



Pickup Trucks: The Path to Electrification and CVRP Participation Through Q1 2023

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Photo by Guiherme Stecanella on Unsplash

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*with thanks to CARB staff, as well as Francis Alvarez, Janet Bowers, and others at the
Center for Sustainable Energy (CSE)*



Outline: Pickup Electrification

- I. Context: Pickup Markets
- II. Goals: Pickup Projections & Paths to Electrification
- III. Products: Existing and Planned Electric Pickups
- IV. Access: Incentive Design for Electric Pickup Affordability
- V. Incentive Program Participation: Rebated Pickups
- VI. Summary & Lessons for Incentive Design

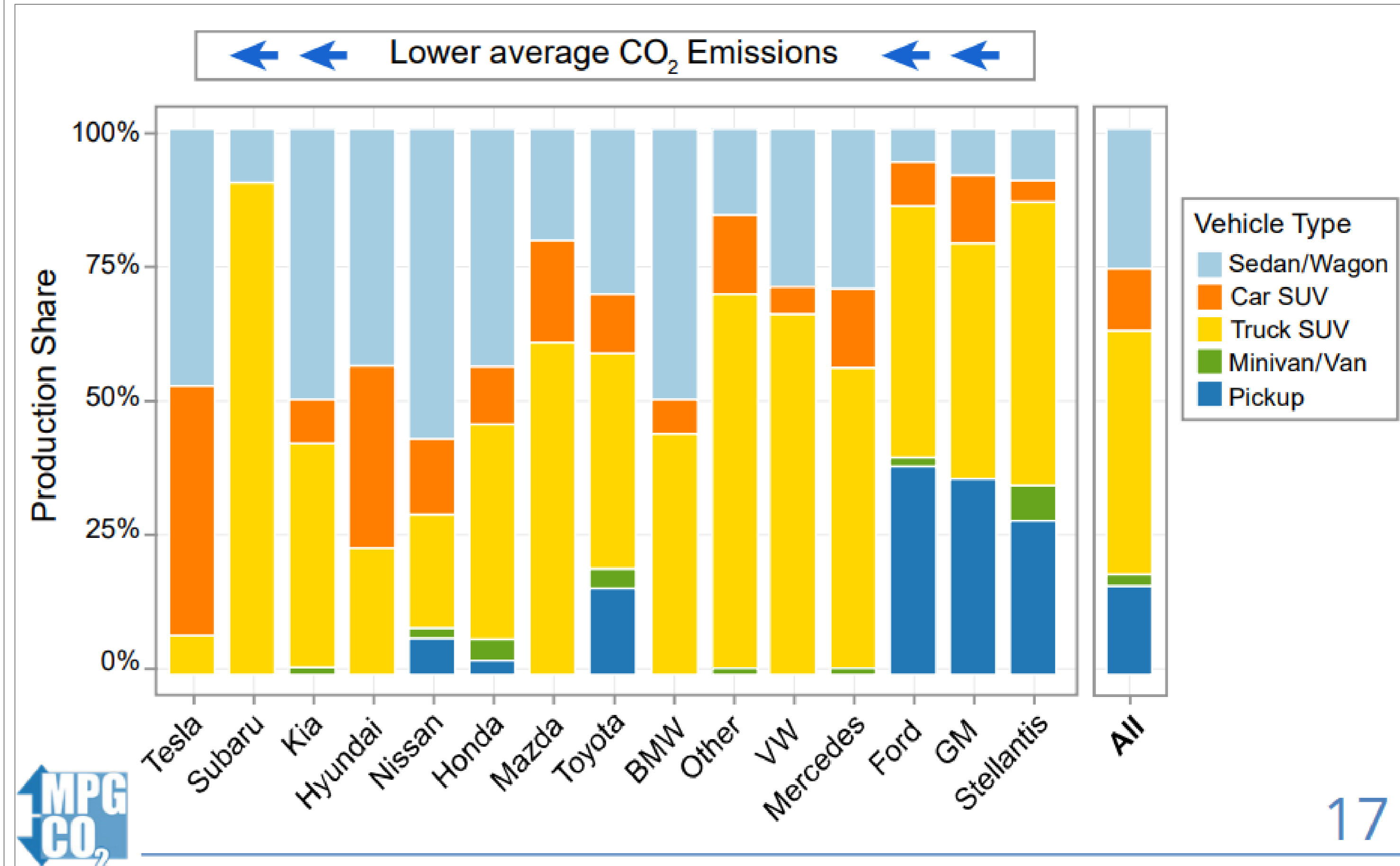
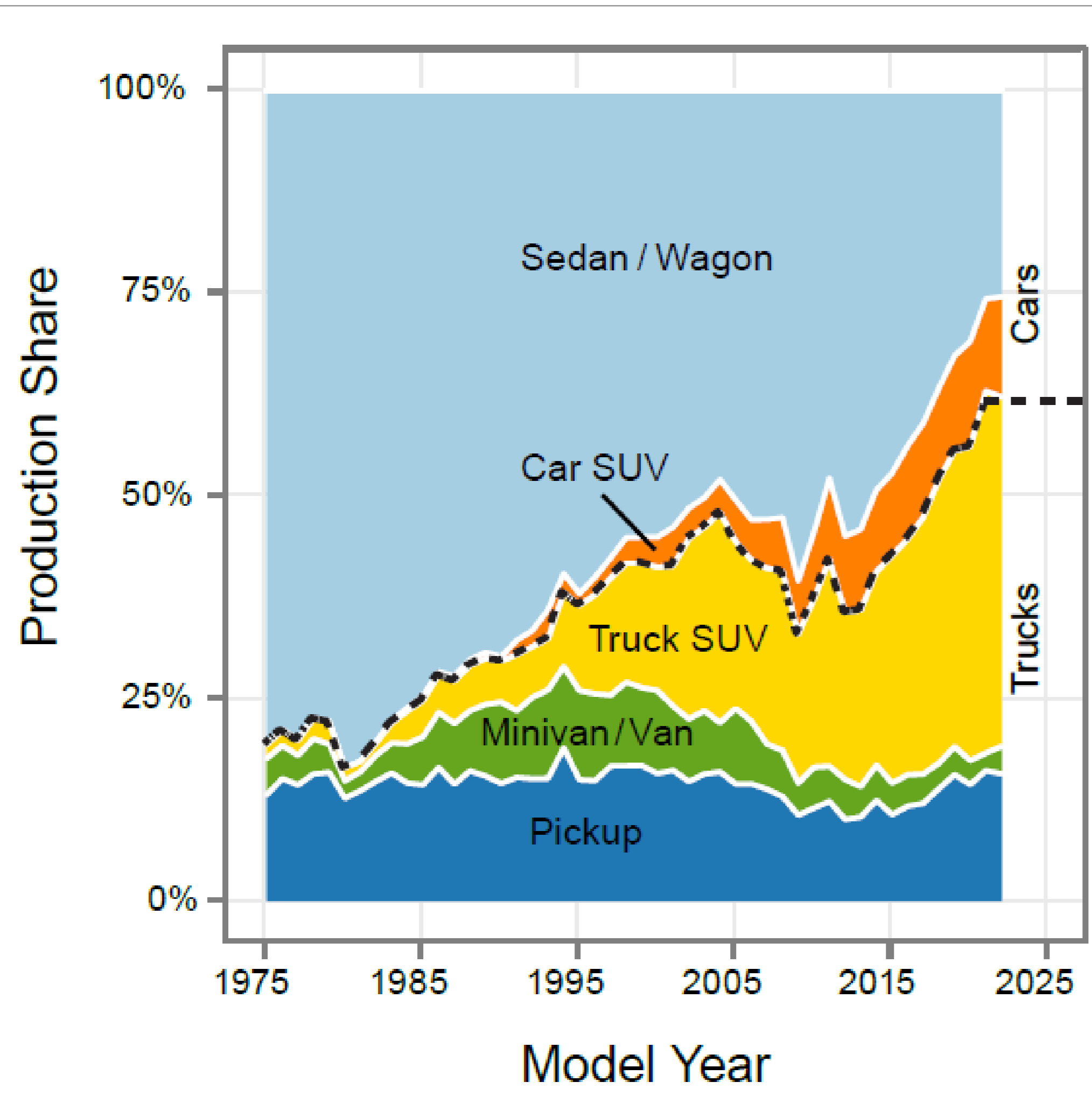
Appendix: Additional Details & Resources

A close-up photograph of a hand plugging a charging cable into an electric vehicle's charging port. The scene is set outdoors during sunset or sunrise, with a bright sun in the upper right corner creating a lens flare effect. The background is slightly blurred, showing a city street with buildings and other vehicles.

Context

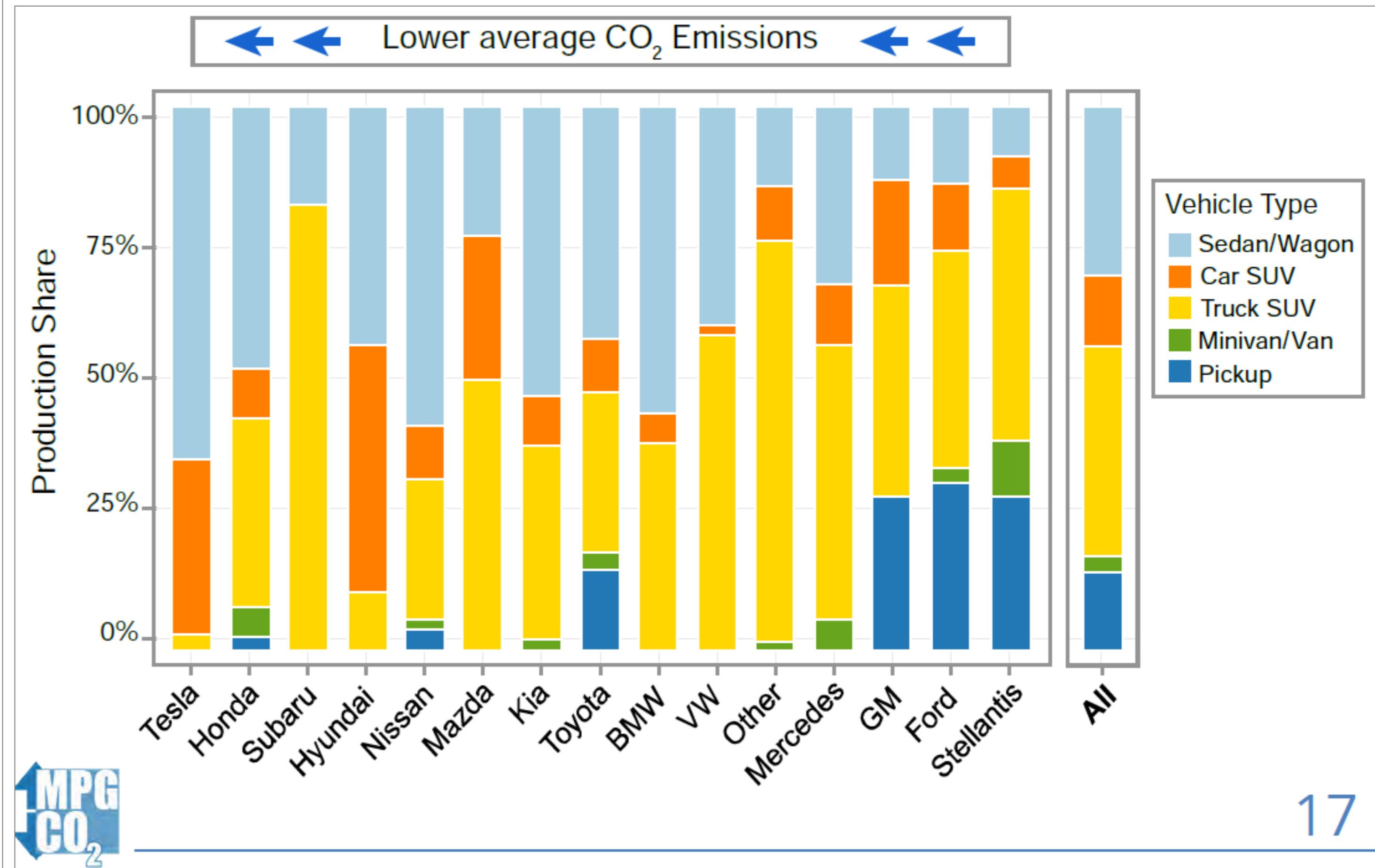
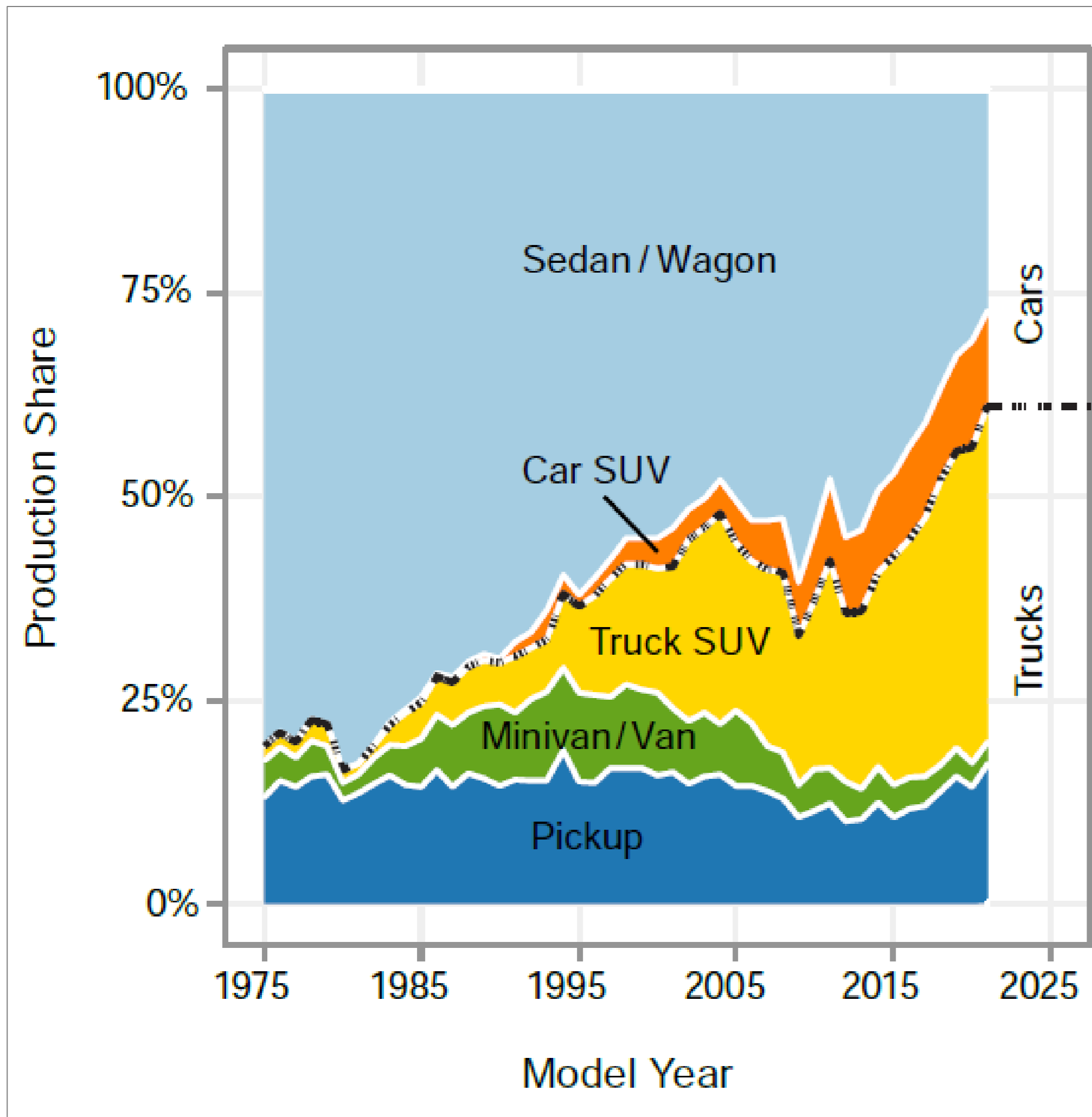
Pickup Markets

Pickups in 2021: 16% of U.S. production, 38% of Ford production



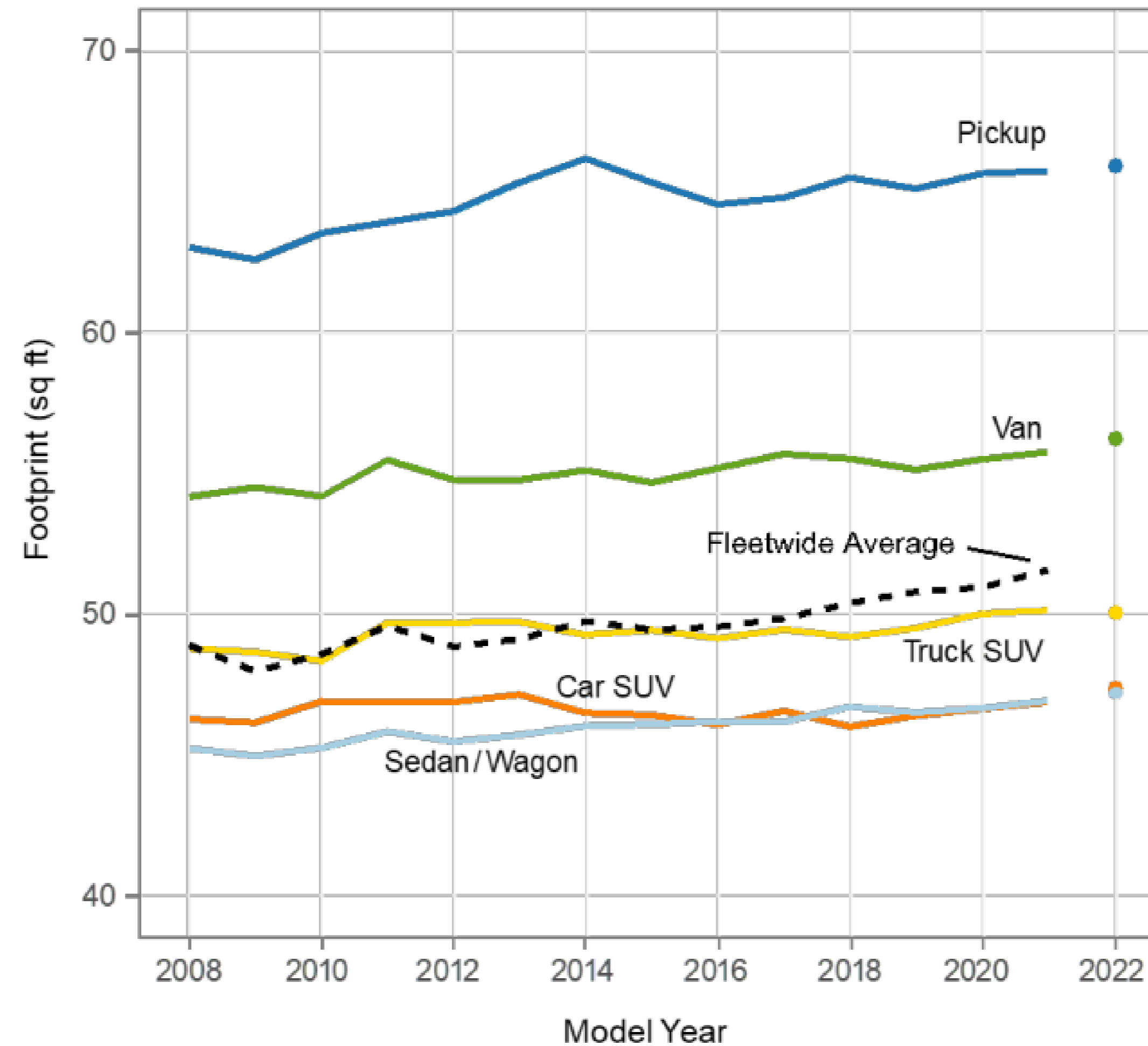
Hula, A., Maguire, A., Bunker, A., Rojeck, T., & Harrison, S. (2022). *The 2022 EPA Automotive Trends Report: Greenhouse Gas Emissions, Fuel Economy, and Technology since 1975 (EPA-420-R-22-029, December 2022)*. <https://www.epa.gov/system/files/documents/2022-12/420s22001.pdf>

Pickups in 2020: 14% of U.S. production, 31% of Ford production

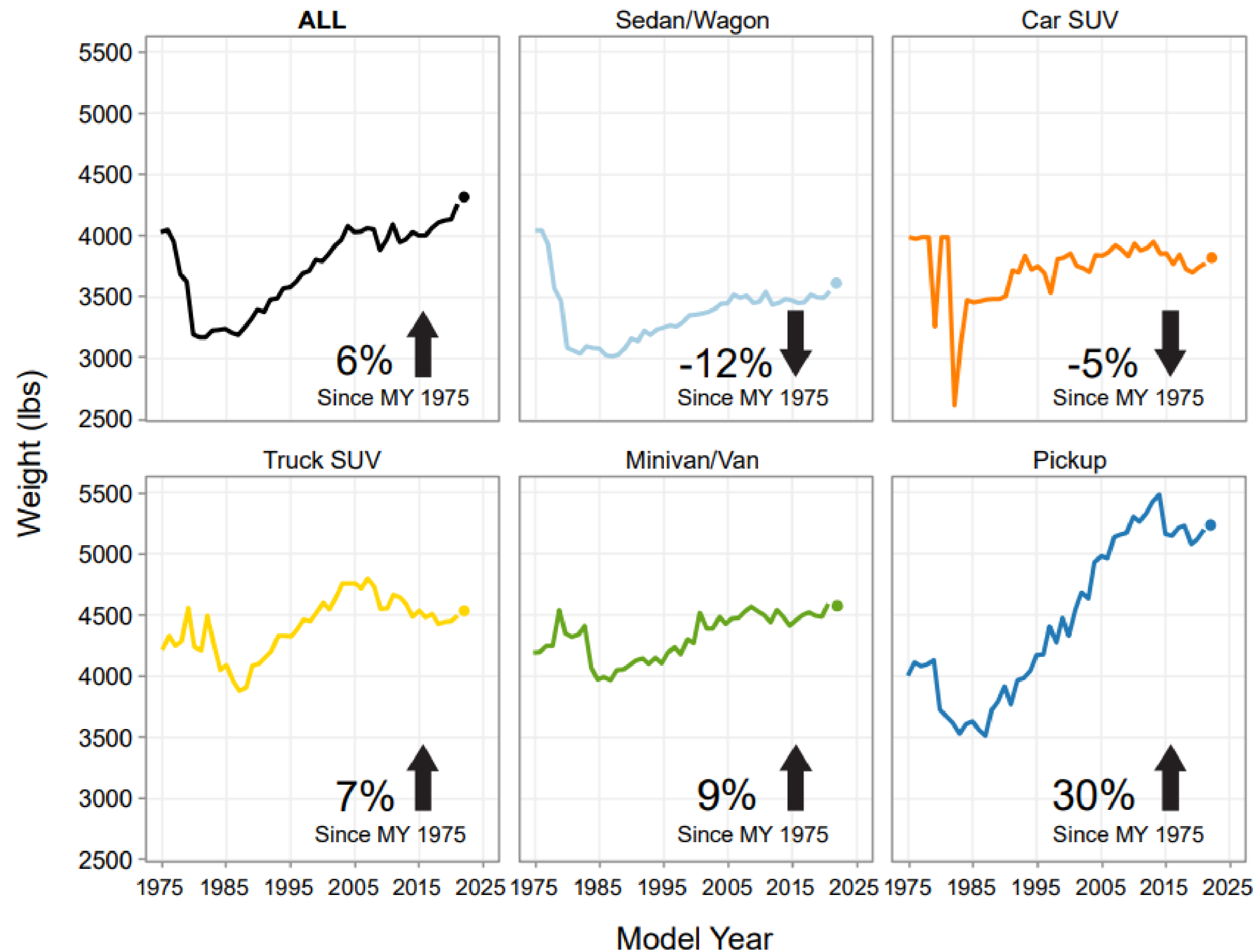


Hula, A., Maguire, A., Bunker, A., Rojeck, T., & Harrison, S. (2021). *The 2021 EPA Automotive Trends Report: Greenhouse Gas Emissions, Fuel Economy, and Technology since 1975* (EPA-420-R-21-003, November 2021). <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1013L10.pdf>

Pickups: Largest footprint, greatest size gain since 2008 (4.3%)



Pickups: Most weight gain since 1975 (30%)



“By model year 2021, the difference between the heaviest and lightest vehicle types had increased to more than 1,600 pounds, about 38% of the average new vehicle weight.”

Didn't always used to be that way:

“In 1975, the average new sedan/wagon outweighed the average new pickup by about 45 pounds...” (from the previous edition of the report)

Pickups: Greatest power and acceleration increases since the 1970s

Figure 3.8. Average New Vehicle Horsepower by Vehicle Type

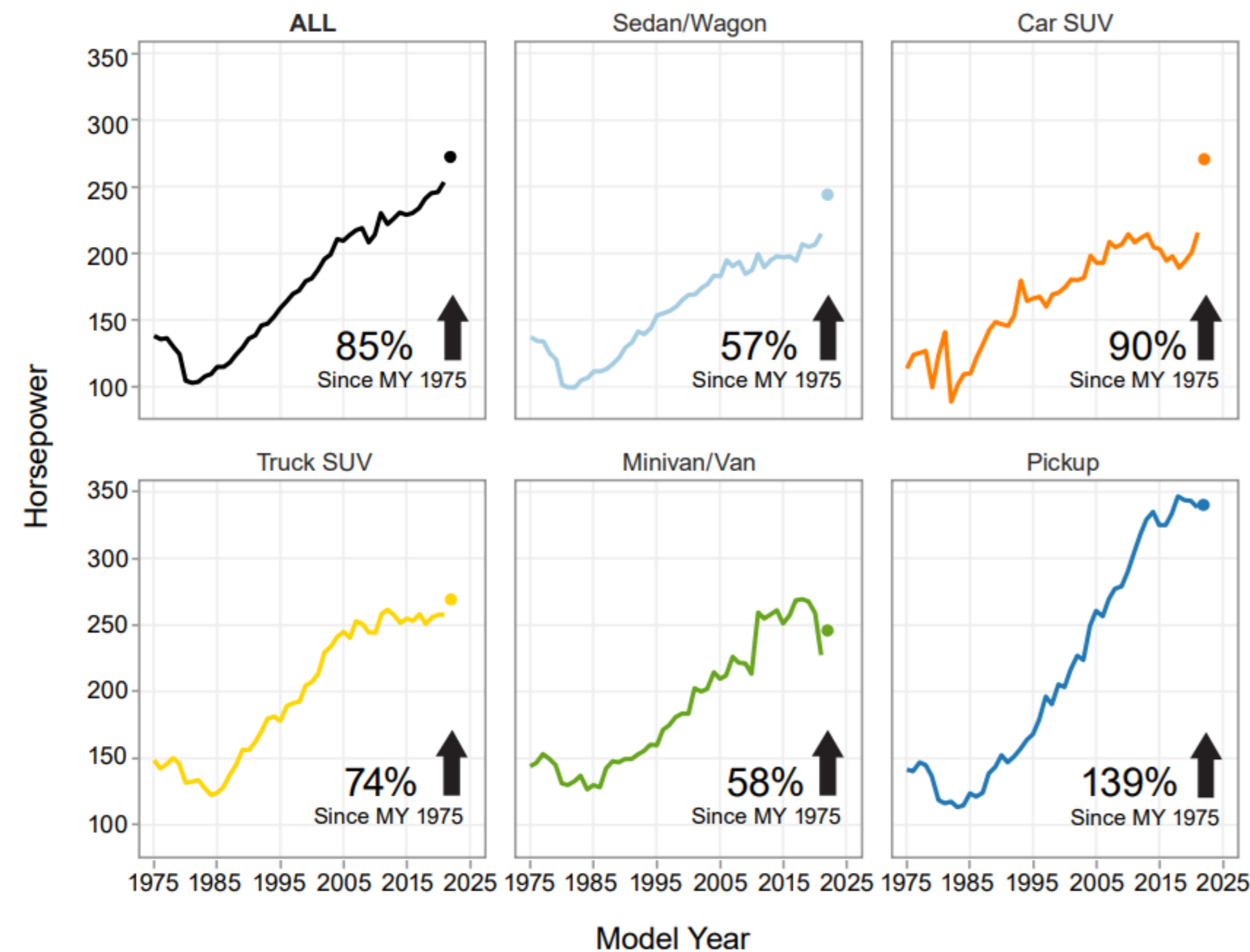
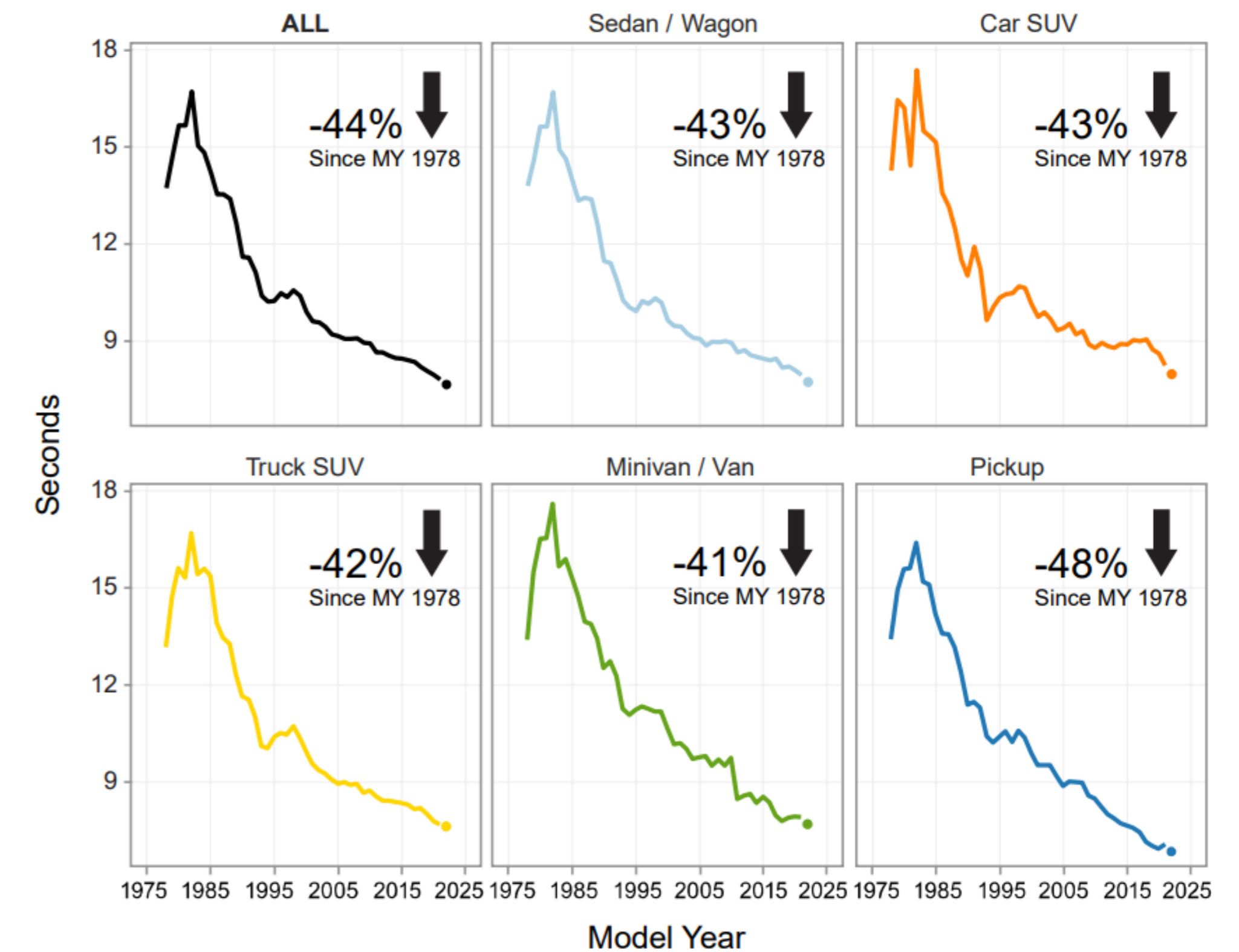
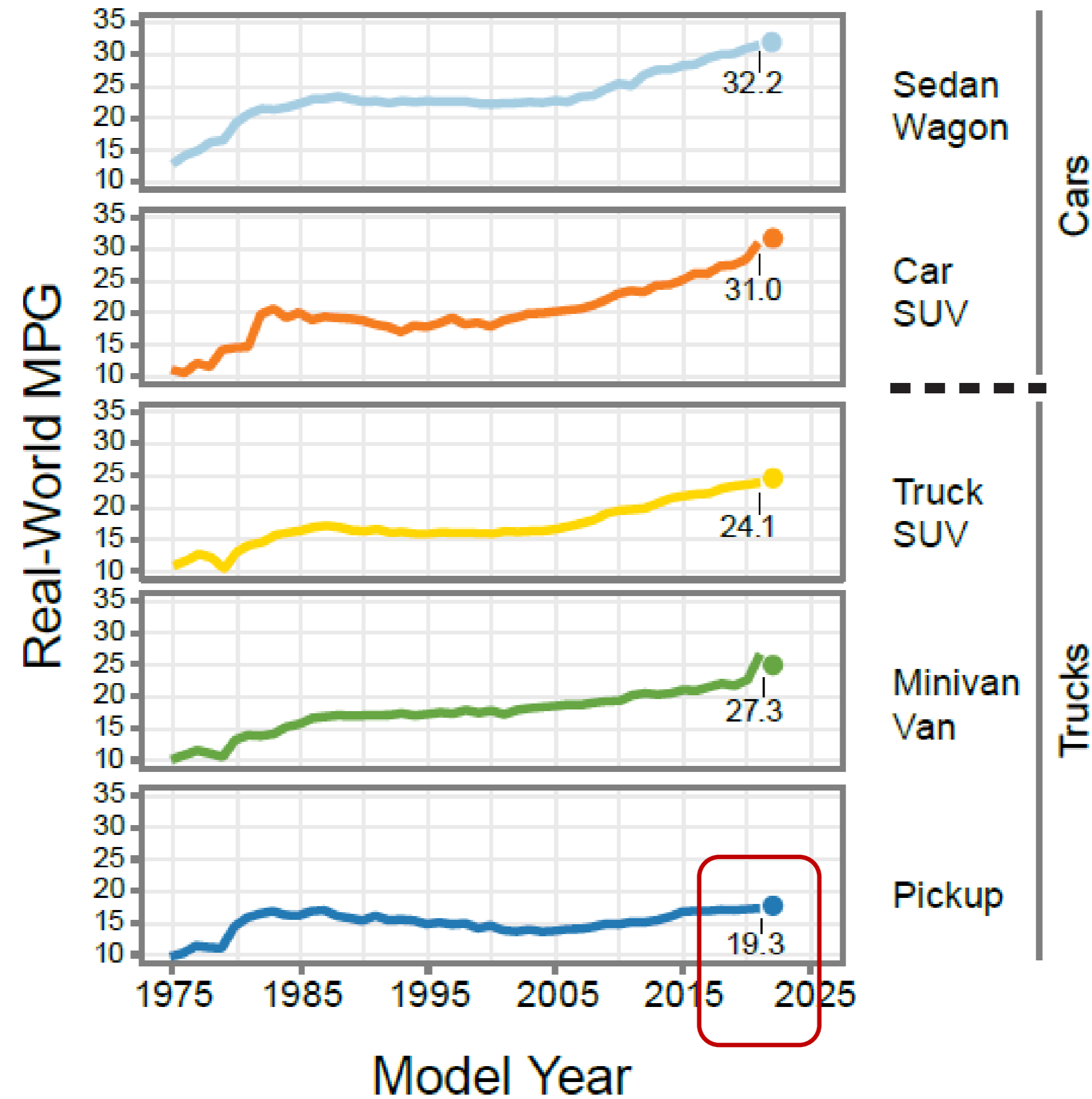


Figure 3.11. Calculated 0-to-60 Time by Vehicle Type

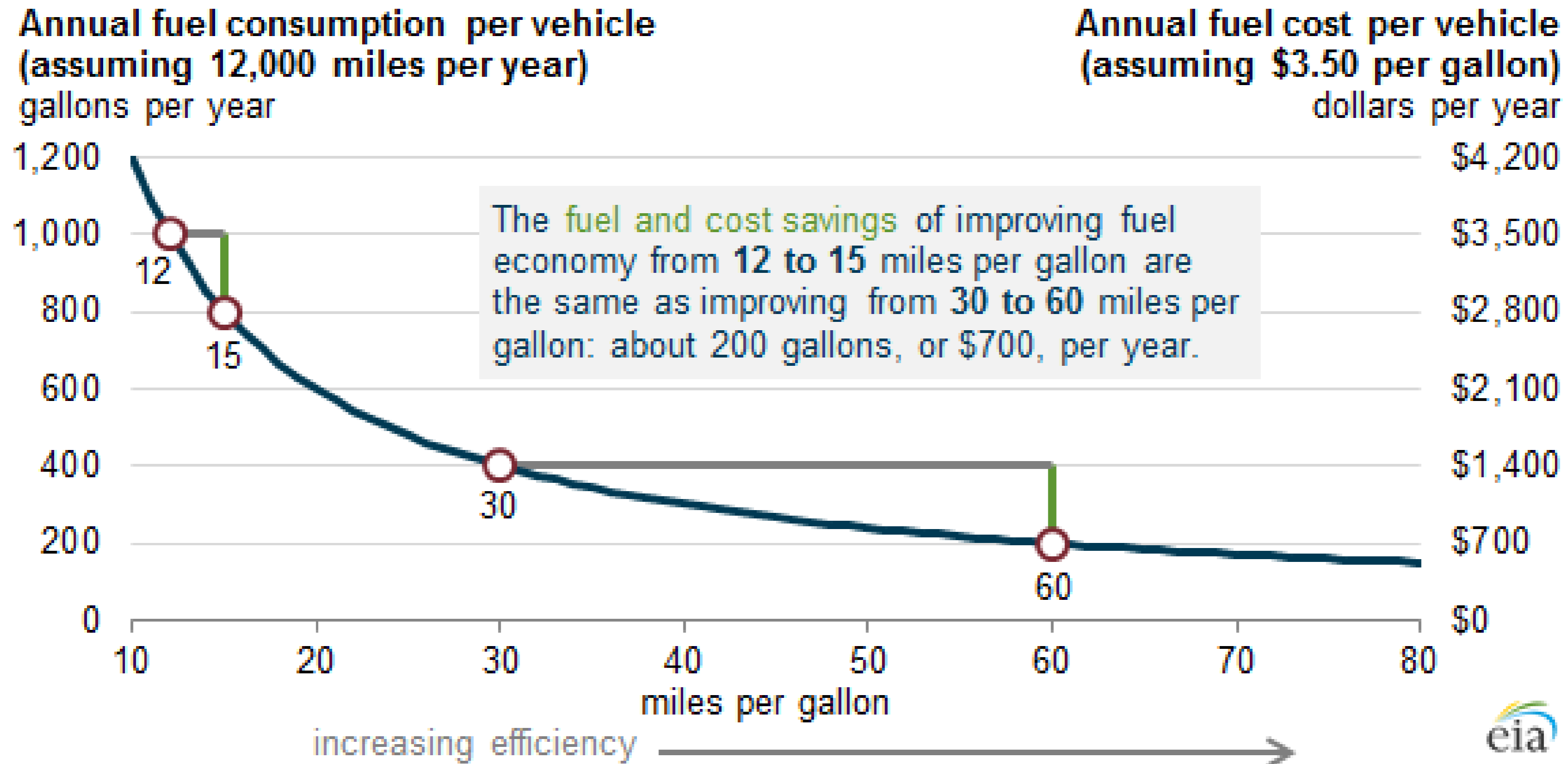


Pickups: *Smallest* fuel-economy increases (only vehicle type to not double its economy since 1975)



Worst ave. real-world fuel economy = 19.3 mpg (2021)

Opportunity: Even Small Improvements in Low-Efficiency Vehicles Produce Large Savings: Fuel, Emissions & \$\$\$



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2014*

Note: Calculations in graphic assume a fuel price of \$3.50 per gallon and annual travel of 12,000 miles per vehicle.

Chase, N. (2014, July 11). *Fuel economy improvements show diminishing returns in fuel savings*. Today in Energy. <https://www.eia.gov/todayinenergy/detail.php?id=17071>

U.S. Environmental Protection Agency (U.S. EPA) Vehicle Classes



CARS		TRUCKS	
Class	Passenger & Cargo Volume (cu. ft.)	Class	Gross Vehicle Weight Rating* (pounds)
TWO-SEATER CARS	Any	PICKUP TRUCKS	
SEDANS		Small	Under 6,000
Minicompact	Under 85	Standard	6,000 to 8,500
Subcompact	85 to 99	VANS	
Compact	100 to 109	Passenger	Under 10,000
Midsize	110 to 119	Cargo	Under 8,500
Large	120 or more	MINIVANS	Under 8,500
STATION WAGONS		SPORT UTILITY VEHICLES	
Small	Under 130	Small	Under 6,000
Midsize	130 to 159	Standard	6,000 to 9,999
Large	160 or more	SPECIAL PURPOSE VEHICLES	Under 8,500

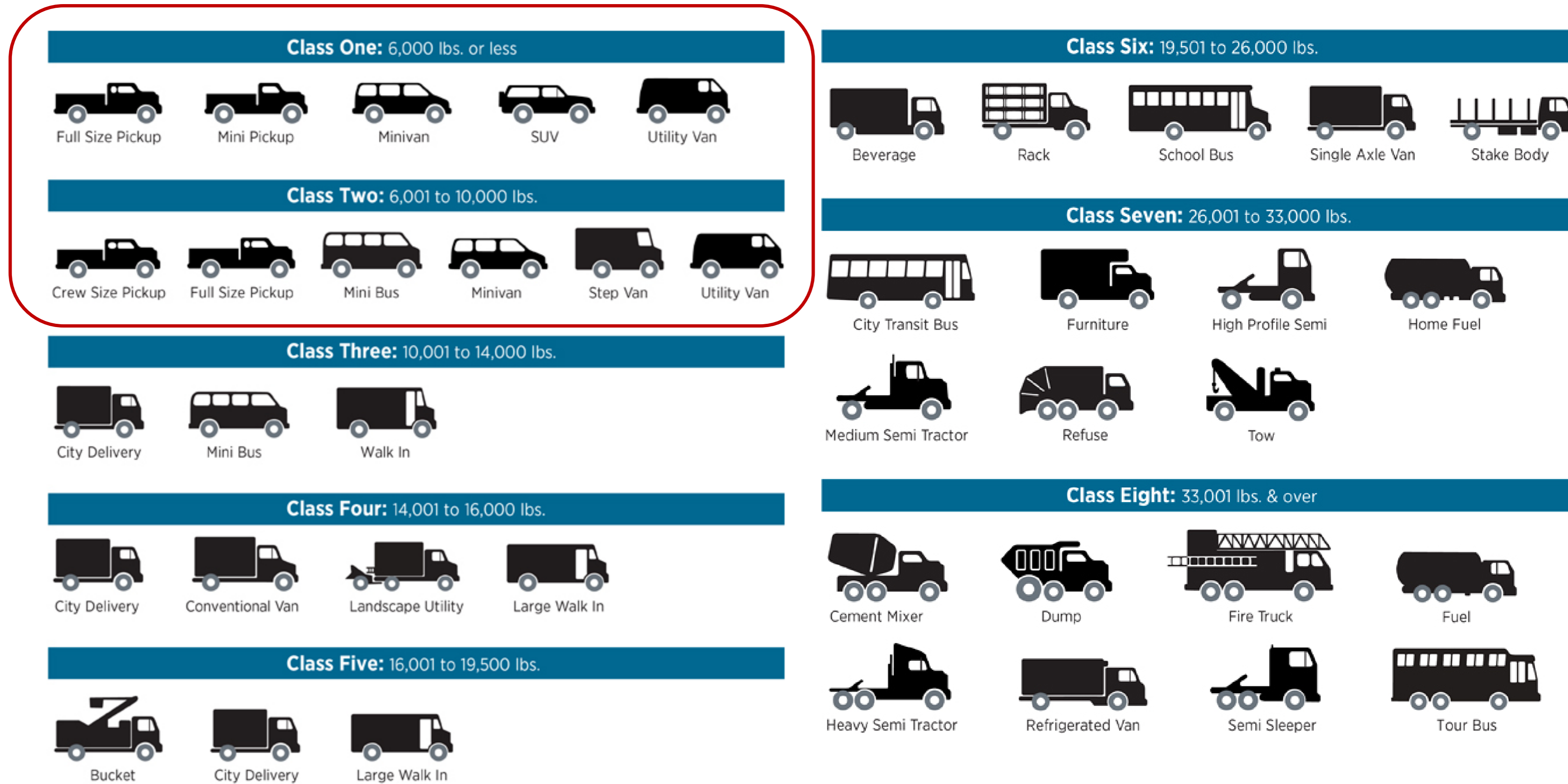
*Gross vehicle weight rating is vehicle weight plus carrying capacity.

Light-duty fuel economy regulations do not apply to

- Sport utility vehicles (SUVs) and passenger vans with a gross vehicle weight rating (GVWR) of more than 10,000 pounds—GVWR is the vehicle weight plus carrying capacity
- Other vehicles with a GVWR of 8,500 pounds or more

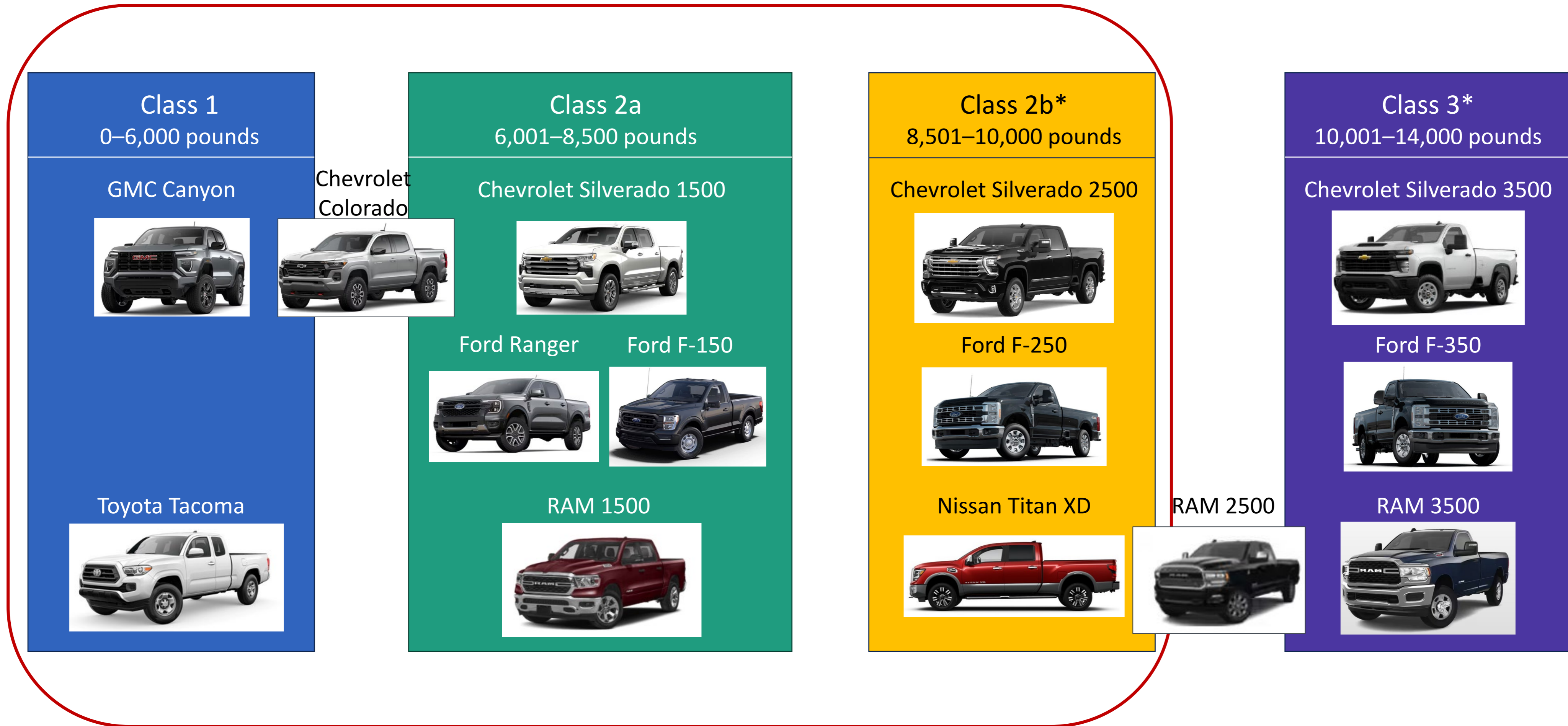
U.S. DOE & U.S. EPA. (2022). *Fuel Economy Guide*. <https://www.fueleconomy.gov/feg/pdfs/guides/feg2023.pdf>, p.1. Similar information for the updated online listings is available at https://www.fueleconomy.gov/feg/which_tested.shtml.

Federal Highway Administration (FHWA) Vehicle Classes



FHWA Class 1–3 Examples: It’s a Bit More Complicated

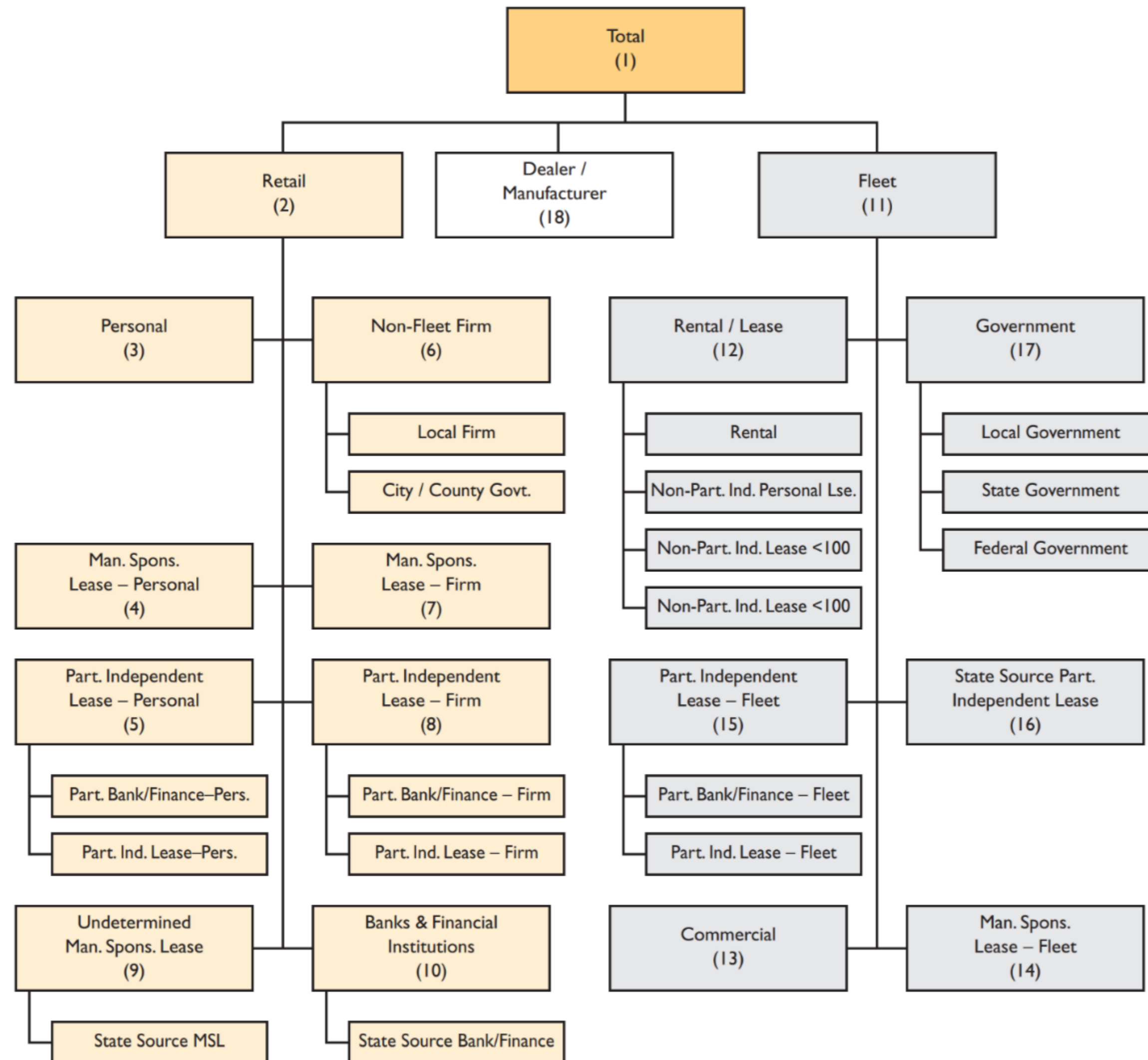
(model years 2021–2022)



GVWR based on 2021 and 2022 model years. Excludes “Incomplete Pickup” vehicle class. Images from manufacturer websites.

* Exempted from fuel economy standards, per https://www.fueleconomy.gov/feg/which_tested.shtml.

New Vehicle Registration Categories



For this analysis:

“Personal” vehicles identified using registration types 3–5.

“Non-Personal” vehicles identified using registration types 6–10, 11, and 18.

All registration types are assumed to be eligible for a CVRP rebate, provided applicants meet other eligibility requirements...

Not Accounted For: CVRP Eligibility Criteria

 = in effect during 2021

<p>as of Mar. 2010</p> <ul style="list-style-type: none"> • Incentive stacking permitted • 36-month ownership requirement • Rebates per year limit = 20 	<p>as of Dec. 2013</p> <ul style="list-style-type: none"> • Rebates per year limit = 2 <p>as of May 2014</p> <ul style="list-style-type: none"> • 18-month application window 	<p>as of Dec. 2014 / Jan. 2015</p> <ul style="list-style-type: none"> • 30-month ownership requirement (retroactive) • Total rebate limit = 2 	<p>as of Mar. 2016</p> <ul style="list-style-type: none"> • \$250k–\$500k income cap (PEVs) • +\$1,500 for income-qualified households ($\leq 300\%$ FPL), excluding ZEMs 	<p>as of Nov. 2016</p> <ul style="list-style-type: none"> • \$150k–\$300k income cap (PEVs) • ≥ 20 UDDS electric miles • +\$2,000 for income-qualified households ($\leq 300\%$ FPL), excl. ZEMs
<p>as of Jan. 2018</p> <ul style="list-style-type: none"> • \$150k–\$300k income cap on stacking HOV decal (only binding on FCEVs) • Rebate Now San Diego County preapproval pilot with point-of-sale option 	<p>as of Jan. 2019</p> <ul style="list-style-type: none"> • Stacking with CVAP grant not permitted (retroactive) 	<p>as of Dec. 2019</p> <ul style="list-style-type: none"> • Total rebates limit = 1[§] • Base MSRP \leq \$60k (PEVs) • 3-month application window[‡] • ≥ 35 UDDS electric miles • +\$2,500[†] for income-qualified households ($\leq 300\%$ FPL), excl. ZEMs 	<p>as of Apr. 2020</p> <ul style="list-style-type: none"> • Stacking with CVAP grant permitted <p>as of Jan. 2021</p> <ul style="list-style-type: none"> • +\$2,500 for income-qualified households, $\leq 400\%$ FPL, excl. ZEMs 	<p>as of Apr. 2021</p> <ul style="list-style-type: none"> • ≥ 30 U.S. EPA electric miles (45 UDDS) • Rebate Now preapproval option limited to income-qualified households, expanded to include SJ Valley

PEVs = plug-in EVs. FPL = Federal Poverty Level. ZEMs = zero-emission motorcycles. UDDS = Urban Dynamometer Driving Schedule. HOV = high-occupancy-vehicle. FCEVs = fuel-cell EVs. CVAP = Clean Vehicle Assistance Program. MSRP = manufacturer suggested retail price.

§ A second rebate can be approved for a FCEV if the first rebate was for a PEV. ‡ COVID exemptions on application window effectively delayed implementation until 4/15/2021. † Change due to \$500 decrease in standard rebate amounts (previous slide).

Processing of S&P Global Data: Personal Vehicles < 10,000 lb (~4,500 kg)



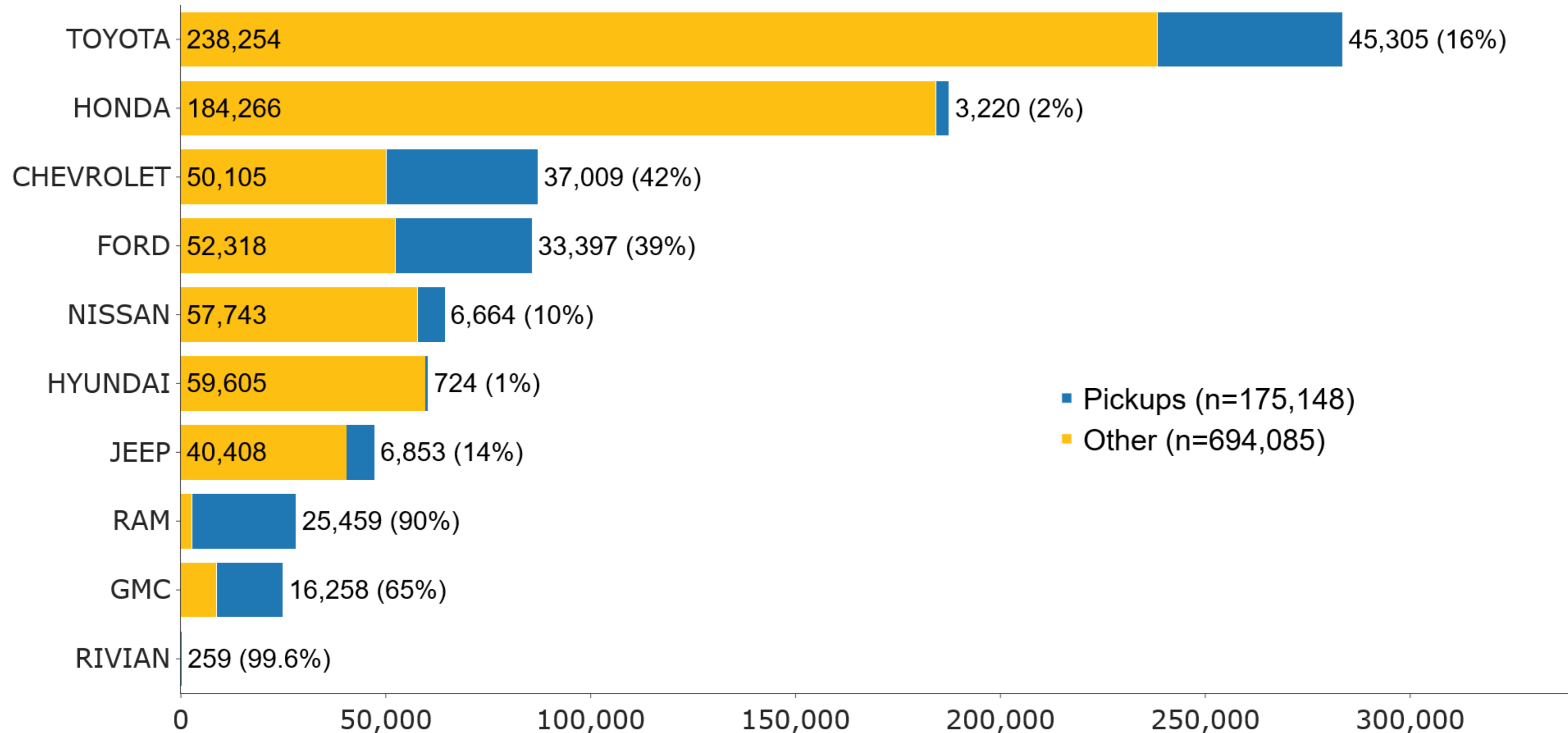
Starting Data	Filter or Transformation	Removed	Retained or Adjusted	Ending Data	Records, 2021	Records, 2022	Records, 2023 Q1
Purchased Data: 50 U.S. states and D.C.	Vehicle technology type and Disadvantaged Community status added. Census tract standardized.		All vehicles and variables retained	New Vehicle Registration Data	15,239,640	13,486,752	3,602,146
New Vehicle Registration Data	Filter by registration type to remove non-personal vehicles	Dealer/OEM, fleets (with more than 10 vehicles) and firms (with 10 or fewer vehicles) [reg. types 18, 11, 6–10]	Personal purchases and most leases [reg. types 3–5]	Personal New Vehicle Reg. Data	12,768,959	10,968,031	2,779,291
Retail New Vehicle Reg. Data	Clean provided vehicle body styles		Adjusted: Pickups ('22) -> Pickup Cab and Chassis ('22) -> Cab Chassis Sport Utility ('22) -> Sport Utility Vehicle Passenger Vans ('22) -> Van Passenger Van ('22) -> Van Cargo Truck ('22) -> Van Cargo	Cleaned Personal New Vehicle Reg. Data	12,768,959	10,968,031	2,779,291
Cleaned Retail New Vehicle Reg. Data	Regroup small-volume body styles with like styles		Adjusted: Sport Utility Truck ('21) -> Pickup Truck Wagon ('22) -> Sport Utility Vehicle Wagon ('21) -> Station Wagon	Regrouped Cleaned Personal New Vehicle Reg. Data	12,768,959	10,968,031	2,779,291
Regrouped Cleaned Retail New Vehicle Reg. Data	Filter body style categories that exceed 10,000 lb gross vehicle weight rating (GVWR) or are intended for commercial customers	Cab Chassis, Cutaway, Incomplete (Strip Chassis), Incomplete Pickup, Straight Truck, Limousine, Commercial Chassis		BS Filtered Regrouped Cleaned Personal New Vehicle Reg. Data	12,740,181	10,953,607	2,776,298
Filtered Regrouped Cleaned Retail New Vehicle Reg. Data	Filter vehicles ≥ 10,000 lb GVWR from Pickup, Van Cargo and Van Passenger body styles	Some GMC and RAM 250(0) pickup trims, GMC, RAM, Chevrolet, Ford 350(0), 450(0) pickup models, GMC Hummer EV ED1 Freightliner/Mercedes-Benz Sprinter 350 and 450 models, Ford Transit Van T3H DRW	Pickups, Van Cargo and Van Passenger < 10,000 lb GVWR	< 10,000 lb BS Filtered Regrouped & Cleaned Personal New Vehicle Reg. Data Aka, Personal Vehicles <10k lb	12,589,423	10,825,717	2,750,847

Processing of S&P Global Data: Non-Personal Vehicles < 10,000 lb (~4,500 kg)



Starting Data	Filter or Transformation	Removed	Retained or Adjusted	Ending Data	Records, 2021	Records, 2022	Records, 2023 Q1
Purchased Data: 50 U.S. states and D.C.	Vehicle technology type and Disadvantaged Community status added. Census tract standardized.		All vehicles and variables retained	New Vehicle Registration Data	15,239,640	13,486,752	3,602,146
New Vehicle Registration Data	Filter by registration type to remove personal vehicles	Personal purchases and most leases [reg. types 3–5]	Dealer/OEM, fleets (with more than 10 vehicles) and firms (with 10 or fewer vehicles) [reg. types 6–10, 12-17]	Non-Personal New Vehicle Reg. Data	2,200,531	2,340,037	760,760
Retail New Vehicle Reg. Data	Clean provided vehicle body styles		Adjusted: Pickups ('22) -> Pickup Cab and Chassis ('22) -> Cab Chassis Sport Utility ('22) -> Sport Utility Vehicle Passenger Vans ('22) -> Van Passenger Van ('22) -> Van Cargo Truck ('22) -> Van Cargo	Cleaned Personal New Vehicle Reg. Data	2,200,531	2,340,037	760,760
Cleaned Retail New Vehicle Reg. Data	Regroup small-volume body styles with like styles		Adjusted: Sport Utility Truck ('21) -> Pickup Truck Wagon ('22) -> Sport Utility Vehicle Wagon ('21) -> Station Wagon	Regrouped Cleaned Personal New Vehicle Reg. Data	2,200,531	2,340,037	760,760
Regrouped Cleaned Retail New Vehicle Reg. Data	Filter body style categories that exceed 10,000 lb gross vehicle weight rating (GVWR) or are intended for commercial customers	Cab Chassis, Cutaway, Incomplete (Strip Chassis), Incomplete Pickup, Straight Truck, Limousine, Commercial Chassis		BS Filtered Regrouped Cleaned Personal New Vehicle Reg. Data	2,089,549	2,300,787	751,648
Filtered Regrouped Cleaned Retail New Vehicle Reg. Data	Filter vehicles ≥ 10,000 lb GVWR from Pickup, Van Cargo and Van Passenger body styles	Some GMC and RAM 250(0) pickup trims, GMC, RAM, Chevrolet, Ford 350(0), 450(0) pickup models, GMC Hummer EV ED1 Freightliner/Mercedes-Benz Sprinter 350 and 450 models, Ford Transit Van T3H DRW	Pickups, Van Cargo and Van Passenger < 10,000 lb GVWR	< 10,000 lb BS Filtered Regrouped & Cleaned Personal New Vehicle Reg. Data Aka, Non-Personal Vehicles <10k lb	1,998,522	2,165,733	712,336

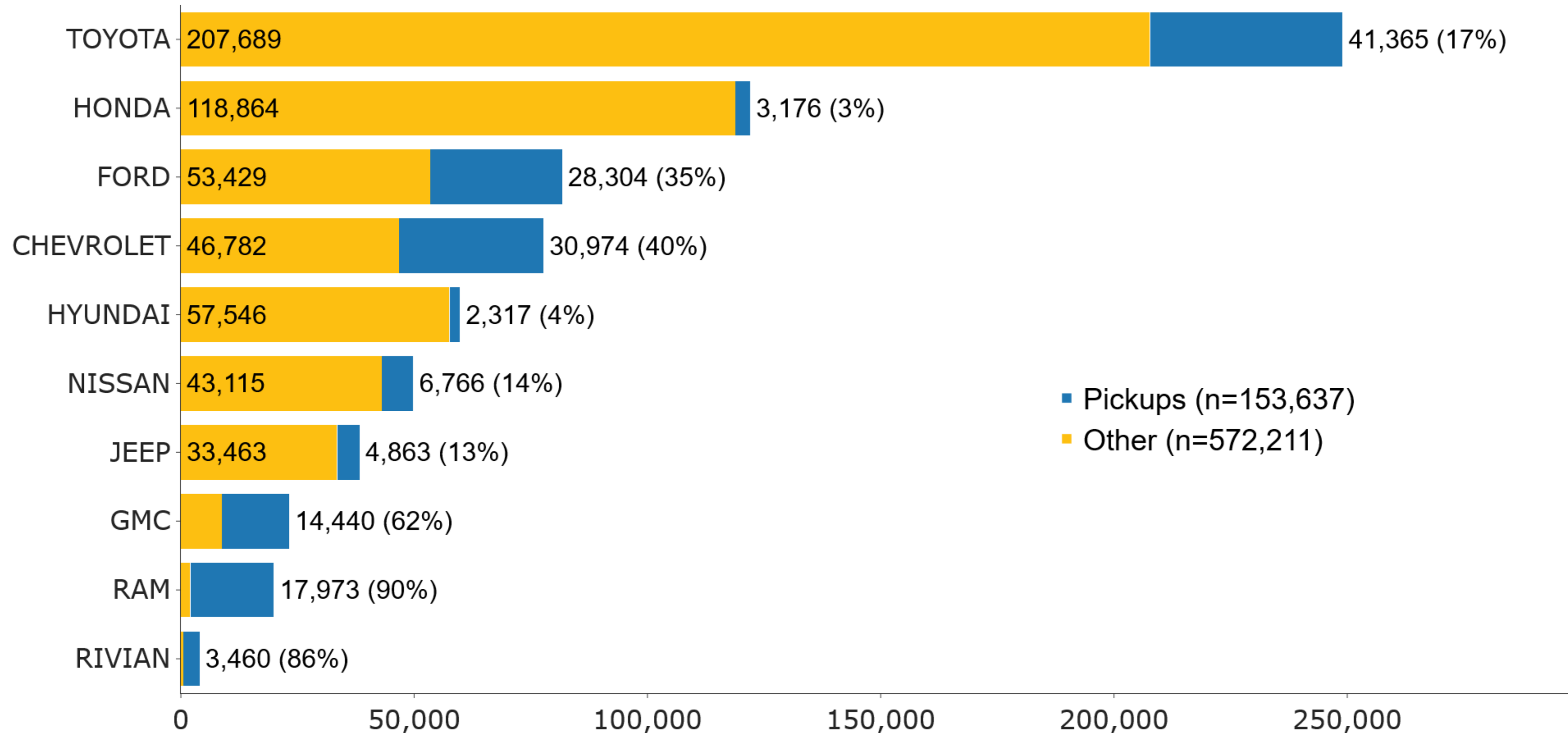
What does 100% of personal-vehicle sales look like in CA? 2021



2021 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2022.

Filtered as described on [S&P Global Data Processing: Personal Vehicles < 10,000 lb](#) slide. Model totals may not sum to category totals due to rounding of weighted registrations.

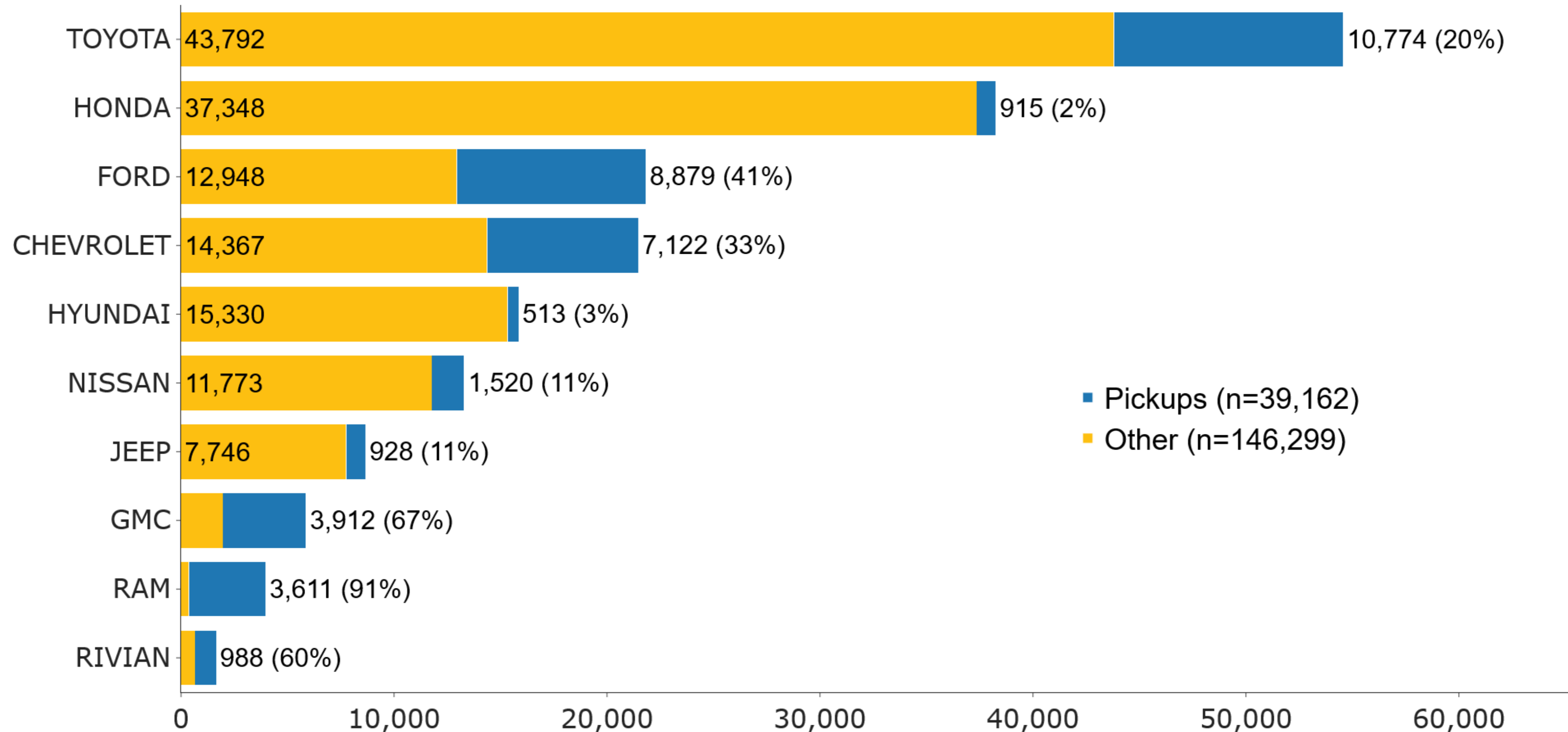
What does 100% of personal-vehicle sales look like in CA? 2022



2022 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2022.

Filtered as described on [S&P Global Data Processing: Personal Vehicles < 10,000 lb](#) slide. Model totals may not sum to category totals due to rounding of weighted registrations.

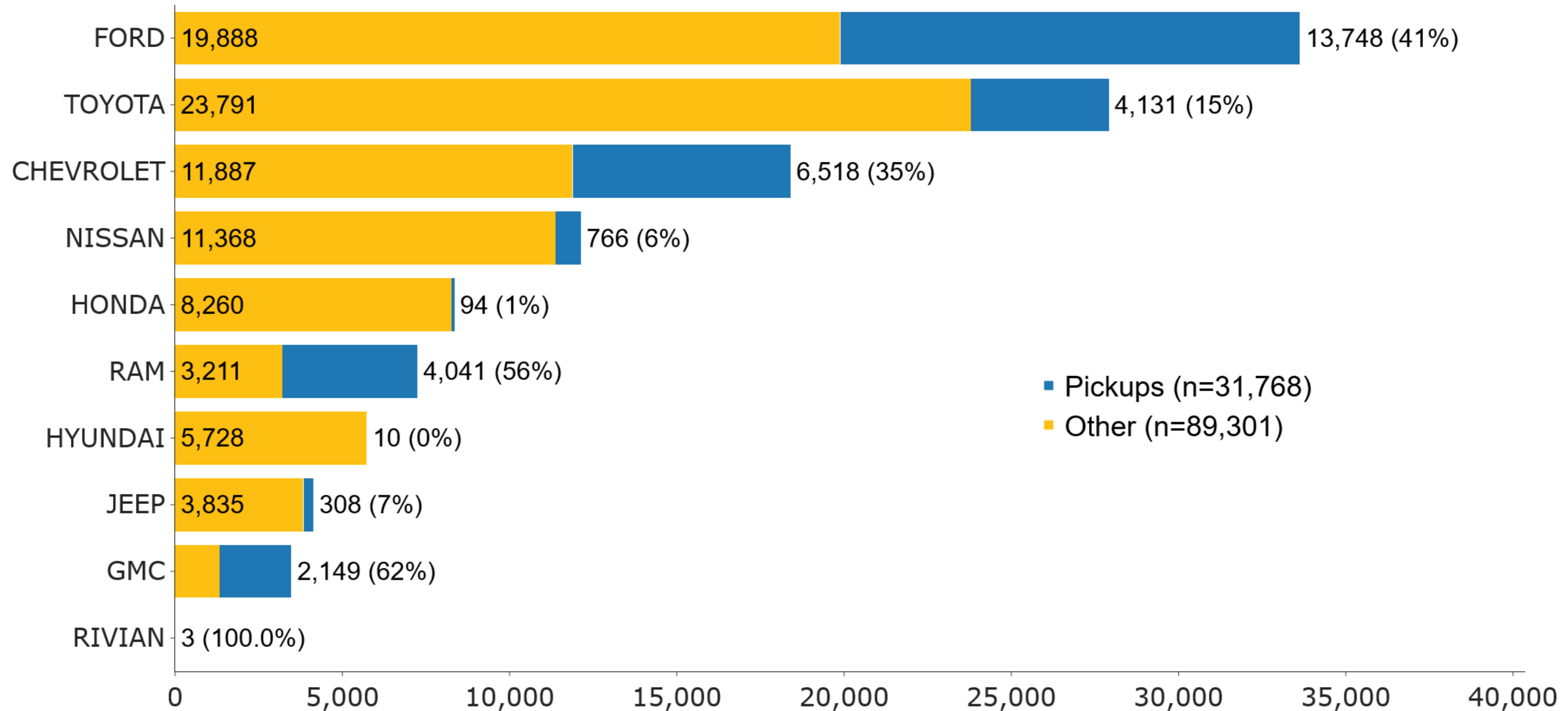
What does 100% of personal-vehicle sales look like in CA? 2023 Q1



2023 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2023.

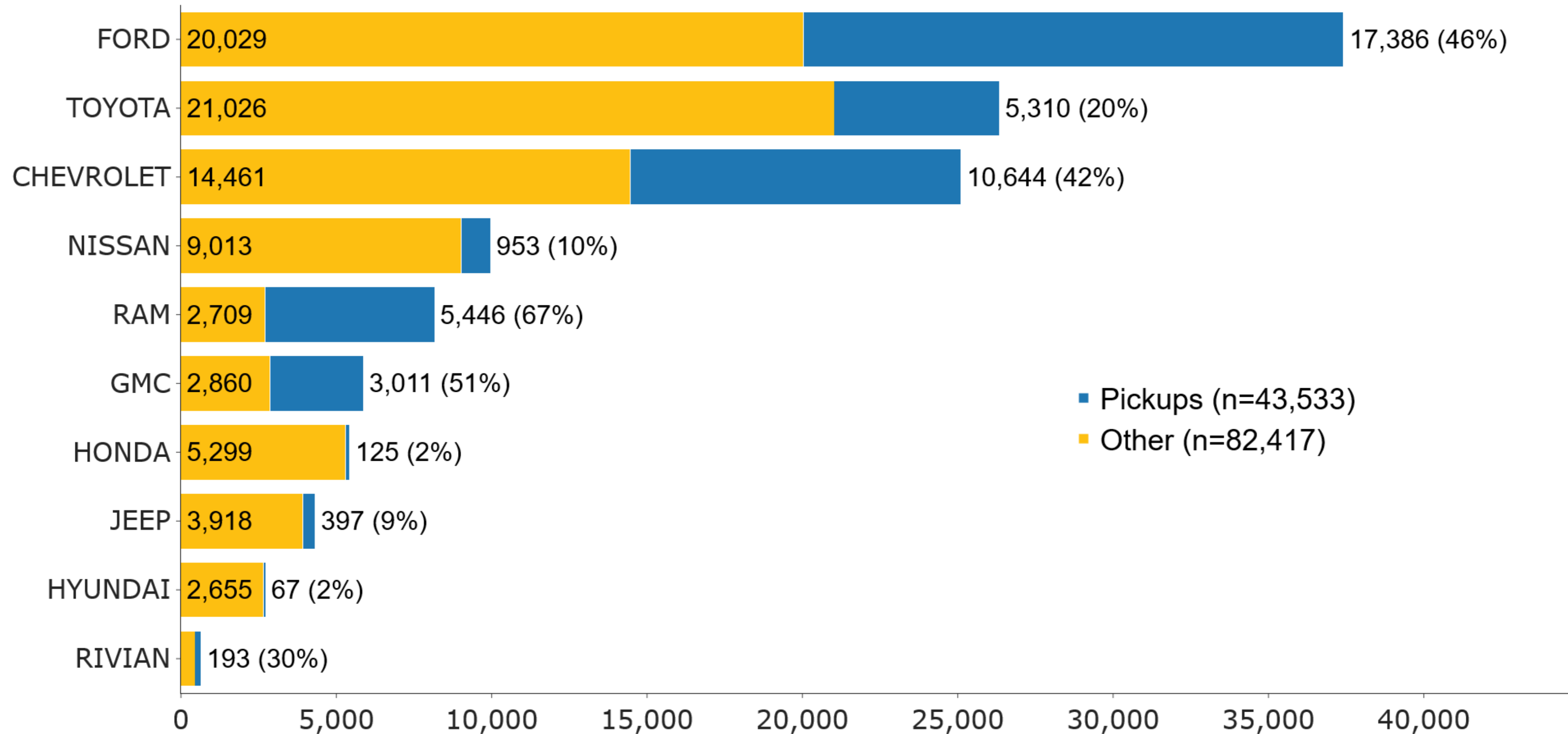
Filtered as described on [S&P Global Data Processing: Personal Vehicles < 10,000 lb](#) slide. Model totals may not sum to category totals due to rounding of weighted registrations.

What does 100% of non-personal-vehicle sales look like in CA? 2021



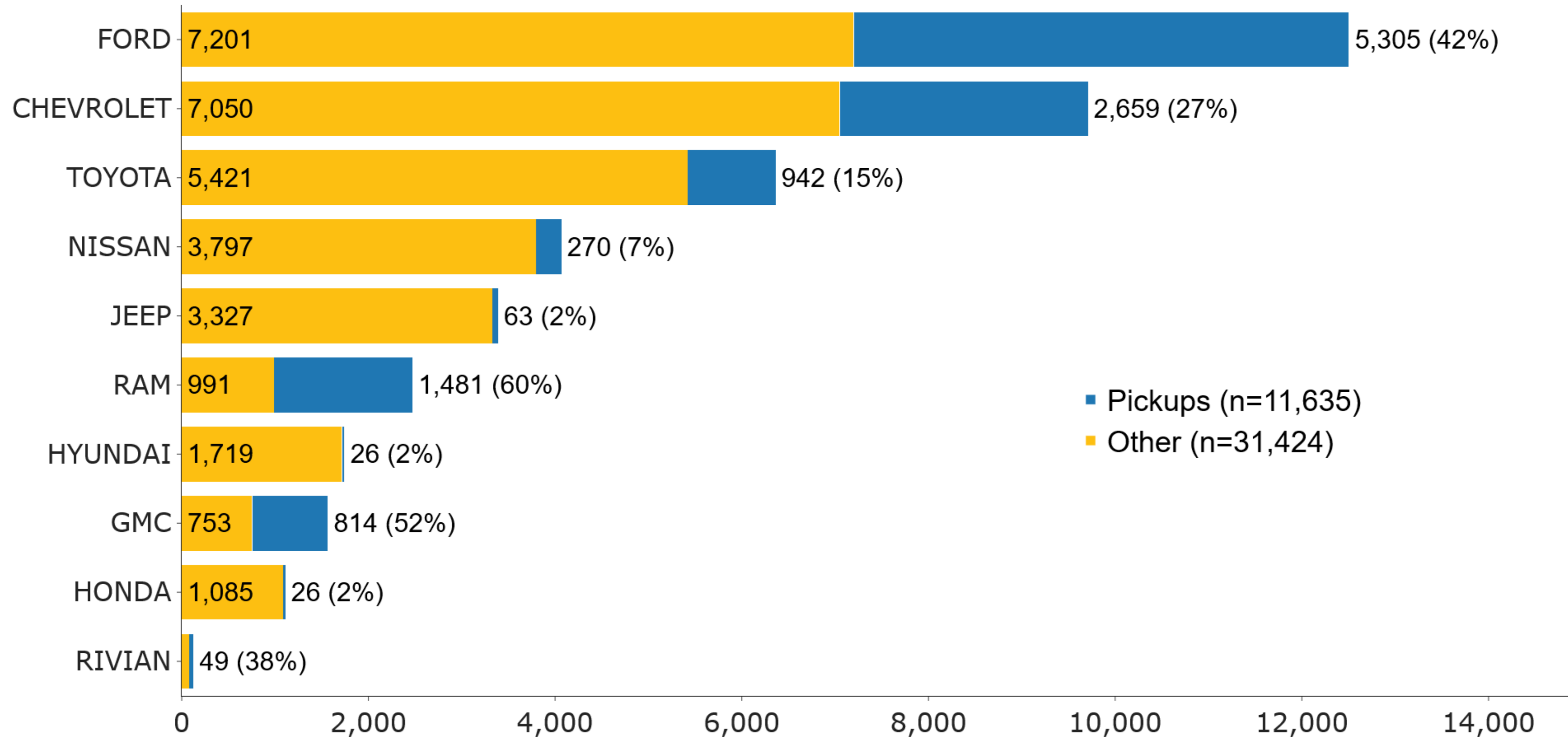
2021 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2021.
 Filtered as described on [S&P Global Data Processing: Non-Personal Vehicles < 10,000 lb](#) slide. Model totals may not sum to category totals due to rounding of weighted registrations.

What does 100% of non-personal-vehicle sales look like in CA? 2022



2022 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2022.
 Filtered as described on [S&P Global Data Processing: Non-Personal Vehicles < 10,000 lb](#) slide. Model totals may not sum to category totals due to rounding of weighted registrations.

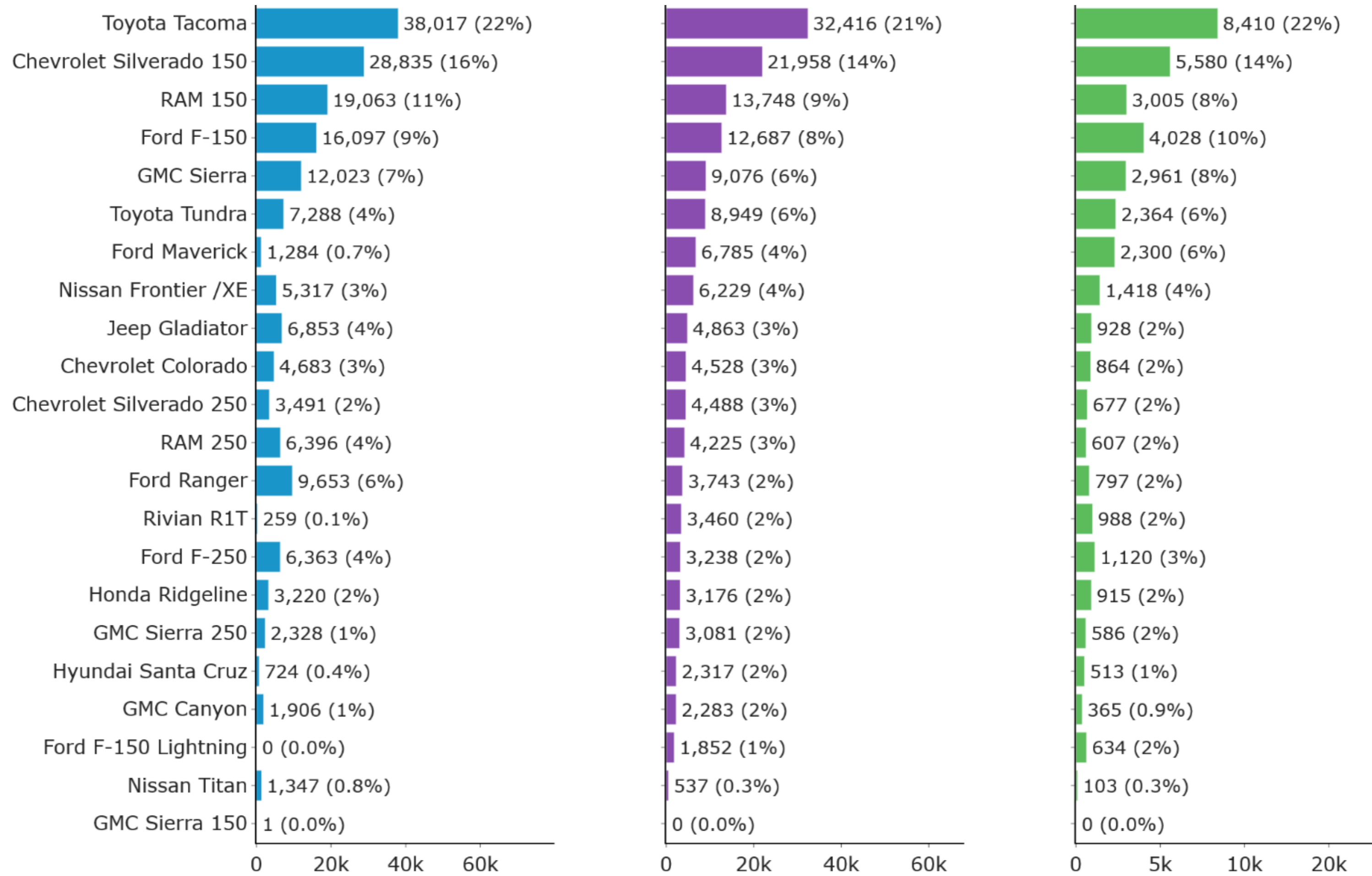
What does 100% of non-personal-vehicle sales look like in CA? 2023 Q1



2023 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2023.
 Filtered as described on [S&P Global Data Processing: Non-Personal Vehicles < 10,000 lb](#) slide.
 Model totals may not sum to category totals due to rounding of weighted registrations.

CA Personal Pickup Sales by “Model”: 2021, 2022, 2023 Q1

< 10,000 lb

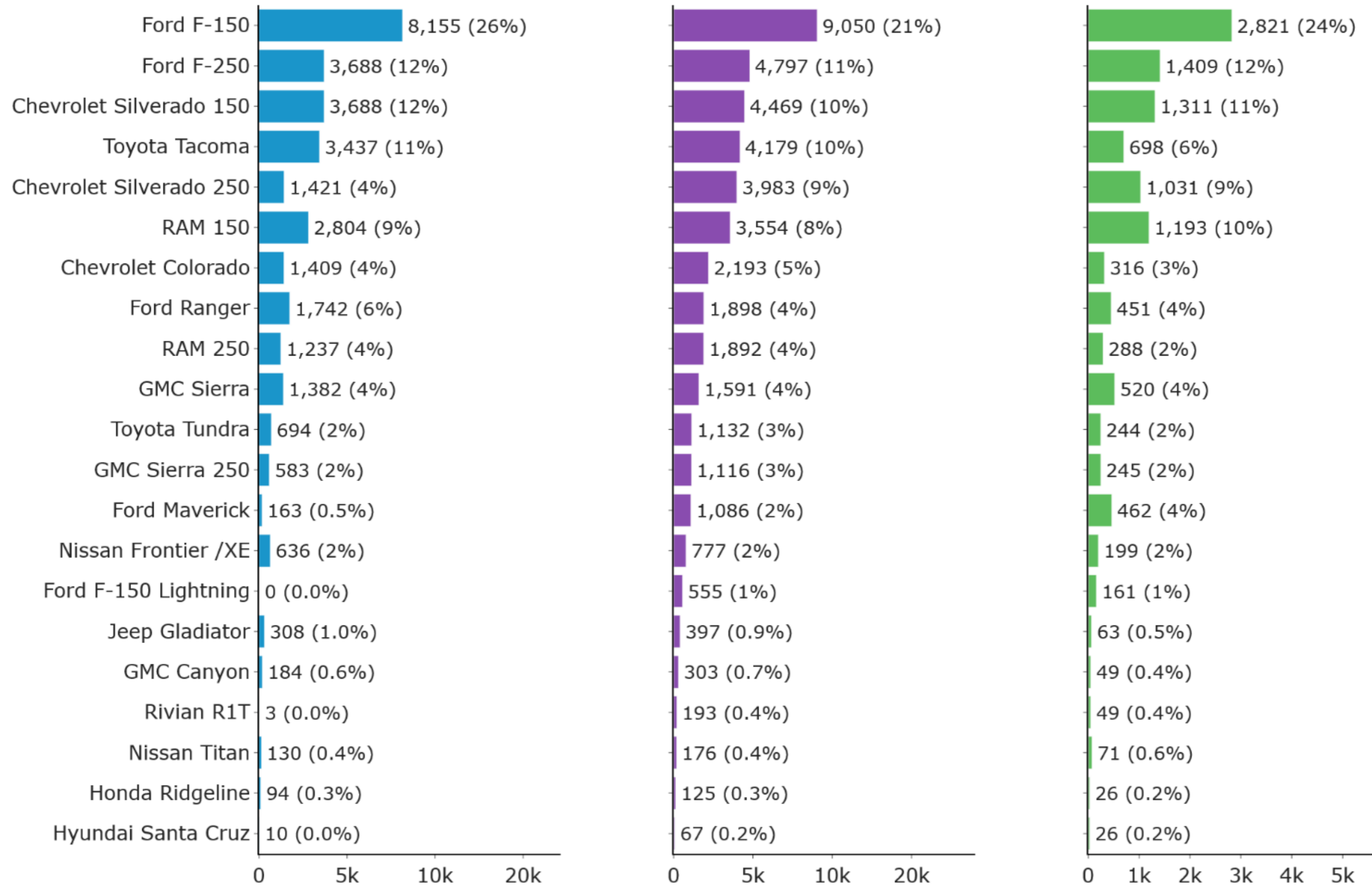


■ 2021 (n=175,148) ■ 2022 (n=153,637) ■ 2023 Q1 (n=39,163)

Contains data from S&P Global Mobility © 2023.

Filtering summarized on [S&P Global Data Processing: Personal Vehicles < 10,000 lb](#) slide. Percentages may not sum to 100% due to rounding.

CA Non-Personal Pickup Sales by “Model”: 2021 and 2022 and 2023 Q1 < 10,000 lb



■ 2021 (n=31,768) ■ 2022 (n=43,534) ■ 2023 Q1 (n=11,635)

Contains data from S&P Global Mobility © 2023.

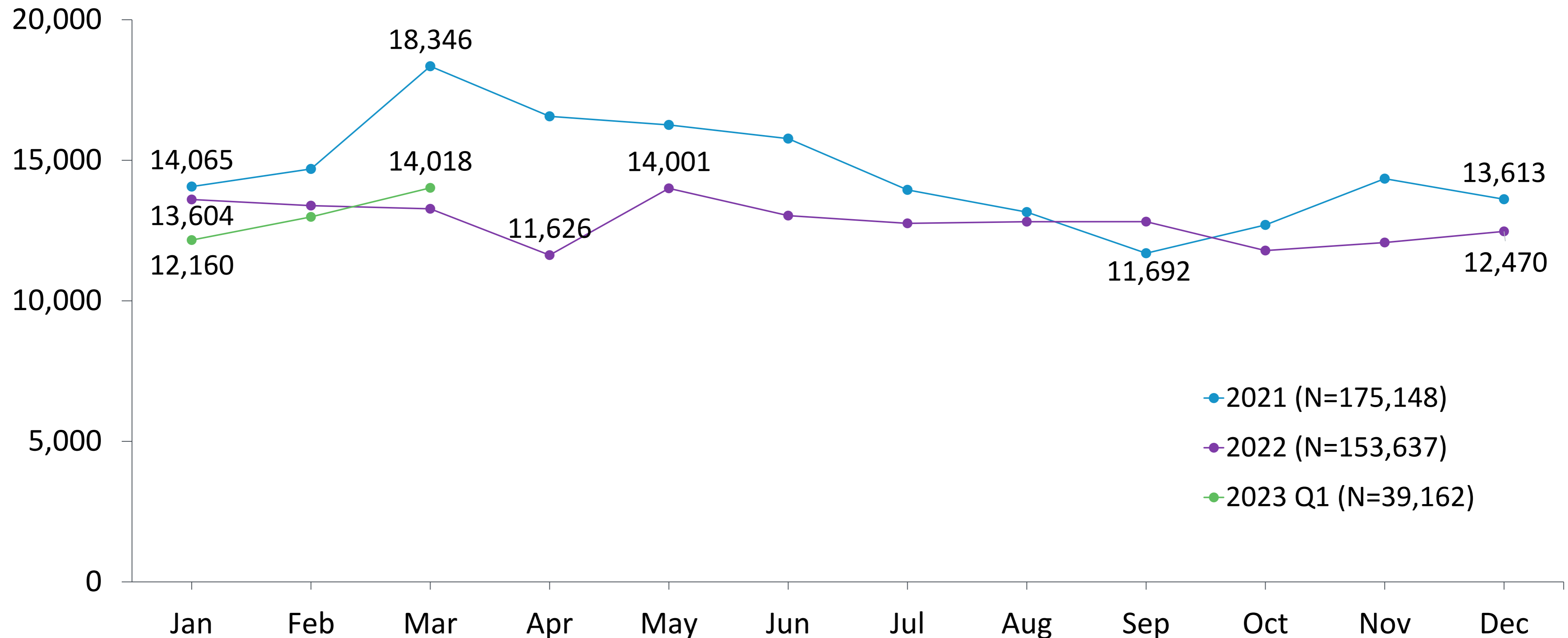
Filtering summarized on [S&P Global Data Processing: Non-Personal Vehicles < 10,000 lb](#) slide. Percentages may not sum to 100% due to rounding.

Monthly CA Personal Pickup Sales: 2021, 2022, and 2023(Q1)

< 10,000 lb



New Pickup Registrations



Contains data from S&P Global Mobility © 2023 filtering to pickups.

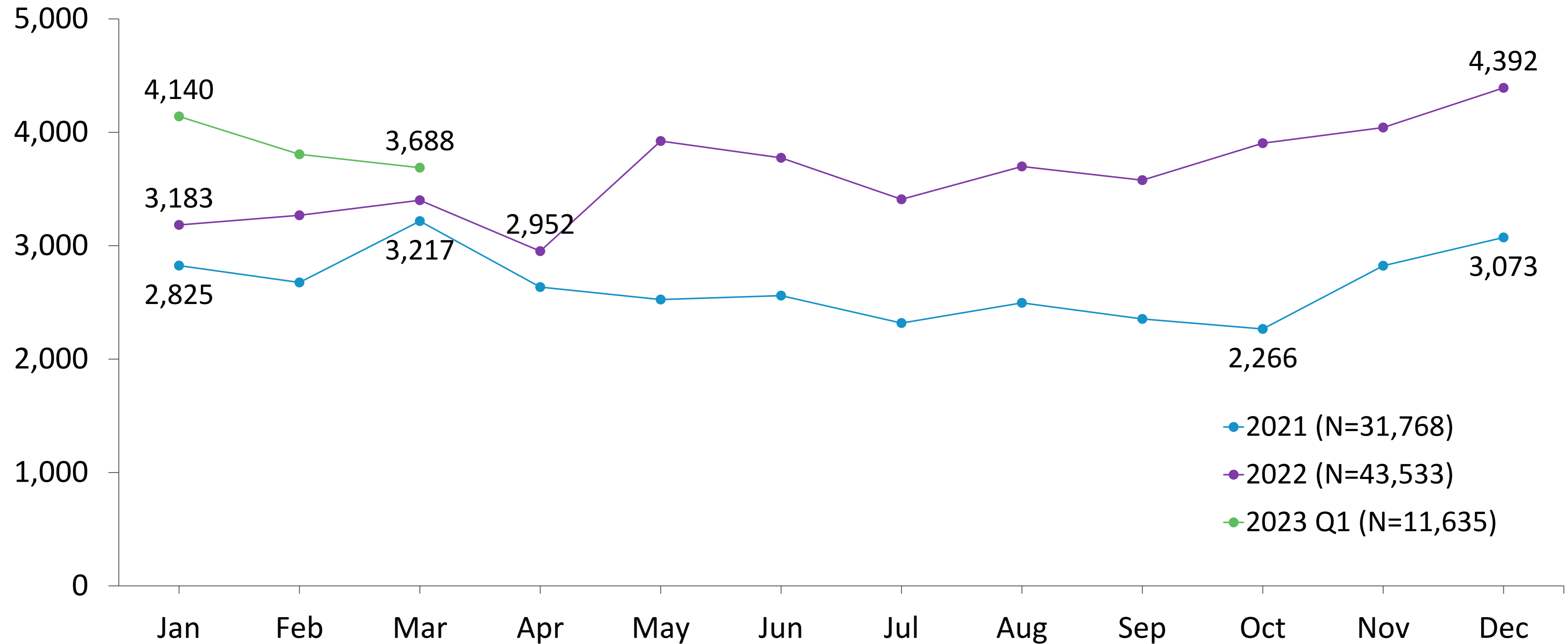
Filtering summarized on [S&P Global Data Processing: Personal Vehicles < 10,000 lb](#) slide. Monthly totals may not sum to annual totals due to rounding of weighted registrations.

Monthly CA Non-Personal Pickup Sales: 2021, 2022, and 2023(Q1)

< 10,000 lb



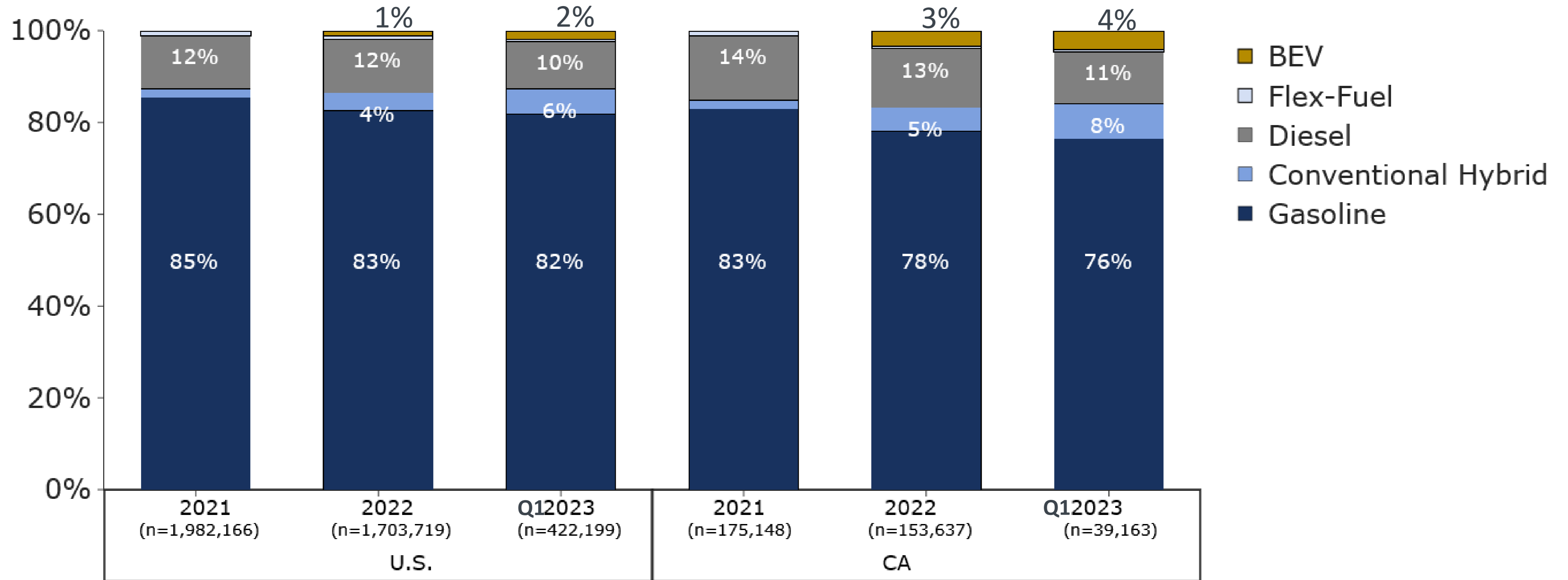
New Pickup Registrations



Contains data from S&P Global Mobility © 2023 filtering to pickups.

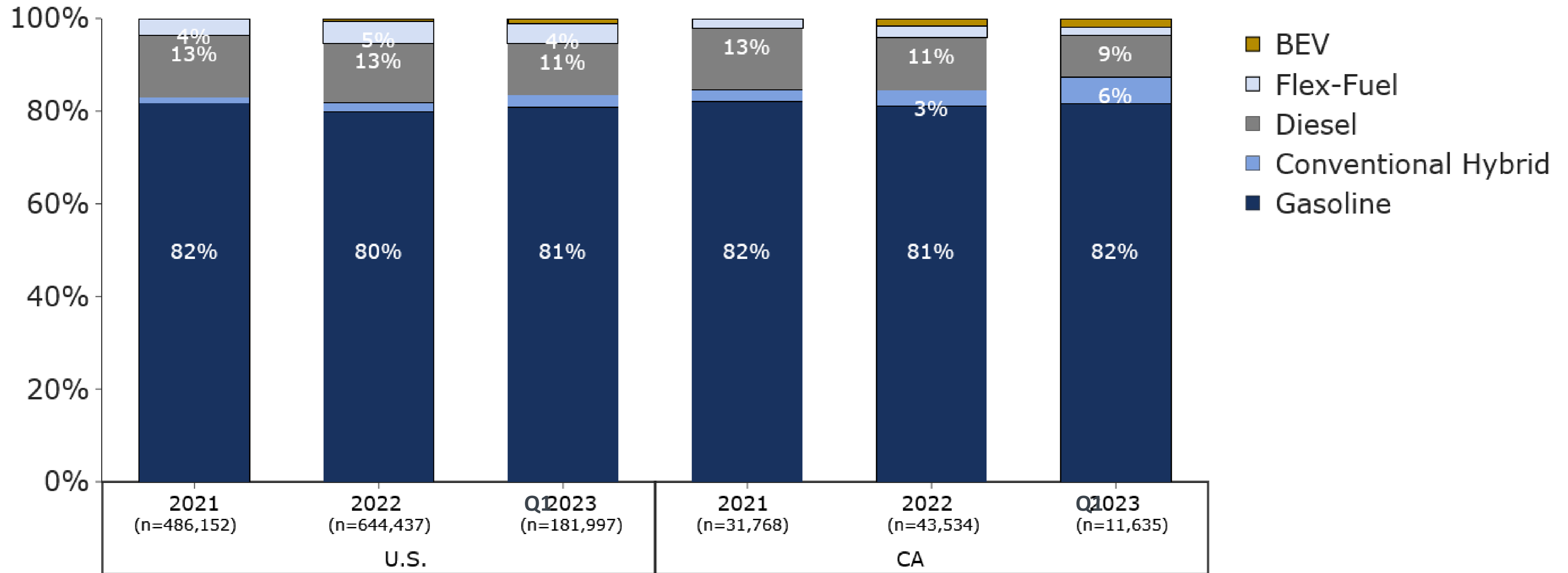
Filtering summarized on [S&P Global Data Processing: Non-Personal Vehicles < 10,000 lb](#) slide. Monthly totals may not sum to annual totals due to rounding of weighted registrations.

Personal Pickup Sales by Fuel Type < 10,000 lb



Contains data from S&P Global Mobility © 2023. Filtering summarized on [S&P Global Data Processing: Personal Vehicles < 10,000 lb](#) slide. Conventional Hybrid refers to gas-only hybrid, not plug-in hybrid. Bars may not sum to 100% due to rounding.

Non-Personal Pickup Sales by Fuel Type < 10,000 lb



Contains data from S&P Global Mobility © 2023. Filtering summarized on [S&P Global Data Processing: Non-Personal Vehicles < 10,000 lb](#) slide. Conventional Hybrid refers to gas-only hybrid, not plug-in hybrid. Bars may not sum to 100% due to rounding.

A close-up photograph of a person's hand plugging a charging cable into the charging port of an electric vehicle. The scene is set outdoors at sunset, with warm, golden light and lens flare effects. In the background, a bicycle is parked at a charging station, and a building is visible. The overall atmosphere is clean and modern, representing sustainable transportation.

Goals: Pickup Projections & Paths To Electrification

Slides led by Francis Alvarez

S&P Global Data Processing: CA Retail & Fleet Pickups < 10,000 lb



Sales*

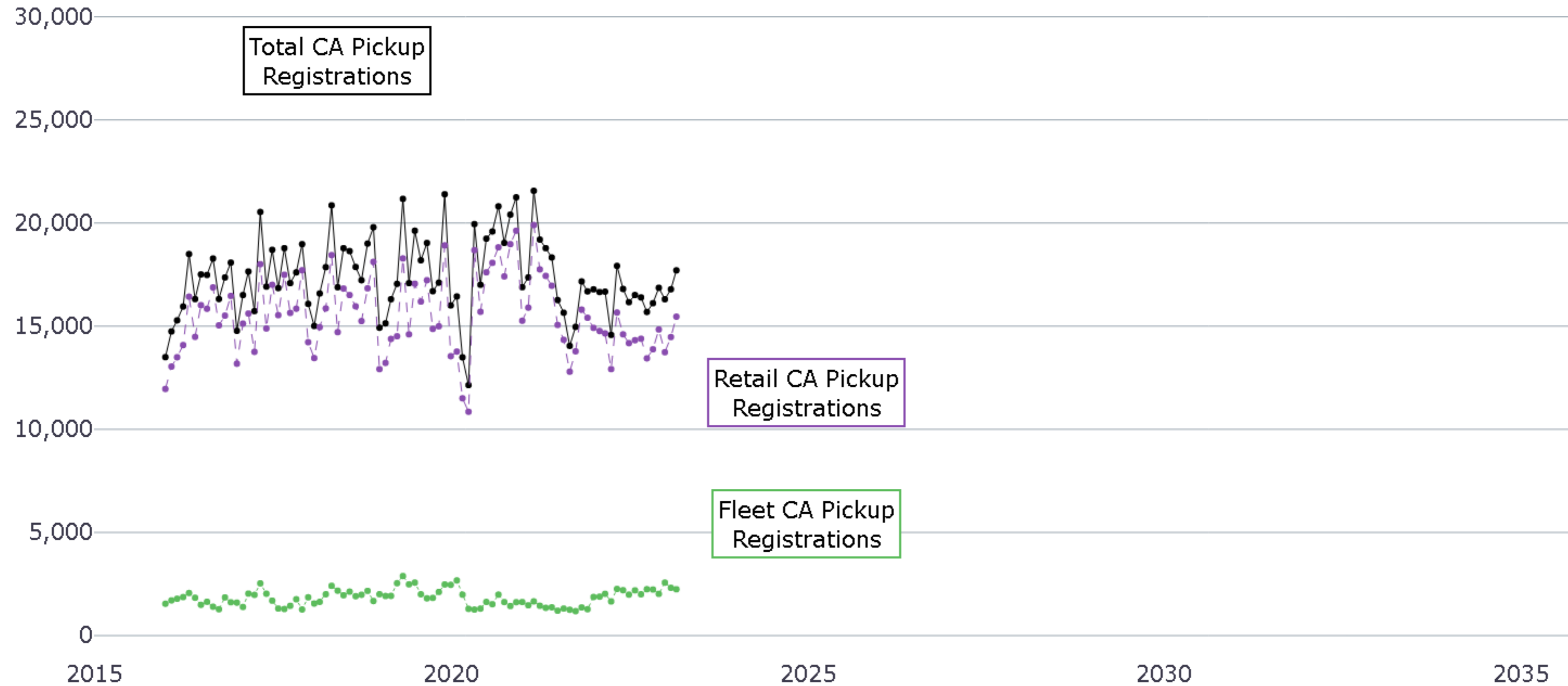
Starting Data	Filter or Transformation	Removed	Retained or Adjusted	Ending Data	2016-2023Q1	2019	2020	2021	2022	2023 Q1
Purchased Data: 50 U.S. states and D.C.	Vehicle technology type and disadvantaged community status added. Census tract standardized.		All vehicles and variables retained	U.S. New Vehicle Reg. Data	N/A	N/A	N/A	15,239,630	13,484,829	3,601,675
U.S. New Vehicle Reg. Data	Filter to California-specific registrations	All registrations other than California	California registrations	CA New Vehicle Reg. Data	13,383,869	1,892,483	1,572,797	1,757,997	1,593,088	430,287
CA New Vehicle Reg. Data	Filter by registration type to align with CVRP rebate-eligible applicants	Dealer/OEM [reg. type 18]	Retail and fleet purchases [reg. types 2 & 11]	Retail & Fleet CA New Vehicle Reg. Data	13,100,800	1,848,148	1,532,582	1,720,158	1,568,309	421,409
Retail & Fleet CA New Vehicle Reg. Data	Clean and regroup provided vehicle body styles		Adjusted: Pickup -> Pickups Sport Utility Trucks -> Pickups	Cleaned & Regrouped Retail & Fleet CA New Vehicle Reg. Data	13,100,800	1,848,148	1,532,582	1,720,158	1,568,309	421,409
Cleaned & Regrouped Retail & Fleet CA New Vehicle Reg. Data	Filter to pickups and trucks	Convertible, Coupe, Hatchback, Passenger Vans, Sedan, Sport Utility, Station Wagon, UNKNOWN, Van, Wagon	Pickups and Trucks	Truck body style (BS) Cleaned & Regrouped Retail & Fleet CA New Vehicle Reg. Data	1,645,329	230,723	233,987	231,663	213,545	54,216
Truck BS Cleaned & Regrouped Retail & Fleet CA New Vehicle Reg. Data	Filter to CVRP eligible pickup types	Cab and Chassis, Commercial Chassis, Cutaway, Incomplete (Strip Chassis), Incomplete Pickup, Straight Truck, Truck	CVRP-Eligible Pickup types	CVRP Eligible Pickup BS Cleaned & Regrouped Retail & Fleet CA New Vehicle Reg. Data	1,584,749	224,262	227,543	218,869	206,832	53,047
CVRP Eligible Pickup BS Cleaned & Regrouped Retail & Fleet CA New Vehicle Reg. Data	Filter vehicles ≥ 10,000 GVWR from Pickup body styles	Chevrolet Silverado 3500, Ford F-Series 350 & 450, GMC Sierra and RAM select 2500 & 3500 Models, GMC Hummer EV ED1	Pickups < 10,000 lb GVWR	<10,000 lb CVRP Eligible Pickup BS Cleaned & Regrouped Retail & Fleet CA New Vehicle Reg. Data Aka, CA Retail & Fleet Pickups < 10k lb	1,508,010	213,736	215,374	206,916	197,148	50,801

* New-vehicle registrations

Contains content from S&P Global Mobility © 2023.
GVWR based on 2021 and 2022 model years.

CA Pickup Sales: Retail & Fleet

< 10,000 lb

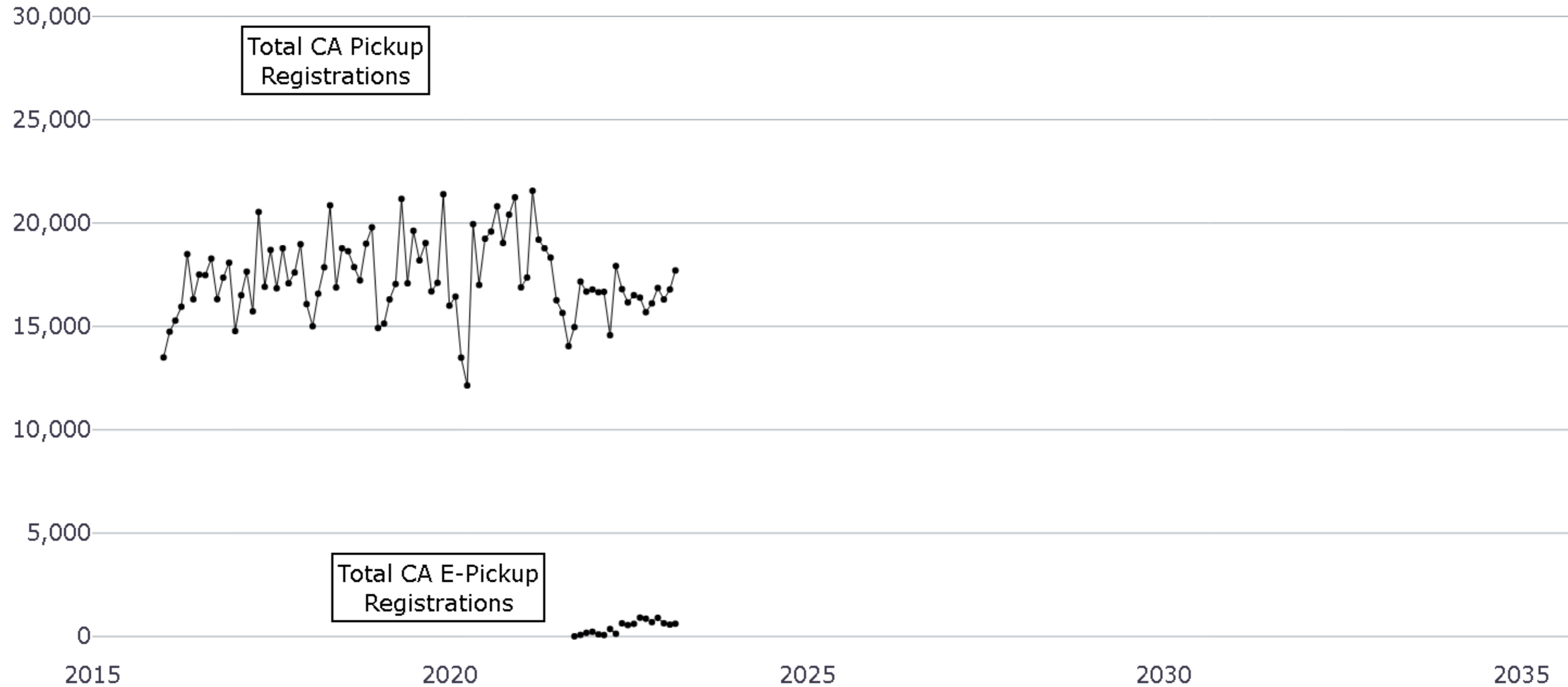


Contains content from S&P Global © 2023. Data span 1/2016 thru 3/2023

Data filtered for California-registered, retail and fleet light-duty (GVWR < 10k) vehicles with the following body styles: pickups, sport utility trucks

CA Pickup Sales: Electric Pickups

Retail & Fleet < 10,000 lb

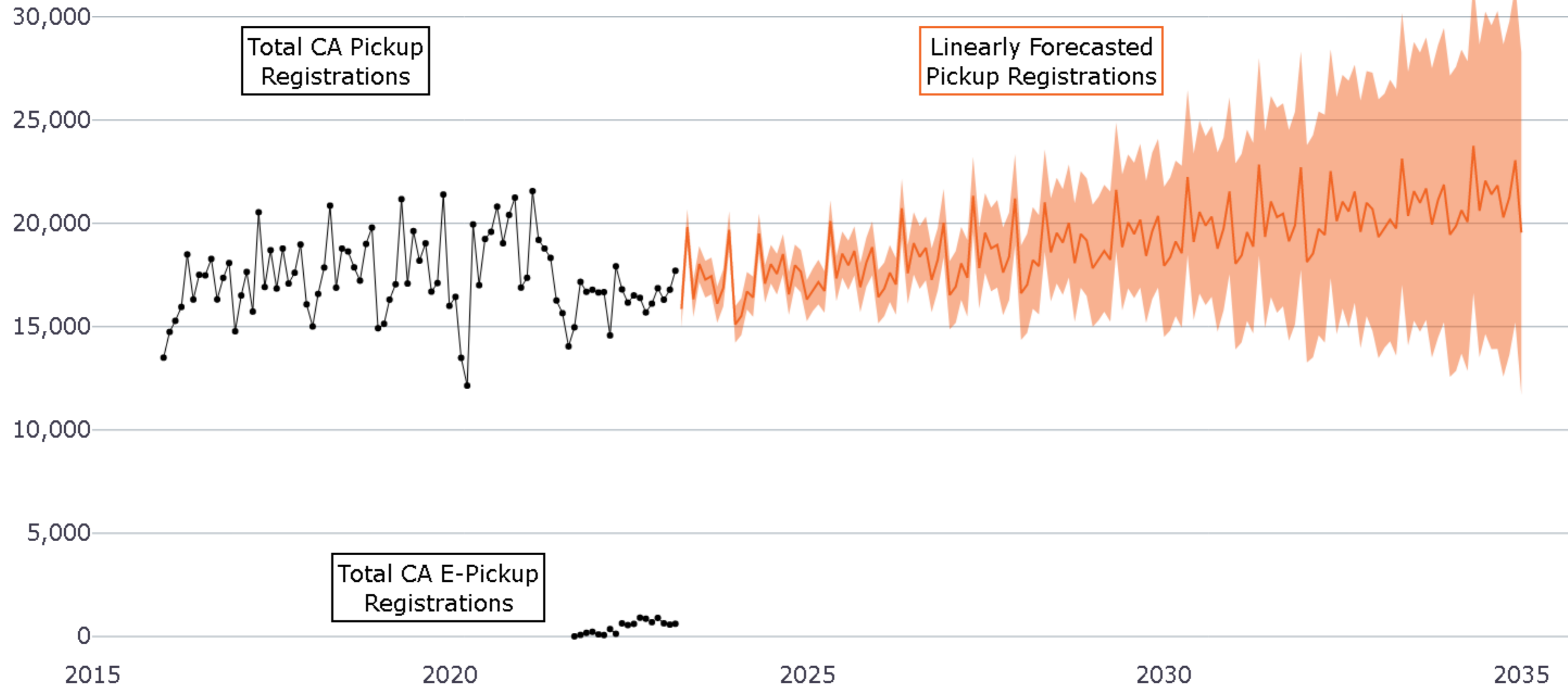


Contains content from S&P Global © 2023. Data span 1/2016 thru 3/2023

Data filtered for California-registered, retail and fleet light-duty (GVWR < 10k) vehicles with the following body styles: pickups, sport utility trucks

CA Pickup Sales: Projections

Retail & Fleet < 10,000 lb

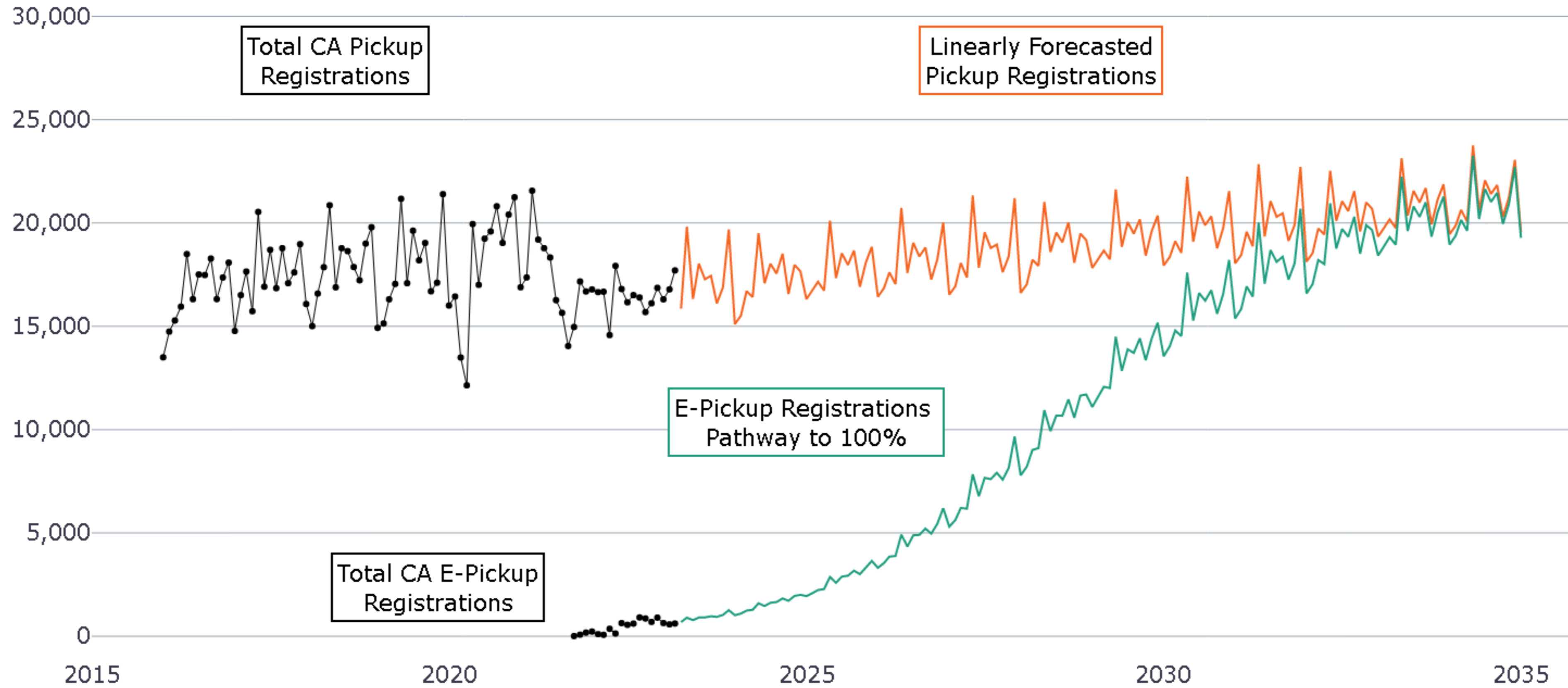


Contains content from S&P Global © 2023. Data span 1/2016 thru 3/2023

Data filtered for California-registered, retail and fleet light-duty (GVWR < 10k) vehicles with the following body styles: pickups, sport utility trucks

CA Pickup Sales: Electrification Pathway to 100% by 2035

Retail & Fleet < 10,000 lb

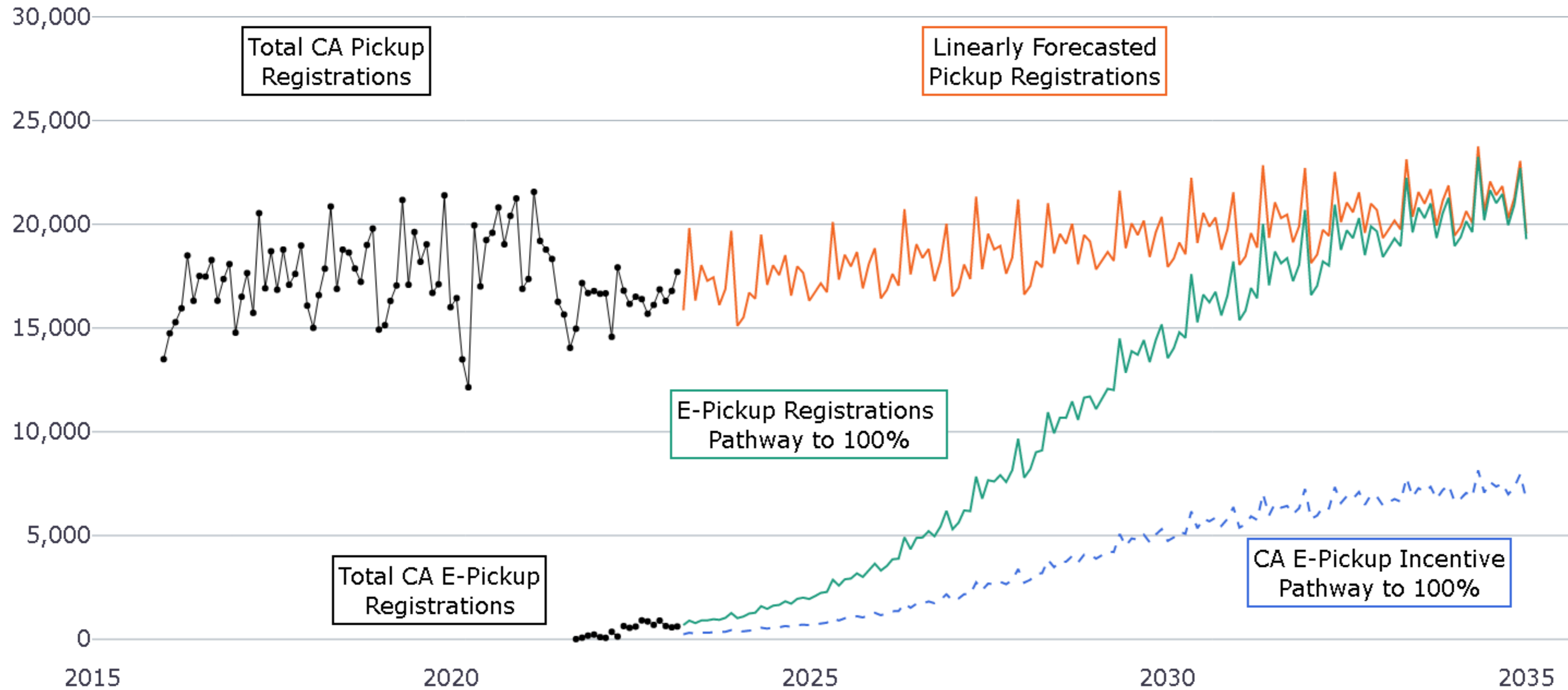


Contains content from S&P Global © 2023. Data span 1/2016 thru 3/2023

Data filtered for California-registered, retail and fleet light-duty (GVWR < 10k) vehicles with the following body styles: pickups, sport utility trucks

CA Pickup Sales: Electric Pickup Rebates (35% scenario, illustrative only)

Retail & Fleet < 10,000 lb



Rebate projections assume rebated percentage continues at recent levels (35%)

Contains content from S&P Global © 2023. Data span 1/2016 thru 3/2023

Data filtered for California-registered, retail and fleet light-duty (GVWR < 10k) vehicles with the following body styles: pickups, sport utility trucks

A close-up photograph of a person's hand plugging a charging cable into the port of an electric vehicle. The scene is set during sunset, with warm, golden light and lens flare effects. The background shows a blurred urban street with other vehicles and buildings.

Products

Existing and Planned Electric Pickups

Electric Pickup Models: Previous (circa end of Q2 2023)








Make	Model/Trim	Model Year	Pickup Class	E-Range (e-mi)	Battery (kWh)	Base MSRP
Chevrolet	S10 Electric	1998	Small, 2WD	72	29	\$33,305*
Ford	Ranger Pickup	1999–2001	Standard, 2WD	50	65	\$50,000*

Information from manufacturer website or [caranddriver.com](https://www.caranddriver.com) as of 7/11/2023.

*Estimated but not definitively confirmed with EPA or manufacturer website.

Electric Pickup Models: Existing (circa end of Q2 2023)



	Make	Model/Trim	Model Year	Pickup Class	E-Range (e-mi)	Battery (kWh)	Base MSRP
	Chevrolet	Silverado EV	2024	Standard, 4WD	450	200*	\$52,000*
	Ford	F-150 Lightning	2022–2023	Standard, 4WD	230–320	98–131*	\$55,974– \$96,874
	Lordstown	Endurance	2023	Standard, 4WD	174	109*	\$65,060 [†]
	GMC	HUMMER EV Pickup	2024	HD (>10,000 lb), Standard, 4WD	298–314	213*	\$79,995* [†]
	Rivian	R1T	2022–2023	MD (>8,500 lb), Standard, 4WD	289–352	105–135*	\$67,500– \$87,600 [†]

Information from manufacturer website or [caranddriver.com](https://www.caranddriver.com) as of 7/11/2023




*Estimated but not definitively confirmed with EPA or manufacturer website.

[†]Above CVRP MSRP cap

Electric Pickup Models Details: Ford, GMC, and Rivian



(circa end of Q2 2023)

	Make	Model/Trim	Model Year	Pickup Class	E-Range (e-mi)	Battery (kWh)	Base MSRP
	Ford	F-150 Lightning Pro	2022–2023	Standard, 4WD	230–240	98	\$39,974–\$46,974
	Ford	F-150 Lightning XLT Extended Range	2022–2023	Standard, 4WD	320	131	\$59,474–\$72,474
	Ford	F-150 Lightning Platinum	2022–2023	Standard, 4WD	300	131	\$90,874–\$98,074
	GMC	HUMMER EV Pickup	2024	HD (>10,000 lb), Standard, 4WD	314	213	\$79,995* [†]
	GMC	HUMMER EV Pickup MT Tires	2024	HD (>10,000 lb), Standard, 4WD	298	213	\$89,990* [†]
	Rivian	R1T	2022	MD (>8,500 lb), Standard, 4WD	314	135	\$67,500 [†]
	Rivian	R1T (20-inch wheels)	2023	MD (>8,500 lb), Standard, 4WD	289	105*	\$82,850 [†]
	Rivian	R1T (21-inch wheels)	2023	MD (>8,500 lb), Standard, 4WD	328	105*	\$73,000 [†]
	Rivian	R1T (22-inch wheels)	2023	MD (>8,500 lb), Standard, 4WD	303	105*	\$76,500 [†]

Information from manufacturer website or [caranddriver.com](https://www.caranddriver.com) as of 7/11/2023

*Estimated but not definitively confirmed with EPA or manufacturer website.

[†]Above CVRP MSRP cap

Electric Pickup Models: **Announced** (circa end of Q2 2023)



Make	Model/Trim	Model Year	Pickup Class	E-Range (e-mi)	Battery (kWh)	Base MSRP
	Tesla Cybertruck	2024?	Standard, 4WD or 2WD	250–500	100–200	\$39,900–\$69,900*
	Canoo Pickup	2024	Small, 4WD or 2WD	200	tbd	tbd
	Dodge RAM 1500 EV	2024	tbd	Up to 500*	tbd	\$58,000+*
	GMC Sierra Denali Edition 1	2024	Standard, 4WD	400	tbd	\$107,000 [†]
	Toyota Tacoma	2024	Standard, 4WD	200+*	tbd	\$50,000+*
	GMC Canyon	2026?	Standard, 4WD	tbd	tbd	tbd

Information sourced from manufacturer website or [caranddriver.com](https://www.caranddriver.com) as of 7/11/2023

*Estimated but not definitively confirmed on manufacturer website

[†]Above CVRP MSRP cap

A close-up photograph of a person's hand plugging a charging cable into the port of an electric vehicle. The scene is set outdoors at sunset, with warm, golden light and lens flare effects. In the background, a public charging station with multiple charging bays is visible, along with a bicycle parked nearby. The overall atmosphere is clean and modern, emphasizing sustainable transportation.

Access: Designing Incentives for Electric Pickup Affordability

Slides led by John Anderson

Electric Pickup Incentive Design for Affordability



New Electric Pickup Affordability Currently Requires Higher Incomes

20% of income, Four-person household



Vehicle (MY 2023)	MSRP	Down Payment	Total Monthly Cost	Minimum Income for Affordable Purchase
Ford F-150 Lightning Platinum	\$96,874	\$10,618	\$2,746	\$329,576
Ford F-150 Lightning Ext. Range	\$80,974	\$8,888	\$2,355	\$282,635
Rivian R1T (20 inch wheels)	\$74,075	\$8,137	\$2,196	\$263,485
Ford F-150 Lightning	\$55,974	\$6,167	\$1,751	\$210,115
Ford F-150 XL 2.7L 2WD	\$35,870	\$3,980	\$1,411	\$169,315

Assumptions: Monthly cost does not exceed 20% of income; Purchasing power adjustment for larger households; Vehicle cost: MSRP without additional options; Interest rate: 17%; Loan term: 60 months; Down payment: 10%; Insurance premium: \$251/month (Forbes); Maintenance: \$65/month (lifetime average); DMV and doc fees: \$789 (for CA); Sales tax rate: 8.82% (average for CA, TaxFoundation.org); Fuel costs: varies by vehicle (FuelEconomy.gov)

New Electric Pickup Affordability Might Depend on Large Incentives

20% of income, Four-person household



Vehicle (MY 2023)	MSRP	Down Payment	Total Monthly Cost	Minimum Income for Affordable Purchase	Min. Income for Affordable Purchase with \$5k Incentive
Ford F-150 Lightning Platinum	\$96,874	\$10,618	\$2,746	\$329,576	\$314,665
Ford F-150 Lightning Ext. Range	\$80,974	\$8,888	\$2,355	\$282,635	\$267,724
Rivian R1T (20 inch wheels)	\$74,075	\$8,137	\$2,196	\$263,485	\$248,573
Ford F-150 Lightning	\$55,974	\$6,167	\$1,751	\$210,115	\$195,203
Ford F-150 XL 2.7L 2WD	\$35,870	\$3,980	\$1,411	\$169,315	\$154,403

Assumptions: Monthly cost does not exceed 20% of income; Purchasing power adjustment for larger households; Vehicle cost: MSRP without additional options; Interest rate: 17%; Loan term: 60 months; Down payment: 10%; Insurance premium: \$251/month (Forbes); Maintenance: \$65/month (lifetime average); DMV and doc fees: \$789 (for CA); Sales tax rate: 8.82% (average for CA, TaxFoundation.org); Fuel costs: varies by vehicle (FuelEconomy.gov)

Electric Pickup Affordability: **Min. MSRP** vs. Average Purchase Price

Rebated Truck Battery EVs

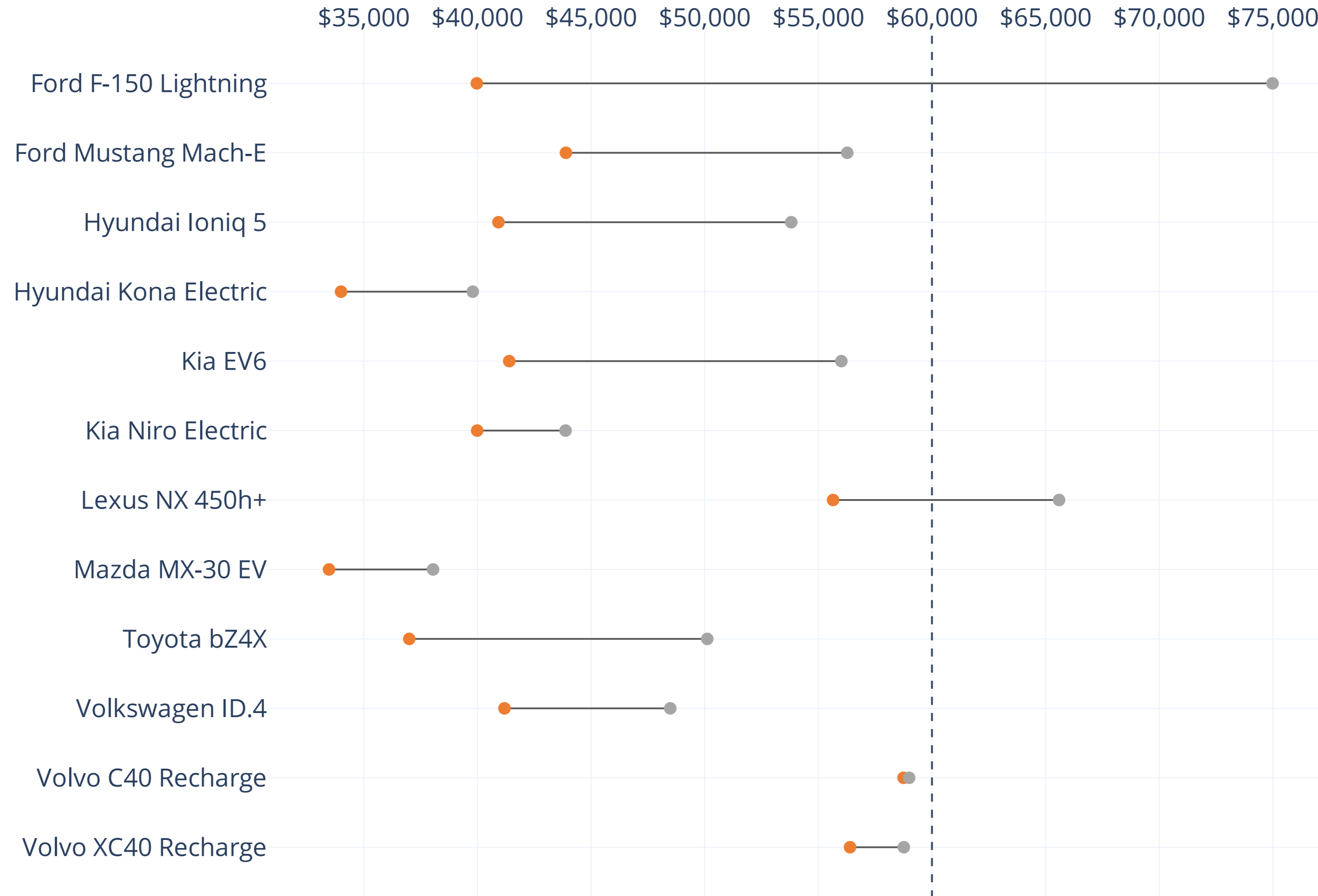


Dashed line indicates CVRP MSRP cap.

Includes approved applications received June 13, 2022 through March 2023. Excludes CVRP records missing price information.

Electric Pickup Affordability: **Min. MSRP** vs. Average Purchase Price

Rebated Truck & SUV Battery EVs

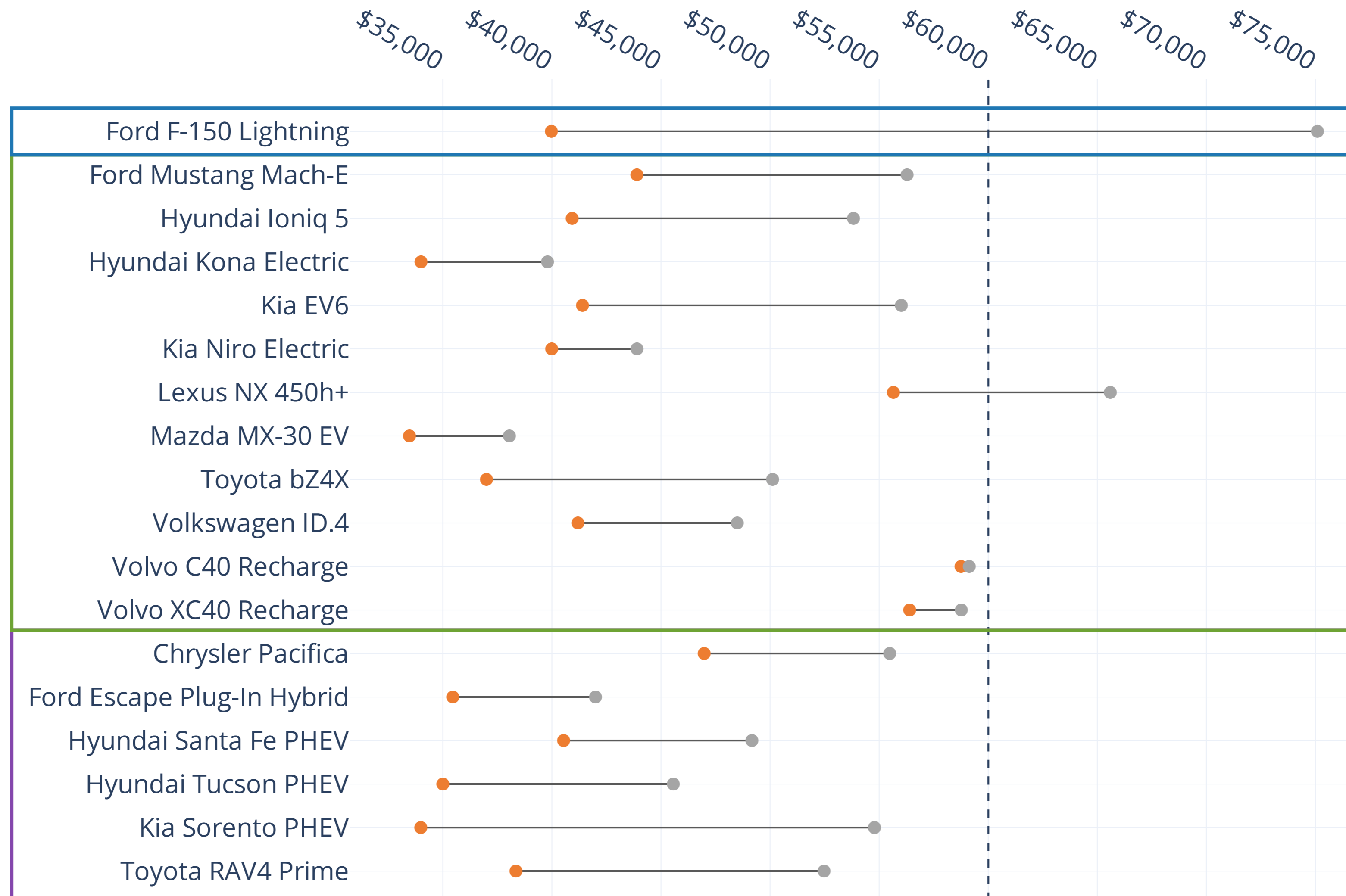


Dashed line indicates CVRP MSRP cap.

Includes approved applications received June 13, 2022 through March 2023. Excludes CVRP records missing price information.

Electric Pickup Affordability: **Min. MSRP** vs. Average Purchase Price

Rebated **Truck Battery EV**, **SUV Battery EVs** & **Plug-in Hybrid EVs**



Dashed line indicates CVRP MSRP cap.

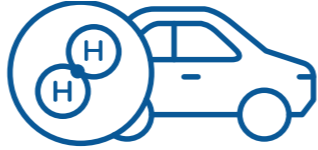
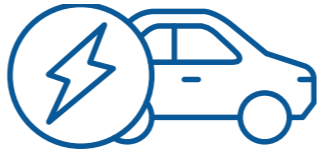

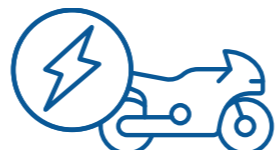
Includes approved applications received June 13, 2022 through March 2023.
 Excludes CVRP records missing price information. Volvo XC60 PHEV omitted.

A close-up photograph of a person's hand plugging a charging cable into the port of an electric vehicle. The scene is set outdoors at sunset, with warm, golden light and lens flare effects. In the background, a public charging station with several orange charging cables is visible, along with a bicycle parked nearby. The overall atmosphere is clean and modern, emphasizing sustainable transportation.

Incentive Program Participation

Rebated Pickups

Rebate Amounts for Individuals

		as of Dec. 2019
Fuel-Cell EVs		\$4,500 (\$7,000*)
Battery EVs †		\$2,000 (\$4,500*)
Plug-in Hybrid EVs		\$1,000 (\$3,500*)
Zero-Emission Motorcycles		\$750

† Includes range-extended battery electric vehicles.

* Income-qualified consumers eligible for an additional \$2,500.

Program Design Shapes Outcomes

Blue = in effect during 2022

...as of Dec. 2014 / Jan. 2015	as of Mar. 2016	as of Nov. 2016	as of Jan. 2018	as of Jan. 2019
<ul style="list-style-type: none"> 30-month ownership requirement (retroactive) Total rebate limit = 2 	<ul style="list-style-type: none"> \$250k–\$500k income cap (PEVs) +\$1,500 for income-qualified households (\leq 300% FPL), excluding ZEMs 	<ul style="list-style-type: none"> \$150k–\$300k income cap (PEVs) \geq 20 UDDS electric miles +\$2,000 for income-qualified households (\leq 300% FPL), excl. ZEMs 	<ul style="list-style-type: none"> \$150k–\$300k income cap on stacking HOV decal (only binding on FCEVs) Rebate Now San Diego County preapproval pilot with point-of-sale option 	<ul style="list-style-type: none"> Stacking with finance assistance programs not permitted (retroactive)

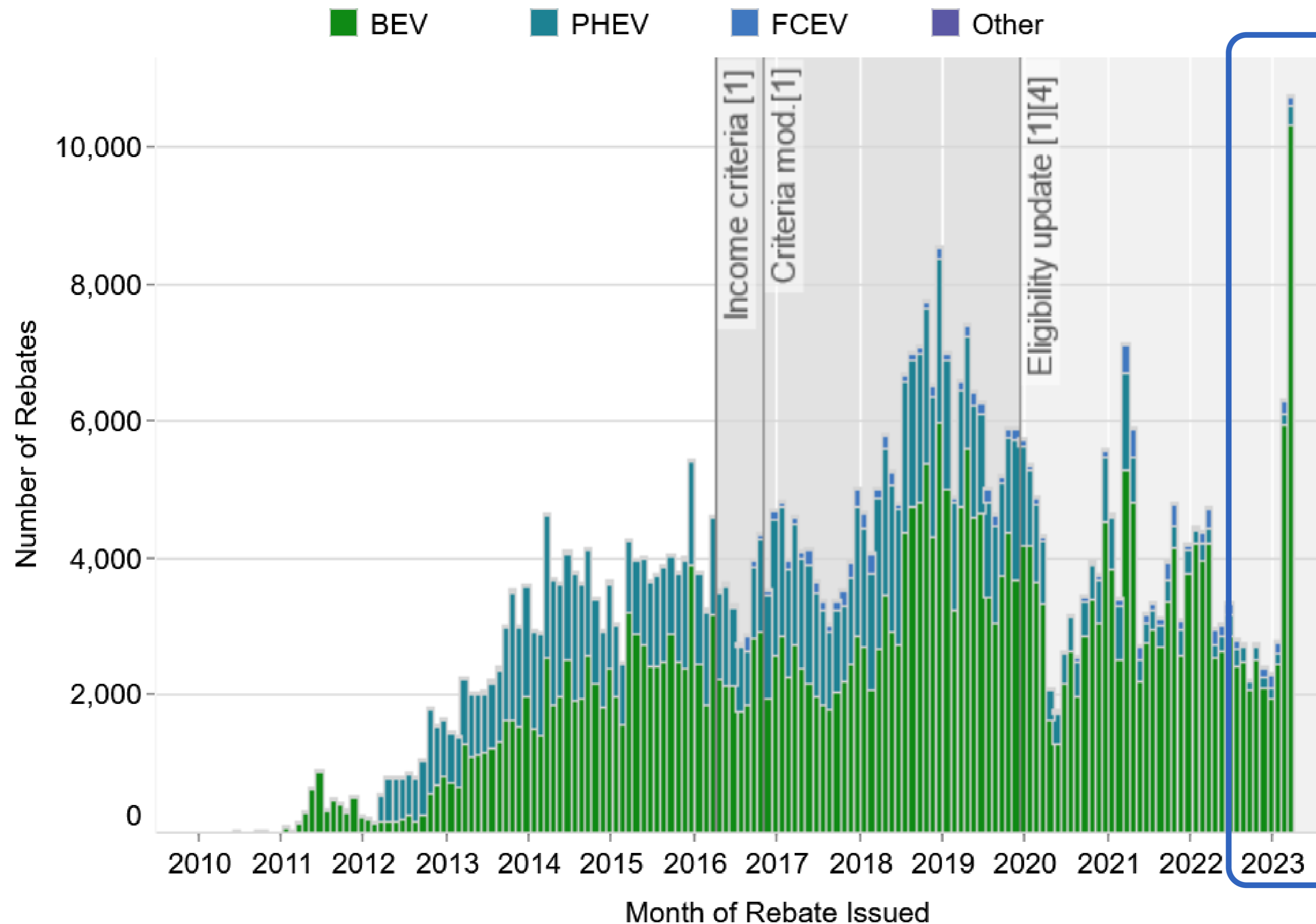
as of Dec. 2019	as of Apr. 2020	as of Apr. 2021	as of Feb. 2022	as of Jul. 2022
<ul style="list-style-type: none"> Total rebates limit = 1 § Base MSRP \leq \$60k (PEVs) 3-month application window † \geq 35 UDDS electric miles +\$2,500 † for income-qualified households (\leq 300% FPL), excl. ZEMs 	<ul style="list-style-type: none"> Can be stacked with finance assistance programs 	<ul style="list-style-type: none"> \geq 30 U.S. EPA electric miles (45 UDDS) Rebate Now preapproval option limited to income-qualified households, expanded to include SJ Valley 	<ul style="list-style-type: none"> \$135k–\$200k income cap (PEVs) Base MSRP: \leq \$60k for Large Vehicles*, \leq \$45k for Cars* \$135k–\$200k income cap on stacking HOV decal (only binding on FCEVs) 	<ul style="list-style-type: none"> \$150k–\$300k income cap on stacking HOV decal (only binding on FCEVs)
	<p>as of Jan. 2021</p>			
	<ul style="list-style-type: none"> +\$2,500 for income-qualified households (\leq 400% FPL), excl. ZEMs 			

PEVs = plug-in EVs. FPL = Federal Poverty Level. ZEMs = zero-emission motorcycles. UDDS = Urban Dynamometer Driving Schedule. HOV = high-occupancy-vehicle. FCEVs = fuel-cell EVs. MSRP = manufacturer suggested retail price.

† Change due to \$500 decrease in standard rebate amounts (previous slide). § A second rebate can be approved for a FCEV if the first rebate was for a PEV.

‡ COVID exemptions on application window effectively delayed implementation until 4/15/2021. * Large Vehicles include minivans, pickups, and SUVs. Cars include all other light-duty vehicle classes (e.g. hatchbacks, sedans, wagons, and two-seaters).

Approved Applications Over Time

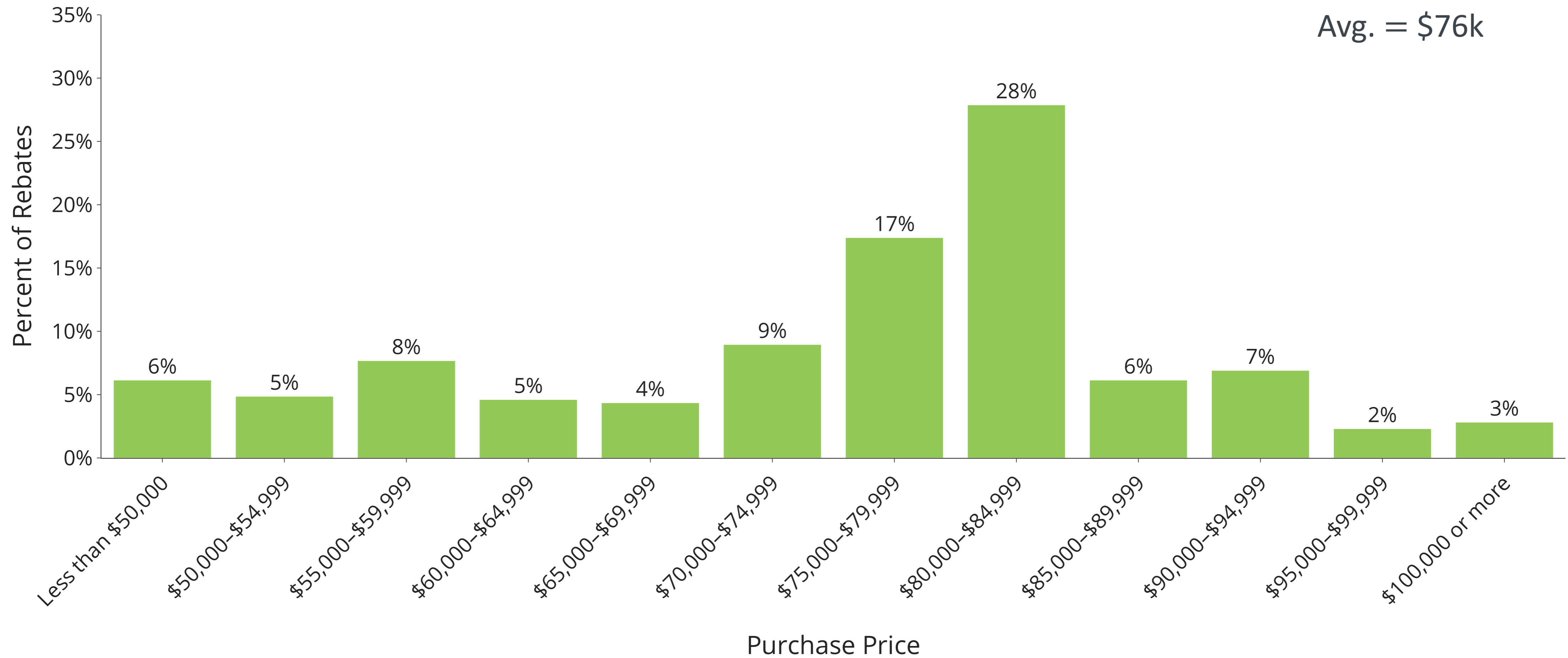


 = e-pickup era

Large increase in applications resulted from Tesla lowering the MSRP of the Model 3 and Y, making them eligible again for CVRP as of Feb. 13, 2023

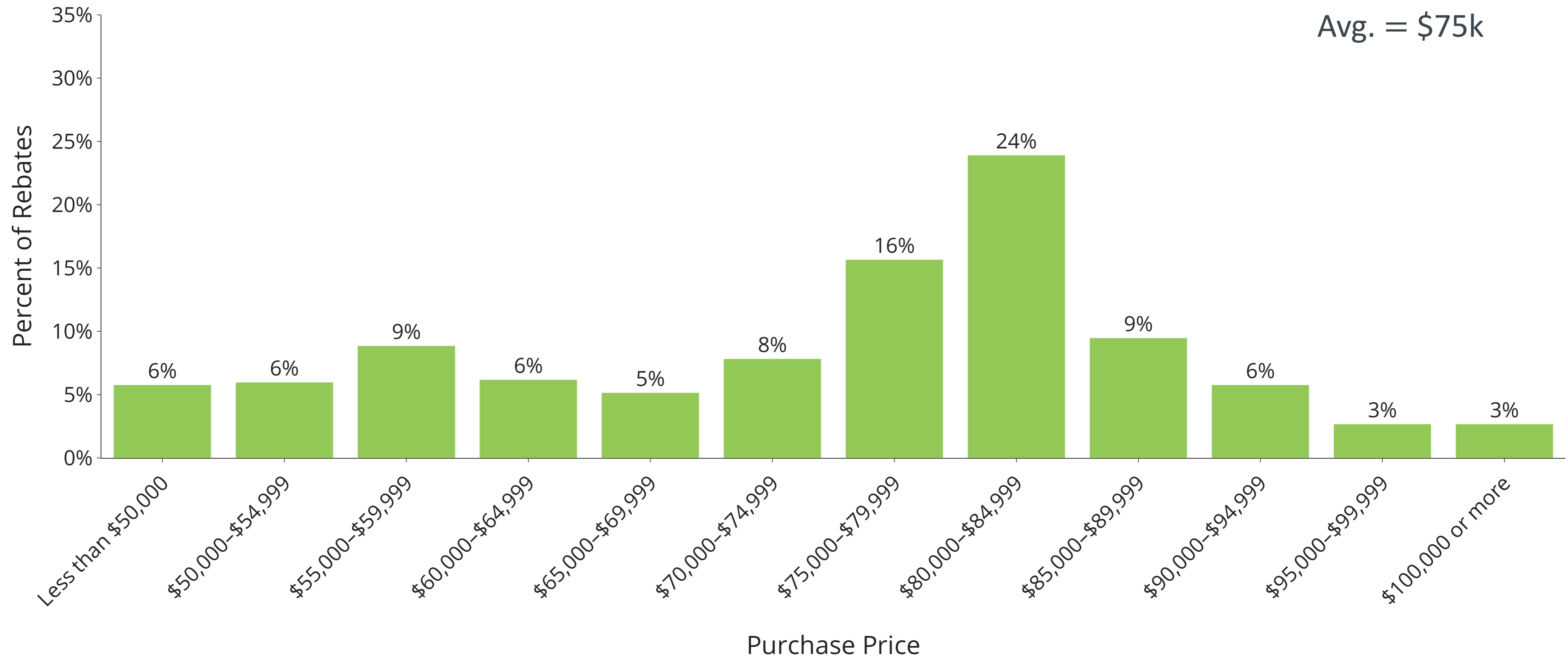
Purchase Price Distribution: Ford F-150 Lightning

2022 purchases/leases



Purchase Price Distribution: Ford F-150 Lightning

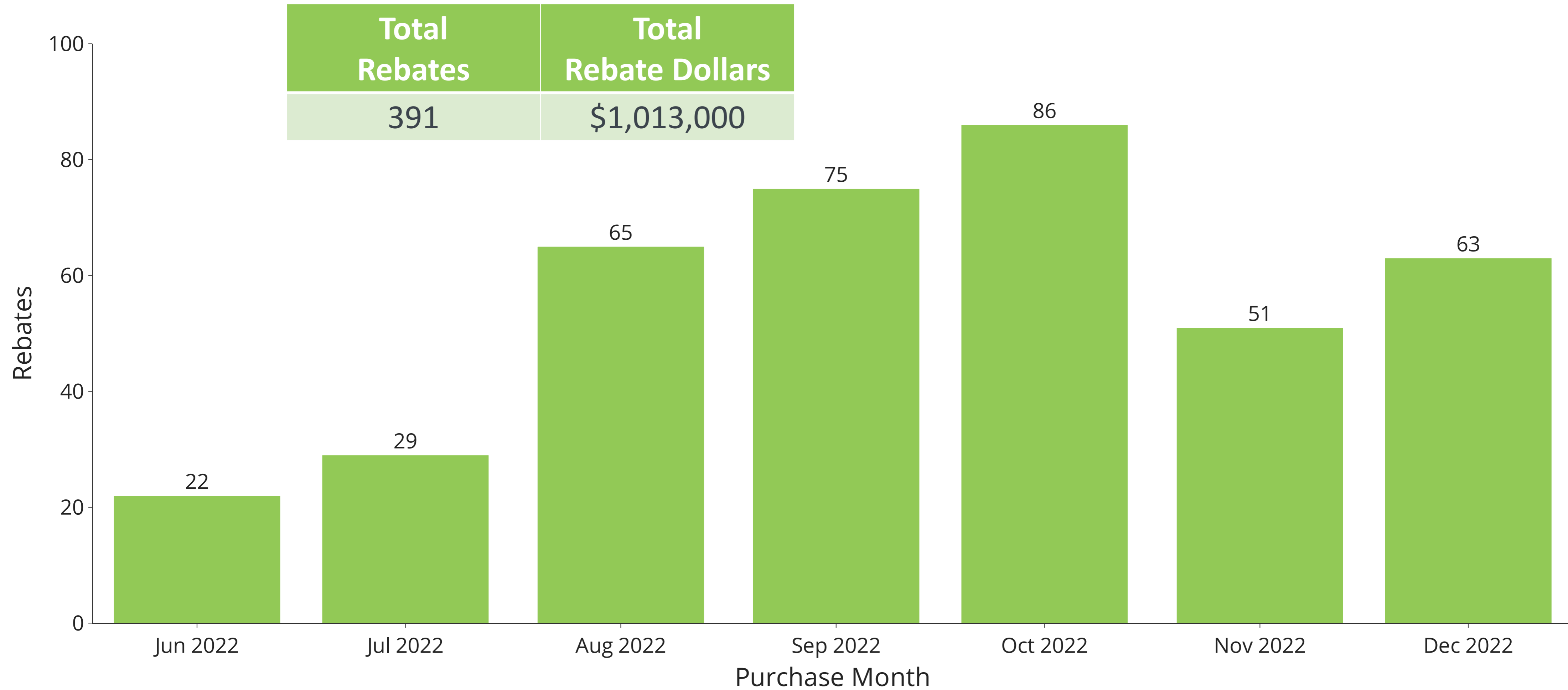
All approved applications received through Mar. 2023



Includes all approved applications through March 2023.

Rebated Electric Pickups Over Time: Ford F-150 Lightning

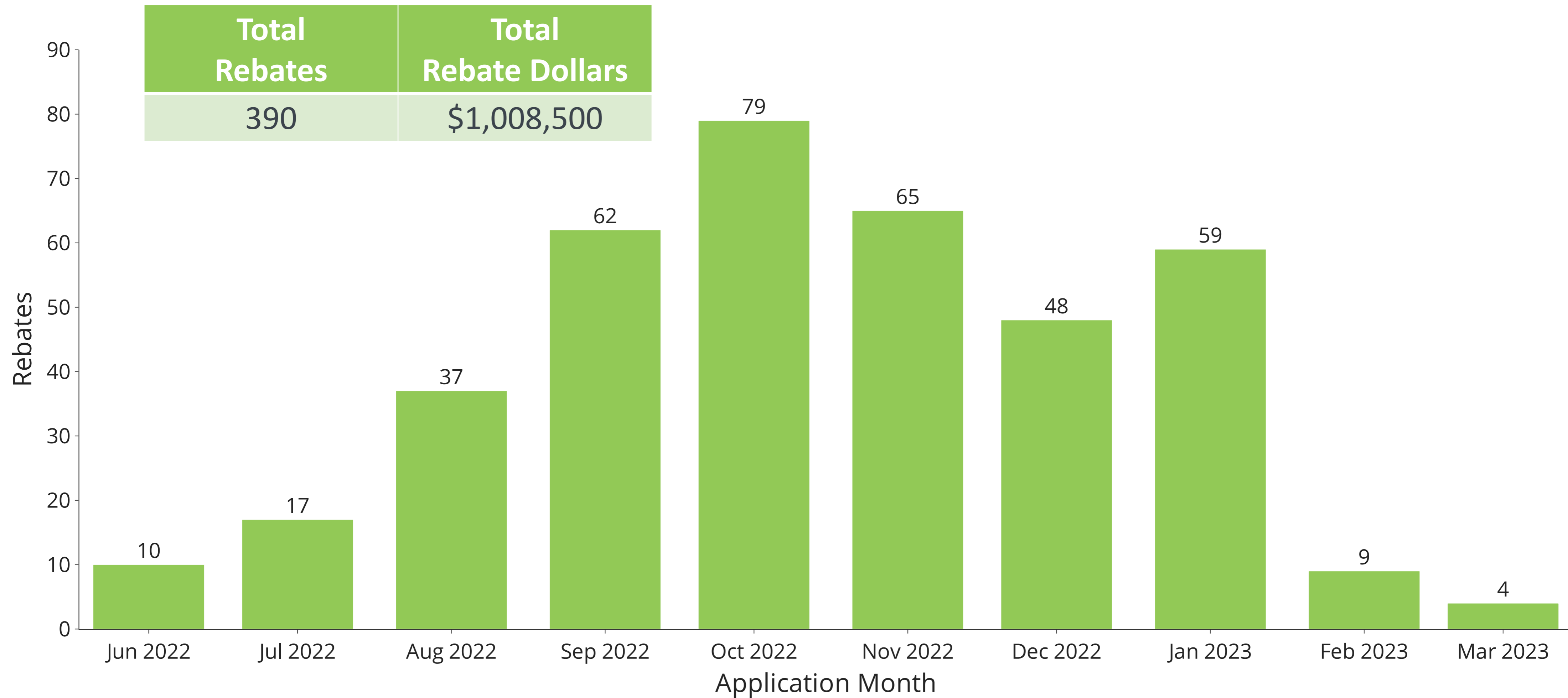
2022 purchase/leases



Includes approved applications as of August 2023.

Rebated Electric Pickups by Application Date: Ford F-150 Lightning

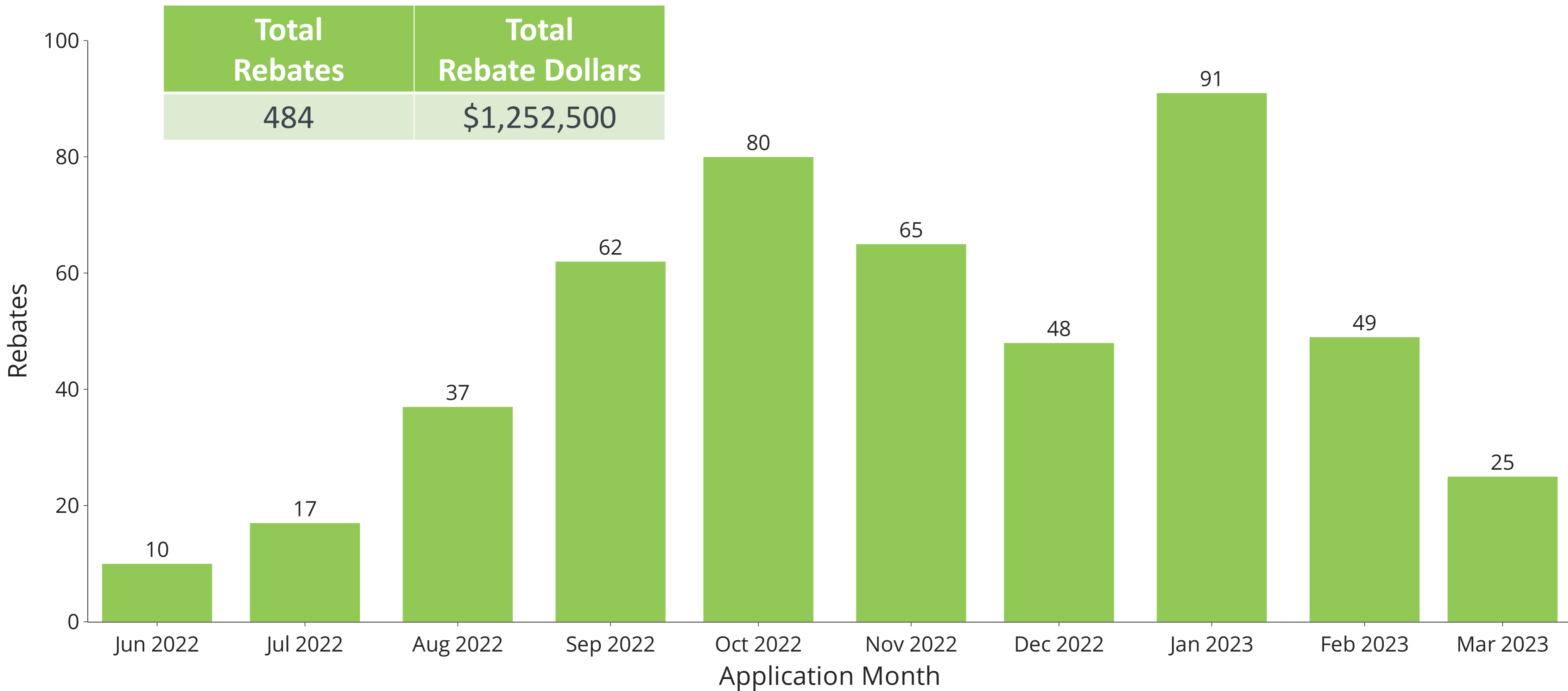
2022 purchase/leases



Includes approved applications as of August 2023, excluding one special case with an application date before June 2022.

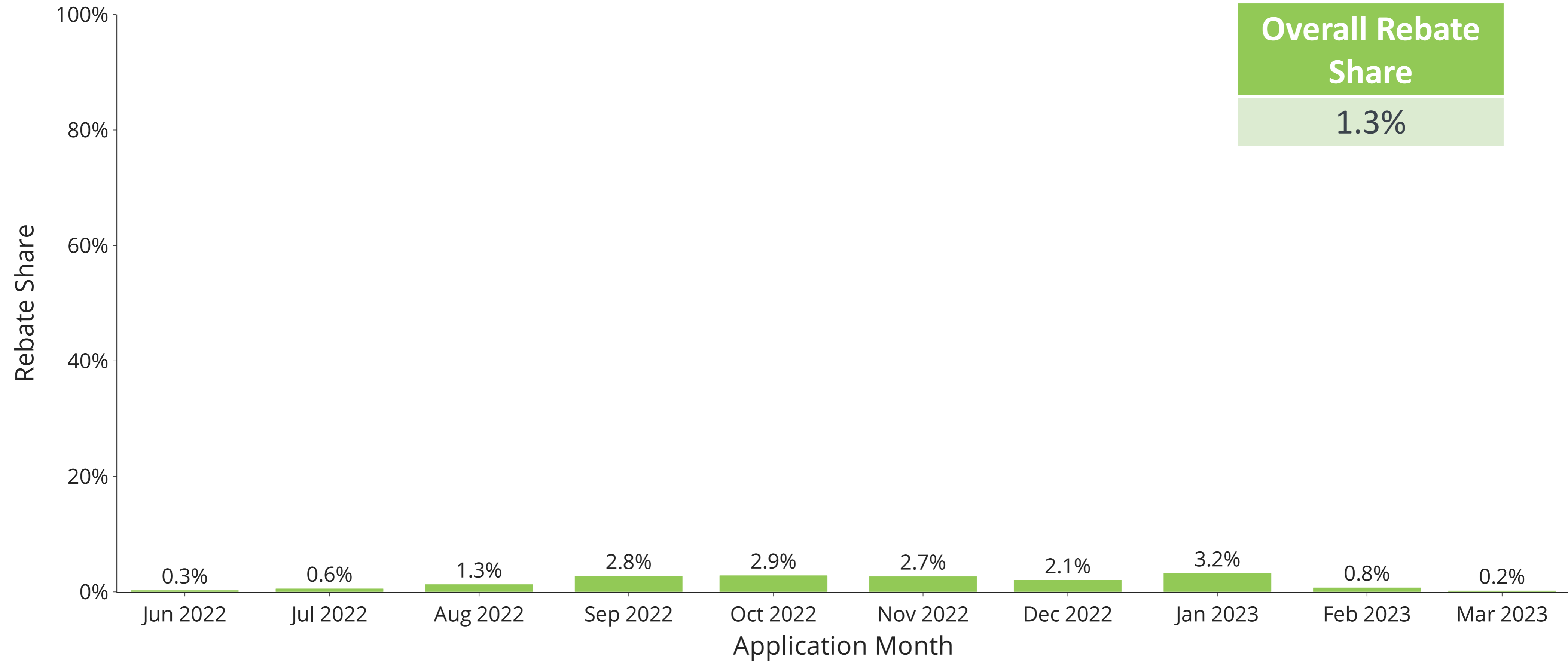
Rebate Applications Over Time: Ford F-150 Lightning

Approved applications received through Mar. 2023



Includes approved applications received January 2022 through March 2023 as of August 8, 2023. Numbers do not reflect all purchases/leases during time period and will change as additional applications are received and approved.

Electric Pickup Rebate Share Overall and Over Time



Includes approved applications received June 2022 through March 2023.

A close-up photograph of a person's hand plugging a charging cable into the charging port of an electric car. The scene is set outdoors at sunset, with warm, golden light and lens flare effects. In the background, a public bicycle-sharing station is visible, with several bicycles docked. The overall atmosphere is one of modern urban infrastructure and sustainable transportation.

Summary & Lessons for Incentive Design

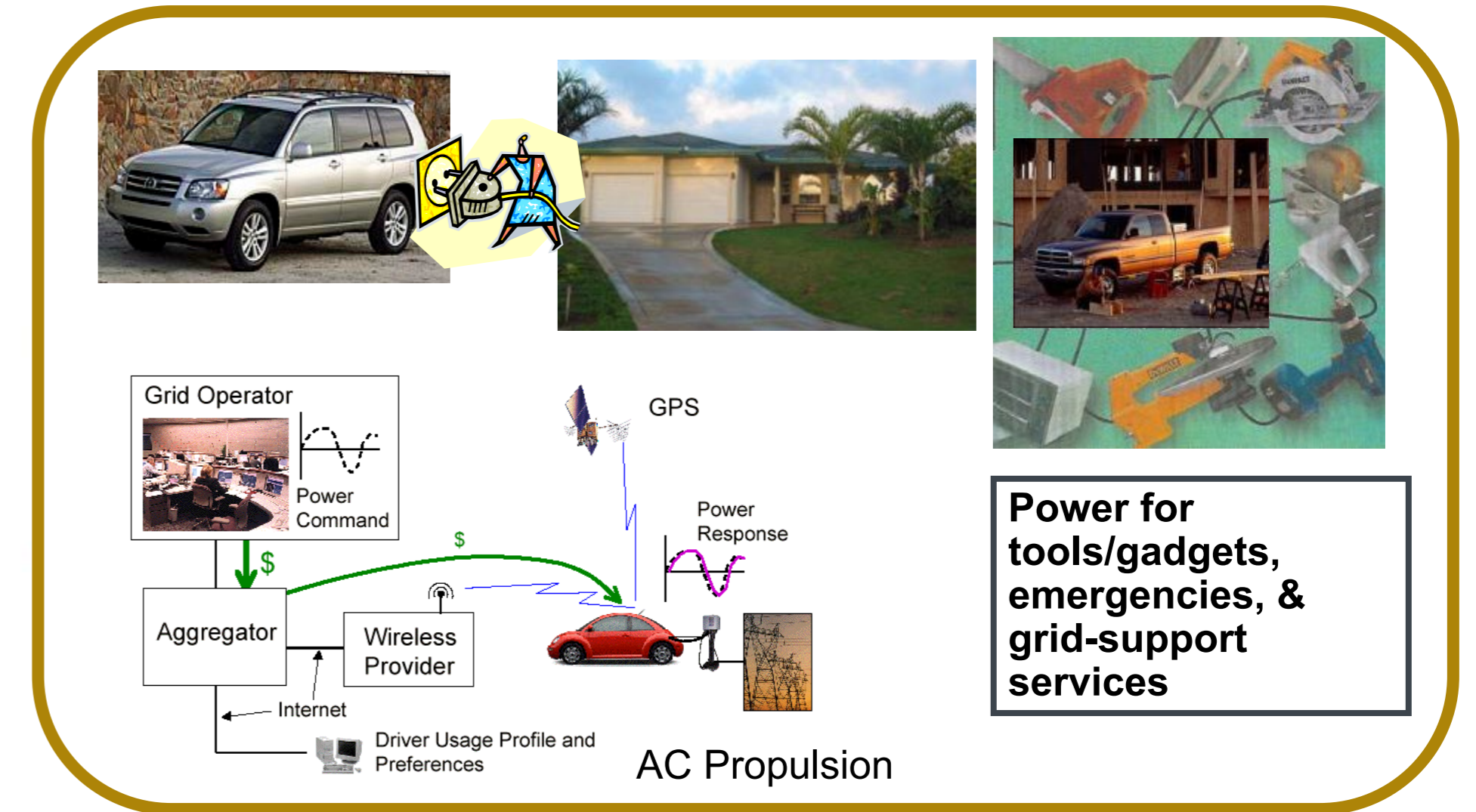
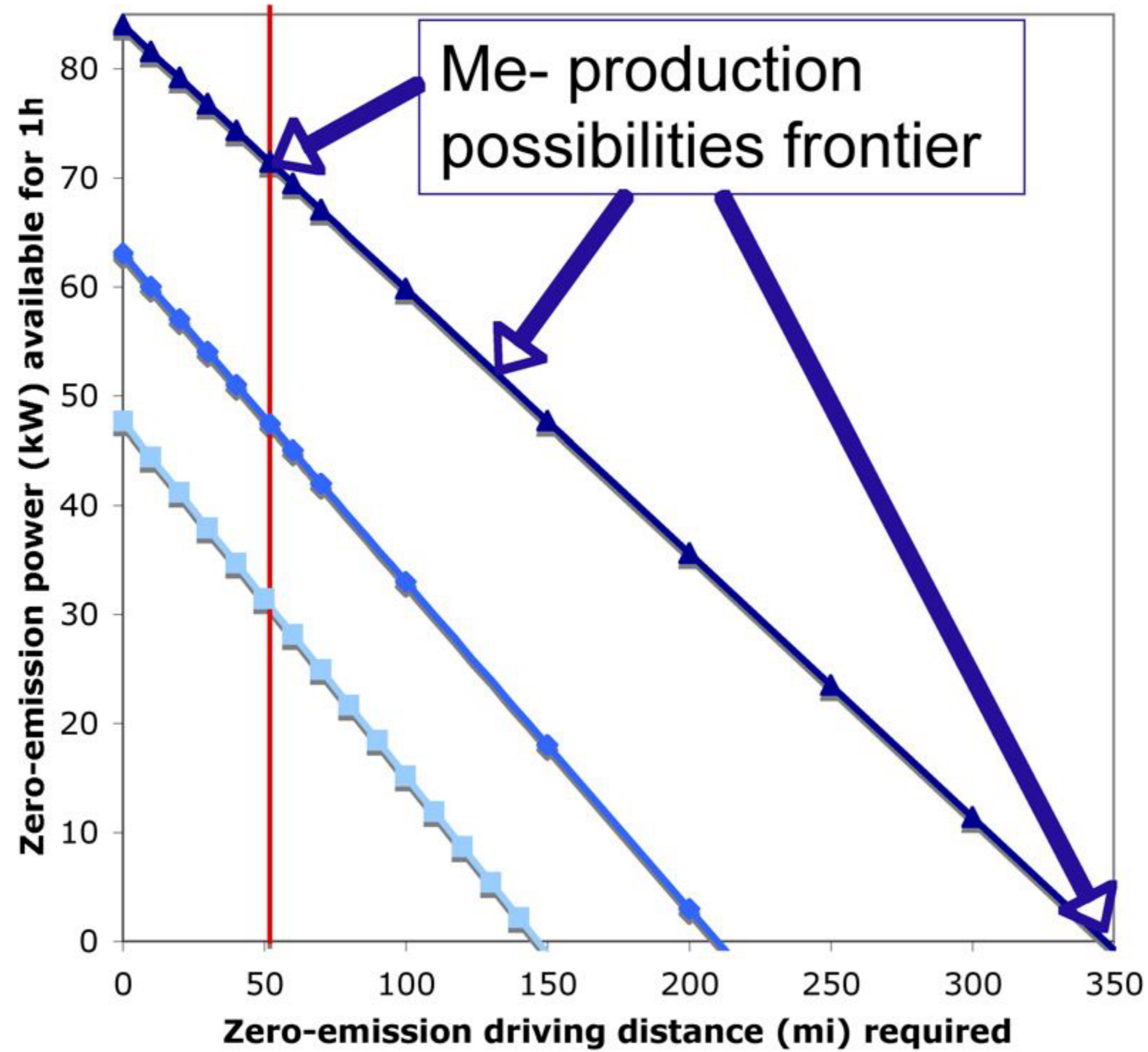
Key Takeaways

- Pickups are a significant portion of the light-duty vehicle market and of U.S. OEM production portfolios
 - Relative to other vehicle types, pickups have gained size, weight, power, and speed but not efficiency
 - Opportunity for improvement is significant, impactful
 - Existing and announced electric pickups are capable but expensive
 - Rebated electric pickups averaged \$75k purchase price; difference between min. MSRP and price is larger than SUVs
 - Even at minimum MSRP, large incentives required to avoid structural unaffordability
 - \$5k incentive lowers income required for vehicle to be “affordable” by ~\$15,000.
 - The journey to 100% electrification is just beginning; a steep path lies ahead for this popular product
 - The CA pickup market in 2022 was 154k personal + 44k non-personal pickups, growth expected over time
 - *Highest* monthly e-pickup share of total pickups in 2022 = 5.6%
 - Pickups as a percentage of CVRP rebates hovered near 3% at end of 2022 and declined in Q1 2023 (reinforced by a sharp increase in Tesla applications in Q1 2023).
- ...and what about non-standard features/capabilities?
- e.g., Mobile & emergency power, V2G, and other “Mobile Electricity” services* (see next slide...)

* B.D. Williams, [Commercializing Light-Duty Plug-In/Plug-Out Hydrogen-Fuel-Cell Vehicles: “Mobile Electricity” Technologies, Early California Household Markets, and Innovation Management](#), PhD Dissertation, University of California at Davis, 2007.; B.D. Williams, K.S. Kurani, [Commercializing light-duty plug-in/plug-out hydrogen-fuel-cell vehicles: “Mobile Electricity” technologies and opportunities](#), J. Power Sources. 166 (2007) 549–566.

Not just range?: Mobile power (Williams 2007)

Zero-emission power vs. driving distance: 1h dispatch



Nov. 2006

B.D. Williams, [Commercializing Light-Duty Plug-In/Plug-Out Hydrogen-Fuel-Cell Vehicles: "Mobile Electricity" Technologies, Early California Household Markets, and Innovation Management](#), PhD Dissertation, University of California at Davis, 2007.;

B.D. Williams, K.S. Kurani, [Commercializing light-duty plug-in/plug-out hydrogen-fuel-cell vehicles: "Mobile Electricity" technologies and opportunities](#), J. Power Sources. 166 (2007) 549–566.

A close-up photograph of a person's hand plugging a charging cable into the port of an electric vehicle. The scene is set outdoors at sunset, with warm, golden light and lens flare effects. In the background, a public charging station with multiple orange charging cables is visible, along with a bicycle parked nearby. The overall atmosphere is bright and modern.

Appendix: Additional Details & Resources



Additional Details



Vehicle Weight Classes and Categories

Gross Vehicle Weight Rating (lbs)	Federal Highway Administration		US Census Bureau
	Vehicle Class	GVWR Category	VIUS Classes
<6,000	Class 1: <6,000 lbs	Light Duty <10,000 lbs	Light Duty <10,000 lbs
10,000	Class 2: 6,001 – 10,000 lbs		
14,000	Class 3: 10,001 – 14,000 lbs	Medium Duty 10,001 – 26,000 lbs	Medium Duty 10,001 – 19,500 lbs
16,000	Class 4: 14,001 – 16,000 lbs		
19,500	Class 5: 16,001 – 19,500 lbs		
26,000	Class 6: 19,501 – 26,000 lbs	Heavy Duty >26,001 lbs	Light Heavy Duty: 19,001 – 26,000 lbs
33,000	Class 7: 26,001 – 33,000 lbs		
>33,000	Class 8: >33,001 lbs		Heavy Duty >26,001 lbs

Gross Vehicle Weight Rating (lbs)	EPA Emissions Classification			
	Heavy Duty Vehicle and Engines			Light Duty Vehicles
	H.D. Trucks	H.D. Engines	General Trucks	Passenger Vehicles
<6,000	Light Duty Truck 1 & 2 <6,000 lbs	Light Light Duty Trucks <6,000 lbs	Light Duty Trucks < 8500 lbs	Light Duty Vehicle < 8500 lbs
6,000		Heavy Light Duty Trucks 6,001-8,500 lbs		
8,500	Light Duty Truck 3 & 4 6,001 – 8,500 lbs	Light Heavy Duty Engines 8,501 lbs – 19,500 lbs	Heavy Duty Vehicle Heavy Duty Engine >8,500 lbs	Medium Duty Passenger Vehicle 8,501 – 10,000 lbs
10,000	Heavy Duty Vehicle 2b 8,501 – 10,000 lbs			
14,000	Heavy Duty Vehicle 3 10,001 – 14,000 lbs			
16,000	Heavy Duty Vehicle 4 14,001 – 16,000 lbs			
19,500	Heavy Duty Vehicle 5 16,001 – 19,500 lbs	Medium Heavy Duty Engines 19,501 – 33,000 lbs		
26,000	Heavy Duty Vehicle 6 19,501 – 26,000 lbs			
33,000	Heavy Duty Vehicle 7 26,001 – 33,000 lbs	Heavy Heavy Duty Engines Urban Bus >33,001		
60,000	Heavy Duty Vehicle 8a 33,001 – 60,000 lbs			
>60,000	Heavy Duty Vehicle 8b >60,001			

“GVWR includes total vehicle weight plus fluids, passengers, and cargo. FHWA categorizes vehicles as Light Duty (Class 1-2), Medium Duty (Class 3-6), and Heavy Duty (Class 7-8). EPA defines vehicle categories, also by GVWR, for the purposes of emissions and fuel economy certification. EPA classifies vehicles as Light Duty (GVWR < 8,500 lb) or Heavy Duty (GVWR > 8,501 lb). Within the Heavy-Duty class, there is a Medium Heavy Duty Diesel Engine class for engine-only certification, but no Medium-Duty Vehicle class. The September 2011 U.S. Department of Transportation (DOT)/EPA rulemaking on [Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles](#) uses categories and weights for Heavy-Duty Vehicle Classes 2b through 8, similar to the FHWA weight classes.”

from: <https://afdc.energy.gov/data/10380>

Personal Light Duty Vehicle Sales by Body Style: 2021

< 10,000 lb



Body Style (GVWR < 10,000 lb)	U.S.		CA	
Sport Utility Vehicle		7,224,684		753,774
Sedan		2,255,901		408,564
Pickup	15.7%	1,982,166	11.5%	175,148
Hatchback		399,960		86,991
Van Passenger		247,544		29,115
Station Wagon		196,049		25,961
Coupe		178,679		28,026
Convertible		64,201		9,340
Van Cargo		40,239		6,524
Total		12,589,423		1,523,443

2021 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2022.



















Filtering summarized on [S&P Global Data Processing: Personal Vehicles < 10,000 lb](#) slide.

Categories may not sum to total due to rounding of weighted registrations.

Non-Personal Light Duty Vehicle Sales by Body Style: 2021

< 10,000 lb



Body Style (GVWR < 10,000 lb)	U.S.	CA
Sport Utility Vehicle	 719,970	 65,325
Pickup	 24.3% 486,152	 18.9% 31,768
Sedan	 393,985	 39,983
Van Cargo	 174,913	 10,738
Van Passenger	 96,763	 7,153
Hatchback	 69,877	 7,994
Station Wagon	 31,583	 1,431
Coupe	 14,280	 1,886
Convertible	 10,999	 1,765
Total	1,998,522	168,043

2021 New Light-Duty Personal Retail Registrations. Contains data from S&P Global Mobility © 2021.

Filtering summarized on [S&P Global Data Processing: Non-Personal Vehicles < 10,000 lb](#) slide.

Categories may not sum to total due to rounding of weighted registrations.

Excerpts from:

Pickup Trucks: The Path to Electrification and 2022 CVRP Participation

International Electric Vehicle Policy Council Meeting, 15 June 2023, Davis CA, USA

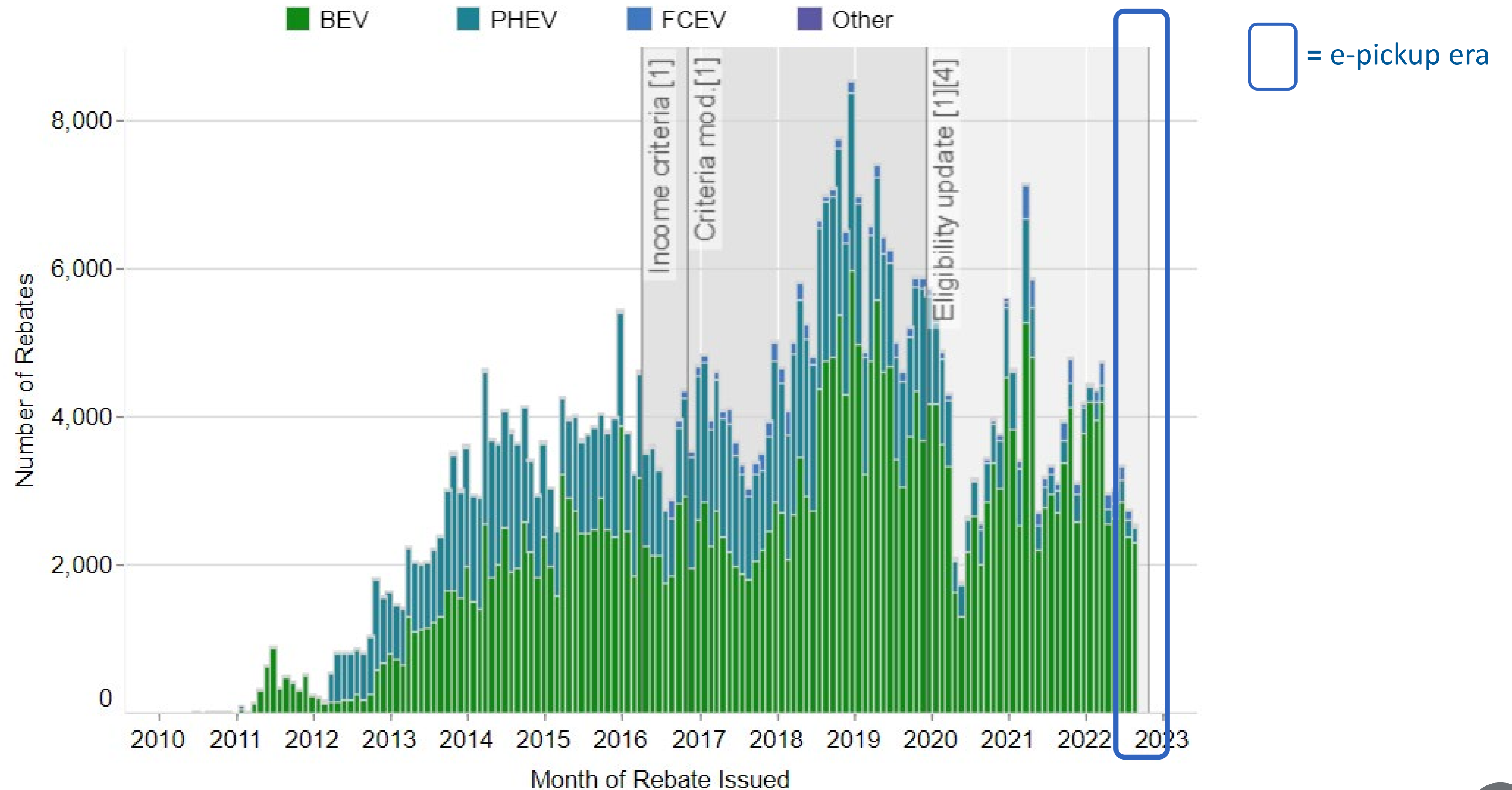
Photo by Guiherme Stecanella on Unsplash

Brett Williams, MPhil (cantab), PhD – Principal Advisor, EV Programs, CSE

with thanks to CARB staff, as well as Francis Alvarez, John Anderson, Janet Bowers and others at the Center for Sustainable Energy (CSE)



Approved Applications Over Time



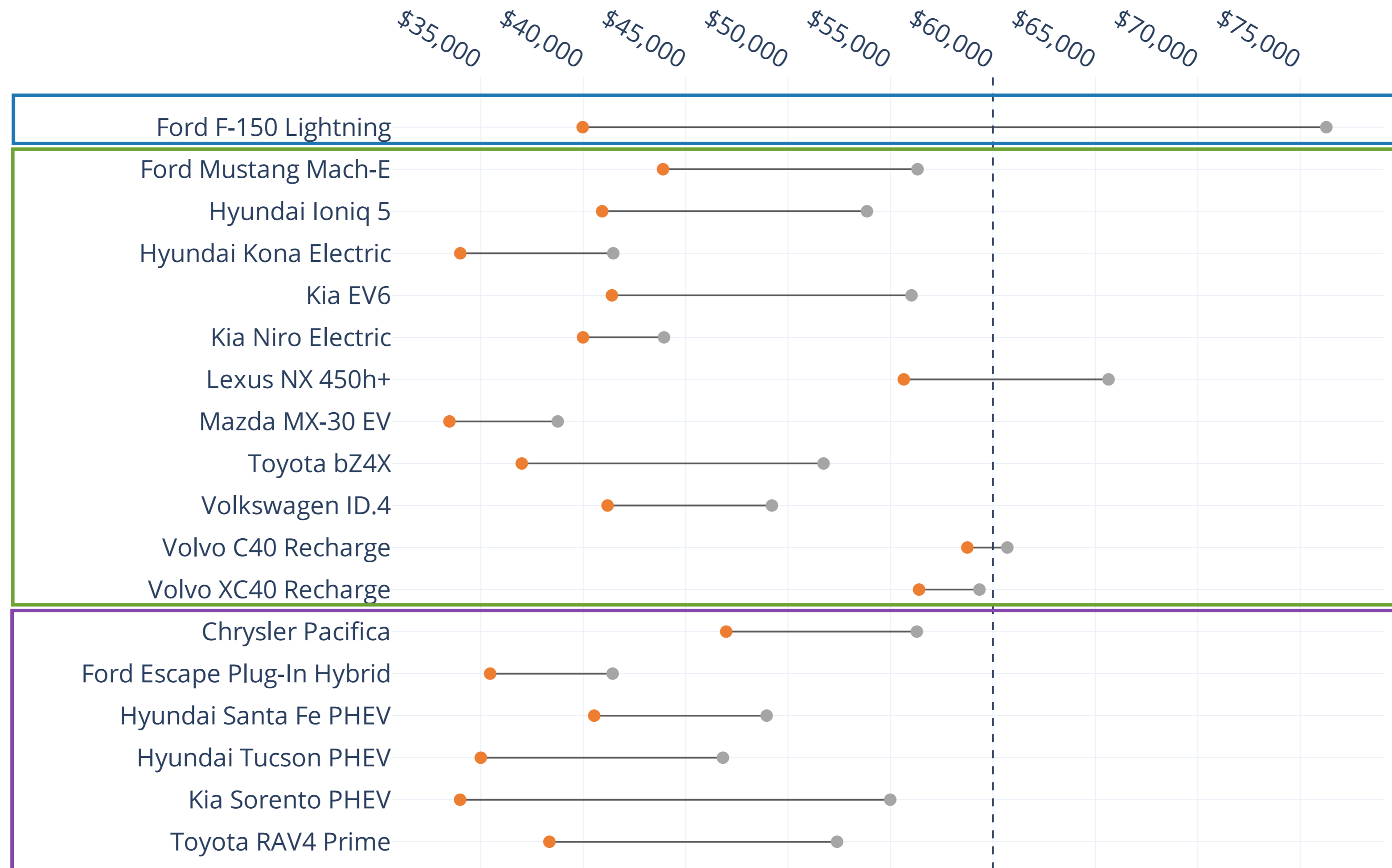
Electric Pickup Models: Previous & Existing (circa end of 2022)

	Make	Model/Trim	Model Year	Pickup Class	E-Range (e-mi)	Battery (kWh)	Base MSRP
	Chevrolet	S10 Electric	1998	Small, 2WD	72	29	\$33,305*
	Ford	Ranger Pickup	1999–2001	Standard, 2WD	50	65	\$50,000*
	GMC	HUMMER EV Pickup	2022	Heavy-duty (>10,000 lb) Standard, 4WD	329*	213	\$108,700*
	Rivian	R1T	2022	Medium-duty (>8,500 lb) Standard, 4WD	314	135	\$67,500
	Ford	F-150 Lightning	2022–2023	Standard, 4WD	230–320	98–131	\$39,974– \$96,874

*Estimated but not definitively confirmed with EPA or manufacturer website
 Information sourced from manufacturer website or www.caranddriver.com as of 12/22/2022

Electric Pickup Affordability: **Min. MSRP** vs. Average Purchase Price

Rebated **Truck Battery EV**, **SUV Battery EVs** & **Plug-in Hybrid EVs**



Dashed line indicates CVRP MSRP cap.

Includes approved applications received June 13, 2022 through December 2022.

Excludes CVRP records missing price information. Volvo XC60 PHEV omitted.

Key Takeaways

through **2022**

- Pickups are a significant portion of the light-duty vehicle market and of U.S. OEM production portfolios
- Relative to other vehicle types, pickups have gained size, weight, power, and speed but not efficiency
 - Opportunity for improvement is significant, impactful
- Existing and announced electric pickups are capable but expensive
 - So far, rebated electric pickups average \$76k purchase price
 - Even at minimum MSRP, large incentives required to avoid structural unaffordability
- The journey to 100% electrification is just beginning, a steep path lies ahead
 - Highest monthly e-pickup share of total pickups in 2022 = 5.6%

...and what about non-standard features/capabilities?

- e.g., Mobile & emergency power, V2G, and other “Mobile Electricity” services*...

* B.D. Williams, [Commercializing Light-Duty Plug-In/Plug-Out Hydrogen-Fuel-Cell Vehicles: “Mobile Electricity” Technologies, Early California Household Markets, and Innovation Management](#), PhD Dissertation, University of California at Davis, 2007.; B.D. Williams, K.S. Kurani, [Commercializing light-duty plug-in/plug-out hydrogen-fuel-cell vehicles: “Mobile Electricity” technologies and opportunities](#), J. Power Sources. 166 (2007) 549–566.



Additional Resources

EV Rebate Program Impacts: Select Publications



(Reverse Chronological, as of 10/2023. [Additional related items.](#))

- B.D.H. Williams and N. Pallonetti (2023, Mar.), [New York State’s Drive Clean Rebate for Electric Vehicles: Measures of Impact](#), *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. [Paper](#). [Slides](#). [CSE posting](#).
- B.D.H. Williams and N. Pallonetti (2023, Mar.), [Rebate Influence on Electric Vehicle Adoption in California](#), *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. [Paper](#). [CSE posting](#). [Precursor slides](#). Conference [slides with updates](#).
- N. Pallonetti and B.D.H. Williams (2023, Mar.), [Vehicle Replacement: Findings from California’s Clean Vehicle Rebate Project](#), *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. [Paper](#). [CSE posting](#). [Precursor slides](#).
- B.D.H. Williams (2023, Apr.), [Assessing progress and equity in the distribution of electric vehicle rebates using appropriate comparisons](#), *Transport Policy*, 137, 141–151. DOI: 10.1016/J.TRANPOL.2023.04.009. [Paper](#). [CVRP posting](#). [CSE posting](#). [Precursor video](#). [Slides](#).
- N. Pallonetti and B.D.H. Williams (2023, Feb.), [CVRP Greenhouse Gas Emission Reductions and Cost-Effectiveness: 2020 Purchases/Leases](#), Clean Vehicle Rebate Project. DOI: 10.13140/RG.2.2.21731.12324. [Paper](#). [CVRP posting](#).
- B.D.H Williams and J.B. Anderson (2022, Sep.), [From Low Initial Interest to Electric Vehicle Adoption: “EV Converts” in New York State’s Rebate Program](#), *Transportation Research Record: Journal of the Transport. Research Board*, 2677, 866–882. DOI: 10.1177/03611981221118537. Data-summary [appendix](#).
- B.D.H. Williams (2022, Jun.), [Targeting Incentives Cost Effectively: “Rebate Essential” Consumers in the New York State Electric Vehicle Rebate Program](#), *35th International Electric Vehicle Symposium (EVS35)*, AVERE, Oslo, Norway. [Paper](#). [Slides](#).
- B.D.H. Williams, J.B. Anderson (2022, Jun.), [Lessons Learned About Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase](#), *35th International Electric Vehicle Symposium (EVS35)*, Oslo, Norway. [Paper](#). [Slides](#).
- B.D.H. Williams (2021, Oct.), [An Electric-Vehicle Consumer Segmentation Roadmap: Strategically Amplifying Participation in the New York Drive Clean Rebate Program](#), Report 21-30, *Clean Transportation Reports*, NYSERDA.
- B.D. Williams, J. Orose, M. Jones, J.B. Anderson (2018, Oct.), [Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition](#), Clean Vehicle Rebate Project Report, San Diego CA. DOI: 10.13140/RG.2.2.36500.58243.
- C. Johnson, B.D. Williams, J.B. Anderson, N. Appenzeller (2017, Jun.), [Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales](#), Center for Sustainable Energy (CSE). DOI: 10.13140/RG.2.2.24448.00004. [CSE posting](#).
- C. Johnson, B.D. Williams (2017, Jan.), [Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by California’s Electric Vehicle Rebate](#), *Transportation Research Record: Journal of the Transport. Research Board*, 2628, 23–31.

EV Rebate Program Impacts: Select Presentations & Videos



(Reverse Chronological, as of 10/2023. [Additional related items.](#))

- [CVRP 2021 Data Compilation: Incentive Influence and MSRP Considerations](#), (2023, Oct.).
- [NY Drive Clean Rebates: Select Impacts Through 2021](#), (2023, Jun. 12). [Paper](#). [CSE posting](#).
- [Lessons Learned About Electric Vehicle Consumers Who Rated the U.S. Federal Tax Credit ‘Extremely Important,’](#) (2022, Jun. 15). [Paper](#).
- [Targeting Incentives Cost Effectively: ‘Rebate Essential’ Consumers in the New York State Electric Vehicle Rebate Program](#), (2022, Jun. 13). [Paper](#).
- Conference video: [“HEC 2022 Panel - Electrification and Transportation,”](#) opening pres. minutes 2–10; 40-min. panel total, (2022, May). [Slides](#).
- [CVRP 2020 Data Brief: Vehicle Replacement](#), (2022, Jun.).
- CARB Video: [“CVRP 2020 Data Brief: Consumer Characteristics,”](#) time 1:05:43–1:26:09, (2022, Mar.). [Slides](#). [Related journal article](#).
- CARB Video: [“Cost-Effectiveness of Greenhouse Gas Emission Reductions Associated with California’s Clean Vehicle Rebate Project in 2019 \(and 2020\),”](#) time 2:01-2:31, (2022, Feb.). [Slides](#).
- [Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness](#), (2021, Jul.).
- [EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts](#), (2020, Dec.).
- [What Vehicles Are Electric Vehicles Replacing and Why?](#), (2019, Nov.).
- [Electric Vehicle Incentives and Policies](#), (2019, Nov.).
- [Targeting EV Consumer Segments & Incentivizing Dealers](#), (2017, Jun.).
- Yale Webinar: [“Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Findings,”](#) 58 minutes, (2017, Apr.). [Slides](#).
- [Electric Vehicle Rebates in Disadvantaged Communities: Evaluating Progress with Appropriate Comparisons](#), (2016, Oct.)
- [Characterizing California Electric Vehicle Consumer Segments](#), (2016).

About CSE

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Thank you for your time and attention!

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B.D.H. Williams and J.B. Anderson (2023, Dec.), Presentation: “Pickup Trucks: The Path to Electrification and CVRP Participation Through Q1 2023,” *Program Reports*, Clean Vehicle Rebate Project, administered by the Center for Sustainable Energy on behalf of the California Air Resources Board.

 CleanVehicleRebate.org

