NATIONAL GOVERNORS ASSOCIATION

Crafting Incentives, Developing Policies & Building Consumer Awareness

Nancy Seidman, Senior Advisor,
Regulatory Assistance Project

#WeTheStates

NATIONAL GOVERNORS ASSOCIATION

Crafting Incentives, Developing Policies & Building Consumer Awareness

Brett Williams, Senior Principal Advisor – EV Programs, Center for Sustainable Energy

#WeTheStates

Crafting Incentives

North/Central Regional Transportation Electrification Workshop

April 29th, 2019, Kansas City, Missouri

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

With thanks to: Nick Pallonetti, Michelle Jones, Nick Russell, Ryan Bodanyi, John Anderson and others at CSE

CALIFORNIA CLEAN VEHICLE REBATE PROJECT

MOR-EV Massachusetts Offers Rebates for Electric Vehicles

CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate

NEW YORK STATE OF OPPORTUNITY. NYSERDA

Center for Sustainable Energy

Center for Sustainable Energy (CSE)

Building Performance

Clean Transportation

Distributed Generation

Energy Efficiency

Energy Storage

Renewable Energy

Center for Sustainable Energy®

EV Rebate Design (as of Jan. 2019)

	CALIFORNIA CLEAN VEHICLE REBATE PROJECT™	MOR-EV Massachusetts Offers Rebates for Electric Vehicles	CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	NEW YORK STATE
Fuel-Cell EVs 	$5,000	$1,500	$5,000	e-miles ≥ 120 $2,000 ≥ 40 $1,700 ≥ 20 $1,100 < 20 $500
All-Battery EVs 	$2,500	$1,500	e-miles ≥ 200 $2,000 ≥ 120 $1,500 < 120 $500	
Plug-in Hybrid EVs 	$2,500 (i3 REx) $1,500	BEVx only: $1,500	≥ 45 $1,000 < 45 $500	
Zero-Emission Motorcycles 	$900	$450		
	e-miles ≥ 20 only; Consumer income cap and increased rebates for lower-income households	MSRP ≤ $50k, no fleet rebates	MSRP ≤ $60k FCEVs, ≤ $50k BEVs, PHEVs; dealer assignment; $150 dealer incentive	MSRP > $60k = $500 max.; point-of-sale via dealer

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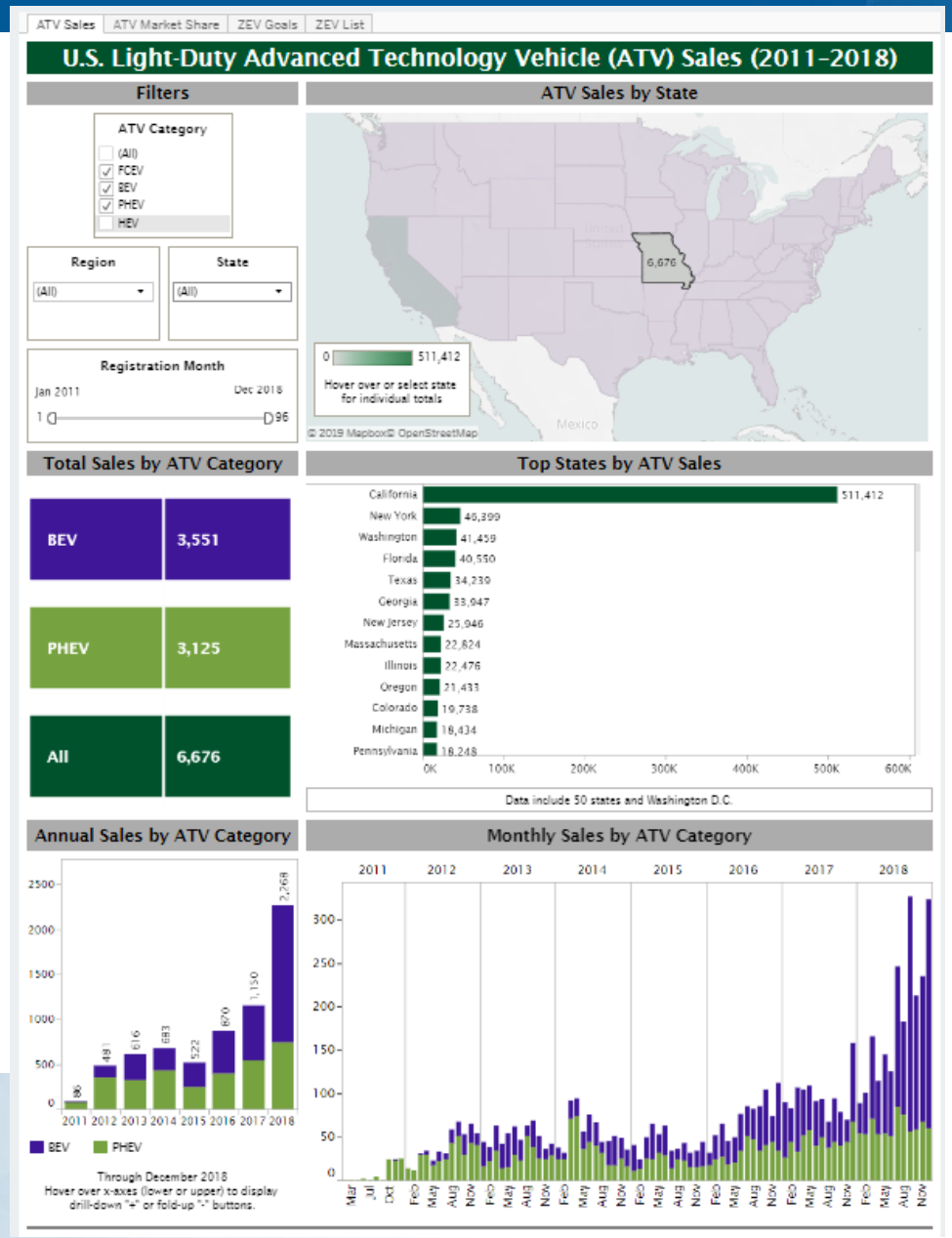
50-State EV Sales and Market-Share Dashboard



Linked at
zevfacts.com

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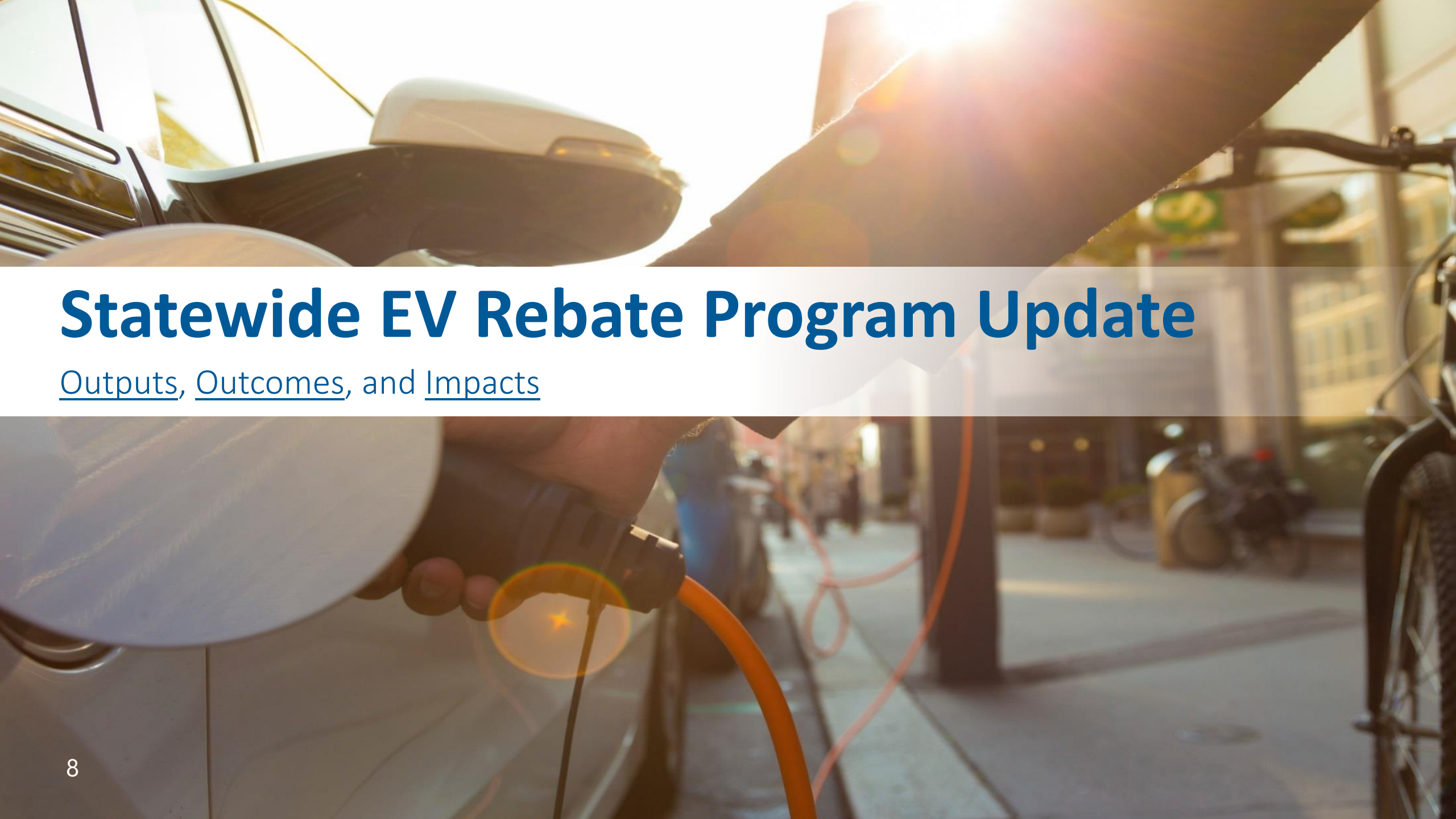
Outline

- Statewide EV Rebate Program Update
  - Outputs: Vehicles & Consumers Rebated
  - Outcomes: Behaviors Influenced
  - Impacts: Emission & Market
- Additional Considerations
  - Rebate Effectiveness
  - Equity: Income and MSRP caps

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



Statewide EV Rebate Program Update

Outputs, Outcomes, and Impacts

EV Rebate Design (as of Sept. 2018)

	CALIFORNIA CLEAN VEHICLE REBATE PROJECT	MOR-EV Massachusetts Offers Rebates for Electric Vehicles	CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	NEW YORK STATE
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All-Battery EVs 	$2,500	$2,500	e-miles ≥ 175 $3,000 ≥ 100 $2,000 < 100 $500	
Plug-in Hybrid EVs 	$2,500 (i3 REx) $1,500	≥10 kWh $2,500 <10 kWh $1,500	≥ 40 $2,000 < 40 $500	
Zero-Emission Motorcycles 	$900	$750		
	e-miles ≥ 20 only; Consumer income cap and increased rebates for lower-income households	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

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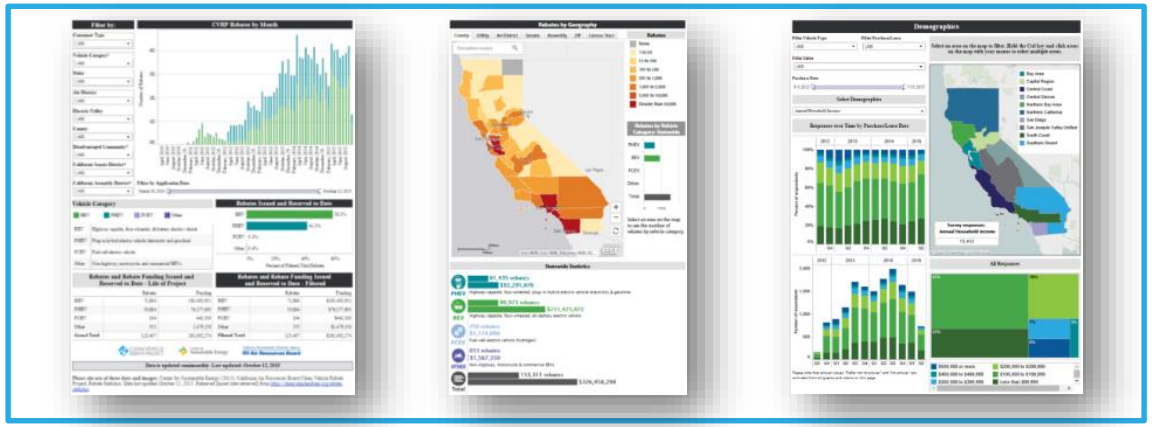
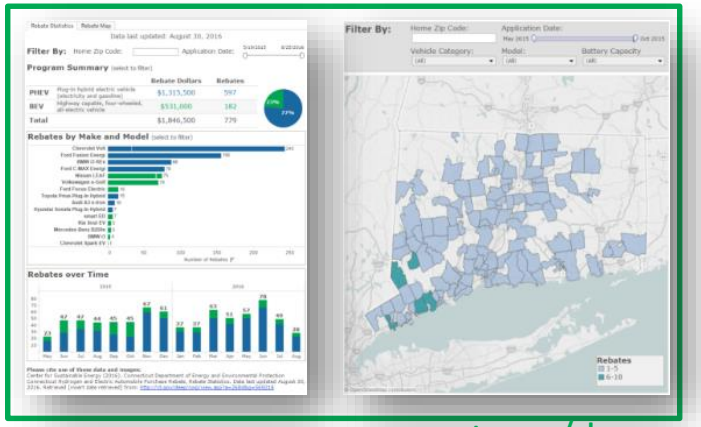
Outputs: Vehicles Rebated

Public dashboards and data facilitate informed action

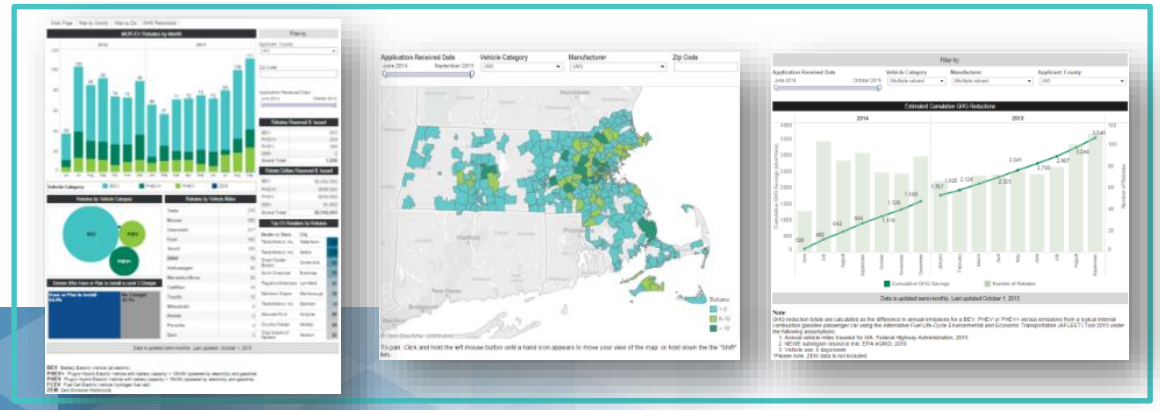
- ~300,000 EVs and consumers have received ~600 M in rebates
- >19,000 survey responses online, statistically represent >91,000 consumers
- Reports, presentations, and analysis growing



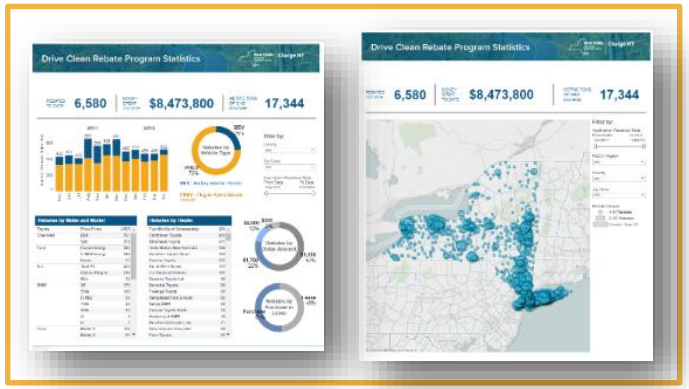
cleanvehiclerebate.org



ct.gov/deep



mor-ev.org



nyserda.ny.gov

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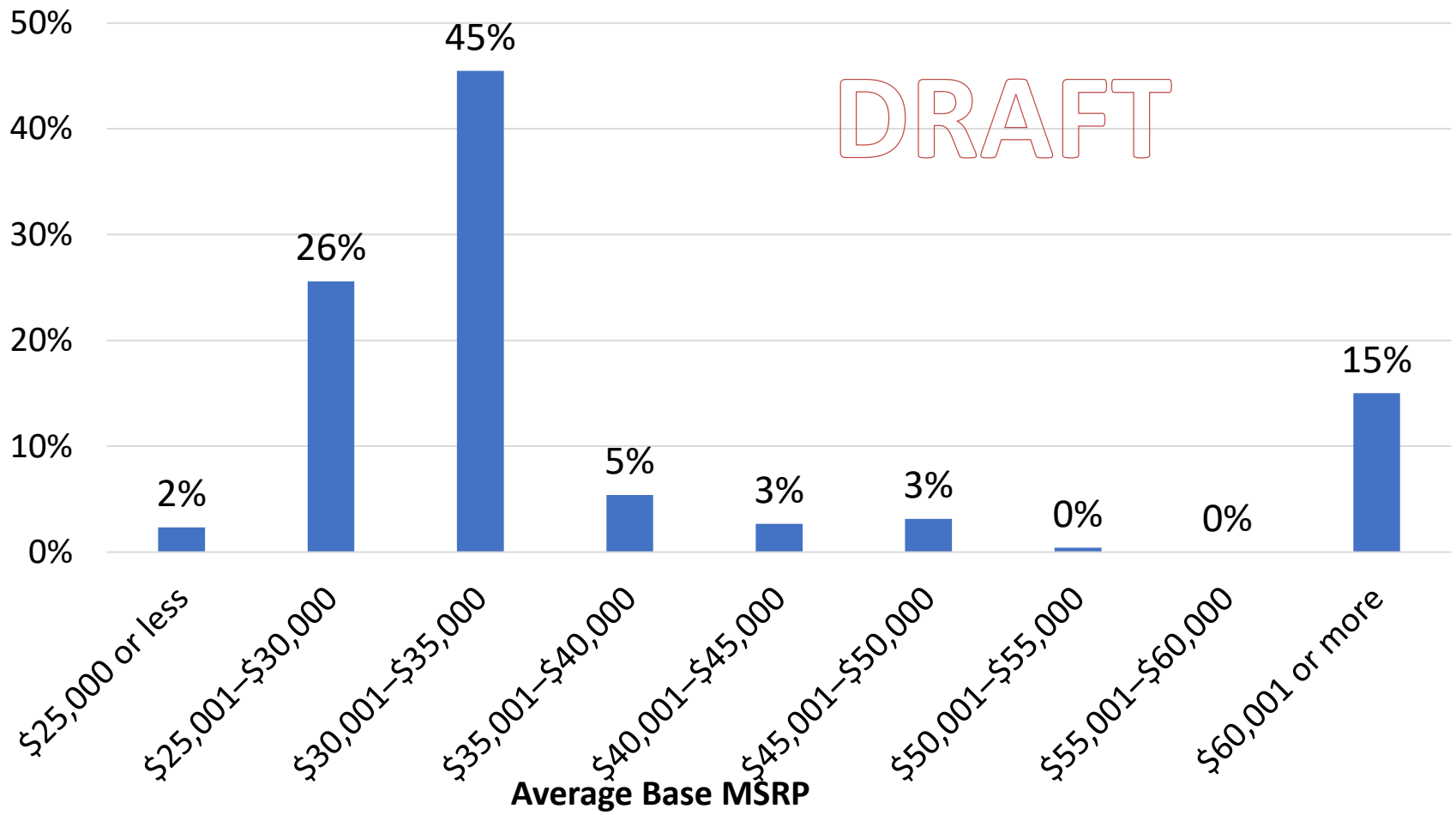
Moderately-Priced Vehicles Receive Most Rebates

(Plug-in Vehicles through Aug. 2018)



Through August 2018. 'Average Base MSRP' does not reflect actual sale price and excludes typical costs (delivery charges, additional features, etc.). Includes content supplied by R.L. Polk & Co, © 2018. Note: 129 vehicles excluded due to insufficient data.

Outputs: Consumers Rebated

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

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

Majority Characteristics

	Vehicle purchase "intenders" (CHTS 2012)	CVRP Consumer Survey 2016 – 17 edition
White/ Caucasian	76%	56%
Male	49%	72%
≥ Bachelor's degree	66%	79%
Detached homes	75%	77%
40–59 years old	52%	50%
< $150k HH Income	79%	80%

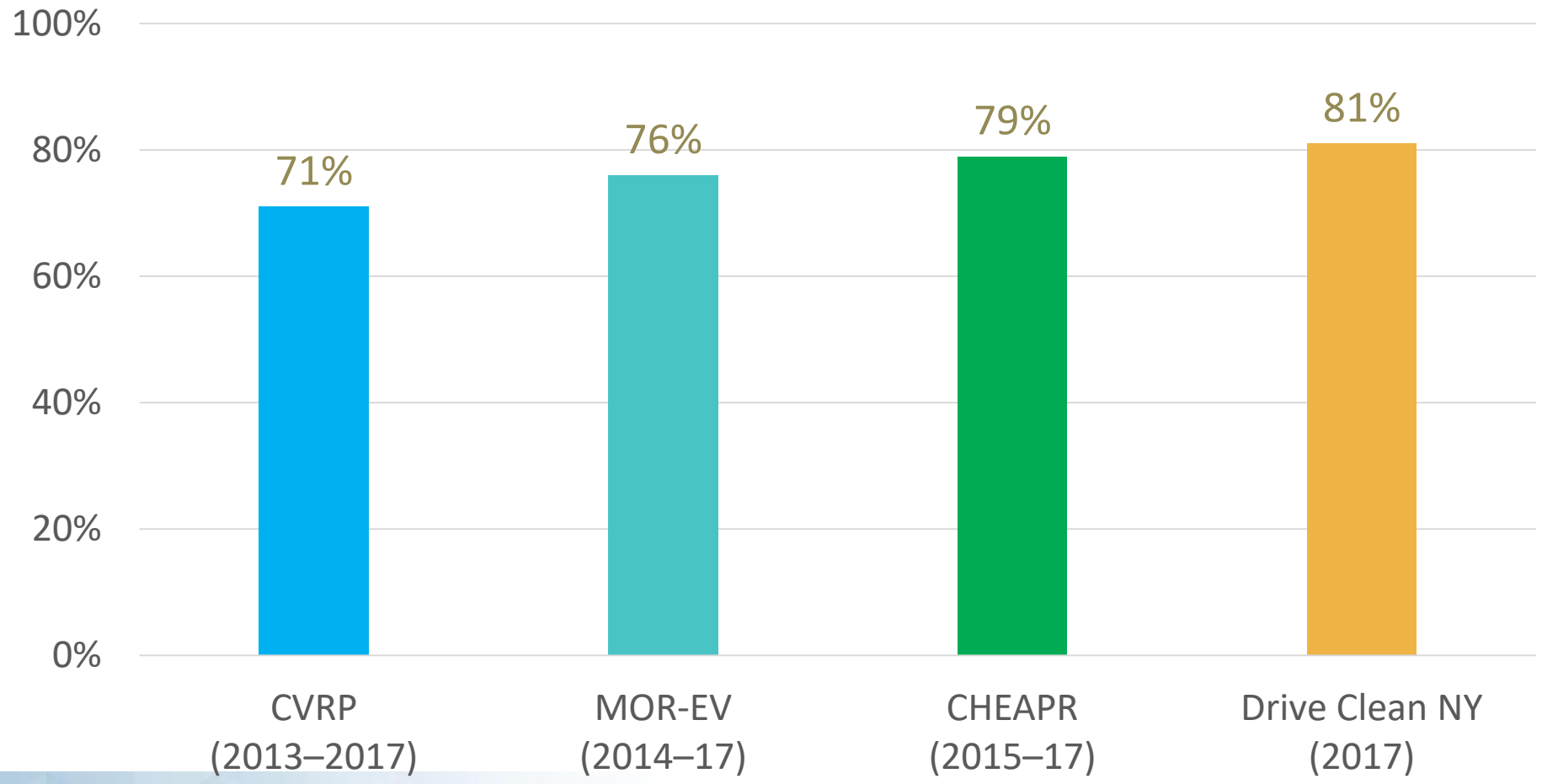
CVRP Consumer Survey: 2016–17 edition, purchase dates Nov 2016–May 2017, weighted n = 5,697

California Household Travel Survey, 2012: weighted, n = 42,431

Outcomes: Behaviors Influenced

Do EVs get used?

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



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

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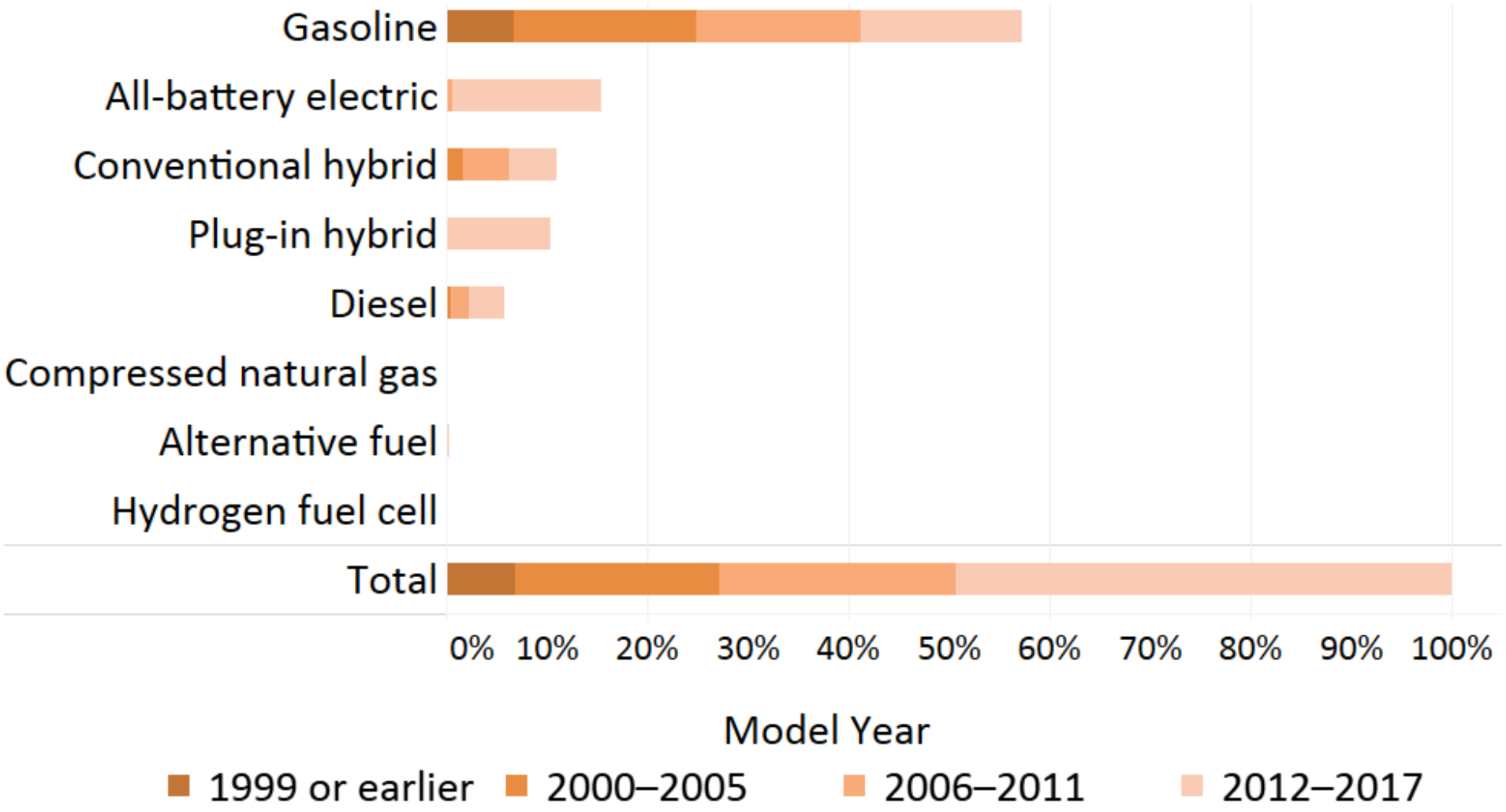
Impacts: Emission

What vehicles types have rebates helped replace?

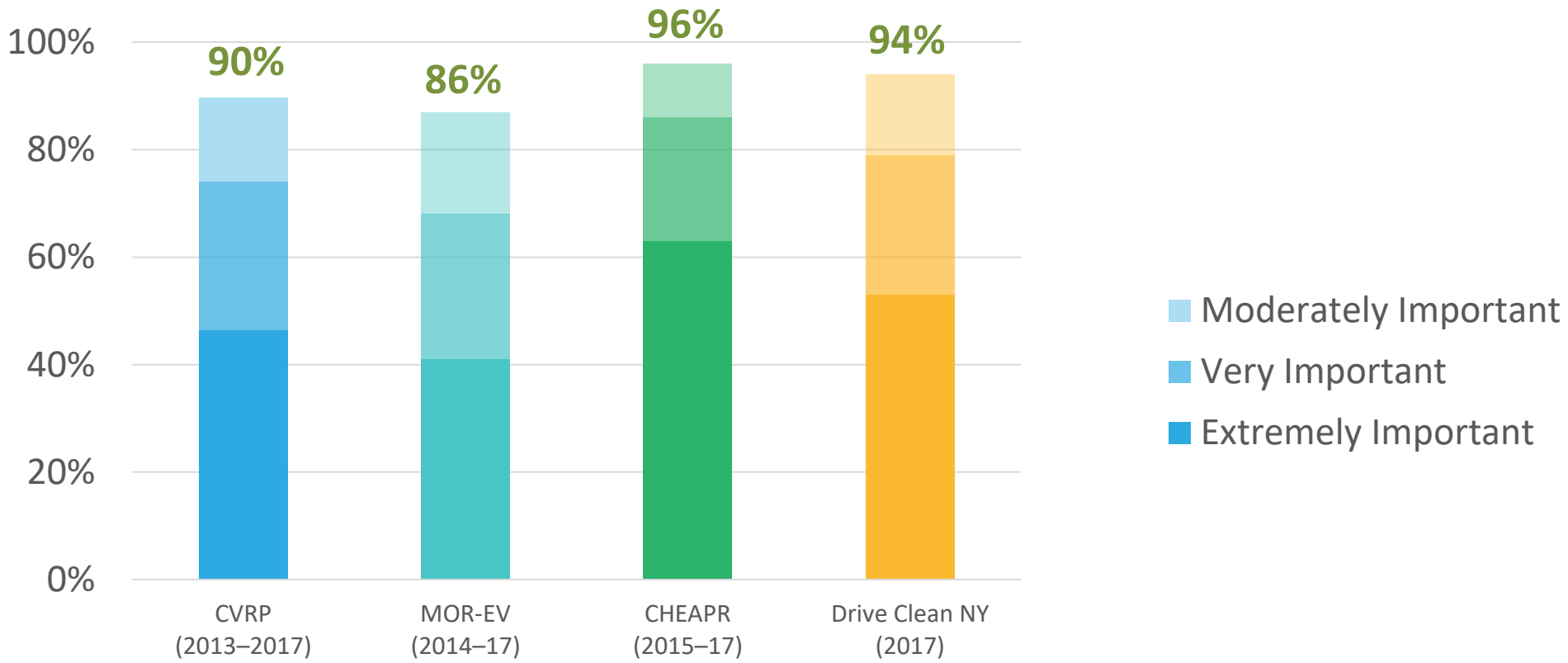


CVRP Consumer Survey. ***2016–2017*** edition, **trimmed to start *November 2016*,**
PEV respondents only, weighted, n=4,695

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

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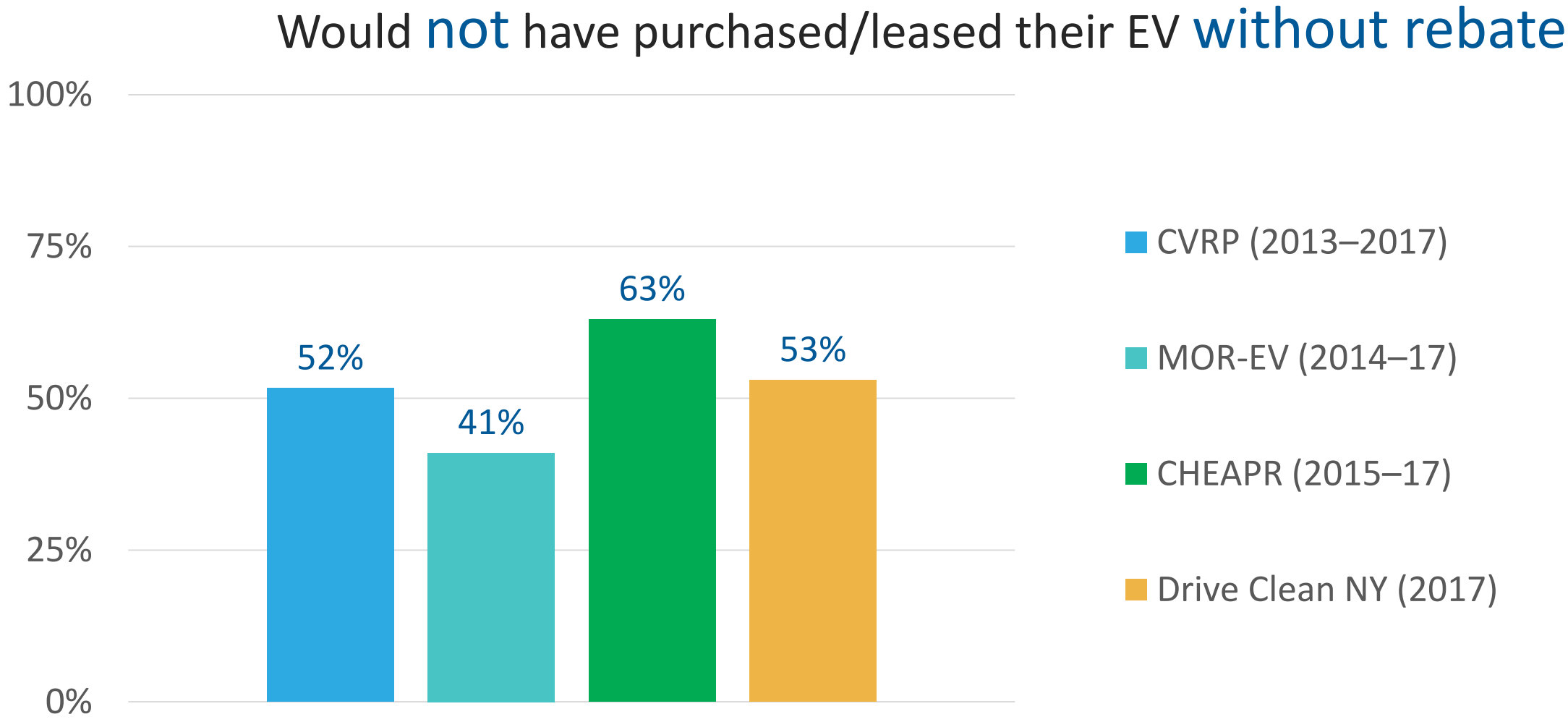
Rebate Influence: Essentiality



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

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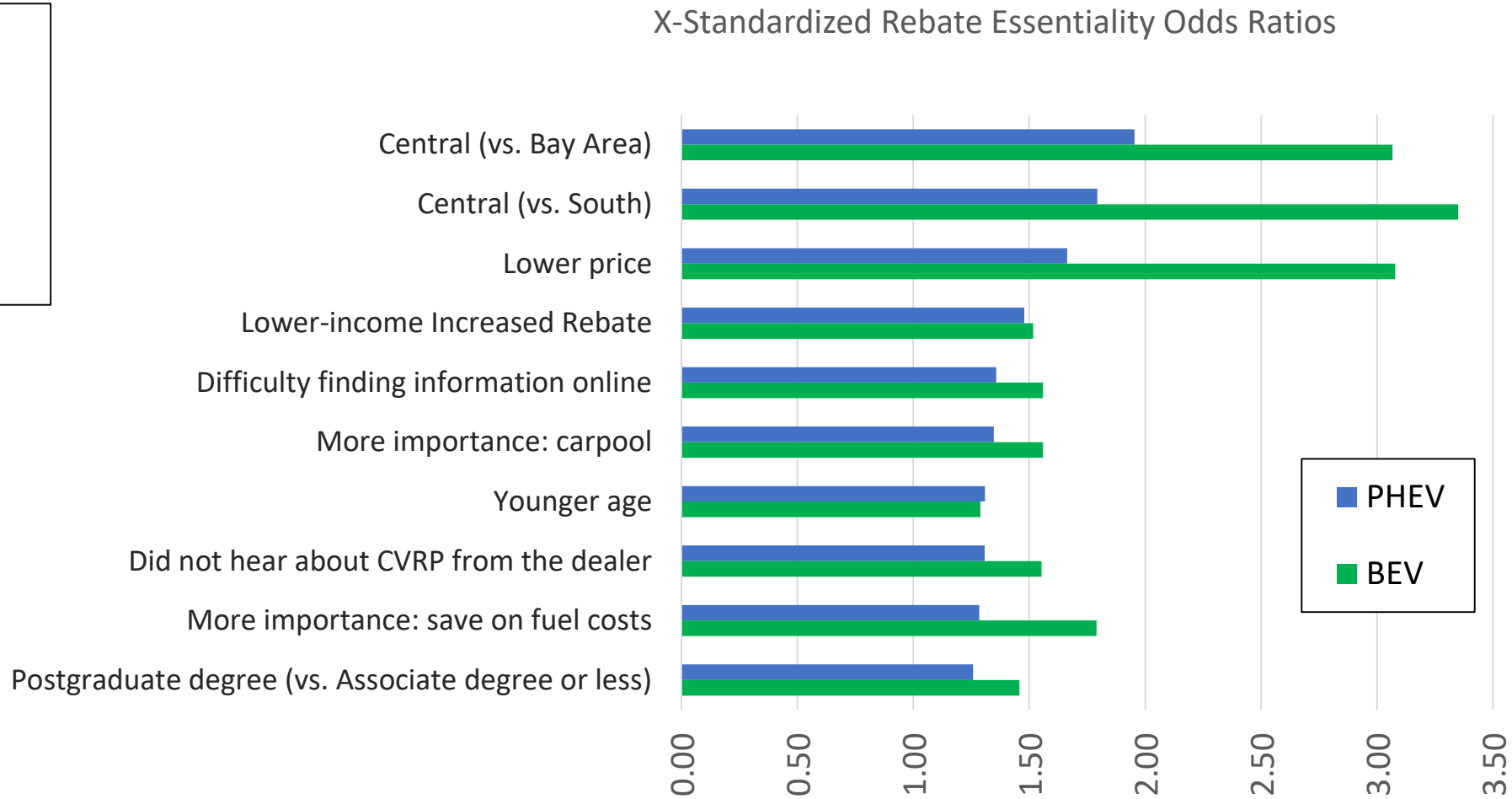
Additional Considerations

Rebate Effectiveness, Income and MSRP caps

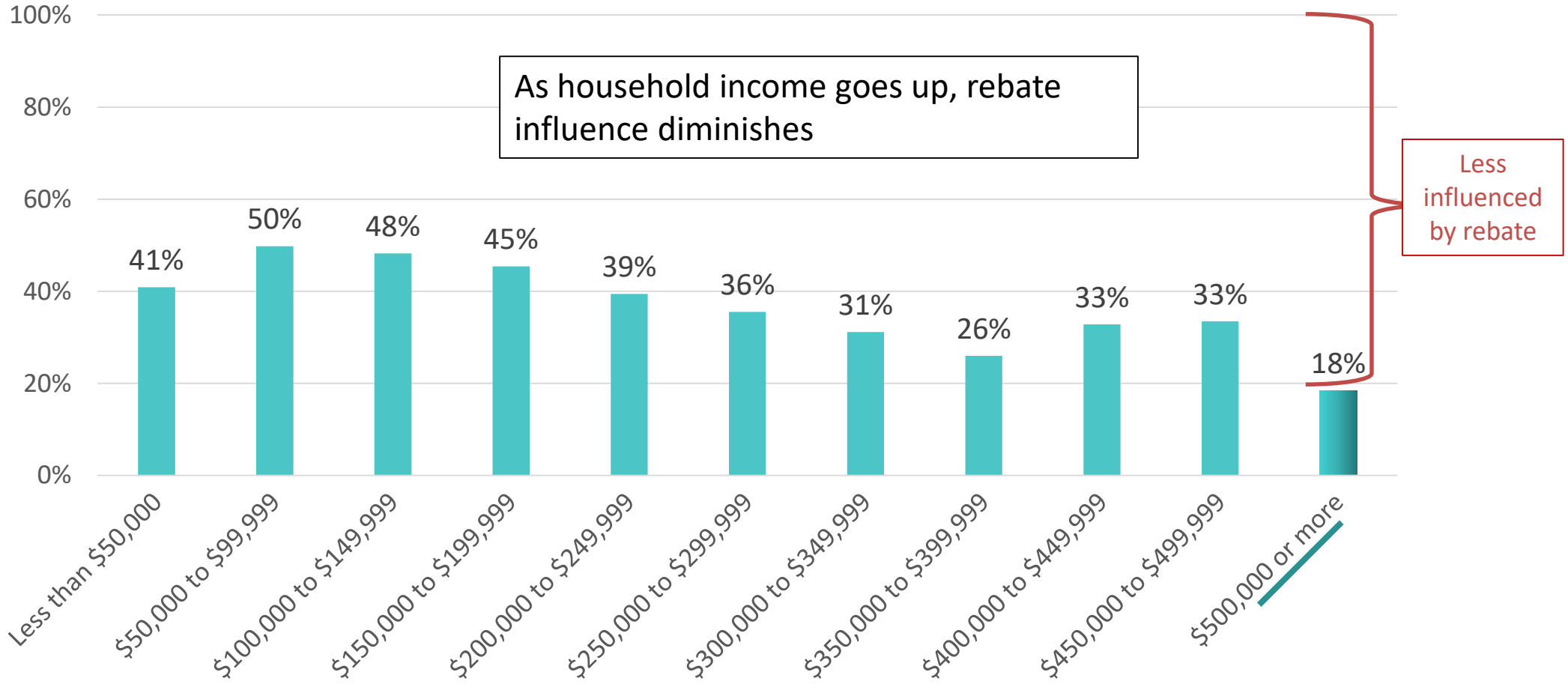
Rebate Essential Consumers are Different

See:

- 2016 BECC talk
- 2017 TRR paper and TRB poster
- 2018 EVS 31 talk…



Percent of MOR-EV Respondents that are "Rebate Essential" by Household Income



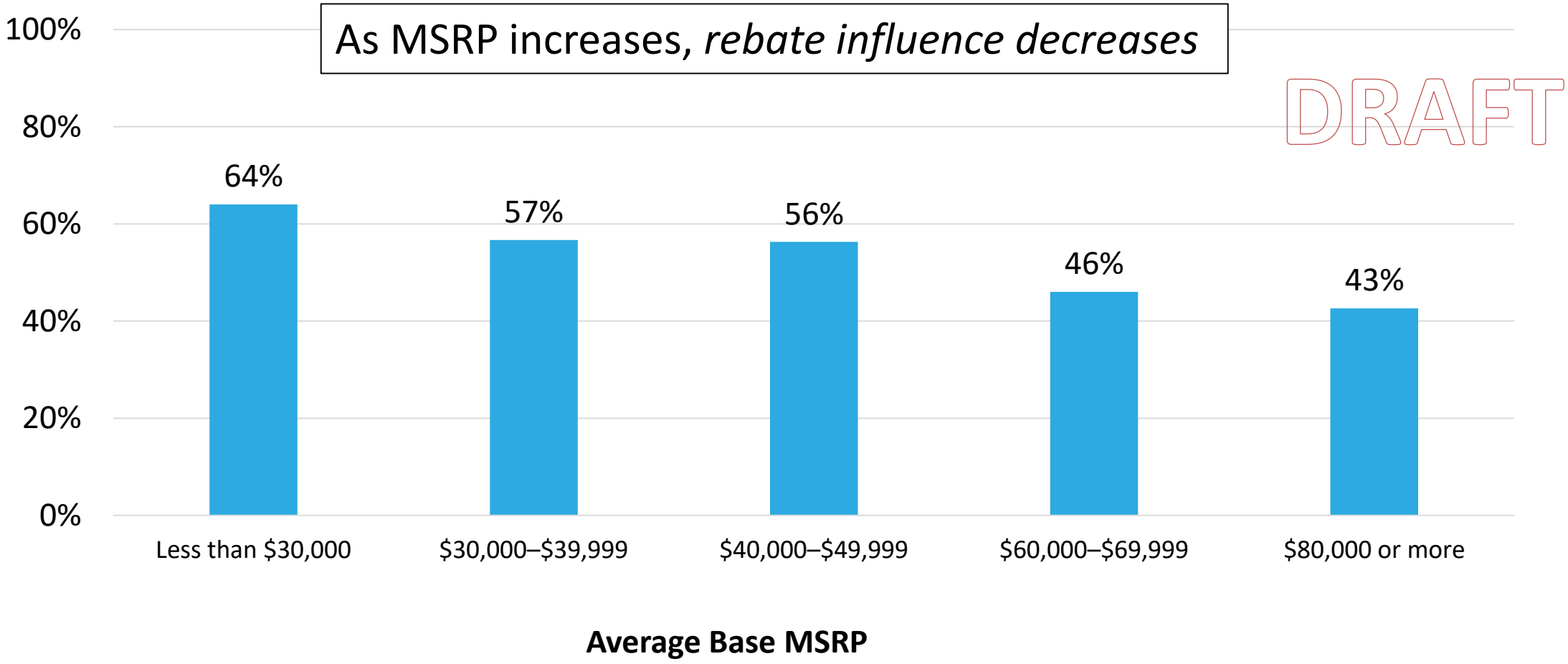
MOR-EV Survey, 2014–17: n = 2,549 total respondents, weighted to represent N=5,754 participants

Income-Based Eligibility: Implementation Considerations

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

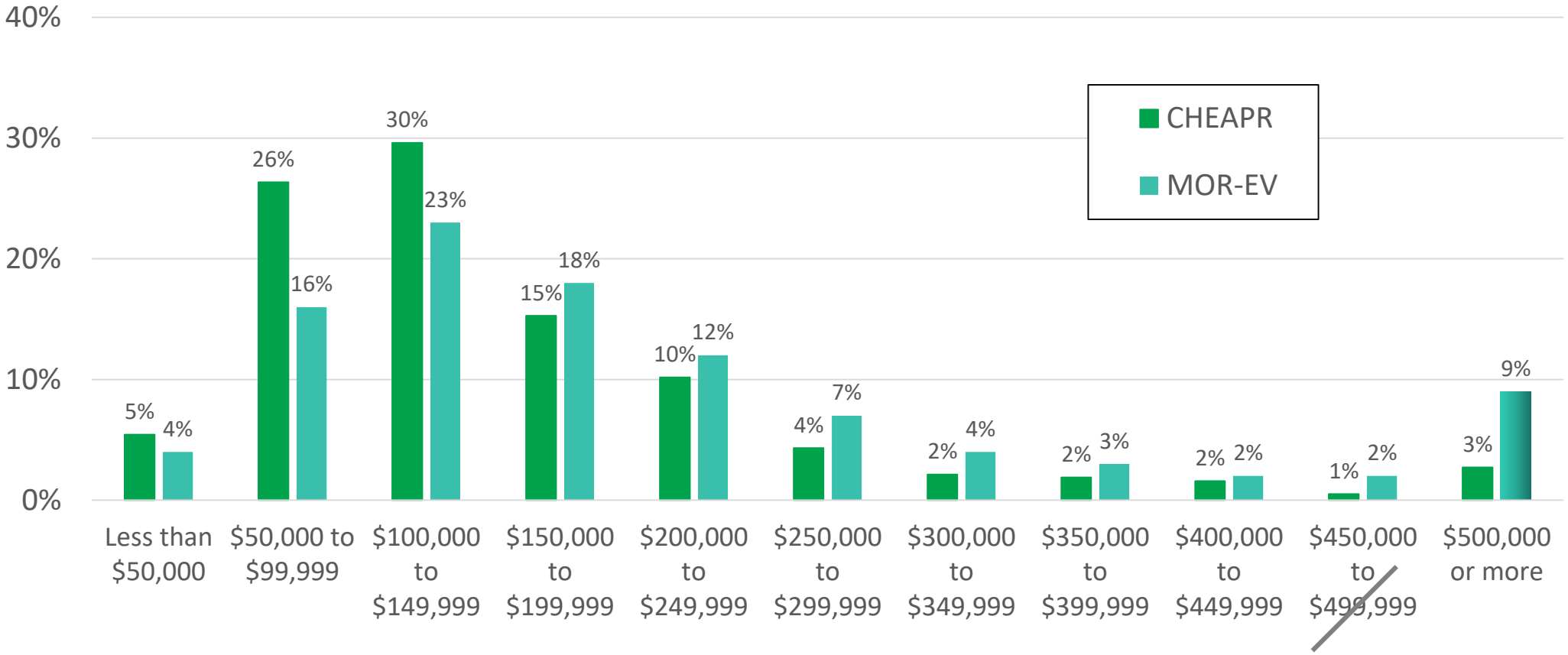
MSRP may be a better proxy for income in program eligibility

Rebate Essentiality Reflects Interesting Trends



CVRP Consumer Survey: 2016–17 edition, weighted, n = 8,927

CHEAPR and MOR-EV Respondents by Household Income



CHEAPR Survey (2015–17): n=819 total respondents, weighted to represent N=1,583 participants
MOR-EV Survey (2014–17): n=2,549 total respondents, weighted to represent N=5,754

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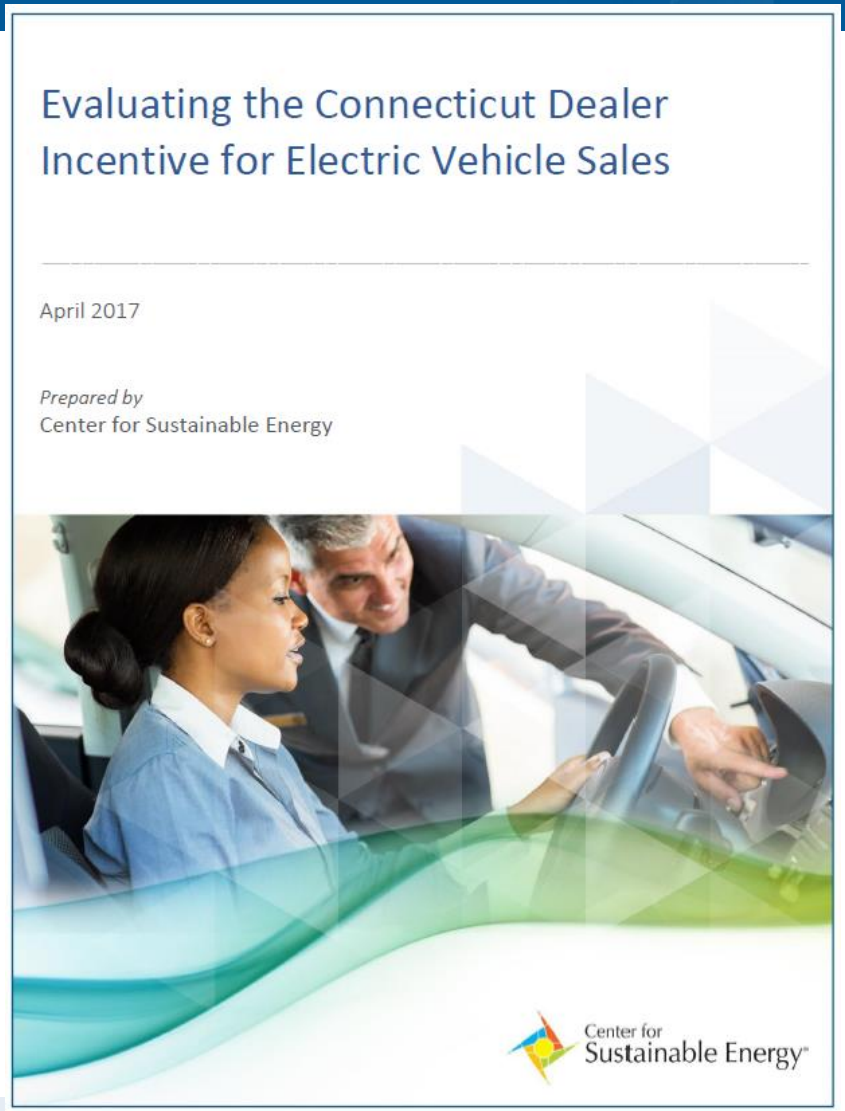
How is the dealer incentive working?



Johnson, Clair, Williams, Brett, Anderson, John & Appenzeller, Nicole (2017), *Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales*, Center for Sustainable Energy.

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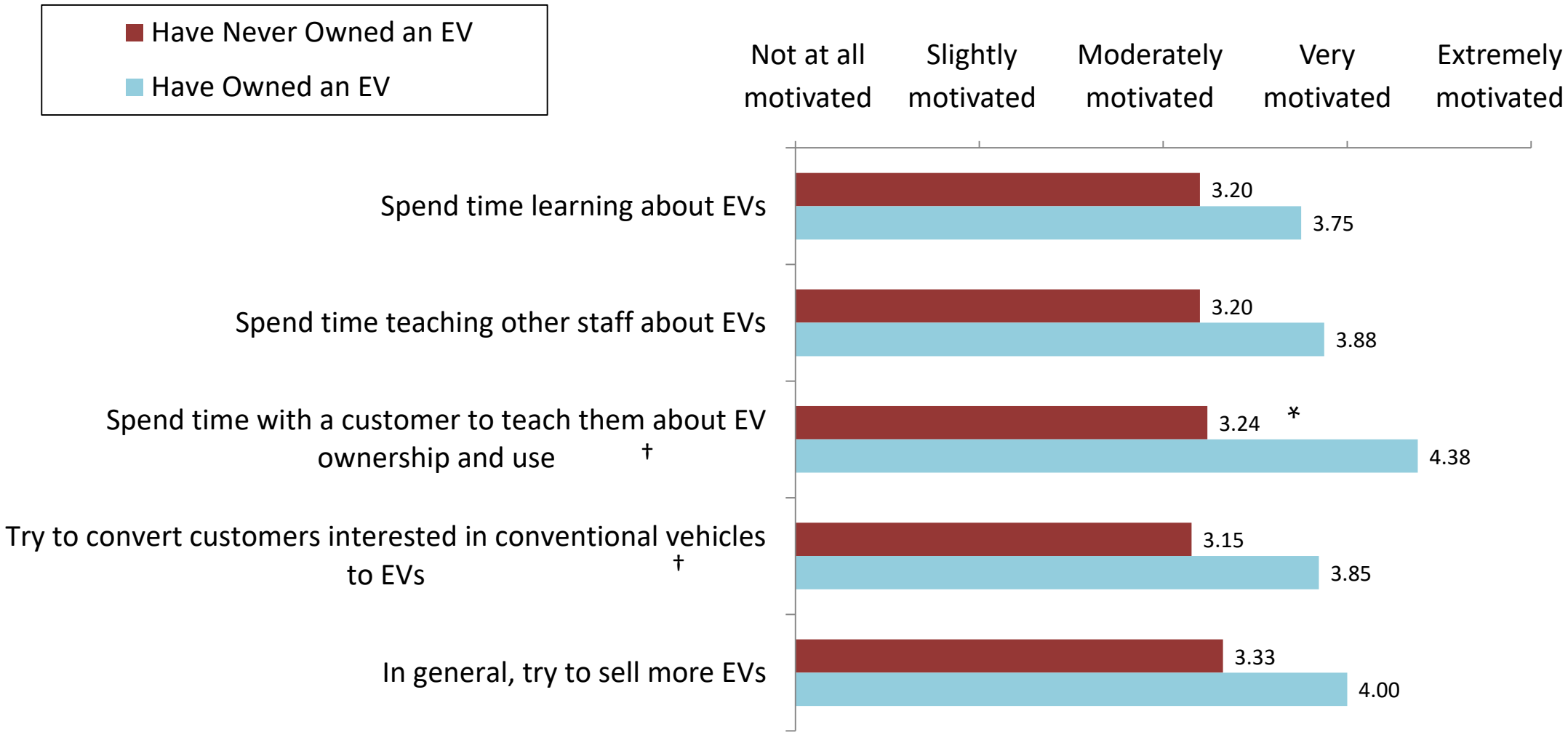
To what extent are you motivated by the current dealer incentive to do each of the following?



Respondents=57

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

*Statistically significant difference ($p < 0.05$)

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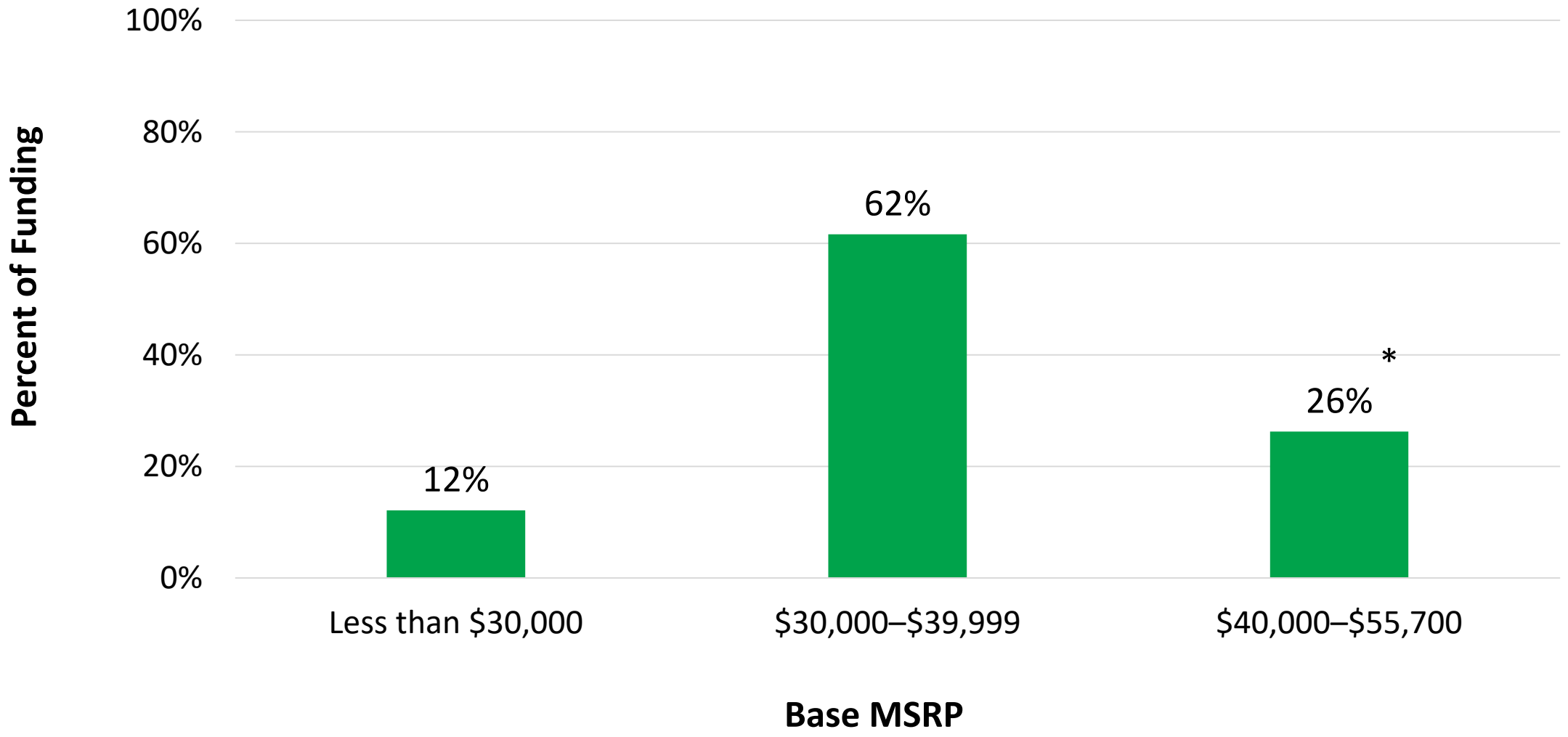
Summary: Findings

- Some consumer differences, particularly gender, remain
  - Trending in the right direction
- ~ 4/5^{ths} of rebated EVs replace older, more polluting vehicles
- Rebate influence on purchase/lease:
  - moderately to extremely important to 9/10^{ths}
  - essential to > half
- Avoiding > 30 tons of GHG emissions per vehicle over ~12-year vehicle life
- Indicators of impact are increasing over time
- Program data help target subsidies cost-effectively, reduce free-ridership
- Programs with MSRP caps may support equity as well as, or better than, programs with income caps
- Dealer sales incentives motivate EV salespeople, particularly those with prior EV ownership experience

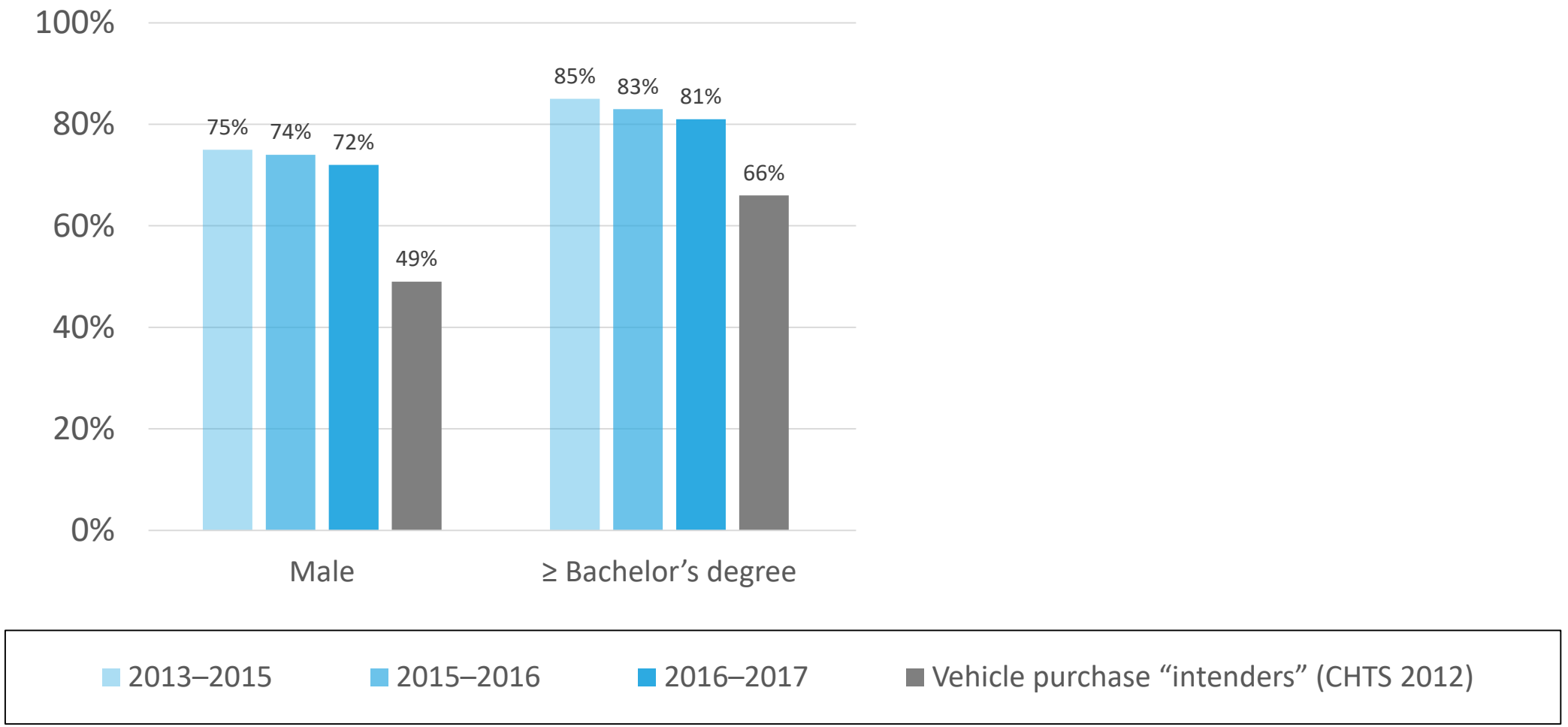
Extra Slides & Online Resources

Moderately Priced Vehicles Receive Most of the Funding
(thru Dec. 2018)



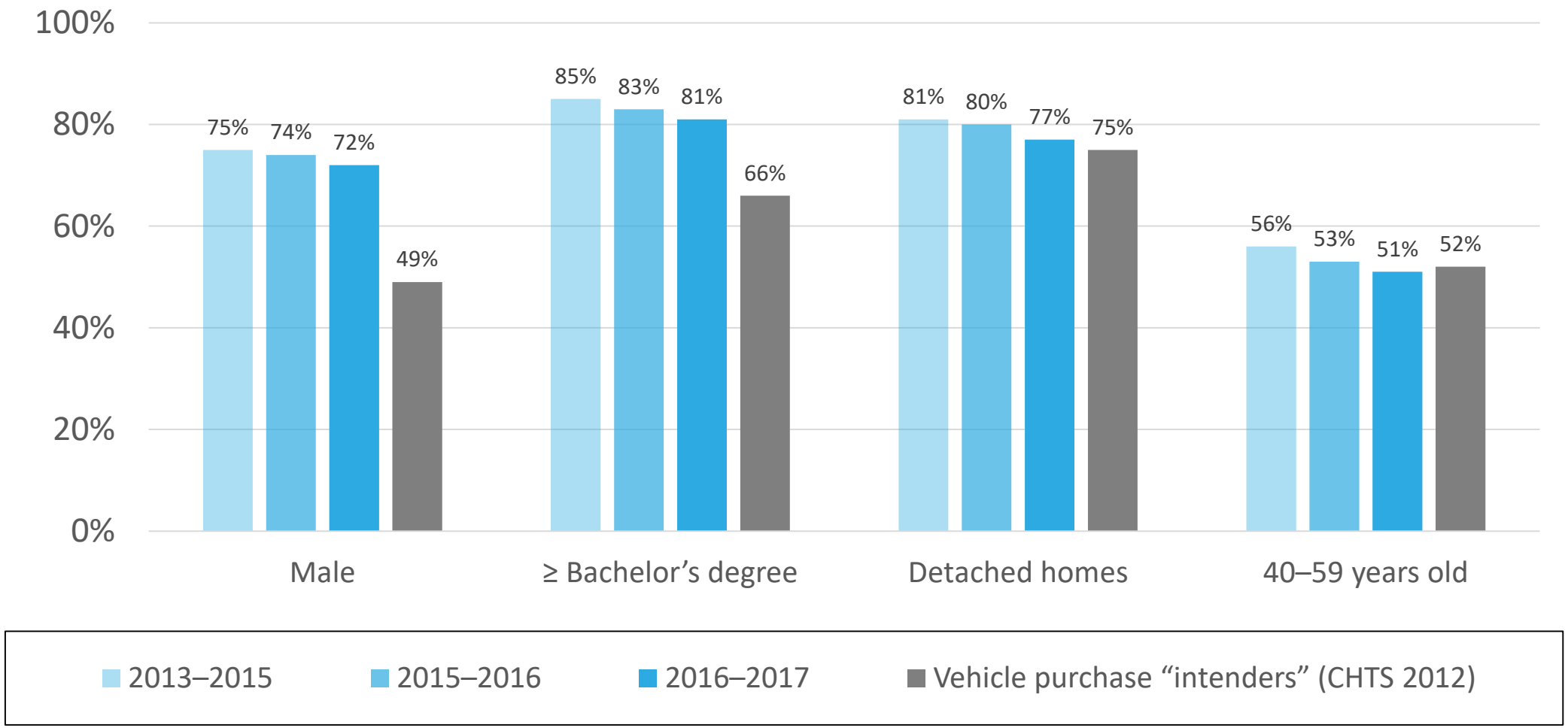
*$44,000 MSRP used for all rebated Model 3 vehicles
N=4,176 Total CHEAPR rebates through December 2018; Includes fleet rebates

Even Where Differences Remain, Rebate Recipients Look More And More Like Other Car Buyers



CVRP Consumer Survey, Sept. 2012–May 2017: 2013–15 edition, weighted, n = 19,460;
2015–16 edition, weighted, n = 11,611; 2016–17 edition, weighted, n = 9,367
California Household Travel Survey, 2012: weighted, n = 42,431

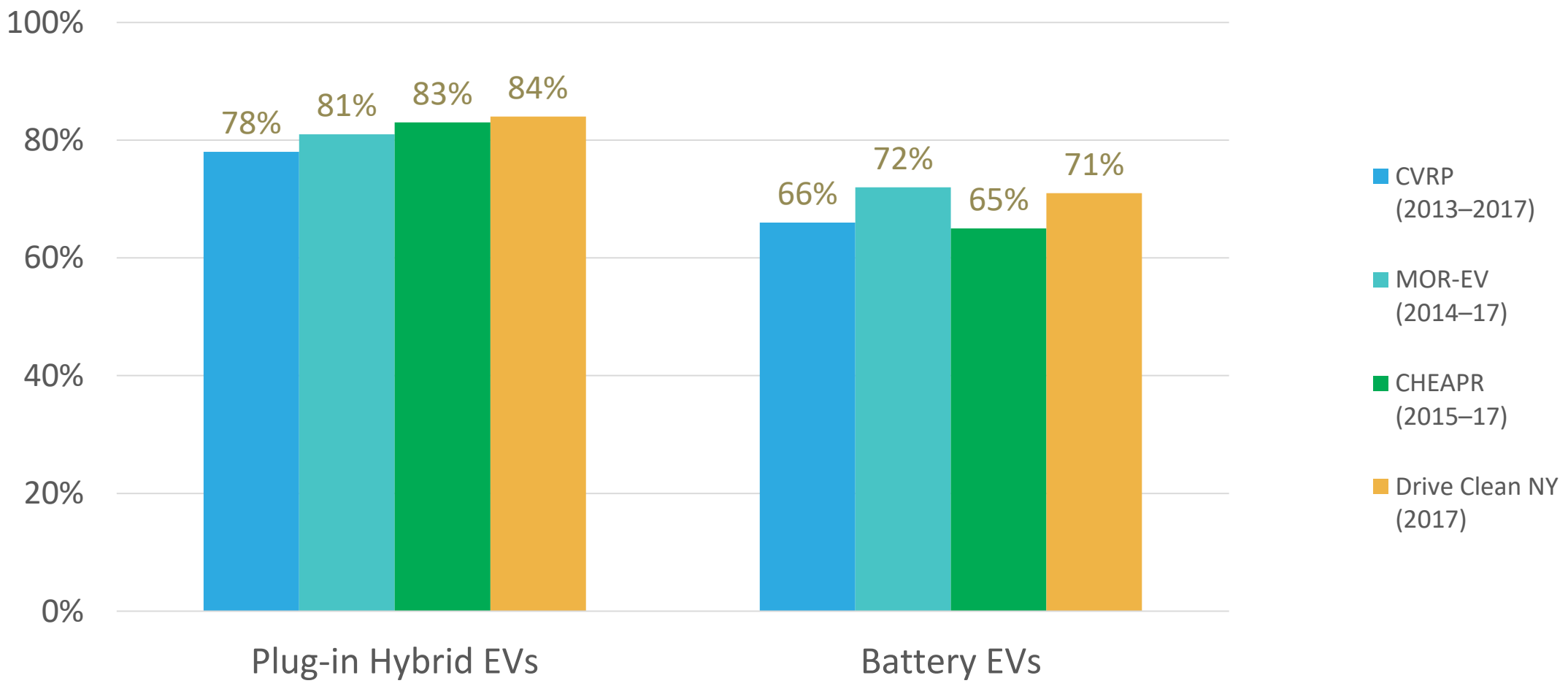
Rebate Recipients Look More And More Like Other Car Buyers



CVRP Consumer Survey, Sept. 2012–May 2017: 2013–15 edition, weighted, n = 19,460;
2015–16 edition, weighted, n = 11,611; 2016–17 edition, weighted, n = 9,367
California Household Travel Survey, 2012: weighted, n = 42,431

Do EVs get used?: by Tech Type

Replaced a vehicle with their rebated EV



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

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Vehicle-Life Emission Reductions (thru 9/17)

Vehicle Category	Per-Vehicle Savings (metric tons of carbon-dioxide-equivalent emissions)
	Assumes vehicle life = 11.6 years*
All (N=205,349)	> 32 tCO_2e
BEV (N=122,969)	> 34 tCO_2e
PHEV (N=82,380)	> 30 tCO_2e

* Average U.S. vehicle age, per https://www.reuters.com/article/us-usa-autos-age/age-of-vehicles-on-u-s-roads-rises-to-11-6-years-ihs-markit-idUSKBN13H1M7

Internal vs. External Perspectives

- Internal (program data):
  - Rebate Essentiality = 52% (59% for non-Tesla BEVs)

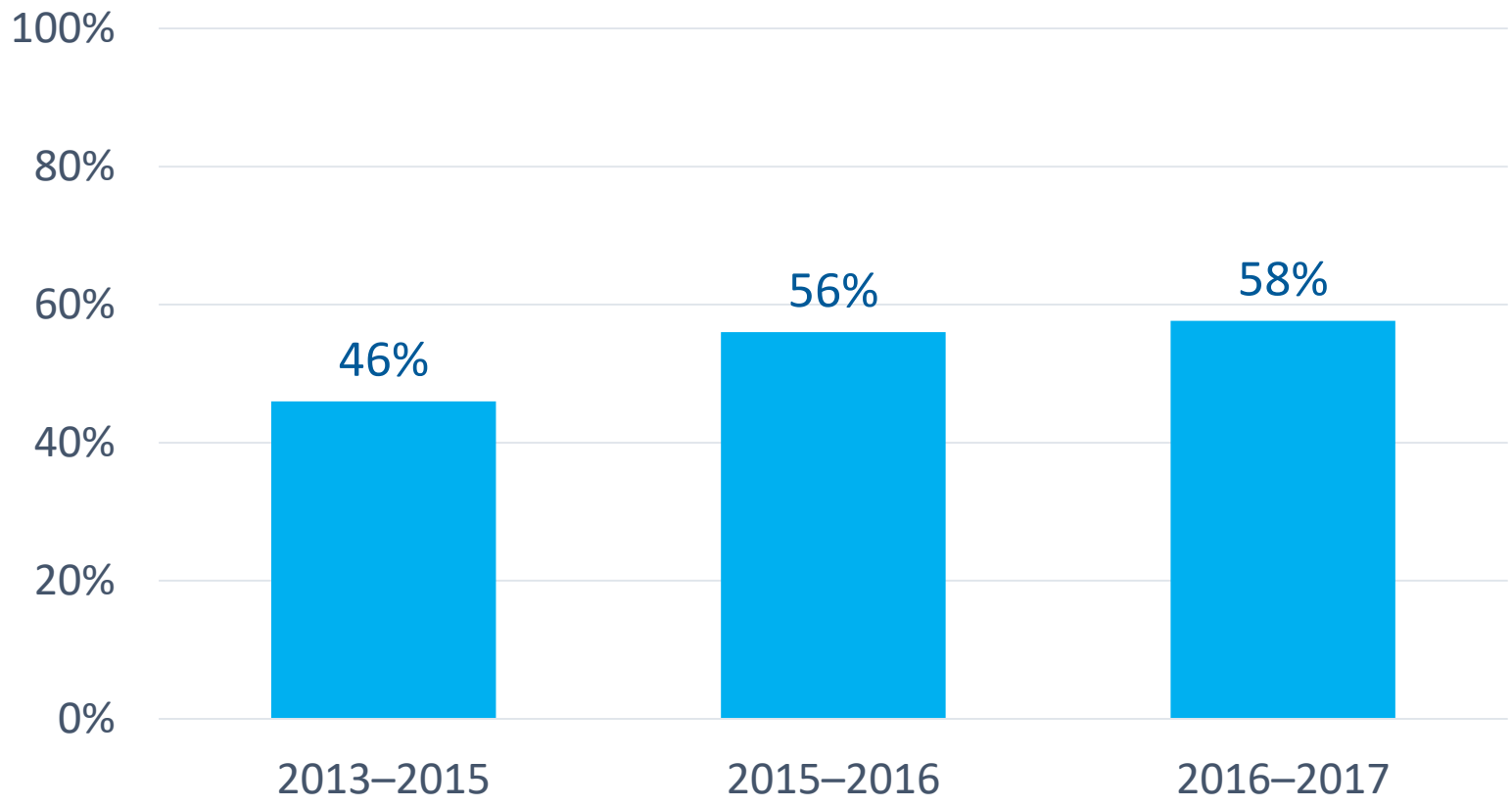
vs.

- External (select pertinent literature):

Source	Metric	Result
Jenn et al. (2018)	Increase in CA EV sales due to rebates	62%
Narassimhan and Johnson (2018)	Increase in BEV sales per ~$2,500 increase in incentives (adapted)	23.5%
Sheldon et al. (2016)	Increase in CA EV sales due to rebates	7%
Clinton et al. (2015)	Increase in BEV sales for every ~$2,500 of incentives (adapted)	18% (+/- ~22%)

Rebate Essentiality is *Increasing* Over Time

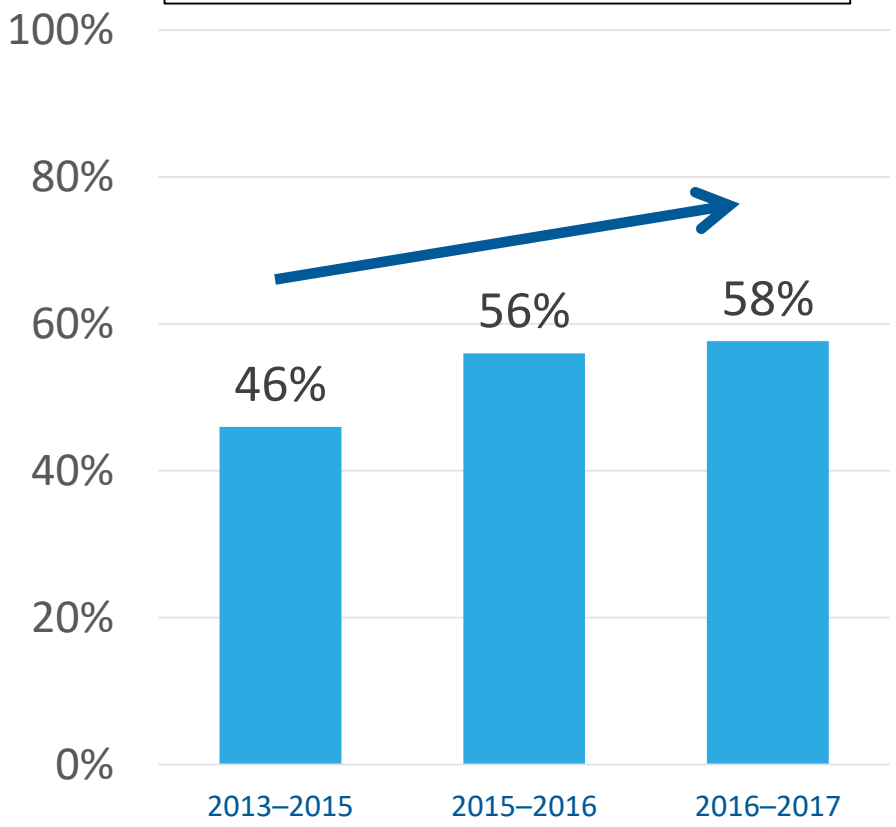
Would not have purchased/leased their EV without rebate



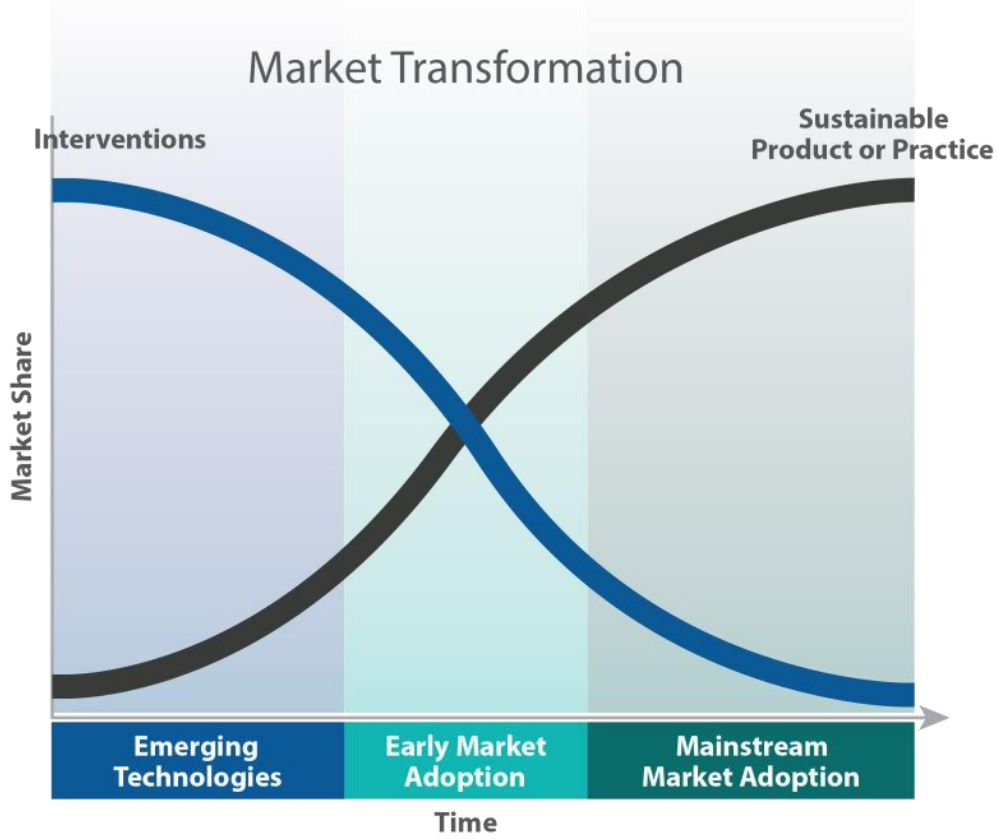
CVRP Consumer Survey. 2013–2015 edition: weighted, n=19,208
2015–2016 edition: weighted, n=11,457
2016–2017 edition: weighted, n=9,261

Rebate Essentiality Data Contradicts a Common Paradigm About Phasing Out Incentives

Rebate Essentiality



Common paradigm

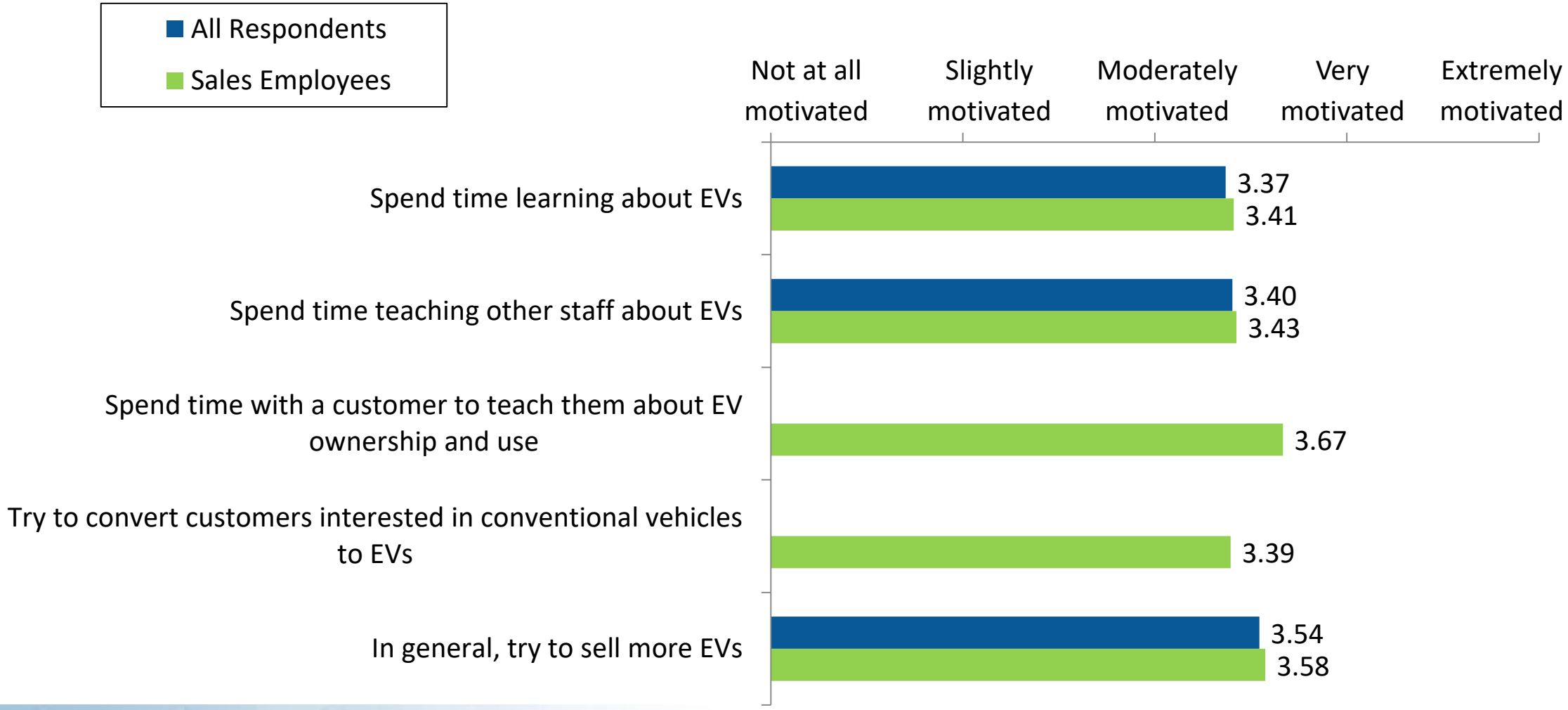


CVRP Consumer Survey. 2013–2015 edition: weighted, n=19,208
2015–2016 edition: weighted, n=11,457
2016–2017 edition: weighted, n=9,261

CVRP	Eligibility		Rebate Amount			
	Filing Status	Gross Annual Income	FCEV	BEV	PHEV	ZEM
Income Cap	Individual	> $150,000	$5,000 (unless received an HOV sticker)	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*	*Household* Income ≤ 300 percent of the federal poverty level (FPL)		$7,000	$4,500	$3,500	

* Applications are also prioritized

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



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

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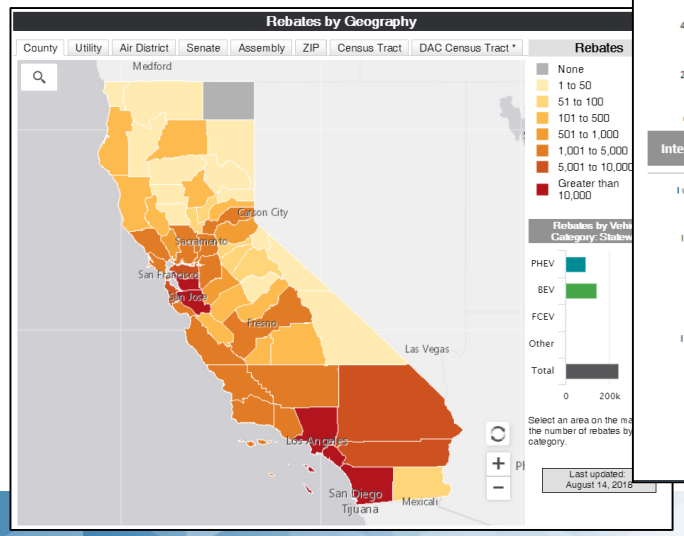
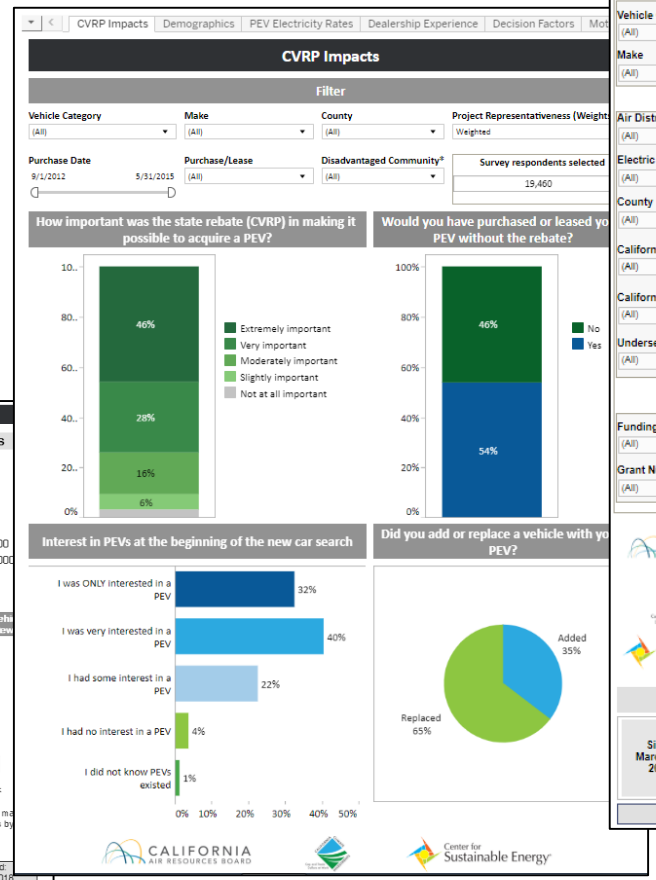
Tracking: CVRP Transparency Tools

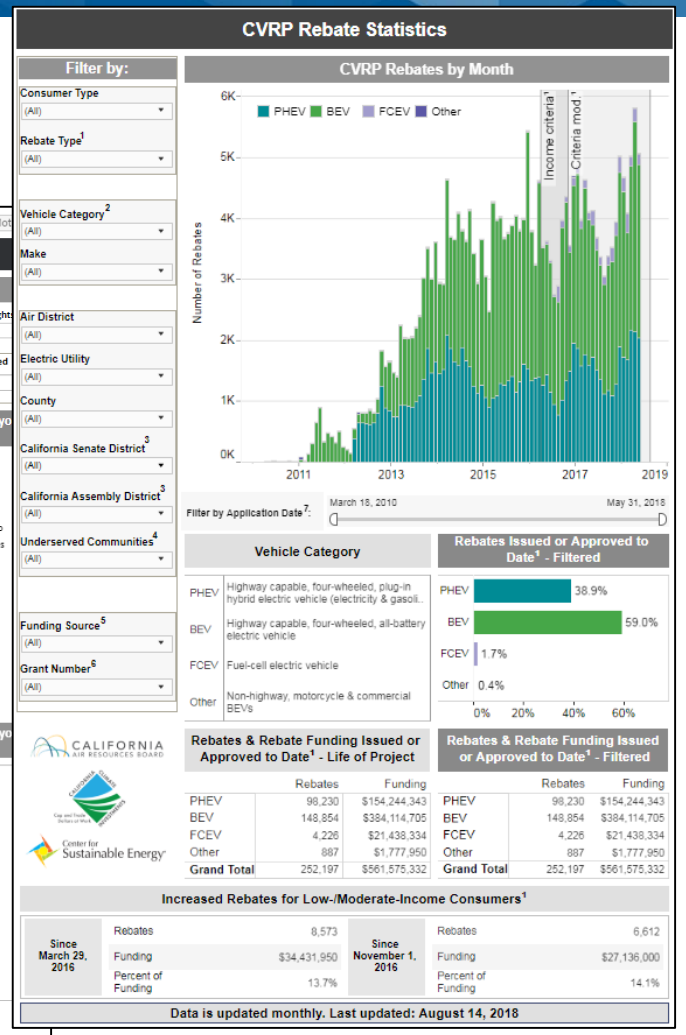
CALIFORNIA CLEAN VEHICLE REBATE PROJECT

Interactive data dashboards and downloads:

- Rebate statistics
- Rebate maps
- Survey results







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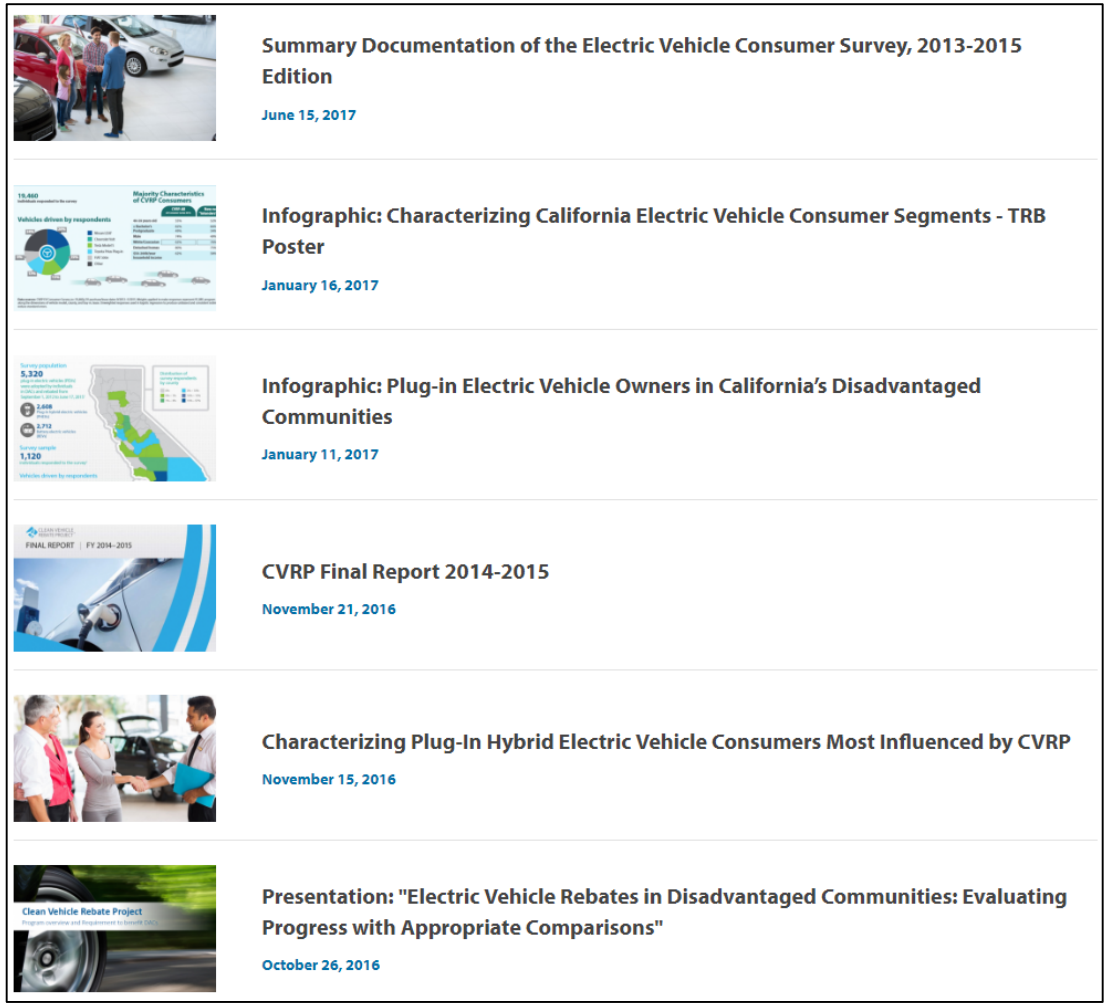
Evaluation

[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

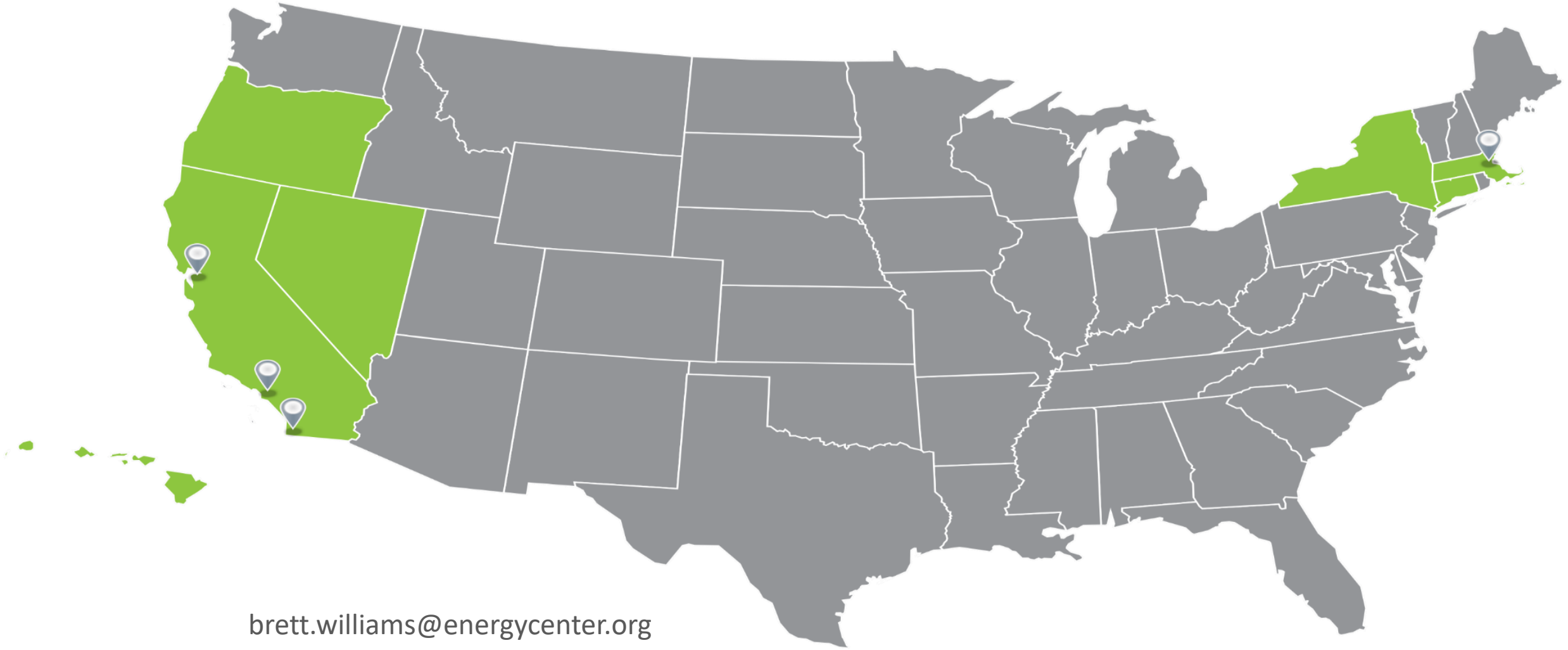
Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by CVRP

November 15, 2016

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

October 26, 2016

How can we help?



brett.williams@energycenter.org

Related analysis available at energycenter.org/resources/transportation

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Crafting Incentives, Developing Policies & Building Consumer Awareness

Britta Gross, Director of Advanced Vehicle Commercialization Policy, GM

#WeTheStates

GENERAL MOTORS

National Governor's Association

29 April 2019

"Crafting Incentives, Developing Policies, and Building Consumer Awareness"

Britta K. Gross
GM, Director Advanced Vehicle Commercialization Policy

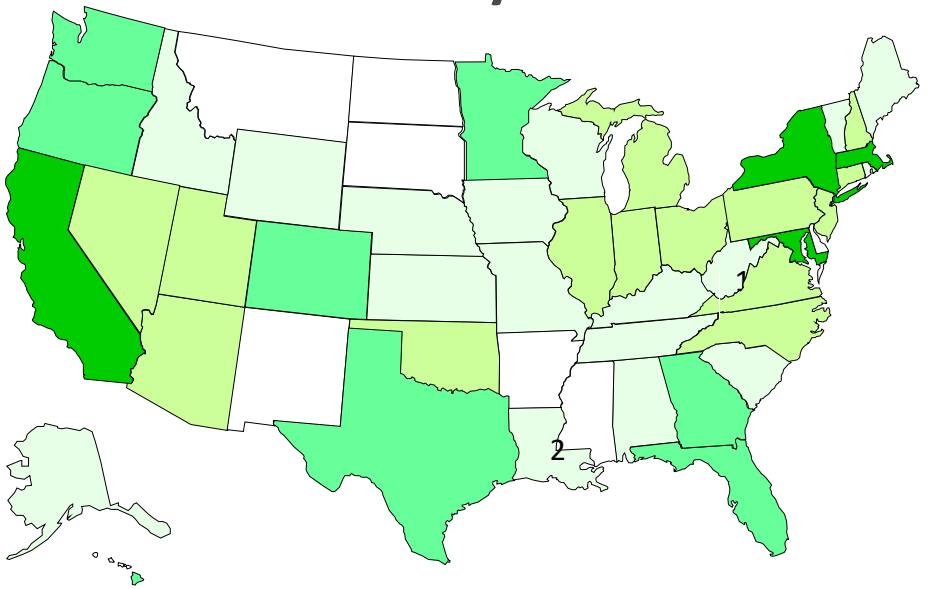
EV MARKET GROWTH REQUIRES A STRONG FOUNDATION OF ENABLERS

Infrastructure

- **Highway** corridor DC fast-charging
- **Urban** DC Fast-Charging Hubs
- **Workplace** charging
- **Multi-unit dwelling** charging
- Public charging at **key destinations**

"Story-telling"

Policy



- Vehicle Incentives – federal and state
- HOV Lane Privileges
- Building Codes
- Preferential EV electricity rates
- Fleet purchase commitments

Education & Outreach

- Drive Consumer Demand
- Build Awareness
- Ride & Drives
- Utilities as trusted 3rd parties

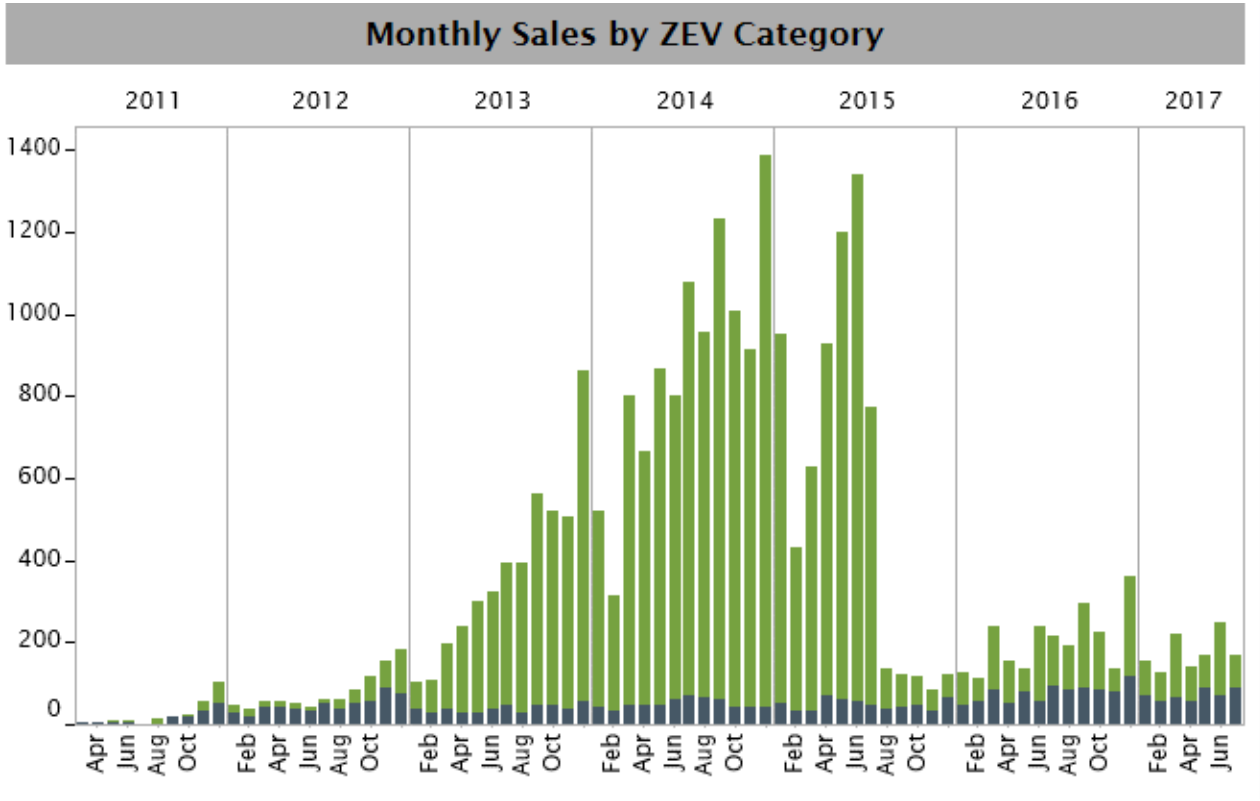
3 Key Barriers: EV Cost, Infrastructure and EV Awareness

INCENTIVES NEED TO BE SUSTAINED AND CERTAIN

We know incentives work, because …

- **Netherlands**: tax incentives gradually phased out for PHEVs
  → 50% drop in PHEV sales
- **Denmark** (ICE 180% import tax): reinstated registration taxes and ended some Gov't procurement
  → 68% drop in EV sales in 2016

Georgia – EV Sales before and after $5,000 state tax credit for BEVs

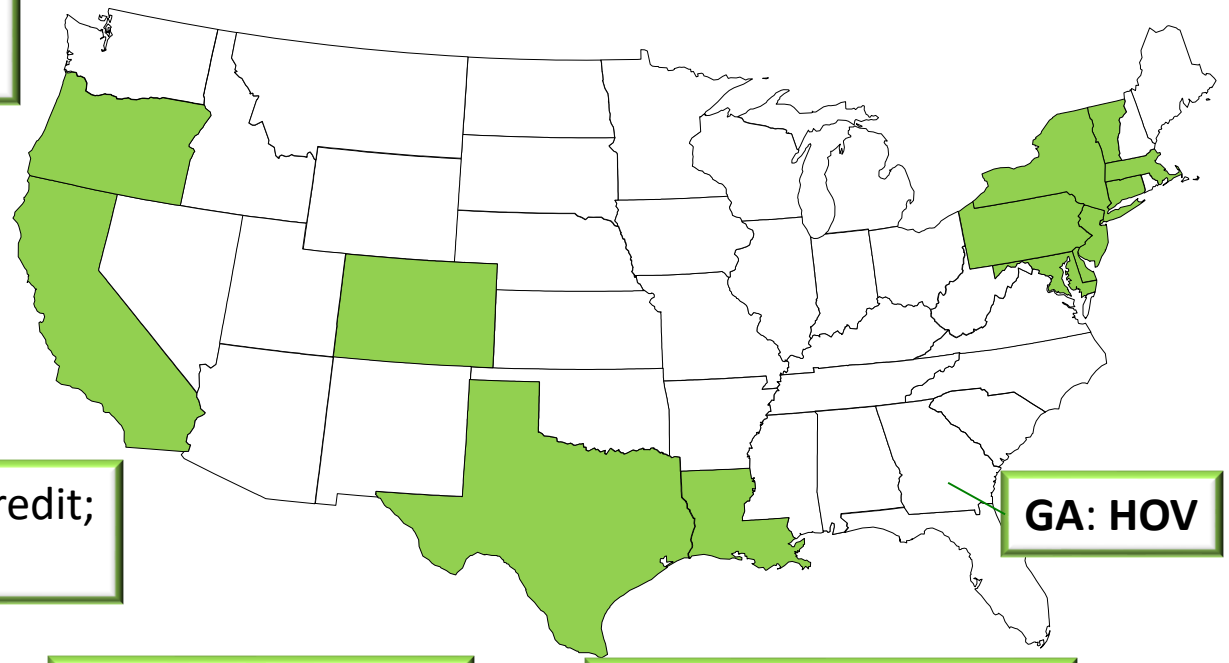


EV incentives work best when they are "noticeable"

Key U.S. EV Incentives – Federal and State – Monetary and non-Monetary

Federal EV Tax Credit: up to $7,500 Tax Credit (capped at 200,000 EV sales/automaker)

12 States offer vehicle incentives



OR: $2,500 rebate; EVSE tax credits

CA: $2,500 BEV rebate ($1,500 PHEV); **HOV** lane access; EVSE grants

CO: $5,000 tax credit; EVSE grants

TX: $2,500 rebate; EVSE tax credits

LA: $2,500 tax credit; EVSE tax credits

GA: **HOV**

NY: $2,000 BEV rebate ($1,700 PHEV); **HOV**; EVSE tax credits

MA: $1,500 BEV rebate

CT: $2,000 BEV rebate ($1,000 PHEV); EVSE rebates

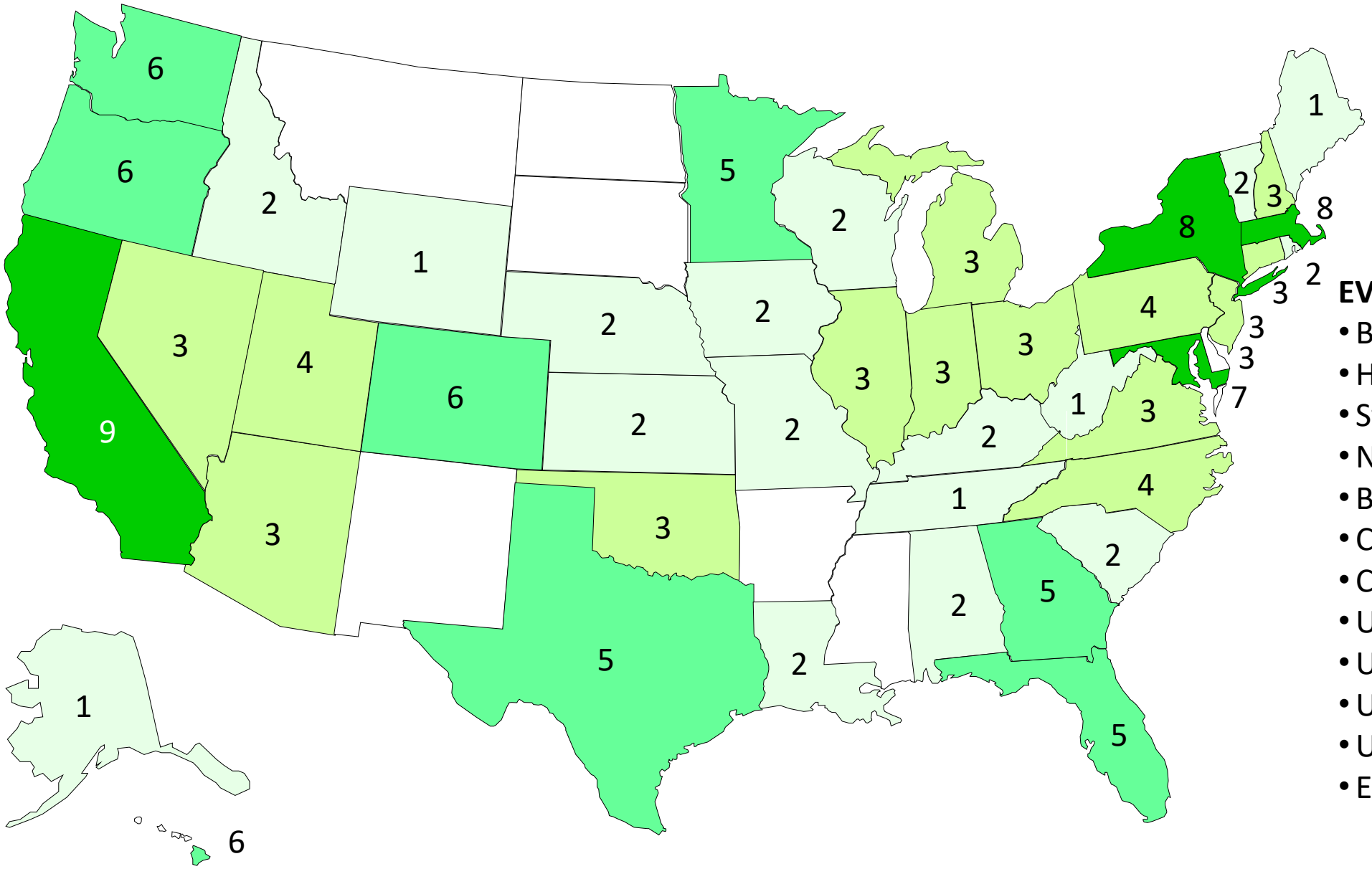
NJ: $2,500 BEV rebate; EVSE rebates

PA: $1,750 BEV rebate ($1,000 PHEV)

DE: $3,500 BEV rebate ($1,500 PHEV); EVSE rebates

MD: $3,000 BEV rebate ($1,840 PHEV); HOV

of KEY EV-ENABLING POLICIES BY STATE



EV-enabling Policy (# of states)

- BEV/PHEV Incentive (12)
- HOV Exemption (11)
- State Fleet Incentive (3)
- NGO Incentive (2)
- Building Codes (3)
- Charging Incentive (21)
- Charging Service Provider (20)
- Utility Enabling Legislation (4)
- Utility Filing (30)
- Utility Incentive (20)
- Utility Own/Operate (11)
- EV Charging Rate (17)

Source of Data: AFDC; Atlas Policy

INFRASTRUCTURE PROGRESS IN THREE MAJOR AREAS

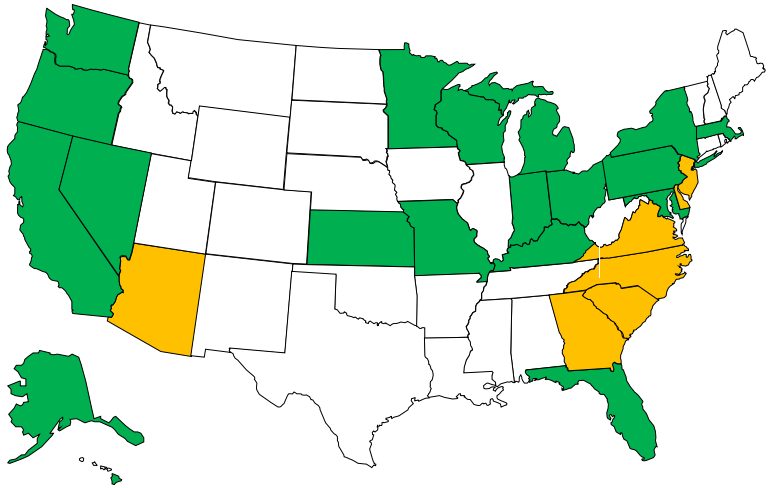
Electrify America
(operational in 2019)

- Compelling “storytelling”
- Part of a $2Bil investment

State Appendix “D” Funds

- 44 States to invest in EV charging
- $343mil investment

Utility Investment
(filings approved and pending)



- Utility engagement is key
- $1B approved / $1.5B pending

Infrastructure growth will significantly contribute to consumer EV awareness

CONSUMER EV AWARENESS

Early EV Adopters are true EV "enthusiasts", but mainstream EV adopters are not…

- Mainstream consumers **don't want to make any sacrifices**

  (cost, comfort, convenience, driving range, travel destinations, …)
- Mainstream consumers are more likely to first hear about EVs from a **Family or Friend**

Effective Consumer EV Awareness:

- Consumers need first-hand exposure to EVs – family, friends, colleagues, ride & drives
- EV ambassadors make a difference – Green Mountain Power (Vermont)
- Workplace charging – virtual showroom of EVs in the parking lot
- Utilities have relationships with every consumer and are viewed as 3rd party experts

THE ROLE OF STATES

As a "Convener" – Utilities, Automakers, Cities, Fleets, other EV Stakeholders

- Prioritize policies
- Strategize and plan EV infrastructure
- View all efforts through "EV Awareness" lens

What "levers" can contribute most to consumer awareness?

- **Incentives** – an upfront EV incentive **OR** enough other reasons to buy an EV
- **Utilities** - encourage utility-led infrastructure **AND** awareness/education programs
- **Workplace Charging** – challenge corporate America
- **Highway Corridors and Key Destinations** – consumers must feel they can go anywhere an ICE can go
- **Building Codes –** require all new construction to include EV-ready wiring to minimize retrofit costs
- **Signage** – ensure highly visible and abundant signage to all EV charging stations

The transition to electrification requires a constant drumbeat of positive EV messages