



Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness

Collaboration for ZEV Success

28 July 2021

Image: <https://www.zevstates.us/about-us//>

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with thanks to N. Pallonetti and others at CSE

and to client state agencies including CARB, MA DOER, CT DEEP, and NYSERDA



Center for
Sustainable
Energy™

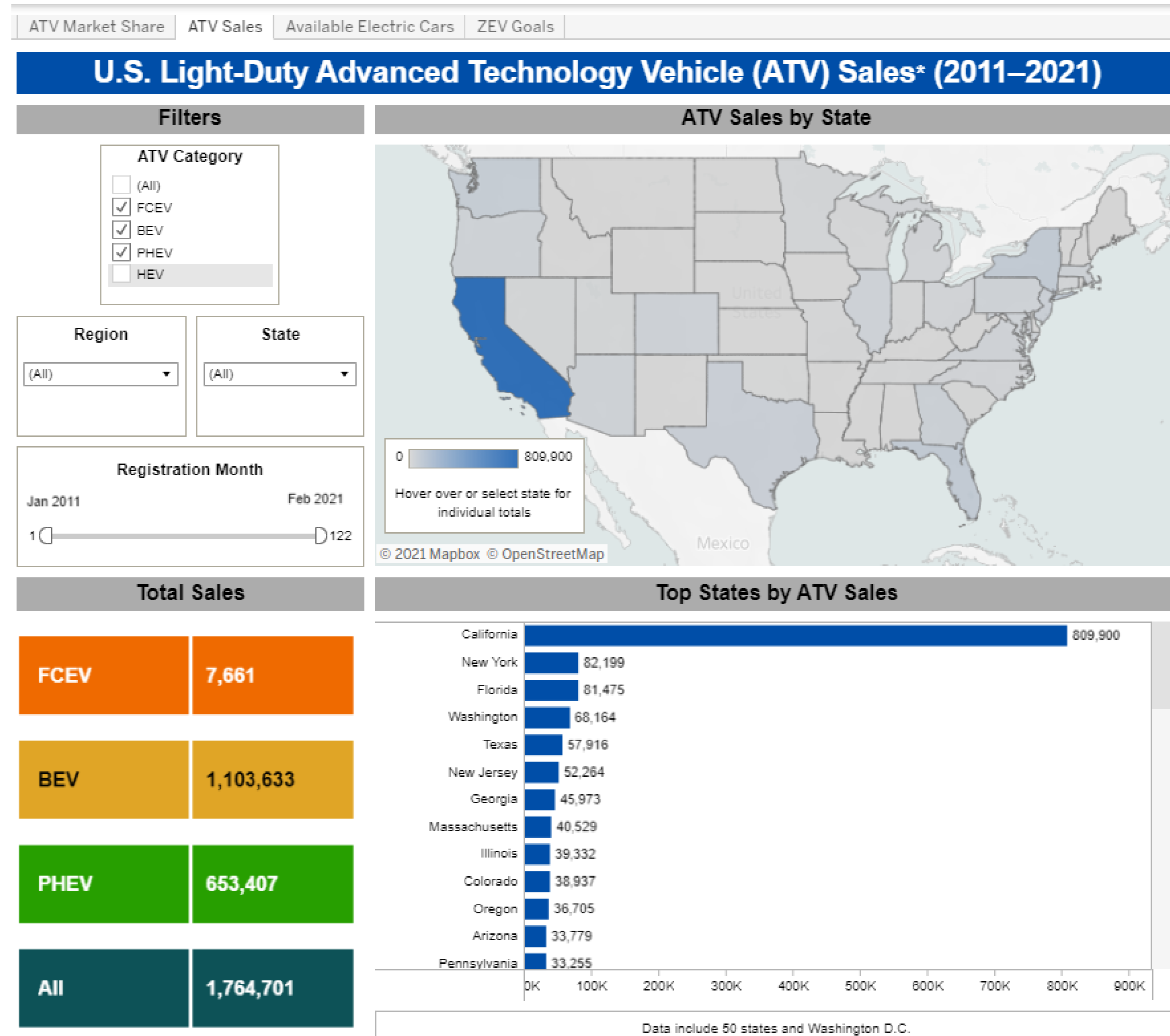
State EV Rebate Programs Administered by CSE (as of 7/6/2021)



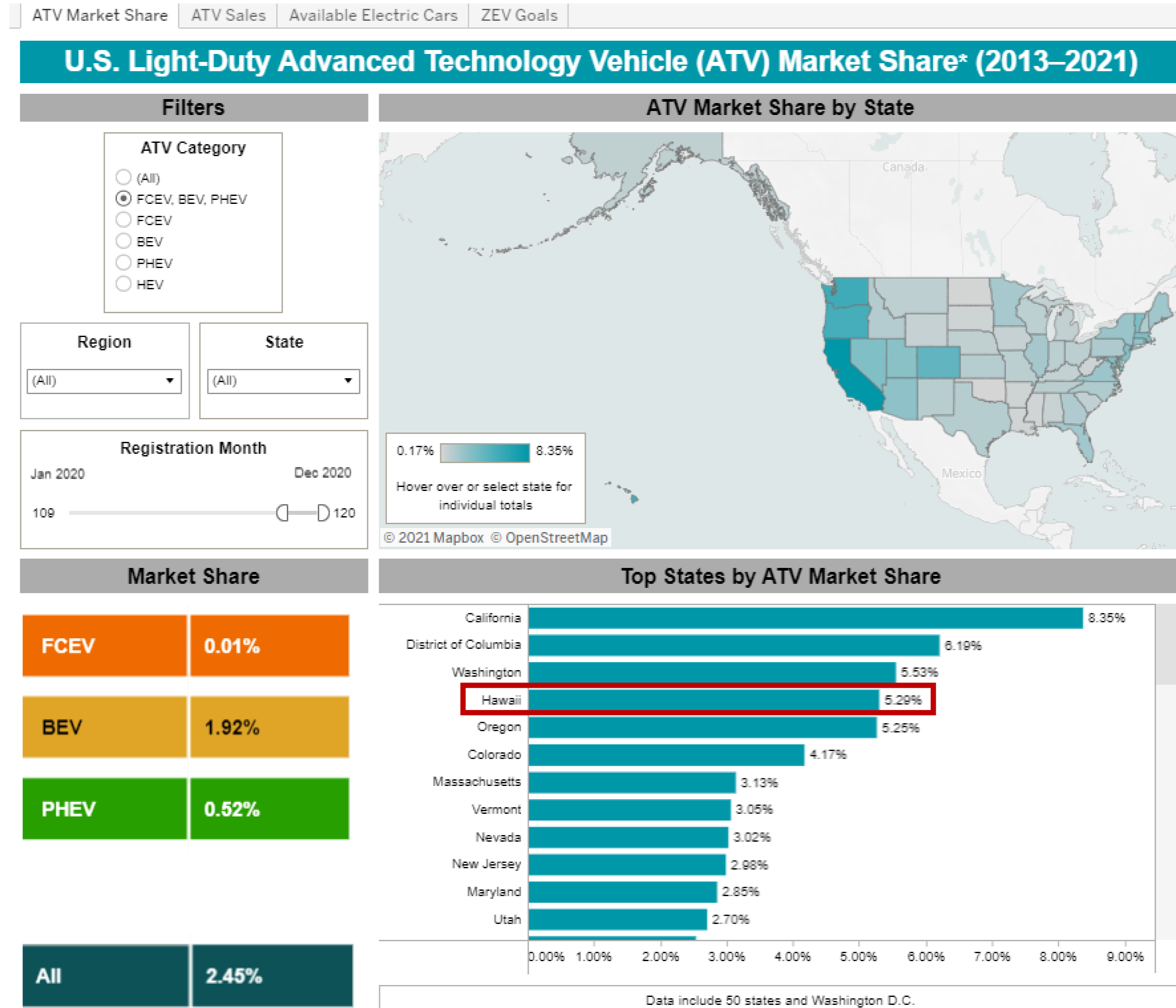
Fuel-Cell EVs	\$4,500 (+2,500*)	\$2,500	\$7,500 (+\$2,000*)	≥ 200 e-miles [†] : \$2,000 ≥ 40 e-miles: \$1,000 < 40 e-miles: \$500 Base MSRP > \$42k: \$500	≥ 10 kWh: \$2,500 (+\$2,500*) < 10 kWh: \$1,500 (+\$2,500*)	--
All-Battery EVs	\$2,000 (+2,500*)	\$2,500	\$2,250 (+\$2,000*)			\$25/e-mile [†] : \$2,000 max for MSRP < \$55k; \$5,000 max for MSRP < \$45k
Plug-in Hybrid EVs	BEVx = \$2,000 Others = \$1,000 (+\$2,500*)	BEVx = \$2,500 Others = \$1,500	\$750 (+\$1,500*)			
Zero-Emission Motorcycles	\$750	--	--	--	\$750 (and NEVs)	--
Program Design Elements	* Rebate adder: income-qualified		* Rebate adder: qualified by proxy		* Rebate adder: income-qualified	
			Point-of-sale option	Point-of-sale	Point-of-sale option	Point-of-sale
	Base MSRP: - PEVs ≤ \$60k	Purchase price ≤ \$50k	Base MSRP: - FCEVs ≤ \$60k - PEVs ≤ \$42k	Base MSRP > \$42k = \$500	Base MSRP < \$50k	Trim-specific MSRP < \$55k
	≥ 30 e-miles [†]	≥ 25 e-miles [†]				
	Income cap		<ul style="list-style-type: none"> Used EV program (\$7.5k/\$3k/\$1.125k) \$125/\$75 dealer sales incentive 		Used EVs also qualify	

[†] Electric miles (e-miles) are U.S.-EPA-rated all-electric miles.

EV Sales (thru 2/2021)



EV Market Share: 2020



Outline

- I. Data Context: Program Design & Funding
- II. Where is the funding going?: Vehicles and Consumers Rebated
- III. What is the path forward?: Strategic Market Segments
- IV. Are rebates impactful?: Vehicle Replacement
- V. Are rebates effective?: Rebate Influence
- VI. Summary & Select Findings

Additional Info, Topics for Discussion

*“EVs” = light-duty plug-in hybrid, battery, and fuel-cell electric vehicles
(PHEVs, BEVx vehicles, BEVs, and FCEVs)*

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 charging cables is visible, along with a bicycle parked nearby. The overall atmosphere is clean, modern, and sustainable.

Data Context: Program Design & Funding

Data Collected During Previous Program Designs

For example, *as of 1/1/2019...*



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

Plug-in Hybrid EVs



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

BEVx only: \$1,500

≥ 45 \$1,000

< 45 \$500

≥ 20 \$1,100

< 20 \$500

Zero-Emission Motorcycles



\$900

\$450

- ≥ 20 UDDS e-miles
- Income cap
- Increased rebates for lower-income households (+\$2k)

- Purchase price ≤ \$50k
- No fleet rebates

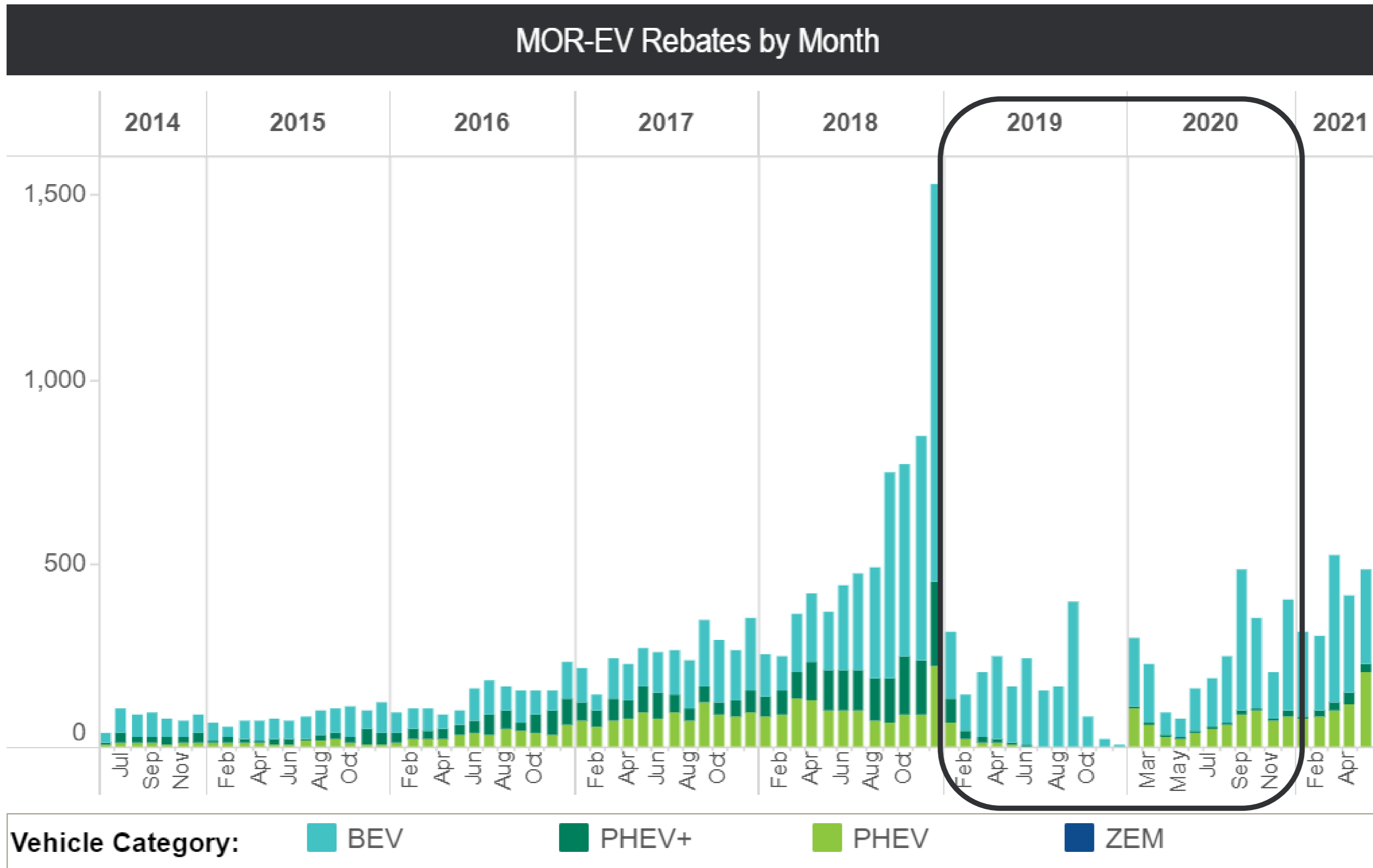
Program ended 9/30/19
restarted 1/1/20

- BEVs & PHEVs ≤ \$50k base MSRP, FCEVs ≤ \$60k
- Point-of-sale option
- \$150 dealer incentive

- Base MSRP > \$60k = \$500 max.;
- Point-of-sale

Applications Over Time: CY 2019 Purchases/Leases

Stats Page | Map by County | Map by Zip | GHG Reductions



With appeals, rebate applications for calendar-year (CY) 2019 purchases/leases for individuals spanned 1/2019 – 12/2020

Jul. 2021 image from <https://mor-ev.org/program-statistics>

Program Design Shapes Outcomes

In effect during CY 2019



<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 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*), excl. ZEMs 	<p>as of Nov. 2016</p> <ul style="list-style-type: none"> \$150k–\$300k income cap (PEVs) +\$2,000 for income-qualified households ($\geq 300\%$ FPL*), excl. ZEMs ≥ 20 UDDS electric miles
<p>as of Jan. 2018</p> <ul style="list-style-type: none"> \$150k–\$300k income cap on stacking HOV decal <ul style="list-style-type: none"> (only binding on FCEVs) Rebate Now SD 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"> Base MSRP \leq \$60k (PEVs) ≥ 35 UDDS electric miles +\$2,500[†] for income-qualified households ($\geq 300\%$ FPL*), excl. ZEMs 3-month application window ‡ Total rebates limit = 1 § 	<p>as of Apr. 2020</p> <ul style="list-style-type: none"> Stacking with CVAP grant permitted 	<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
			<p>as of Jan. 2021</p> <ul style="list-style-type: none"> +\$2,500 for income-qualified households ($\geq 400\%$ FPL*), excl. ZEMs 	

* FPL = Federal Poverty Level.

† Change due to \$500 decrease in standard rebate amounts.

‡ COVID exemptions on application window effectively delayed implementation until 3/20/2021.

§ A second rebate can be approved for a FCEV if the first rebate was for a PEV.

Funding Availability Has Been Regularly Disrupted

(as of Oct 2019)



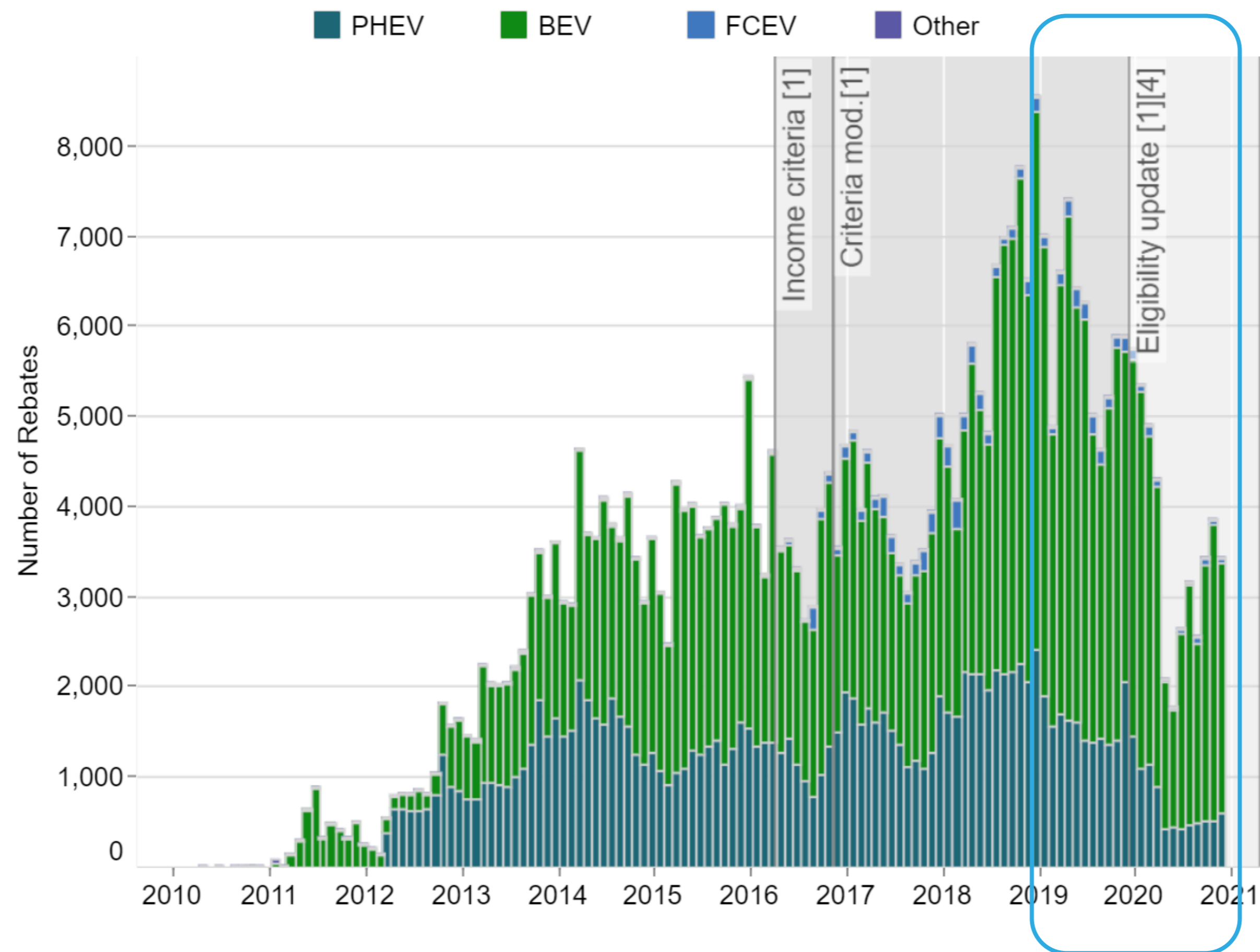
Table 3: CVRP Waitlists

Waitlist Year	Start Date	End Date	Length in Days
2011*	6/20	9/30	102
2013*	5/1	6/30	60
2014	3/28	7/22	116
2016	6/11	9/28	109
2017**	6/30	11/20	143
2019**	6/5	9/23	110

* Dates approximate.

** For standard applications only; no waitlist for income-qualified increased rebates.

Approved Applications Over Time: CY 2019 Purchases/Leases

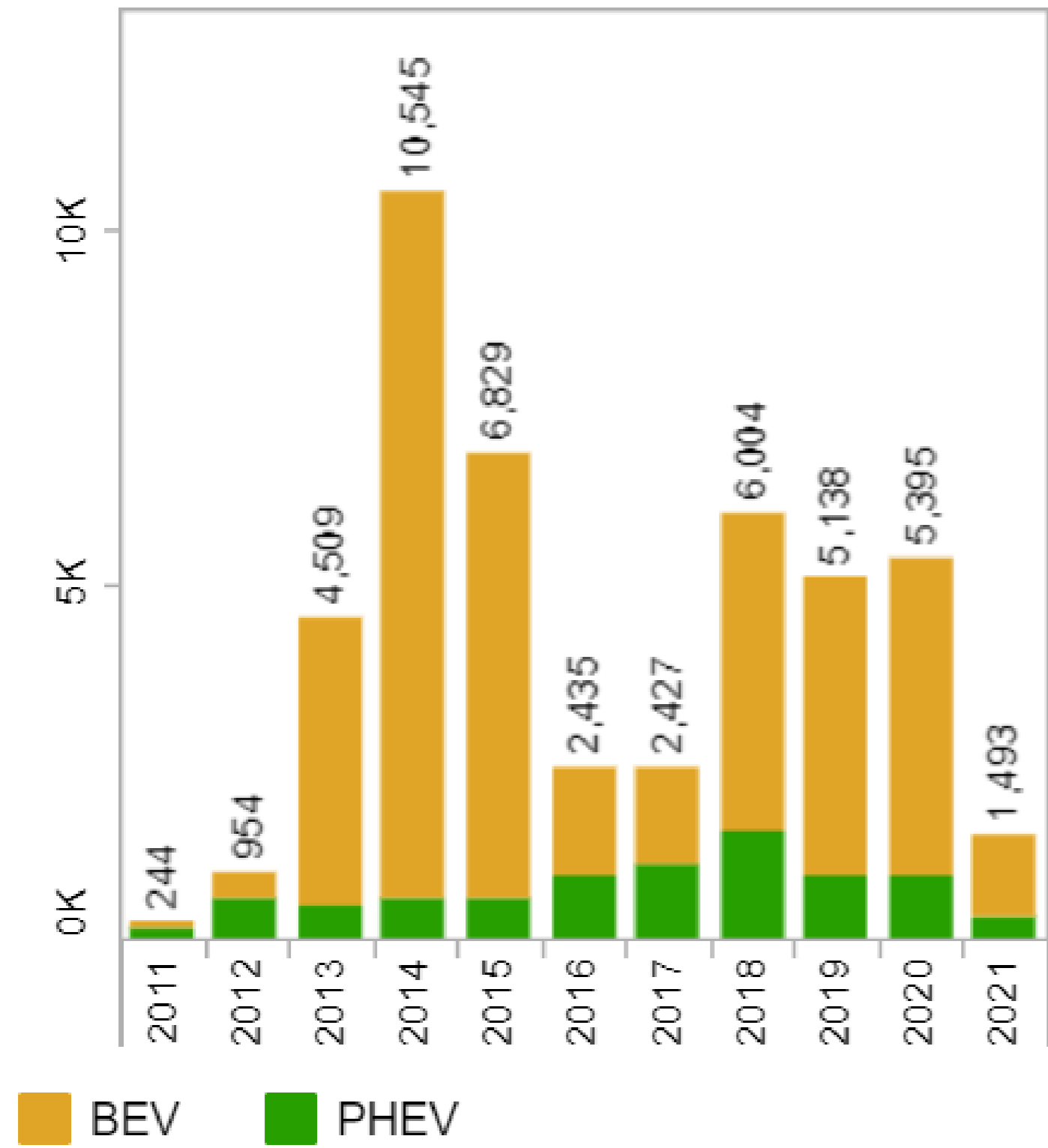


With COVID exemptions, rebate applications for calendar-year (CY) 2019 purchases/leases for individuals spanned 1/1/2019 – 1/6/2021

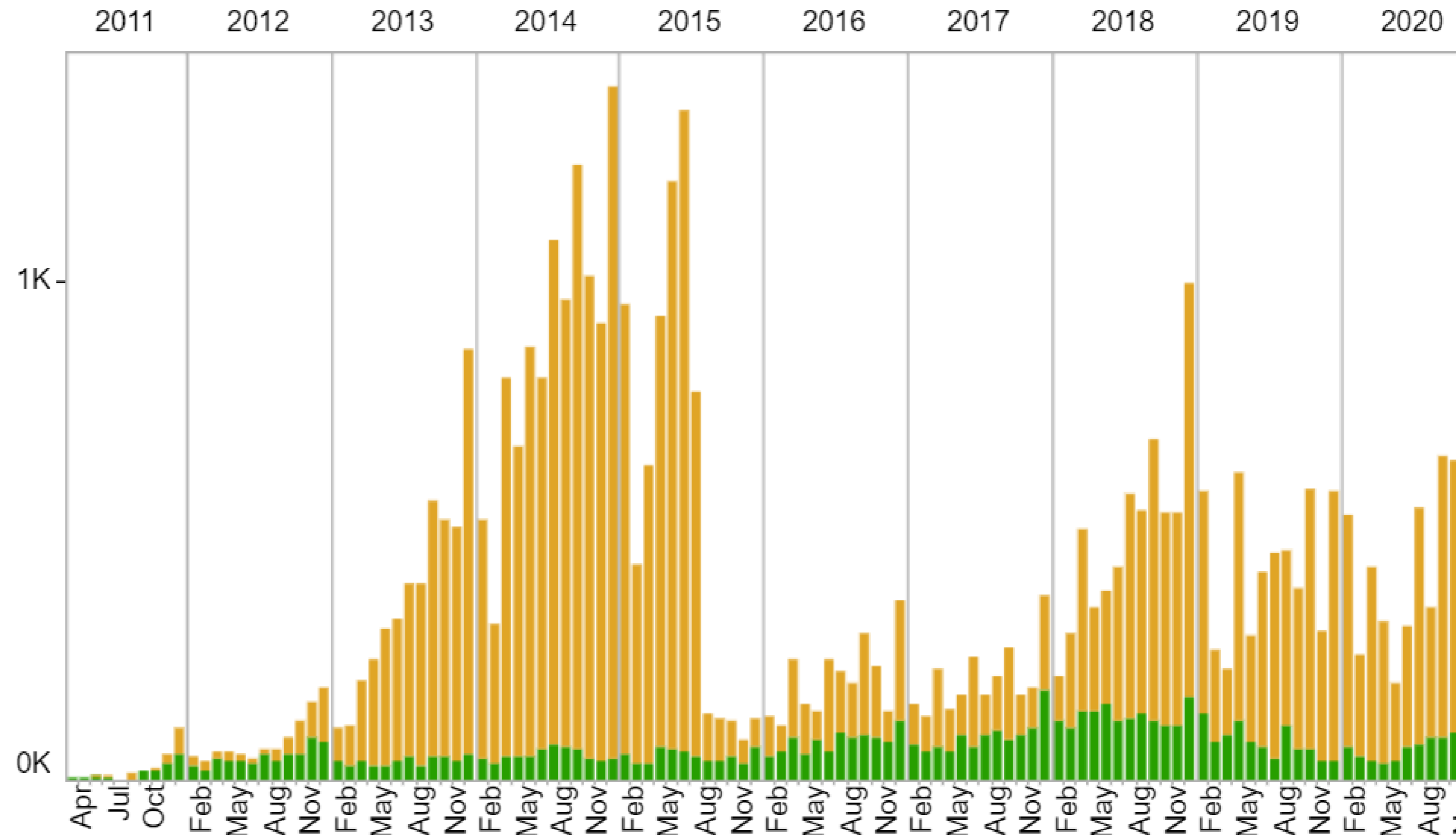
Incentive Disruption: Georgia Flips from BEV Incentive to Fee in 2015



Annual Sales



Monthly Sales



Through February 2021
 Hover over x-axes (lower or upper) to display
 drill-down "+" or fold-up "-" buttons.

Choice is Emerging: 53 Zero-Emission Vehicles Available

(as of 2/2021)

FCEV	BEV	PHEV
Honda Clarity Fuel Cell	Audi e-tron	Audi A7 e
Hyundai Nexso	BMW i3	Audi A8
Toyota Mirai Fuel Cell Vehicle	Chevrolet Bolt EV	Audi Q5
	Ford Mustang Mach-E	Bentley Bentayga
	Hyundai Ioniq Electric	BMW 330e
	Hyundai Kona Electric	BMW 530e
	Jaguar I-PACE	BMW 745e
	Kia Niro EV	BMW X3
	MINI Cooper SE Hardtop	BMW X5
	Nissan LEAF	Chrysler Pacifica
	Polestar 2	Ferrari SF90 Stradale
	Porsche Taycan	Ford Escape
	Tesla Model 3	Ford Fusion Energi
	Tesla Model S	Honda Clarity Plug-In Hybrid
	Tesla Model X	Hyundai Ioniq Plug-in Hybrid
	Tesla Model Y	Karma Revero
	Volvo XC40 Recharge	Kia Niro Plug-In Hybrid
		Land Rover Range Rover Plug-in Hybrid
		Lincoln Aviator Grand Touring
		Mercedes-Benz GLC350e
		MINI Cooper S E Countryman ALL4
		Mitsubishi Outlander PHEV
		Polestar 1
		Porsche Cayenne S E-Hybrid
		Porsche Panamera 4 E-Hybrid
		Subaru Crosstrek Hybrid
		Toyota Prius Prime
		Toyota RAV4 Prime
		Volvo S60
		Volvo S90
		Volvo V60
		Volvo XC60
		Volvo XC90



<https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard>

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 charging station and a bicycle are visible, though slightly out of focus.

Who and What do Rebates Benefit?

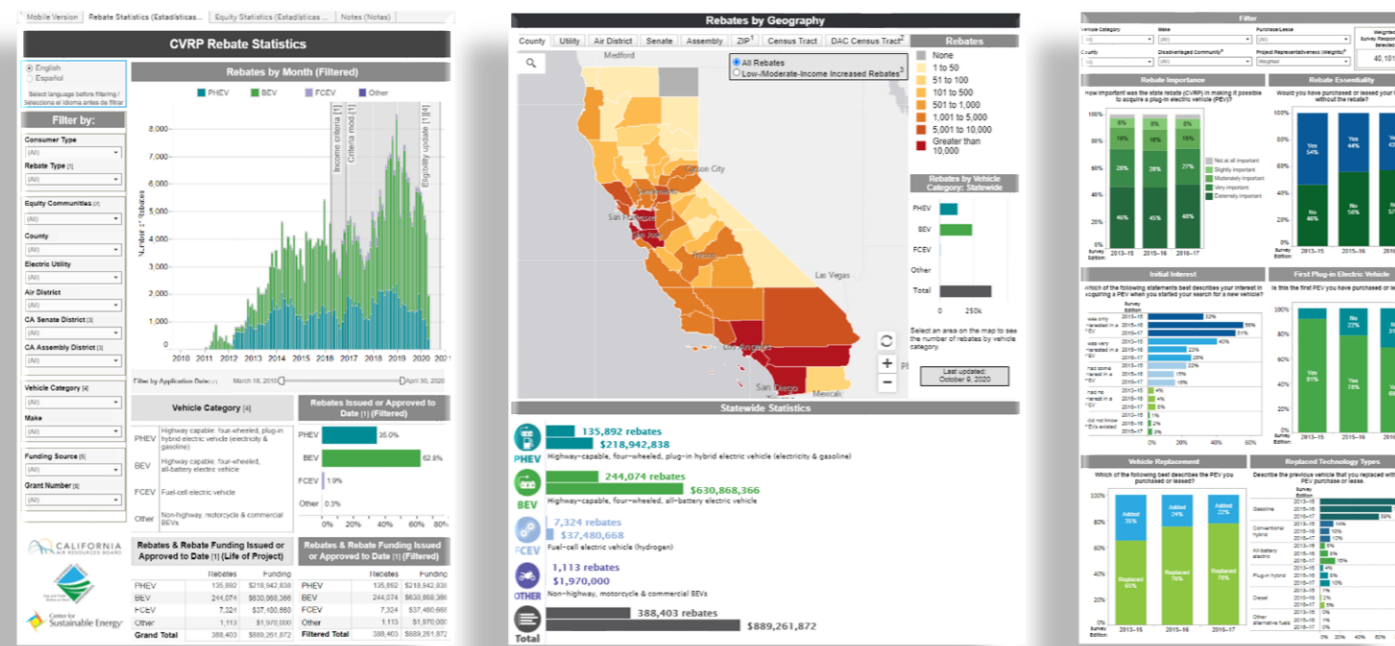
Rebated Vehicles and Consumers



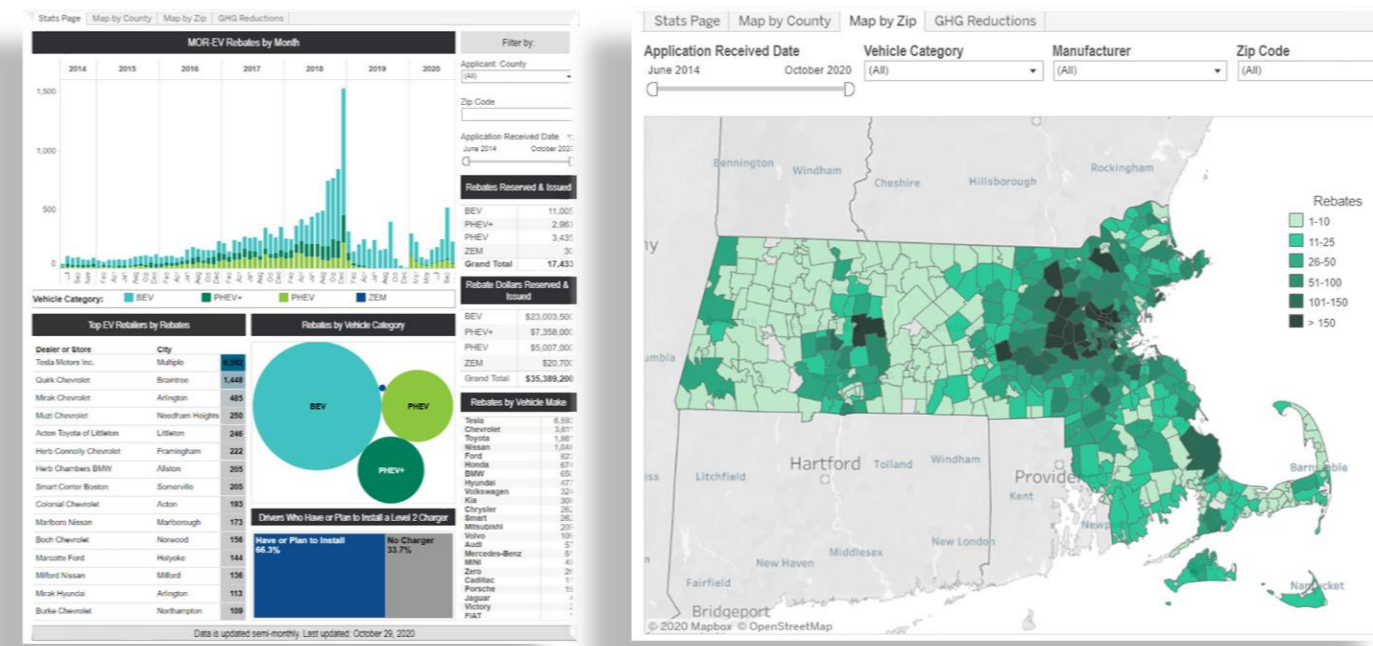
Outputs: Vehicles Rebated

Where Are EV Rebates Going? Public Dashboards and Data Facilitate Informed Action

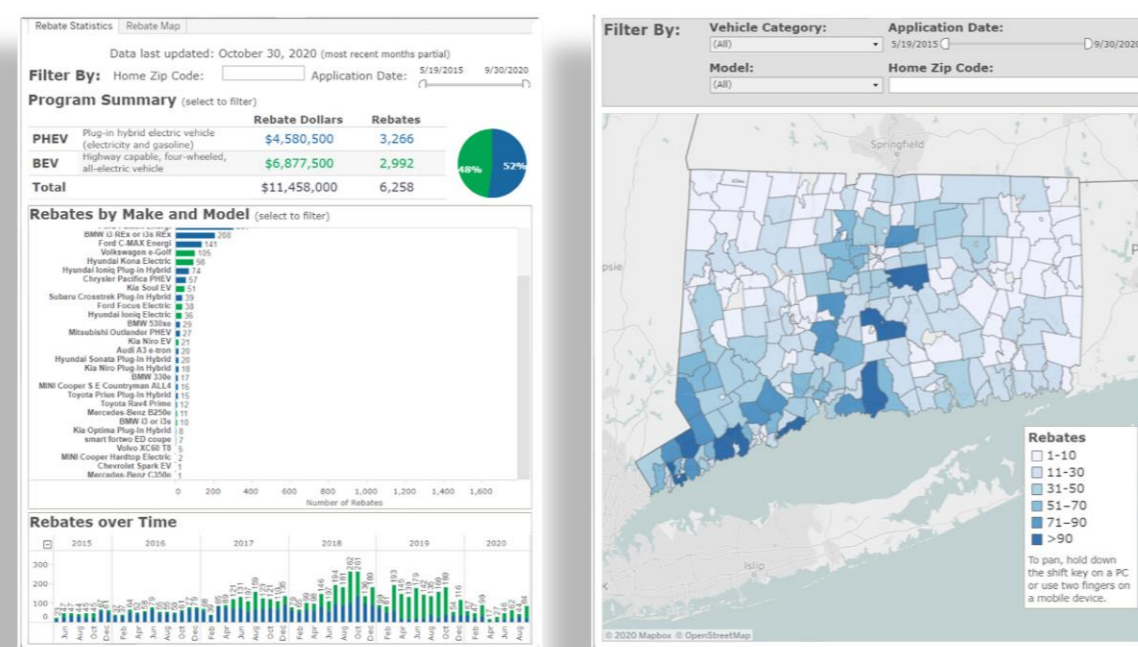
Statewide EV Rebate Programs: CA, MA, CT, NY (OR and NJ dashboards forthcoming)



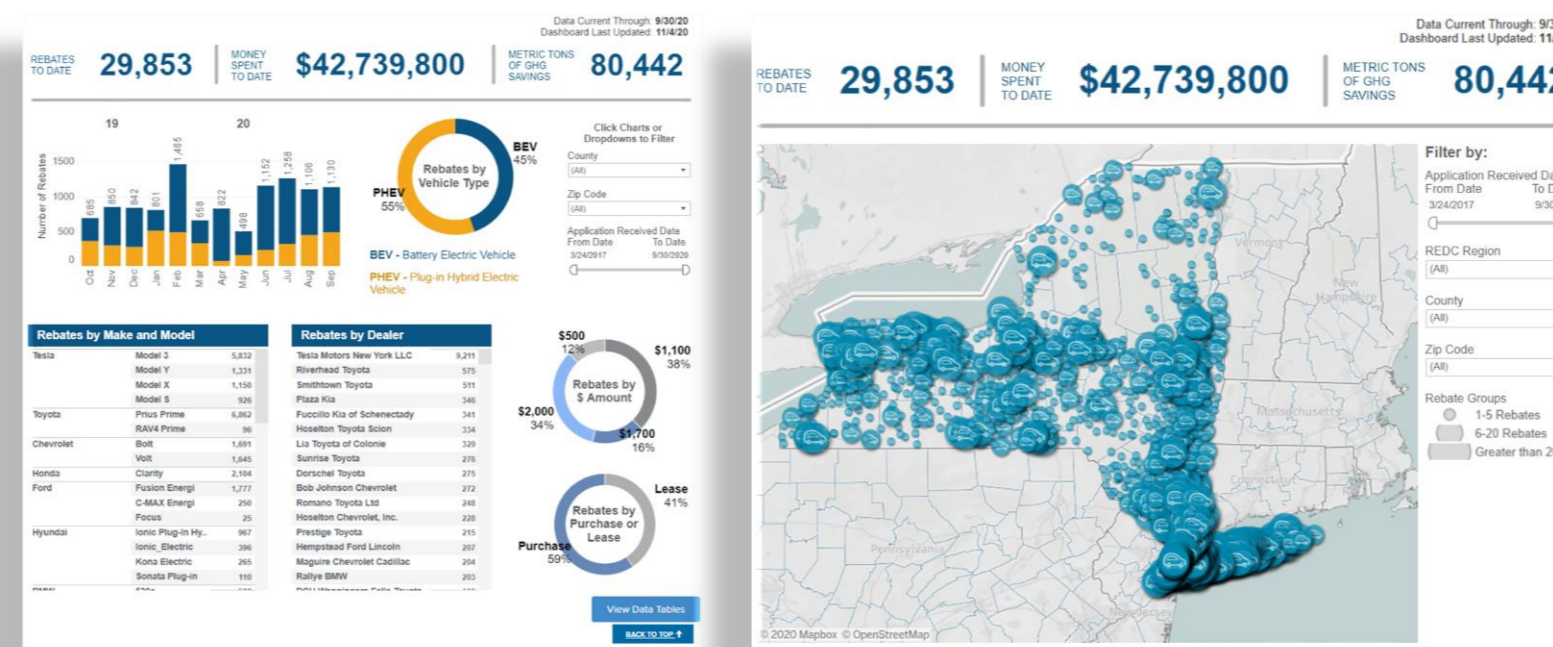
cleanvehiclerebate.org



mor-ev.org



ct.gov/deep



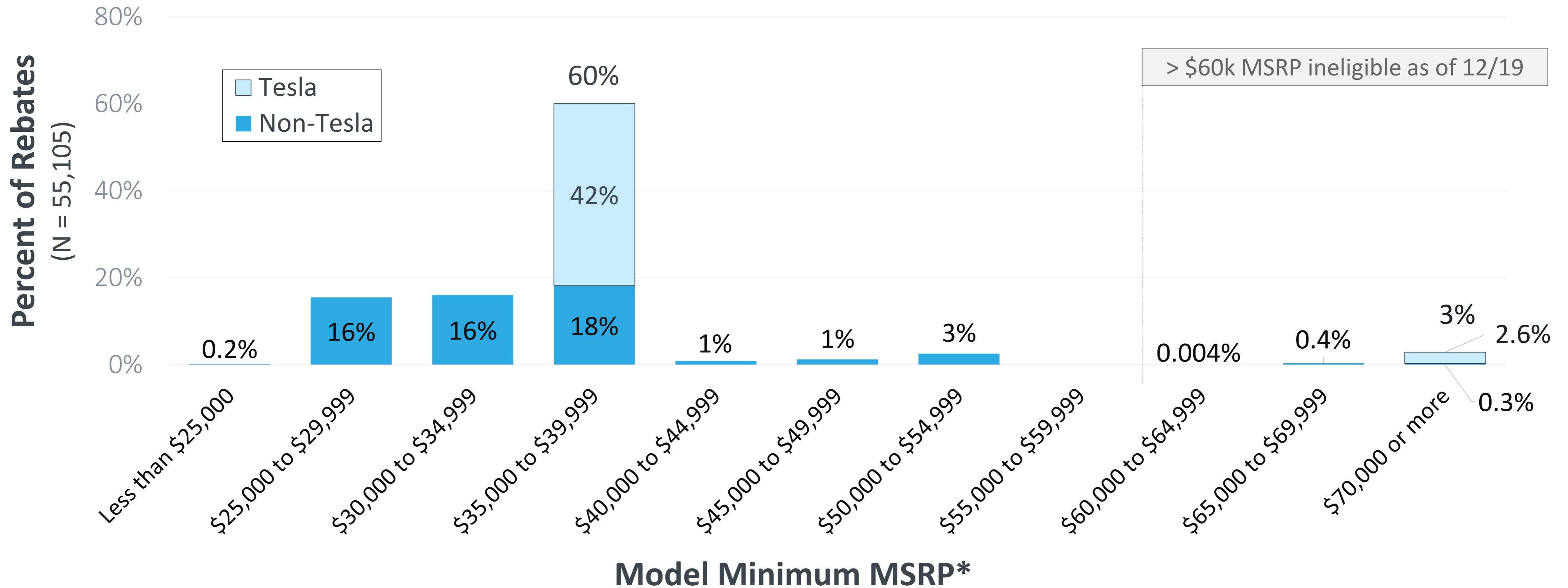
nyserdera.ny.gov (dashboards done by NYSERDA)

- > 442,000 EVs and consumers have received > \$979 M in rebates
- > 75,000 survey responses being analyzed so far, statistically represent > 319,000 consumers
- Reports, presentations, and analysis growing

As of 11/4/2020

Moderately-Priced Vehicles Receive Most Rebates

Rebated MY 2019 Plug-in Electric Vehicles (Purchased/Leased 1/2018–1/2021)



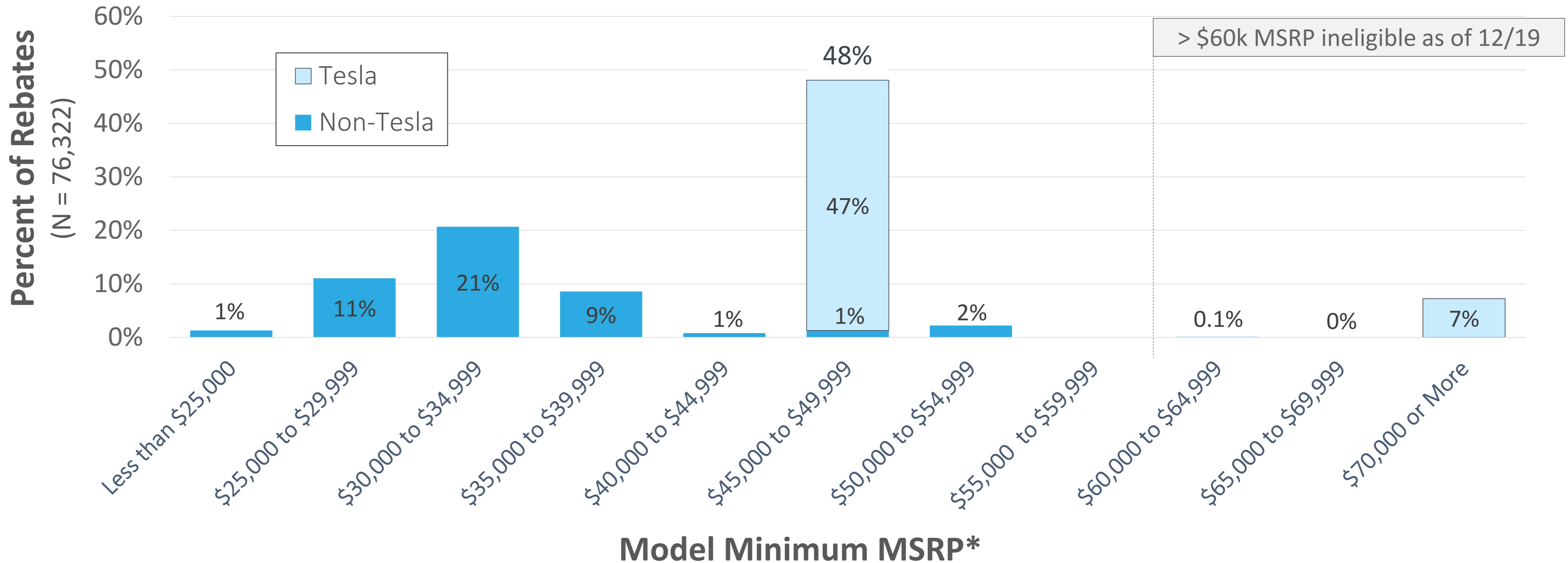
*Does not reflect sales price:

Each vehicle was assigned the minimum Manufacturer's Suggested Retail Price (MSRP) for that model/MY on fueleconomy.gov. Tesla Model 3's were assigned an MSRP of \$35k. Where MY 2019 MSRPs were unavailable, MY '18 MSRPs were used.

Moderately-Priced Vehicles Receive Most Rebates

(especially non-Tesla)

Rebated MY 2018 Plug-in Electric Vehicles (Purchased/Leased 1/2017–4/2020)

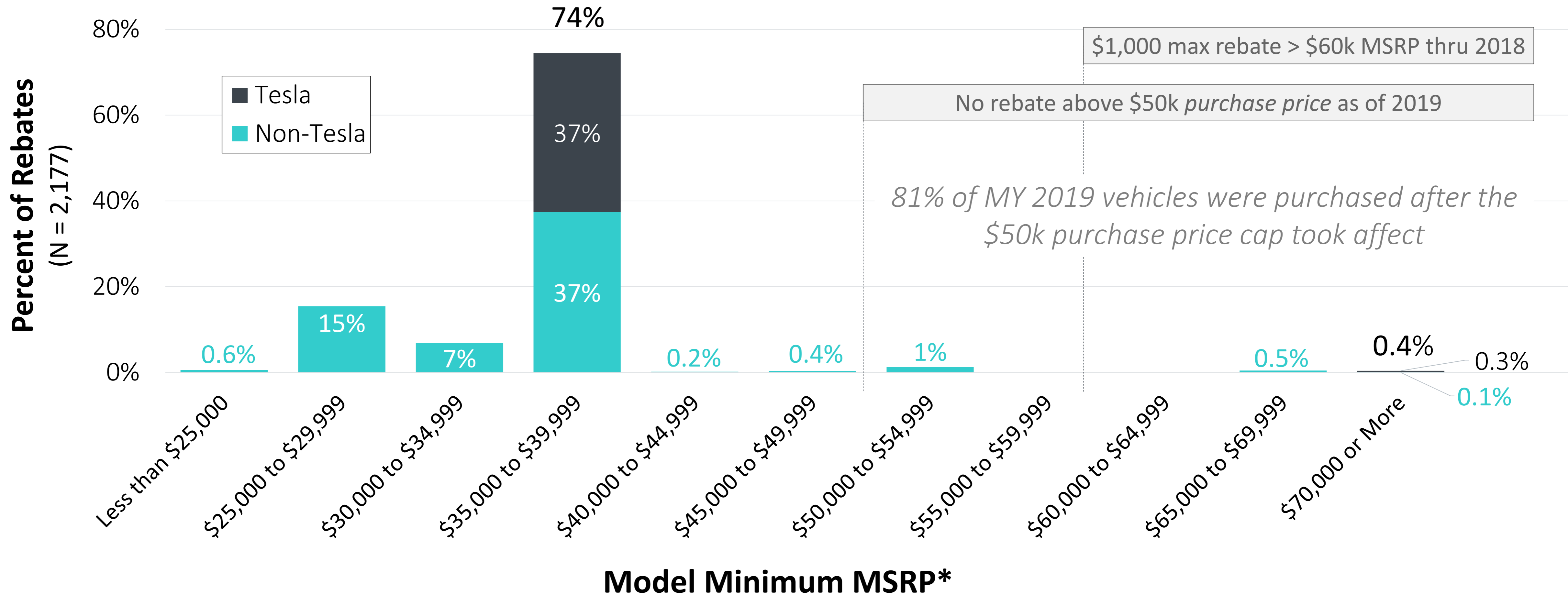


*Each vehicle was assigned the minimum Manufacturer’s Suggested Retail Price (MSRP) for that model on fueleconomy.gov and does not reflect sale price. Where MY 2018 MSRPs were unavailable, MY’17 MSRPs (Chevrolet Volt & Bolt EV) or MY’19 MSRP (Kia Soul EV) were used. All Tesla Model 3’s were assigned an MSRP of \$49k (that of the predominantly available model variant at the time, the Long Range).

Moderately-Priced Vehicles Receive Most Rebates: MOR-EV



Rebated MY 2019 Plug-in Electric Vehicles (Purchased/Leased 1/2018–7/2020)



*Does not reflect sales price:

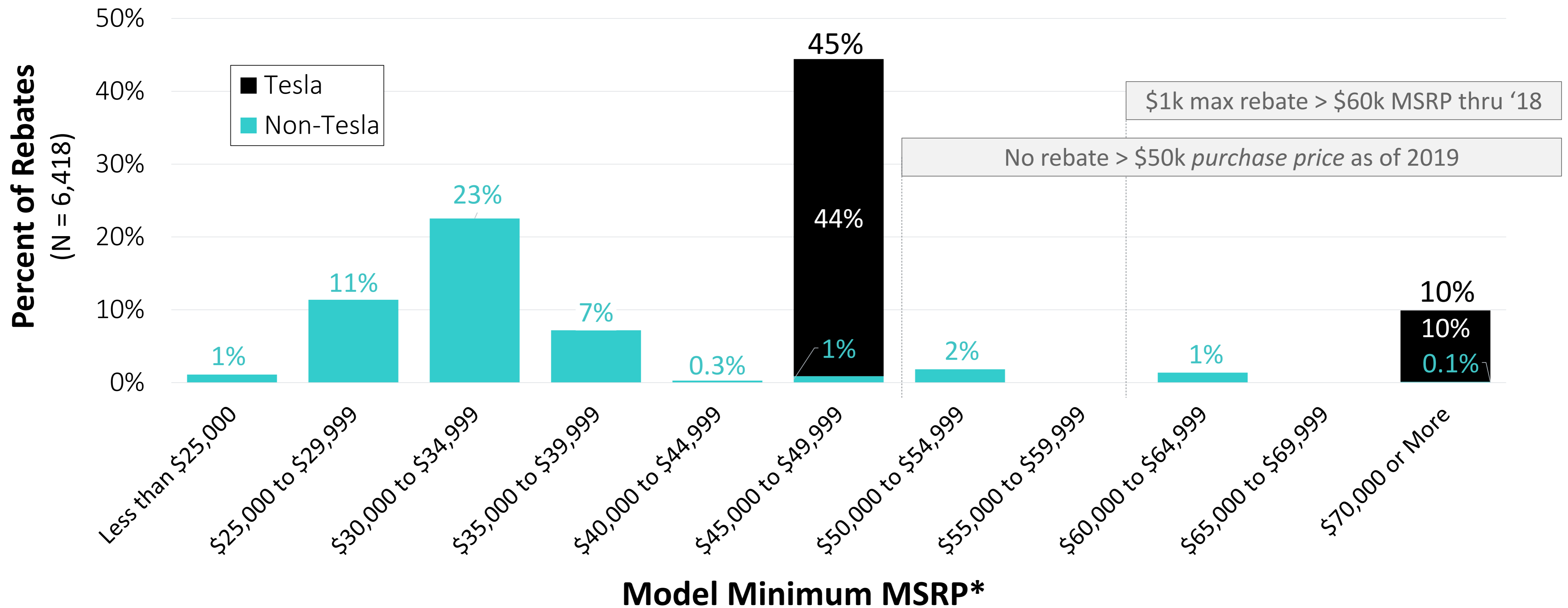
Each vehicle was assigned the minimum Manufacturer's Suggested Retail Price (MSRP) of all variants of that model on fueleconomy.gov or OEM websites. For example, Tesla Model 3's were assigned an MSRP of \$35k (that of the Standard Range). BMW i3 and i3 REx are treated as different models.

Public rebate data source: <https://mor-ev.org/program-statistics> (as of Aug. 2020)

Moderately-Priced Vehicles Receive Most Rebates

(especially non-Tesla)

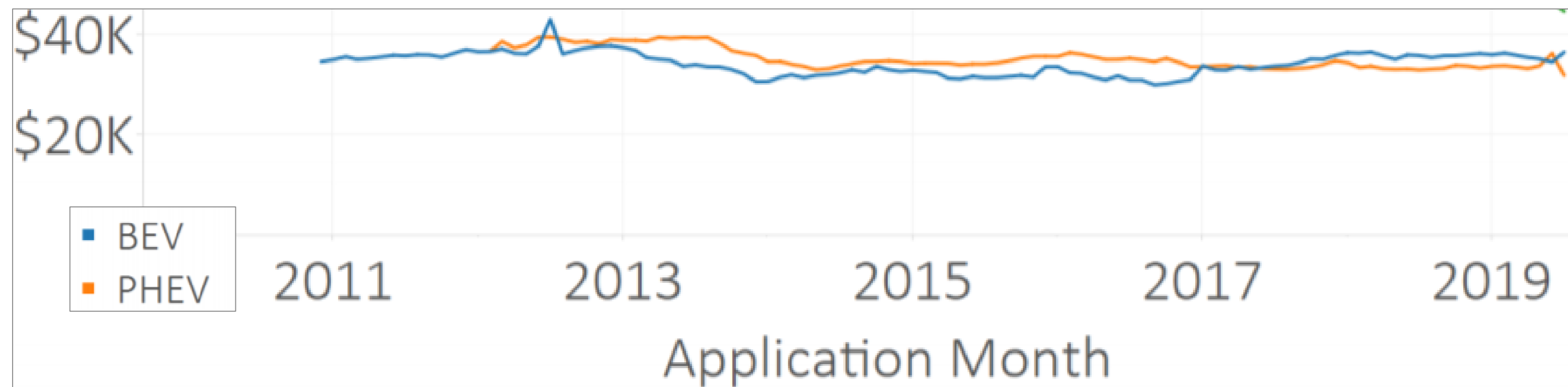
Rebated MY 2018 Plug-in Electric Vehicles (Purchased/Leased 5/2017–1/2020)



*Each vehicle was assigned the minimum Manufacturer's Suggested Retail Price (MSRP) for that model on fueleconomy.gov and does not reflect sale price. Where MY 2018 MSRPs were unavailable, MY'17 MSRPs (Chevrolet Volt & Bolt EV) or MY'19 MSRP (Kia Soul EV) were used. All Tesla Model 3's were assigned an MSRP of \$49k (that of the predominantly available model variant at the time, the Long Range).

Decreasing Costs Don't Always Mean Decreasing Prices

Average Rebated Purchase Price for non-Tesla Vehicles (as of 7/19)



Excerpted from slide 37 in:

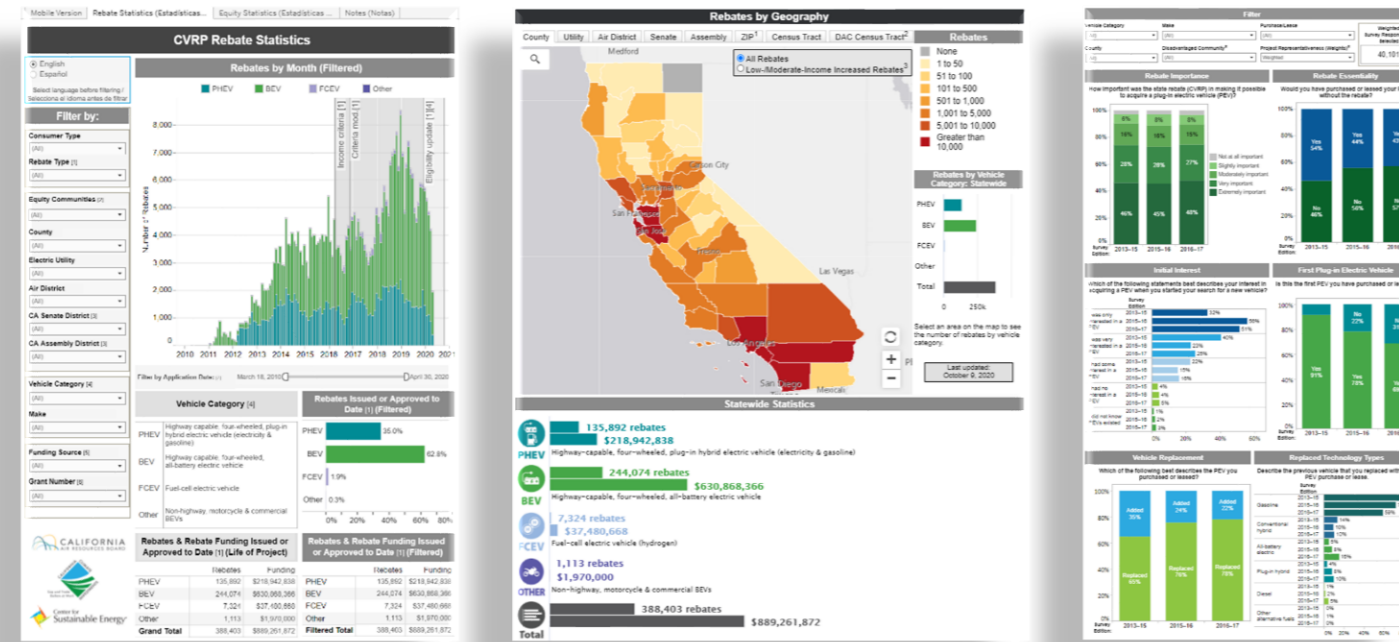
<https://cleanvehiclerebate.org/eng/content/proposed-fy-2019%E2%80%9320-funding-plan-final-cvrp-supporting-analysis>



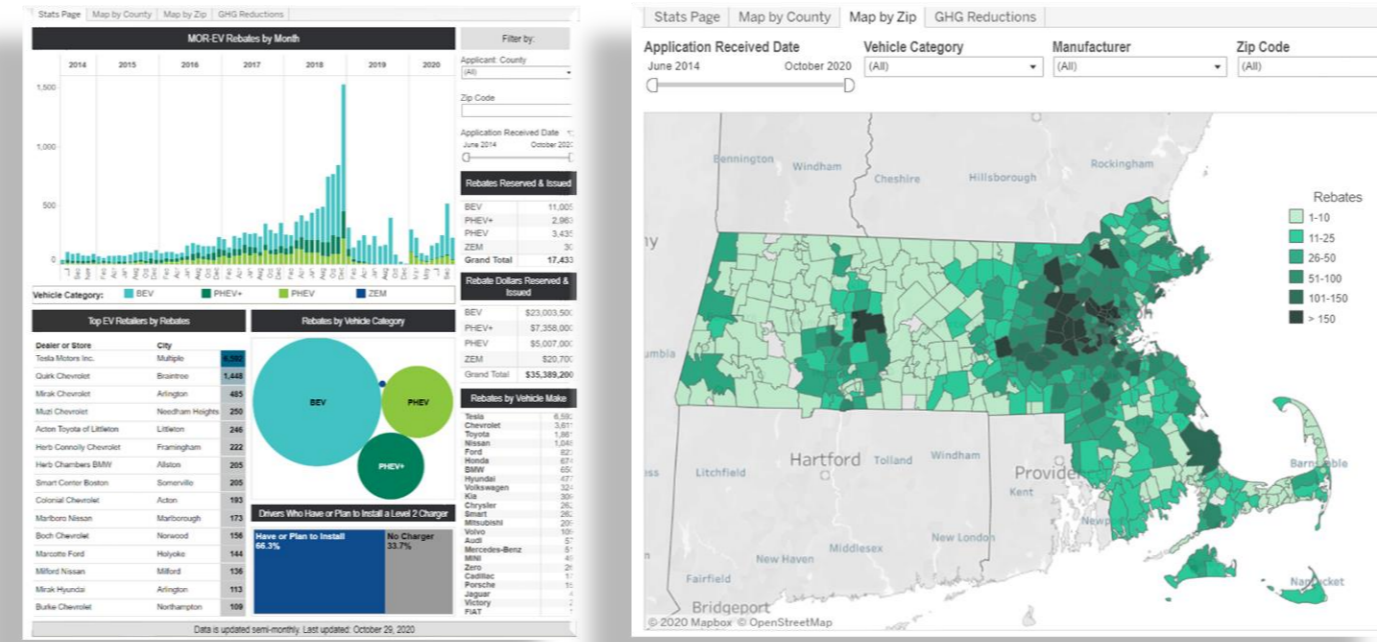
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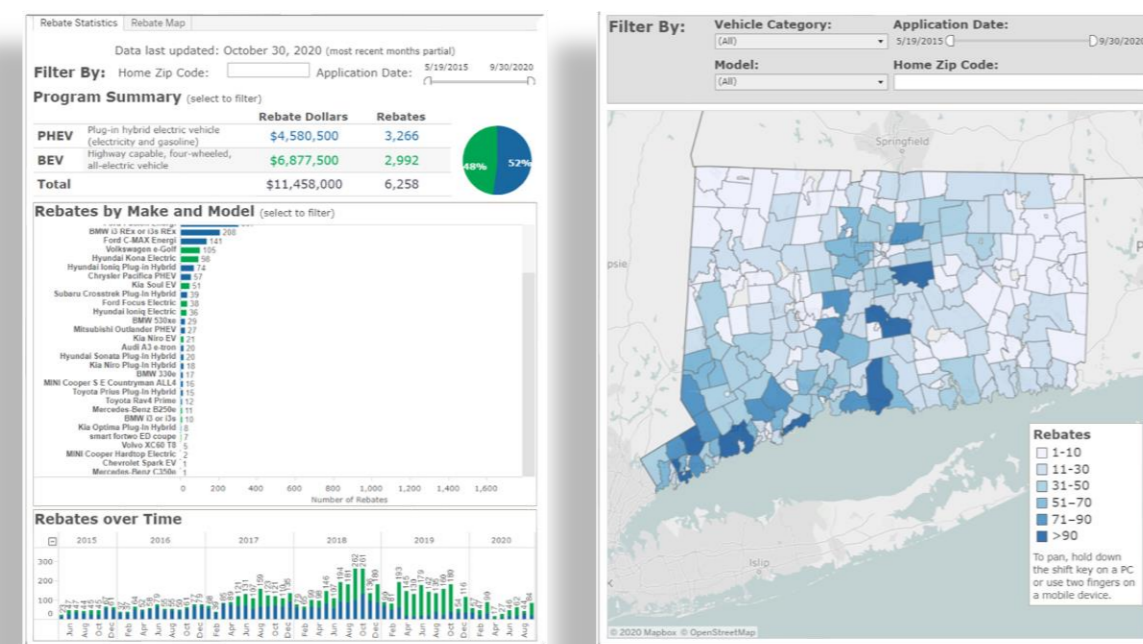
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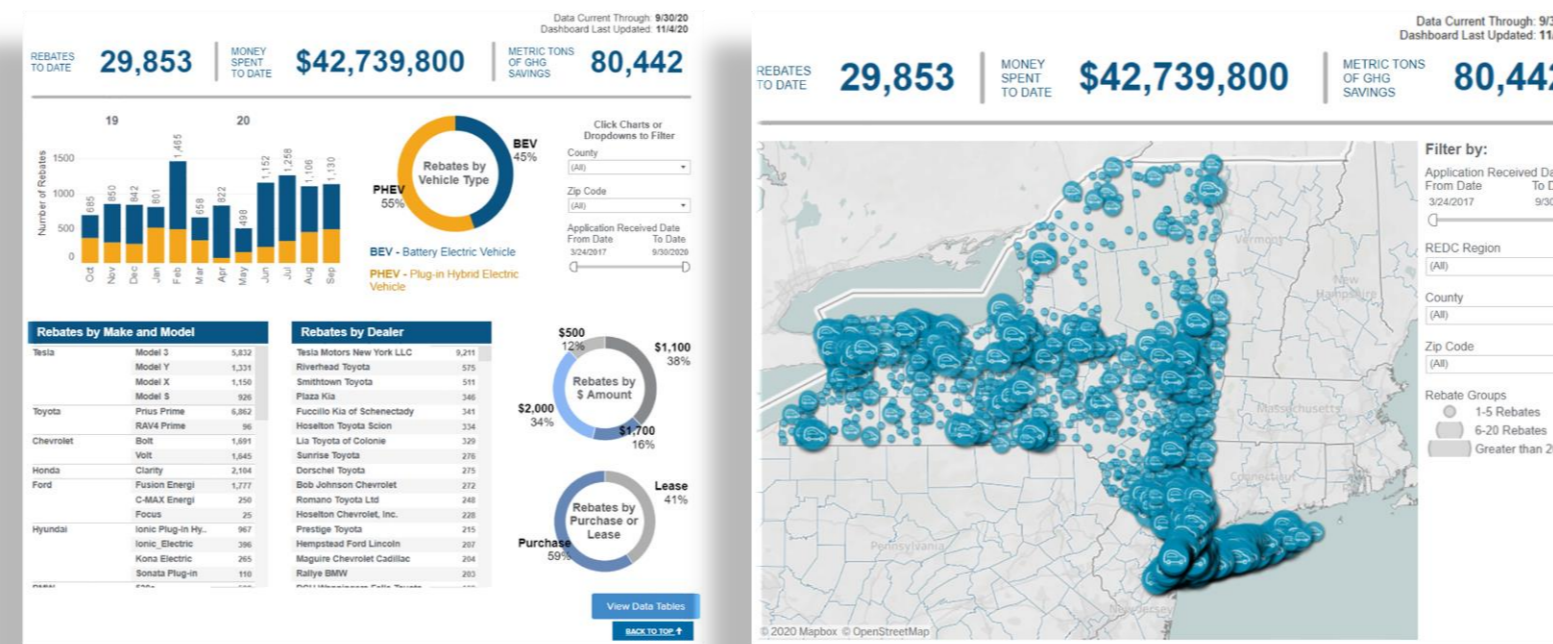
cleanvehiclerebate.org



mor-ev.org



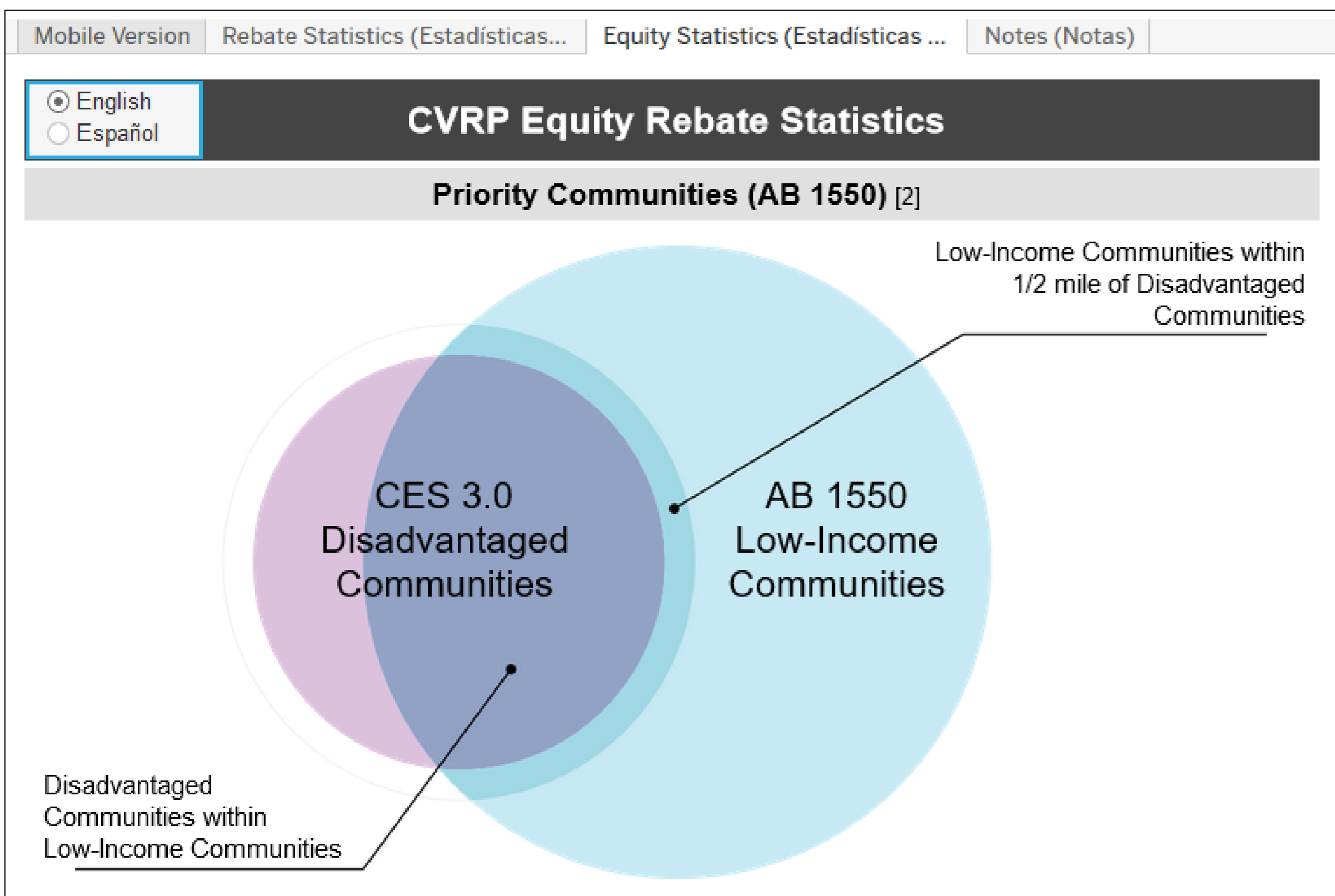
ct.gov/deep



nyserdera.ny.gov (dashboards done by NYSERDA)

- > 442,000 EVs and consumers have received > \$979 M in rebates
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Equity Statistics Dashboard *(partial)*



Rebates by Equity Group [2]





Timeframe: [1]

	Rebates	Funding	Percent of Funding
All Equity Groups	54,424	\$151,975,082	32.4%
Disadvantaged Communities	17,550	\$44,608,659	9.5%
Low-Income Communities	39,425	\$98,332,205	20.9%
Disadvantaged Communities within Low-Income Communities	12,336	\$31,796,734	6.8%
Low-Income Communities within 1/2 mile of a Disadvantaged Community [2]	7,876	\$19,767,185	4.2%
Increased Rebates for Low-/Moderate-Income Consumers [1]	16,217	\$66,901,536	14.2%

Geography

Rebate Type

Consumer Survey Data *(Shows Rebates to Individuals Only)*

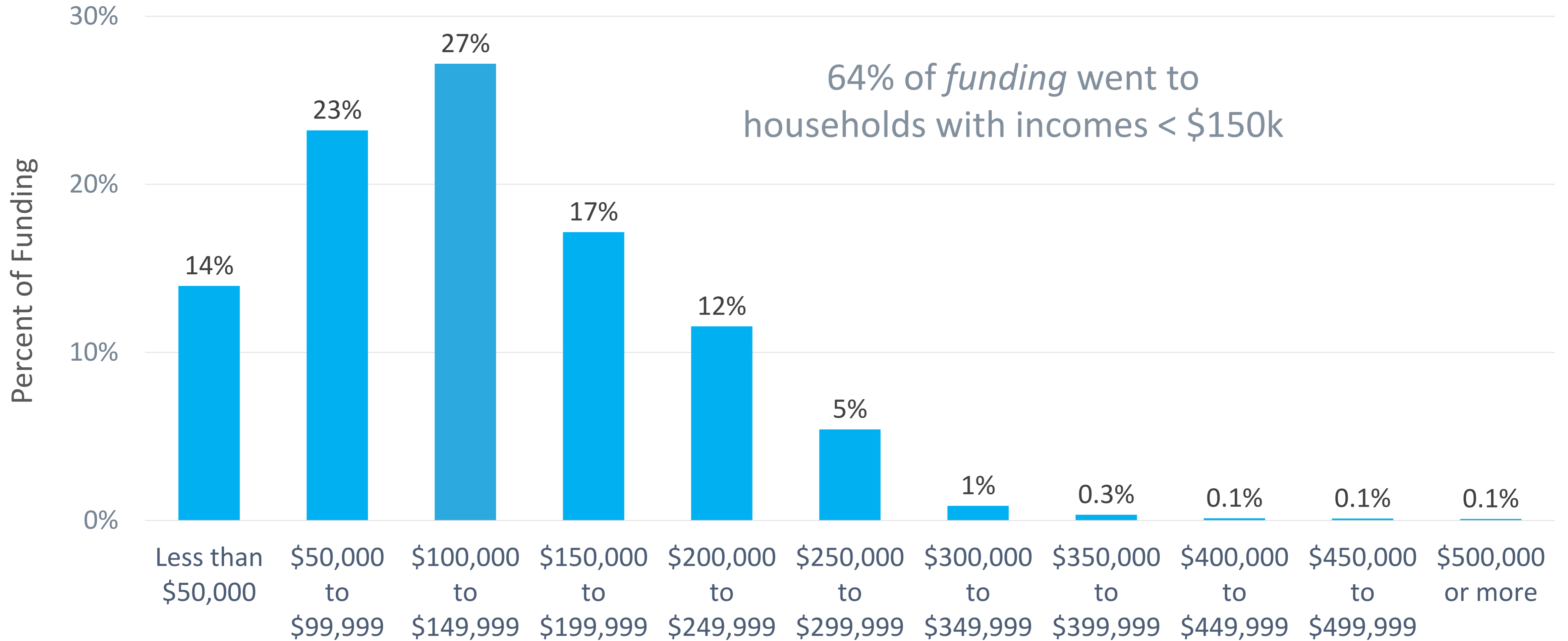
	 CALIFORNIA CLEAN VEHICLE REBATE PROJECT™	 MOR-EV Massachusetts Offers Rebates for Electric Vehicles	 CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	 NEW YORK STATE	Total
Vehicle Purchase/Lease Dates	Sep. 2012* – Dec. 2019	Jun. 2014 – Apr. 2020	May 2015 – Sep. 2018	Mar. 2017 – Dec. 2019	Sep. 2012* – Apr. 2020
Survey Responses (total n)**	66,902	6,616	1,565	5,474	80,557
Program Population (N), rounded***	339,200	16,100	3,500	21,800	380,700

*Two fuel-cell EVs rebated by CVRP with purchase/lease dates from Dec. 2010 – Sep. 2012 are included.

** Subsequently weighted to represent the program population along the dimensions of vehicle category, model, buy vs. lease, and county.


*** Small numbers of rebated vehicles are not represented in the time frames due to application lags. Rounded to nearest 100 in each case.

Distribution of Plug-in EV *Funding* by Household Income: CY 2019 Purchases/Leases



CVRP Consumer Survey: 2017–2019 edition.
Filtered, question-specific, weighted n = 5,501.

Setting an Appropriate Baseline: U.S. Car Buyers Are Different Than the Population

	 All U.S. Population (Census 2018)		New-Vehicle Buyers U.S. MYs 2016–17 (2017 NHTS)
Selected solely White/Caucasian	61%	<<	74%
≥ 50 Years Old	35%	<<	51%
≥ Bachelor's Degree	23%	<<<<	57%
Own Residence*	63%	<<	77%
≥ \$75k HH Income*	40%	<<<	62%
Selected Male	49%	≈	51%

- New-car buyers are different on almost every dimension.
- More frequently:
 - White
 - Older
 - Degree holders
 - Residence owners
 - Higher income
- *Some* of the difference explained by driving or buying age
- **The rest may be due in part to *social inequities***

* Based upon household level data.

Census 2018: 2014–2018 American Community Survey, PUMS. NHTS 2017 is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned. “Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout.

Assessing Progress with Appropriate Comparisons (not population statistics)



	Drive Clean Rebate Program	NY New-Vehicle Buyers	NY Population
The majority of new-car buyers	CY 2019 weighted n = 2,146	MYs 2016–17 (2017 NHTS)	2018 (Census)
Selected solely White/Caucasian	78%	75%	56%
≥ 40 years old	74%	70%	48%
≥ Bachelor’s degree	77%	65%	27%
Own Residence	88%	75% §	53% §
≥ \$100k Household Income	69%	51% §	33% §
Selected Male	73%	51%	49%

§ Based upon household-level data.

“Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout.

NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Census 2018: 2014–2018 American Community Survey, PUMS.

Assessing Progress with Appropriate Comparisons (not population statistics)



The majority of new-car buyers	Drive Clean Rebate Program CY 2019 weighted n = 2,146	Portion of total difference attributable to EVs	NY New-Vehicle Buyers MYs 2016–17 (2017 NHTS)	Portion of total difference explained by car buying	NY Population 2018 (Census)
Selected solely White/Caucasian	78%	← 14% →	75%	← 86% →	56%
≥ 40 years old	74%	← 15% →	70%	← 85% →	48%
≥ Bachelor’s degree	77%	← 24% →	65%	← 76% →	27%
Own Residence	88%	← 37% →	75% §	← 63% →	53% §
≥ \$100k Household Income	69%	← 50% →	51% §	← 50% →	33% §
Selected Male	73%	← 92% →	51%	← 8% →	49%

§ Based upon household-level data.

“Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout.

NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Census 2018: 2014–2018 American Community Survey, PUMS.

Explaining Differences with Appropriate Comparisons (not population statistics)


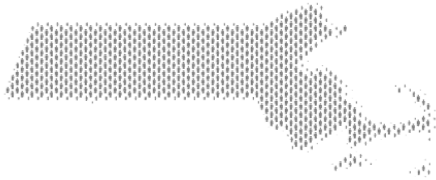


	CVRP Plug-in EVs CY 2019 Purchase/Leases wghtd n = 6,196	Portion of total difference attributable to EVs	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on)	Portion of total difference explained by car buying	CA Population (Census 2018)
The majority of new-car buyers					
Selected solely White/Caucasian	51%	← 0% →	51%	← 100% →	38%
≥ 40 years old	73%	← 18% →	68%	← 82% →	45%
≥ Bachelor’s degree	82%	n.a.	58% †	n.a.	24% †
≥ \$100k Household Income	68%	← 36% →	56% §	← 64% →	35% §
Own Residence	80%	← 65% →	63% §	← 35% →	54% §
Selected Male	70% ¶	← 100% →	50%	← 0% →	50%

* FCEV weighted n = 1,087. † FCEV weighted n = 415. ‡ Census & NHTS data characterize individual educational attainment, whereas rebate data characterize highest household attainment. § Based upon household-level data. ¶ Starting in June 2017, 100% includes non-binary options.

“Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout. Census 2018: 2014–2018 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

Rebated EV Consumer Characteristics: Trending in Some of the Right Directions

	 Purchase/lease dates:			New England New-Vehicle Buyers MYs 2016–17 (2017 NHTS)	 MA Population (Census 2018)
	CY 2017 weighted n = 1,330	CY 2018 weighted n = 2,844	CY 2019 weighted n = 630		
Selected solely White/Caucasian	85%	80%	75%	87%	72%
≥ 50 years old	61%	55%	50%	49%	36%
≥ Bachelor’s degree in HH	90%	90%	93%	61%*	33%*
Own Residence	92%	91%	91%	83%**	62%**
≥ \$75k HH Income	88%	91%	92%	72%**	51%**
Selected Male	74%	79%	79%	50%	49%

* Census & NHTS data characterize individual educational attainment, whereas rebate data characterize highest household attainment. ** Based upon household-level data. “Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout.

Census 2018: 2014–2018 American Community Survey, PUMS.

2017 NHTS: filtered for states = CT, MA, ME, RI, VT, NH. NHTS is weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Rebated EV Consumer Characteristics: Trending in Some of the Right Directions



	CVRP, Purchase/Lease Dates:			CA New-Vehicle Buyers
	9/12 – 12/18 Clean Vehicles wghtd n = 62,092 *	CY 2017 Clean Vehicles wghtd n = 9,664 †	CY 2019 Plug-in EVs wghtd n = 6,196	MYs 2016–17 (2017 NHTS CA add-on)
The majority of new-car buyers				
Selected solely White/Caucasian	59%	58%	51%	51%
≥ 40 years old	76%	76%	73%	68%
≥ Bachelor’s degree in HH	83%	82%	82%	58% ‡
≥ \$100k Household Income	74%	68%	68%	56% §
Own Residence	83%	79%	80%	63% §
Selected Male	74% ¶	72% ¶	70% ¶	50%

* FCEV weighted n = 1,087. † FCEV weighted n = 415. ‡ Census & NHTS data characterize individual educational attainment, whereas rebate data characterize highest household attainment. § Based upon household-level data. ¶ Starting in June 2017, 100% includes non-binary options.

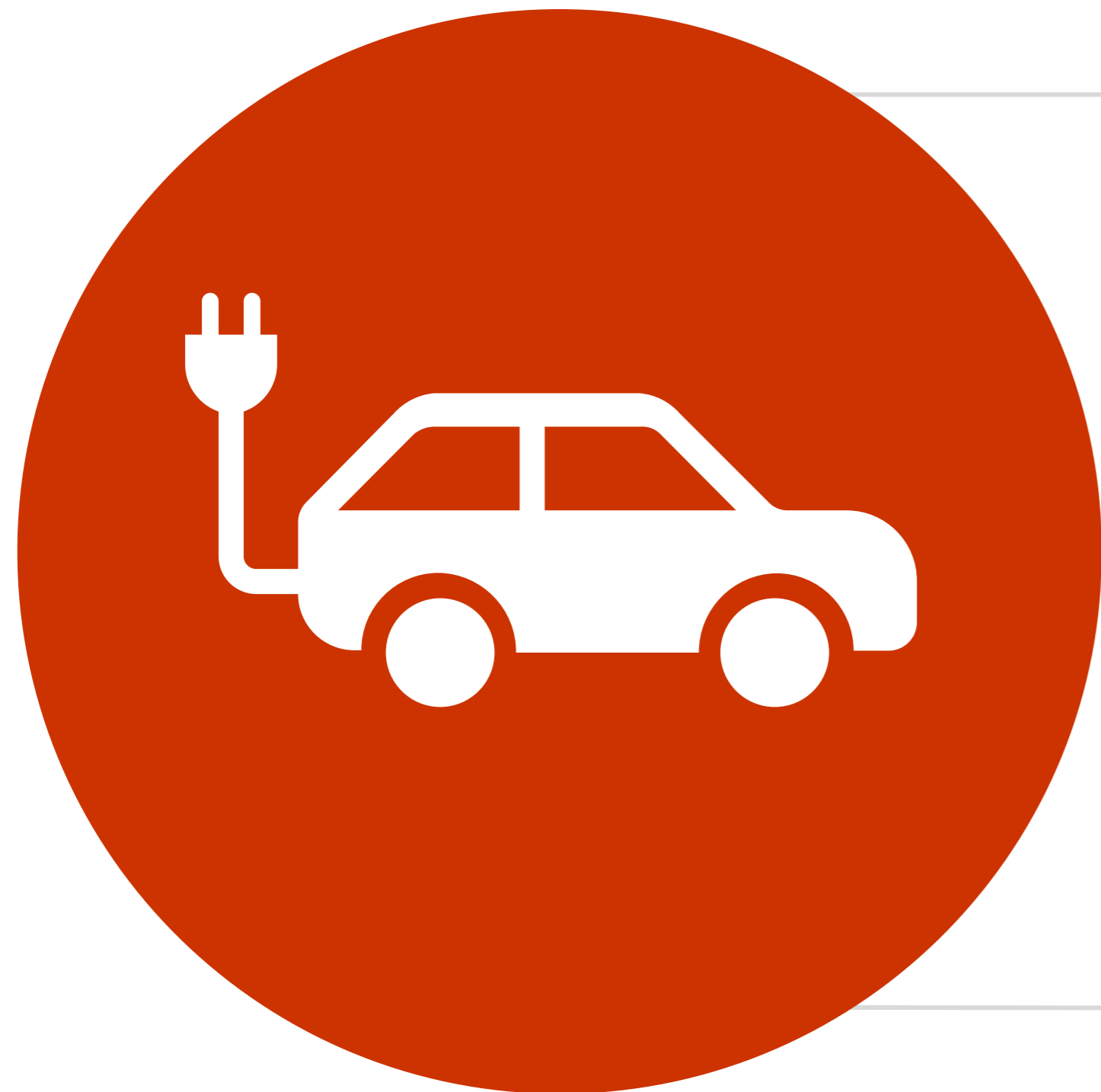
“Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout. Census 2018: 2014–2018 American Community Survey, PUMS. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified by within-100-mile match between odometer and miles driven while owned.

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 bicycle is parked at a charging station, and a building is visible. The overall atmosphere is one of modern, sustainable urban transportation.

What is the path forward?

Strategies for Program Design and Outreach

How Can Research Help Us Grow Markets for Electric Vehicles?



Low-Hanging Fruit

Understand existing adopters to reinforce and scale what is already working



Expanding Market Frontiers

Go beyond the enthusiastic core of EV markets in order to expand further into the mainstream

- “*Rebate Essentials*” increase cost-effectiveness
- “*EV Converts*” point toward the mainstream



Tough Nuts to Crack

Understand and break down barriers faced by consumers targeted based on policy priorities

Paths Forward: CA Plug-in Vehicles

Low-Hanging Fruit (Existing Adopters)

CY 2019
weighted n = 6,196







Selected solely White/Caucasian	51%
≥ 40 Years Old	73%
≥ Bachelor's Degree in HH	82%
Own Residence	80%
≥ \$100k HH Income	68%
Selected Male	70% ‡

CA New-Vehicle Buyers
MYs '16-'17 (2017 NHTS)
51%
68%
58%*
63% †
56% †
50%

* NHTS data characterize individual educational attainment, whereas other data characterize highest household attainment. † Based upon household-level data. ‡ 100% includes non-binary options. Rebate data filtered by purchase/lease date. "Prefer not to answer," "I don't know," and similar responses are excluded throughout. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

Paths Forward: CA Plug-in Vehicles

	Low-Hanging Fruit (Existing Adopters) CY 2019 weighted n = 6,196 	“Rebate Essentials” CY 2019 weighted n = 3,340 	“EV Converts” CY 2019 weighted n = 1,262 	CA New- Vehicle Buyers MYs ’16–’17 (2017 NHTS)	Increased Rebate Recipients Low-/Moderate-Income CY 2019 weighted n = 687 
Selected solely White/Caucasian	51%	45%	39%	51%	36%
≥ 40 Years Old	73%	70%	68%	68%	67%
≥ Bachelor’s Degree in HH	82%	83%	79%	58%*	66%
Own Residence	80%	78%	77%	63% †	63%
≥ \$100k HH Income	68%	64%	63%	56% †	6%
Selected Male	70% ‡	71% ‡	66% ‡	50%	65% ‡

* NHTS data characterize individual educational attainment, whereas other data characterize highest household attainment. † Based upon household-level data. ‡ 100% includes non-binary options. Rebate data filtered by purchase/lease date. “Prefer not to answer,” “I don’t know,” and similar responses are excluded throughout. NHTS weighted to represent population, not new-vehicle subset. New-vehicle buyers identified based on within-100-mile match between odometer and miles driven while owned.

A close-up photograph of a person's hand plugging a charging cable into 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 and a bicycle are visible, suggesting an urban or public parking area.

Are Rebates Impactful?

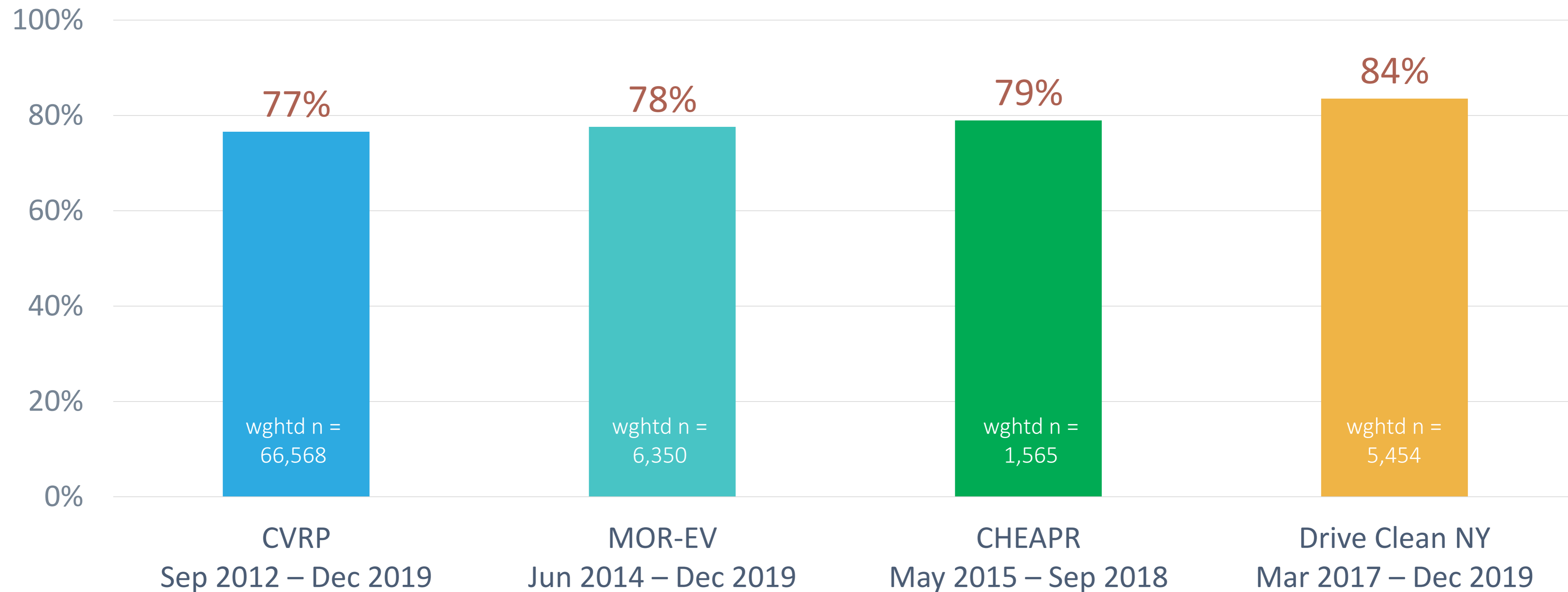
Vehicle Replacement



Vehicle Replacement Rates

Do EVs Get Used?

Replaced a vehicle with their rebated *clean vehicle*

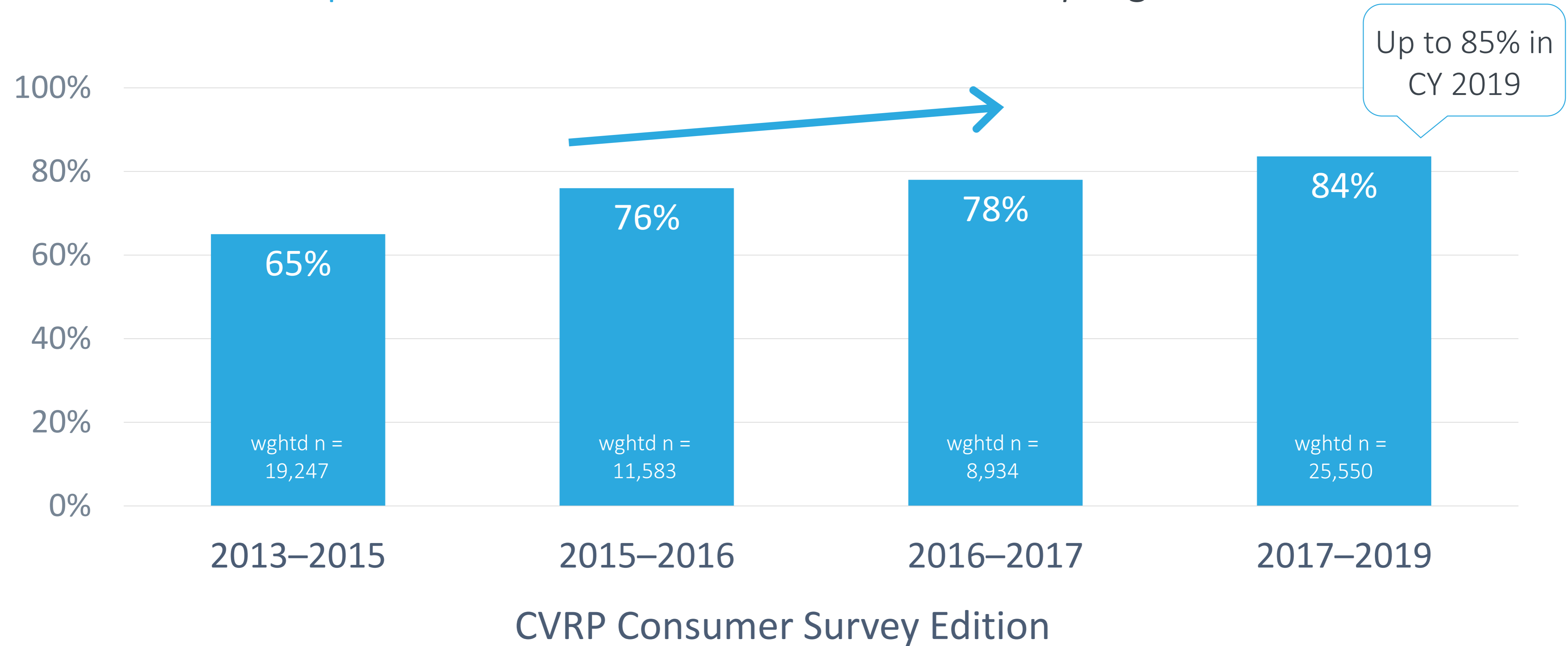


Weighted n values are question-specific.

Overall datasets: 80,557 total survey respondents weighted to represent 380,700 rebate recipients.

Vehicle Replacement is Increasing

Replaced a vehicle with their rebated *plug-in EV*

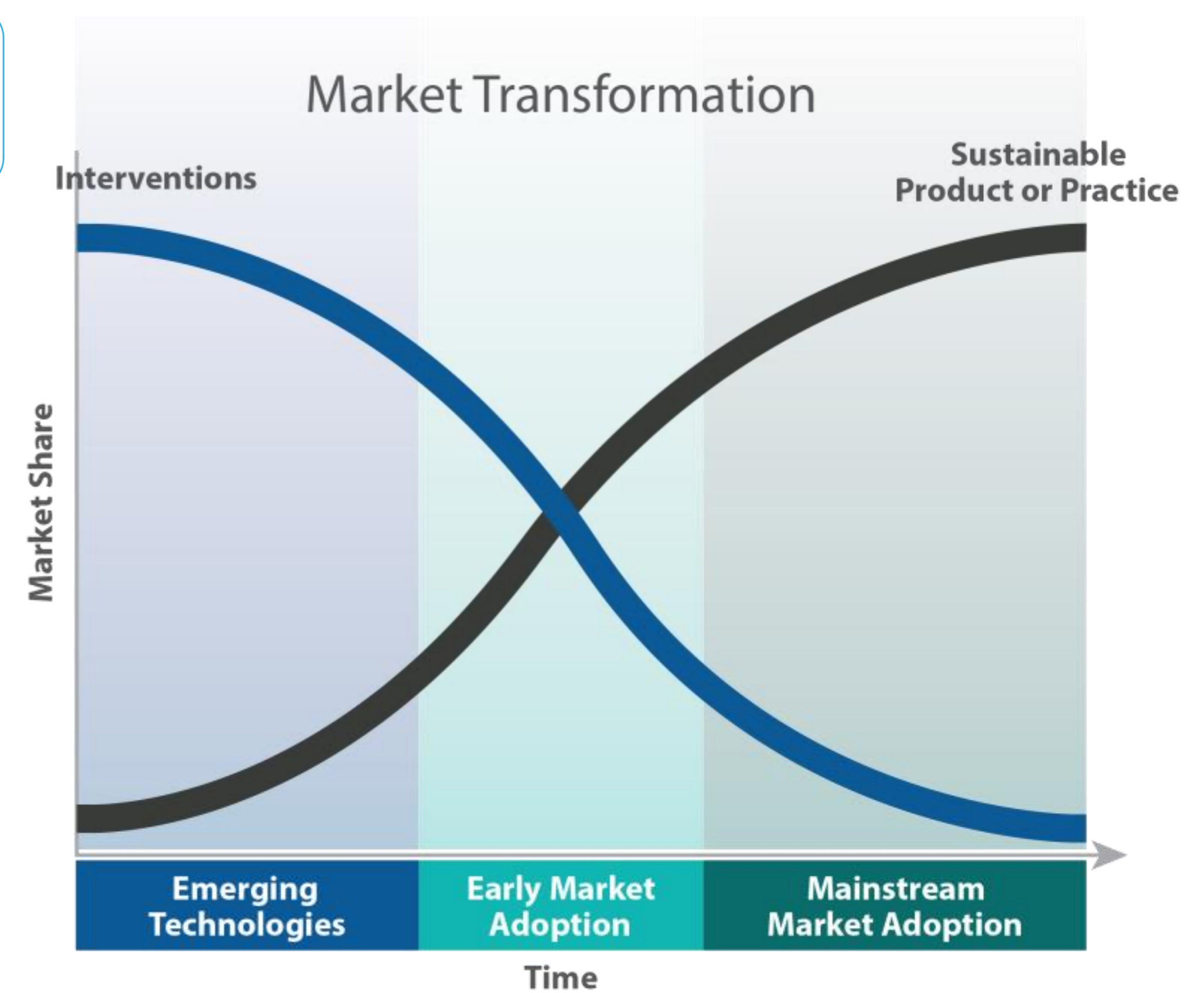
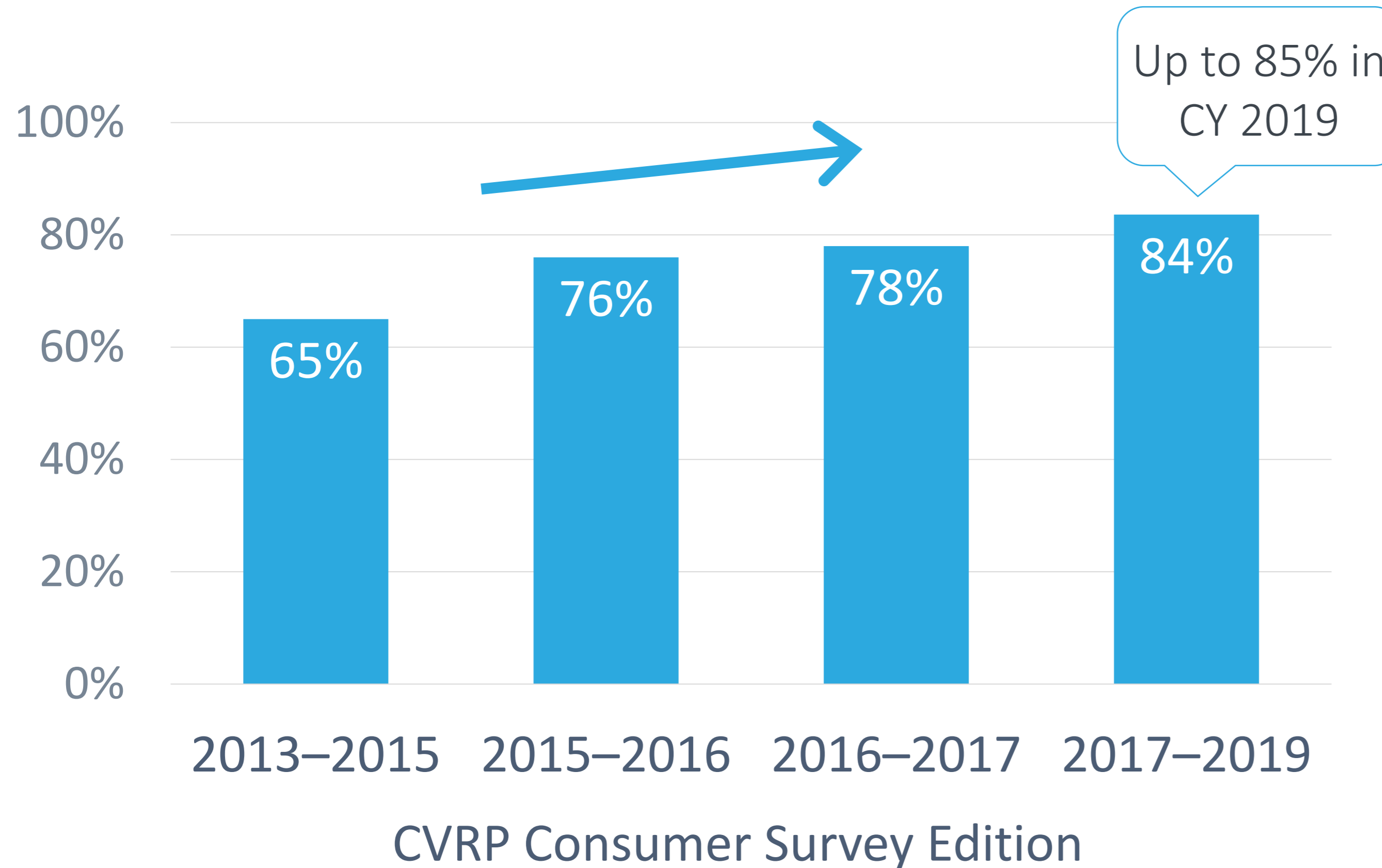


Overall datasets: 65,643 total survey respondents weighted to represent 332,600 rebate recipients.

Vehicle Replacement is *Increasing* Over Time, Contradicting a Common Paradigm About Phasing Out Incentives

Replaced a vehicle with their *plug-in EV* ≠

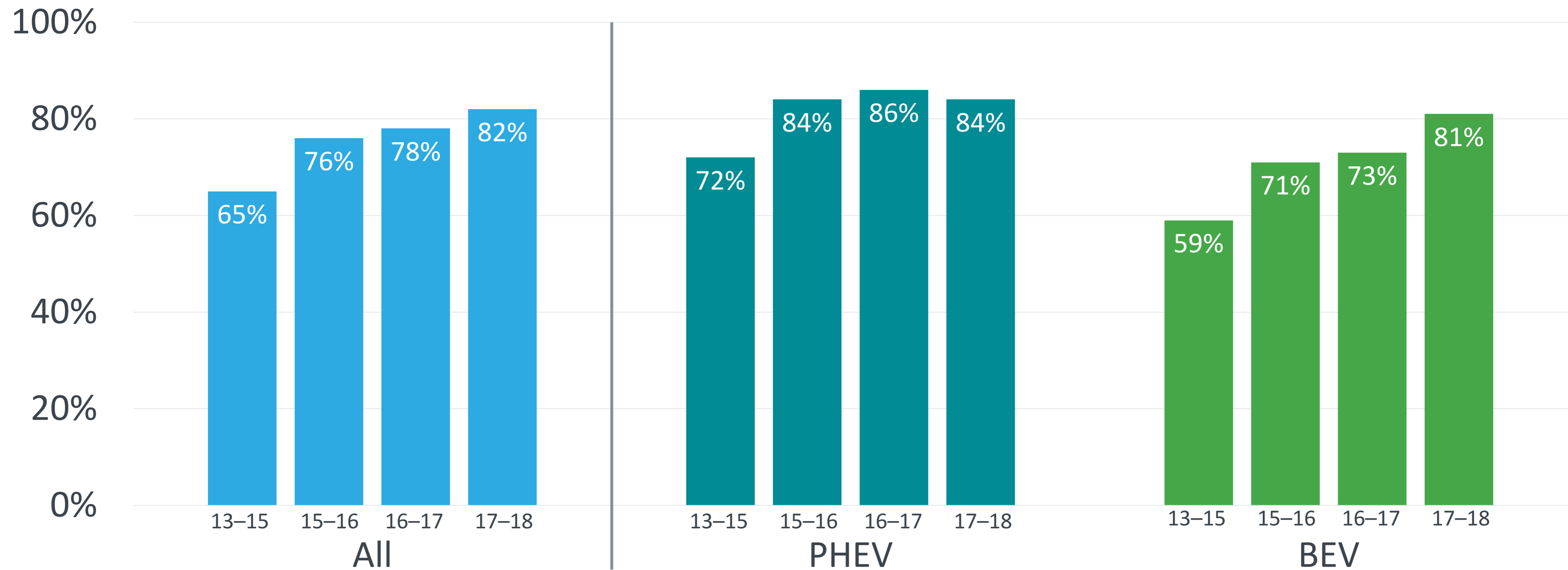
Common paradigm



Overall datasets: 65,643 total survey respondents weighted to represent 332,600 rebate recipients.

Vehicle Replacement Has Long Been High for PHEVs, Is Growing for BEVs

Replaced a vehicle with their rebated *plug-in EV*



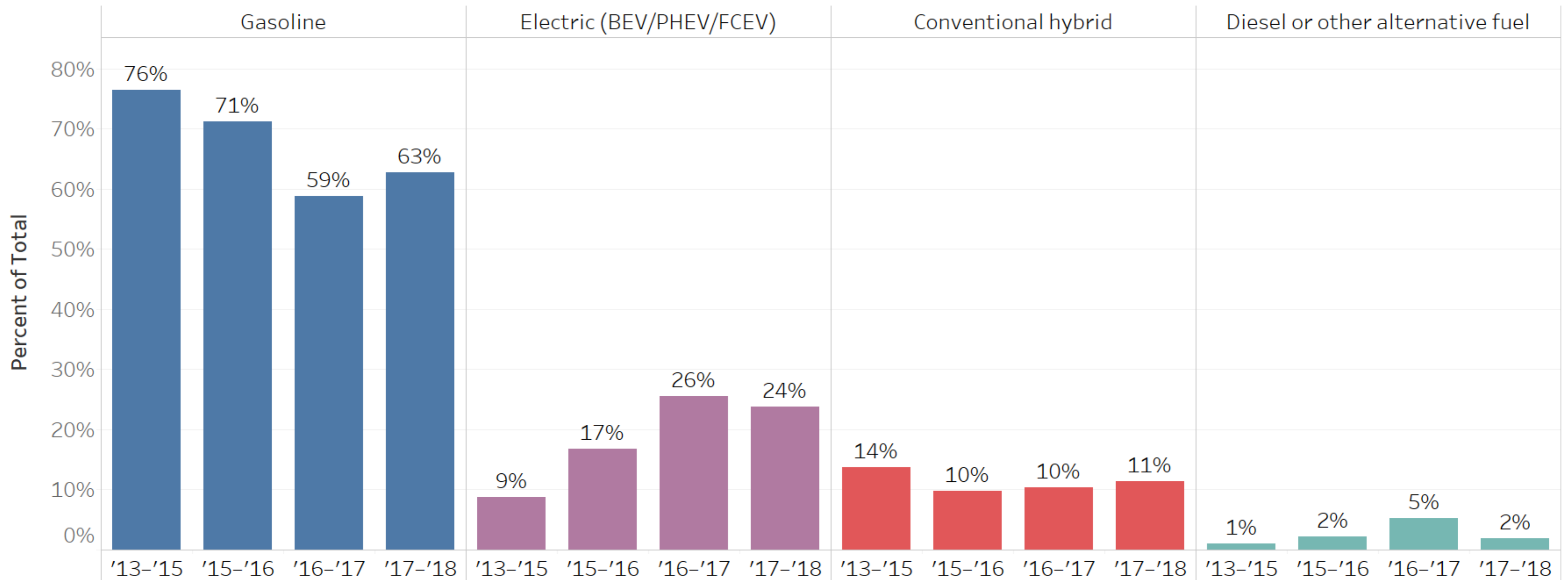
CVRP Consumer Survey: 2013–2015 edition: weighted, question n=19,247
2015–2016 edition: weighted, question n= 11,583
2016–2017 edition: weighted, question n= 9,006
2017–2018 edition: weighted, question n= 20,847



Vehicle Types Replaced



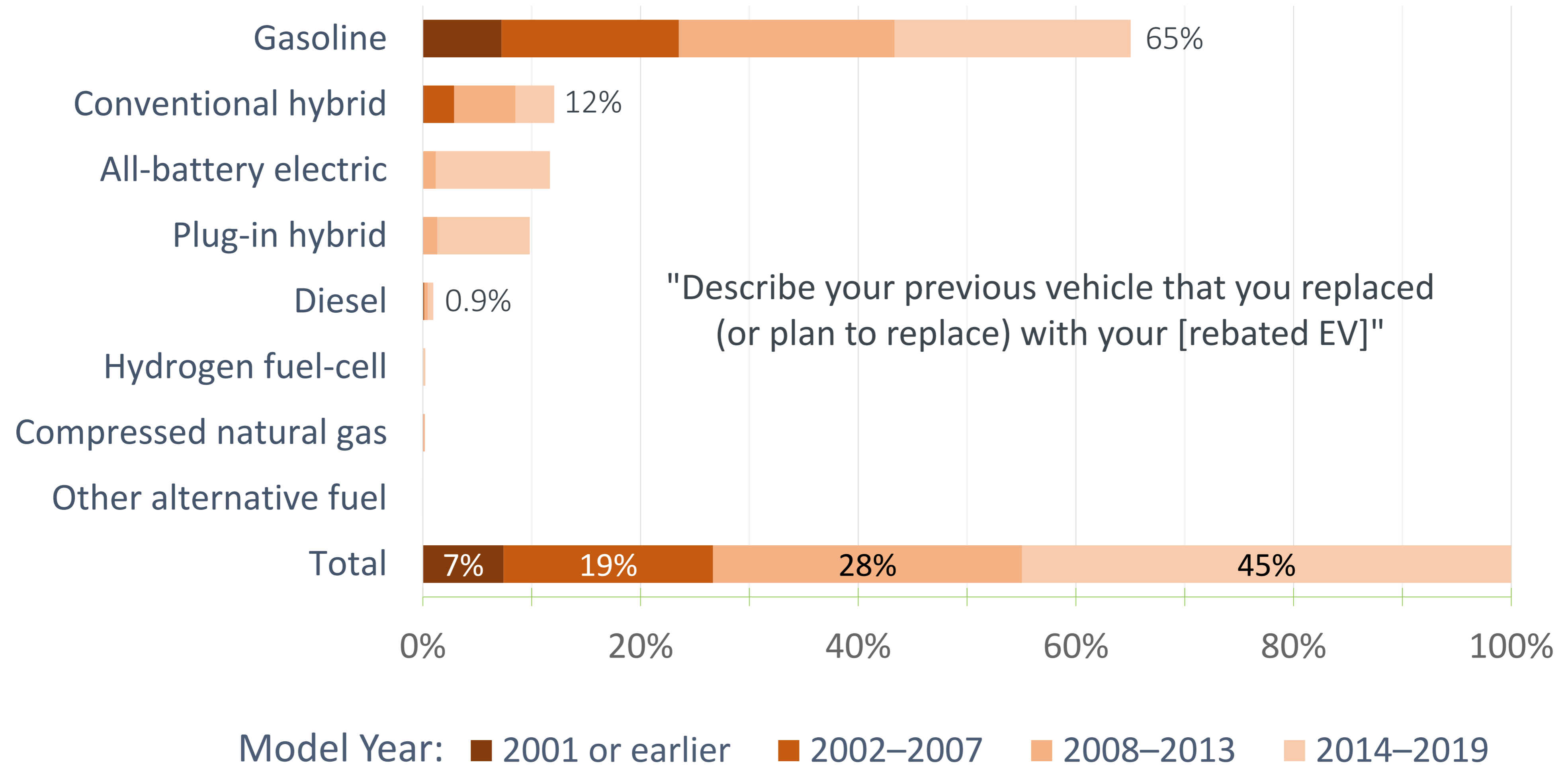
What Vehicle Types Have Rebates Helped Replace?



CVRP Consumer Survey: 2013–2015 edition: weighted, question n= 12,332
 2015–2016 edition: weighted, question n= 8,594
 2016–2017 edition: weighted, question n= 6,925
 2017–2018 edition: weighted, question n= 17,021

What Vehicles Have Rebates Helped Replace?

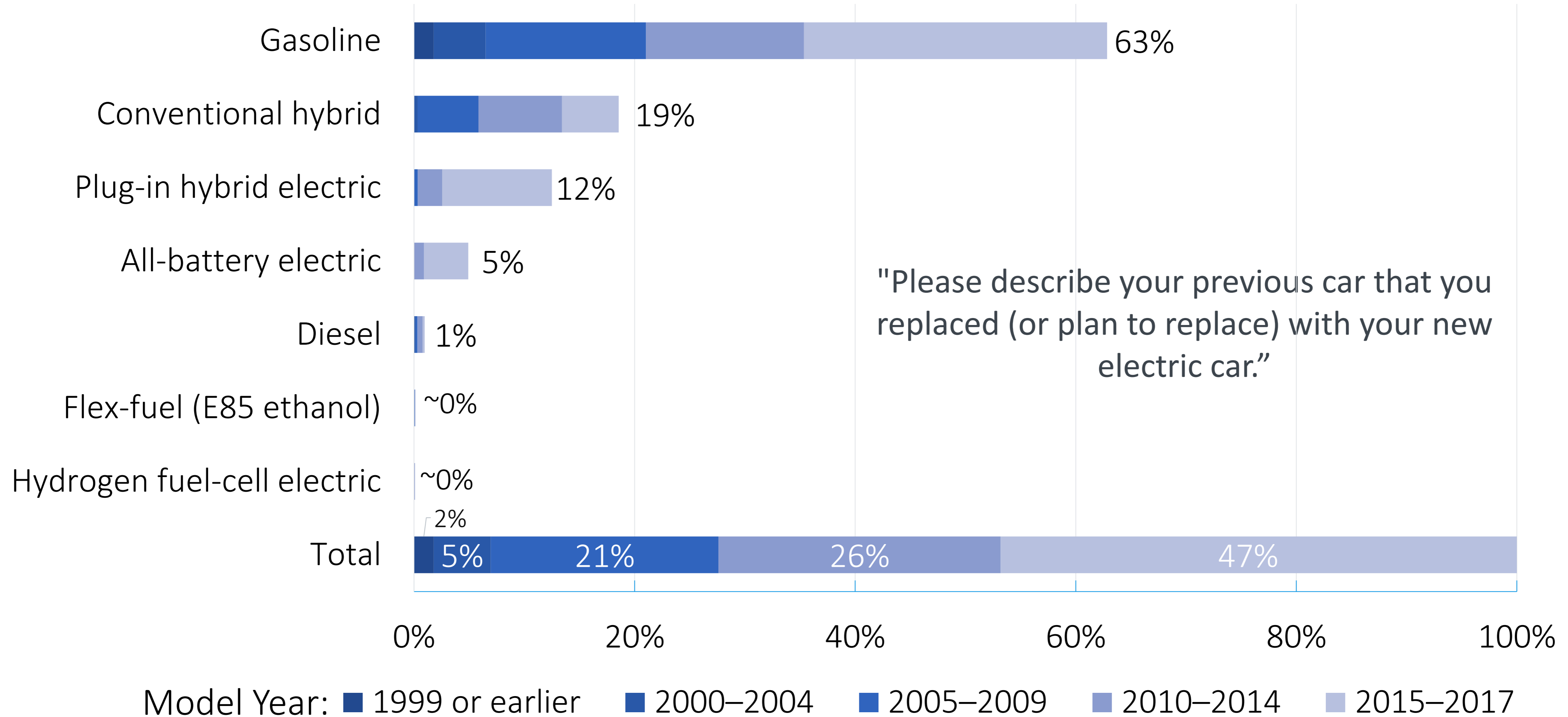
CY 2019 Plug-in Electric Vehicle Purchases/Leases



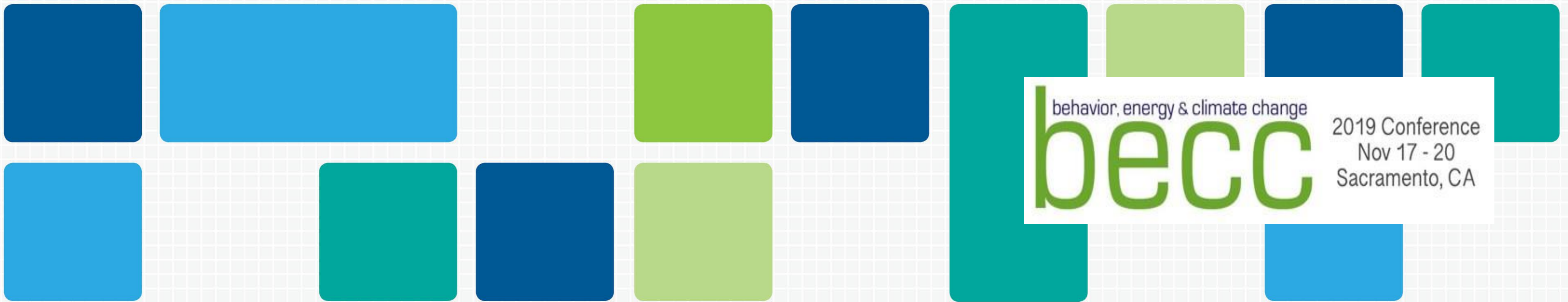
CVRP Consumer Survey: 2017-2019 edition. Filtered, question-specific, weighted n = 4,465.

What Vehicles Have Rebates Helped Replace?

CY 2019 Plug-in Electric Vehicle Purchases/Leases



NYSERDA Consumer Survey: 2017–2019 edition. Filtered, question-specific, weighted n = 1,220



What Vehicles Are Electric Vehicles Replacing and Why?

BECC Conference, "Charging Into the Future" Session, 19 November 2019, Sacramento CA

Nicholas Pallonetti – Research Analyst — CSE

Brett Williams, PhD – Principal Advisor, EV Programs — CSE

with thanks to Keir Havel and others at CSE



A close-up photograph of a person's hand plugging a charging cable into the charging port of a white 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 blurred city street scene.

Are Rebates Effective?

Rebate Influence

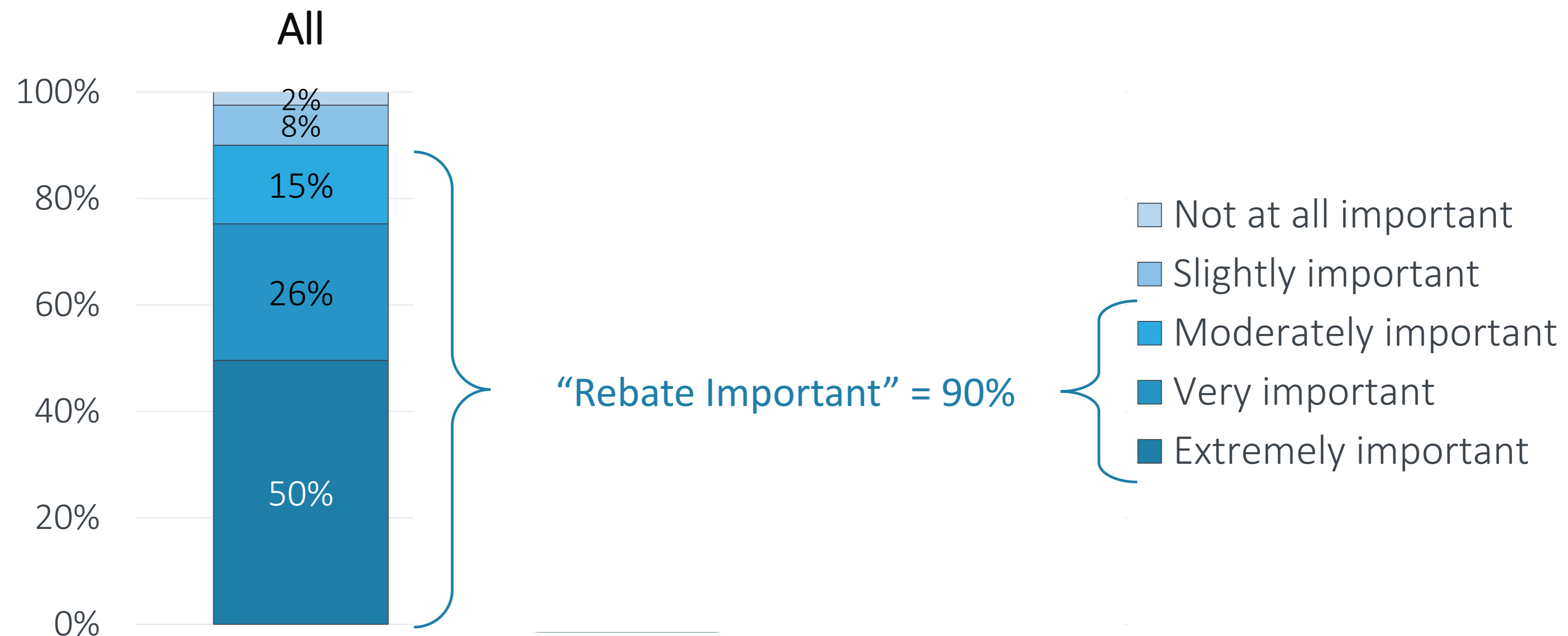


Rebate Importance

Rebate Importance

(CY 2019 Plug-in EVs)

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



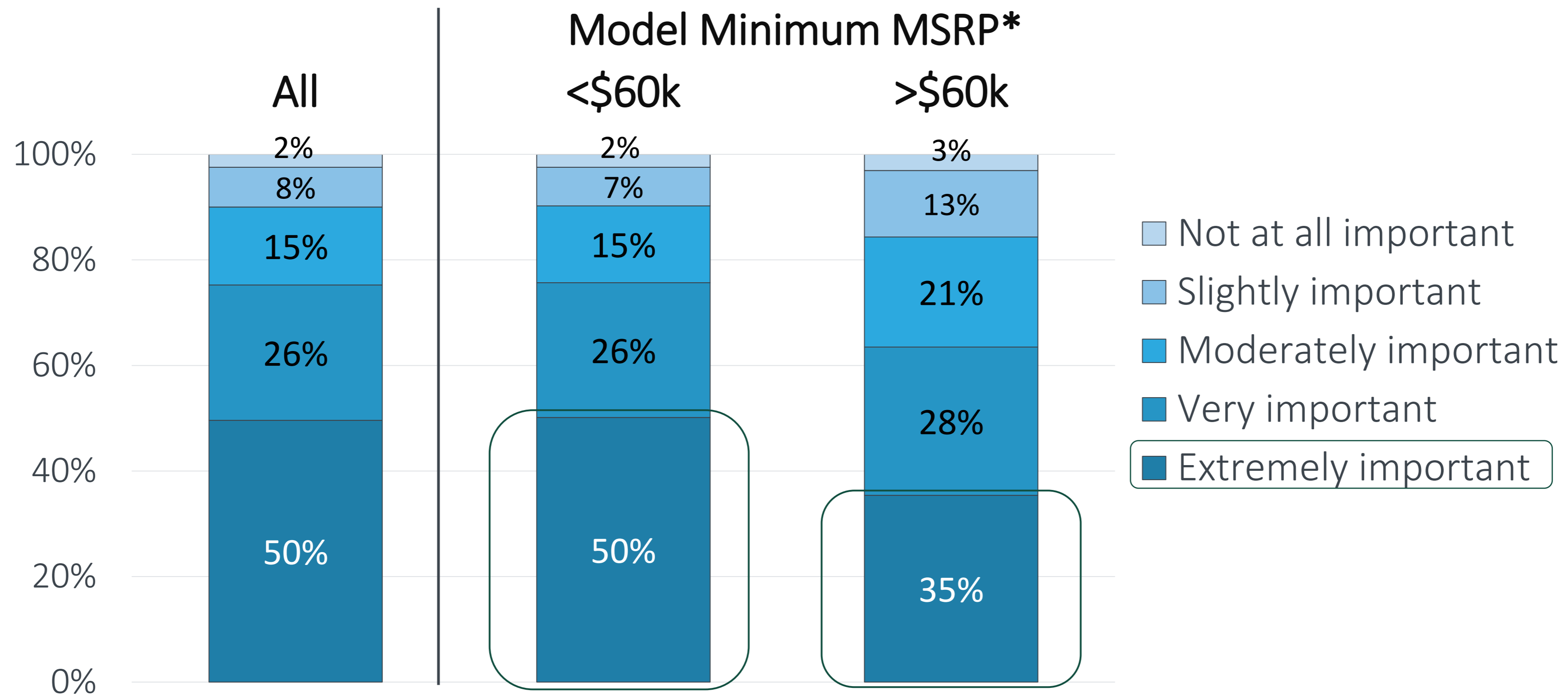
*CVRP Consumer Survey: 2017–2019 edition. Question-specific weighted n = 6,120.
Starting Dec. 2019, PEVs with base MSRP greater than \$60k became ineligible.*

Rebate Importance Decreases Above \$60k MSRP

(CY 2019 Plug-in EVs)



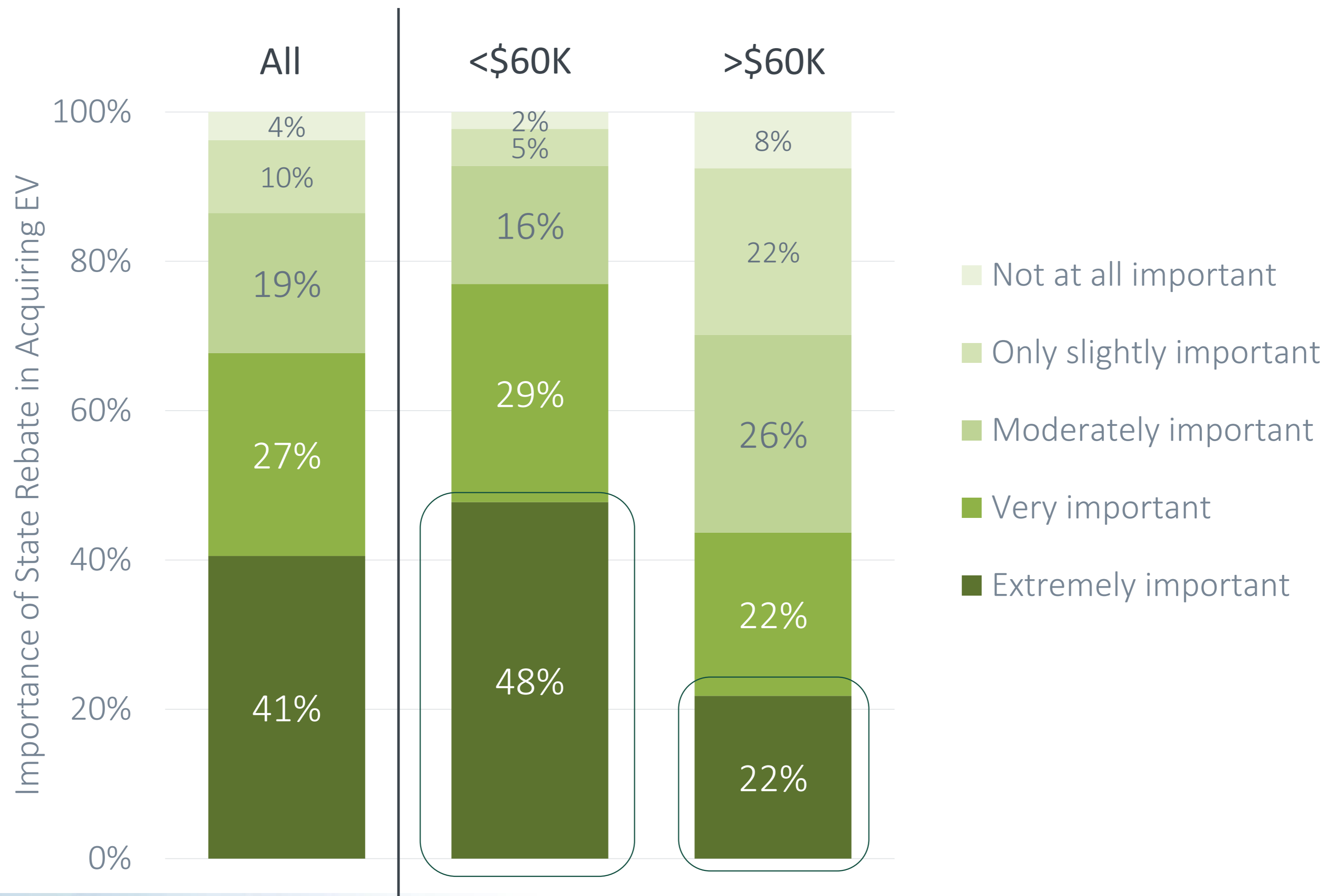
How **important** was the state rebate in **making it possible** for you to acquire your clean vehicle?



*Each vehicle was assigned the minimum Manufacturer's Suggested Retail Price (MSRP) for that model/MY on fueleconomy.gov and does not reflect sale price. Where MSRPs were unavailable for a given MY, MSRPs from the previous or following MY were used. Tesla Model 3's were assigned an MSRP of \$49k for MY 2018, \$35k for MY 2019 and 2020.

CVRP Consumer Survey: 2017–2019 edition. Question weighted n = 6,120. Starting Dec. 2019, PEVs with base MSRP greater than \$60k became ineligible.

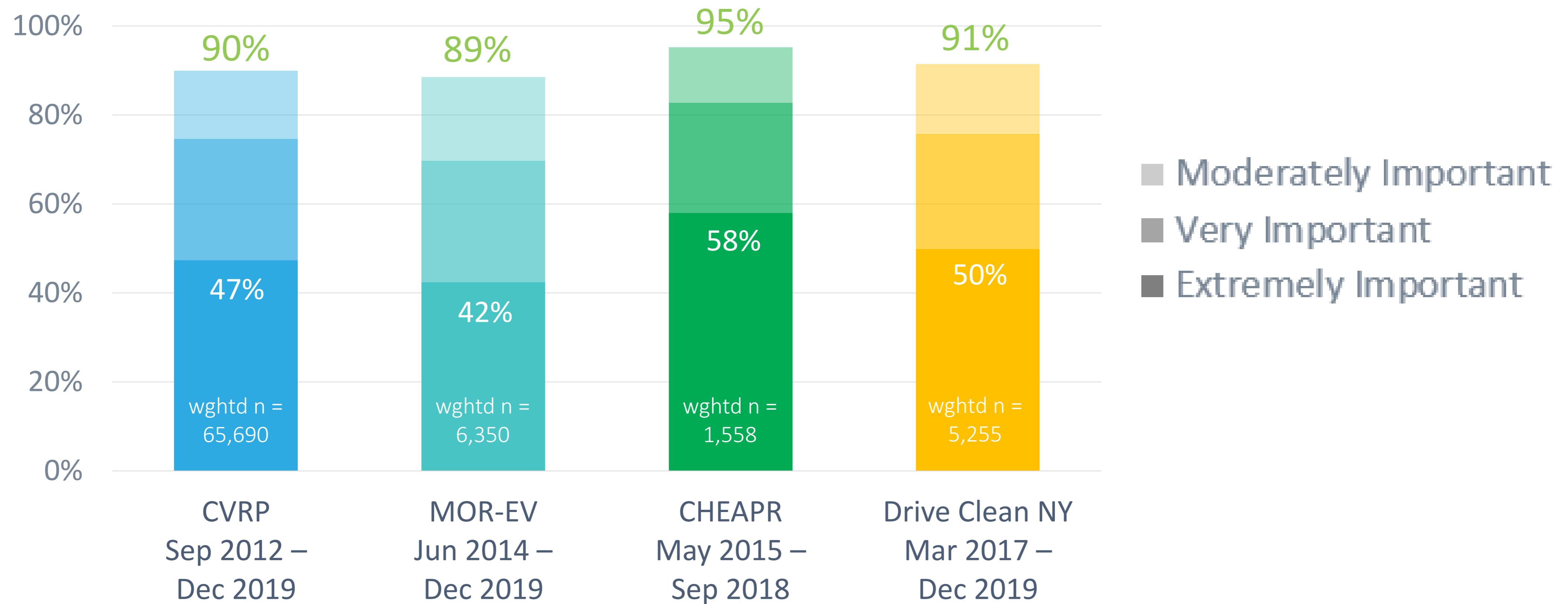
Rebate Importance by Vehicle Price



MOR-EV Survey, 2014–17: n = 2,549 total respondents weighted to represent N = 5,754 participants
Excludes one response missing price data.

Rebate Influence: Importance

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



Weighted n values are question-specific.

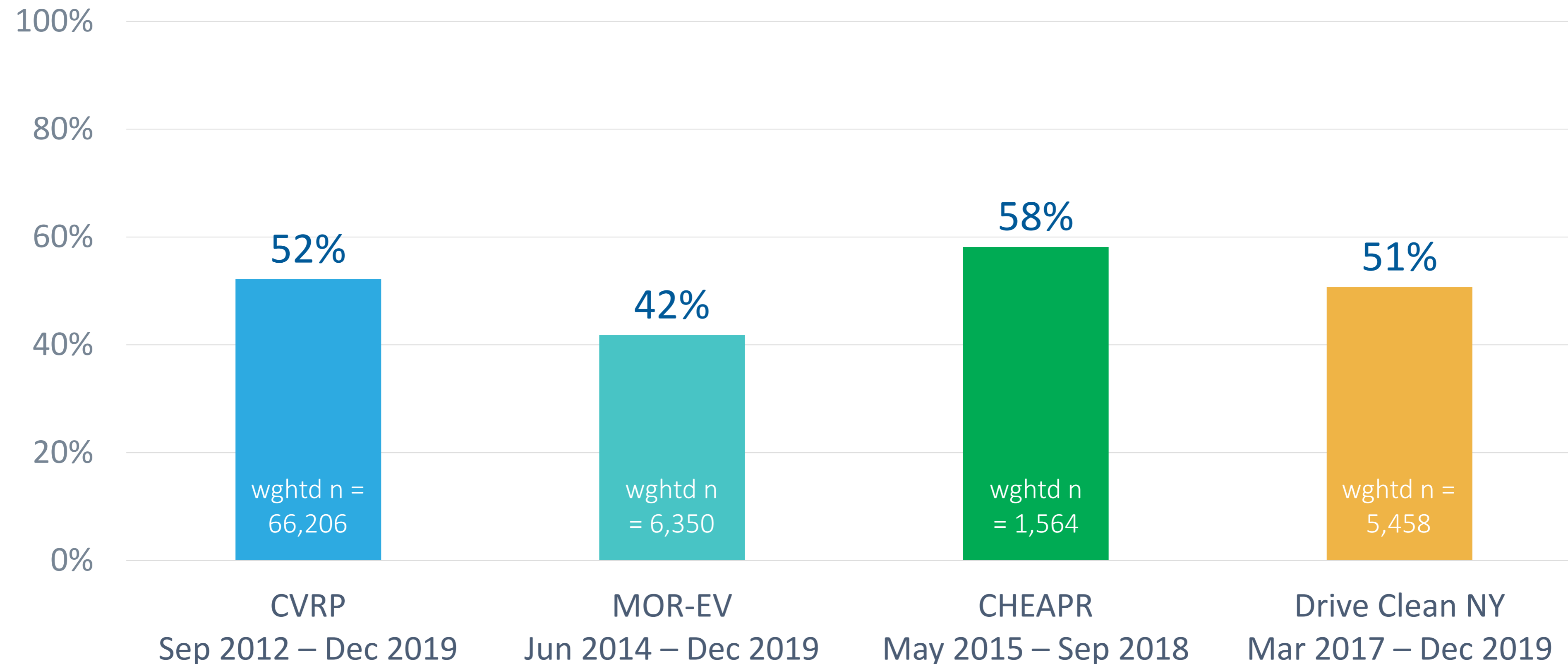
Overall datasets: 80,557 total survey respondents weighted to represent 380,700 rebate recipients.



Rebate Essentiality

Rebate Influence: Essentiality

Would **not** have purchased/leased their clean vehicle **without rebate**



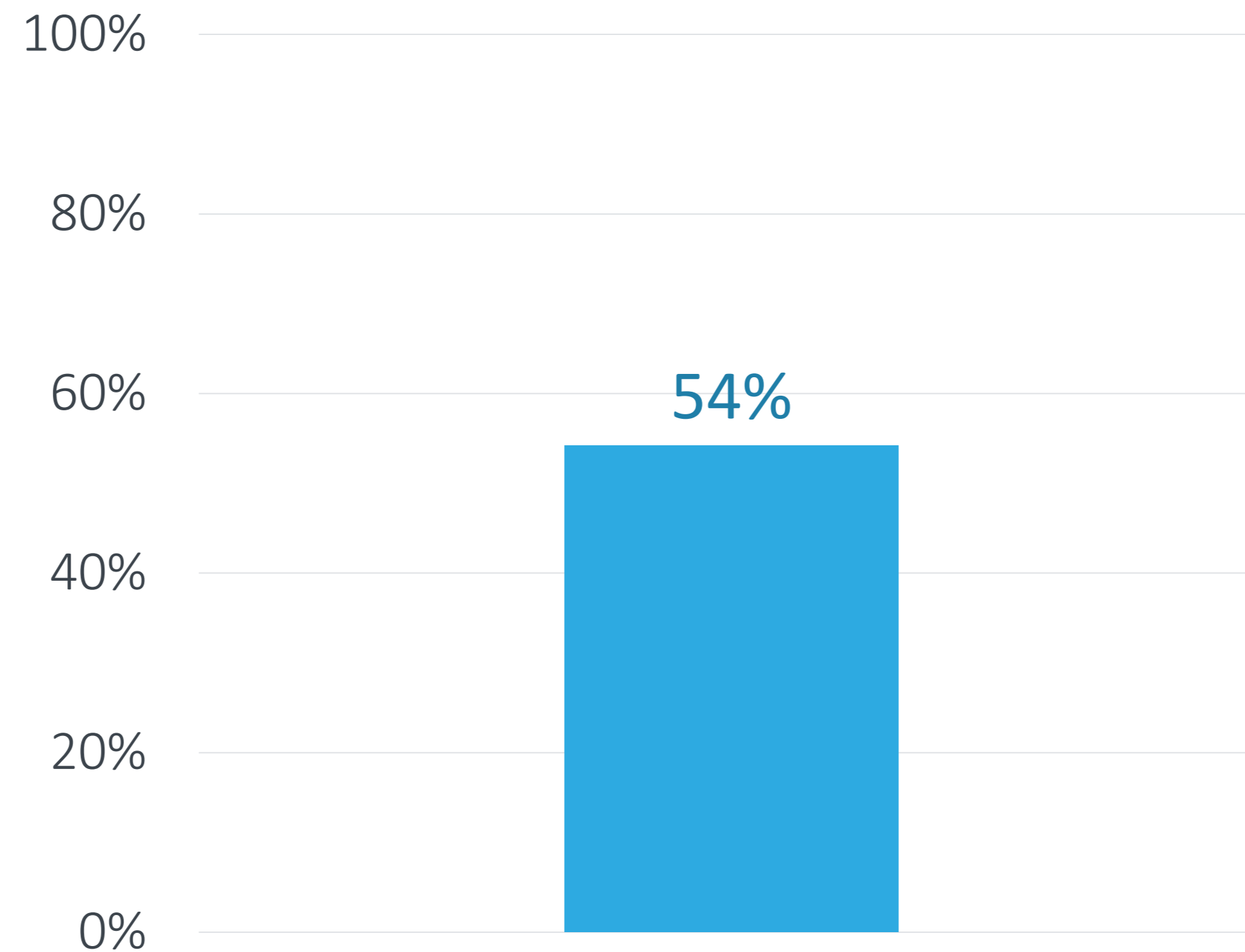
Weighted n values are question-specific.

Overall datasets: 80,557 total survey respondents weighted to represent 380,700 rebate recipients.

Rebate Essentiality

(CY 2019 Plug-in EV Purchases/Leases)

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

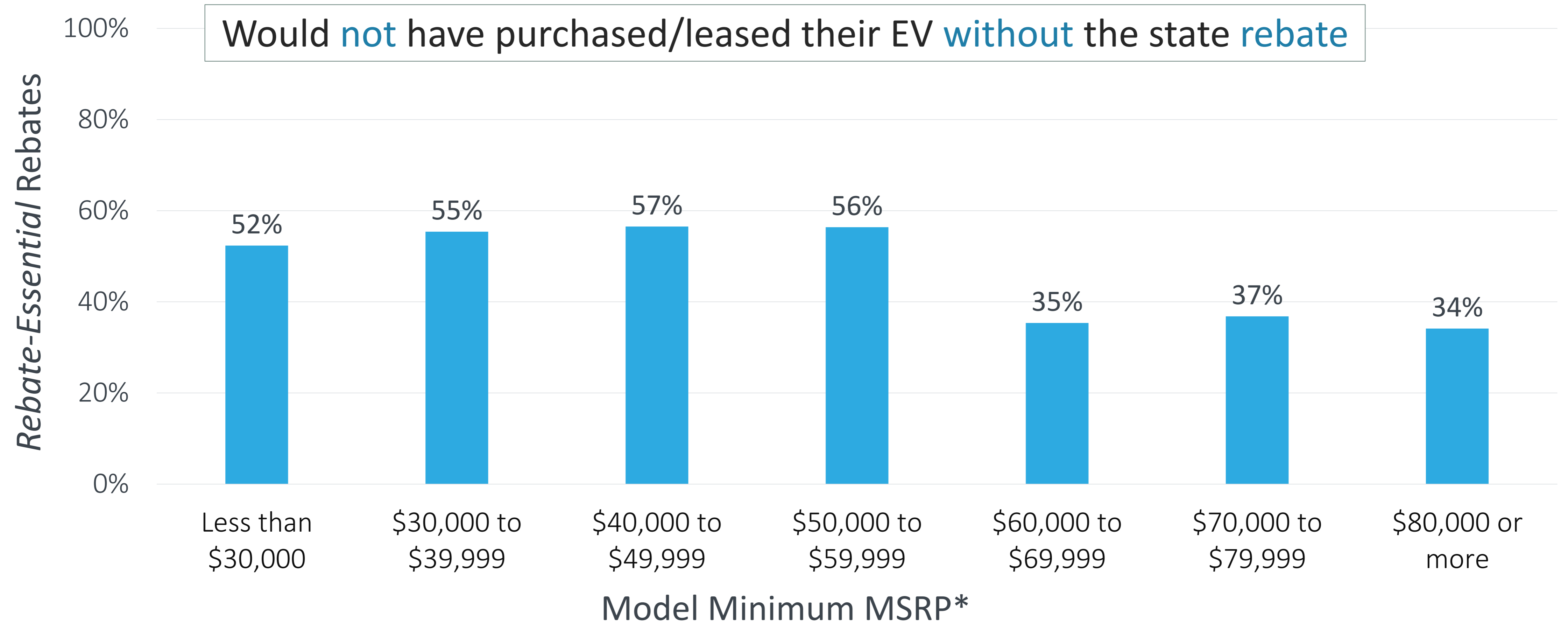


CVRP Consumer Survey: 2017–2019 edition. Filtered question, weighted n = 6,158.

Starting 12/2019, PEVs with base MSRP > \$60k became ineligible.

Rebate Essentiality Decreases Above \$60k MSRP

(CY 2019 Plug-in EV Purchases/Leases)



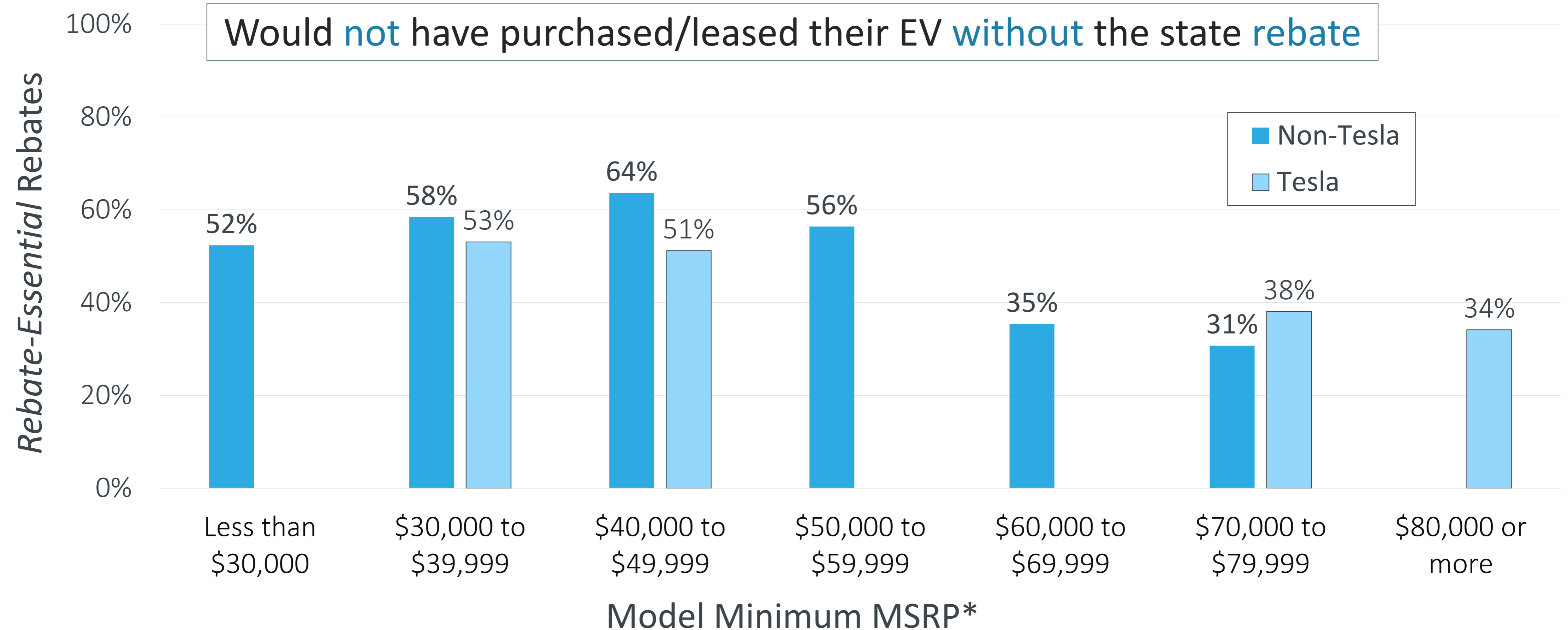
CVRP Consumer Survey: 2017–2019 edition. Filtered question, weighted $n = 6,158$. Starting 12/2019, PEVs with base MSRP > \$60k became ineligible.

* Each vehicle was assigned the minimum Manufacturer's Suggested Retail Price (MSRP) for that model/MY on fueleconomy.gov and does not reflect sale price. Where MSRPs were unavailable for a given MY, MSRPs from the previous or following MY were used.

Tesla Model 3's were assigned an MSRP of \$49k for MY 2018, \$35k for MY 2019 and 2020.

Rebate Essentiality Similar But Lower for Tesla

(CY 2019 Plug-in EV Purchases/Leases)

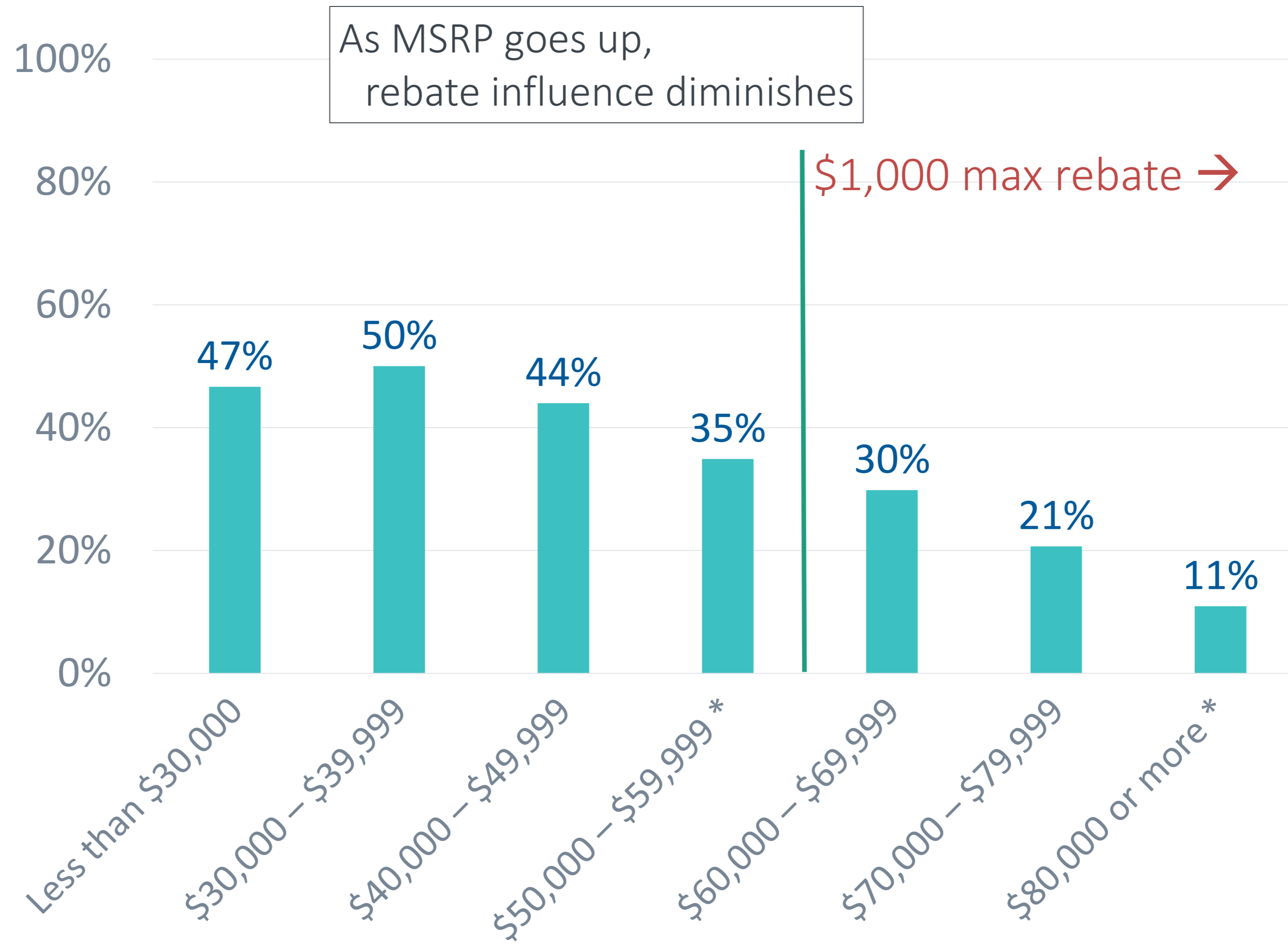


CVRP Consumer Survey: 2017–2019 edition. Filtered question, weighted $n = 6,158$. Starting 12/2019, PEVs with base MSRP > \$60k became ineligible.

* Each vehicle was assigned the minimum Manufacturer's Suggested Retail Price (MSRP) for that model/MY on fueleconomy.gov and does not reflect sale price. Where MSRPs were unavailable for a given MY, MSRPs from the previous or following MY were used.

Tesla Model 3's were assigned an MSRP of \$49k for MY 2018, \$35k for MY 2019 and 2020.

Percent of MOR-EV Respondents that are “Rebate Essential” by Base MSRP













* = small sample size (n < 30) in bin. MOR-EV Survey, 2014–17: n = 2,549 total respondents, weighted to represent N=5,754 participants



Federal Tax Credit Influence

Federal Tax Credit: Background

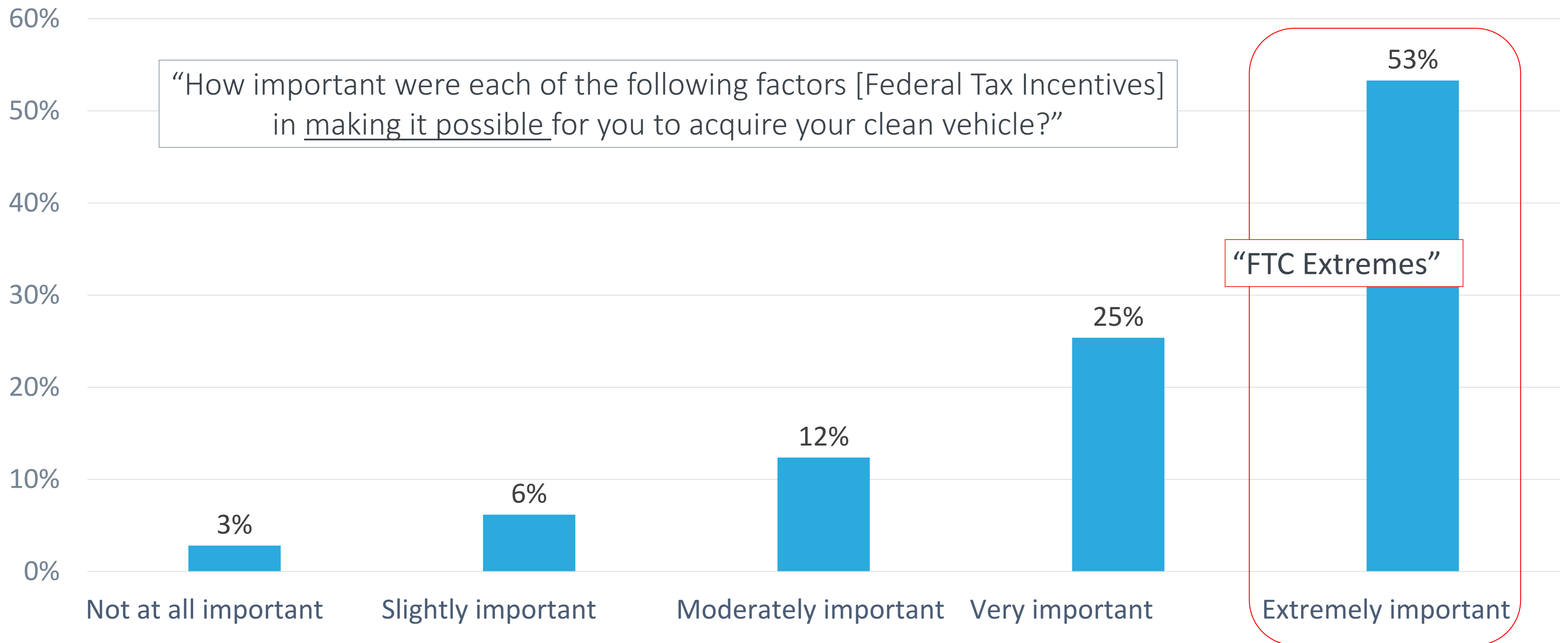
- Up to \$7,500 for the purchase or lease of a plug-in electric vehicle (PEV)*
 - Credit amount decreases on the second calendar quarter after a manufacturer has sold 200,000...

Tesla Motors		1/1/10 to 12/31/18	1/1/19 to 6/30/19	7/1/19 to 12/31/19	
	2012–19 Model S	EV	\$7,500	\$3,750	\$1,875
	2016–19 Model X	EV	\$7,500	\$3,750	\$1,875
	Model 3 Standard Range Plus	EV	\$7,500	\$3,750	\$1,875
	2017–19 Model 3 Long Range	EV	\$7,500	\$3,750	\$1,875
	2019 Model 3 Long Range AWD and AWD Performance	EV	\$7,500	\$3,750	\$1,875
	2018–19 Model 3 Mid Range	EV	\$7,500	\$3,750	\$1,875
	2008–11 Roadster	EV	\$7,500	\$3,750	\$1,875
Chevrolet		1/1/10 to 3/31/19	4/1/19 to 9/30/19	10/1/19 to 3/31/20	
	2017–19 Chevrolet Bolt EV	EV	\$7,500	\$3,750	\$1,875
	2011–19 Chevrolet Volt	PHEV	\$7,500	\$3,750	\$1,875
	2014–16 Chevrolet Spark EV	EV	\$7,500	\$3,750	\$1,875

* Light-duty plug-in electric vehicles, including both plug-in hybrid EVs (PHEVs) and battery EVs (BEVs)
 Images taken 8/16/19 from <https://www.fueleconomy.gov/feg/taxevb.shtml>

Importance of Federal Tax Credit for Plug-in EVs

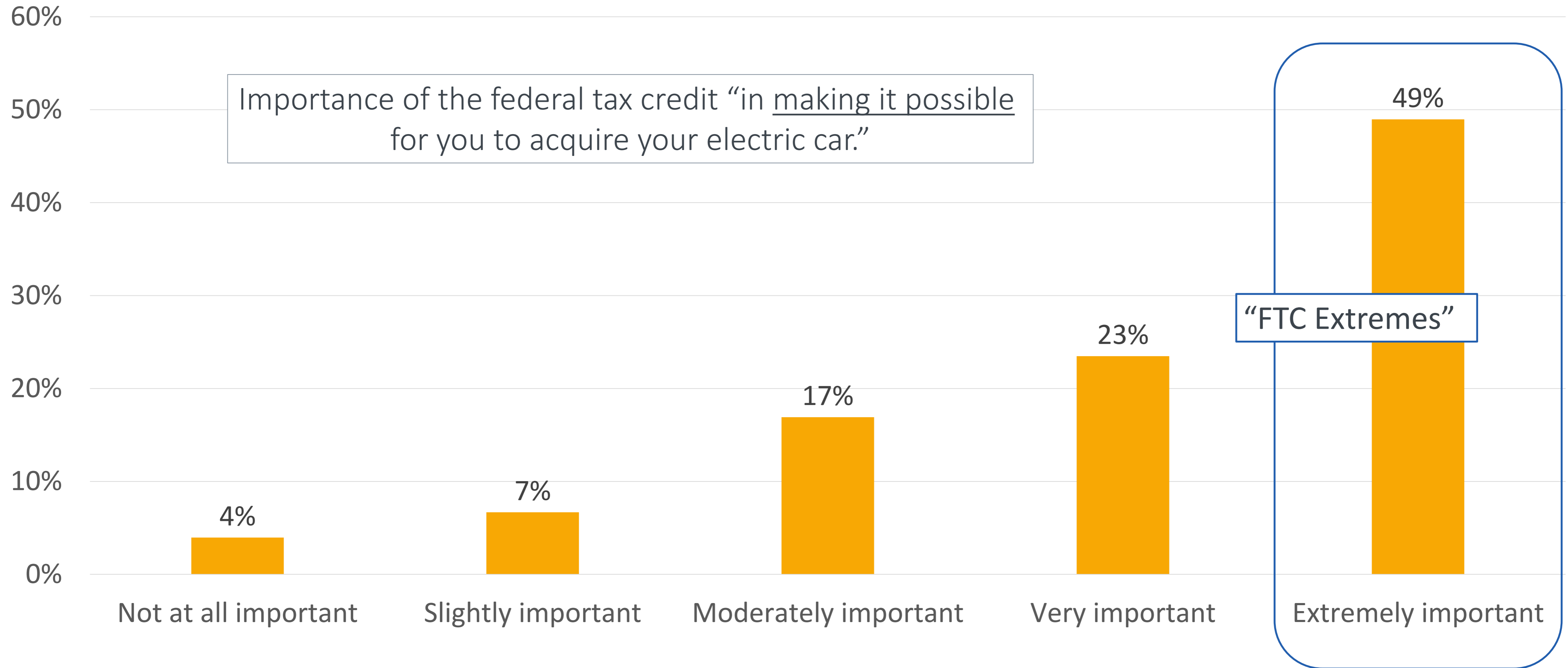
Consumer Survey, 2017–19 Edition*



* Note: federal tax credit began phasing out for Tesla and GM in 2019
Question-specific weighted n = 24,487.

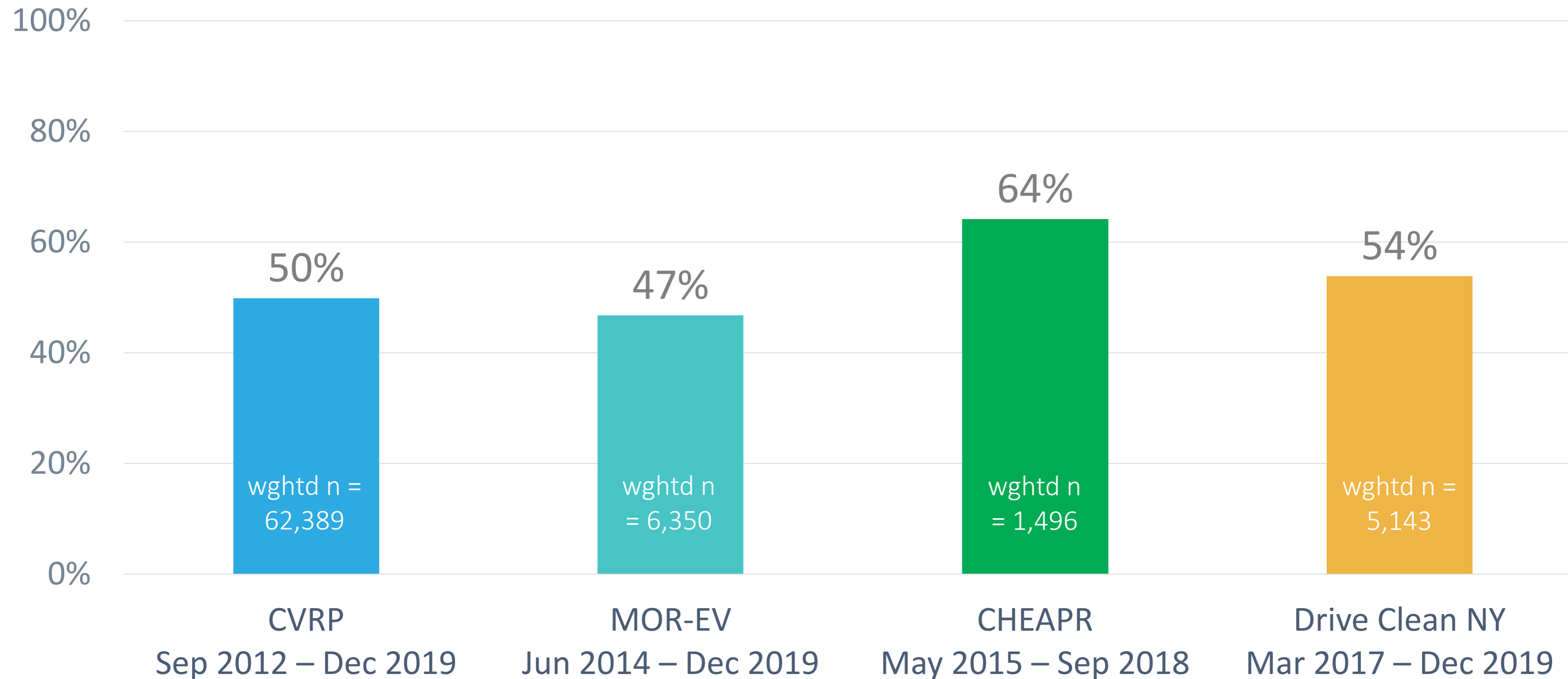
Importance of Federal Tax Credit for Plug-in EVs

CY 2019*



* Note: federal tax credit began phasing out for Tesla and GM in 2019
Question weighted n = 2,033

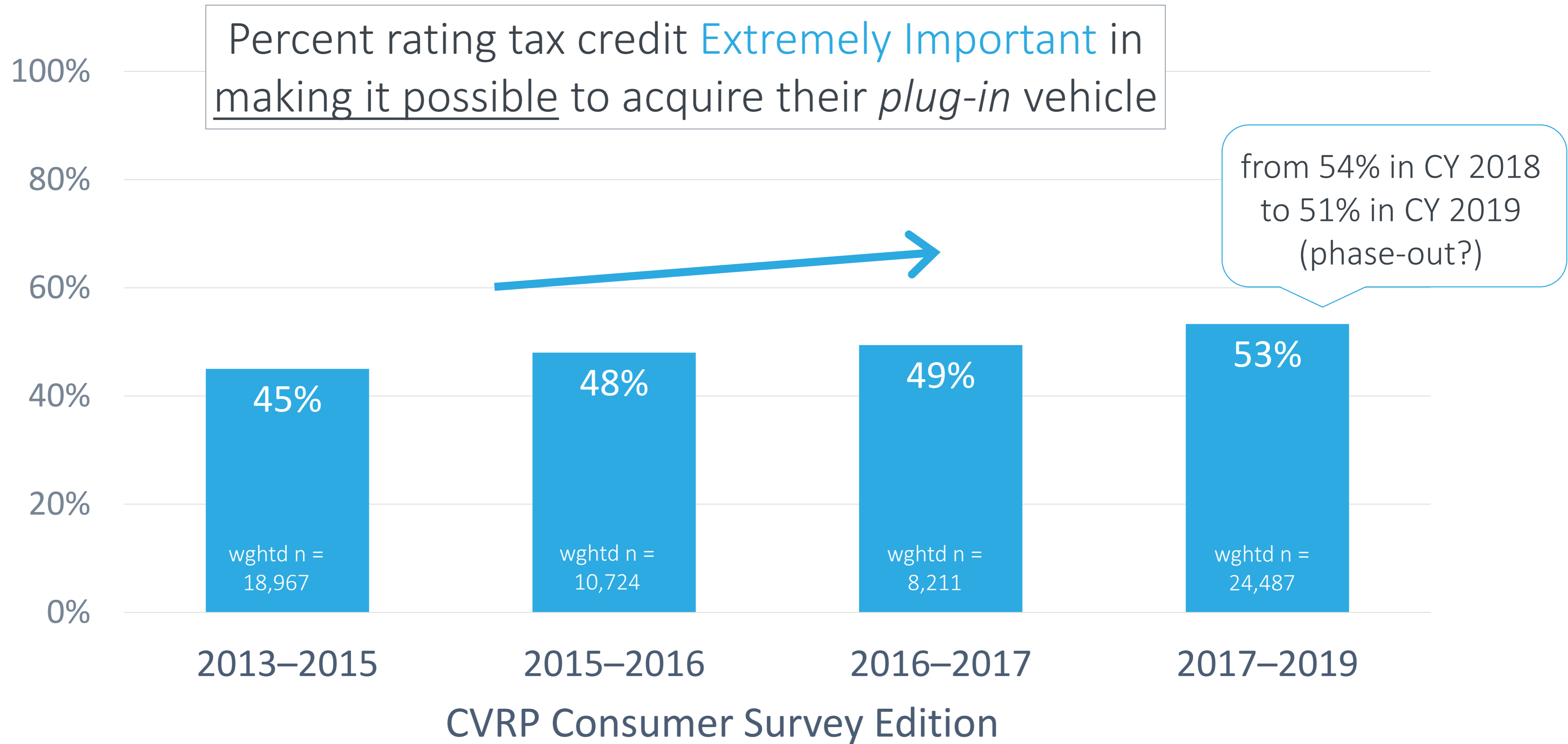
Percent Rating the Federal Tax Credit “Extremely Important” (“...in making it possible” to acquire plug-in EVs)



Weighted n values are question-specific.

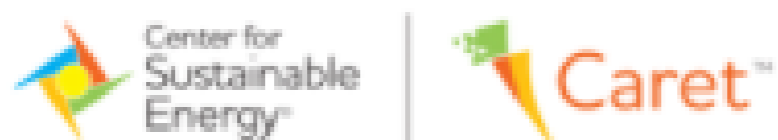
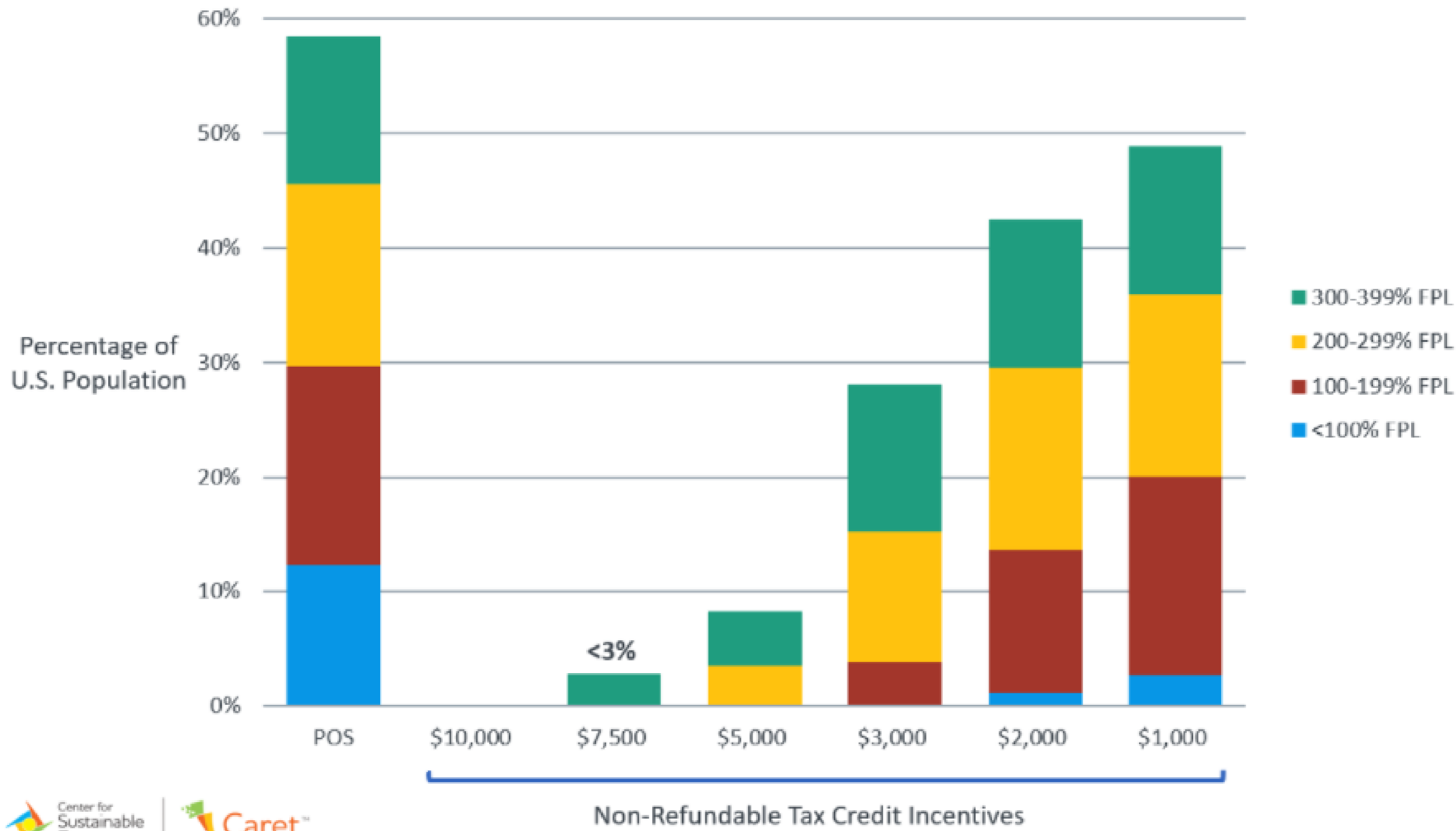
Overall datasets: 80,557 total survey respondents weighted to represent 380,700 rebate recipients.

Extreme Importance of Federal Tax Credit *Was* Increasing



Overall datasets: 65,643 total survey respondents weighted to represent 332,600 rebate recipients.

U.S. Population (by FPL status) Able to Receive Full Value of EV Tax Credit (based on average tax liability)



A close-up photograph of a hand plugging a charging cable into the charging port of a white electric car. The scene is set outdoors at sunset, with warm, golden light and lens flare effects. In the background, a parking lot with other vehicles and a building is visible. A semi-transparent white banner is overlaid across the middle of the image, containing the text 'Dealer Incentives'.

Dealer Incentives

How is the Dealer Incentive Working?

Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales

April 2017

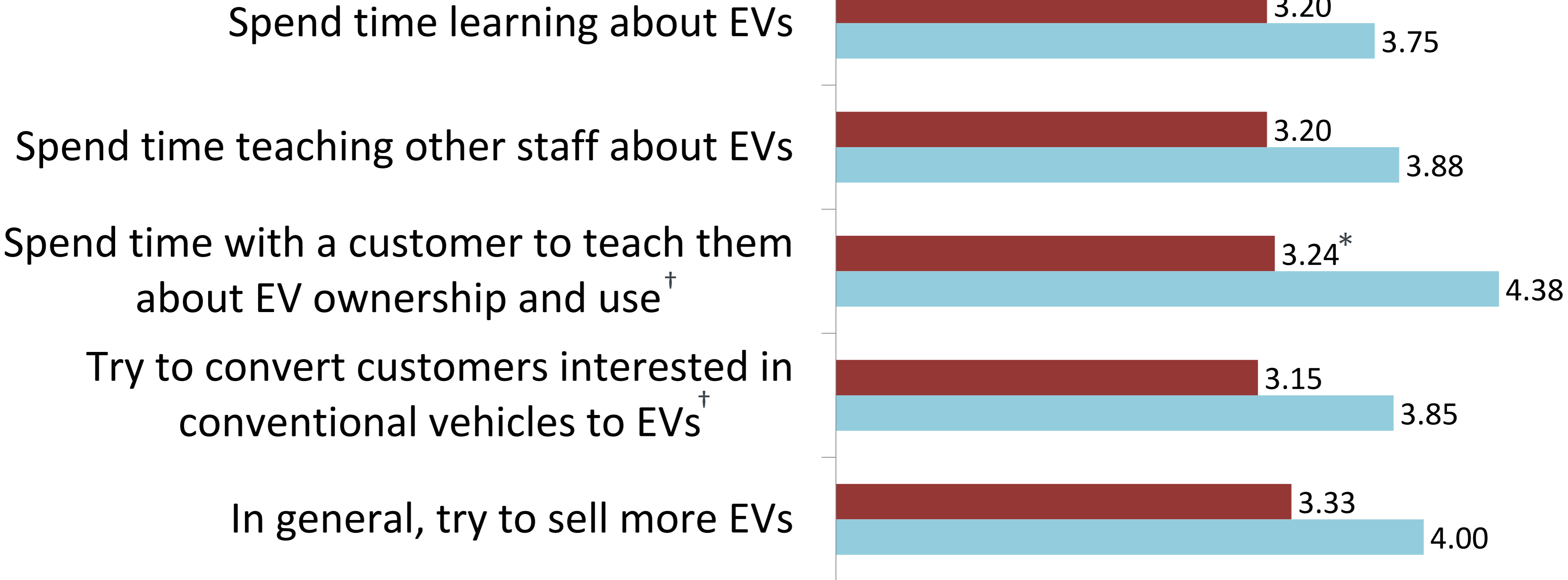
Prepared by
Center for Sustainable Energy



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

■ Have Never Owned an EV
 ■ Have Owned an EV

Not at all motivated Slightly motivated Moderately motivated Very motivated Extremely motivated



Respondents=57

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

*Statistically significant difference (p < 0.05)



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, representing sustainable transportation.

Summary and Select Findings

Select Findings: CY 2019 (part 1)



Program design and disruptions shape impacts

Vehicles Rebated

- Predominantly moderate-MSRP models:
 - > 92% with model-minimum MSRP <\$40,000 before incentives

Consumers Rebated: Characteristics *and Appropriate Baselines*

- Metrics of race/ethnicity and age becoming comparable to new-vehicle buyers, others trending in right direction
- Home ownership and, in particular, male gender much more frequent among rebated EV consumers
- Household income also higher, but 62% of rebates in CA < \$150k, 70% in NY < \$200k; different picture than painted by population stats
- New-car buying explains ½ to ⅔ of difference in the income metric between the population and rebate recipients

Paths Forward

- Strategic consumer segments present possible paths toward the mainstream and beyond to increased access

Select Findings: CY 2019 (part 2)



Vehicle Replacement

- Increased to 84+%:
 - > 77% were gasoline-fueled vehicles; > half were 5+ years old; > a quarter were 10+ years old
- Indicators of impact tend to be **increasing**
- PHEVs produced strong replacement rates early, BEVs catching up
- Related research: when compared to buying a *new* non-EV, rebated EVs may be saving >35 tons of GHG emissions per vehicle (12-year life) at costs <\$80/ton

Incentive Influence

- >89% found rebate an important enabler of EV acquisition; half or more would not have purchased/leased without it
- At MSRP greater than \$60k, rebate influence decreases substantially
- Attractive offerings (including Tesla products) have somewhat lower *Rebate Essentiality*, but the differences between luxury/non-luxury MSRPs are bigger
- Rebate influence and federal-tax-credit influence are similar
 - Half or more rated federal tax credit an extremely important enabler
 - Down somewhat from 2018 peak before phase out

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

Additional Resources

Select Publications *(Reverse Chronological)*

- B.D.H. Williams, J.B. Anderson, [Strategically Targeting Plug-In Electric Vehicle Rebates and Outreach Using “EV Convert” Characteristics, *Energies*. 14 \(2021\) 1899.](#)
- B.D.H. Williams, J.B. Anderson, A. Lastuka, [Characterizing Plug-in Hybrid Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase](#), in: 33rd Electr. Veh. Symp., Electric Drive Transportation Association (EDTA), EVS33, and Zenodo, Portland OR, 2020. <https://doi.org/10.5281/ZENODO.4021408>
- S. Hardman, P. Plötz, G. Tal, J. Axsen, E. Figenbaum, P. Jochem, S. Karlsson, N. Refa, F. Sprei, B.D. Williams, J. Whitehead, B. Witkamp, [Exploring the Role of Plug-In Hybrid Electric Vehicles in Electrifying Passenger Transportation](#), International EV Policy Council, UC Davis Plug-in Hybrid and Electric Vehicle Research Center, 2019.
- Pallonetti, B.D. Williams, [Exploratory Estimation of Greenhouse-Gas Emissions Reductions Associated with California’s Clean Vehicle Rebate Project](#), in: 98th Annu. Meet. Transp. Res. Board, National Research Council, Washington DC, 2019.
- B.D. Williams, J. Orose, M. Jones, J.B. Anderson, [Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition](#) | Clean Vehicle Rebate Project, Center for Sustainable Energy (CSE), San Diego CA, 2018.
- B.D. Williams, J.B. Anderson, [Strategically Targeting Plug-in Electric Vehicle Rebates and Outreach Using Characteristics of ‘Rebate-Essential’ Consumers in 2016–2017](#), in: 31st Int. Electr. Veh. Symp., Society of Automotive Engineers of Japan, Inc., Kobe, Japan, 2018.
- C. Johnson, B.D. Williams, C. Hsu, J.B. Anderson, [Summary Documentation of the Electric Vehicle Consumer Survey, 2013–2015 Edition](#) | Clean Vehicle Rebate Project, Center for Sustainable Energy (CSE), San Diego CA, 2017.
- C. Johnson, B.D. Williams, J.B. Anderson, N. Appenzeller, [Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales](#), Center for Sustainable Energy (CSE), 2017.
- C. Johnson, B.D. Williams, [Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by California’s Electric Vehicle Rebate](#), *Transp. Res. Rec.* 2628 (2017) 23–31.

Select Presentations *(Reverse Chronological)*

- [CVRP CY 2019 Data Brief: Vehicle Replacement & Incentive Influence](#)
- [CVRP CY 2019 Data Brief: Consumer Characteristics](#)
- [CVRP Data Brief: MSRP Considerations](#)
- [EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts](#)
- [What Vehicles Are Electric Vehicles Replacing and Why?](#)
- [Electric Vehicle Incentives and Policies](#)
- [Proposed FY 2019–20 Funding Plan: Final CVRP Supporting Analysis](#)
- [CVRP: Data and Analysis Update](#)
- [Cost-Effectively Targeting EV Outreach and Incentives to “Rebate-Essential” Consumers](#)
- [Electric Vehicle Rebates: Exploring Indicators of Impact in Four States](#)
- [Targeting EV Consumer Segments & Incentivizing Dealers](#)
- [Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Select Findings](#)
- [Yale Webinar: Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Select Findings](#)
- [CVRP Income Cap Analysis: Informing Policy Discussions](#)

Introducing...



Caret™ is a dynamic platform for designing and optimizing EV incentive programs that empowers decision-makers to make data-driven choices.

It helps policymakers determine which mix of incentives will encourage EV adoption and reduce GHG emissions at the lowest cost and in the shortest time.

With Caret™ you can:

- Take EV incentive ideas for a virtual test drive
- See in real time the costs and impacts of various decisions
- Continuously optimize incentives to meet your goals

Learn more about Caret™ at EnergyCenter.org/software/caret

Recommended citation:

B.D.H. Williams and N. Pallonetti, Presentation: “Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness,” Presented to the Collaboration for ZEV Success, July 2021.

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