CVRP 2020 Data Brief: Vehicle Replacement

- 2013–2015: 65%
- 2015–2016: 76%
- 2016–2017: 78%
- 2017–2020: 84%

June 2022

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Nicholas Pallonetti – Research Analyst, CSE

with thanks to J. Bowers and others at the Center for Sustainable Energy (CSE)
Outline: Vehicle Replacement (during the onset of COVID-19)

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
## Base Rebate Amount for Most Individuals Decreased $500

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel-Cell EVs</strong></td>
<td>$3,000–$5,000 ‡</td>
<td>$1,500–$2,500 ‡</td>
<td>$2,500</td>
<td>$5,000</td>
<td>$5,000 *</td>
<td>$5,000 **</td>
<td>$4,500 ***</td>
</tr>
<tr>
<td><strong>Battery EVs †</strong></td>
<td>$3,000–$5,000 ‡</td>
<td>$1,500–$2,500 ‡</td>
<td>$2,500</td>
<td>$2,500</td>
<td>$2,500 *</td>
<td>$2,500 **</td>
<td>$2,000 ***</td>
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<tr>
<td><strong>Plug-in Hybrid EVs</strong></td>
<td>$3,000</td>
<td>$1,500</td>
<td>$1,500</td>
<td>$1,500</td>
<td>$1,500 *</td>
<td>$1,500 **</td>
<td>$1,000 ***</td>
</tr>
<tr>
<td><strong>Zero-Emission Motorcycles</strong></td>
<td>$1,500</td>
<td>$900</td>
<td>$900</td>
<td>$900</td>
<td>$900</td>
<td>$900</td>
<td>$750</td>
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<tr>
<td><strong>Neighborhood EVs</strong></td>
<td>$1,500</td>
<td>$900</td>
<td>$900</td>
<td>$900</td>
<td>$900</td>
<td>None eligible</td>
<td>None eligible</td>
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<tr>
<td><strong>Commercial Zero-Emission Vehicles</strong></td>
<td>$20,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† Includes range-extended battery electric vehicles.
‡ Amounts varied by ZEV type. For definitions, see CCR 1962.1.
* Lower-income consumers eligible for an additional $1,500.
** Lower-income consumers eligible for an additional $2,000.
*** Lower-income consumers eligible for an additional $2,500.
## Program Design Shapes Outcomes

<table>
<thead>
<tr>
<th>Date</th>
<th>Incentive stacking permitted</th>
<th>Rebates per year limit</th>
<th>30-month ownership requirement (retroactive)</th>
<th>$250k–$500k income cap (PEVs)</th>
<th>$150k–$300k income cap (PEVs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 2010</td>
<td>Yes</td>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dec. 2013</td>
<td>Yes</td>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dec. 2014 / Jan. 2015</td>
<td>Yes</td>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mar. 2016</td>
<td>Yes</td>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Nov. 2016</td>
<td>Yes</td>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### As of May 2014
- Rebates per year limit = 20
- 18-month application window

### As of May 2014
- 30-month ownership requirement (retroactive)
- Total rebate limit = 2

### As of Jan. 2018
- $150k–$300k income cap on stacking HOV decal (only binding on FCEVs)
- Rebate Now San Diego County preapproval pilot with point-of-sale option
- Stacking with CVAP grant not permitted (retroactive)

### As of Jan. 2019
- Base MSRP ≤ $60k (PEVs)
- ≥ 35 UDDS electric miles
- $2,500 † for income-qualified households (≤ 300% FPL), excl. ZEMs
- Total rebates limit = 1 §
- 3-month application window ‡

### As of Apr. 2020
- Stacking with CVAP grant permitted
- ≥ 30 U.S. EPA electric miles (45 UDDS)
- Rebate Now preapproval option limited to income-qualified households, expanded to include SJ Valley

### As of Apr. 2021
- $2,500 for income-qualified households (≤ 400% FPL), excl. ZEMs

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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.

† Change due to $500 decrease in standard rebate amounts (previous slide).
§ 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.
2020 Results/Trends Should be Interpreted with Caution (COVID)
Applications Saw Dramatic Decline But Significant Recovery


12% applied in 2021.

6/3/22 image from https://cleanvehicleredesbate.org/eng/rebate-statistics
### CVRP Consumer Survey Editions
(shows rebates to individuals for plug-in EVs* only)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Survey Responses (total n)**</td>
<td>19,460</td>
<td>11,611</td>
<td>8,957</td>
<td>32,524</td>
<td>72,552</td>
</tr>
<tr>
<td>Program Population (N)***</td>
<td>91,100</td>
<td>45,700</td>
<td>46,800</td>
<td>193,200</td>
<td>376,800</td>
</tr>
</tbody>
</table>

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

** Subsequently weighted to represent the program population along the dimensions of vehicle category, vehicle model, buy vs. lease, and county. Weighting dimensions for the 2017–20 Edition also included year of purchase/lease.

*** Small numbers of rebated vehicles are not represented in the time frames due to application lags. Rounded to nearest 100.
## CVRP Consumer Survey Data Used
(shows rebates to individuals for plug-in EVs only)

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Responses (total n)</td>
<td>19,460**</td>
<td>11,611**</td>
<td>8,957**</td>
<td>32,524**</td>
<td>14,757</td>
<td>8,991</td>
<td>4,331**</td>
<td>72,552</td>
</tr>
<tr>
<td>Program Population (N)**</td>
<td>91,100</td>
<td>45,700</td>
<td>46,800</td>
<td>193,200</td>
<td>78,600 (filtered subset of weighted Edition)</td>
<td>61,300 (filtered subset of weighted Edition)</td>
<td>26,500</td>
<td>376,800</td>
</tr>
</tbody>
</table>

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

** Subsequently 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 also included year of purchase/lease. The 2020 subset was also independently weighted, producing only minor differences compared to the filtering approach.

*** Small numbers of rebated vehicles are not represented in the time frames due to application lags. Rounded to nearest 100.
Vehicle Replacement
(during the onset of COVID-19)
Vehicle Replacement: Select Resources with Related Content
(reverse chronological, as of 3/2022)

Publications

Presentations
• Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness
• CVRP CY 2019 Data Brief: Vehicle Replacement & Incentive Influence (updated here)
• Infographic: What Vehicles Are Electric Vehicles Replacing and Why?
• What Vehicles Are Electric Vehicles Replacing and Why?
• EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts
• Electric Vehicle Incentives and Policies
• CVRP: Data and Analysis Update
• Electric Vehicle Rebates: Exploring Indicators of Impact in Four States
• 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 Findings
Vehicle Replacement Rates
(during the onset of COVID-19)
Do EVs Get Used?

2020 Purchases/Leases

Replaced a vehicle with their rebated plug-in EV


$n$-value is filtered and question-specific.
Vehicle Replacement is Increasing

Replaced a vehicle with their rebated plug-in EV

Vehicle Replacement is Increasing
(recent-year breakdown)

Replaced a vehicle with their rebated plug-in EV

CVRP Consumer Survey Edition or Purchase/Lease Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Weighted Percent of Rebates</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013–2015</td>
<td>65%</td>
<td>19,249</td>
</tr>
<tr>
<td>2015–2016</td>
<td>76%</td>
<td>11,584</td>
</tr>
<tr>
<td>2016–2017</td>
<td>78%</td>
<td>8,933</td>
</tr>
<tr>
<td>2017–2020: CY 2018</td>
<td>84%</td>
<td>14,721</td>
</tr>
<tr>
<td>2017–2020: CY 2019</td>
<td>85%</td>
<td>8,970</td>
</tr>
<tr>
<td>2017–2020: CY 2020</td>
<td>86%</td>
<td>4,322</td>
</tr>
</tbody>
</table>

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

n-values are filtered and question-specific. CY 2020 weights specific to 2020 purchases/leases.
Vehicle Replacement Has Long Been High for PHEVs, BEVs Gradually Caught Up

Replaced a vehicle with their rebated plug-in EV


n-values are filtered and question-specific. CY 2020 weights specific to 2020 purchases/leases.
Vehicle Age & Types Replaced
(during the onset of COVID-19)
What Vehicles Have Rebates Helped Replace?

2020 Plug-in Electric Vehicle Purchases/Leases

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.
What Vehicles Have Rebates Helped Replace?

2019 Plug-in Electric Vehicle Purchases/Leases

- Gasoline: 65%
- Conventional hybrid: 12%
- All-battery electric: 7%
- Plug-in hybrid: 19%
- Diesel: 0.9%
- Hydrogen fuel-cell: 0%
- Compressed natural gas: 0%
- Other alternative fuel: 0%
- Total: 45%

"Describe your previous vehicle that you replaced (or plan to replace) with your [rebated EV]"

Model Year:
- 2001 or earlier
- 2002–2007
- 2008–2013
- 2014–2019

Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.
What Vehicles Have Rebates Helped Replace?

- Gasoline: 57%
- All-battery electric
- Conventional hybrid
- Plug-in hybrid
- Diesel
- Compressed natural gas
- Alternative fuel
- Hydrogen fuel cell

Total: 57%

Model Year:
- 1999 or earlier
- 2000–2005
- 2006–2011
- 2012–2017

Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV. CVRP Consumer Survey. 2016–2017 edition, trimmed to start November 2016, weighted n=4,695
Replaced Vehicle Age

(stacked)

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

Replaced Vehicle Age

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

Vehicles 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.
What Vehicle Types Have Plug-in EV Rebates Helped Replace? (stacked)

What Vehicle Types Have Plug-in EV Rebates Helped Replace?

What Vehicle Types Have Plug-in EV Rebates Helped Replace?

What Vehicle Types Have “Essential” Rebates for Plug-in EVs Helped Replace?

2020 Purchases/Leases

Follow-on replacement questions shown only to those that responded they replaced a vehicle with their rebated EV.

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

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

Summary & Select Findings
Summary & Select Findings: 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
  • > 1/4th were 12+ years old

Replaced Types
• > 3/4ths of replaced vehicles were gasoline-fueled (incl. conventional hybrid)
  • ~2/3rds 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
Related Research: Replacement Behavior & Impacts

**What Vehicles Are Electric Vehicles Replacing and Why?** (BECC 2019)
- Replacement motivations and what might have happened without the rebate

**Cost-Effectiveness of Greenhouse Gas Emission Reductions Associated with California’s Clean Vehicle Rebate Project in 2019 (and 2020)** (CARB workshop 2022)
- When compared to buying a new gasoline vehicle, rebated EVs may be saving 30–33 tons of GHG emissions per vehicle at a cost of $99–$160/ton of Rebate Essential GHG reductions
Additional Details & Resources
Funding Availability Has Been Regularly Disrupted
(as of Sept. 2021)

### Table 4: CVRP Waitlists

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

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

Table adapted from [https://cleanvehiclerebate.org/sites/default/files/attachments/Disruptions_Fact_Sheet_9_2021.pdf](https://cleanvehiclerebate.org/sites/default/files/attachments/Disruptions_Fact_Sheet_9_2021.pdf)
Vehicle Replacement is Consistent Across Measures of Rebate Influence

Replaced a vehicle with their rebated plug-in EV


$n$-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

CVRP Consumer Survey Edition

<table>
<thead>
<tr>
<th>Year</th>
<th>Weighted Percent of Rebates</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013–2015</td>
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<tr>
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<tr>
<td>2017–2020: CY 2020</td>
<td>86%</td>
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</tbody>
</table>

Overall datasets: 72,552 total survey respondents weighted to represent 376,800 rebate recipients. CY 2020 weights specific to 2020 purchases/leases.
Vehicle Replacement Has Long Been High for PHEVs, BEVs Gradually Caught Up

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

CVRP Consumer Survey Edition or Purchase/Lease Year

2015–2016 Edition: n = 11,584
2016–2017 Edition: n = 8,933

*n*-values are filtered and question-specific. CY 2020 weights specific to 2020 purchases/leases.
Model-Year Distribution of Vehicles Replaced by 2017–18 Edition Survey Respondents

Repeat buyers?

BECC 2019

## Consumer Survey Data

(shows rebates to individuals only)

<table>
<thead>
<tr>
<th>Vehicle Purchase/Lease Dates</th>
<th>CVRP</th>
<th>MOR-EV</th>
<th>CHEAPR</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun. 2014 – Apr. 2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 2015 – Sep. 2018</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Survey Responses (total n)**</th>
<th>CVRP</th>
<th>MOR-EV</th>
<th>CHEAPR</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>66,902</td>
<td></td>
<td>6,616</td>
<td>1,565</td>
<td>80,557</td>
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</table>

<table>
<thead>
<tr>
<th>Program Population (N)***</th>
<th>CVRP</th>
<th>MOR-EV</th>
<th>CHEAPR</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>339,200</td>
<td></td>
<td>16,100</td>
<td>3,500</td>
<td>380,700</td>
</tr>
</tbody>
</table>

Includes fuel-cell EVs (CVRP only).

*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.
Across Four States, Do EVs Get Used?

Replaced a vehicle with their rebated *clean vehicle*

<table>
<thead>
<tr>
<th>Program</th>
<th>Year</th>
<th>Weighted n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVRP</td>
<td>Sep 2012 – Dec 2019</td>
<td>66,568</td>
<td>77%</td>
</tr>
<tr>
<td>MOR-EV</td>
<td>Jun 2014 – Dec 2019</td>
<td>6,350</td>
<td>78%</td>
</tr>
<tr>
<td>CHEAPR</td>
<td>May 2015 – Sep 2018</td>
<td>1,565</td>
<td>79%</td>
</tr>
<tr>
<td>Drive Clean NY</td>
<td>Mar 2017 – Dec 2019</td>
<td>5,454</td>
<td>84%</td>
</tr>
</tbody>
</table>

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

*Overall datasets: 80,557 total survey respondents weighted to represent 380,700 rebate recipients.*
Select Publications (reverse chronological, as of 3/2022)


• Williams, B. D. H. (2022, Jan.), Brief: PHEV Consumers Most Highly Influenced by the U.S. Federal Tax Credit. Clean Vehicle Rebate Project


Select Presentations & Videos (Reverse Chronological, as of 6/2022)

- CVRP 2020 Data Brief: Incentive Influence
- California Plug-in Hybrid EV Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase
- Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness
- CVRP CY 2019 Data Brief: Vehicle Replacement & Incentive Influence
- 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
- CVRP Income Cap Analysis: Informing Policy Discussions
Recommended citation: