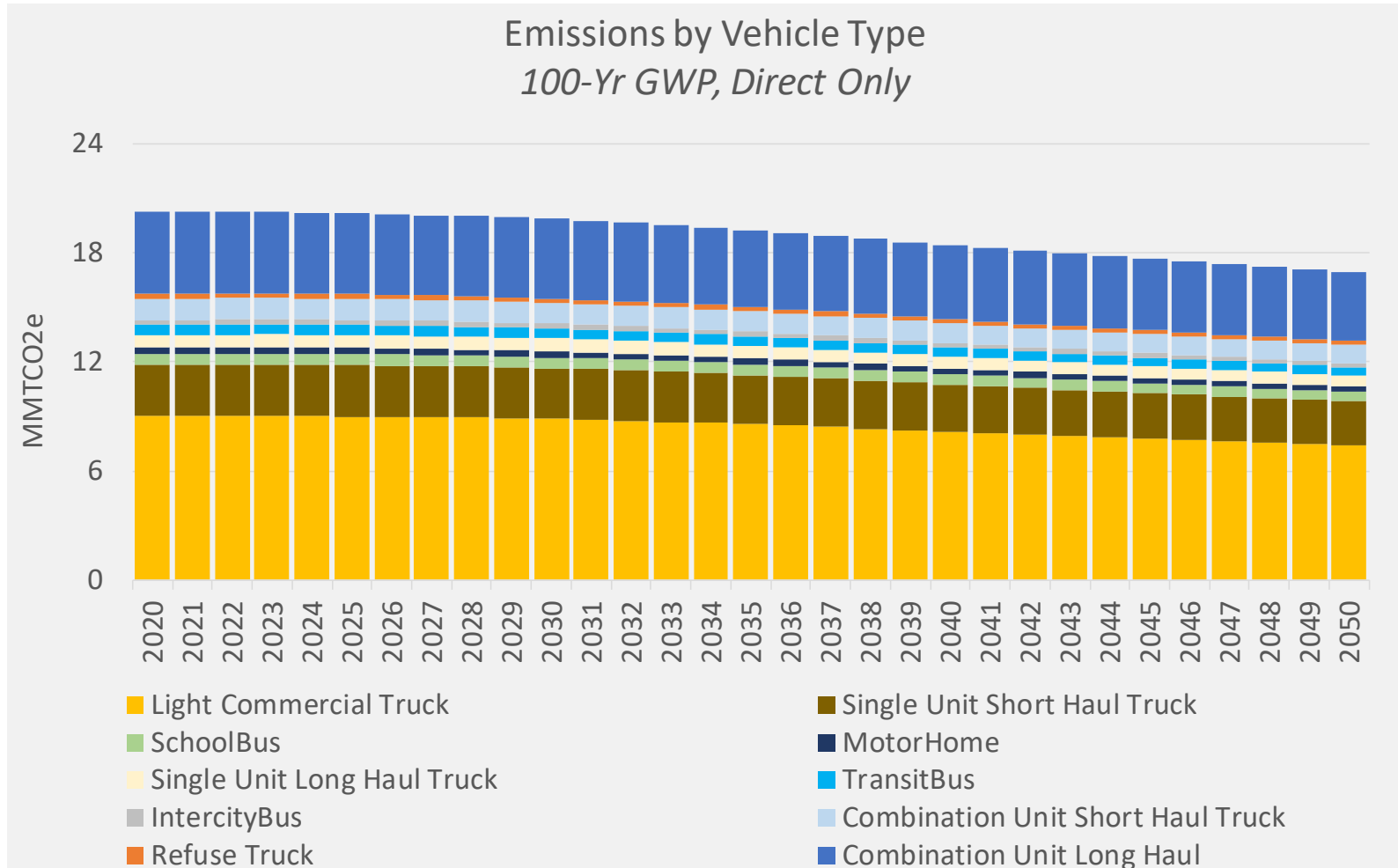


- LDV Residential-L1
- LDV Residential-L2
- LDV Public-L2
- LDV Work-L2
- LDV Public-DCFC
- Light Commercial Truck
- SchoolBus
- Refuse Truck
- Combination Unit Short Haul Truck
- Combination Unit Long Haul
- Single Unit Long Haul Truck
- TransitBus
- Single Unit Short Haul Truck

Source: Cadmus analysis using EVSE accounting tool

Reference Case | Medium/Heavy-Duty Vehicles

GHG emissions decline by -0.6% per year (16% total) relative to today, driven largely by vehicle efficiency improvements.

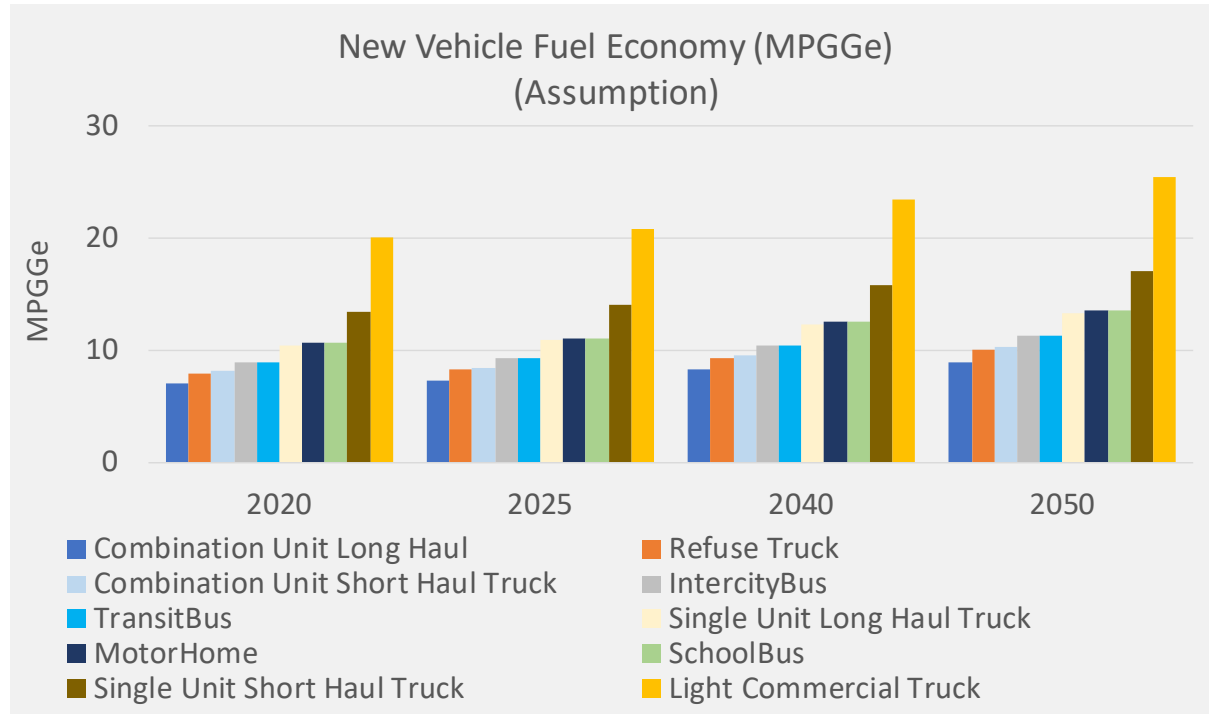


Source: Cadmus analysis using NY-VISION tool

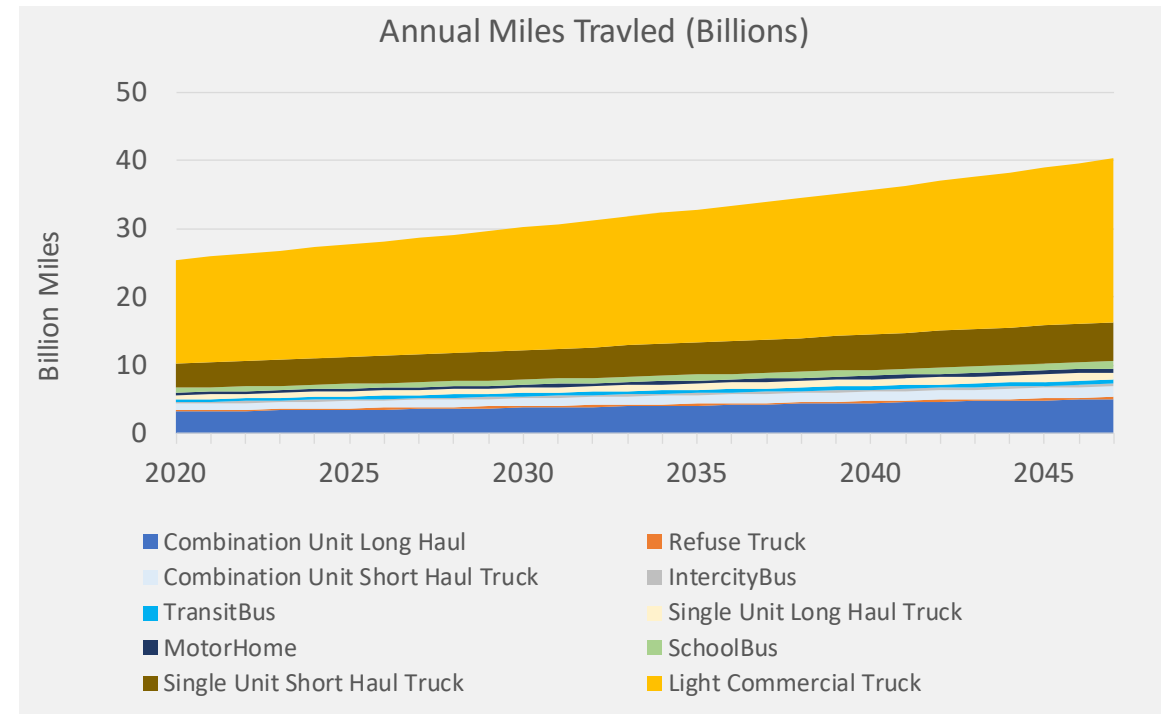
Reference Case | MHDV Fuel Economy & VMT

VMT increases by +0.6% to +4.2% per year depending on vehicle type.

Fuel economy increases by +0.3% to +0.8% per year



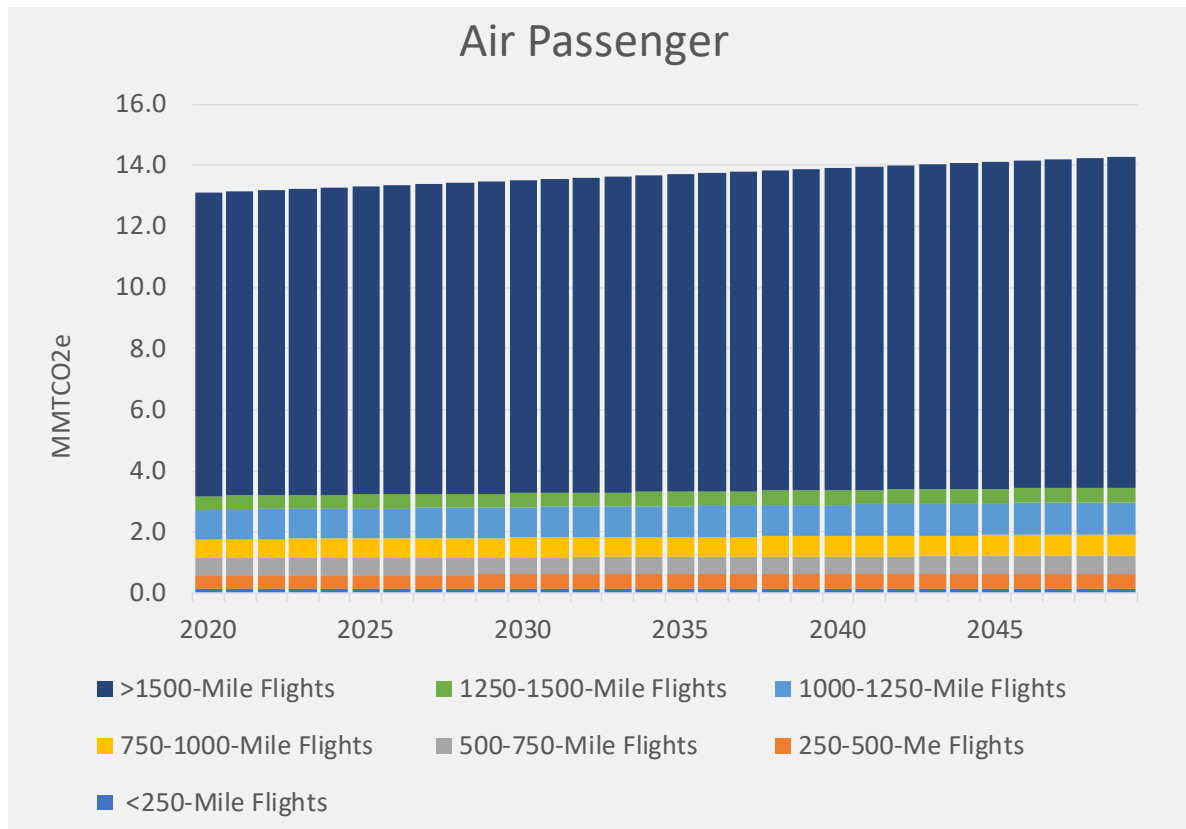
Source: Cadmus analysis using MOVES output



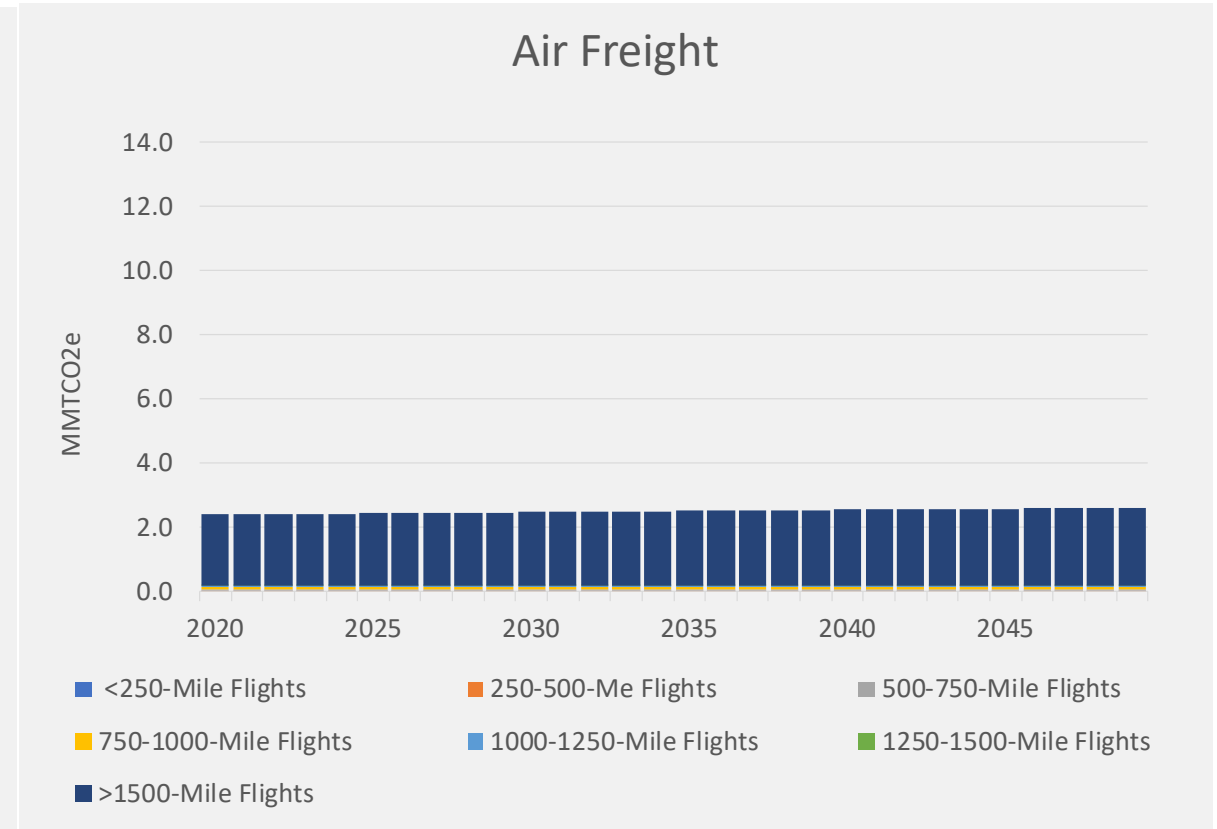
Source: Cadmus analysis using MOVES output

Reference Case | Aviation

Pass/ton-miles grow at 1.6% while aircraft efficiency grows at 1.3% per year. Overall GHG emissions increase by 9% relative to today with an annual growth rate of +0.3%.



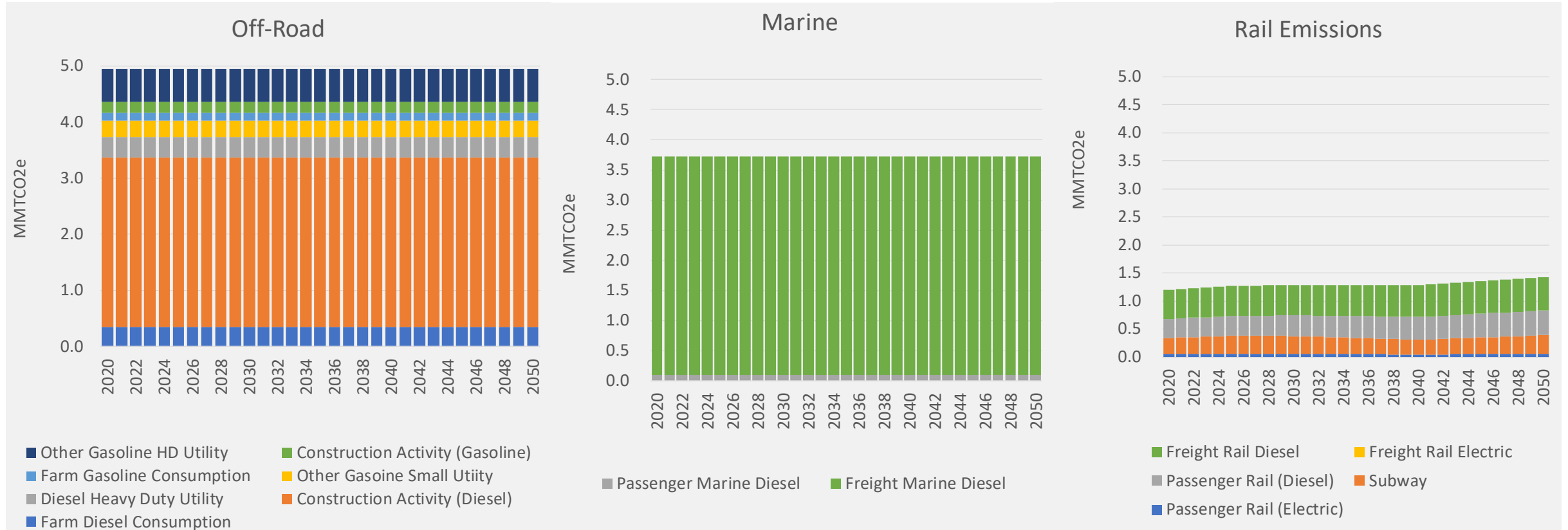
Source: Cadmus analysis using EPA SIT data



Source: Cadmus analysis using EPA SIT data

Reference Case | Marine, Rail

Marine emissions are stay flat over time. Rail emissions increase by +0.6% per year.



Source: Cadmus analysis using EPA SIT data

Source: Cadmus analysis of marine emissions

Source: Cadmus analysis of rail emissions

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Policy Insights | Qualitative Comparison

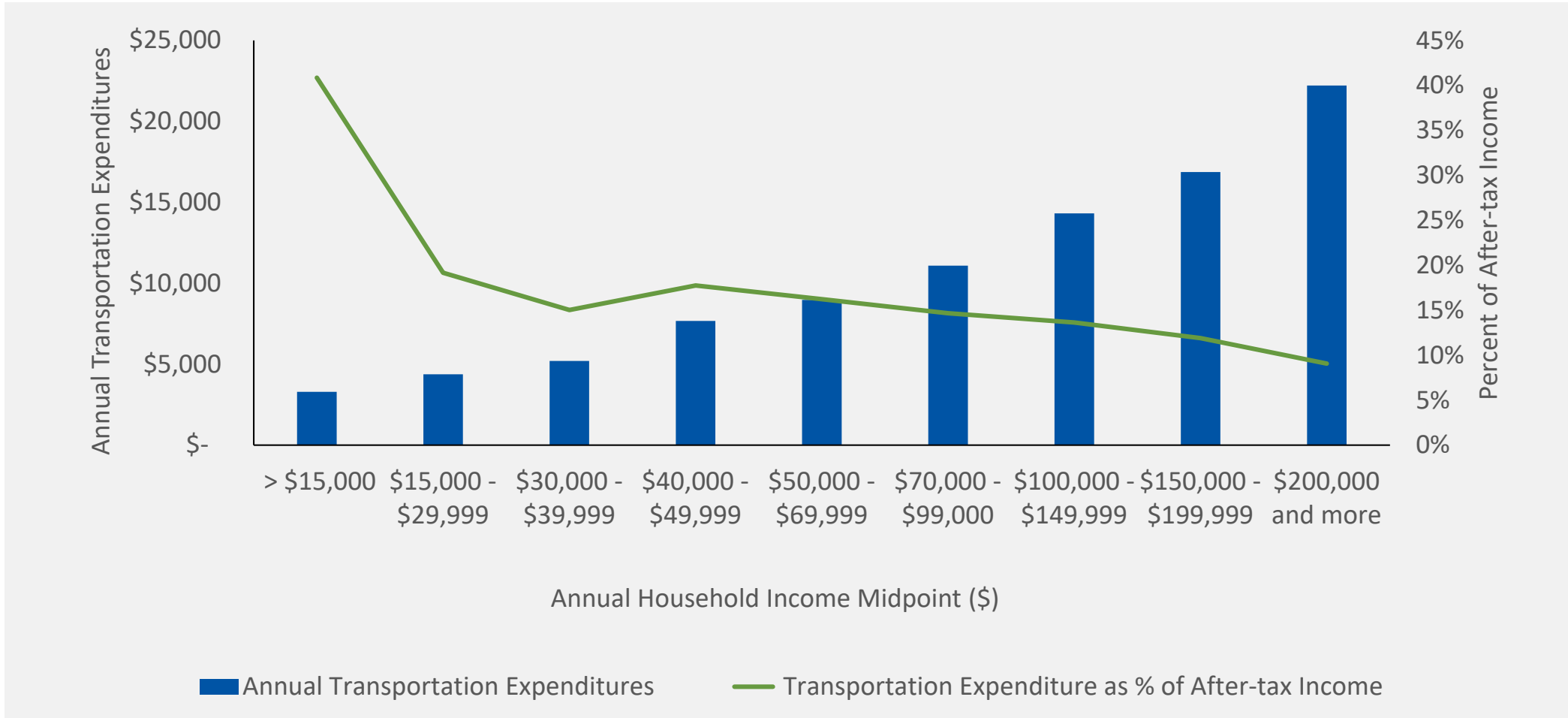
High-Priority Policy Suitability Matrix (High is More Desirable)

Policy	EV Sales Impact	Fiscal Impact	Equity/Health Impact
CA ACC2 Revised ZEV Mandate Extension	High	High	Medium
CA Advanced Clean Trucks Rule	High	High	High
Vehicle Purchase Incentives	Medium	Low	Medium
Feebates	Medium	High	Low
Carbon Pricing	Medium	High	Low
Low Carbon Fuel Standard	Medium	Medium	Medium
Outreach and Education	Medium	Medium	Low
Charging Infrastructure Investment	Medium	Low	Low
Utility Rate Designs	Low	Medium	Low

Source: Cadmus analysis

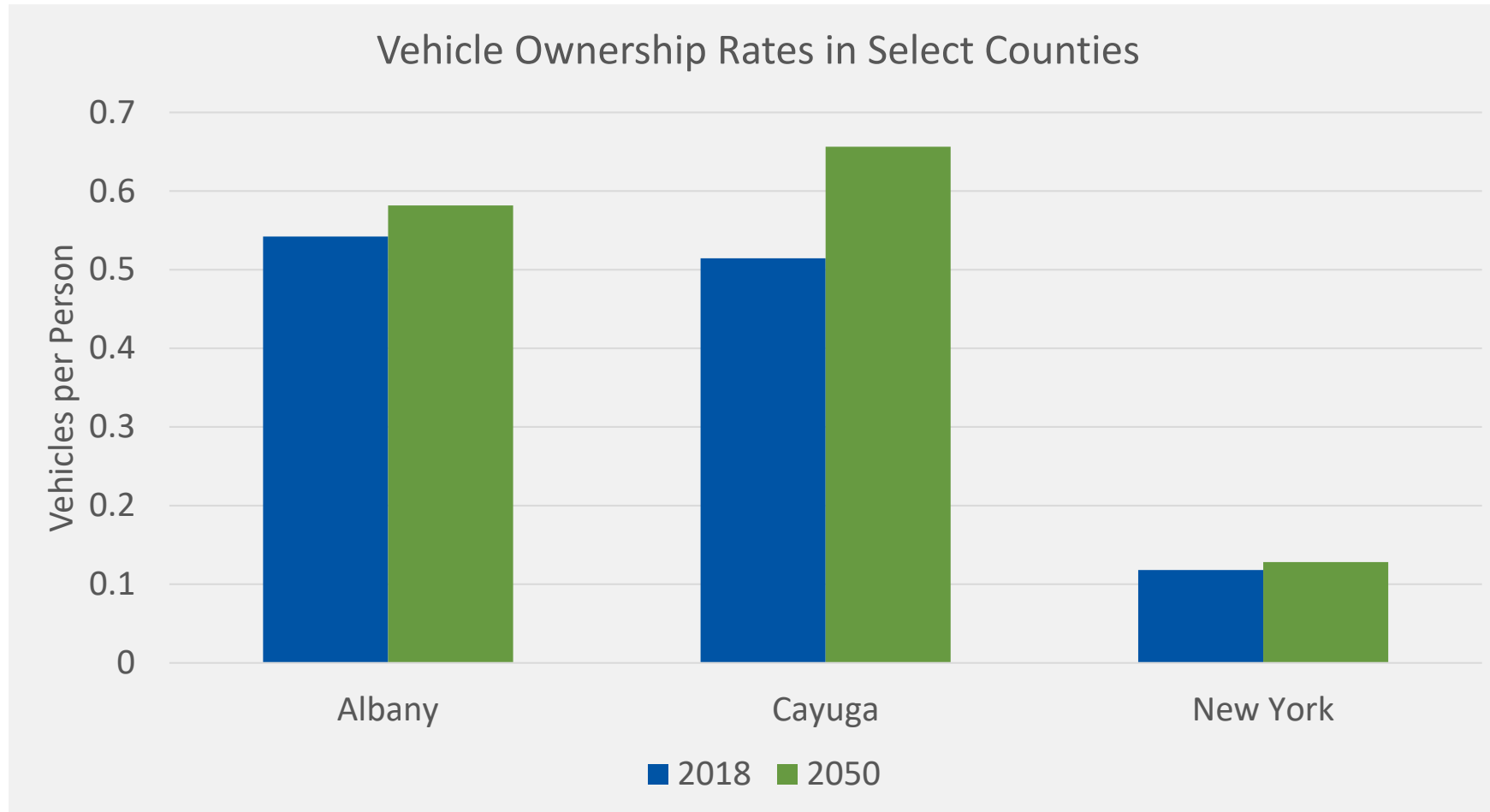
Policy Insights | Differential Burden of Transportation Costs

Lower income households spend higher share of after-tax income on transportation. Trend very prominent in households under \$30K per year.



Policy Insights | Differential Vehicle Ownership Rates

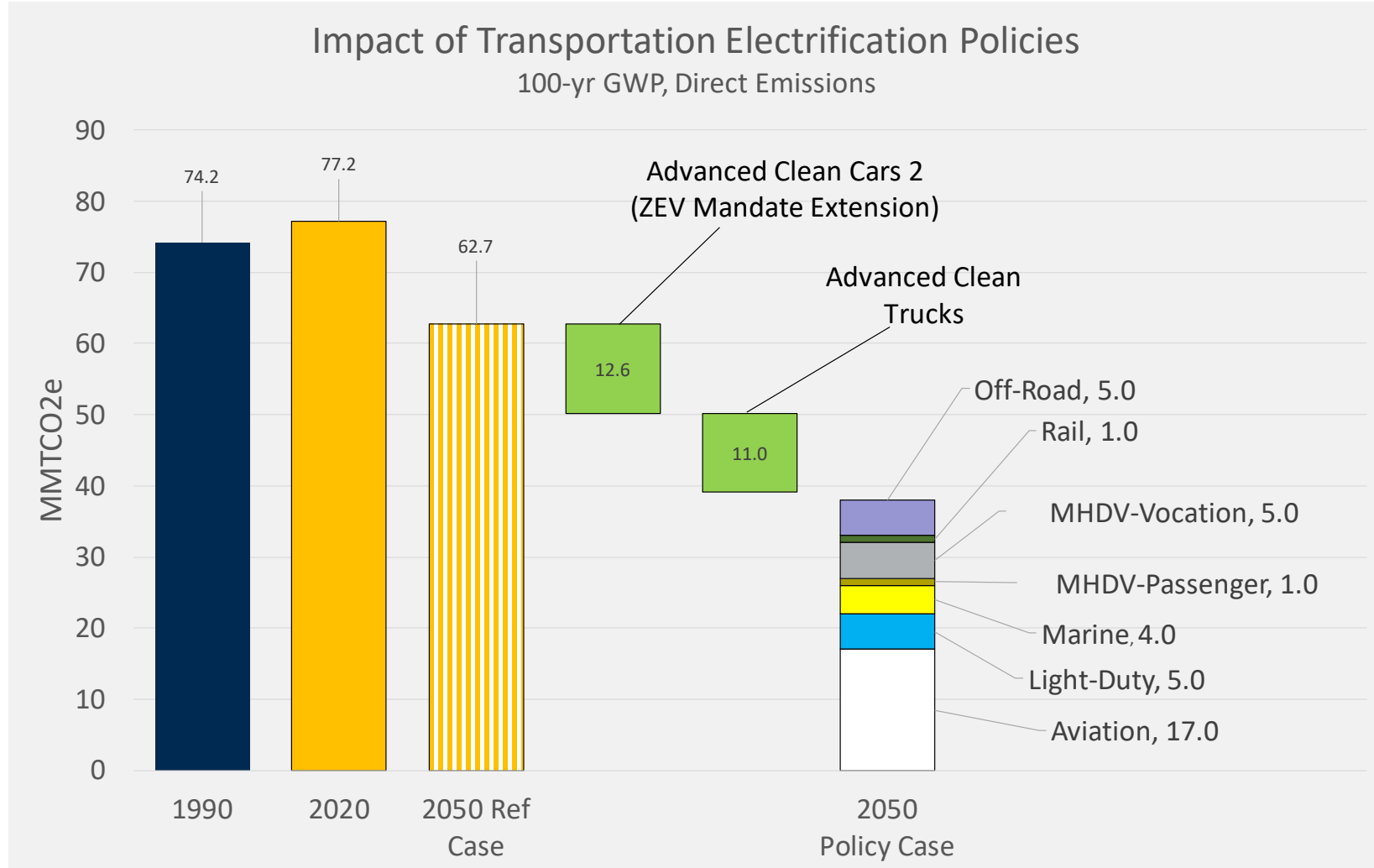
Rates of car ownership vary across the state and can be factored into how equity is considered in policy designs.



Source: Cadmus analysis

Policy Insights | CA ACC2 + ACT ZEV Mandates

These two policies reduce GHGs by ~40% relative to 2050 Reference Case levels.



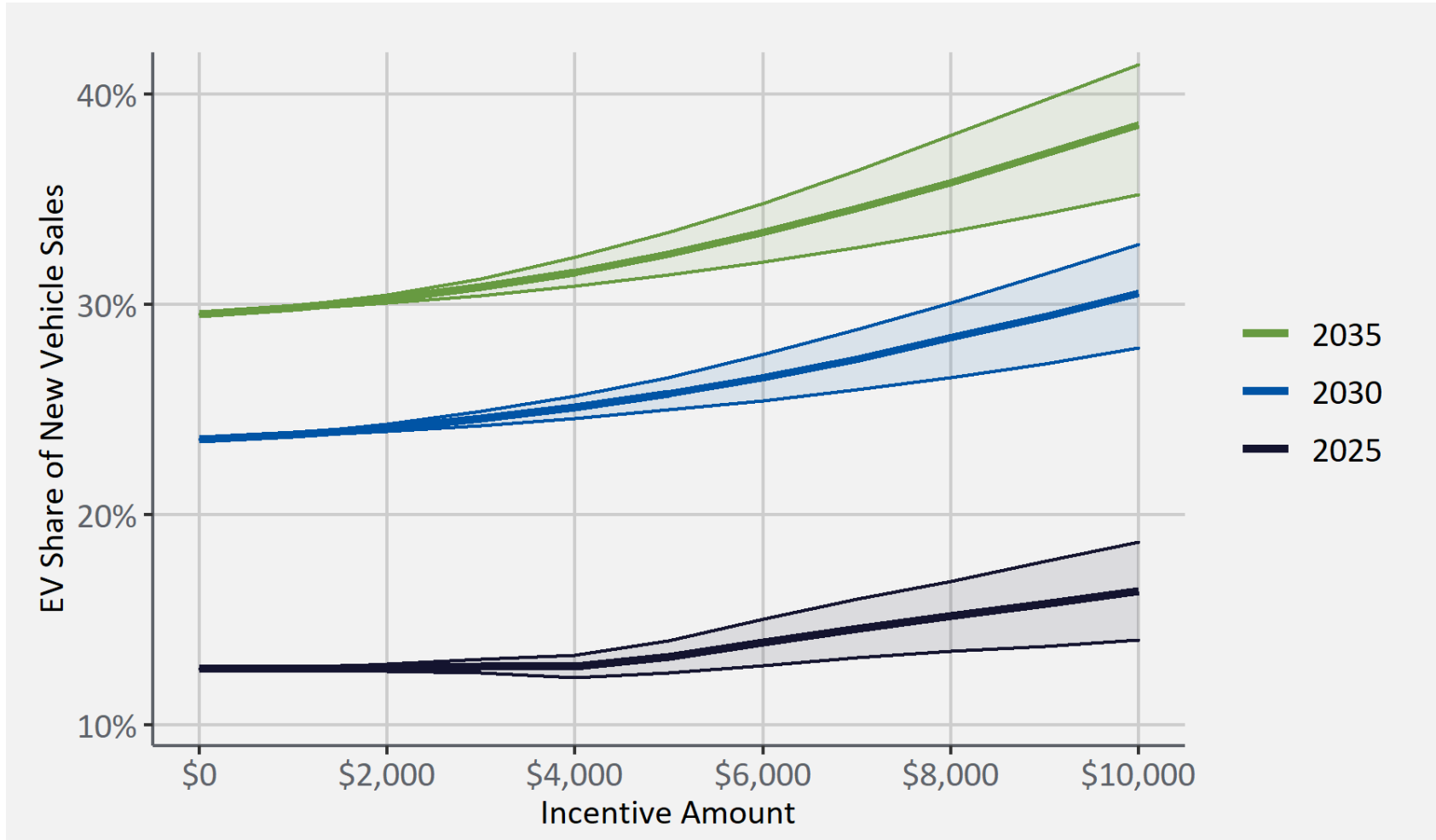
Source: Cadmus analysis using NY-VISION tool

Insights:

- ACC2 has larger impact on GHG emissions than ACT
- About ~1/2 of remaining emissions in 2050 are from aviation sector
- Some LDV emissions remain because not 100% of vehicles have turned over

Policy Insights | Vehicle Purchase Incentive/Feebate

EV sales shares increase with increasing incentives (figure does not include impact of ZEV Mandate or federal EV tax credit)



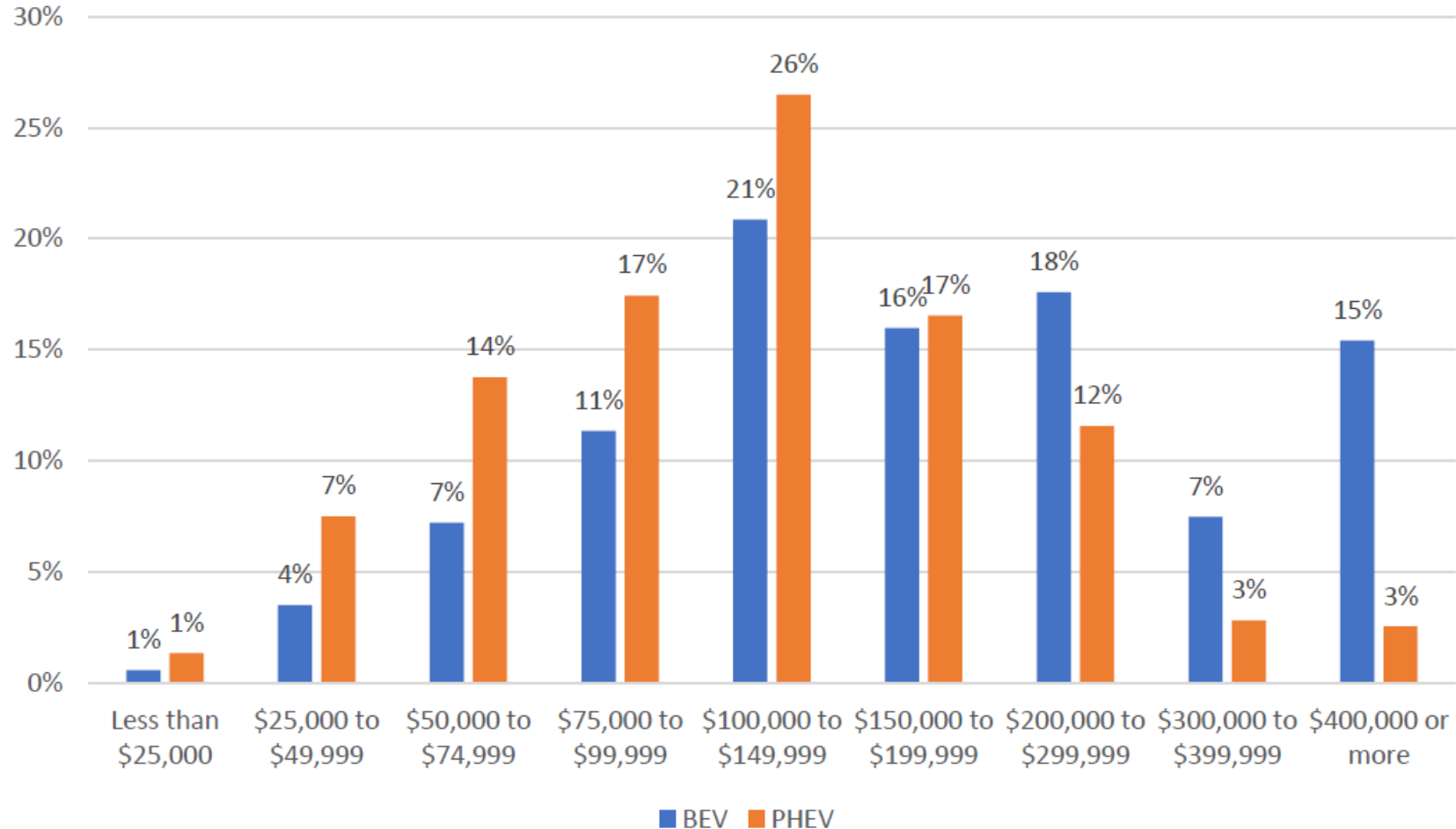
Insights:

- Elasticity of new EV sales share with respect to incentive value is low
- Increases with incentive value

Source: Cadmus analysis using customized NY vehicle choice model

Policy Insights | Vehicle Purchase Incentive/Feebate

Among New York Drive Clean rebate recipients, 77% of BEV owning participants and 61% of PHEV owning participants have an annual household income greater than \$100,000.



Source: Drive Clean Survey Report 2018-2019

Policy Insights | Vehicle Purchase Incentive/Feebate



Equity Challenge

Tax credits require tax liability to claim

Incentives focused on higher income buyers

Vehicle Eligibility

Reaching non-drivers

Policy Design Choices to Enhance Equity



Design Solution

“On-the-hood” rebates are more accessible for consumers across income classes

Tax refunds are another way to ensure a tax credit is available to consumers that do not have tax liability

Limit eligibility for higher income EV buyers and/or provide bonuses for lower income EV buyers

Offering incentives for sales of used EVs in addition to new sales

Incentives to support electric buses and rail, other modes like biking

Policy Insights | Charging Station Incentives



Challenge

Poor ROI for Charging Stations

EV owners will charge at peak times without appropriate price signals

Current electric tariffs can lead to very high cost per kWh, especially for high-powered charging

Improving the Business Case for Charging Stations



Solution

More EVs on the road will improve utilization, ROI

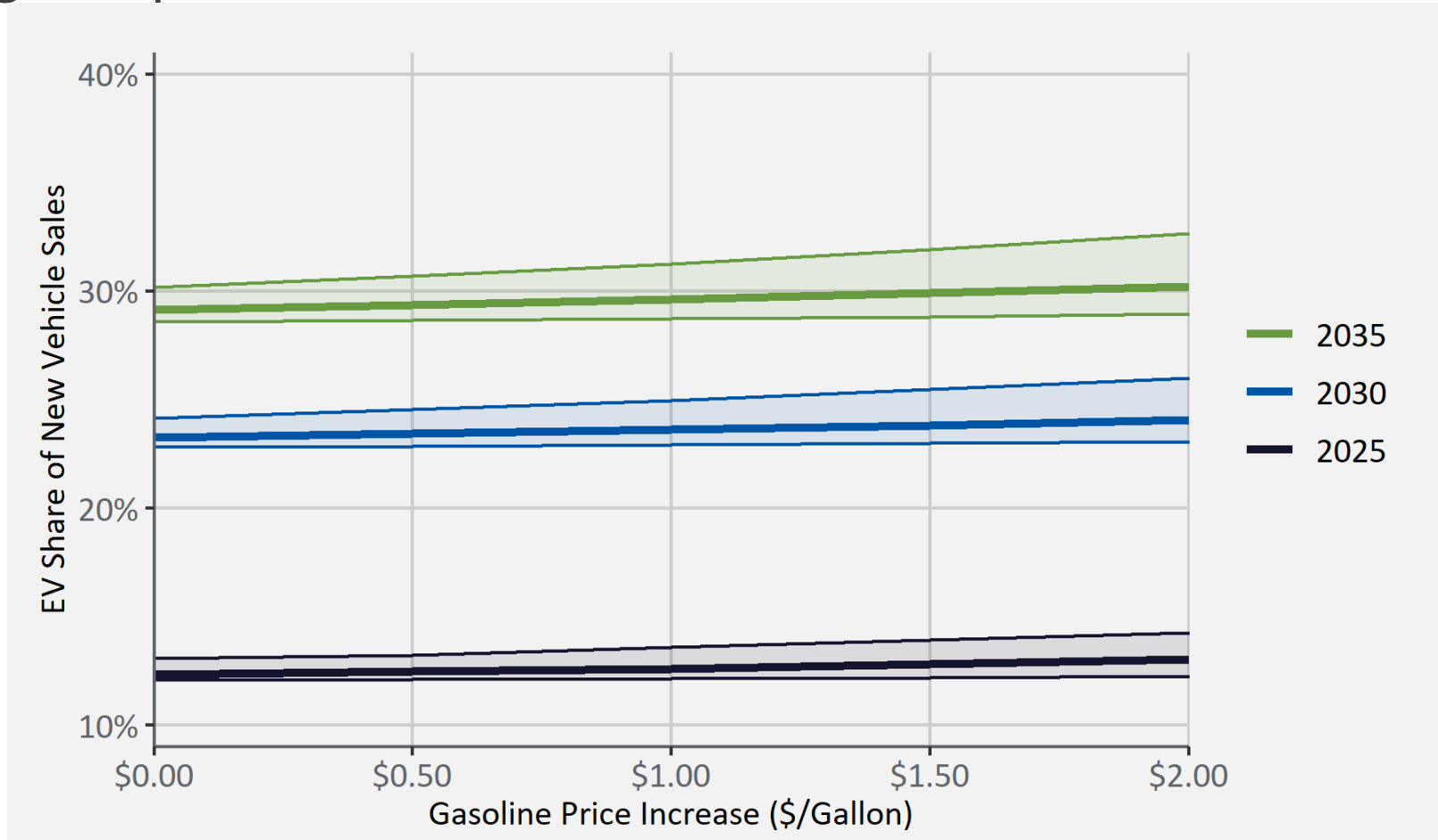
Direct support for EVSE installations

Work with utilities to use technology to manage charging and get customers on TOU rates

Alternative rate structures that encourage EV adoption while also considering costs to electric grid

Policy Insights | Carbon Price/LCFS

EV sales share is highly inelastic to changes in gasoline price. Though limited direct impact on electrification, revenues from a carbon price invested in electrification could have larger impact.



Source: Cadmus analysis using customized NY vehicle choice model

Policy Insights | Carbon Price/LCFS



Equity Challenge

least-cost GHG reductions may not spread benefits evenly across communities

uniform price signals may have disproportionate impacts on LMI households

Policy Design Choices to Enhance Equity



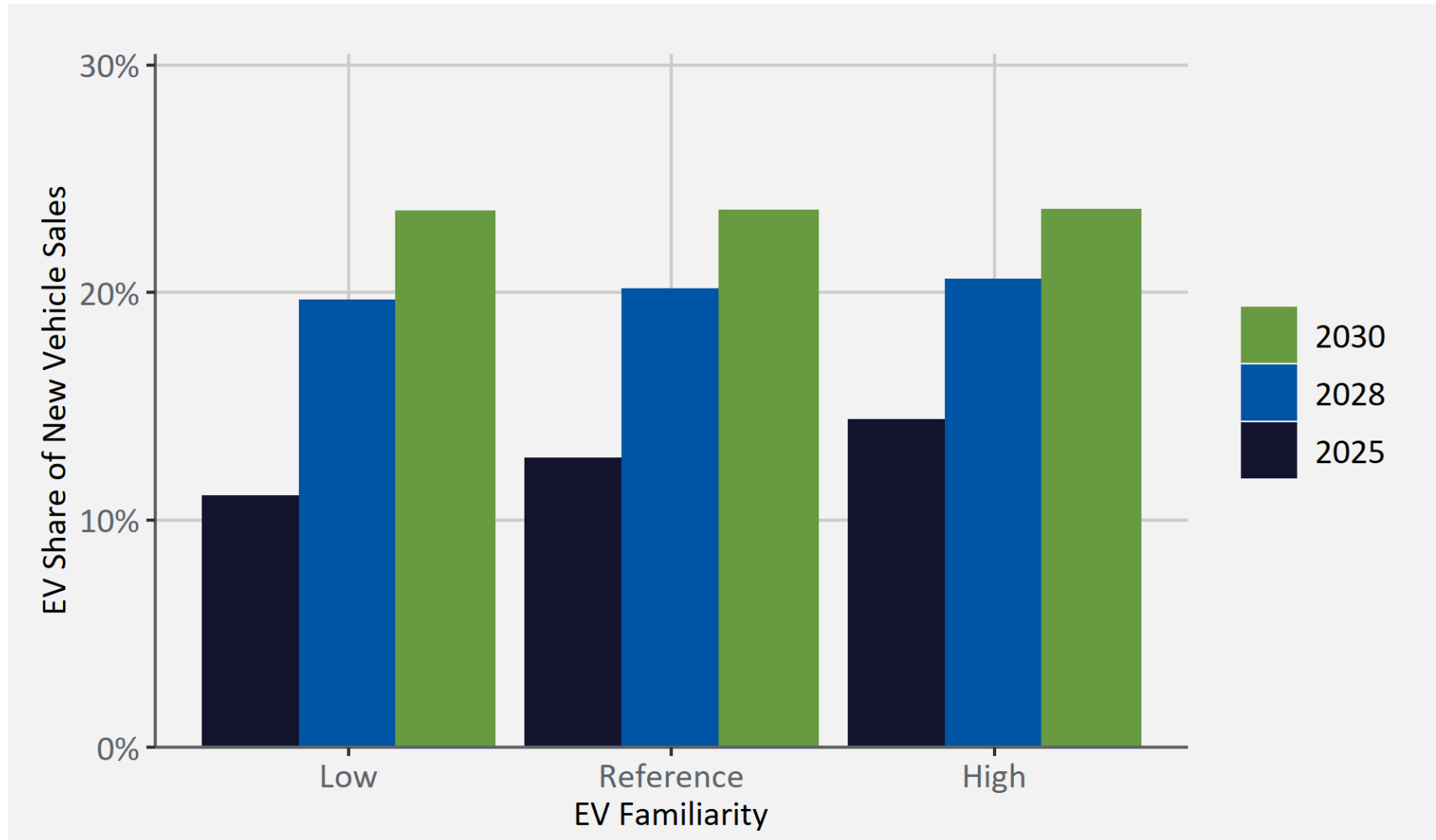
Design Solution

Pair GHG programs with programs that specifically target co-pollutants to ensure local impacts are addressed

focus investment of program revenues in disadvantaged communities

Policy Insights | Outreach and Education

Outreach and education programs that increase EV familiarity have a measurable effect on EV market share. Increasing familiarity matters more in the near-term when awareness is low.



Source: Cadmus analysis using customized NY vehicle choice model

Q&A

Electrification/Fuels Sub-Work Group Report Out & Discussion



Public Transportation Sub-Work Group Report Out & Discussion



Smart Growth Sub-Work Group Report Out & Discussion



Open Panel Discussion on Policy Recommendations



Next Steps/Open Discussion

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