



Electric Vehicle Rebates: Lessons Learning

Connecticut EV Roadmap Technical Meeting, 8 February 2019

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

With thanks to: Nick Russell, Nick Pallonetti, Amy Lastuka, and others at:



Statewide Electric Vehicle Rebates (as of Jan. 2019)



Fuel-Cell EVs



\$5,000

\$1,500

\$5,000

e-miles

≥ 120 \$2,000

All-Battery EVs



\$2,500

\$1,500

e-miles

≥ 200 \$2,000

≥ 120 \$1,500

< 120 \$500

≥ 40 \$1,700

≥ 20 \$1,100

Plug-in Hybrid EVs



\$2,500 (i3 REx)
\$1,500

BEVx only:
\$1,500

≥ 45 \$1,000

< 45 \$500

< 20 \$500

Zero-Emission Motorcycles



\$900

\$450

e-miles ≥ 20;
Consumer income cap;
Increased rebates for lower-income

MSRP ≤ \$50k,
no fleet rebates

MSRP ≤ \$50k (PHEV & BEVs),
MSRP ≤ \$60k (FCEVs);
dealer assignment;
\$150 dealer incentive

MSRP > \$60k = \$500 max.;
point-of-sale via dealer

Outline

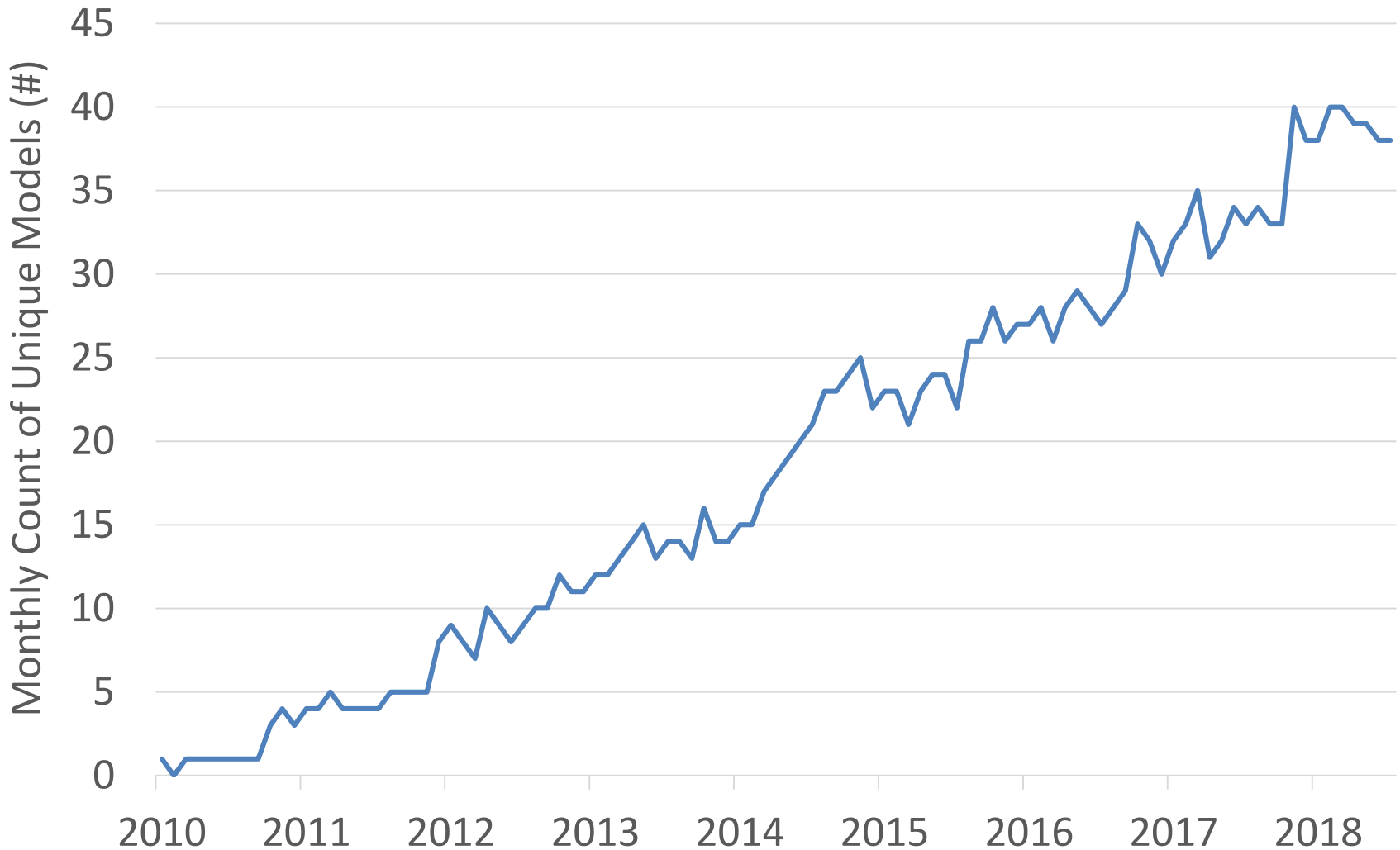
1. EV Market Update
 - Models, Market Share
 - Trajectory
2. CHEAPR Update
 - Outputs: Vehicles & Consumers Rebated
 - Outcomes: Behaviors Influenced
 - Impacts: Emission & Market
3. Additional Considerations
 - Designing for Equitable Access
 - Dealer Sales Incentive
 - Rebate Amounts

A close-up photograph of a person's hand holding a white and black charging cable, plugging it into the charging port of a silver electric car. The scene is set outdoors at sunset, with the sun low on the horizon, creating a warm, golden glow and lens flare effects. In the background, a city street is visible with a bicycle rack and other vehicles.

Market Update

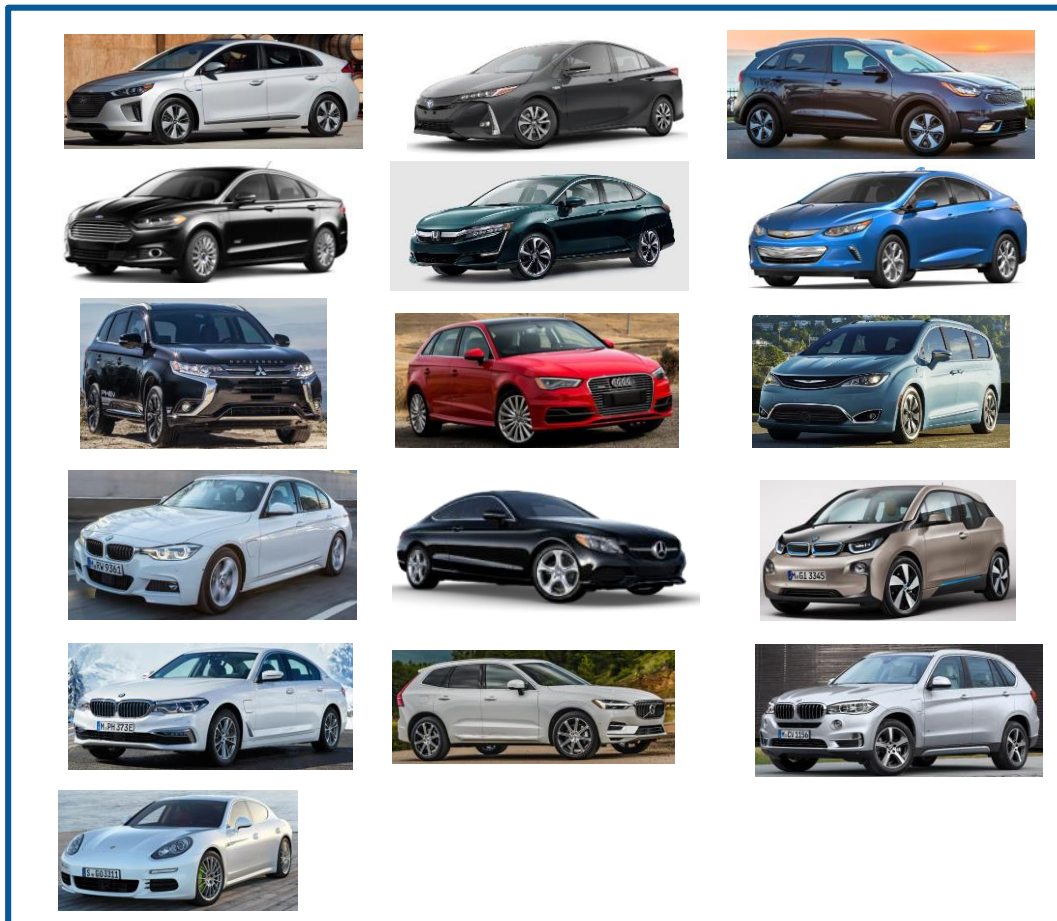
Models, Market Share & Sales Price: EVs and non-EVs

Unique Light-Duty Electric Vehicle Models Registered: California



Electric Vehicle Choices: Major 2018 Models

Plug-in hybrid EVs



All-battery EVs

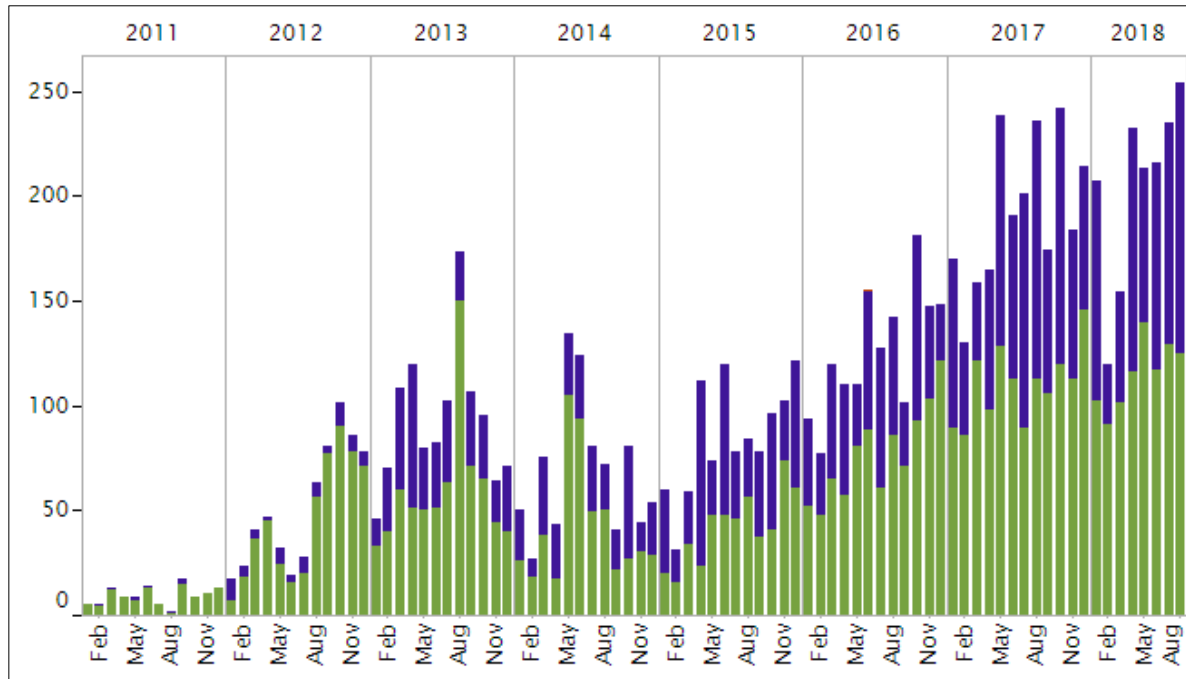


Fuel-cell EVs

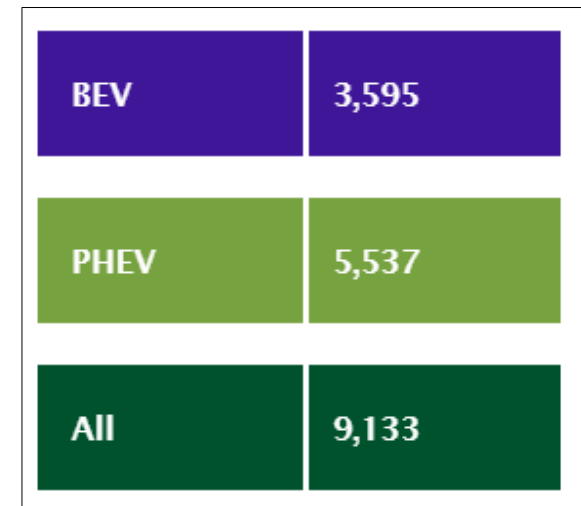


Connecticut EV Sales (Jan 2011–Aug 2018)

Monthly



Total

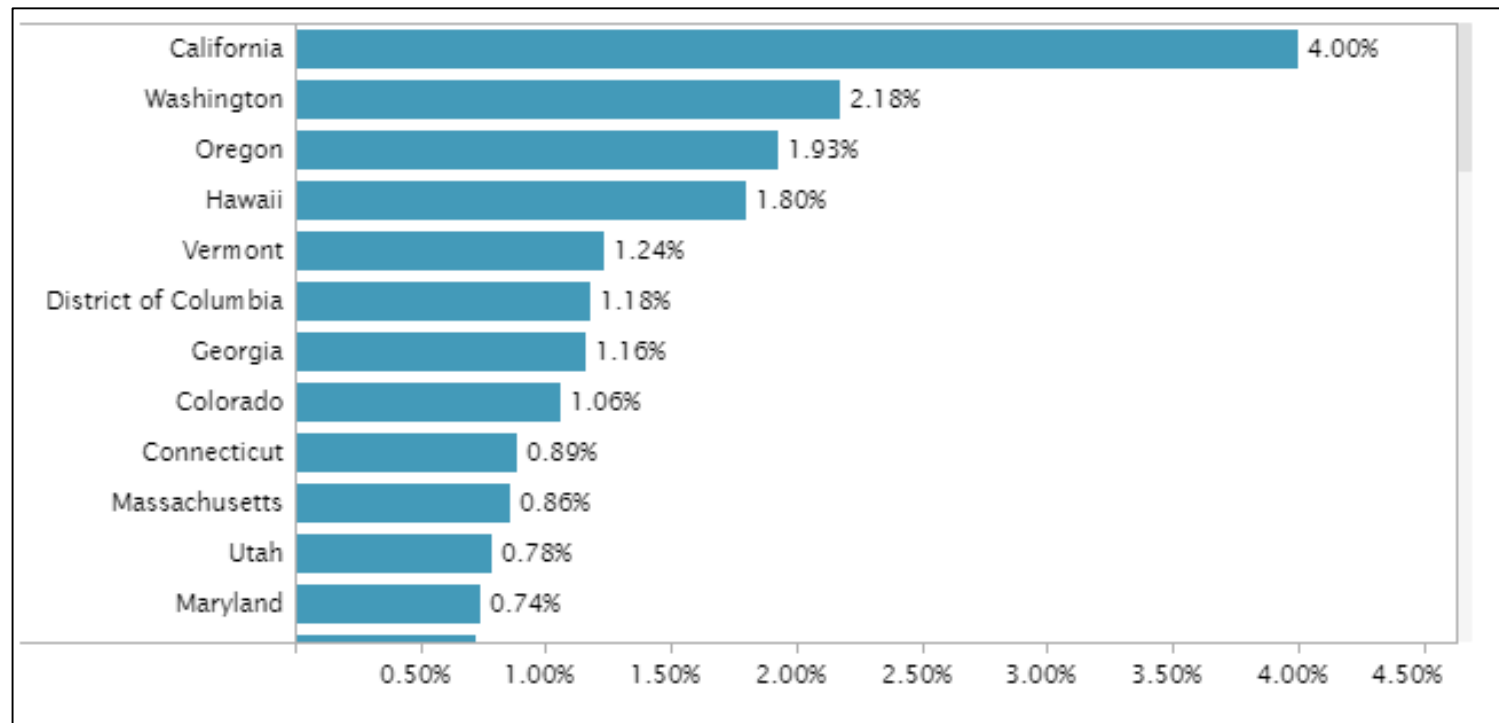


CT DMV: >>9,289
as of 1/1/2019

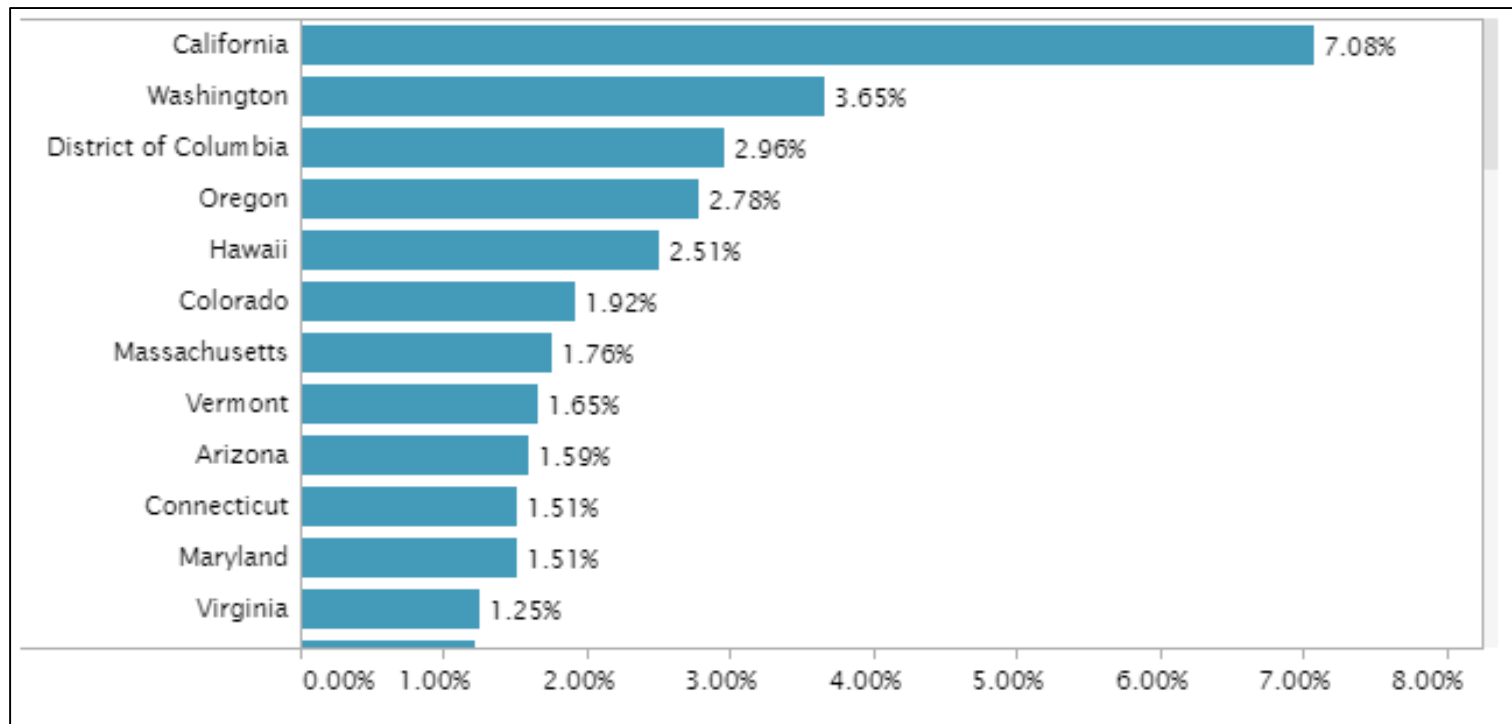
Sources: <https://autoalliance.org/energy-environment/zev-sales-dashboard/>

CT DMV: <https://www.ct.gov/dmv/cwp/view.asp?a=807&q=600850>

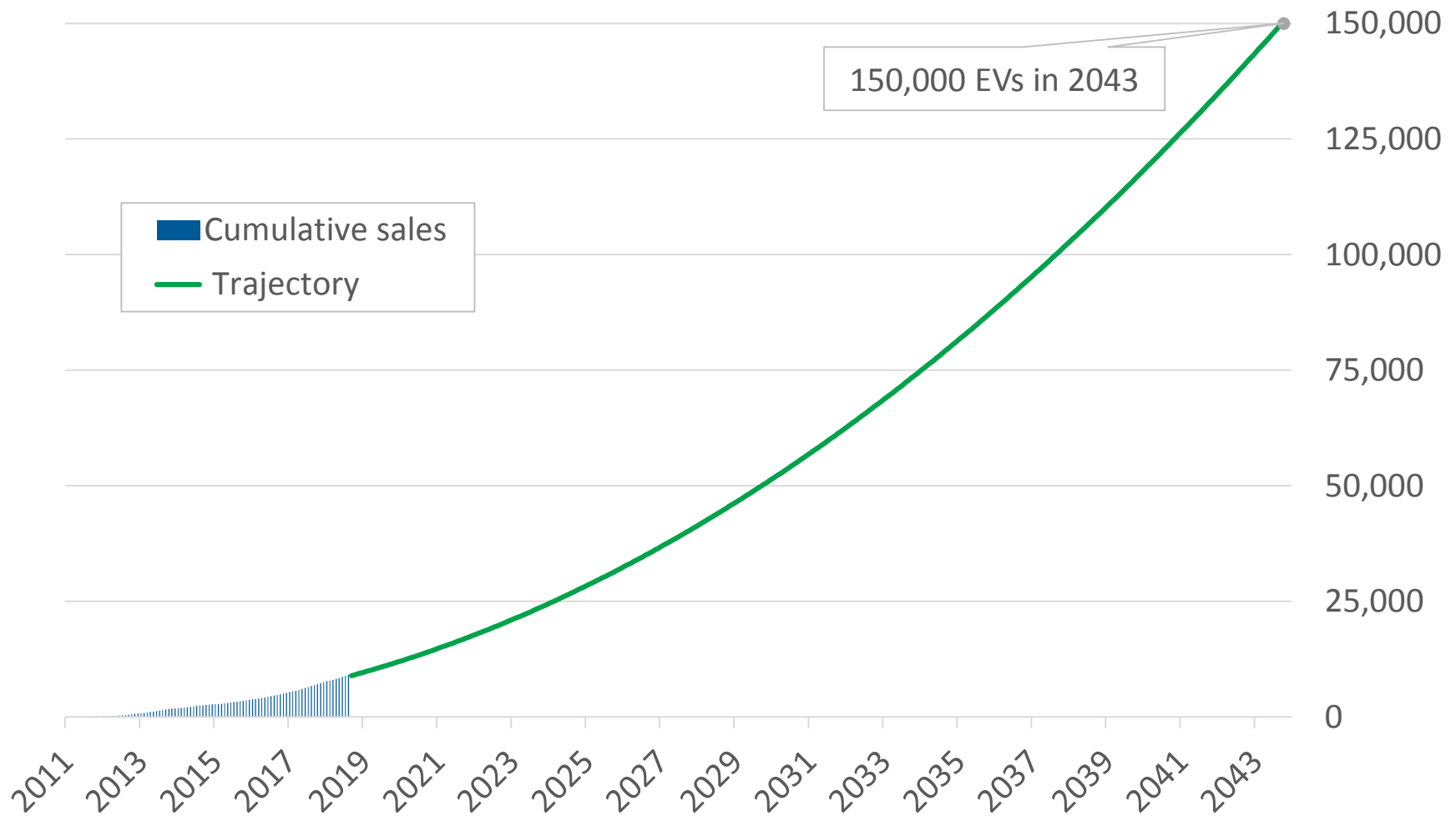
Market Share (2011–Aug. 2018)



Market Share (2018 thru August)



Policy Support is Needed: Simplistic Trajectory Toward State Goal



Sales data and state goal from

<https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/>

A close-up photograph of a person's hand holding a charging cable connected to an electric vehicle. The scene is set in a city street during sunset, with warm, golden light and lens flare effects. In the background, a bicycle is parked on the sidewalk, and a building is visible. The overall atmosphere is bright and modern.

CHEAPR Update

Outputs, Outcomes, and Impacts

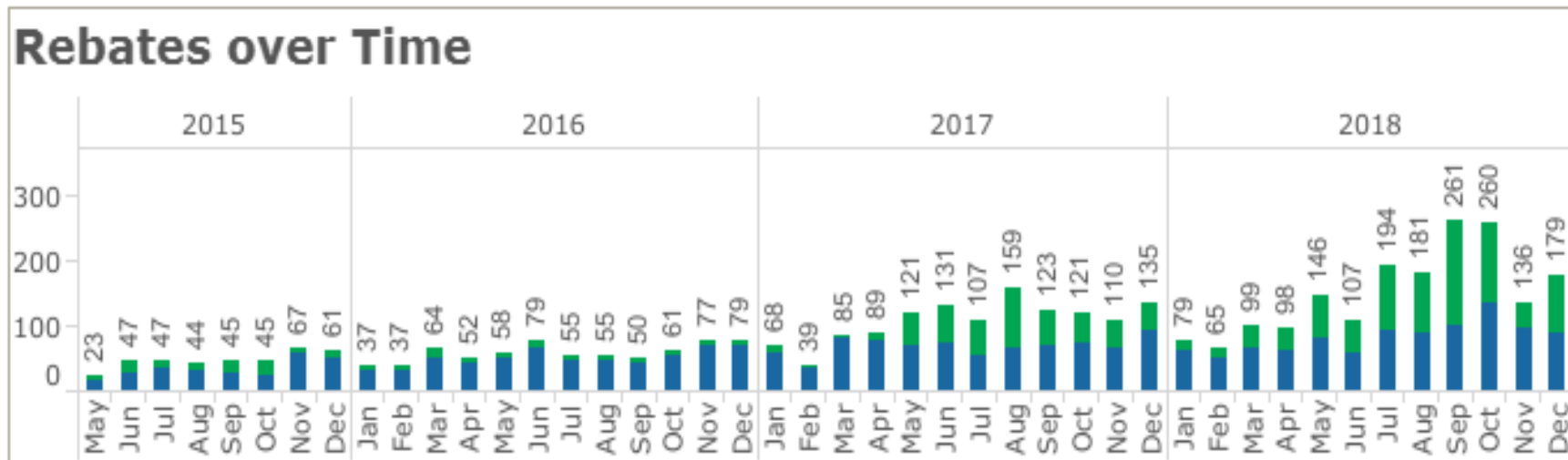
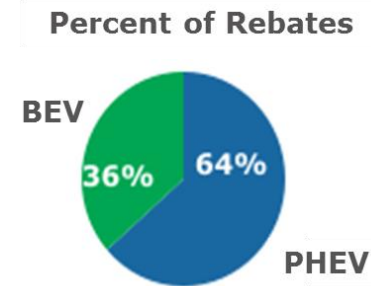


CHEAPR Outputs

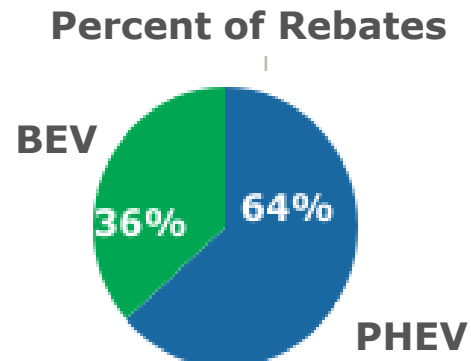
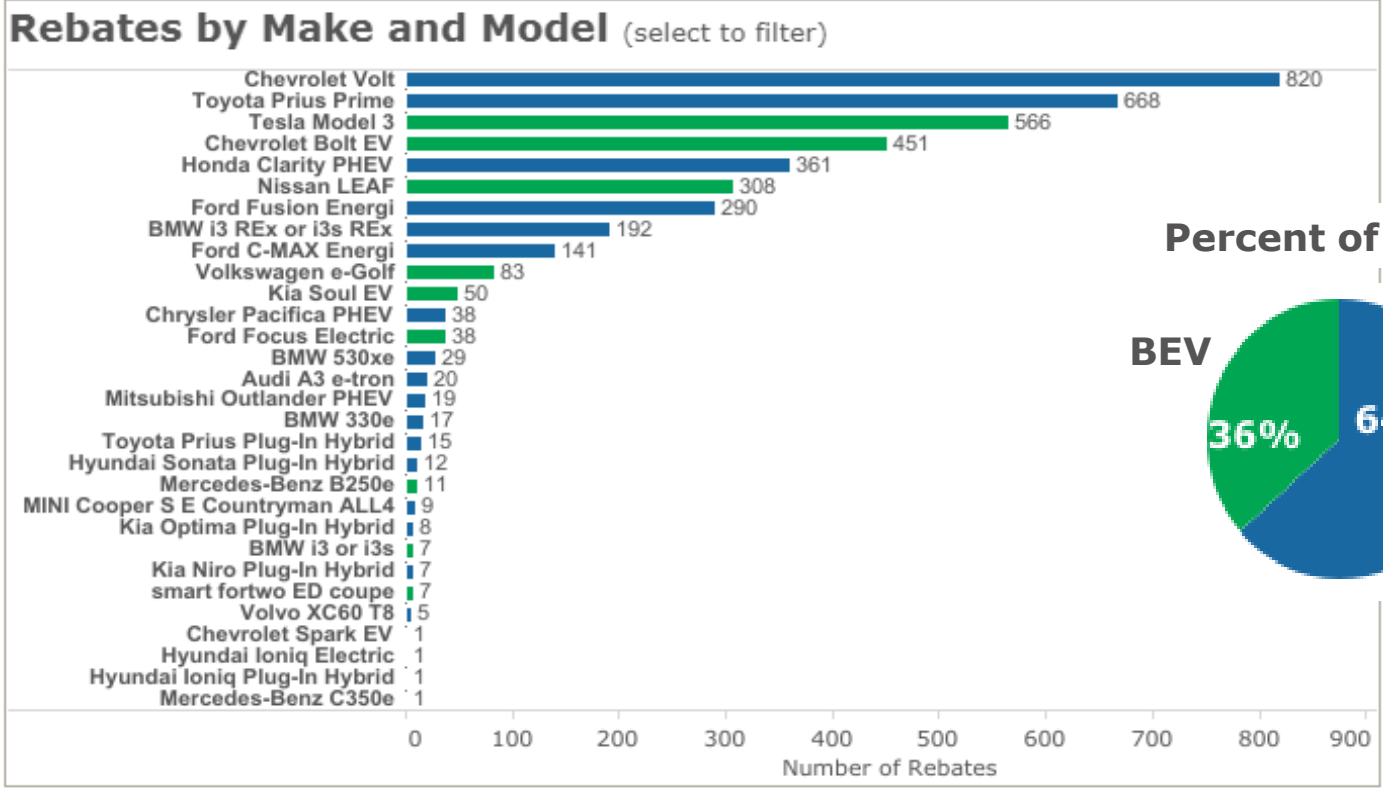
Vehicles Rebated

Rebates and Funding (thru Dec. 2018)

		Rebate Dollars	Rebates
PHEV	Plug-in hybrid electric vehicle (elect..	\$4,195,000	2,653
BEV	Highway capable, four-wheeled, all-..	\$4,221,500	1,523
Total		\$8,416,500	4,176

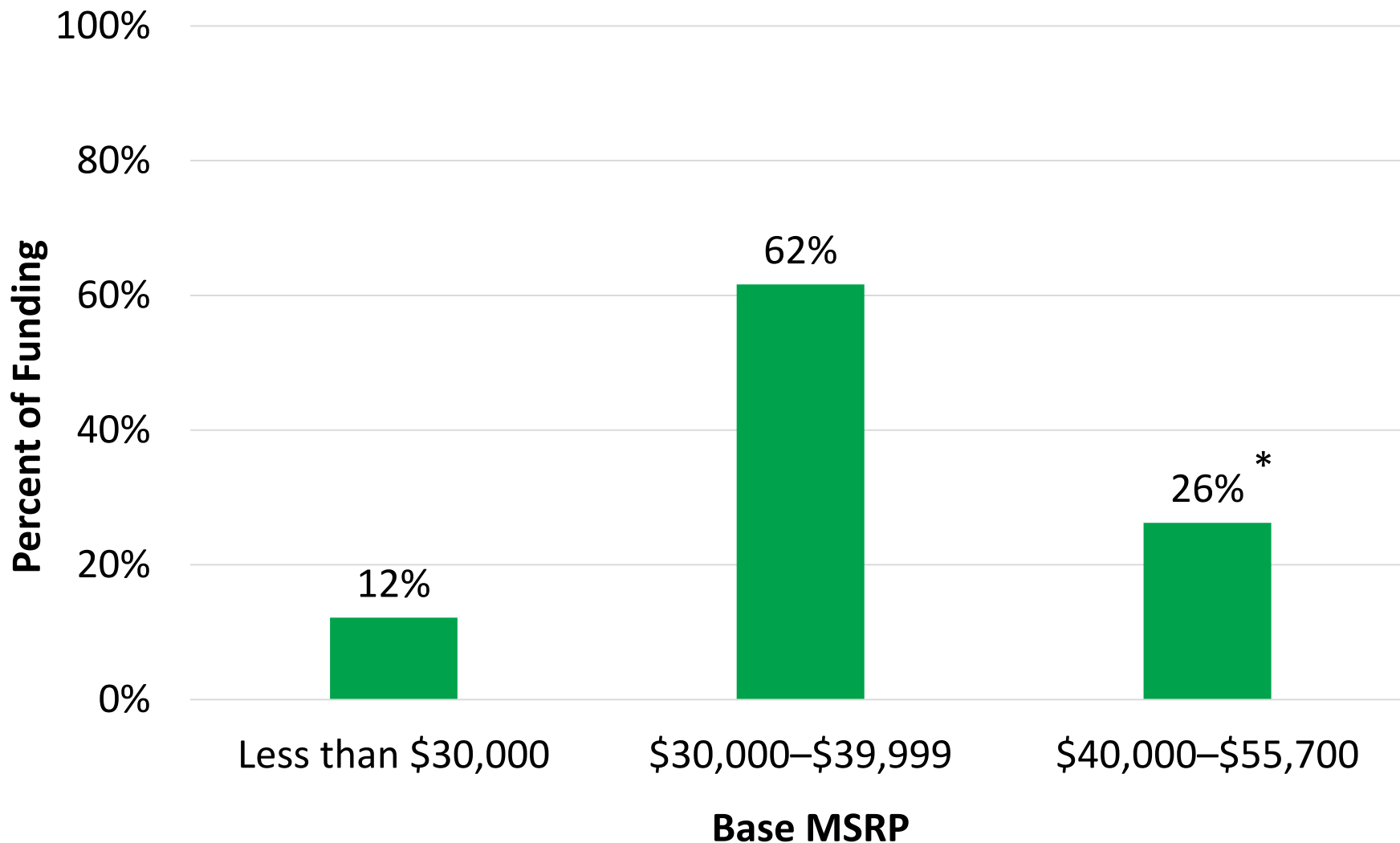


Rebated Vehicles (thru Dec. 2018)

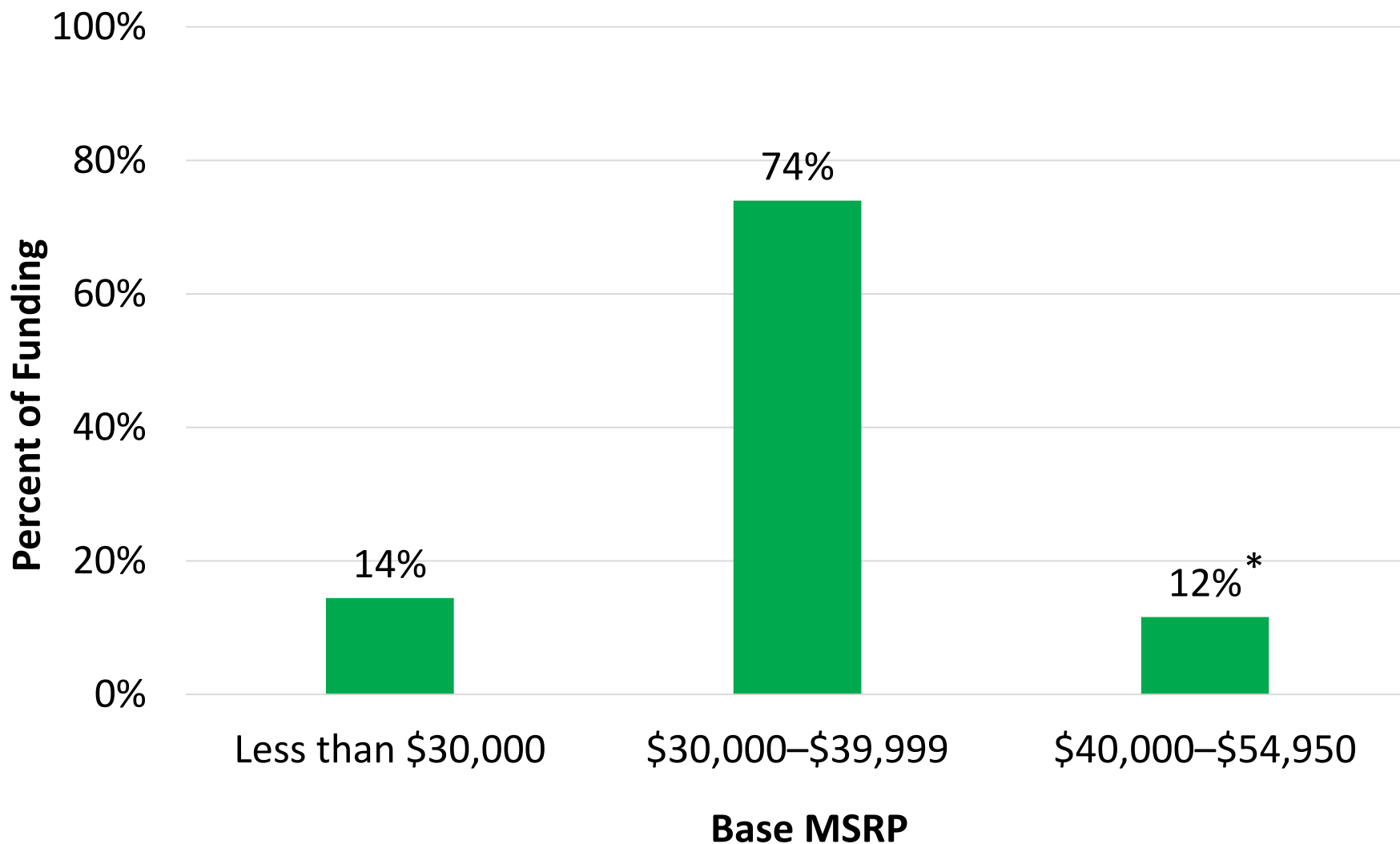


Moderately Priced Vehicles Received Most of the Funding

(thru Dec. 2018)

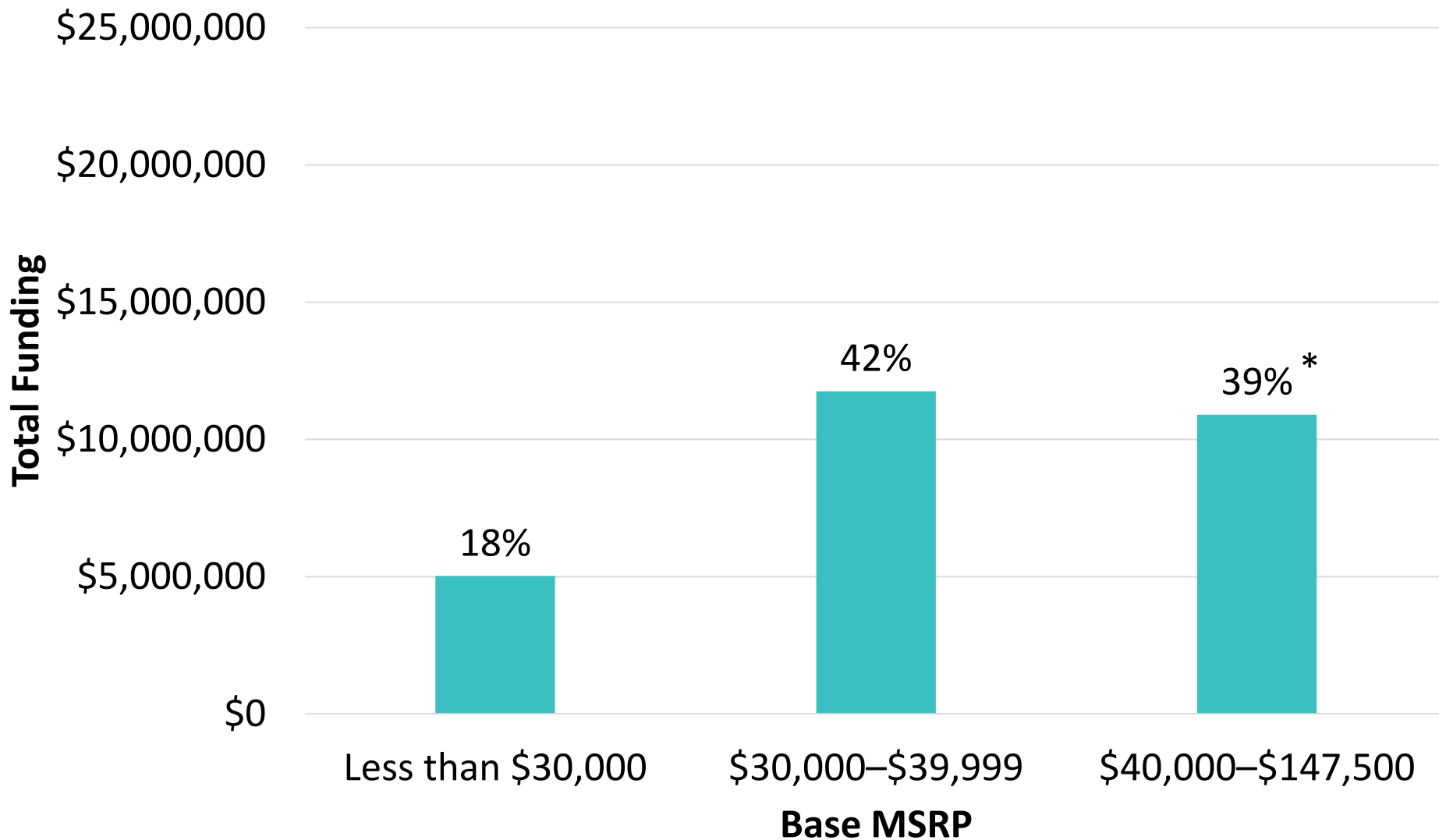


Moderately Priced Vehicles Received Most Funding: thru April 2018 (pre-“Model 3 effect”)



Moderately Priced Vehicles Received Most Funding

(thru Dec. 2018)

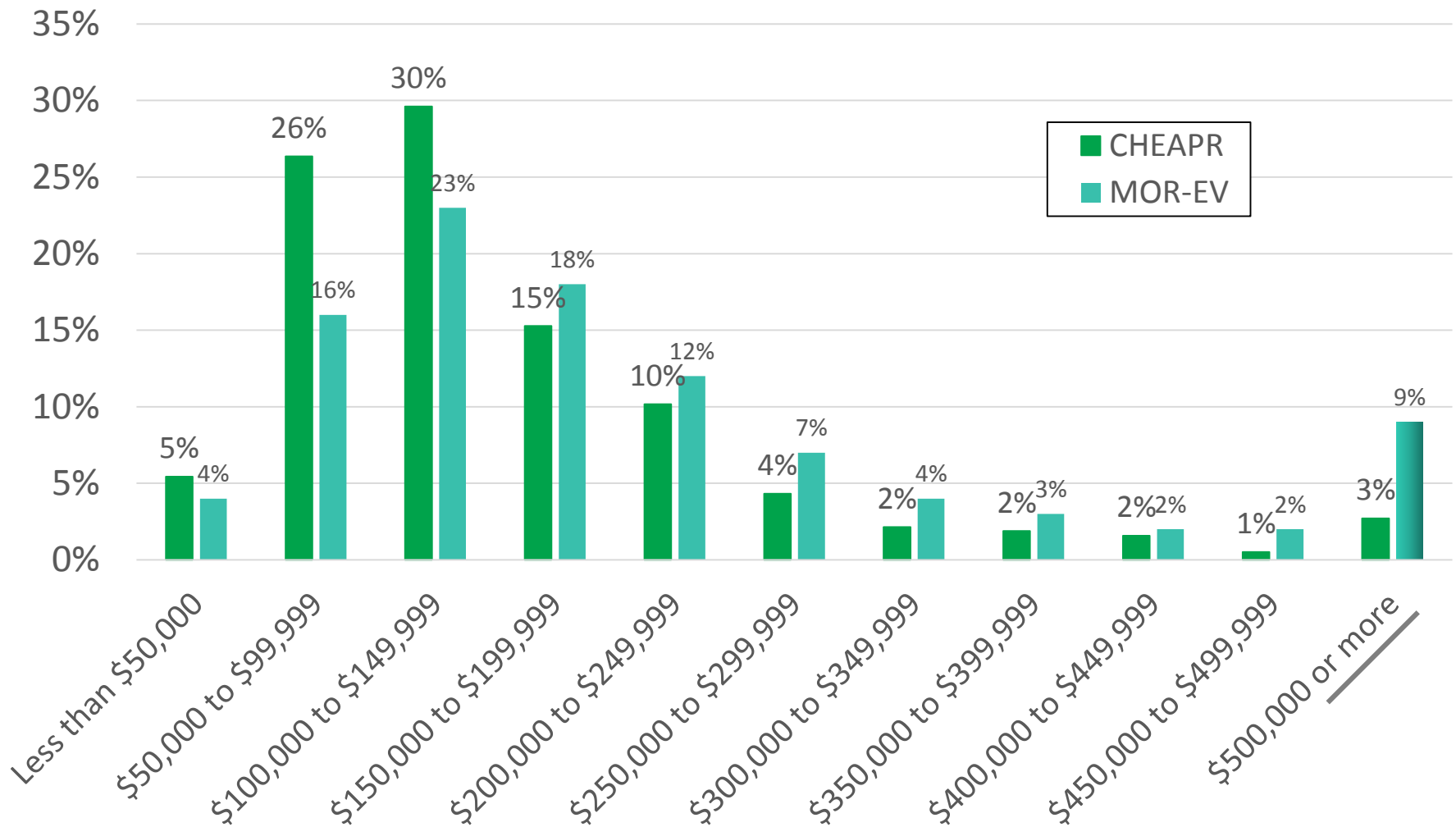




Outputs

Consumers Rebated

CHEAPR and MOR-EV Respondents by Household Income

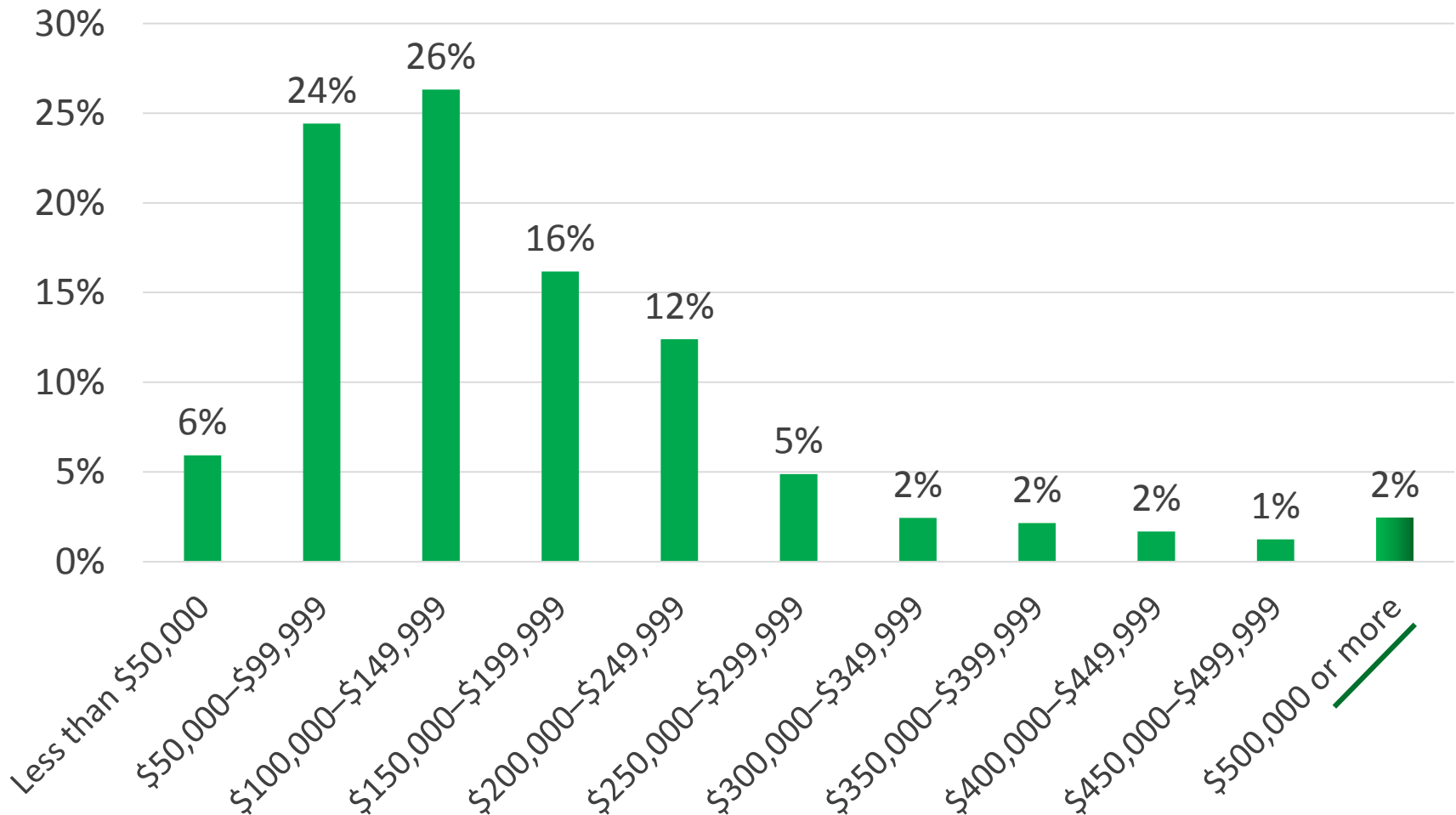


Income-Based Eligibility: Implementation Considerations

- **Outreach complexity**, consumer confusion
- **Dealer reluctance**, fears about liability
- **Application complexity**, affects all applicants
- **Intrusiveness**, tax forms
- **Fraud**
- **Loopholes**
- **Investment** in processing systems, **labor**
- **Wait times**, even for priority applicants
- **Precludes a point-of-sale rebate**, which would benefit those that need the rebate most

MSRP may be a better proxy for equity in program eligibility

The majority of rebated consumers have annual household incomes less than \$150,000



Excerpts adapted from the presentation available on the [program reports page](#) at CleanVehicleRebate.org ...



Electric Vehicle Rebates: Exploring Indicators of Impact in Four States

EV Roadmap 11, Portland OR, 20 June 2018

Brett Williams, Ph.D. – Principal Advisor, Clean Transportation

Michelle Jones and Georgina Arreola – Analysts

Thanks also to Jaclyn Vogel and others at CSE



Data comparability: Program designs varied



Fuel-Cell EVs



\$5,000

\$2,500

\$5,000

e-miles

All-Battery EVs



\$2,500

\$2,500

e-miles

≥ 175 \$3,000

≥ 100 \$2,000

< 100 \$500

≥ 120 \$2,000

≥ 40 \$1,700

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Plug-in Hybrid EVs



\$2,500 (i3 REx)
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≥10 kWh \$2,500
<10 kWh \$1,500

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Zero-Emission Motorcycles



\$900

\$750





e-miles ≥ 20;
Consumer income cap;
Increased rebates for lower-income

MSRP ≥ \$60k = \$1,000 max., no fleet rebates

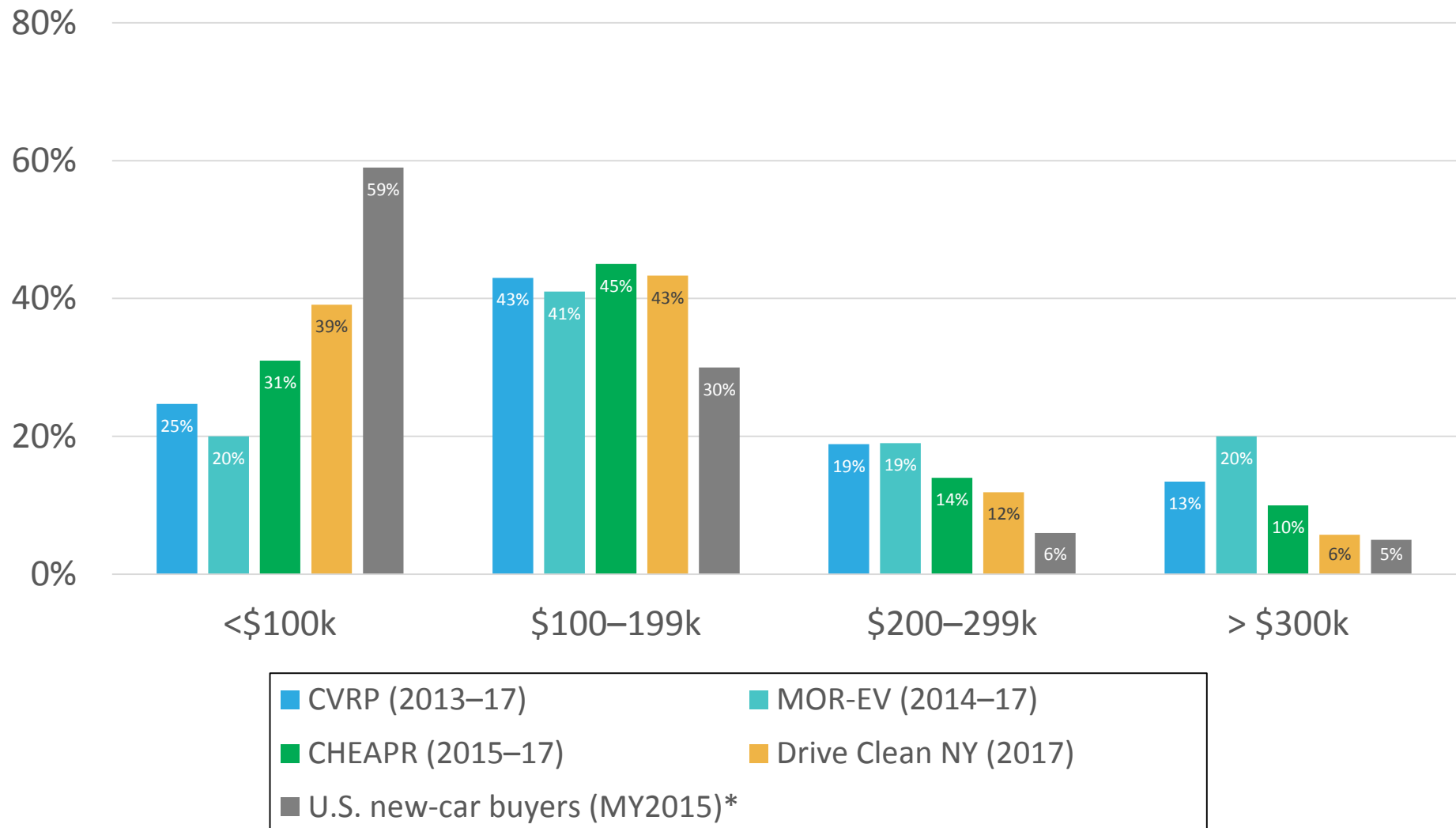
MSRP ≤ \$60k only; Dealer assignment; \$150 dealer incentive (\$300 previous)

MSRP > \$60k = \$500 max.; point-of-sale via dealer

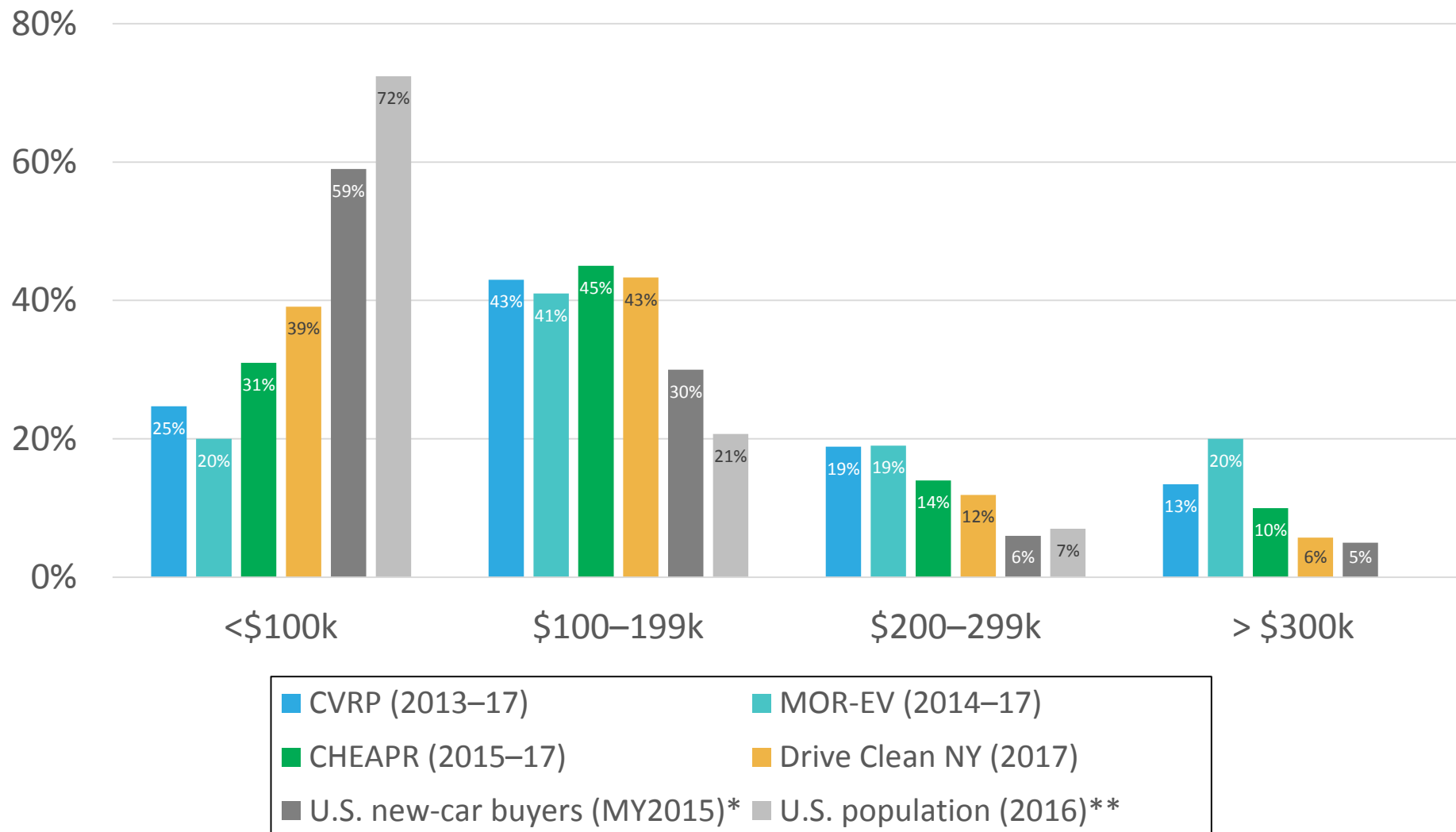
Consumer Survey Data *(Rebates to Individuals Only)*

	 CALIFORNIA CLEAN VEHICLE REBATE PROJECT™	 MOR-EV Massachusetts Offers Rebates for Electric Vehicles	 CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	 NEW YORK STATE	Total
Vehicle Purchase/ Lease Dates	Dec. 2010 – May 2017	July 2014 – October 2017	May 2015 – June 2017	March 2017 – Nov. 2017	Dec. 2010 – Nov. 2017
Survey Responses (total n)*	40,438	2,549	819	817	44,623
Program Population (N)	185,367	5,754	1,583	3,937	196,641

Most Rebate Recipients Have Moderate Household Incomes



The Best Comparison is to New Car Buyers, *Not the U.S. Population*

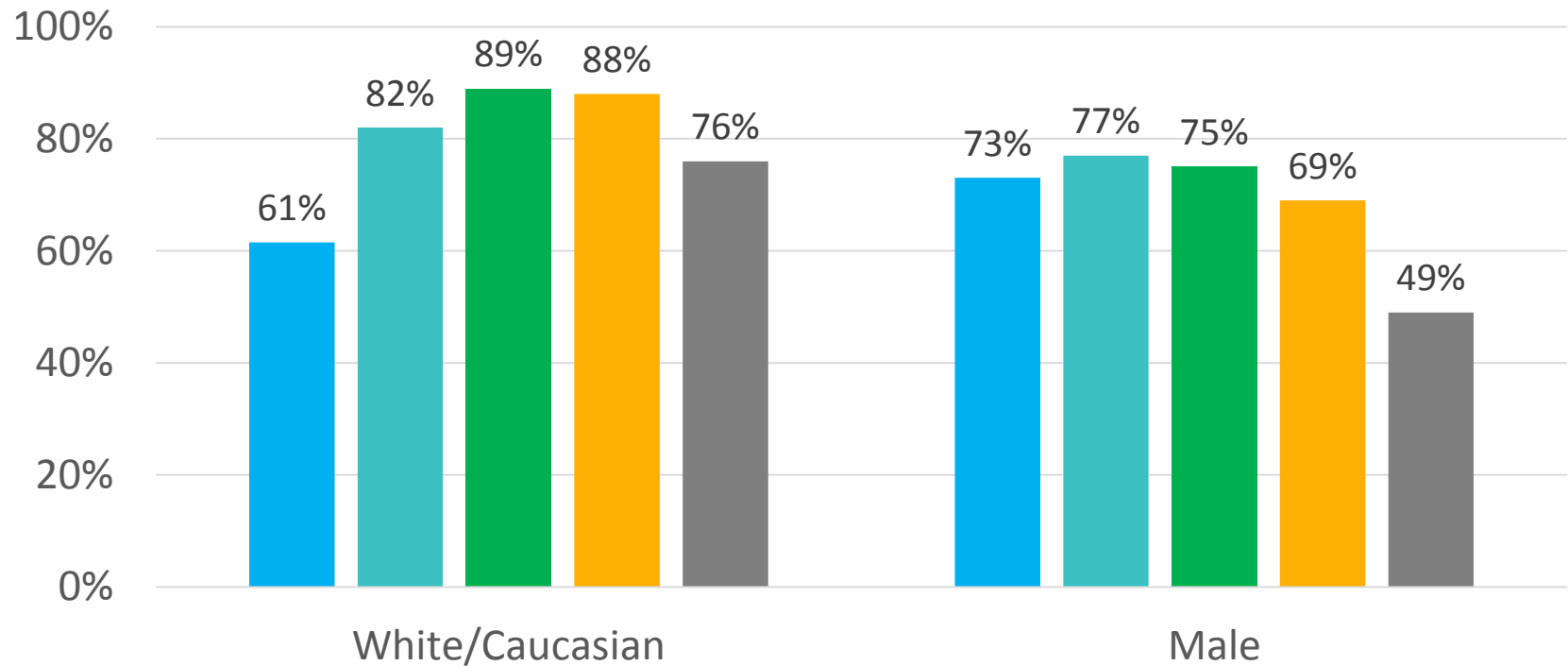


44,623 total survey respondents weighted to represent 196,641 participants

* Personal correspondence, Prof. Bunch (UCD)

** U.S. Census Data

Are White Males Over-Represented??



■ CVRP (2015-2017)

■ MOR-EV (2014-2017)

■ CHEAPR (2015-2017)

■ Drive Clean NY (2017)

■ CA vehicle-purchase "intenders" (CHTS 2012)

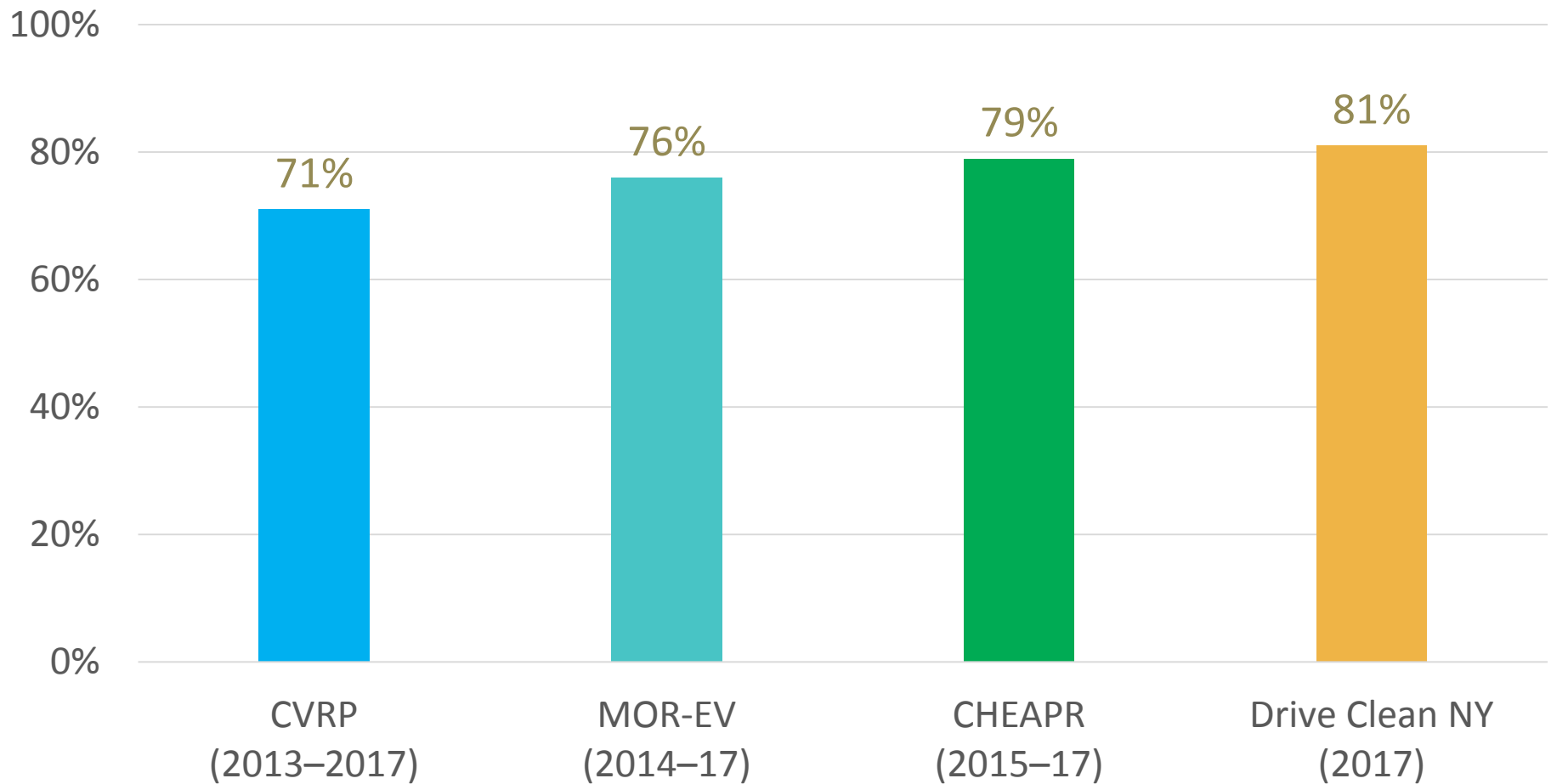


Outcomes

Behaviors Influenced

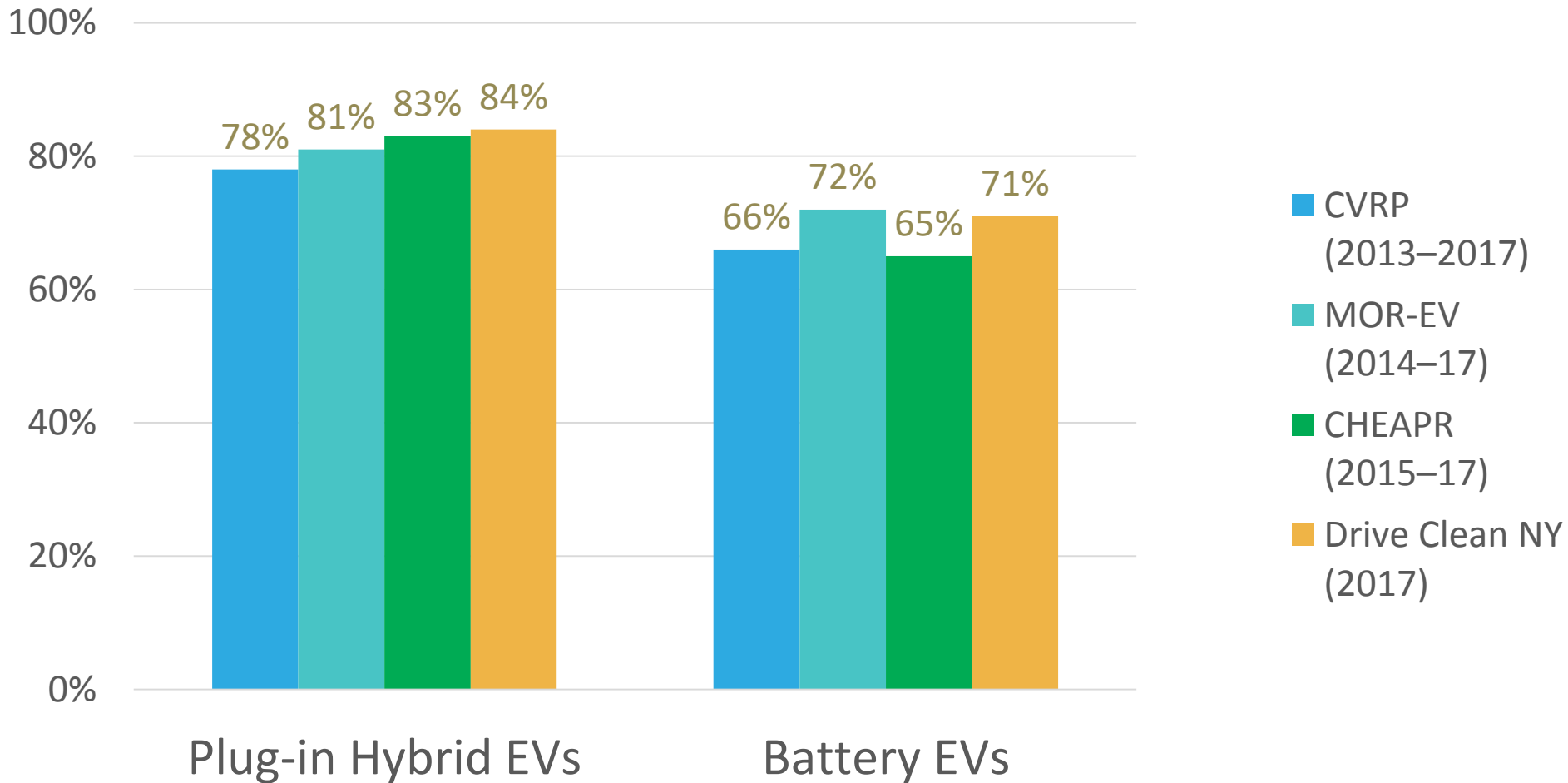
Do EVs get used?

Replaced a vehicle with their rebated **clean vehicle**



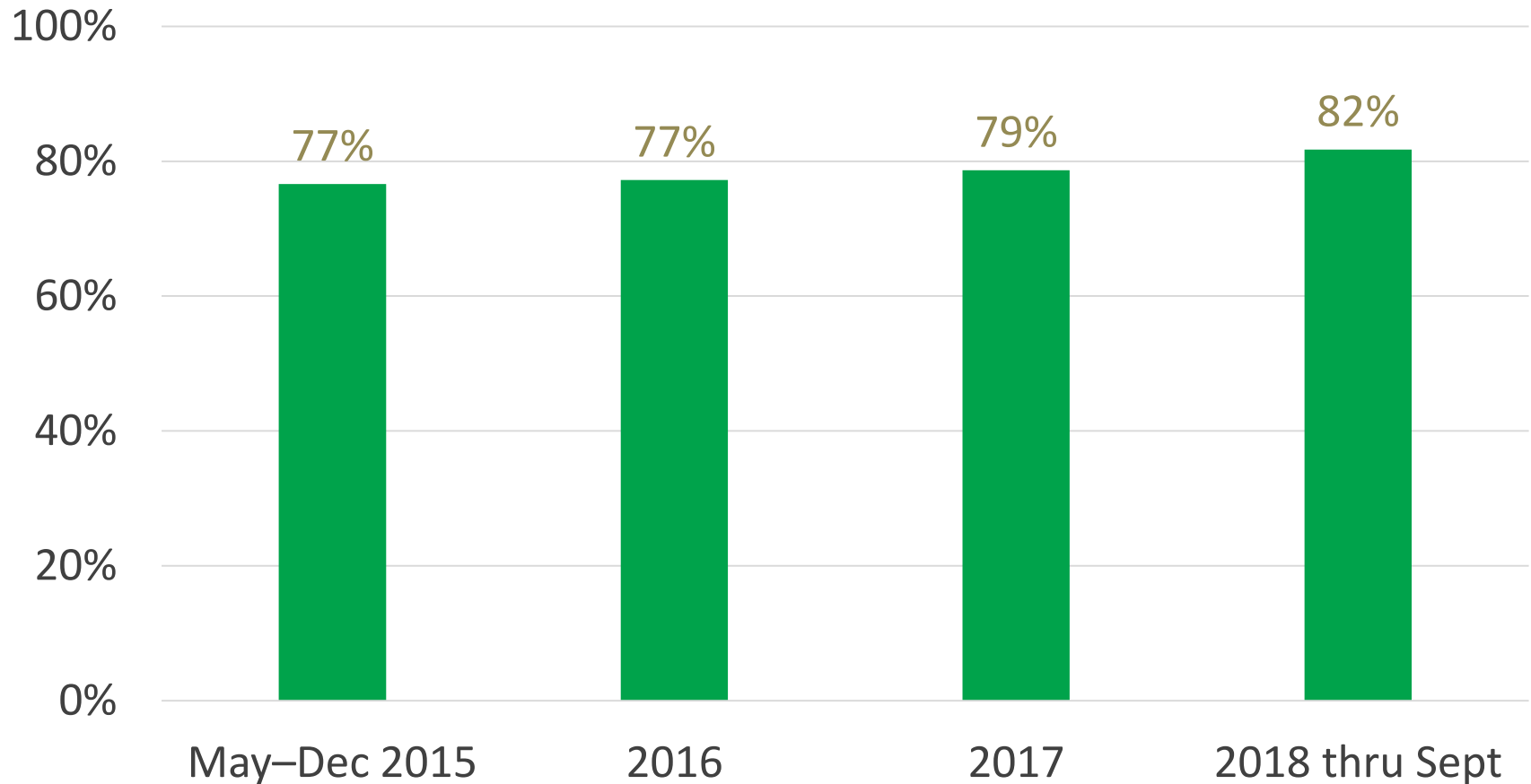
Do EVs get used?: by Tech Type

Replaced a vehicle with their rebated EV



Do EVs get used?: Trend

Replaced a vehicle with their rebated EV



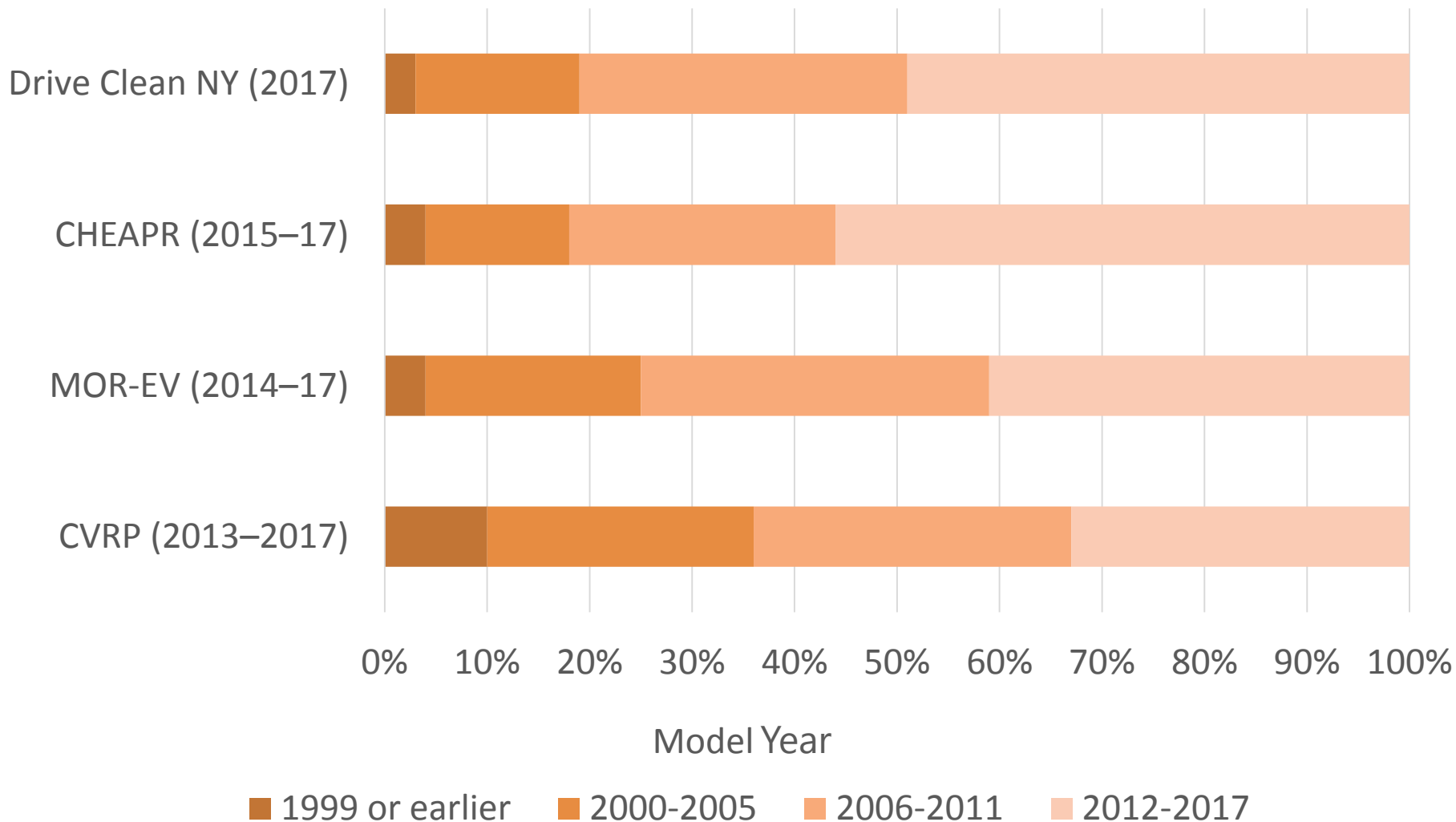


Impacts

Emission



What vehicles have rebates helped replace?



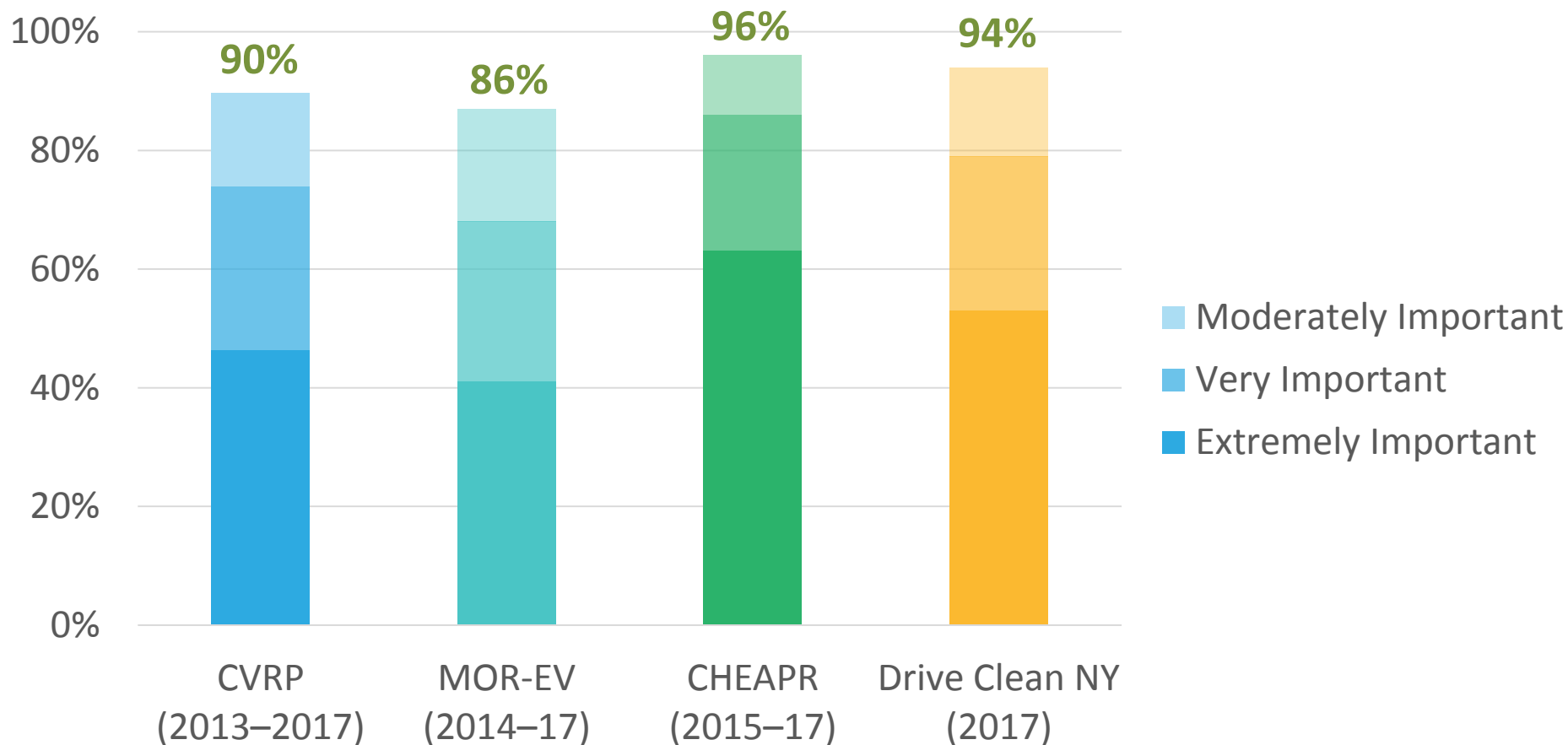


Impacts

Market

Rebate Influence: Importance

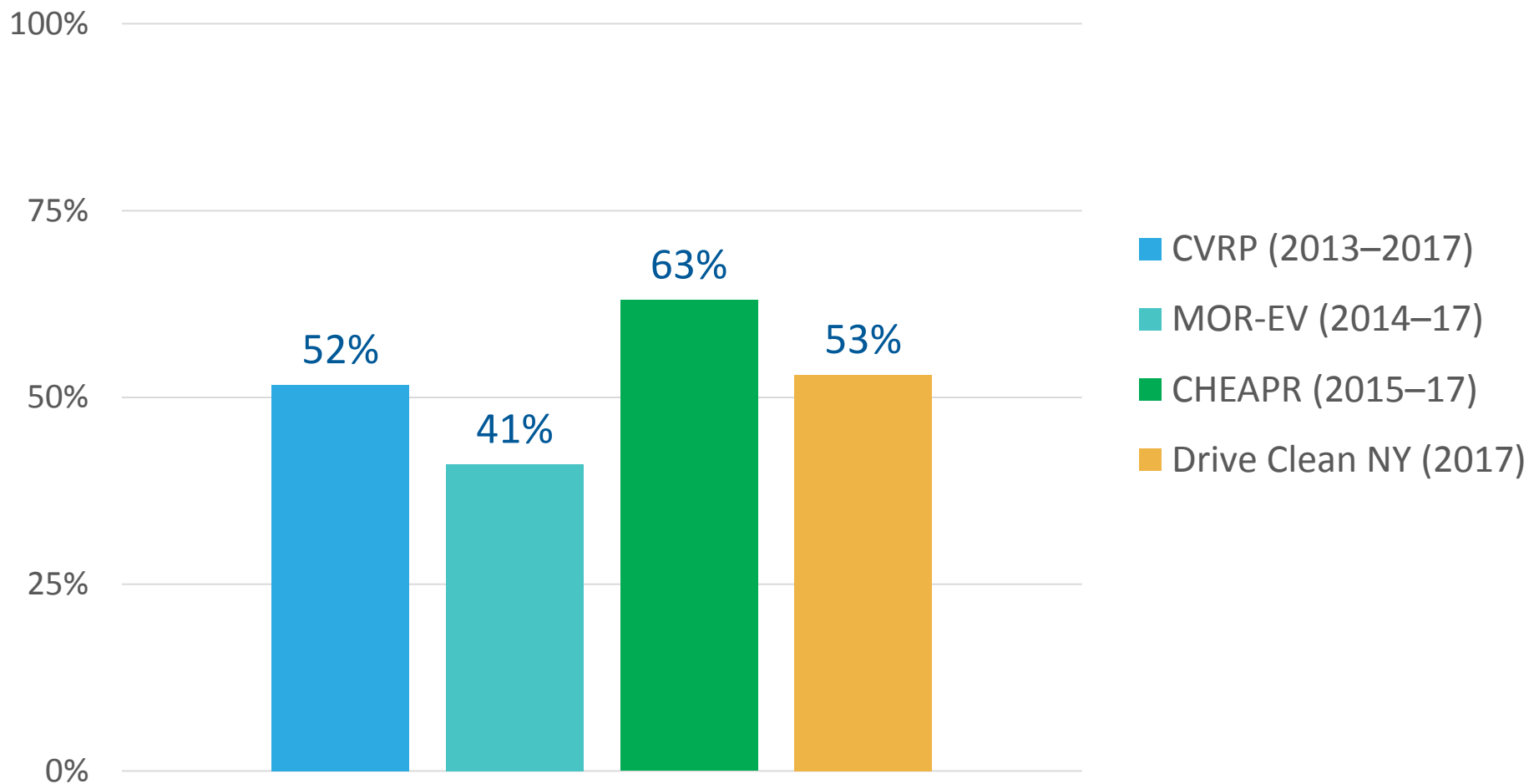
How **important** was the state rebate in **making it possible** for you to acquire your clean vehicle?



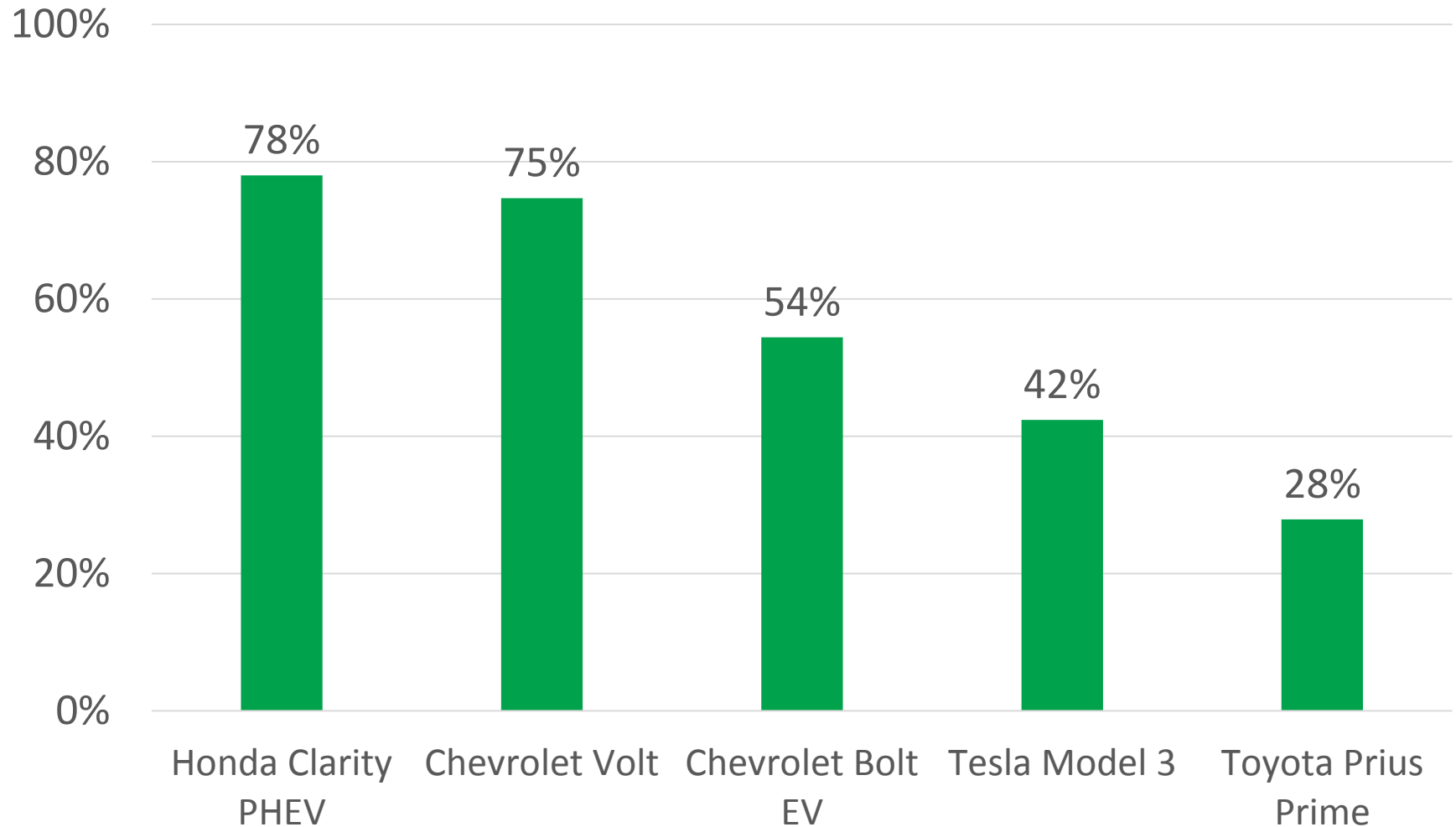
Datasets: 44,623 total survey respondents weighted to represent 196,641 participants

Rebate Influence: Essentiality

Would **not** have purchased/leased their EV **without** rebate

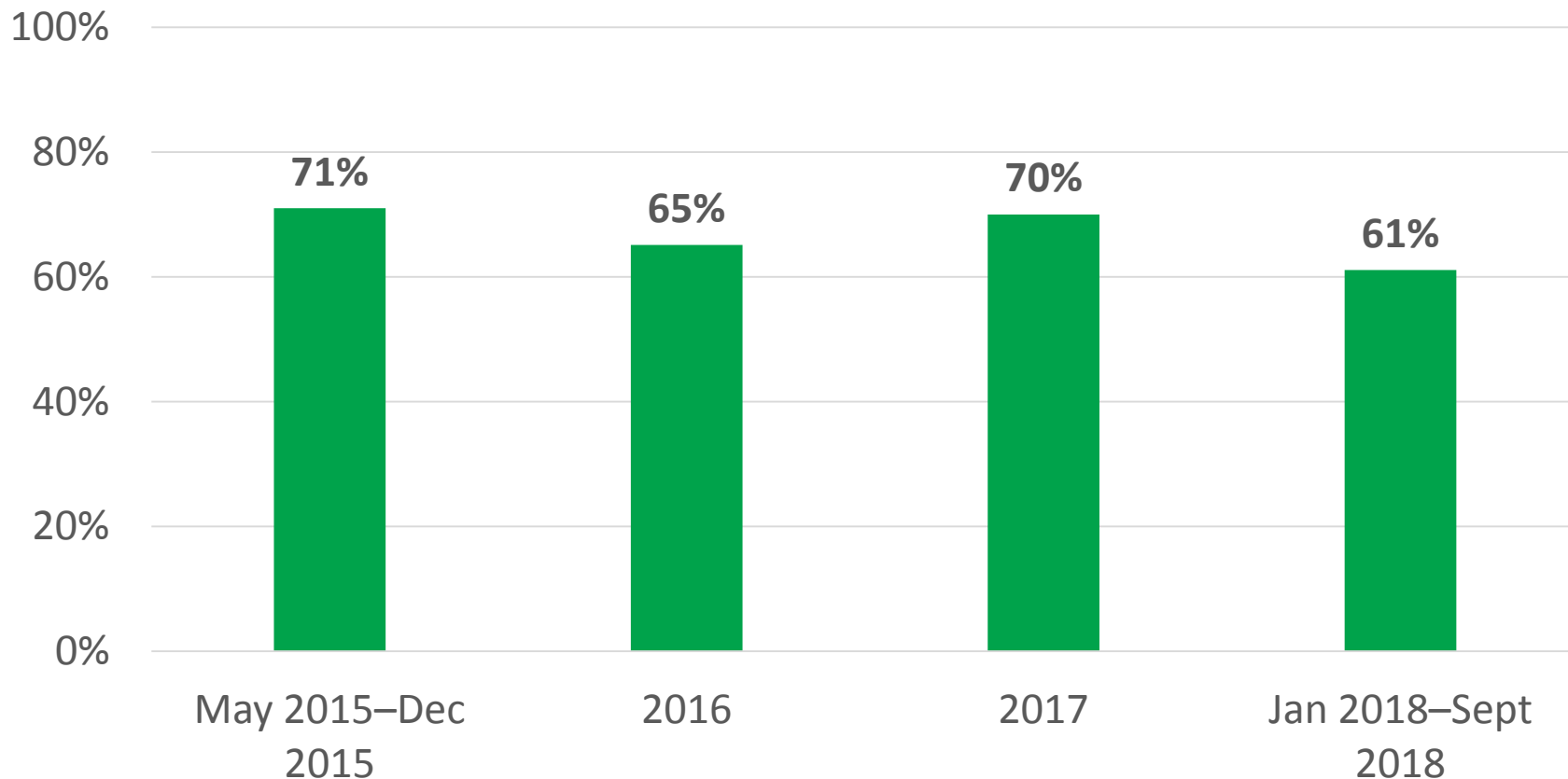


Rebate Essentiality for Most Rebated MY 2018 Models



Rebate Essentiality: Trend without Tesla or Prius Prime

Would **not** have purchased/leased their EV **without rebate**



Date Ranges based on vehicle purchase/lease date

A close-up photograph of a person's hand holding a black charging cable connected to a white electric vehicle. The scene is set outdoors at sunset, with a bright sun in the upper right corner creating a lens flare. In the background, a public charging station with orange cables is visible, along with a bicycle parked nearby. The overall atmosphere is warm and modern.

Additional Considerations

Adapted in part from this talk given to Charge Ahead stakeholders in 2016

CVRP Income Cap Analysis: Informing Policy Discussions

Stakeholder Briefing, August 2016

Brett Williams, Ph.D. – Principal Advisor, Clean Transportation

Colin Santulli, M.A., PMP – Director, Clean Transportation

Thanks also to John Anderson, Clair Johnson, PhD, Roman Partida-Lopez,
and others at CSE

Overview

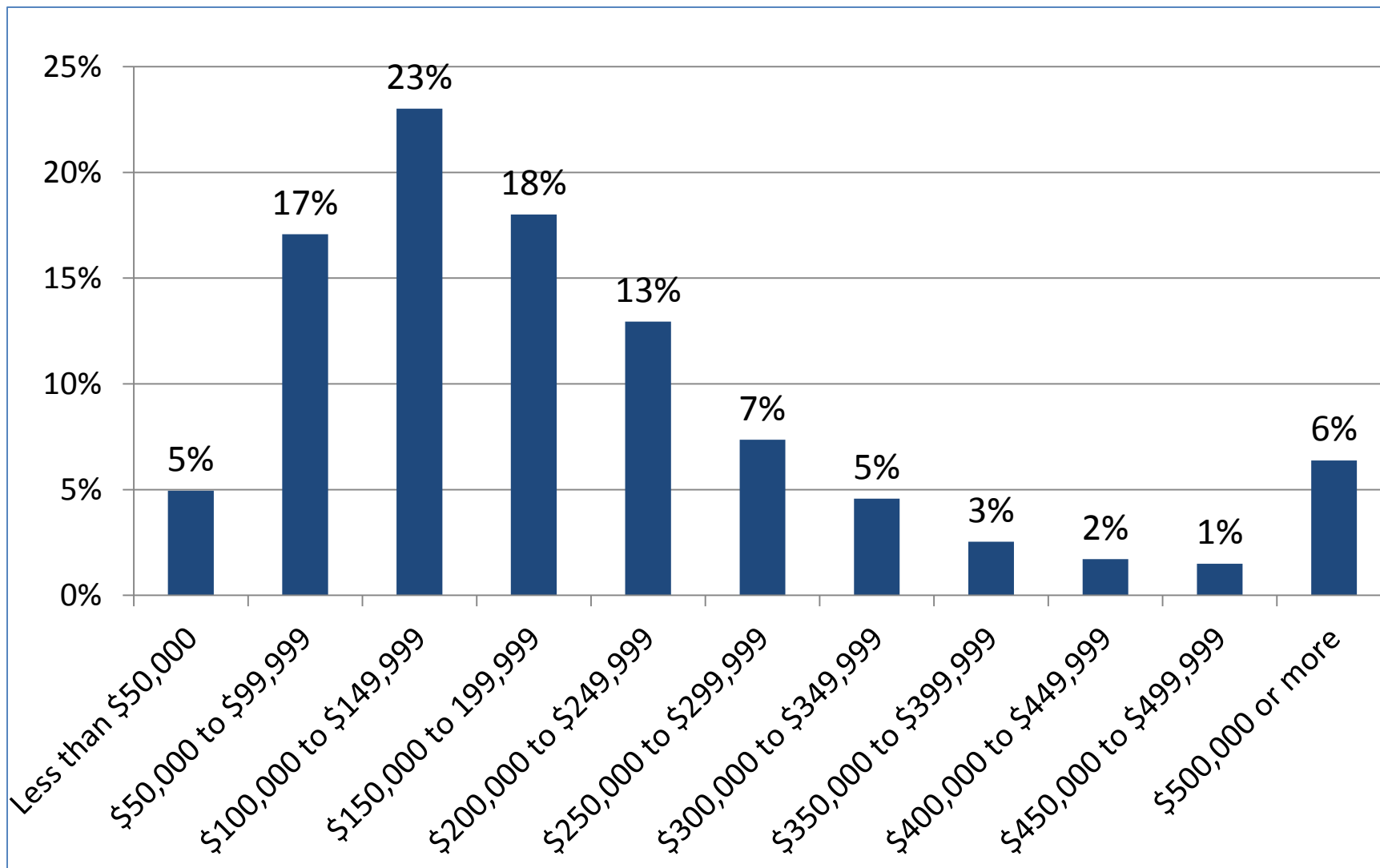
CSE Priorities:

- Support state ZEV goals (2023 & 2025)
- Long-term incentive funding (3–5 year funding)
- Program design based on data and evaluation

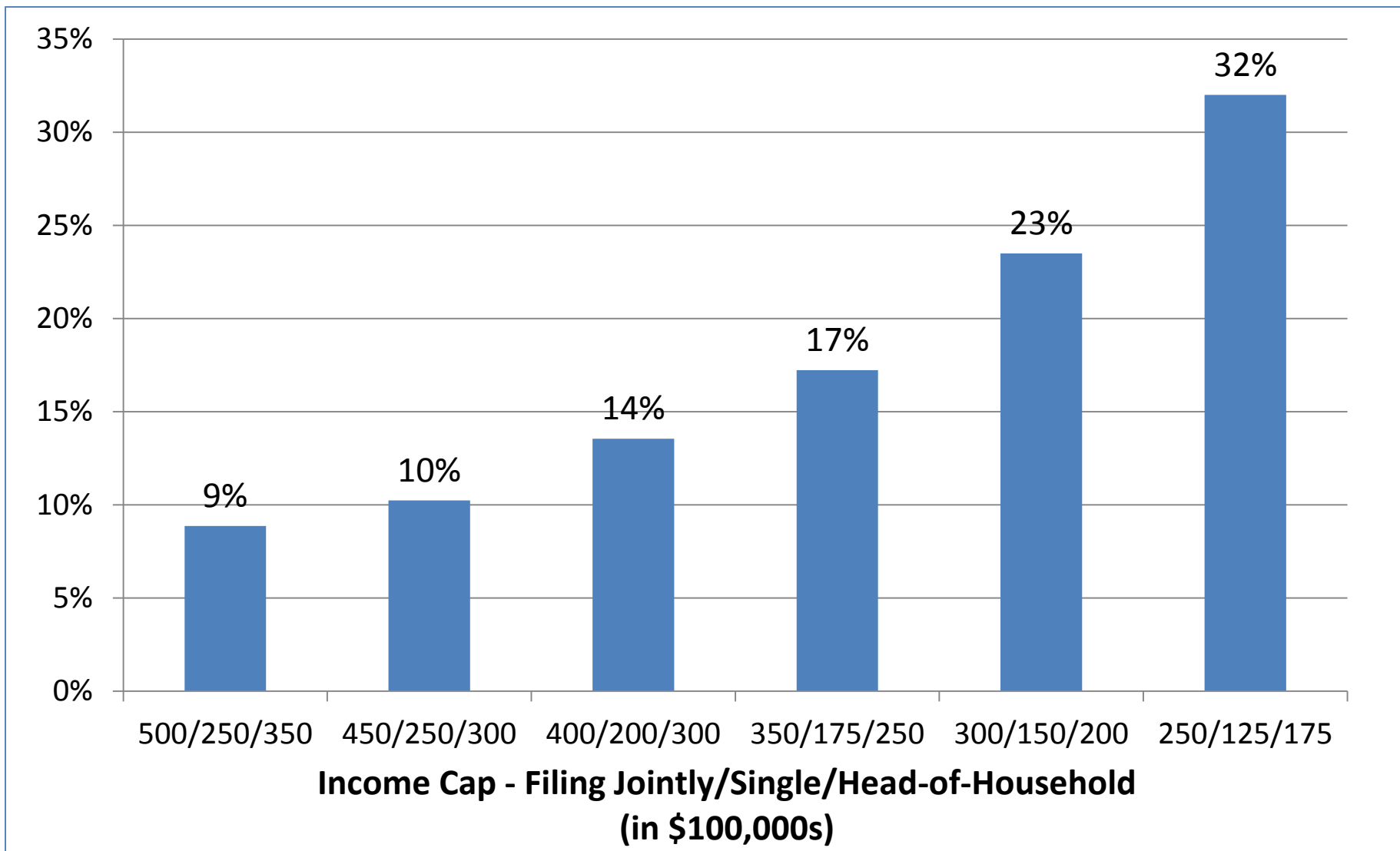
Analysis:

- This analysis is best effort to evaluate potential impact of different income cap levels using available historical data
- Actual impact of the current cap on the ZEV market is unclear at this time; Effective date was March 2016

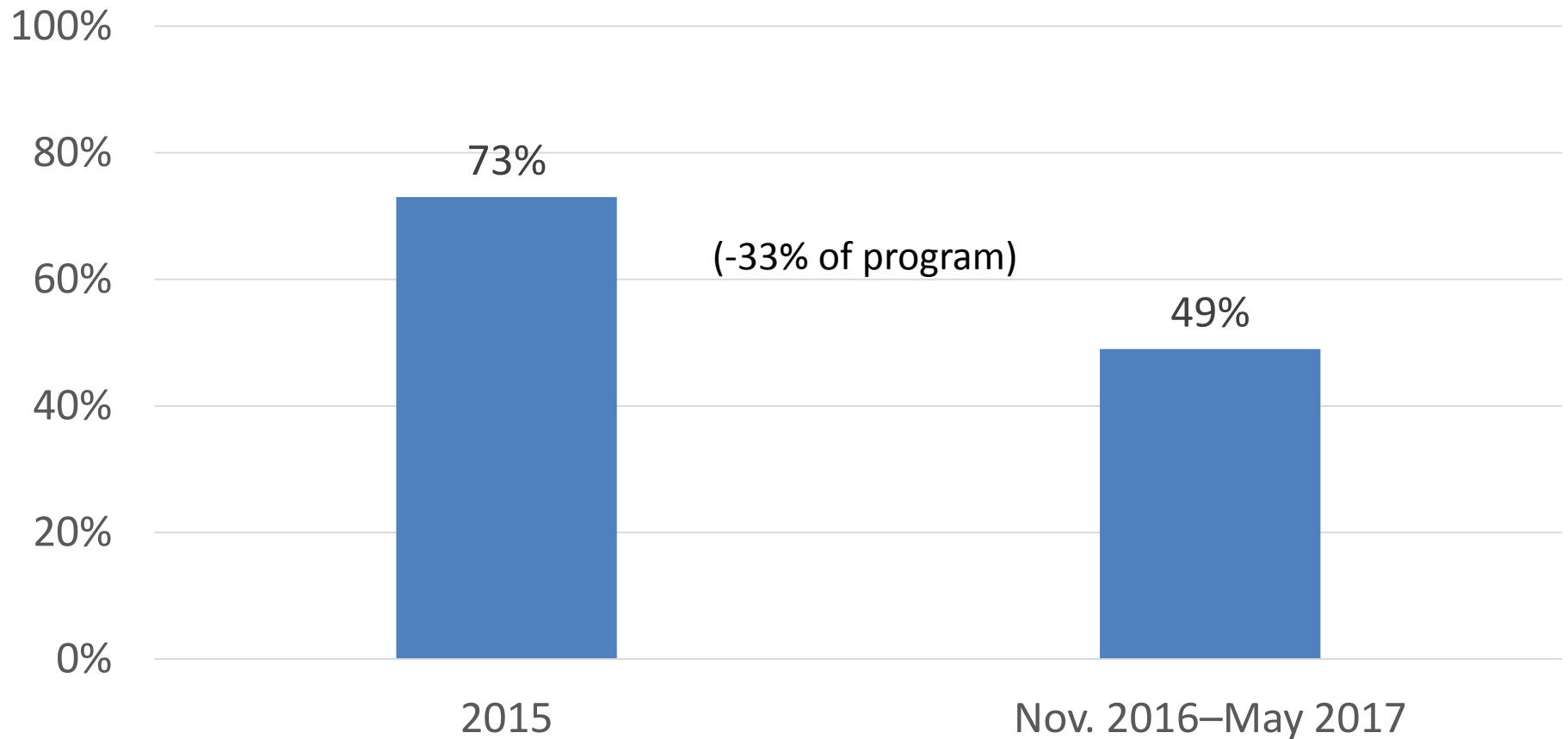
Distribution of CVRP Respondents by Household Income



Percent of CVRP Program Excluded



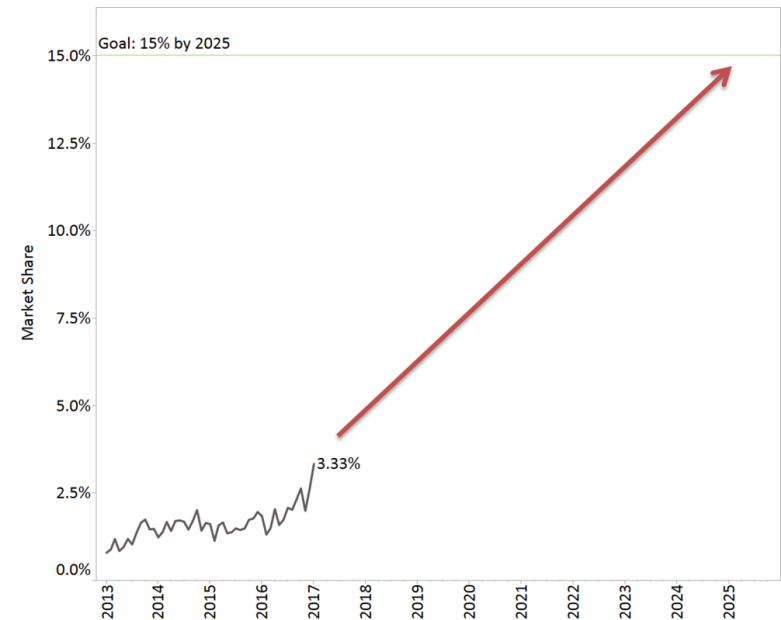
Percent of Market Rebated (individuals only): Before and After the Income Cap (illustrative eras)



Why are added vehicle volumes important?

Volume is a proxy for a variety of market benefits, e.g.:

- For producers
 - Economies of scale
 - OEM learning-by-doing
 - Supply-chain creation
- For dealers
 - Salesperson familiarity
 - Supply on the lot
- For consumers
 - Consumer awareness and understanding
 - Parking lots as “second showrooms”
 - Information spillovers
 - Consumer learning-by-doing
 - Charging confidence
 - Adoption network effects
- For society
 - Use potential
 - Positive environmental externalities



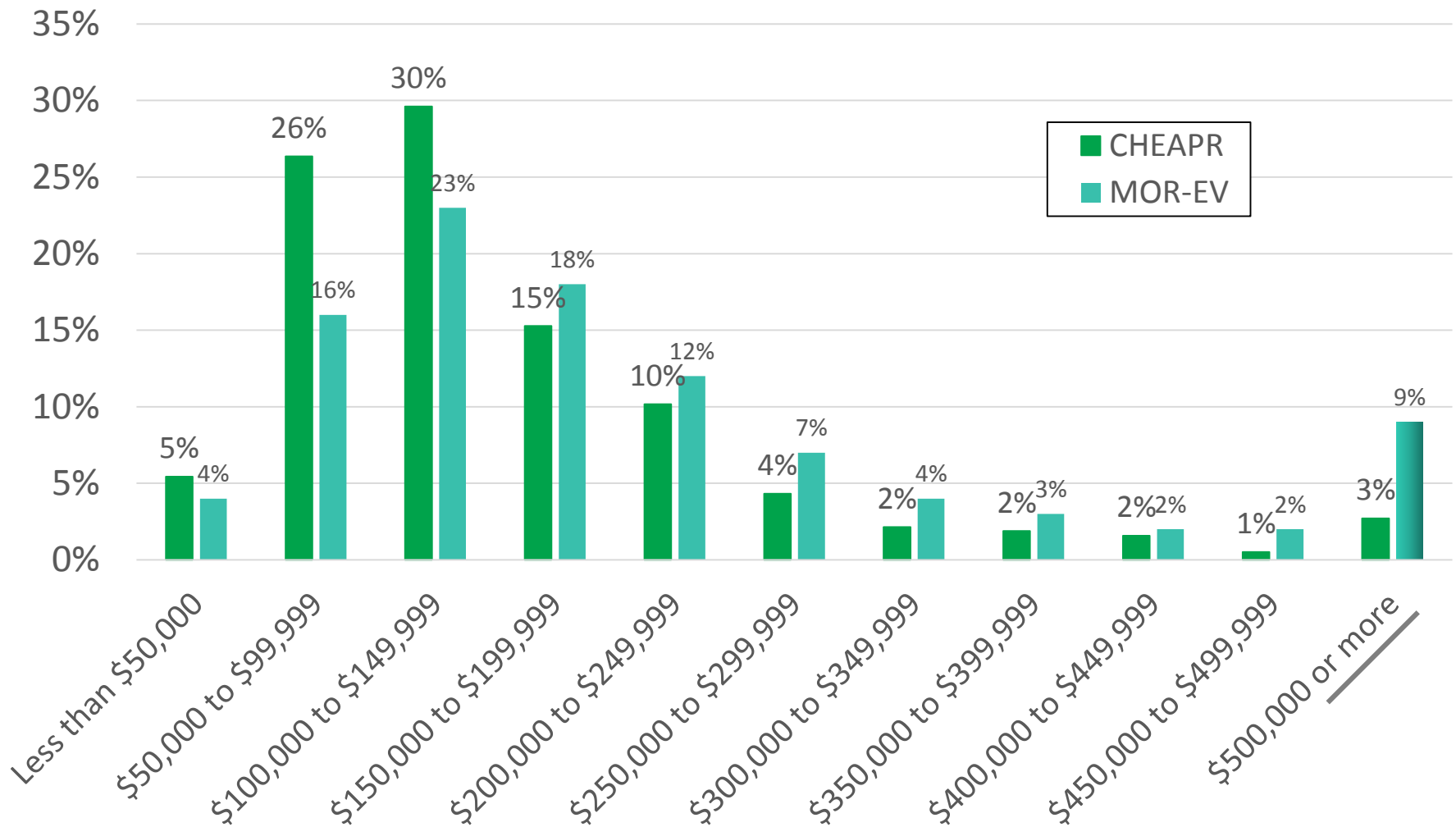
CVRP	Eligibility		Rebate Amount			
	Filing Status	Gross Annual Income	FCEV	BEV	PHEV	ZEM
Income Cap	Individual	> \$150,000	\$5,000	Not Eligible		
	Head of Household	> \$204,000				
	Joint	> \$300,000				
Standard Rebate	Individual	300% FPL to \$150,000	\$5,000	\$2,500	\$1,500	\$900
	Head of Household	300% FPL to \$204,000				
	Joint	300% FPL to \$300,000				
Increased Rebate for Low-Income Applicants*	<i>Household</i> Income ≤ 300 percent of the federal poverty level (FPL)		\$7,000	\$4,500	\$3,500	

Program Effectiveness: MSRP criteria

- Are trivial to implement, already a program concept
- Avoid public investment in luxury products
- Direct private investments made by remaining rebate-motivated higher-income participants towards increasing the volume of mainstream products
- Reduce the cost of mainstream vehicles
- Reduce free ridership in a similar, if somewhat different manner
- “Optimal” thresholds are easier to identify

In brief, increases equity and reduces free ridership with minimal program costs (and market impacts are focused on luxury products with greater margins)

CHEAPR and MOR-EV Respondents by Household Income



How is the dealer incentive working?

Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales

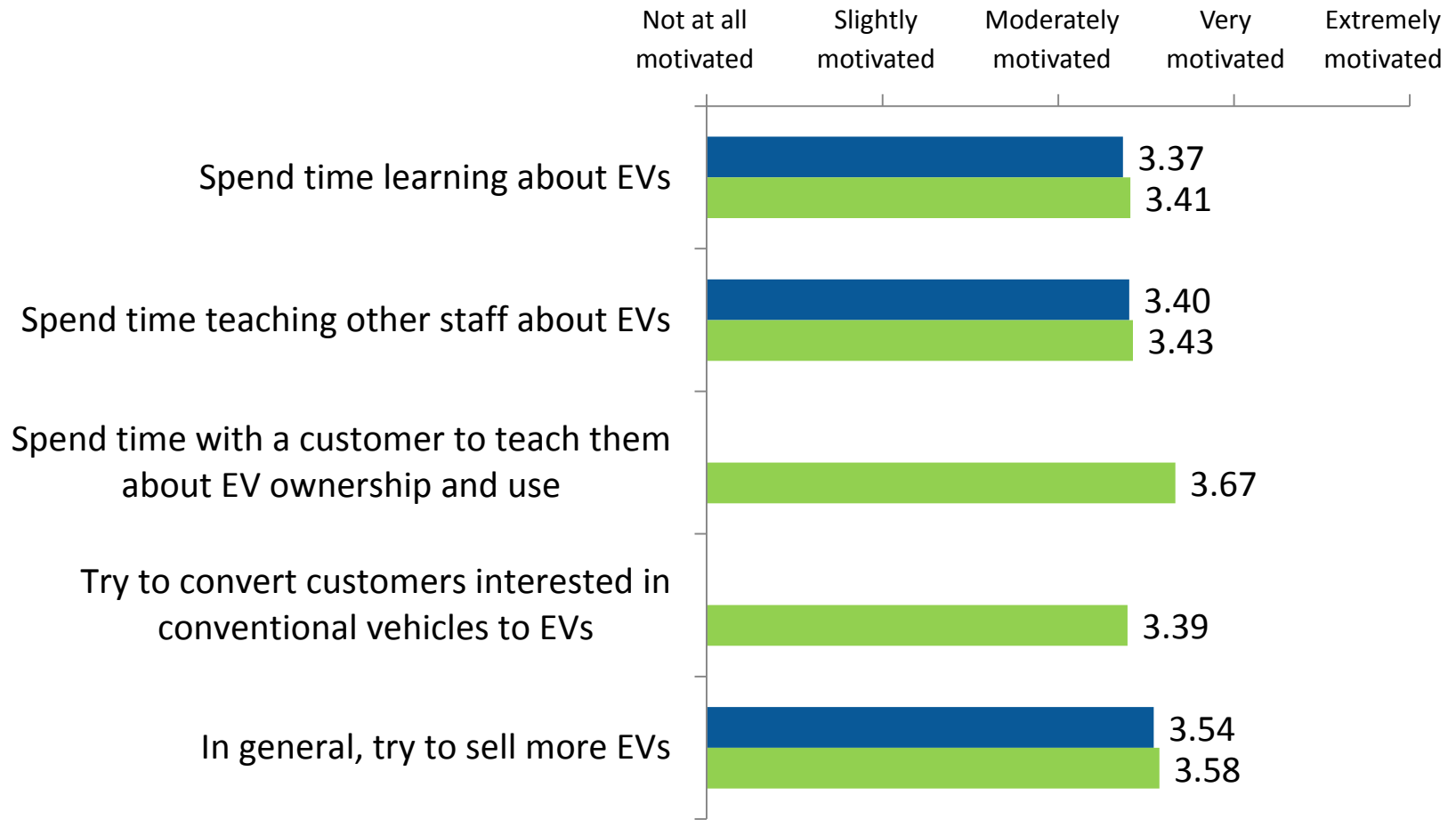
April 2017

Prepared by
Center for Sustainable Energy



To what extent are you motivated by the current dealer incentive to do each of the following?

■ All Respondents ■ Sales Employees



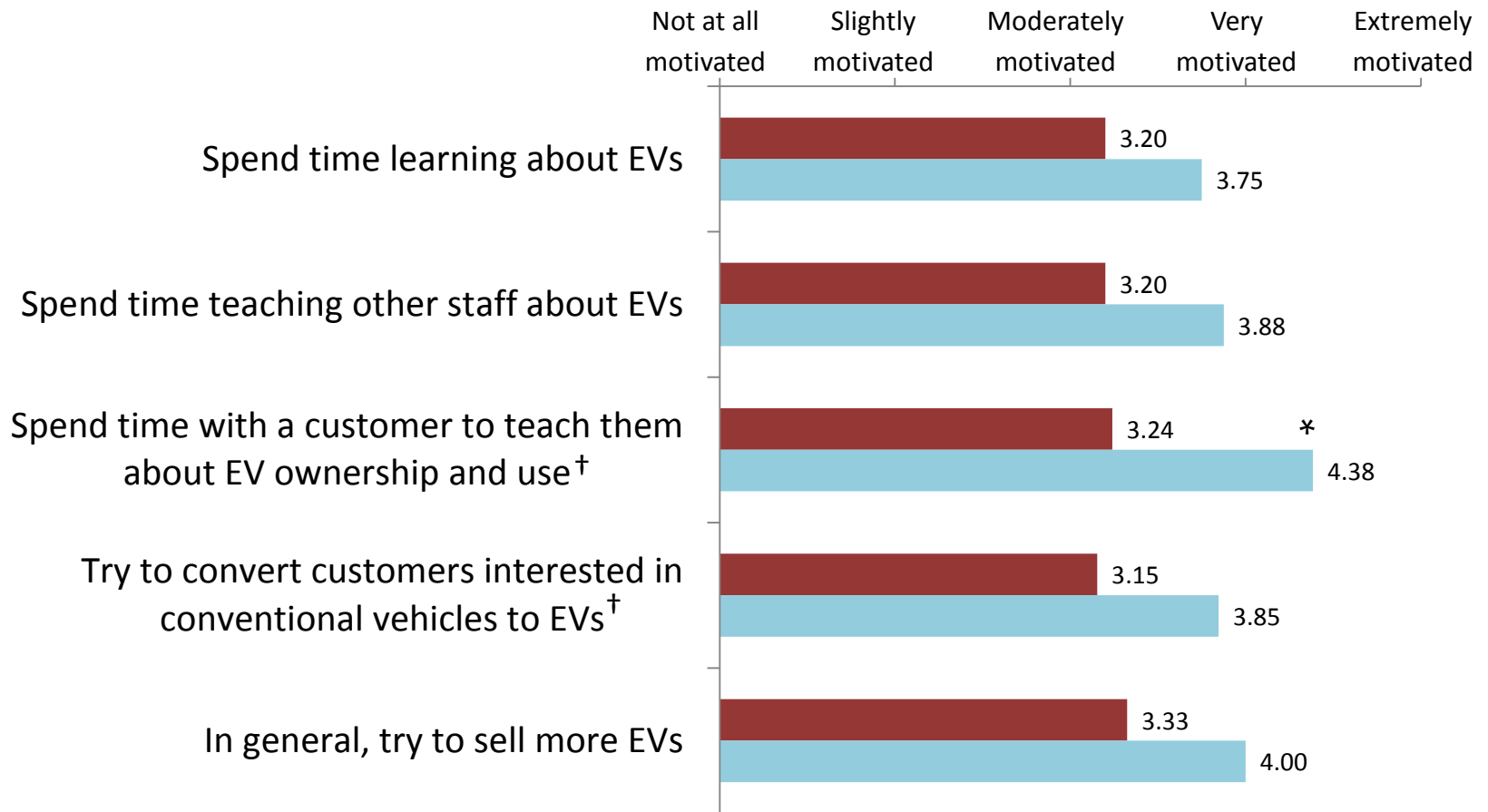
Question only asked of respondents who said they were aware of the dealer incentive; Respondents=57

Third and fourth statements only appeared to sales employees; Respondents=40

1 = Not at all motivated, 5 = Extremely motivated

To what extent are you motivated by the current dealer incentive to do each of the following?

■ Have Never Owned an EV ■ Have Owned an EV

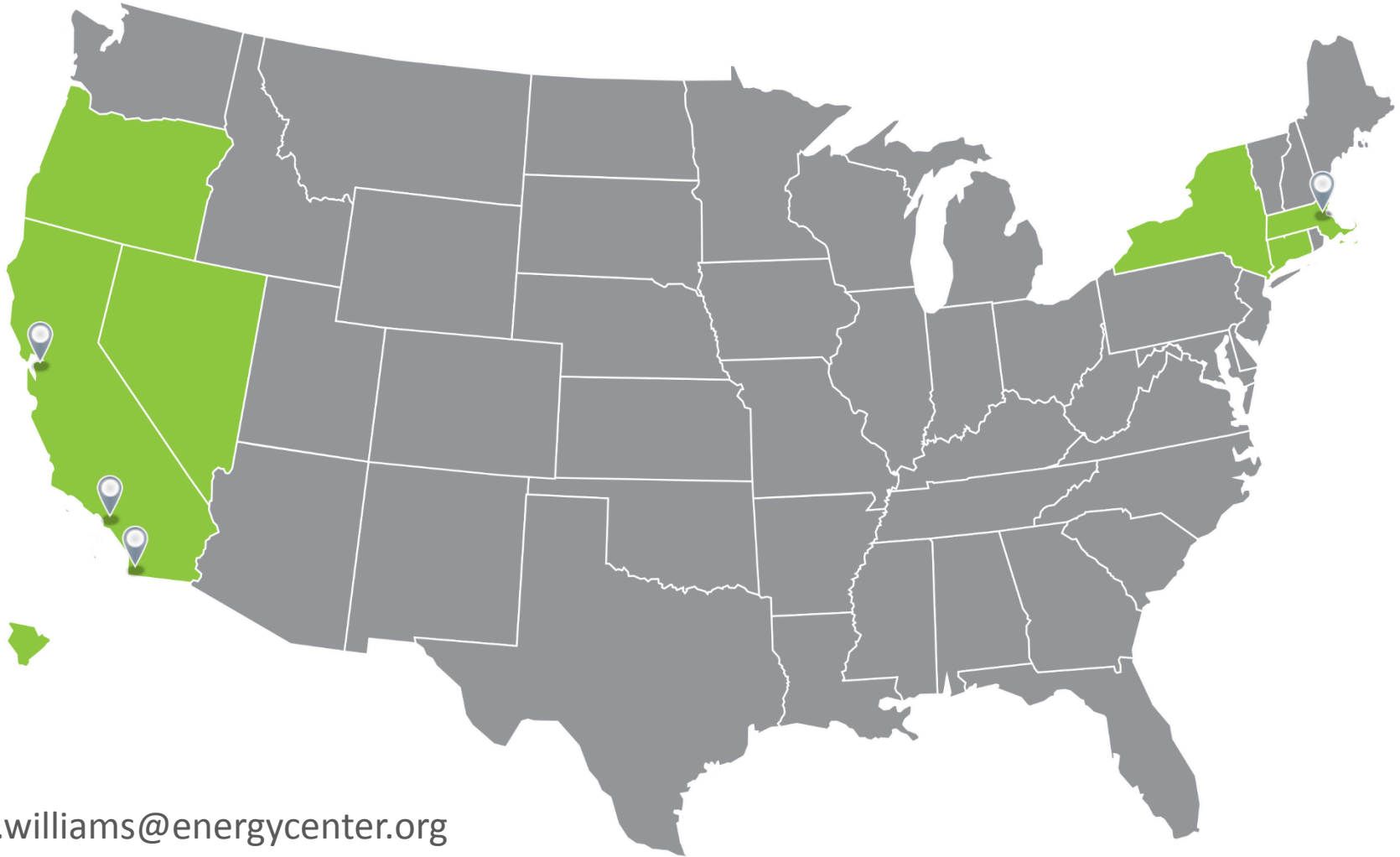


Respondents=57

[†] Fourth and fifth statements only appeared to sales employees; respondents=40

*Statistically significant difference ($p < 0.05$)

How can we help?



brett.williams@energycenter.org

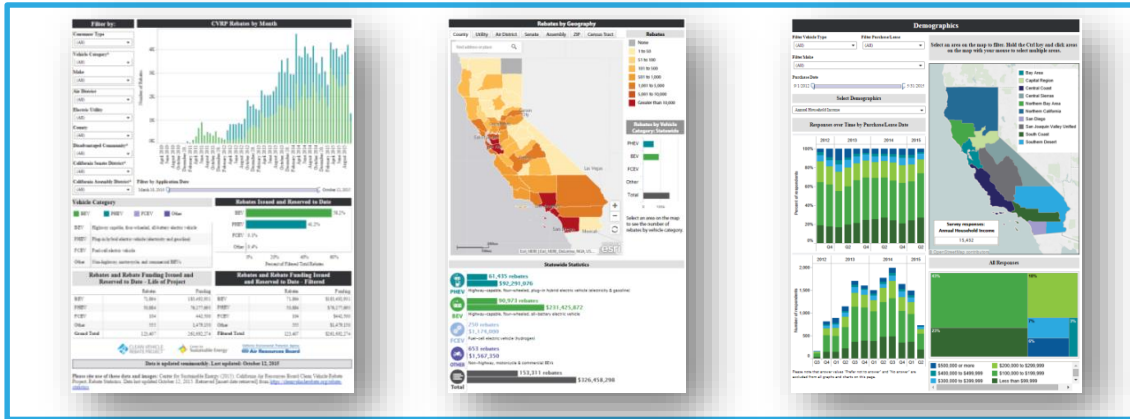
Related analysis available at energycenter.org/resources/transportation

A close-up photograph of a person's hand plugging a charging cable into the charging port of a silver electric car. The scene is set outdoors at sunset, with the sun low on the horizon, creating a warm, golden glow and lens flare effects. In the background, a city street is visible with a bicycle rack and other vehicles. The overall atmosphere is bright and modern.

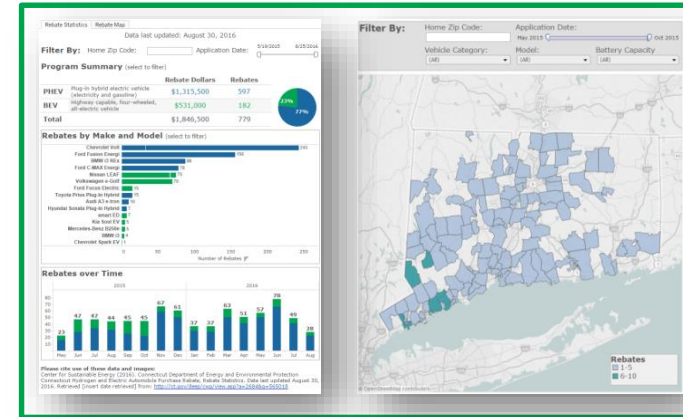
Online Resources & Extra Slides

Where can I get additional data?: Transparency Tools

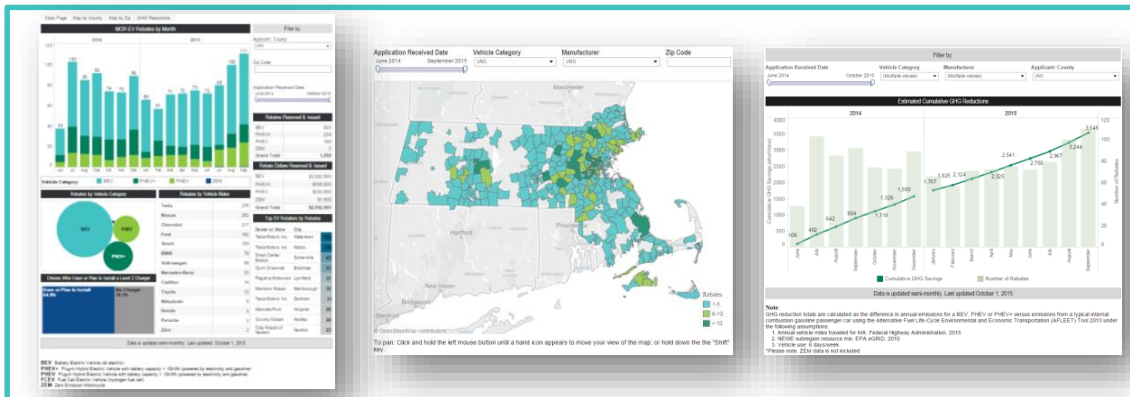
Public dashboards facilitate informed action across multiple U.S. states and regions



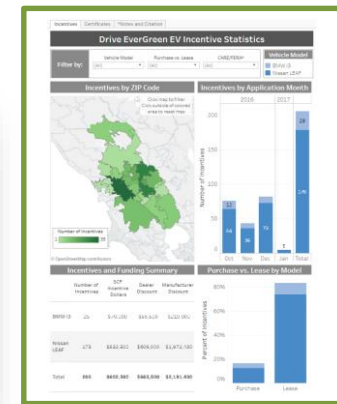
cleanvehiclerebate.org



ct.gov/deep



mor-ev.org



sonomacleanpower.org



zevfacts.com

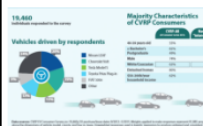
Evaluation

Reports, analysis, infographics & presentations



Summary Documentation of the Electric Vehicle Consumer Survey, 2013-2015 Edition

June 15, 2017



Infographic: Characterizing California Electric Vehicle Consumer Segments - TRB Poster

January 16, 2017



Infographic: Plug-in Electric Vehicle Owners in California's Disadvantaged Communities

January 11, 2017



CVRP Final Report 2014-2015

November 21, 2016



Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by CVRP

November 15, 2016



Presentation: "Electric Vehicle Rebates in Disadvantaged Communities: Evaluating Progress with Appropriate Comparisons"

October 26, 2016