

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

Nicholas Pallonetti – Research Analyst, CSE

*with thanks to J. Galbiati, J. Bowers and others at the Center for Sustainable Energy (CSE)*



# Outline: Vehicle Replacement (2021)

- I. Context: Program Design, Market Dynamics, & Data
- II. Vehicle Replacement
  - A. Replacement Rates
  - B. Vehicle Age & Types Replaced
- III. Summary & Select Findings

## Additional Details & Resources

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

# Context

Program Design, Market Dynamics, & Data

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# Base Rebate Amount for Most Individuals At or Near Lowest Levels



	as of Mar. 2010	as of Jun. 2011	as of Jul. 2013	as of Jun. 2014	as of Mar. 2016	as of Nov. 2016	as of Dec. 2019
Fuel-Cell EVs 	\$3,000– \$5,000 ‡	\$1,500– \$2,500 ‡	\$2,500	\$5,000	\$5,000 *	\$5,000**	\$4,500***
Battery EVs † 	\$3,000– \$5,000 ‡	\$1,500– \$2,500 ‡	\$2,500	\$2,500	\$2,500 *	\$2,500**	\$2,000***
Plug-in Hybrid EVs 	\$3,000	\$1,500	\$1,500	\$1,500	\$1,500 *	\$1,500**	\$1,000***
Zero-Emission Motorcycles 	\$1,500	\$900	\$900	\$900	\$900	\$900	\$750
Neighborhood EVs	\$1,500	\$900	\$900	\$900	\$900	None eligible	None eligible
Commercial Zero-Emission Vehicles	\$20,000						

† Includes range-extended battery electric vehicles.  
 ‡ Amounts varied by ZEV type. For definitions, see CCR 1962.1.  
 \* Income-qualified consumers eligible for an additional \$1,500.  
 \*\* Income-qualified consumers eligible for an additional \$2,000.  
 \*\*\* Income-qualified consumers eligible for an additional \$2,500.

# Program Design Shapes Outcomes

  = in effect during 2021, **highlights**



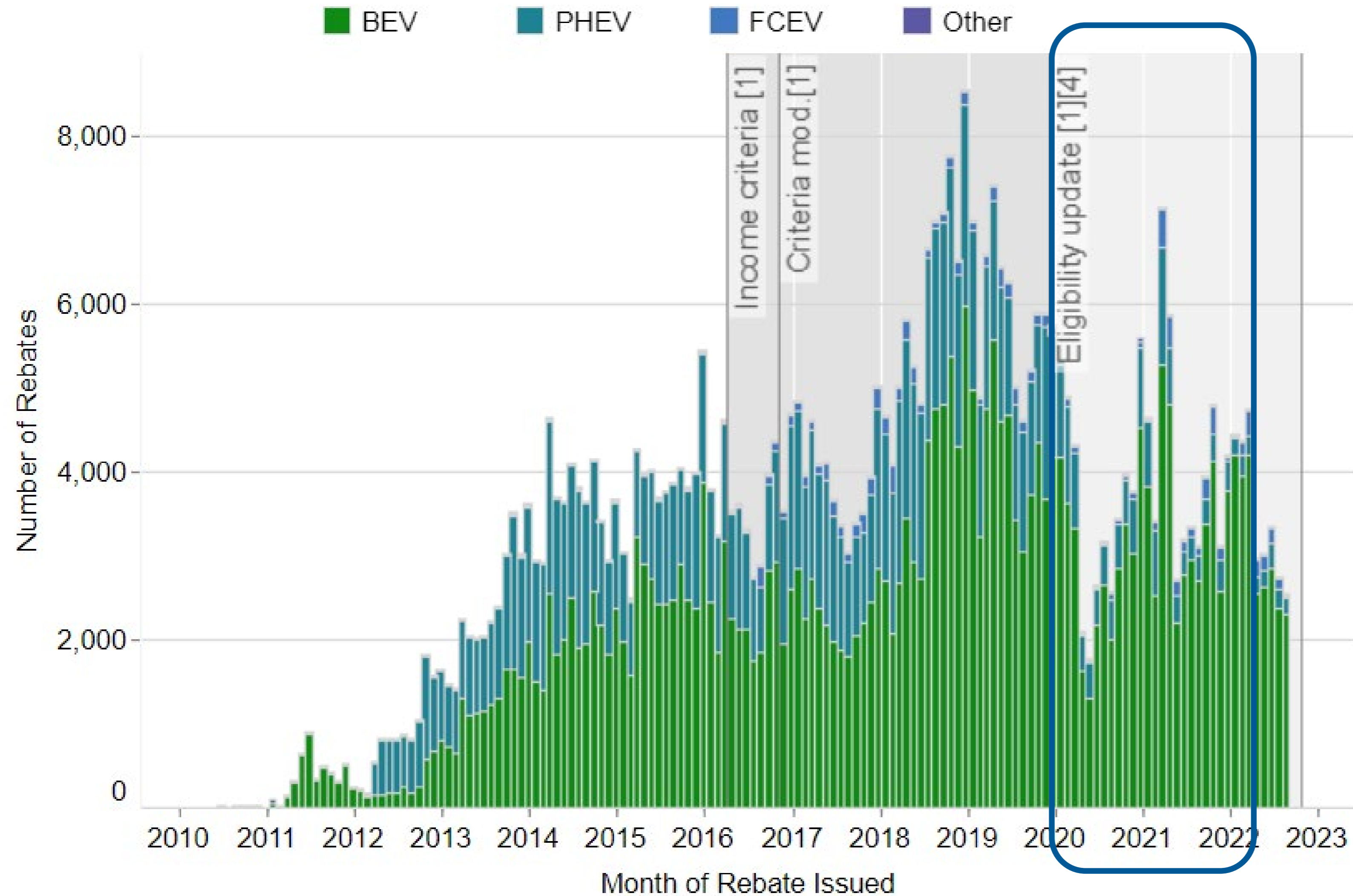
<p><b>as of Mar. 2010</b></p> <ul style="list-style-type: none"> <li>• Incentive stacking permitted</li> <li>• 36-month ownership requirement</li> <li>• Rebates per year limit = 20</li> </ul>	<p><b>as of Dec. 2013</b></p> <ul style="list-style-type: none"> <li>• Rebates per year limit = 2</li> </ul>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

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

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

# 2020–21 Results/Trends Should be Interpreted with Caution (COVID)

## Applications Saw Dramatic Decline But Some Recovery



Rebate applications for calendar year 2021 purchases/leases for individuals spanned 1/1/2021 – 7/1/2022\*.

9% applied in 2022.

\* Special waivers permitted ~20 applications beyond the 3-month application window. 1/5/23 image from <https://cleanvehiclerebate.org/eng/rebate-statistics>

# CVRP Consumer Survey Editions

(shows rebates to individuals for plug-in EVs\* only)

	<b>2013–2015 Edition</b>	<b>2015–2016 Edition</b>	<b>2016–2017 Edition</b>	<b>2017–2020 Edition</b>	<b>2020–2022 Interim Dataset</b>	<b>Total</b>
<b>Vehicle Purchase/ Lease Dates</b>	Sep. 2012 – May 2015	April 2015 – May 2016	May 2016 – May 2017	June 2017 – Nov. 2020	Dec. 2020 – Sep. 2022	Sep. 2012 – Sep. 2022
<b>Survey Responses (total <i>n</i>)**</b>	19,460	11,611	8,957	32,524	13,997	86,549
<b>Program Population (<i>N</i>)***</b>	91,081	45,685	46,839	193,167	79,780	456,552

\*Plug-in EVs (PEVs) include PHEVs and BEVs.

\*\* Subsequently weighted to represent the program population, see “CVRP Consumer Survey: Weighting Detail” slide for further detail.

\*\*\* Small numbers of rebated vehicles are not represented in the time frames due to application lags. Numbers may not be exactly comparable due to evolving weighting practices..

# CVRP Consumer Survey Data Used

(shows rebates to individuals for plug-in EVs only)

	2013–2015 Edition	2015–2016 Edition	2016–2017 Edition	2017–2020 Edition	2018 purchases/ leases subset	2019 purchases/ leases subset	“2020” purchases/ leases subset	2020–2022 Interim Dataset	2021 purchases/ leases subset	Total
<b>Vehicle Purchase/ Lease Dates</b>	Sep. 2012 – May 2015	April 2015 – May 2016	May 2016 – May 2017	June 2017 – Nov. 2020	Jan. 2018 – Dec. 2018	Jan. 2019 – Dec. 2019	Jan. 2020 – Nov.* 2020	Dec. 2020 – Sep. 2022	Jan. 2021– Dec. 2021	Sep. 2012 – Sep. 2022
<b>Survey Responses (total <i>n</i>)</b>	19,460**	11,611**	8,957**	32,524**	14,757	8,991	4,331**	13,997**	7,694**	86,549
<b>Program Population (<i>N</i>)***</b>	91,081	45,685	46,839	193,167	78,591 <small>(filtered subset of weighted Edition)</small>	61,277 <small>(filtered subset of weighted Edition)</small>	26,463	79,780	45,261	456,552

\* ~8k 2020 purchases/leases were invited to respond to the successive survey edition and are not represented in these data.

\*\* Subsequently weighted to represent the program population, see “CVRP Consumer Survey: Weighting Detail” slide for further detail.

\*\*\* Small numbers of vehicles are not represented in the time frames due to application lags. Numbers may not be exactly comparable due to evolving weighting practices.



# CVRP Consumer Survey: Weighting Detail

- Each survey edition is individually weighted to represent the program population along the dimensions of vehicle category, vehicle model, buy vs. lease, and county.
  - Weighting for the 2017–20 Edition & 2020–22 Interim Dataset also included year of purchase/lease.
- The 2020 & 2021 purchase/lease subsets were also independently weighted
  - This produced only minor differences compared to the filtered approach used for the 2018 & 2019 subsets.
  - Weighting for the 2021 subset also includes rebate type (Standard Rebate vs. Increased Rebate).
- Summary of weights, 2021 purchases/leases:

Min	Median	Mean	Max
0.29	0.999	1	2.72

# Vehicle Replacement

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# Vehicle Replacement: Select Resources



## Publications

- ❖ N. Pallonetti and B.D.H. Williams (2023, Mar.), [Vehicle Replacement: Findings from California's Clean Vehicle Rebate Project](#), *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. [Paper](#). [CSE posting](#). [Precursor slides](#).
- ❖ B.D.H. Williams and N. Pallonetti (2023, Mar.), [New York State's Drive Clean Rebate for Electric Vehicles: Measures of Impact](#), *36th International Electric Vehicle Symposium (EVS36)*, EDTA, Sacramento CA, USA. [Paper](#). [Slides](#). [CSE posting](#).
- B.D. Williams, J. Orose, M. Jones, J.B. Anderson (2018, Oct.), [Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition](#), *Program Reports*, Clean Vehicle Rebate Project, San Diego CA.
- C. Johnson, B.D. Williams, C. Hsu, J.B. Anderson (2017, Jun.), [Summary Documentation of the Electric Vehicle Consumer Survey, 2013–2015 Edition](#), *Program Reports*, Clean Vehicle Rebate Project, San Diego CA.

## Presentations & Video

- ❖ [NY Drive Clean Rebates: Select Impacts Through 2021](#). [Paper](#). [CSE posting](#). (2023, Jun. 12).
- ❖ [CVRP 2020 Data Brief: Vehicle Replacement](#)
- [Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness](#) (2021, Jul.)
- [EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts](#) (2020, Dec.)
- [Infographic: What Vehicles Are Electric Vehicles Replacing and Why?](#) (2020, Jan.)
- ❖ [What Vehicles Are Electric Vehicles Replacing and Why?](#) (2019, Nov.)
- [Electric Vehicle Incentives and Policies](#) (2019, Nov.)
- [CVRP: Data and Analysis Update](#) (2018, Dec.)
- [Electric Vehicle Rebates: Exploring Indicators of Impact in Four States](#) (2018, Jun.)
- Yale Webinar: [“Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Findings,”](#) 58 minutes. [Slides](#). (2017, Apr.)

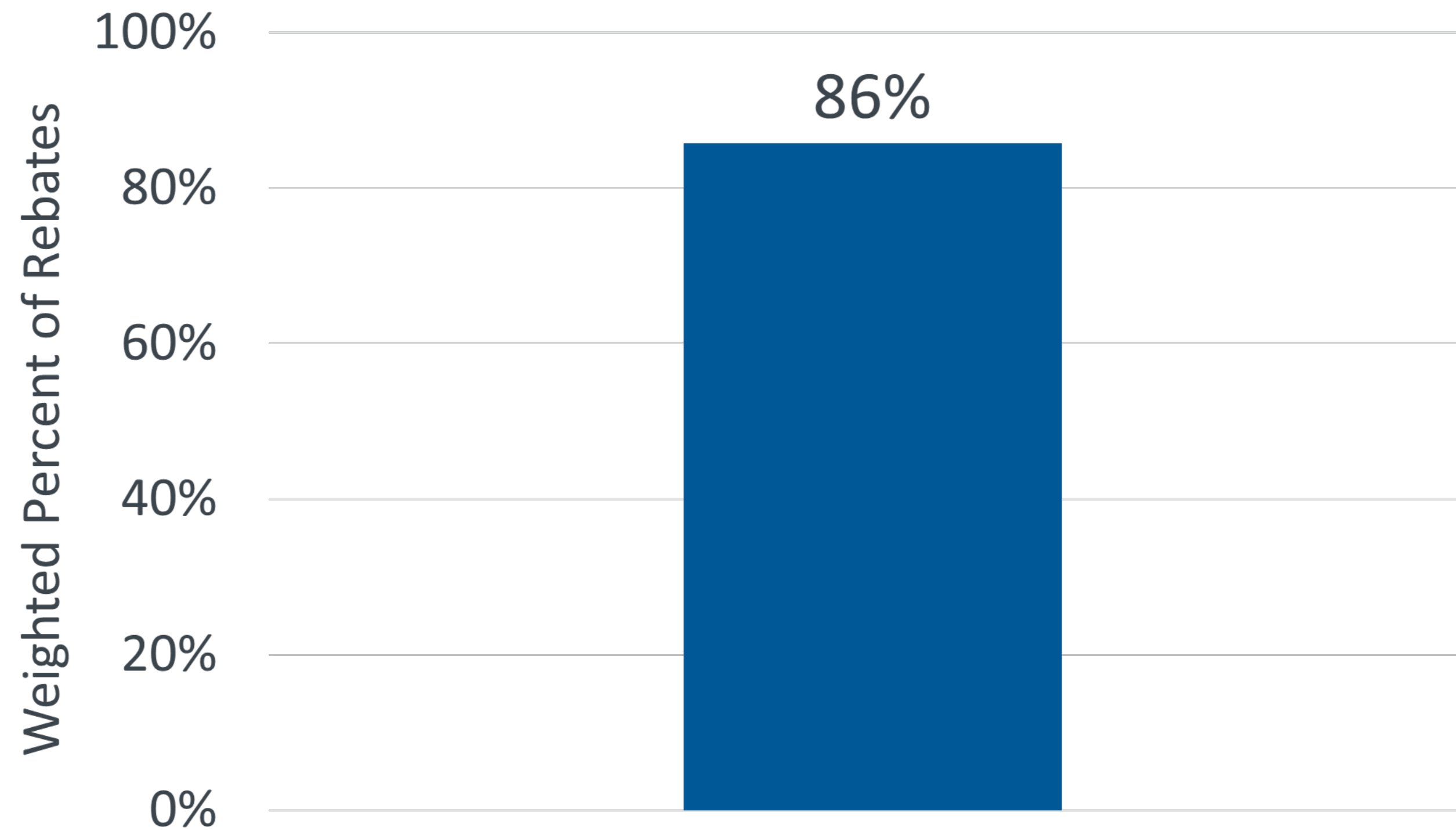
A close-up photograph of a person's hand plugging a charging cable into the port of an electric vehicle. The scene is set outdoors at sunset, with warm, golden light and lens flare effects. In the background, a public charging station with multiple orange charging cables is visible, along with a blurred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

# Vehicle Replacement Rates

# Do EVs Get Used?

## 2021 Purchases/Leases

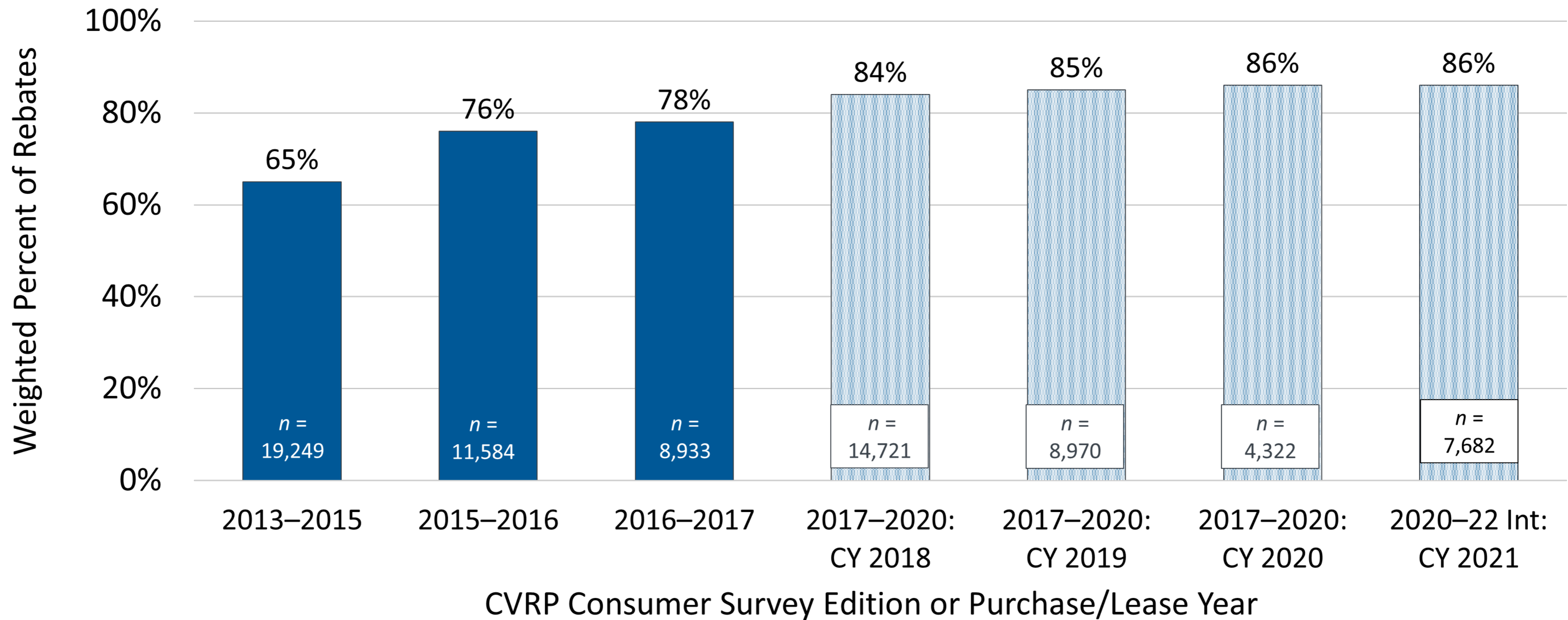
Replaced a vehicle with their rebated *plug-in EV*



*CVRP Consumer Survey, 2020–2022 Interim Dataset.  
n-value is filtered and question-specific.*

# Vehicle Replacement has Increased

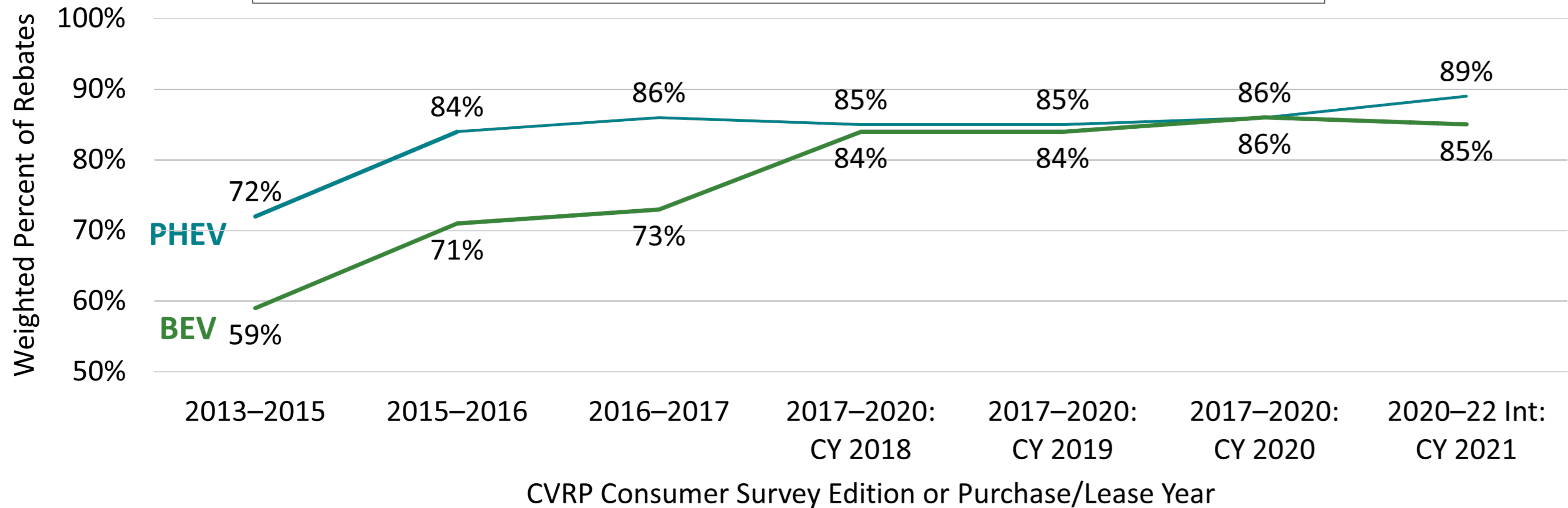
## Replaced a vehicle with their rebated *plug-in EV*



Overall datasets: 86,549 total survey respondents weighted to represent 456,552 rebate recipients.  
*n-values are filtered and question-specific.*

# Vehicle Replacement Has Long Been High for PHEVs, BEVs Gradually Caught Up

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



CVRP Consumer Survey, 2013–2015 Edition: n = 19,249. 2015–2016 Edition: n = 11,584. 2016–2017 Edition: n = 8,933. 2017–2020 Edition: CY 2018 n = 14,721; CY 2019 n = 8,970; CY 2020 n = 4,322. 2020–2022 Interim Dataset: CY 2021 n = 7682.  
n-values are filtered and question-specific.

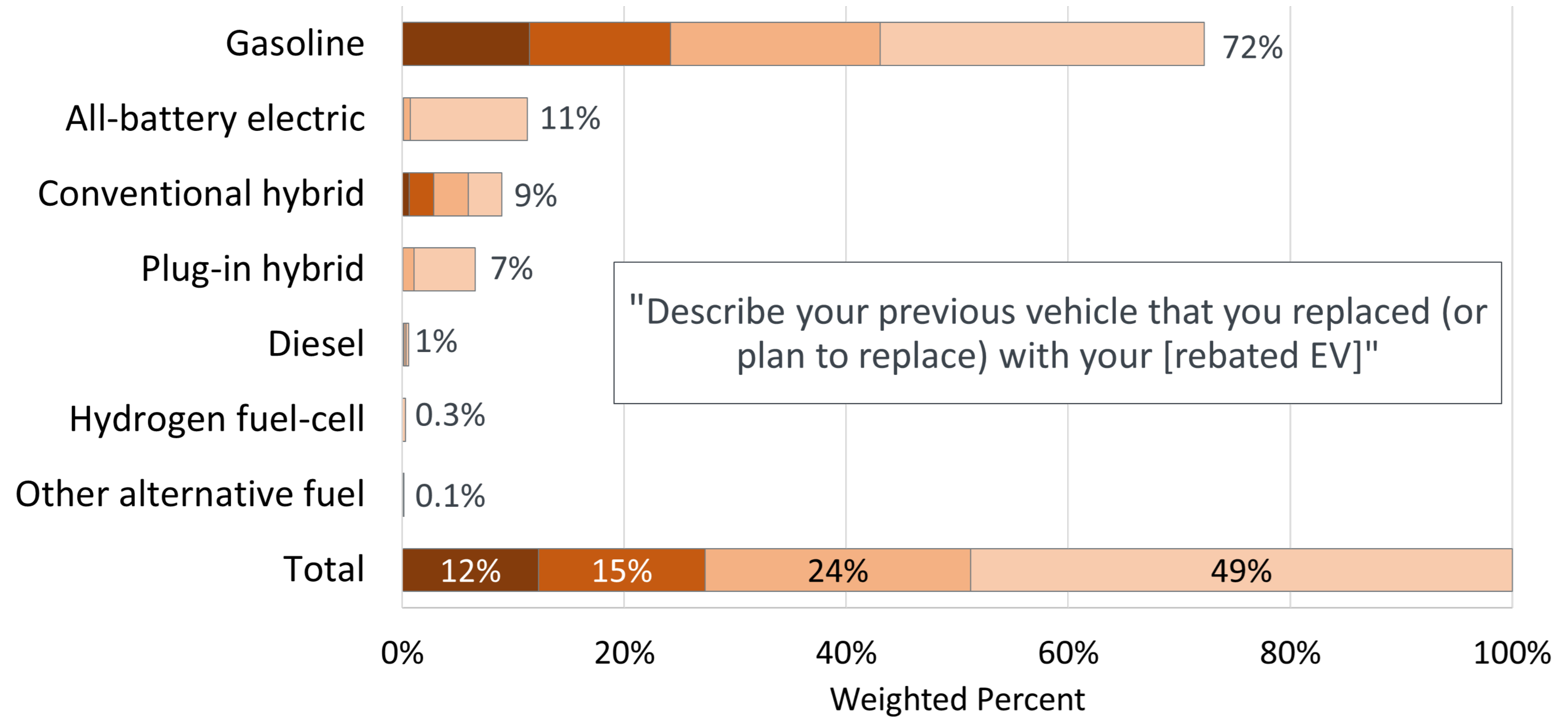
A close-up photograph of a person's hand plugging a charging cable into the charging port of a light-colored electric vehicle. The scene is set outdoors at sunset, with a bright sun in the upper right corner creating a lens flare effect. In the background, a public charging station with several orange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

# Vehicle Age & Types Replaced



# What Vehicles Have Rebates Helped Replace?

## 2021 Plug-in Electric Vehicle Purchases/Leases

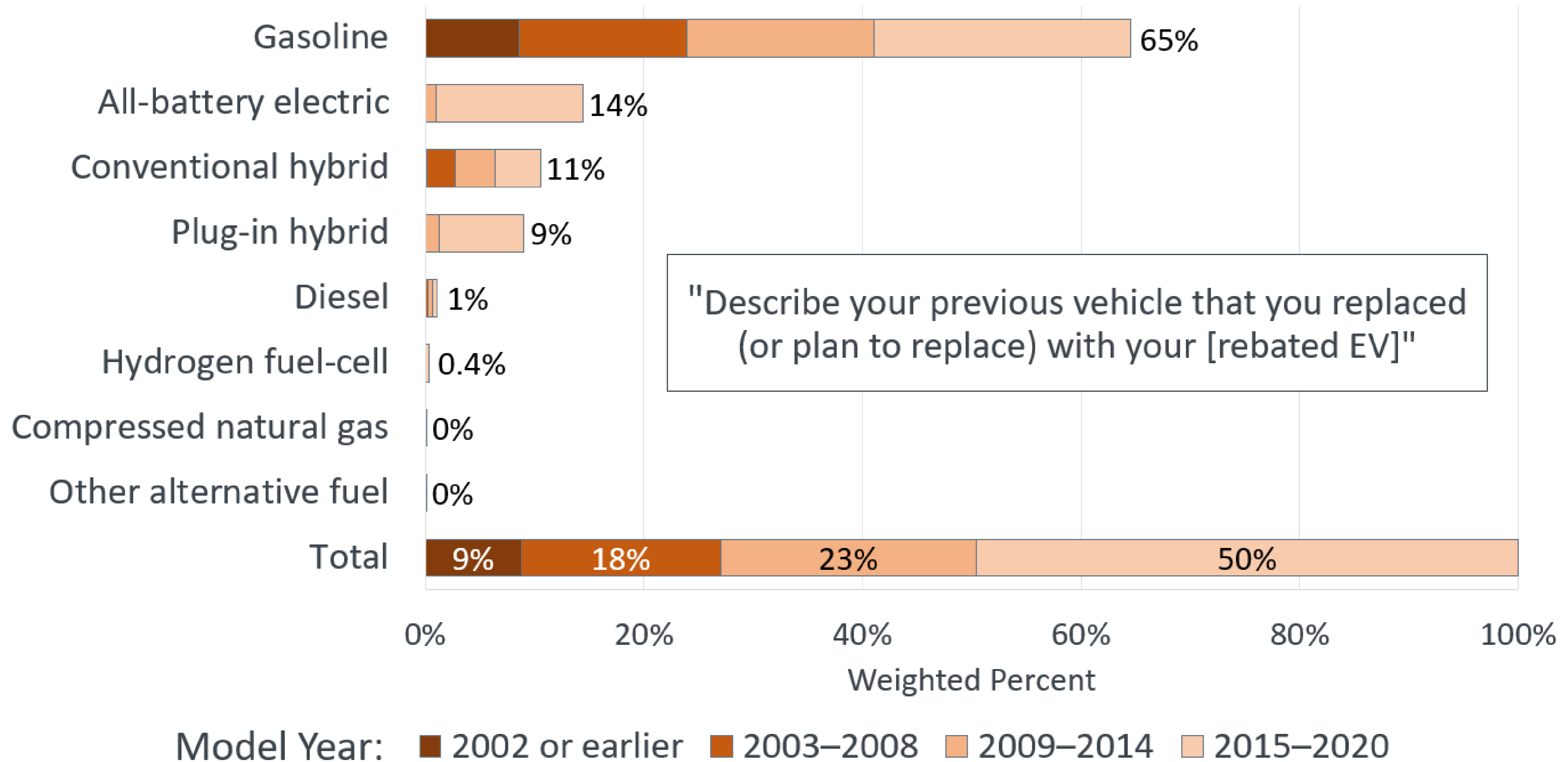


Model Year: ■ 2005 or earlier ■ 2006–2010 ■ 2011–2015 ■ 2016 or later

*Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
CVRP Consumer Survey 2020–2022 Interim Dataset. Filtered, question-specific, n = 6,493.*

# What Vehicles Have Rebates Helped Replace?

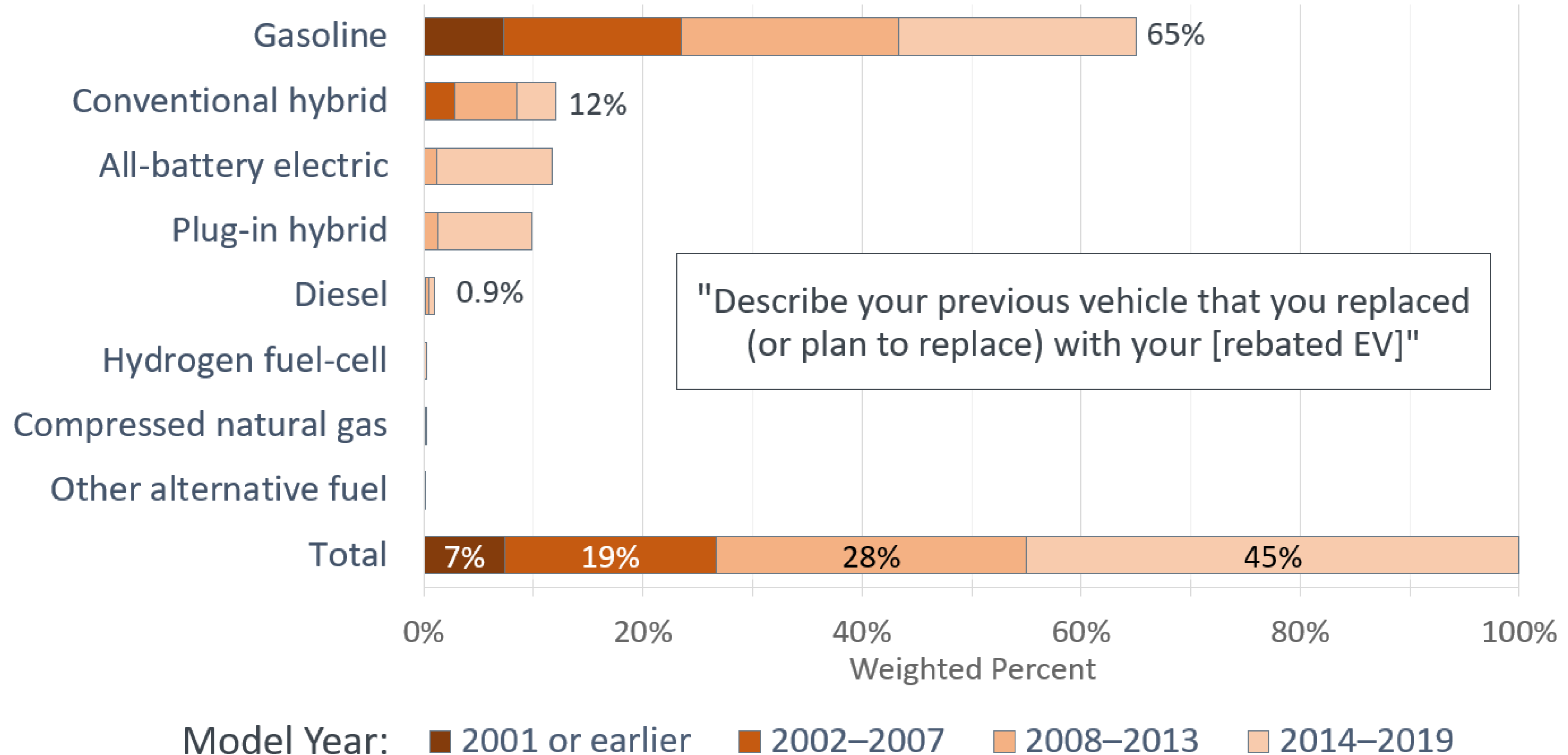
2020 Plug-in Electric Vehicle Purchases/Leases



Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
CVRP Consumer Survey, 2017–2020 Edition. Filtered, question-specific, n = 3,146.

# What Vehicles Have Rebates Helped Replace?

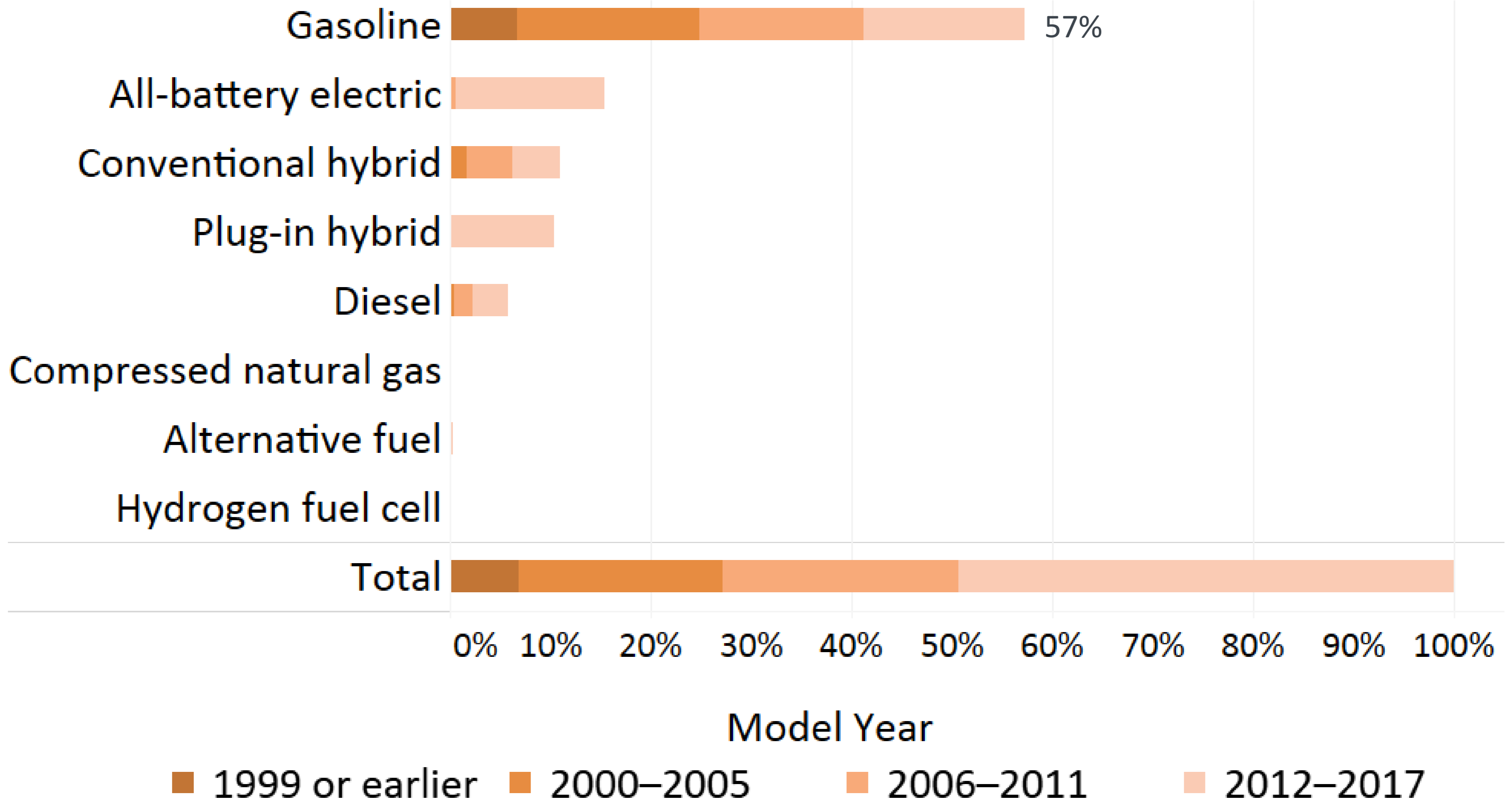
2019 Plug-in Electric Vehicle Purchases/Leases



Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
CVRP Consumer Survey: 2017–2019 edition. Filtered, question-specific, weighted n = 4,465.

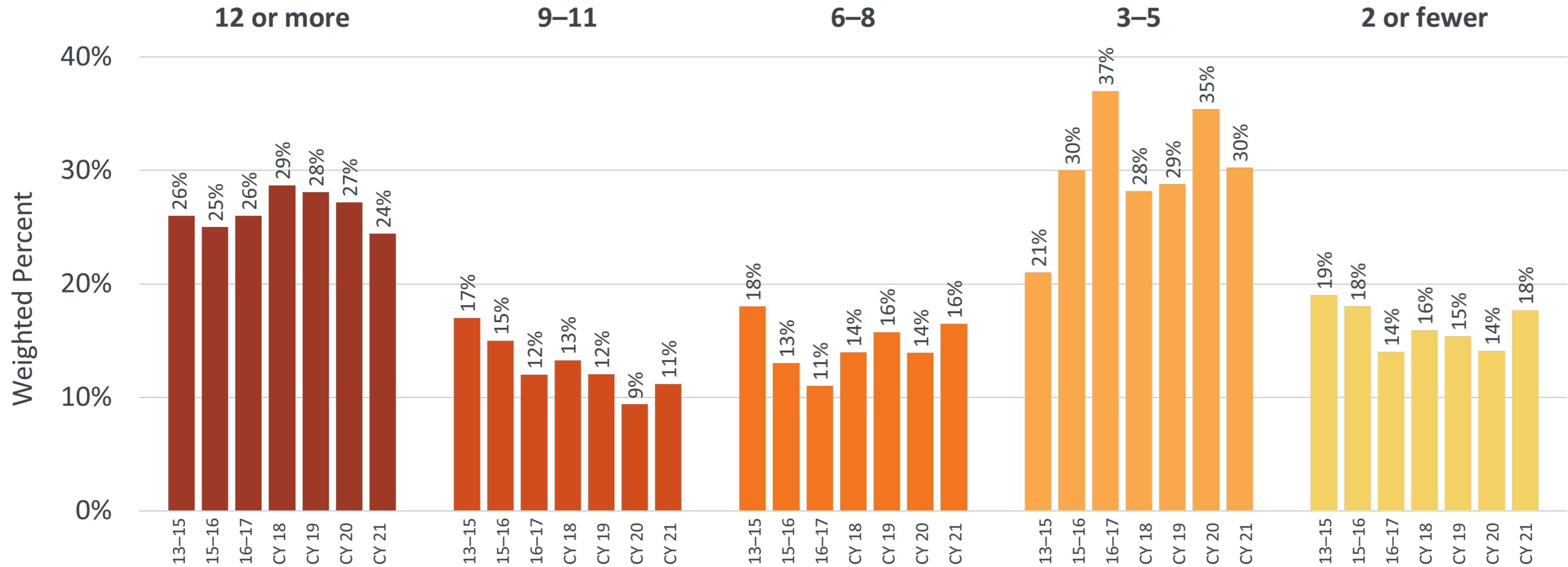
# What Vehicles Have Rebates Helped Replace?

## Plug-in Electric Vehicle Purchases/Leases (2016–17 Survey Edition)



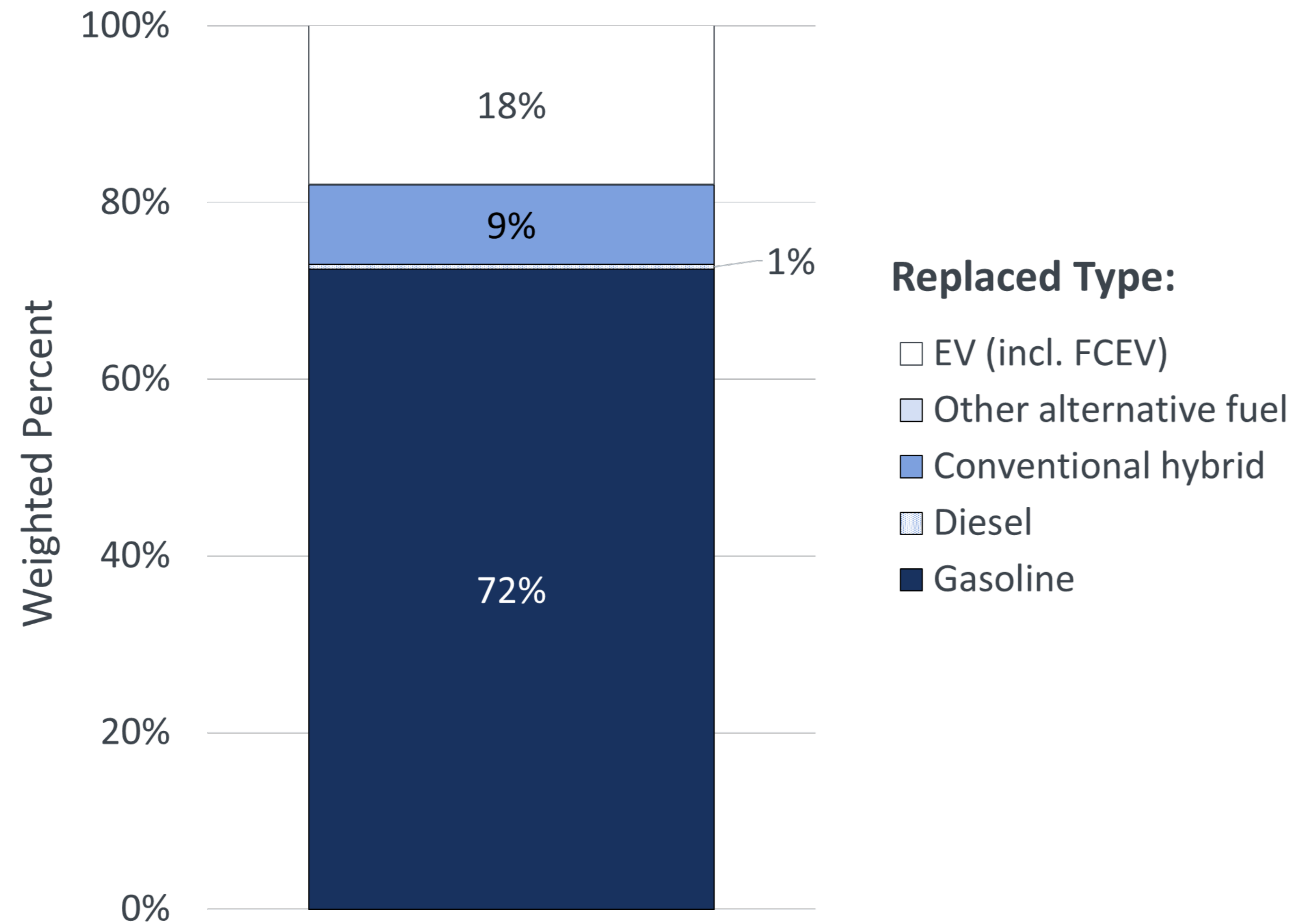
# Replaced Vehicle Age

Age = Rebated plug-in EV model year – Replaced vehicle model year



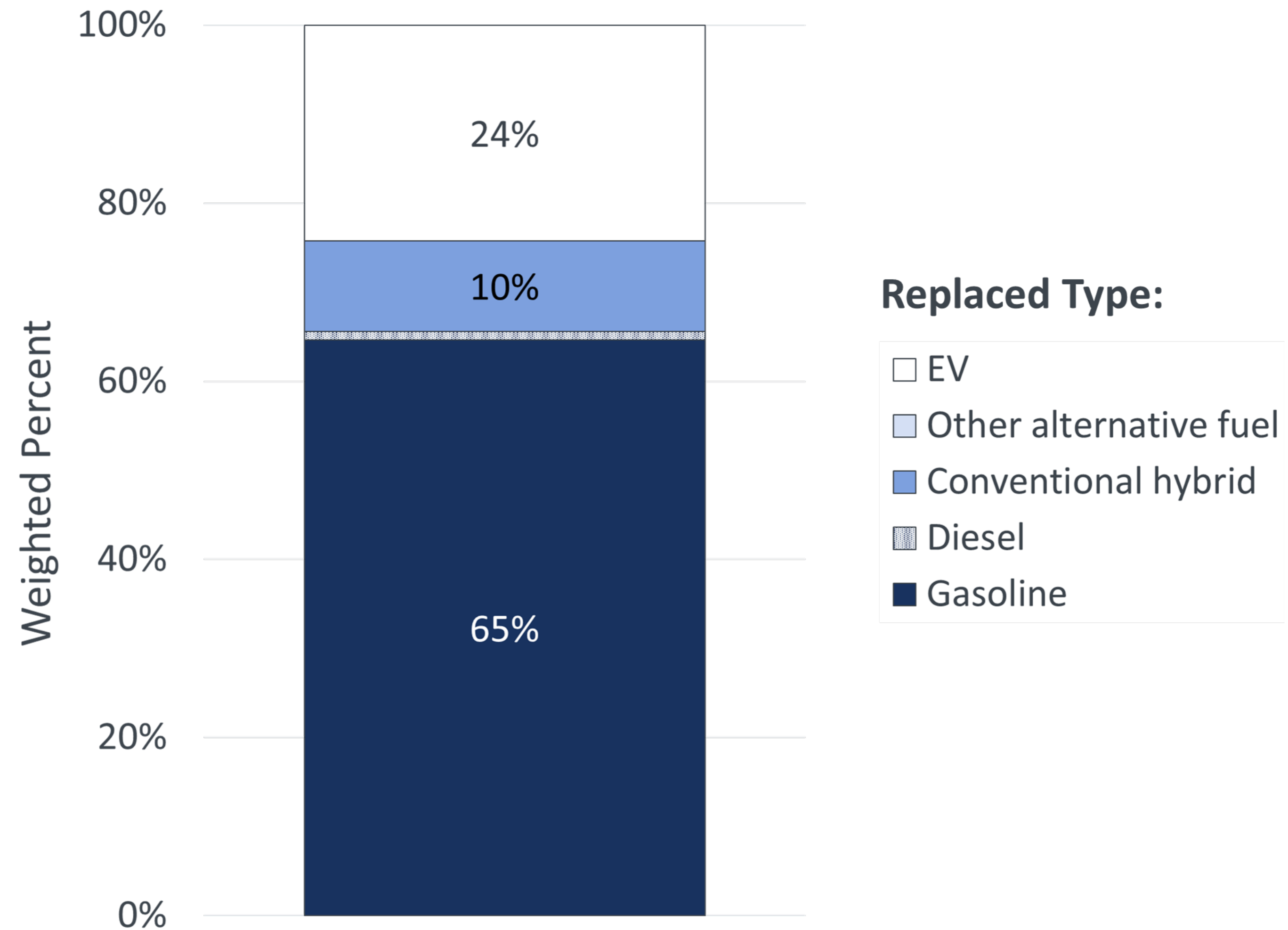
Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV. CVRP Consumer Survey, 2013–2015 Edition: n = 12,273. 2015–2016 Edition: n = 8,651. 2016–2017 Edition: n = 6,968. 2017–2020 Edition: CY 2018 n = 10,964; CY 2019 n = 6,507; CY 2020 n = 3,149. 2020–2022 Interim Dataset: CY 2021 n = 6,494. n-values are filtered and question-specific.

# Vehicle Types Replaced by 2021 Plug-in EV Purchases/Leases



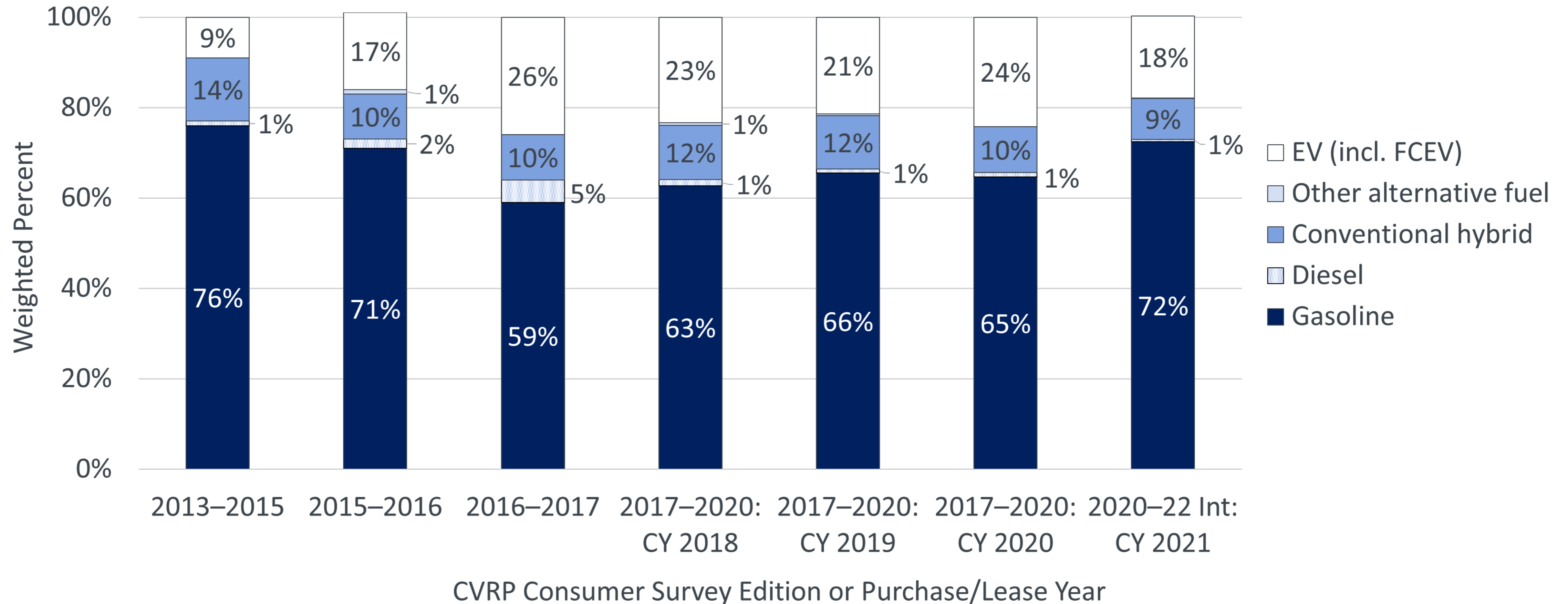
*Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,513.*

# Vehicle Types Replaced by 2020 Plug-in EV Purchases/Leases



*Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
CVRP Consumer Survey, 2017–2020 Edition. Filtered, question-specific n = 3,725.*

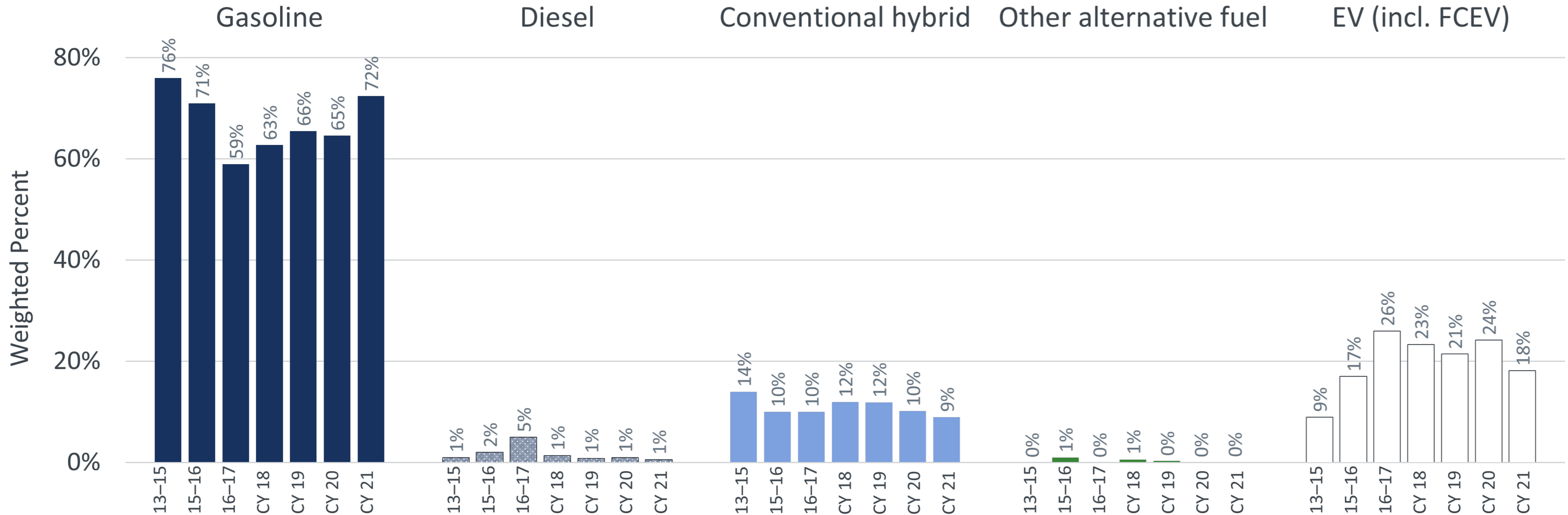
# What Vehicle Types Have Plug-in EV Rebates Helped Replace Over Time? (stacked)



Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV. CVRP Consumer Survey, 2013–2015 Edition: n = 12,350. 2015–2016 Edition: n = 8,620. 2016–2017 Edition: n = 6,958. 2017–2020 Edition: CY 2018 n = 12,321; CY 2019 n = 7,616; CY 2020 n = 3,725. 2020–2022 Interim Dataset: CY 2021 n = 6,513. n-values are filtered and question-specific.



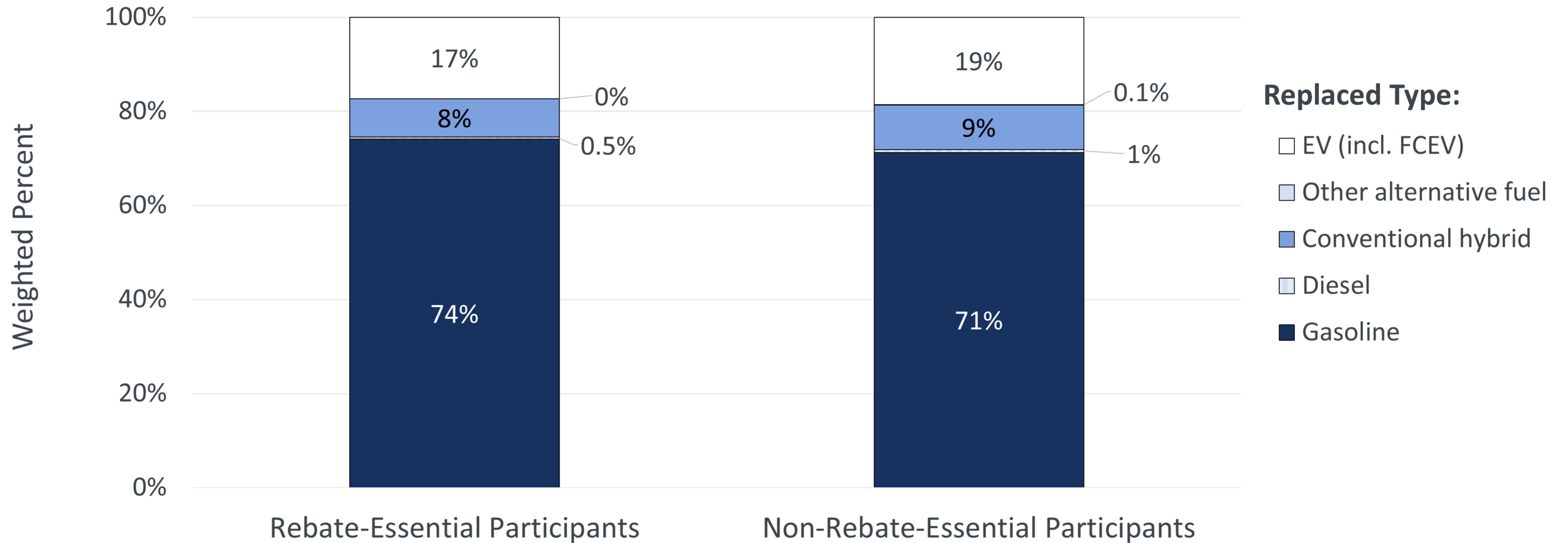
# What Vehicle Types Have Plug-in EV Rebates Helped Replace Over Time? (unstacked)



Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV. CVRP Consumer Survey, 2013–2015 Edition: n = 12,350. 2015–2016 Edition: n = 8,620. 2016–2017 Edition: n = 6,958. 2017–2020 Edition: CY 2018 n = 12,321; CY 2019 n = 7,616; CY 2020 n = 3,725. 2020–2022 Interim Dataset: CY 2021 n = 6,513. n-values are filtered and question-specific.

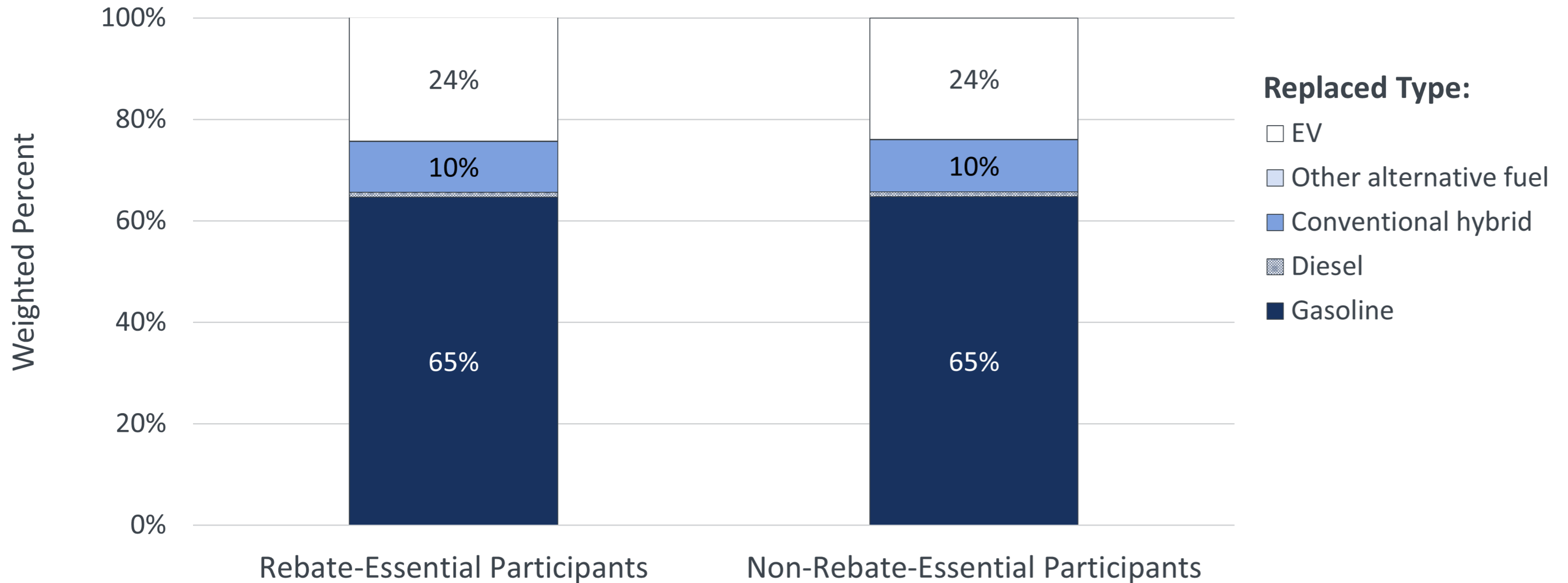
# “Essential” and “non-Essential” Rebates Replace Similar Vehicle Types

## 2021 Purchases/Leases



For more on *Rebate Essentiality* metrics and their definition, see the EVS36 paper [Rebate Influence on Electric Vehicle Adoption in California](#).  
 Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
 CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,485.

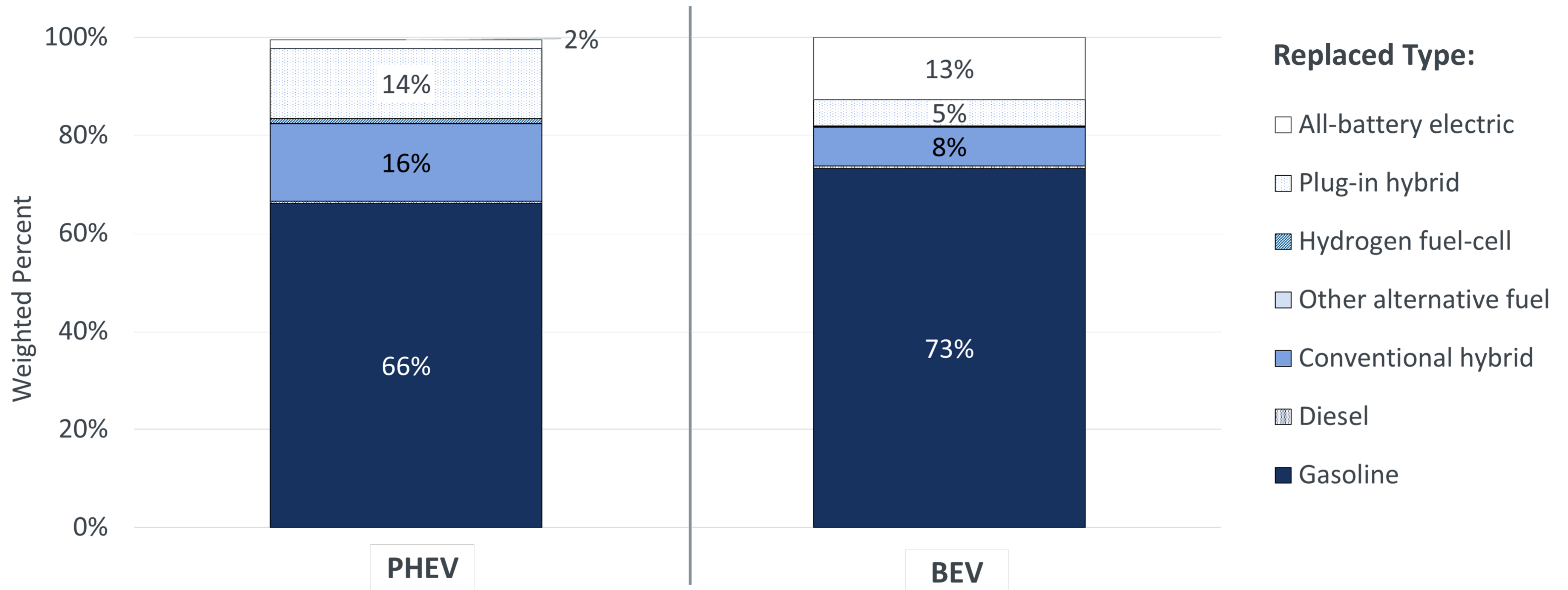
# What Vehicle Types Have “Essential” Rebates for Plug-in EVs Helped Replace? 2020 Purchases/Leases



For more on *Rebate Essentiality* metrics and their definition, see the EVS36 paper [Rebate Influence on Electric Vehicle Adoption in California](#).  
 Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
 CVRP Consumer Survey, 2017–2020 Edition. Filtered, question-specific n = 3,704.

# Replaced-Vehicle Technology Types by Rebated-Vehicle Technology Type

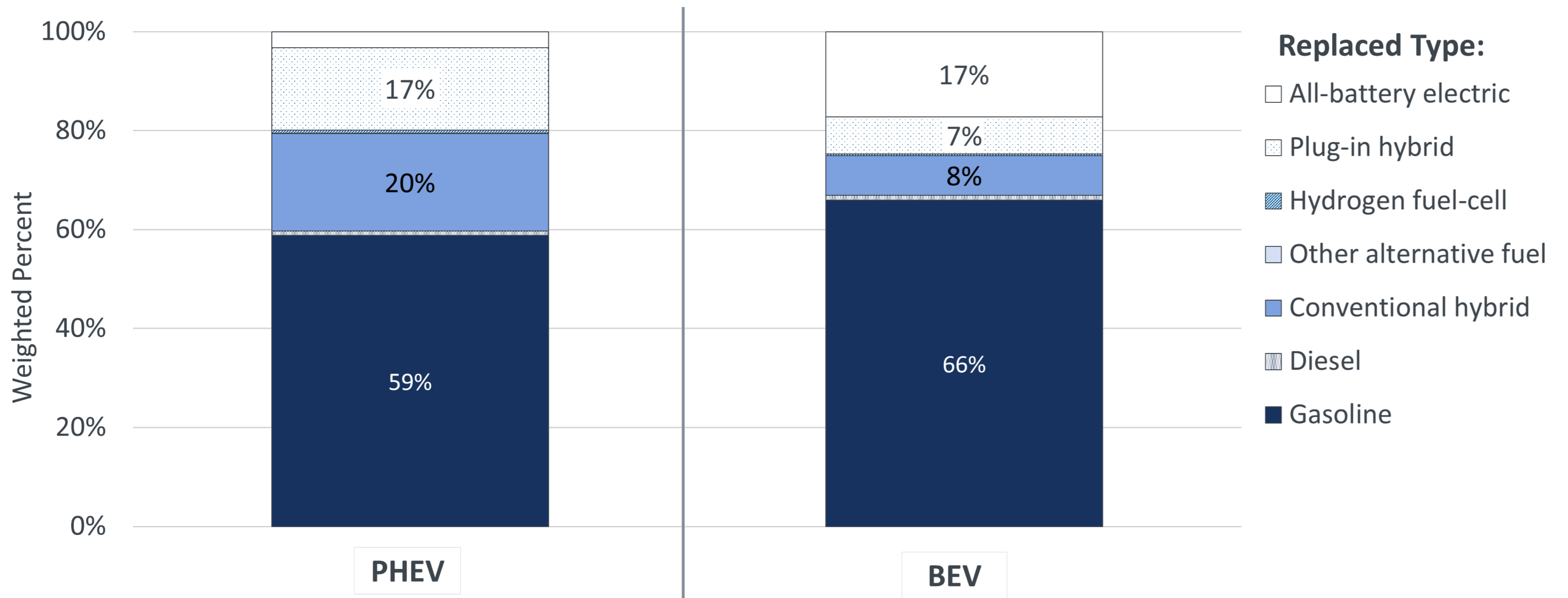
## 2021 Purchases/Leases



Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
 CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,513.

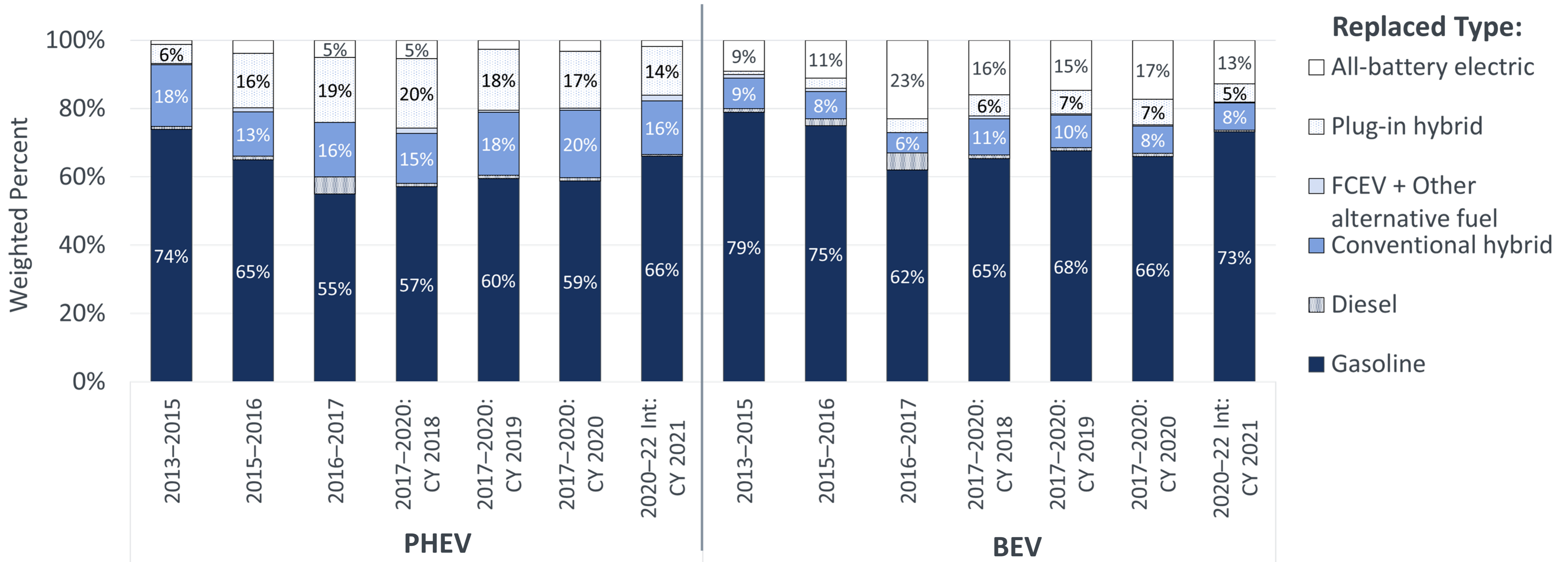
# Replaced-Vehicle Technology Types by Rebated-Vehicle Technology Type

## 2020 Purchases/Leases



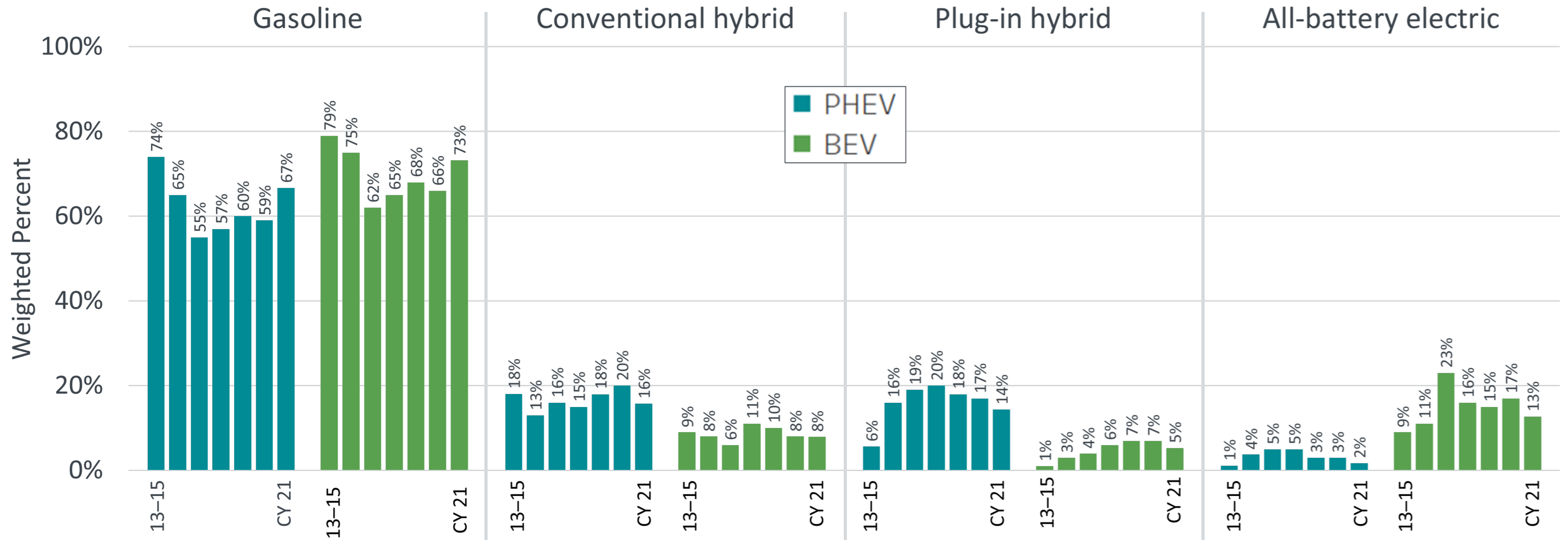
Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.  
 CVRP Consumer Survey, 2017–2020 Edition. Filtered, question-specific n = 3,725.

# Replaced-Vehicle Technology Types by Rebated-Vehicle Technology Type Over Time



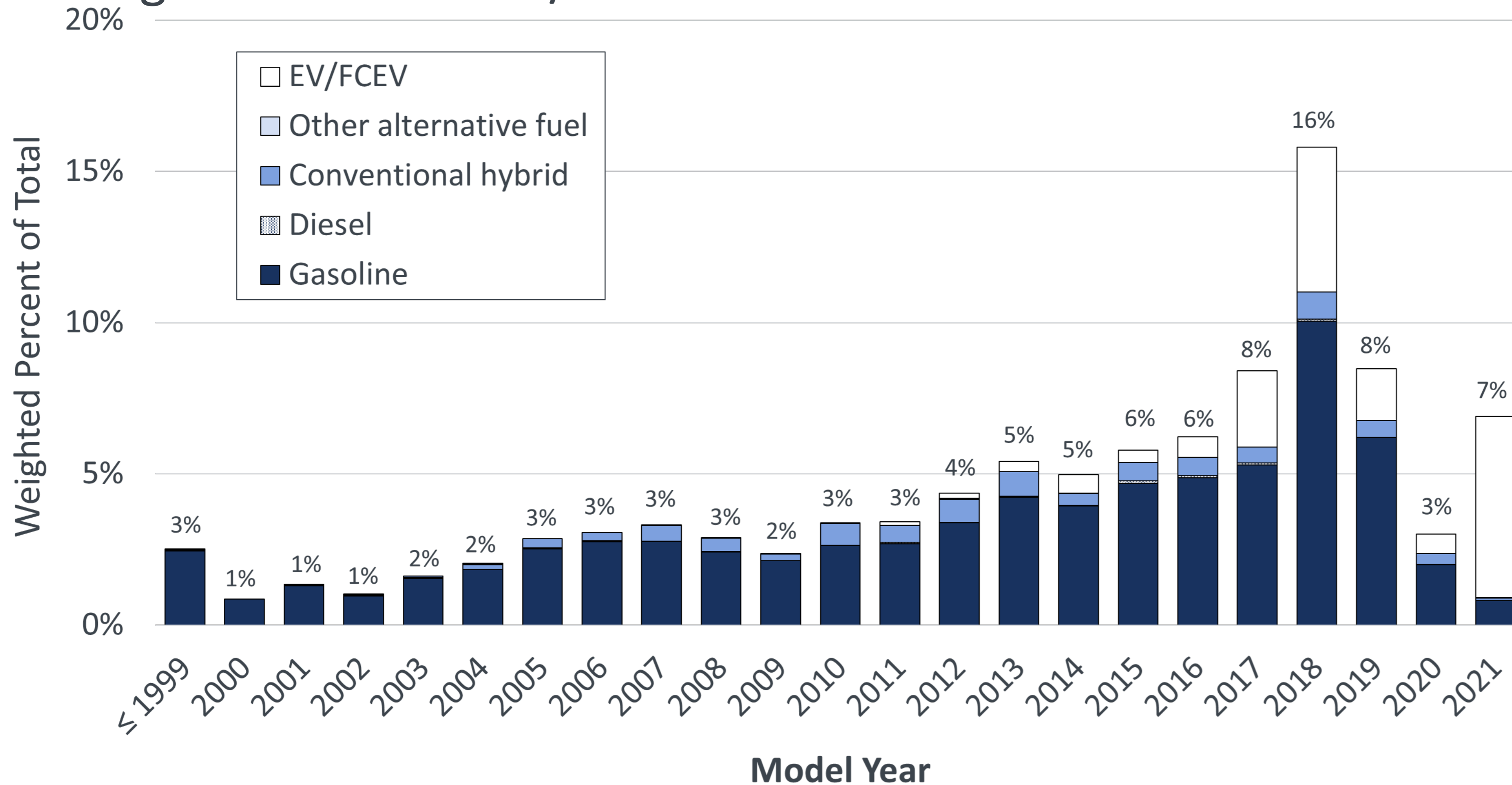
Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV. CVRP Consumer Survey, 2013–2015 Edition: n = 12,350. 2015–2016 Edition: n = 8,620. 2016–2017 Edition: n = 6,958. 2017–2020 Edition: CY 2018 n = 12,321; CY 2019 n = 7,616; CY 2020 n = 3,725; 2020–2022 Interim Dataset n = 6513. n-values are filtered and question-specific.

# Top 4 Replaced-Vehicle Technology Types by Rebated-Vehicle Technology Type



Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV. CVRP Consumer Survey, 2013–2015 Edition: n = 12,350. 2015–2016 Edition: n = 8,620. 2016–2017 Edition: n = 6,958. 2017–2020 Edition: CY 2018 n = 12,321; CY 2019 n = 7,616; CY 2020 n = 3,725; 2020–2022 Interim Dataset n = 6513. n-values are filtered and question-specific.

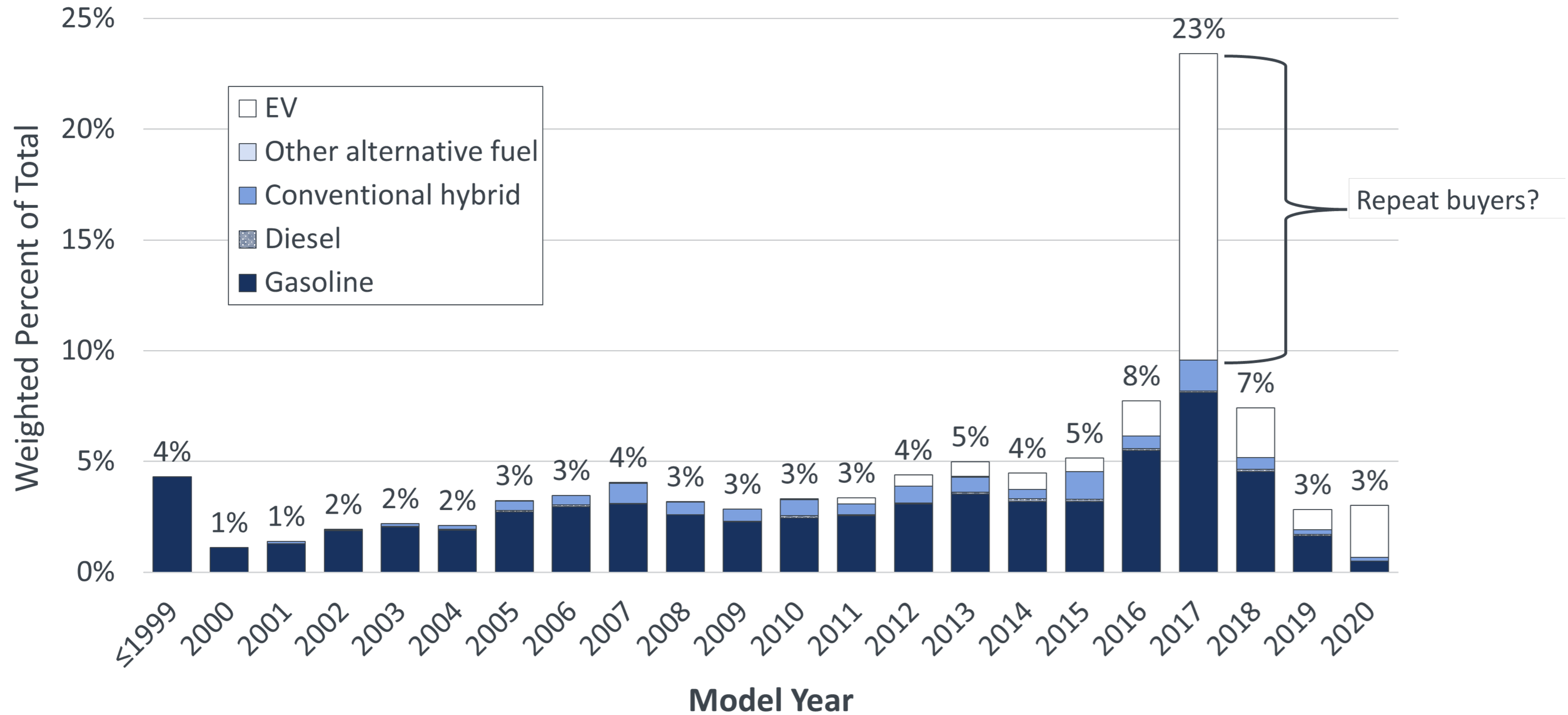
# Model-Year Distribution of Vehicles Replaced by 2021 Plug-in EV Purchases/Leases



CVRP Consumer Survey, 2020–2022 Interim Dataset. Filtered, question-specific n = 6,493



# Model-Year Distribution of Vehicles Replaced by 2020 Plug-in EV Purchases/Leases



CVRP Consumer Survey, 2017–2020 Edition. Filtered, question-specific n = 3,146.

# Summary & Select Findings

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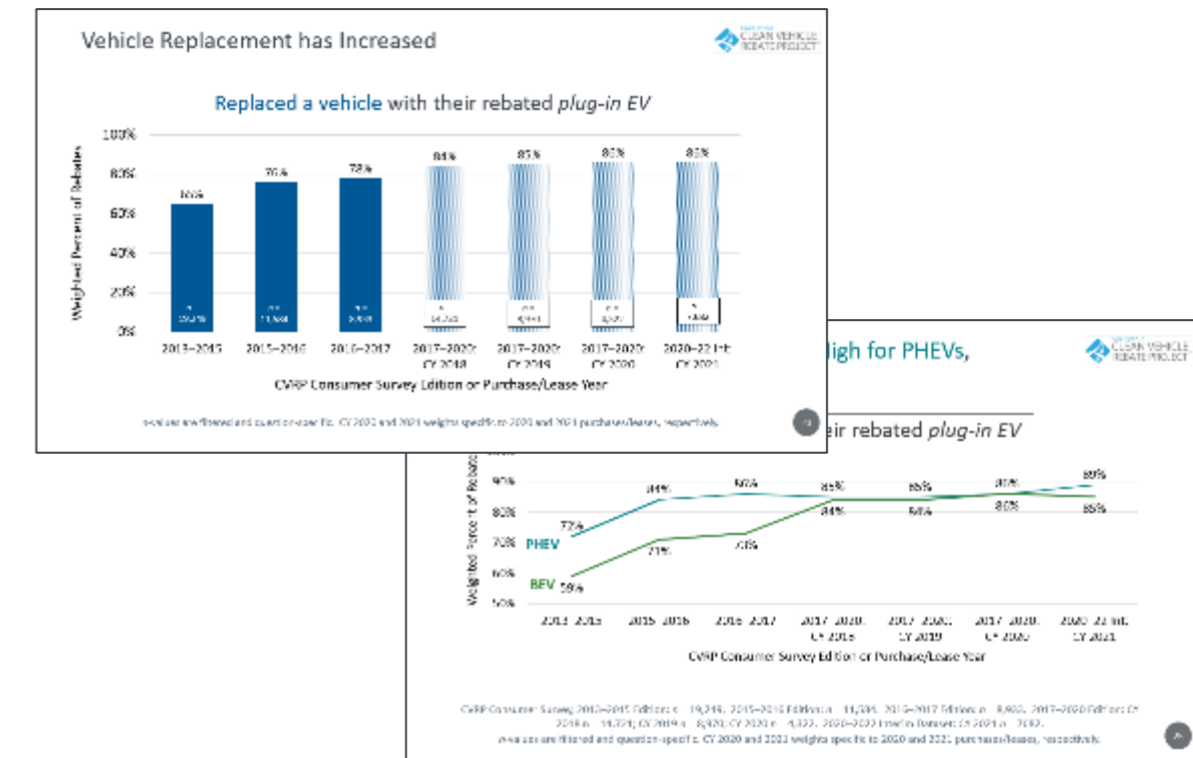
# Summary & Select Findings: 2021 Vehicle Replacement

## Context

- Program design and COVID-19 fallout shaped impacts in 2021

## Replacement Rates

- 86% overall and 89% for PHEVs
  - PHEVs produced strong replacement rates early, BEVs gradually caught up

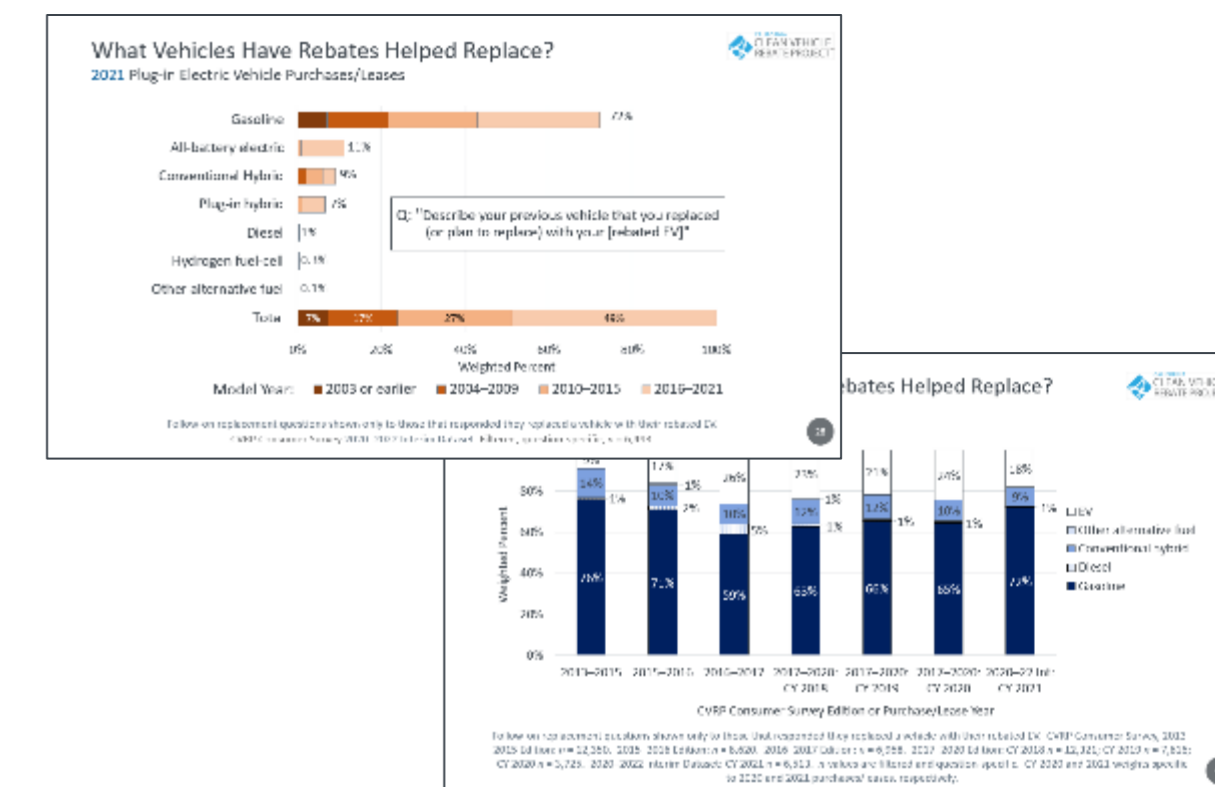


## Replaced Age

- ~1/2 were 5+ years old
  - ~1/4<sup>th</sup> were 11+ years old

## Replaced Types

- > 4/5<sup>ths</sup> of replaced vehicles were **gasoline-fueled** (incl. conventional hybrid)
  - non-hybrid gasoline replacement *increased* from 65% (in 2020) to 72%
- PHEVs replaced slightly more gasoline vehicles overall (incl. hybrids) and PHEVs
- BEVs replaced more non-hybrid gasoline vehicles and BEVs

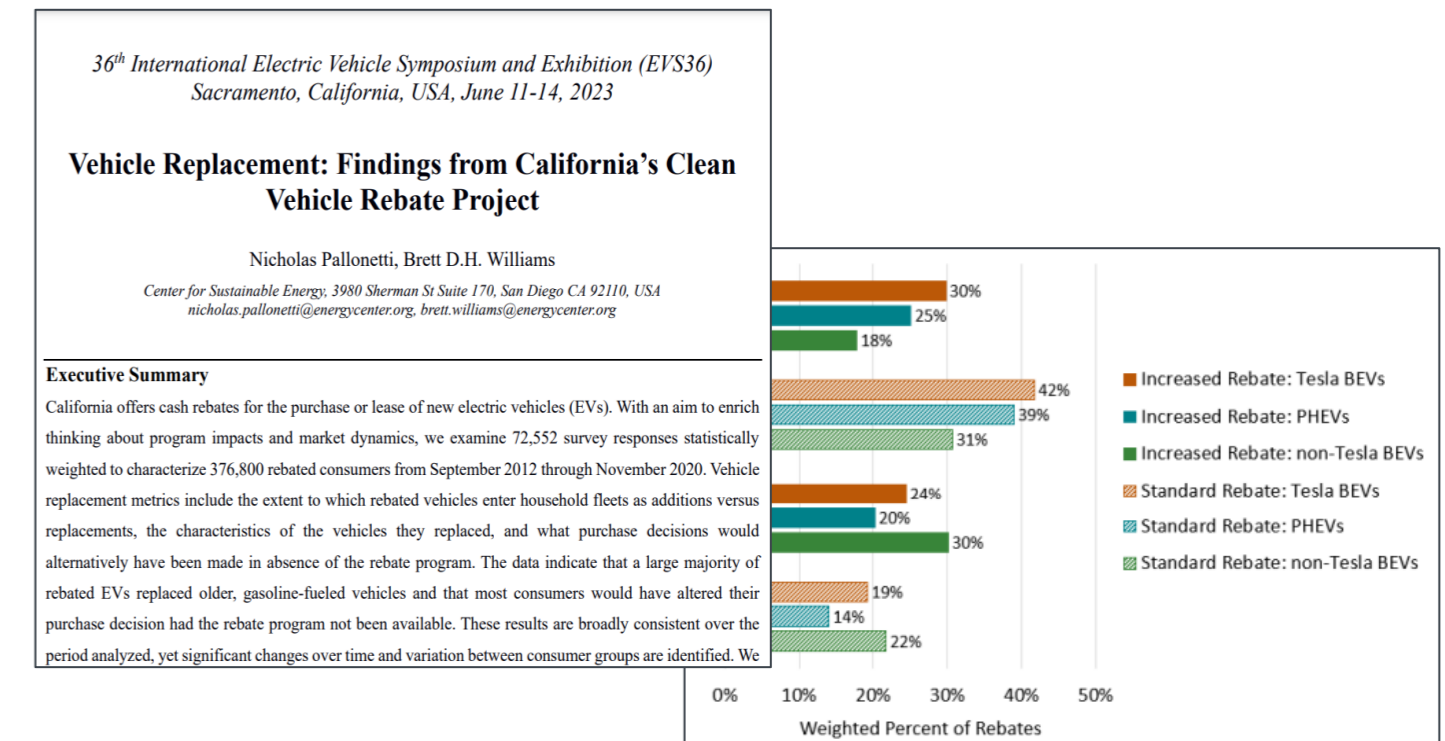


Bottom line: Most rebated EVs replaced older, more polluting vehicles

# Related Research: Replacement Behavior & Impacts

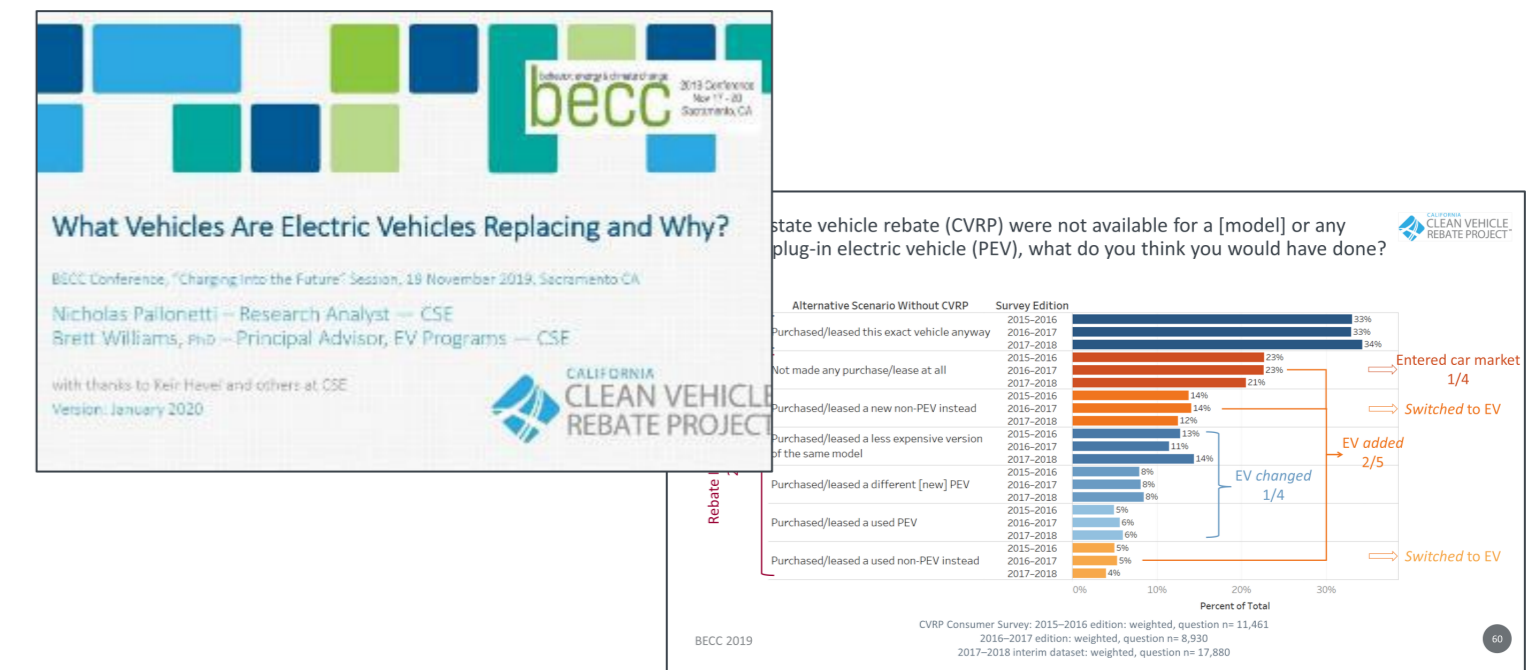
## Vehicle Replacement: Findings from California's Clean Vehicle Rebate Project (EVS36)

- Replacement motivations and what might have happened without the rebate



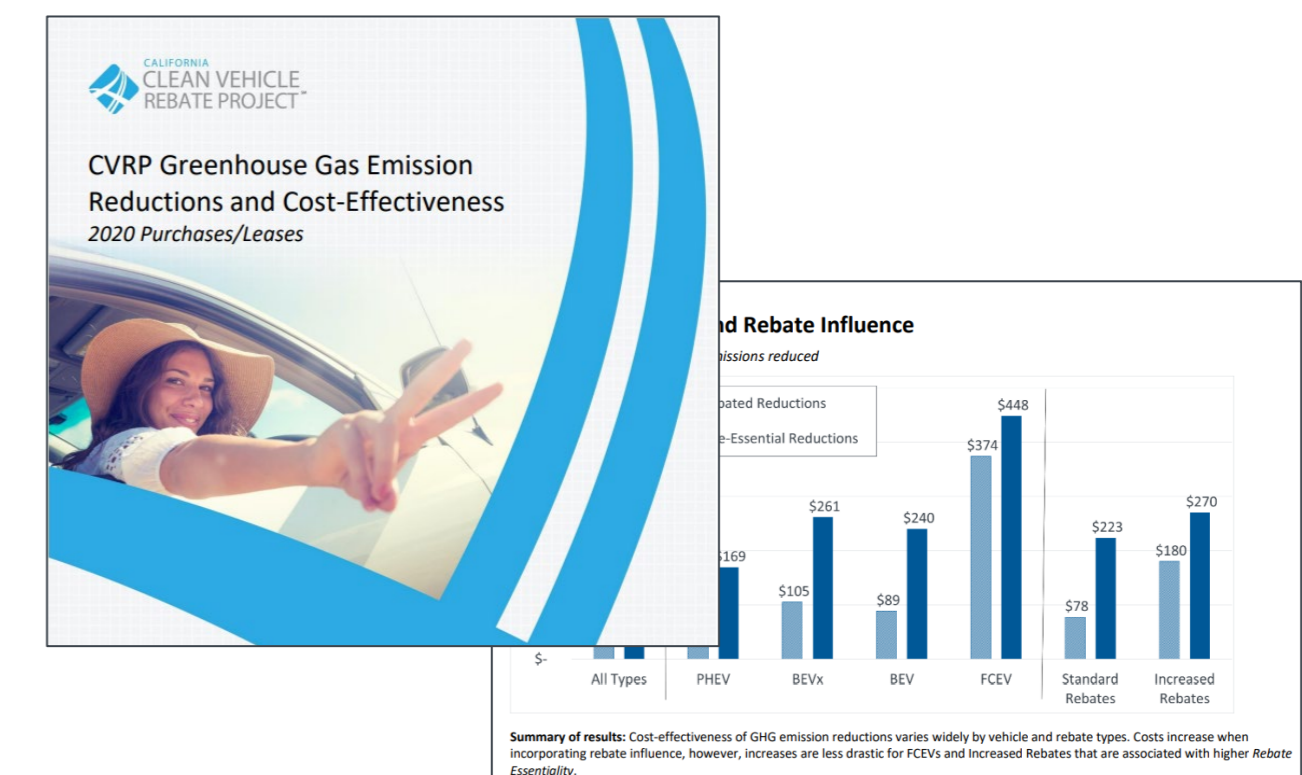
## What Vehicles Are Electric Vehicles Replacing and Why? (BECC 2019)

- Replacement motivations and what might have happened without the rebate



## CVRP Greenhouse Gas Emission Reductions and Cost-Effectiveness: 2021 Purchases/Leases

- When compared to buying a new gasoline vehicle, rebated plug-in EVs may be saving 17–24 tons of GHG emissions over 100k miles per vehicle at a cost of \$246–\$301/ton of *Rebate Essential* GHG reductions



# Additional Details & Resources

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# Funding Availability Has Been Regularly Disrupted

(as of Sept. 2021)



## Table 4: CVRP Waitlists

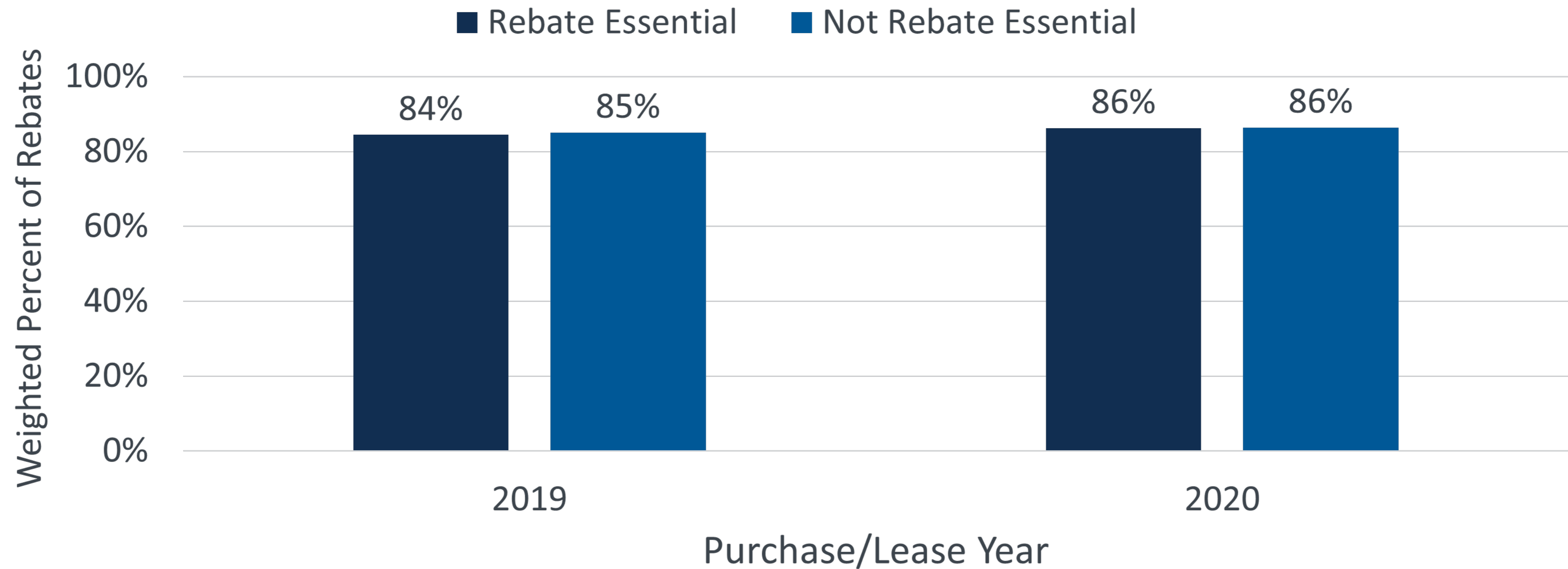
Waitlist Year	Start Date	End Date	Length in Days
2011*	Jun. 20	Sept. 30	102
2013*	May 1	Jun. 30	60
2014	Mar. 28	Jul. 22	116
2016	Jun. 11	Sept. 28	109
2017**	Jun. 30	Nov. 20	143
2019**	Jun. 5	Sept. 23	110
2021	Apr. 23	Sept. 15	145

\* Dates approximate.

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

# Vehicle Replacement is Consistent Across Measures of Rebate Influence

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



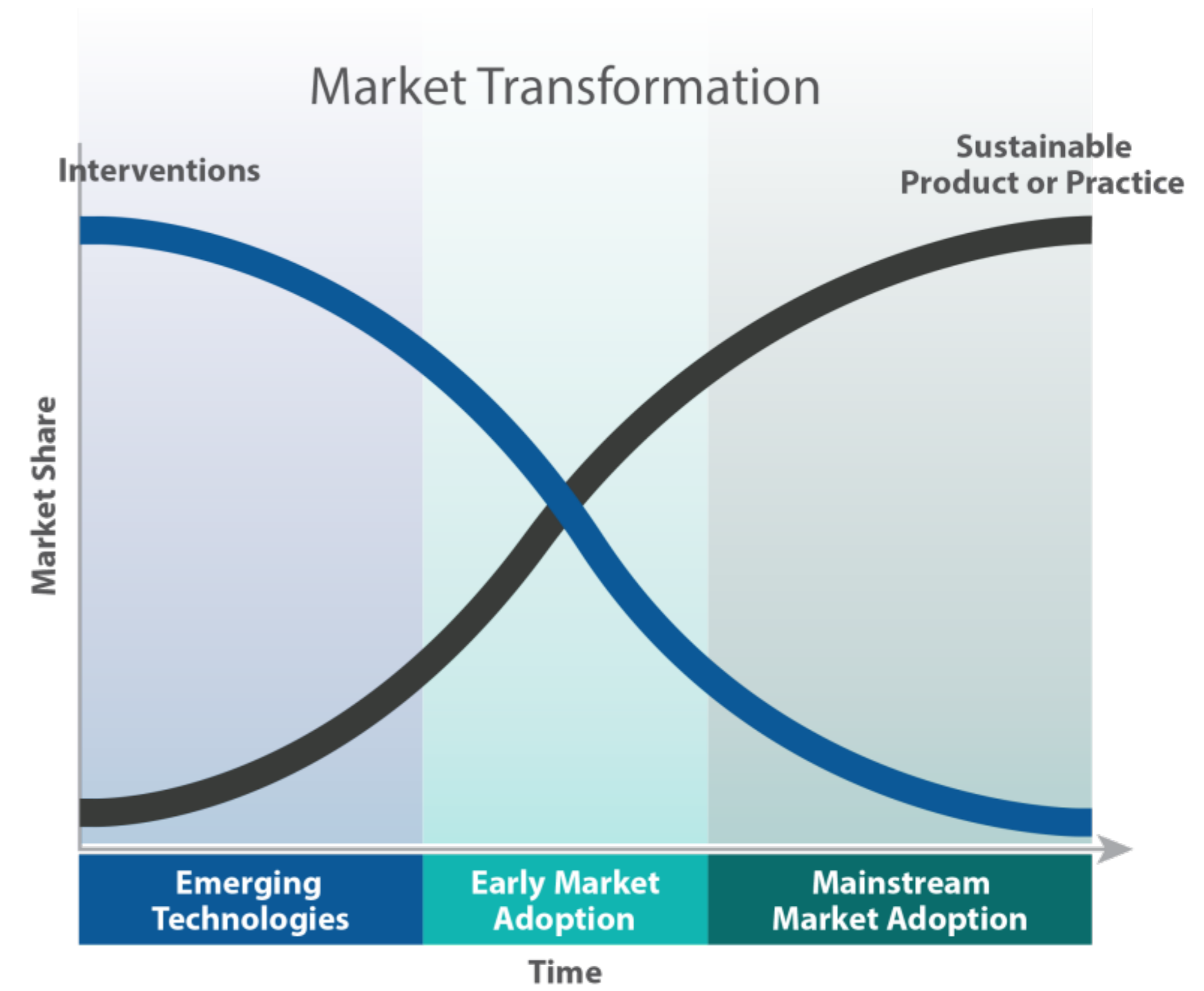
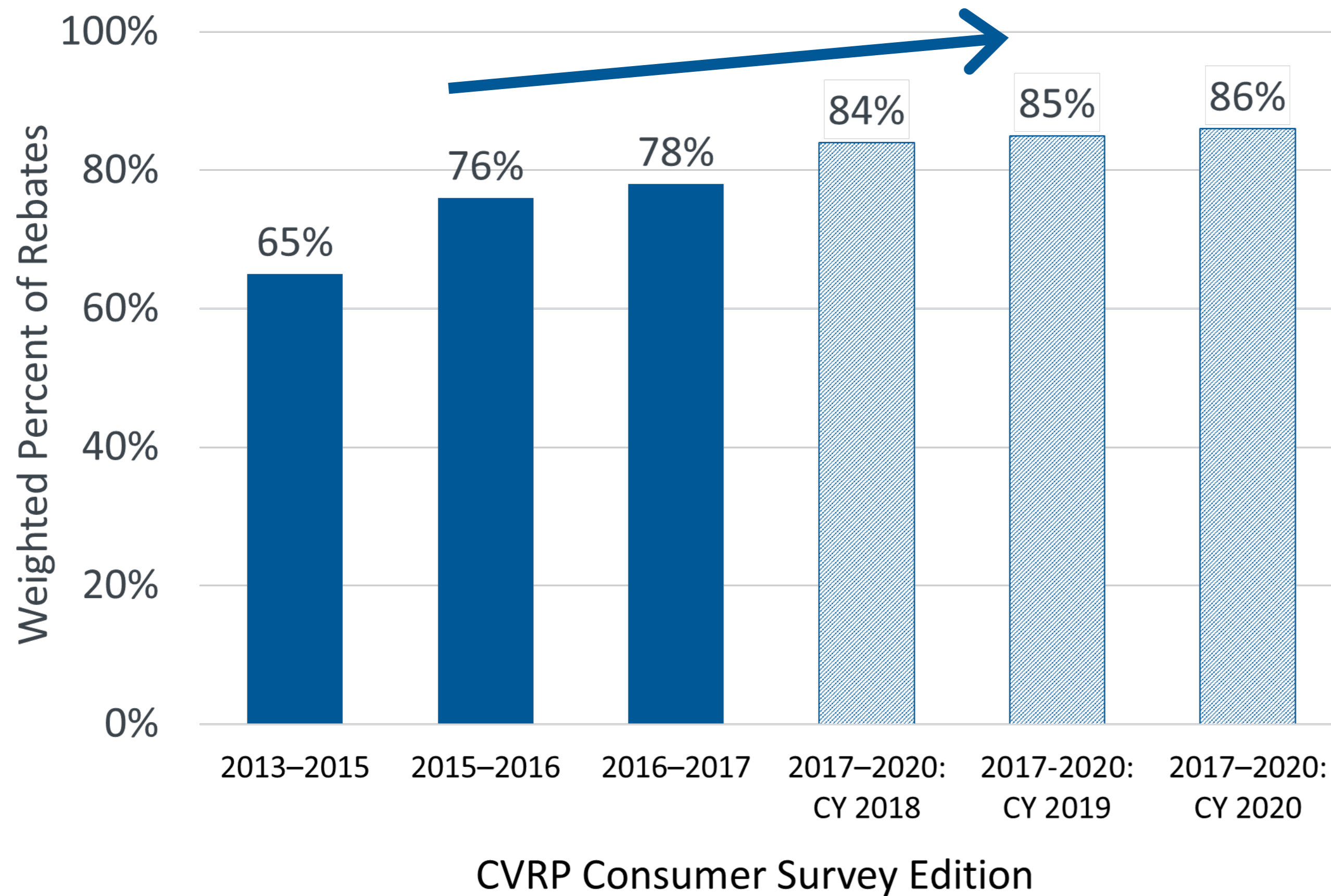
*CVRP Consumer Survey, 2017–2020 Edition. 2019 n = 8,909. 2020 n = 4,295.  
n-values are filtered and question-specific. 2020 weights specific to 2020 purchases/leases.*

# Incentive impact is increasing: Is it too soon to phase them out?

Replaced a vehicle with their *plug-in EV*

≠

Common paradigm

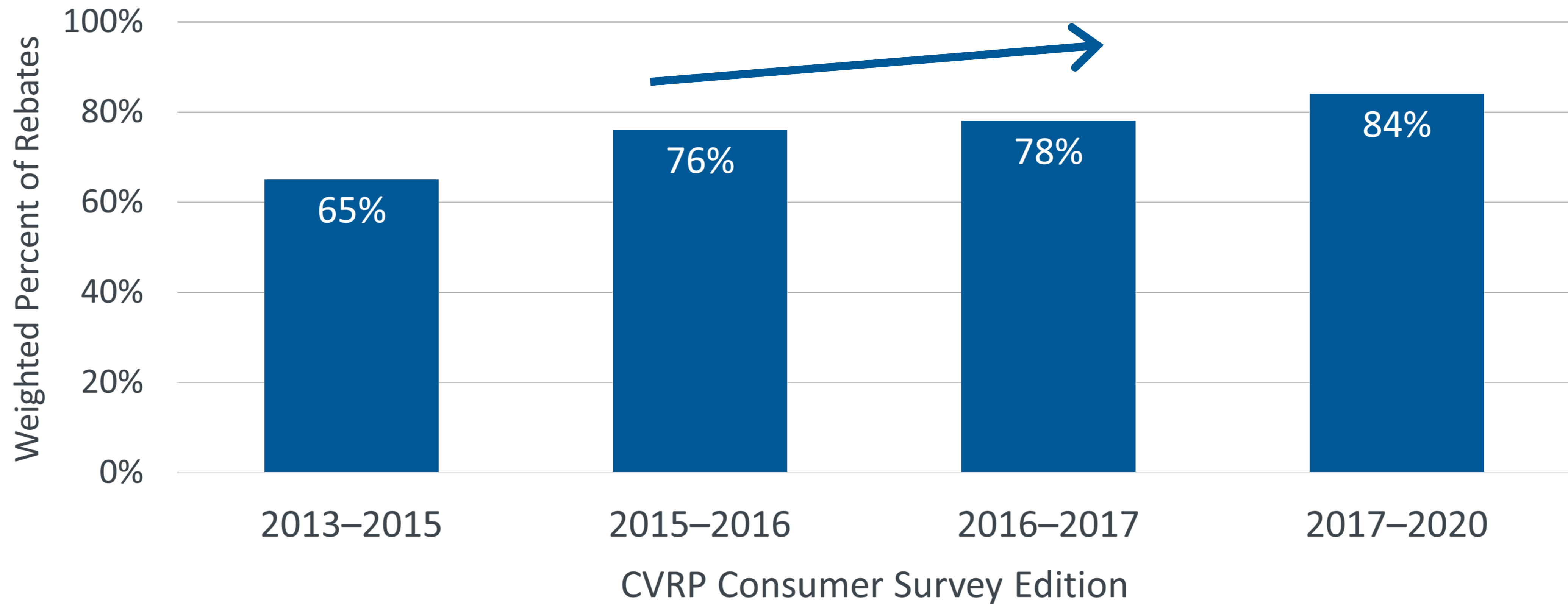


Overall datasets: 72,552 total survey respondents weighted to represent 376,800 rebate recipients. CY 2020 weights specific to 2020 purchases/leases.



# Vehicle Replacement is Increasing

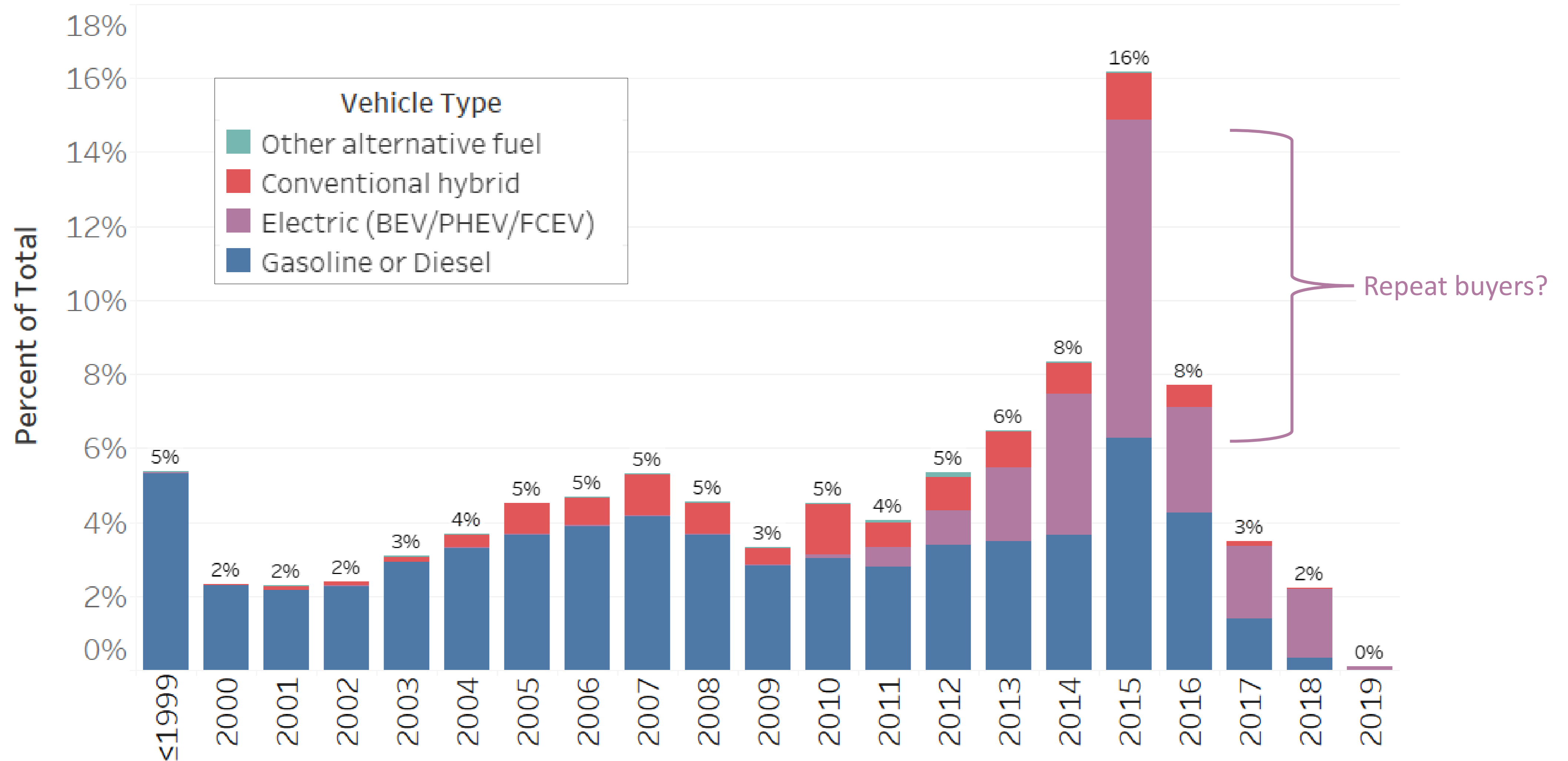
Replaced a vehicle with their rebated *plug-in EV*



Overall datasets: 72,552 total survey respondents weighted to represent 376,800 rebate recipients.

2013–15 Edition:  $n = 19,249$ . 2015–16 Edition:  $n = 11,584$ . 2016–17 Edition:  $n = 8,933$ . 2017–20 Edition: weighted  $n = 32,446$ .  $n$ -values are filtered and question-specific.

# Model-Year Distribution of Vehicles Replaced by 2017–18 Edition Survey Respondents



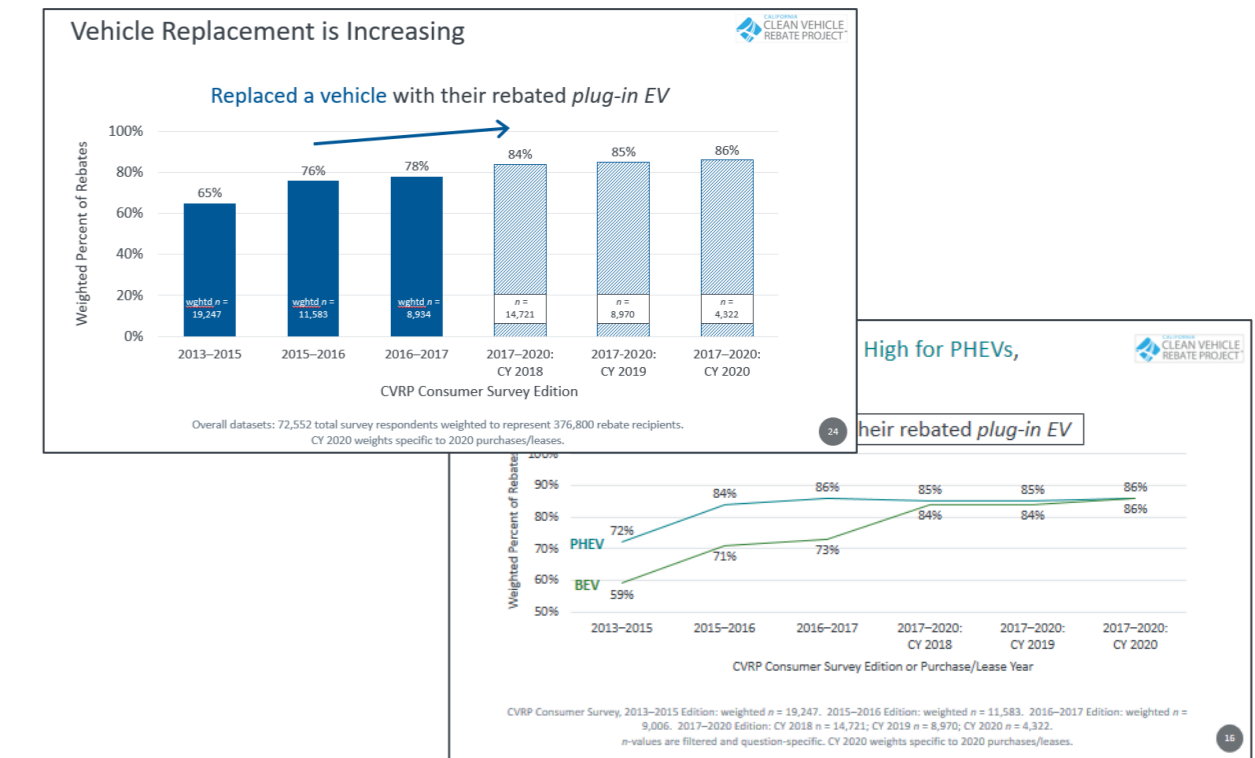
# Summary & Select Findings: 2020 Vehicle Replacement (at the onset of COVID-19)

## Context

- Program design and COVID-19 shaped impacts in 2020

## Replacement Rates

- Replacement rates continue increasing — up to 86% in 2020.
  - PHEVs produced strong replacement rates early, BEVs gradually caught up

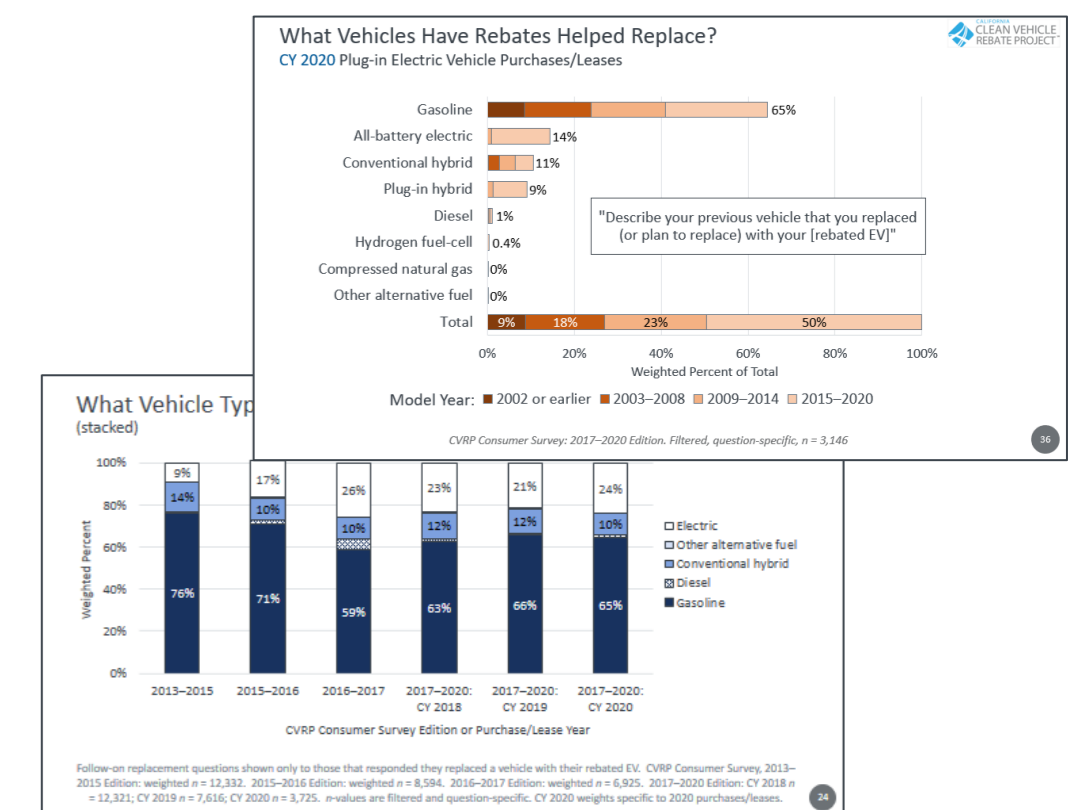


## Replaced Age

- 1/2 were 6+ years old
  - > 1/4<sup>th</sup> were 12+ years old

## Replaced Types

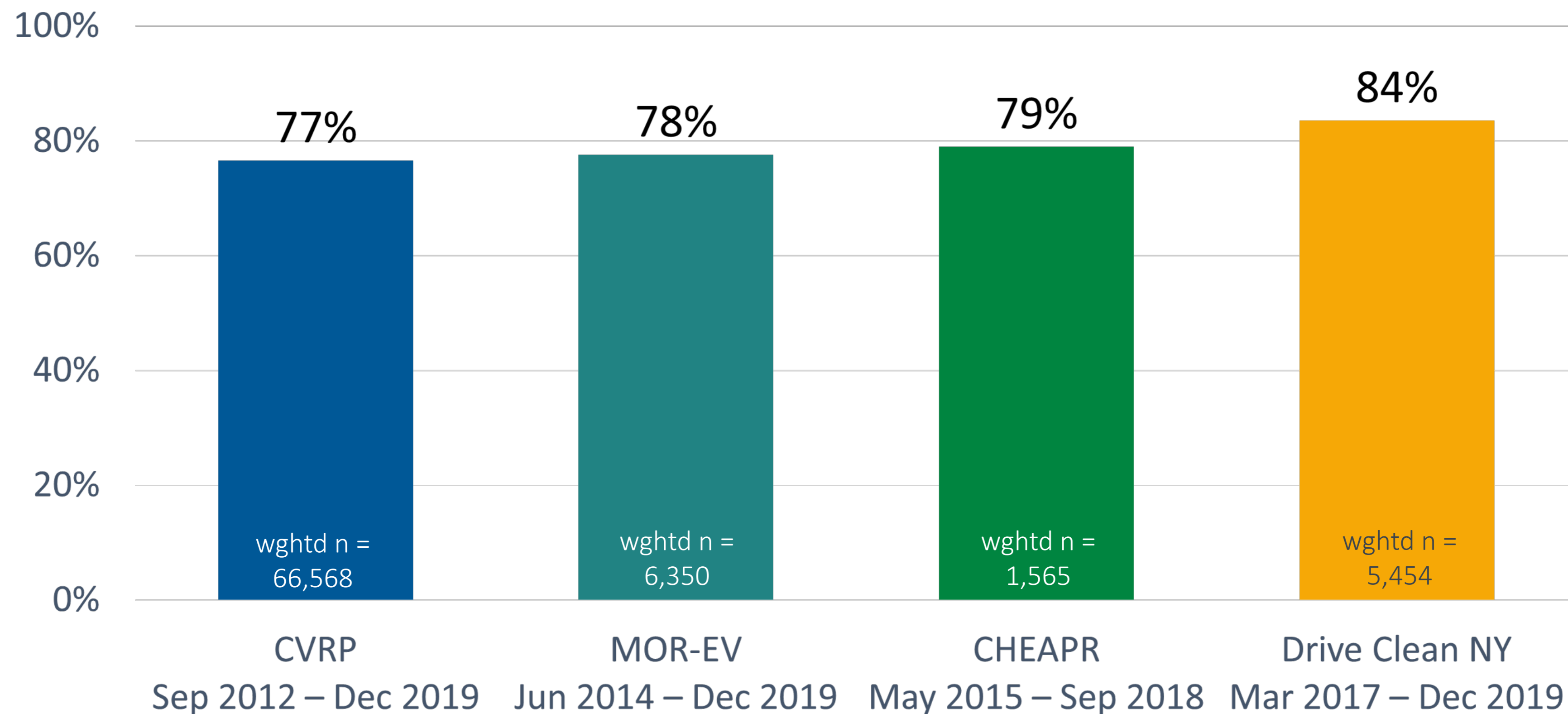
- > 3/4<sup>ths</sup> of replaced vehicles were **gasoline-fueled** (incl. conventional hybrid)
  - ~2/3<sup>rds</sup> were non-hybrid gasoline
- PHEVs replaced more gasoline vehicles overall (incl. hybrids) and PHEVs
- BEVs replaced more non-hybrid gasoline vehicles and BEVs



Bottom line: Most rebated EVs replaced older, more polluting vehicles

# Across Four States, Do EVs Get Used?

Replaced a vehicle with their rebated *clean vehicle*



*Weighted n-values are filtered and question-specific.*

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

# EV Rebate Program Impacts: Select Publications

(Reverse Chronological, as of 10/2023)



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

# EV Rebate Program Impacts: Select Presentations & Videos

(Reverse Chronological, as of 11/2023)



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

Recommended citation:

B.D.H. Williams and N. Pallonetti (2023, Nov.), Presentation: “CVRP 2021 Data Brief: Vehicle Replacement,” prepared by the Center for Sustainable Energy for the Clean Vehicle Rebate Project, California Air Resources Board, Sacramento USA.

brett.williams@energycenter.org  
EnergyCenter.org

 [CleanVehicleRebate.org](https://CleanVehicleRebate.org)

