

Growing the Electric Vehicle Market: EV Adopters, “Rebate Essentials,” and “EV Converts”

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December 2019 version with updates and corrections

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with thanks to Michelle Jones, Jamie Orose, and Laura Parsons



Center for
Sustainable
Energy™

CSE Areas of Expertise



Clean Transportation

Adoption of electric vehicles
and deployment of charging
infrastructure



Built Environment

Advancing energy efficiency
and renewable resources



Technology Convergence

Interconnecting systems to
achieve decarbonization

State EV Rebate Programs Administered by CSE

(as of Jan. 2019; Oregon pending)



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 e-miles only
- Income cap
- Increased rebates for lower-income households

- Base MSRP ≤ \$50k
- No fleet rebates

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

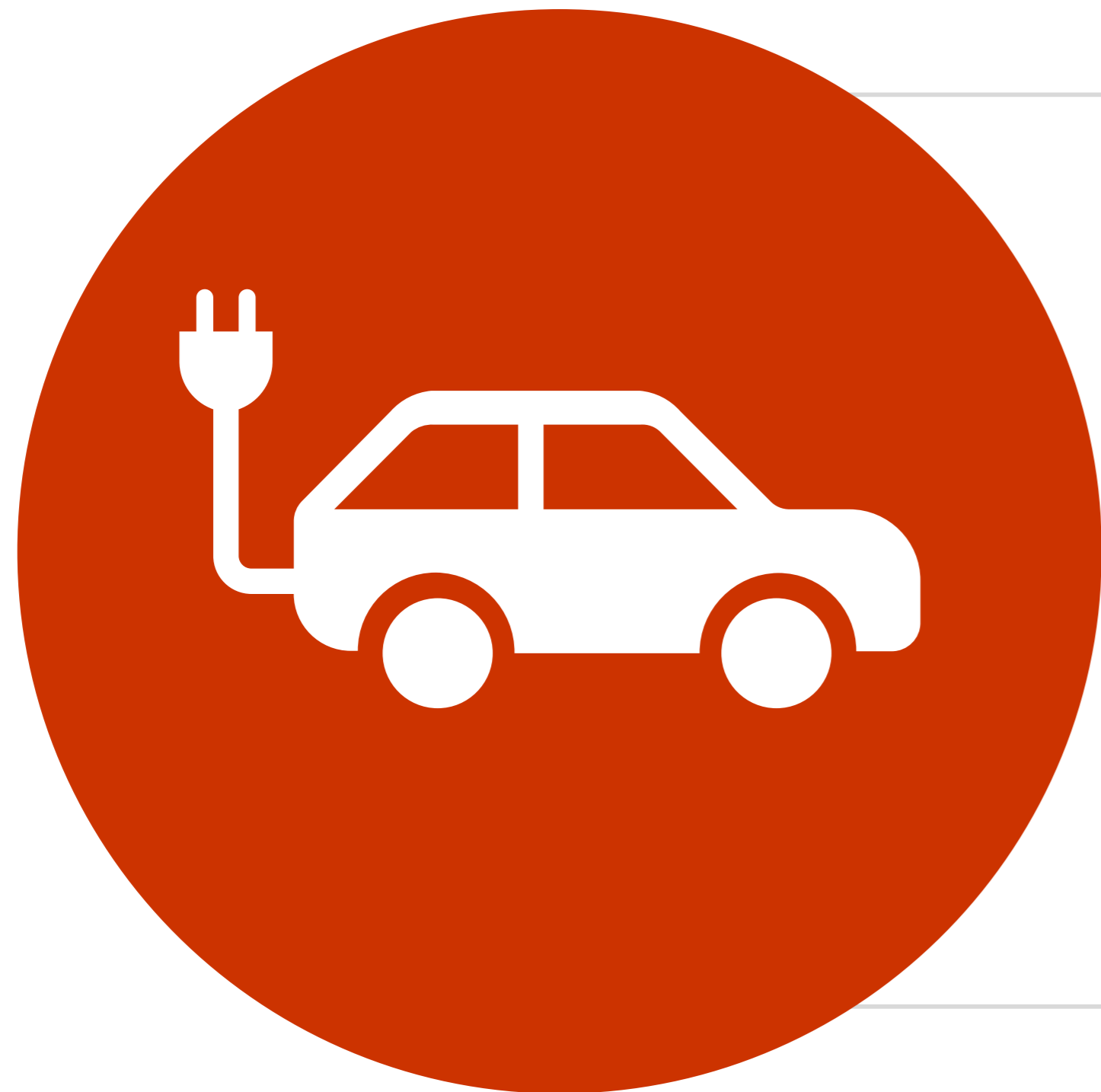
- Base MSRP > \$60k = \$500 max.;
- Point-of-sale

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	Dec. 2010 – May 2017	June 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

* Weighted to represent the program population along the dimensions of vehicle category, vehicle model, buy vs. lease, and county (using raking method)

How can research help us grow markets for electric vehicles?



Low-Hanging Fruit

Understand existing adopters to reinforce and scale what is already working



Tough Nuts to Crack

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



Expanding Market Frontiers

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

Characterizing (Rebated) EV Market Segments



Existing Adopters: Market Acceleration

Characterize existing, generally enthusiastic and pre-adapted consumers, to target similar consumers who have the highest likelihood of adoption



“Rebate Essential” Consumers: Minimizing Free Ridership

Characterize adopters most highly influenced by supportive resources to join the EV market, to improve the cost-effectiveness of outreach and program design



“EV Converts”: Moving Mainstream

Characterize EV consumers with low initial interest in EVs, to look for additional opportunities to expand into the mainstream



Existing Adopters: Recent Rebate Recipients

Data used:

- CA's CVRP Consumer Survey, 2016–2017 edition

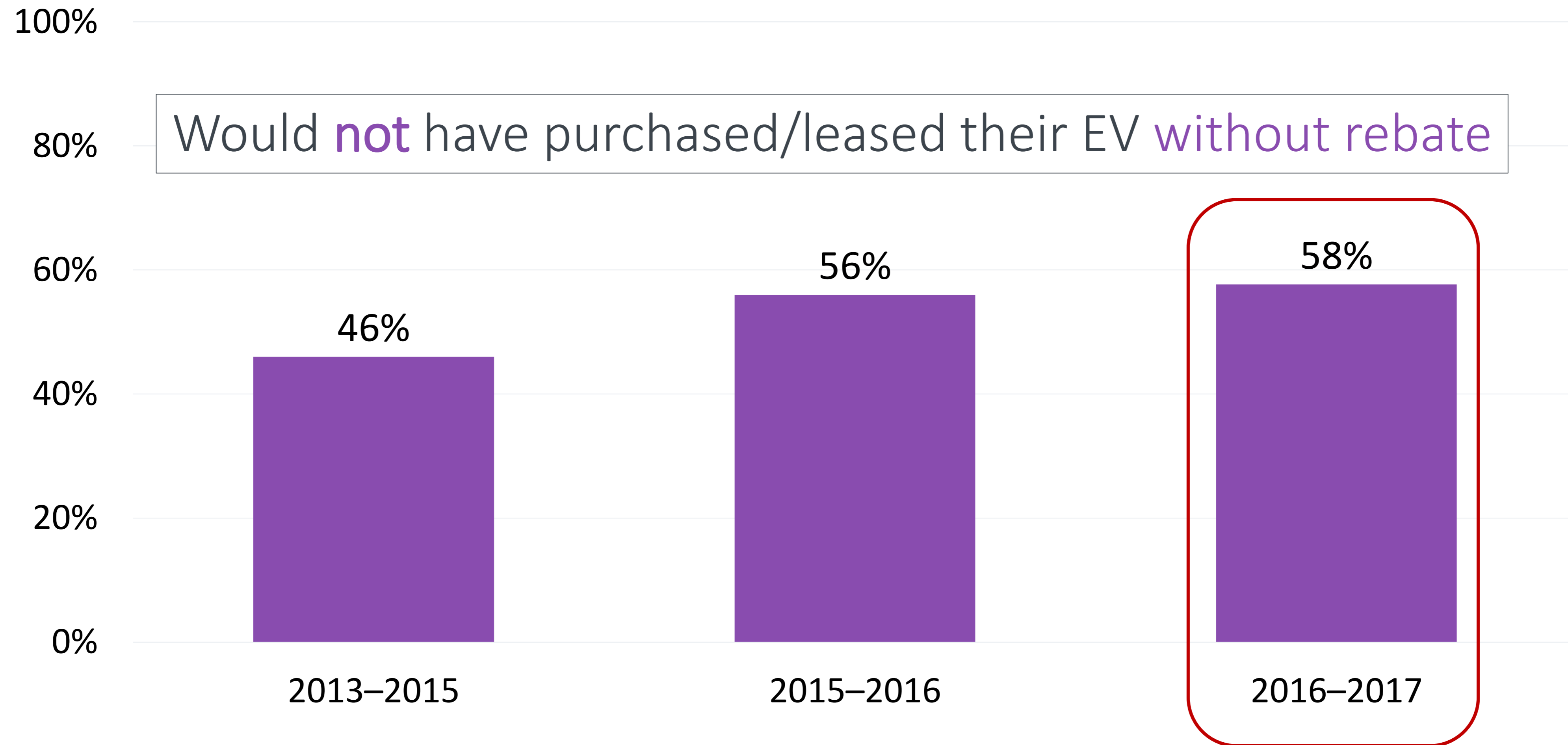
Subgroup examined:

- Individual consumers
- **Purchased/leased PEVs between Nov 2016–May 2017**
–after most recent change to CVRP on Nov. 1st, 2016
- Received \$1,500–\$4,500 rebates

Additional details are available in the appendix slides



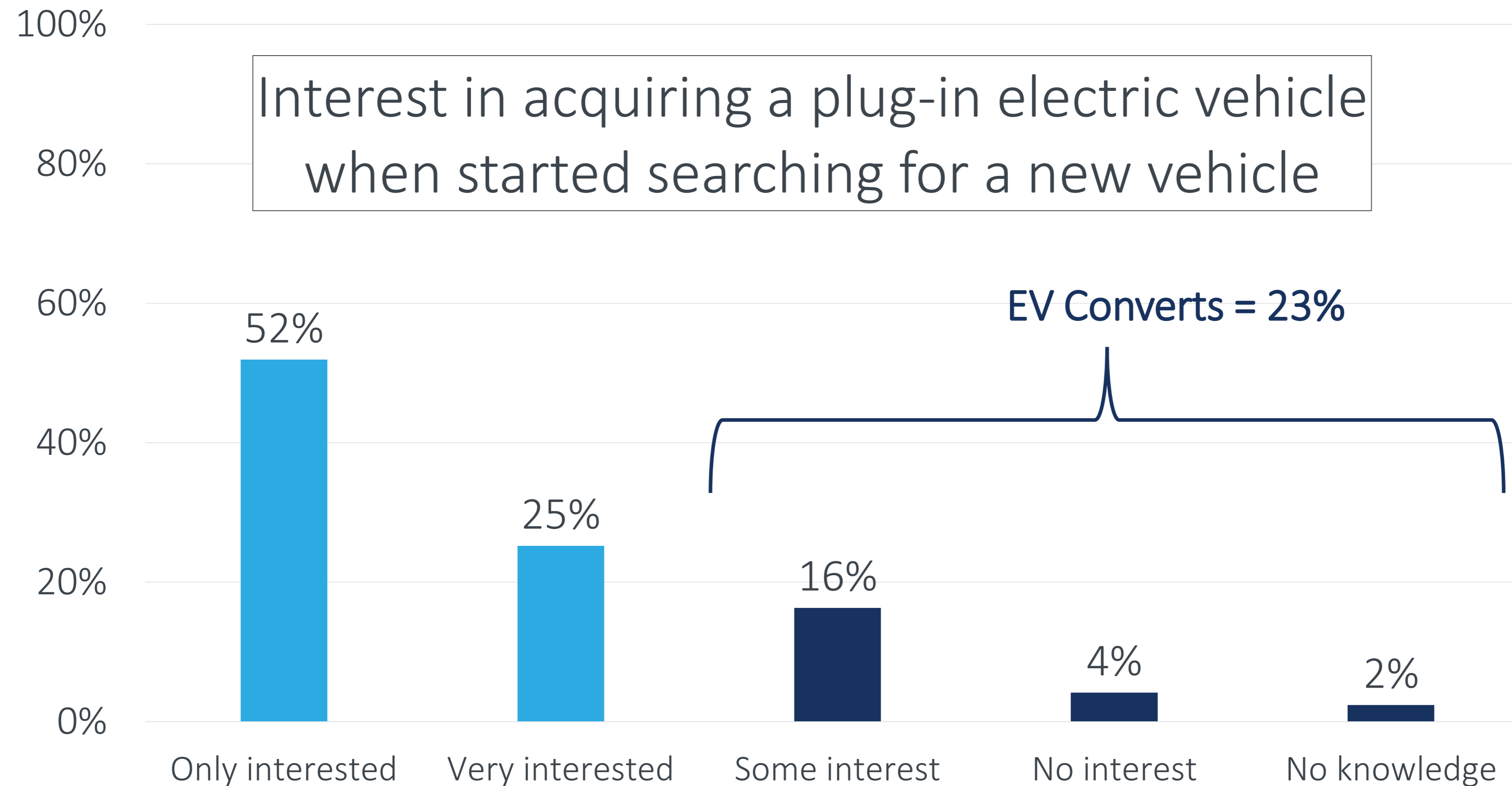
“Rebate Essentials”: Highly Influenced



CVRP Consumer Survey: 2013–2015 edition: weighted, question n=19,208;
2015–2016 edition: weighted, question n=11,457;
2016–2017 edition: weighted, question n=9,261



“EV Converts”: Low Initial Interest



Analysis: Description

Corrected and Updated

Setting an Appropriate Baseline: CA Car Buyers Are Different Than the Population

	California Population (Census 2018)	New-vehicle Buyers (2017 CA-NHTS)
Selected Solely White/Caucasian	38%	51%
Male	50%	50%
≥ Bachelor's Degree*	33%	58%
Own Residence	55%	63%
≥ 50 Years Old	32%	46%
≥ \$150k HH Income	18%	32%

Census 2018: American Community Survey, 2013–2017 5-Year Estimates, Tables DP05, S1501, DP04, S0101, DP03
National Household Travel Survey, California Add-On, 2017, weighted n = 742,702. 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.

* Census data: individual educational attainment for population 25 or older, NHTS: education of main driver

EV Consumer Characteristics




	California Population (Census 2018)	New-vehicle Buyers (2017 CA-NHTS)	EV Consumers, rebated for Nov. 2016 – May 2017 adoption (CVRP Consumer Survey, weighted n=5,327)		
			All	PHEV	BEV
Selected Solely White/Caucasian	38%	51% <	58%	60%	57%
Male	50%	50% <<<	72%	70%	73%
≥ Bachelor's Degree*	33%	58%	81%	78%	83%
Own Residence	55%	63% <<	79%	76%	81%
≥ 50 Years Old	32%	46% <	50%	53%	47%
≥ \$150k HH Income	18%	32% <	40%	34%	44%

Census 2018: American Community Survey, 2013–2017 5-Year Estimates, Tables DP05, S1501, DP04, S0101, DP03
 National Household Travel Survey, California Add-On, 2017, weighted n = 742,702. 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.

CVRP Consumer Survey, 2016–17 edition: filtered to purchase/lease dates Nov 2016–May 2017 & analytical filters, weighted n = 5,327

* Census data: individual educational attainment for population 25 or older, NHTS: education of main driver, CVRP survey: highest household attainment

Target Segment Comparisons to Car Buyers

	California Population (Census 2018)	New vehicle buyers (2017 CA-NHTS)	EV consumers, rebated for Nov. 2016 – May 2017 adoption (CVRP Consumer Survey, weighted n=5,327)		
			All 	Rebate Essentials 	Converts 
Selected Solely White/Caucasian	38%	51%	58%	53%	50%
Male	50%	50%	72%	73%	67%
≥ Bachelor’s Degree*	33%	58%	81%	82%	79%
Own Residence	55%	63%	79%	77%	72%
≥ 50 Years Old	32%	46%	50%	44%	41%
≥ \$150k HH Income	18%	32%	40%	38%	32%

Census 2018: American Community Survey, 2013–2017 5-Year Estimates, Tables DP05, S1501, DP04, S0101, DP03
 National Household Travel Survey, California Add-On, 2017, weighted n = 742,702. 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.

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* Census data: individual educational attainment for population 25 or older, NHTS: education of main driver, CVRP survey: highest household attainment

Analysis: Explanation

—

Factors that Increase the Odds of Being an EV Convert* (Relative to Other EV Adopters)



EV consumers (both PHEV and BEV) are more likely converts if they:

- are *younger*, do *not* have *solar*
- are *not* highly *motivated by* reducing *environmental* impacts or *HOV lane* access
- do *not* spend time *researching EVs online*

Additionally:

- PHEV consumers are more likely converts if they chose PHEVs other than the Volt
- BEV consumers are more likely converts if they:
 - are *women*, do *not* identify as *white*/Caucasian, *live in* the *Central Valley or LA/SoCal* area, or have *lower income*
 - are *moderately motivated by energy independence*
 - Have *no workplace charging*
 - choose BEVs other than Bolt or Tesla (long-range BEVs?)
 - find the *rebate essential* to purchase/lease

* Significantly associated factors in binary logistic regression

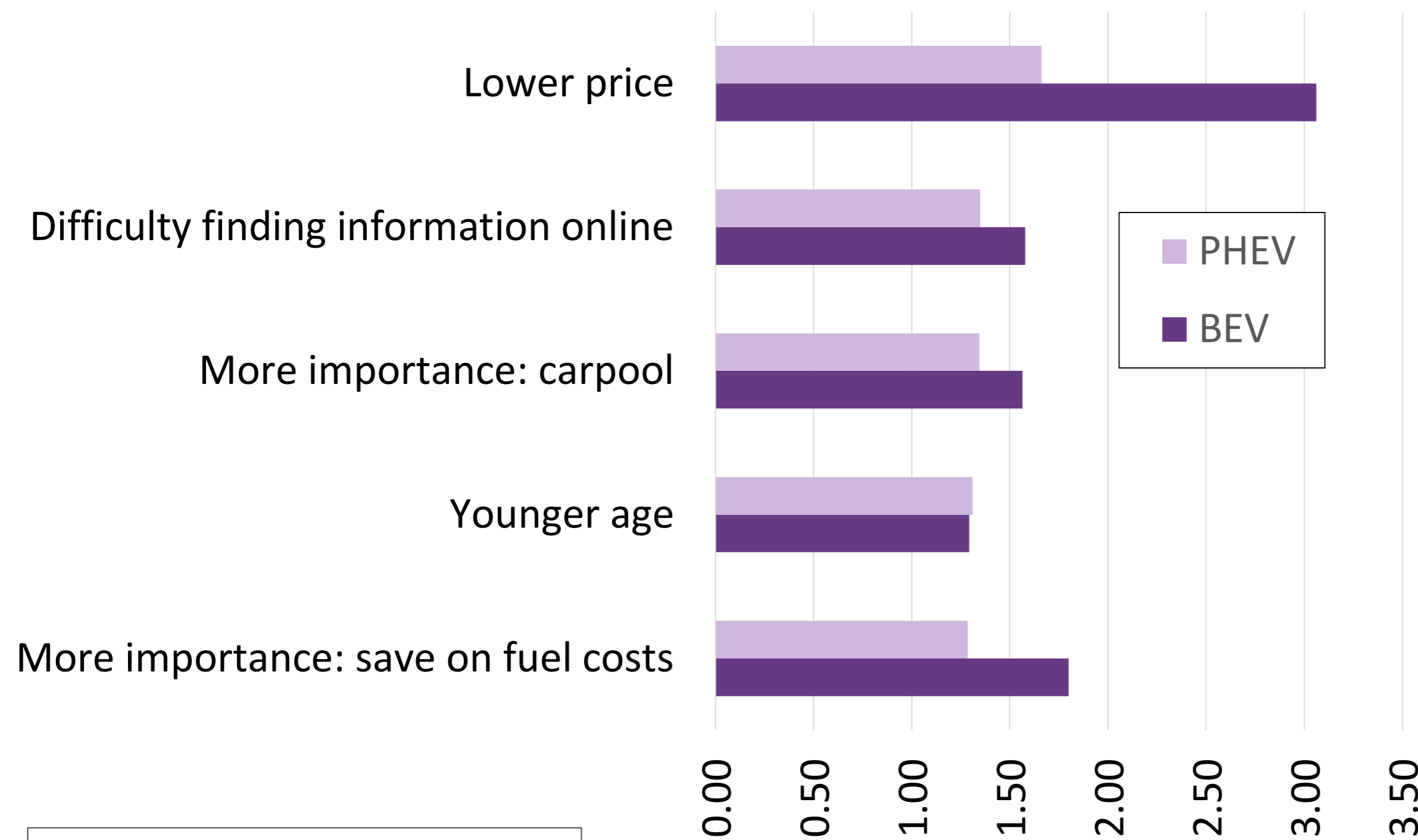
Analysis: Prioritization

Comparison to Other Plug-in EV Adopters: Rebate Essential Explanatory Factors*

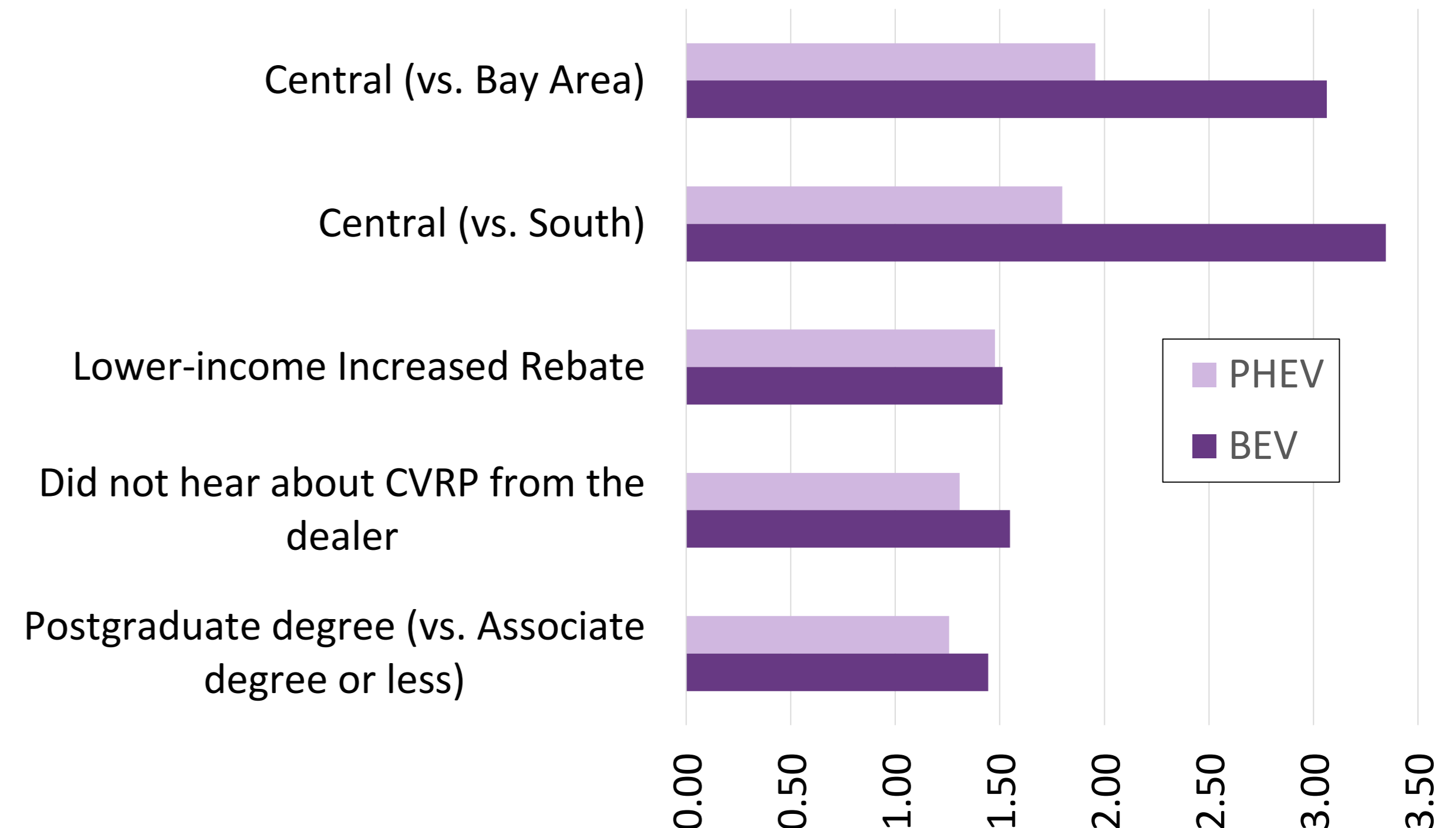


Corrected and Updated

Continuous variables



Categorical variables



X-Standardized Rebate Essentiality Odds Ratios

For more info, see:

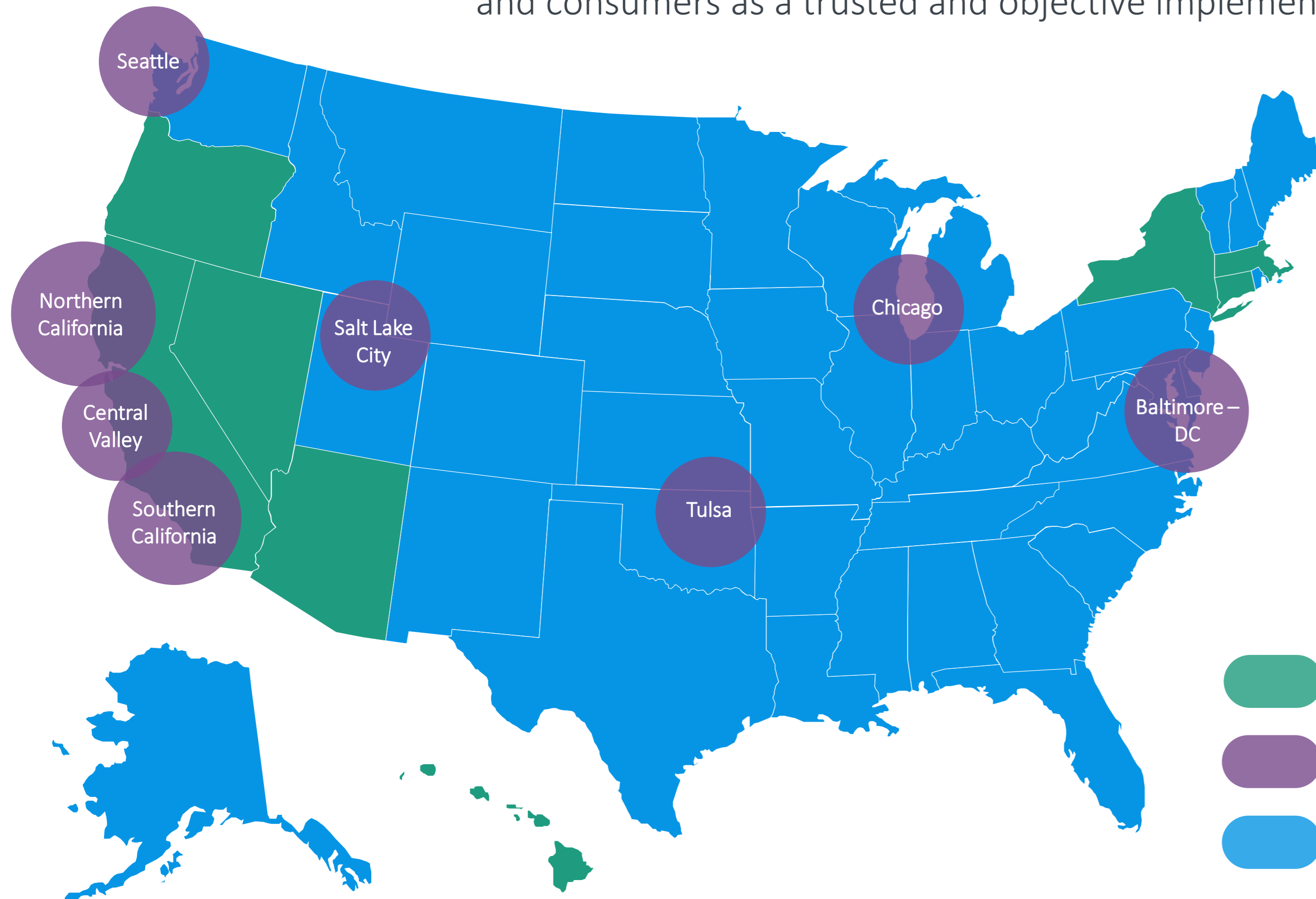
- 2016 BECC talk
- 2017 TRR [paper](#) and TRB [poster](#)
- 2018 EVS 31 [talk...](#)

* Significantly associated factors in binary logistic regression.

Note: standardized odds ratios for categorical and continuous variables are not directly comparable.

How can we help?

We work with governments, regulators, utilities, CCAs, businesses, property owners, and consumers as a trusted and objective implementation partner and technical advisor.






For more information:

<https://cleanvehiclerebate.org/eng/program-reports>

<https://energycenter.org/thought-leadership/research-and-reports>

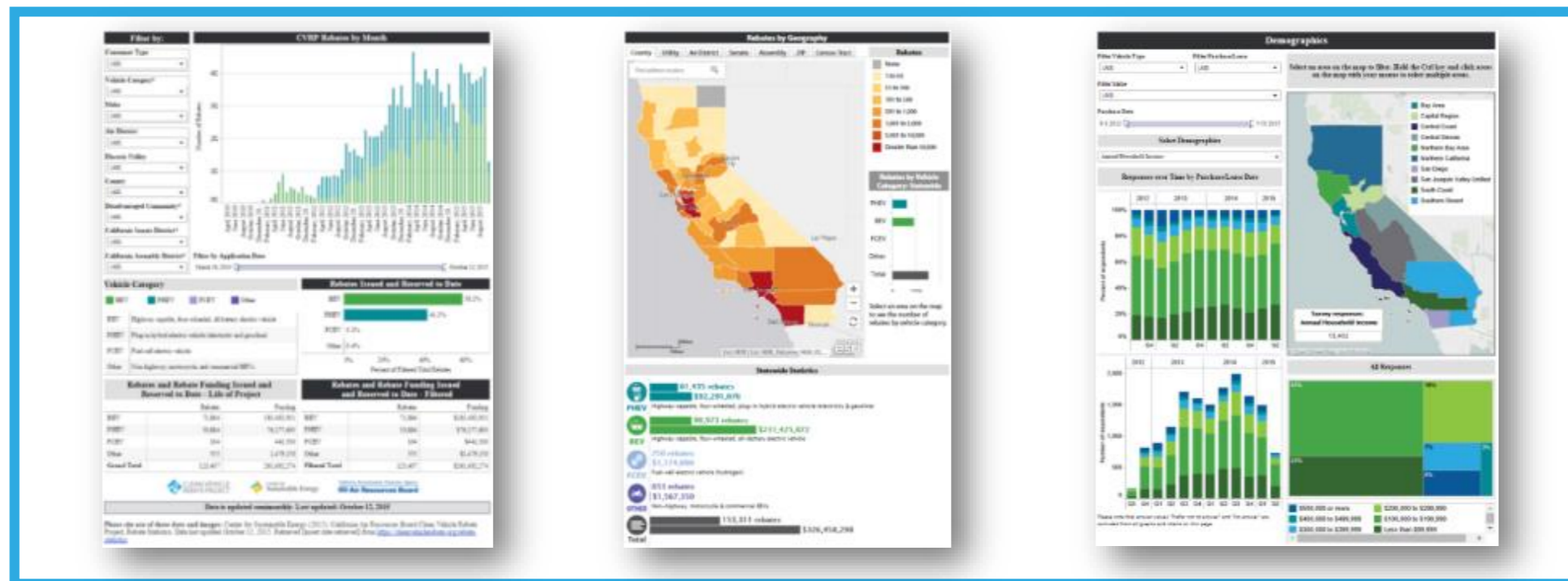
brett.williams@energycenter.org

-  Statewide incentive programs
-  Region-specific solutions
-  Tackling issues of national importance

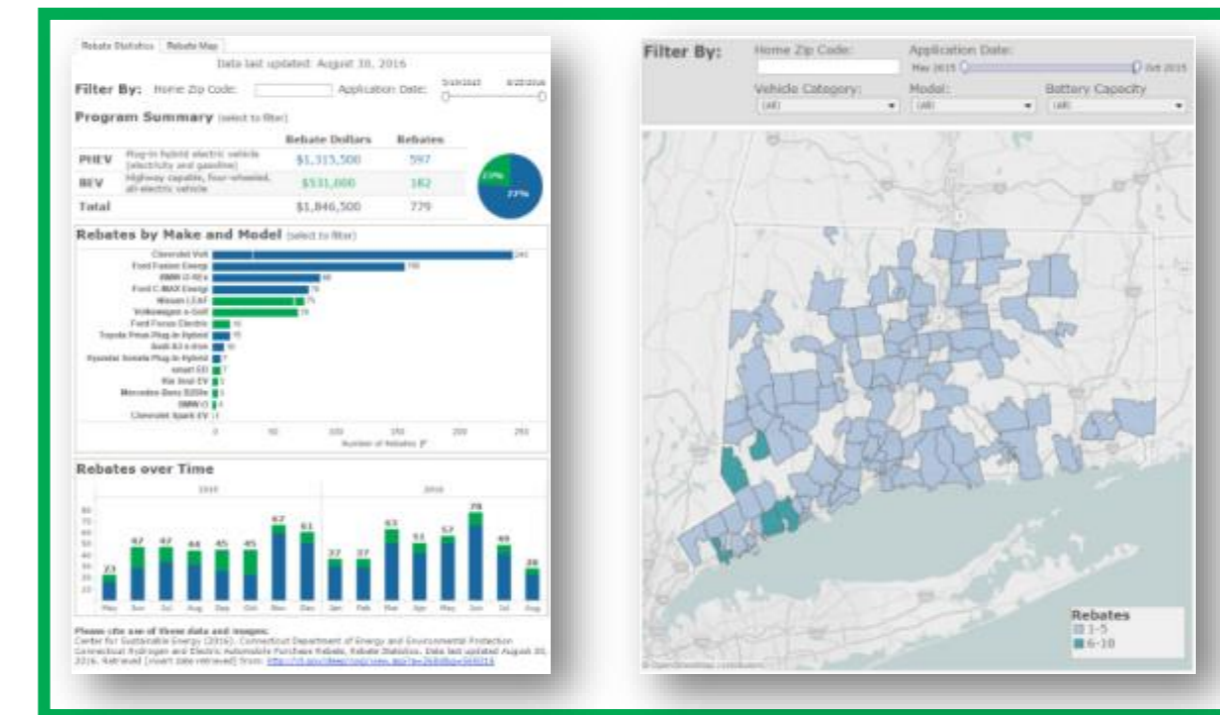
Appendix

Public dashboards and data facilitate informed action

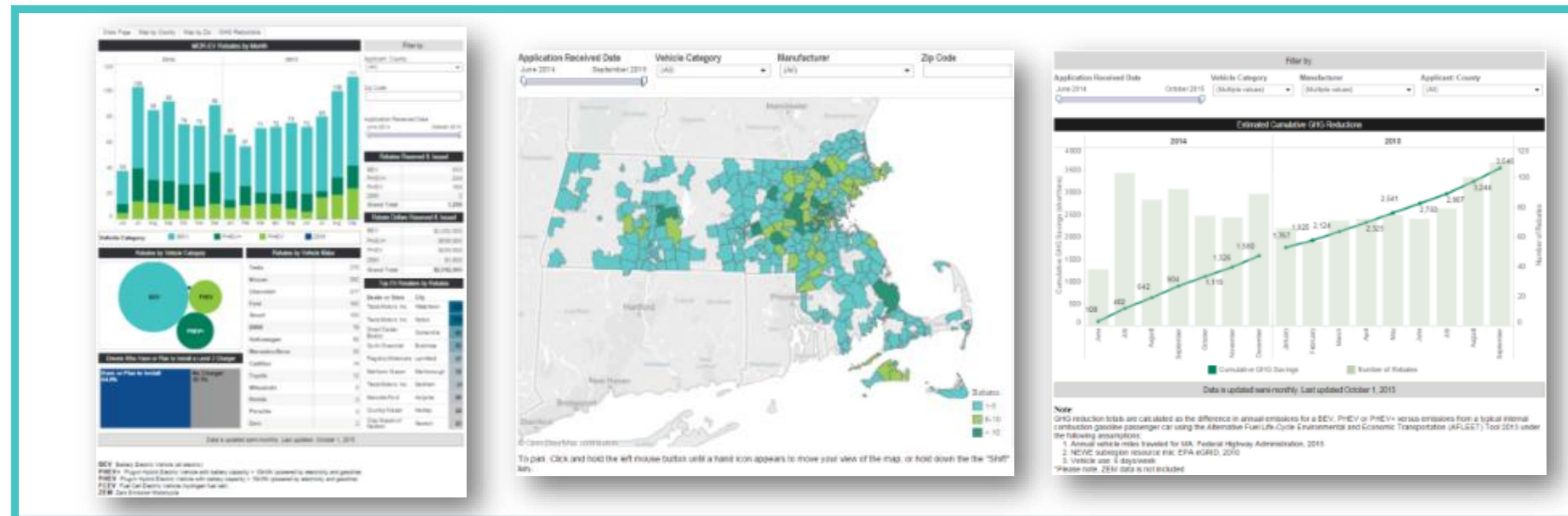
- >300,000 EVs and consumers have received >\$675 M in rebates
- >45,000 survey responses being analyzed so far, statistically represent >200,000 consumers
 - Reports, presentations, and analysis growing



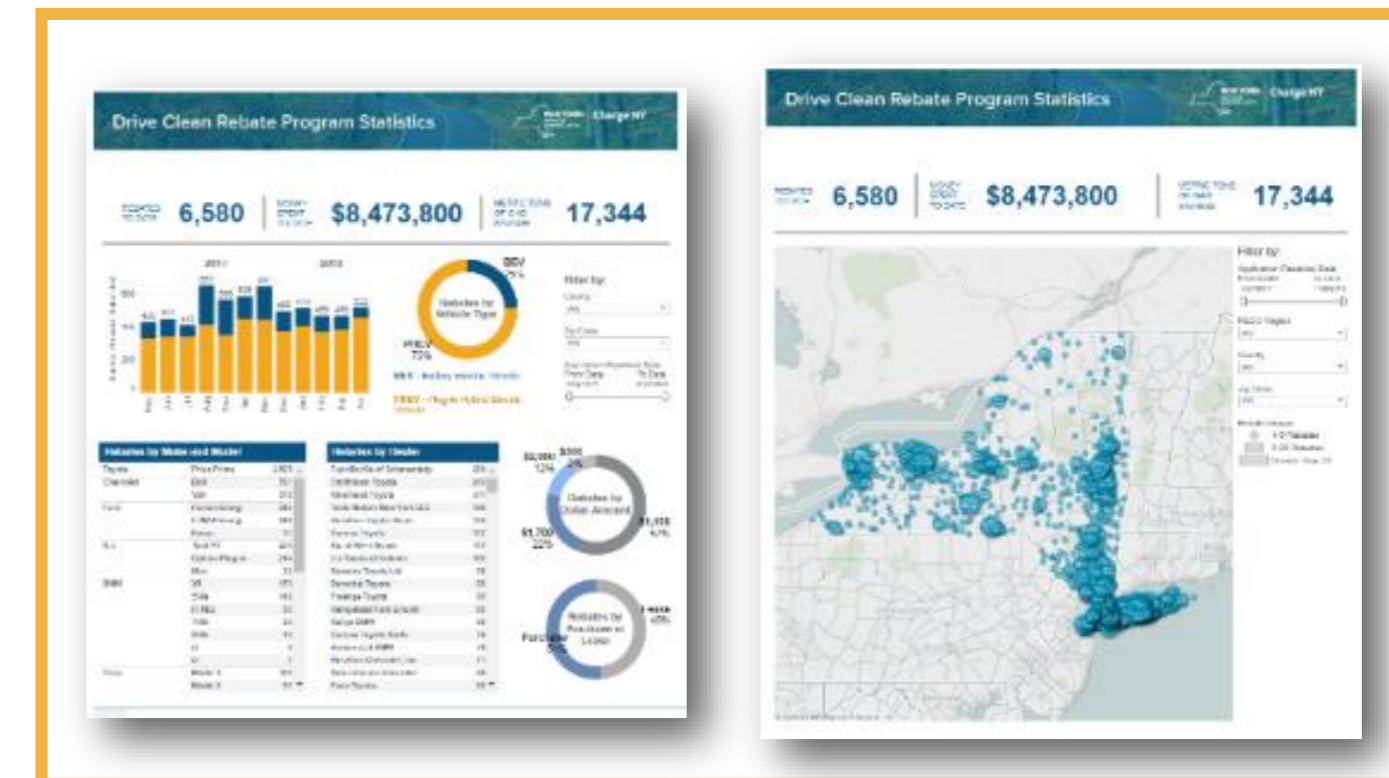
cleanvehiclerebate.org



ct.gov/deep



mor-ev.org



nyserdera.ny.gov

Data Used: CVRP Consumer Survey, 2016–17 edition

- Responses from individual PEV consumers

n=8,957

- Weighted to represent applicant population

N=46,839

- After filtering

- current program era: purchase dates Nov 2016–May 2017
- other analytical factors

weighted n=5,327

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	

CSE: A Nonprofit With Billion Dollar Program Management Experience

- **Five Statewide Electric Vehicle Rebate Programs**
 - > \$700 million
 - > 300,000 rebated vehicles
 - > 200,000 consumers characterized
- **Statewide EV Charging Incentives**
 - > \$100 million
 - 367 DC fast chargers, 211 Level 2 chargers and growing
 - Diverse: urban, rural, mountains, deserts, plains
- **Solar On Multifamily Affordable Housing Program**
 - \$1 billion
 - 300 MW + virtual net energy metering



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