California’s Electric Vehicle Rebates: Exploring Impact
BECC, 17 October 2017, Sacramento

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Kipp Searles – Analyst

Thanks to Nick Pallonetti, Michelle Jones, Jamie Orose, John Anderson, and others at CSE
Outline

• Objectives
• Introduction
• Impact:
  – Outputs: Vehicles and Consumers Rebated
  – Outcomes: Behaviors Influenced
  – Implications: Market and Emissions
• Summary and Next Steps
• Additional Online Resources
Objectives

• To explore the impact of a statewide rebate program for clean-vehicle adoption

• **CARB** (Sep 2017)\(^1\)

  “...conservatively estimates the emission reductions...”

  “anticipates updating and revising... as new data becomes available and methodologies are refined.”

• This work

  – aims to inform that process and causal studies by assessing the use of program-specific data

  – is not an official CARB position

\(^1\) Fiscal Year 2017-18 Funding Plan for Clean Transportation Incentives: Discussion Draft, California Air Resources Board Staff, Released 26 Sept 2017, online [here](#).
Introduction: Electric Vehicles & Rebates
All models pictured had > 100 national sales in Q1 2017 (http://insideevs.com/monthly-plug-in-sales-scorecard/)
## EV Incentive Programs: Rebate Design

<table>
<thead>
<tr>
<th>Type</th>
<th>Rebate Design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel-Cell EVs</strong></td>
<td>$5,000</td>
</tr>
<tr>
<td><strong>All-Battery EVs</strong></td>
<td>$2,500</td>
</tr>
<tr>
<td><strong>Plug-in Hybrid EVs</strong></td>
<td>$2,500 (i3 REx) $1,500</td>
</tr>
<tr>
<td><strong>Zero-Emission Motorcycles</strong></td>
<td>$900</td>
</tr>
</tbody>
</table>

### Rebate Variations

- **E-miles**
  - \(\geq 120\) $2,000
  - \(\geq 40\) $1,700
  - \(\geq 20\) $1,100
  - < 20 $500

- **Battery Capacity**
  - \(\geq 10\) kWh $2,500
  - < 10 kWh $1,500

- **MSRP**
  - \(\leq $60k\) only; dealer assignment; $300 dealer incentive
  - \(> $60k\) $500 max.; point-of-sale

- **Consumer Income Cap and Increased Rebates**
  - e-miles \(\geq 20\) only; Consumer income cap and increased rebates

- **MSRP \(\geq $60k\)**
  - only; $1,000 max.
Data Summary (Rebates to Individuals Only)

CVRP Consumer Survey

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Responses</td>
<td>n = 19,460</td>
<td>n = 11,611</td>
<td>n = 31,071</td>
</tr>
</tbody>
</table>

CVRP Program Population (Application Data)

<p>| | | | |</p>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Participants survey was weighted to represent*</td>
<td>N = 91,081</td>
<td>N = 45,698</td>
<td>N = 136,779</td>
</tr>
</tbody>
</table>

Note: Before Income Cap. These results are conservative.

* Along the dimensions of vehicle model, county, and buy vs. lease (raking method)
Program Outputs

Rebated Vehicles and Consumers
## Majority Characteristics of CVRP Participants

<table>
<thead>
<tr>
<th>CVRP 2015–2016 Survey</th>
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<tbody>
<tr>
<td>40–59 years old</td>
<td>53%</td>
</tr>
<tr>
<td>$50–200k/y household income</td>
<td>58%</td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>65%</td>
</tr>
<tr>
<td>Male</td>
<td>74%</td>
</tr>
</tbody>
</table>
### Majority Characteristics of Car Buyers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>40–59 years old</td>
<td>53%</td>
<td>52%</td>
</tr>
<tr>
<td>$50–200k/y household income</td>
<td>58%</td>
<td>58%</td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>65%</td>
<td>76%</td>
</tr>
<tr>
<td>Male</td>
<td>74%</td>
<td>49%</td>
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California Household Travel Survey, 2012: weighted, n = 42,431
## Majority Characteristics: Comparison

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<td>65%</td>
<td>76%</td>
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<tr>
<td>Male</td>
<td>74%</td>
<td>49%</td>
</tr>
<tr>
<td>≥ Bachelor’s</td>
<td>83%</td>
<td>66%</td>
</tr>
<tr>
<td>≥ Postgraduate</td>
<td>50%</td>
<td>34%</td>
</tr>
<tr>
<td>Detached homes</td>
<td>80%</td>
<td>75%</td>
</tr>
</tbody>
</table>

California Household Travel Survey, 2012: weighted, n = 42,431
How can consumer research help us grow markets for electric vehicles?

• **Disadvantaged Communities**
  - (AEA pres 2016)
  - (CVRP DAC infographic, 2017)

• **Information Channels**
  - (EV Roadmap pres, 2016)

• **Target Segments**
  - (TRR 2016 research paper)
  - (AEA 2016 pres)
  - (TRB 2017 poster)
Where can I get the data?: Transparency Tools

Public dashboards facilitate informed action

- >215,000 EVs and consumers
- >19,000 survey responses statistically represent >91,000 consumers
- >$470M in rebates processed
The Clean Vehicle Rebate Project

June 2017
Prepared for
California Air Resources Board
Prepared by
Center for Sustainable Energy

https://cleanvehiclerebate.org/eng/survey-dashboard
https://cleanvehiclerebate.org/eng/program-reports
Program Outcomes

Influenced Behaviors
Do EVs get used?

Replaced a vehicle with their rebated EV

- 2013–2015: 65%
- 2015–2016: 76%
Do EVs get used?

Replaced a vehicle with their rebated EV

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<th>Plug-in hybrid EVs</th>
<th>Battery EVs</th>
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</thead>
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<tr>
<td>2013–2015</td>
<td>72%</td>
<td>59%</td>
</tr>
<tr>
<td>2015–2016</td>
<td>85%</td>
<td>72%</td>
</tr>
</tbody>
</table>

What vehicles have rebates helped replace?

- Gasoline
- Conventional hybrid
- All-battery electric
- Plug-in hybrid
- Diesel

CVRP Consumer Survey. **2015–2016 edition**: weighted, n=8,532
How important was the State Rebate (CVRP) in making it possible for you to acquire your clean vehicle?

- **2013–2015**: 91%  
  - Moderately Important + Very Important + Extremely Important

- **2015–2016**: 89%  
  - Moderately Important + Very Important + Extremely Important

Rebate “Important” = Moderately Important + Very Important + Extremely Important

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Difference statistically significant (Chi-2, ***)

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Center for Sustainable Energy
How *important* was the State Rebate (CVRP) in making it *possible* for you to acquire your clean vehicle?

Getting the most out of stated-preference data

• “Importance” can be a useful indicator
  – High response rate
• But it is difficult to define and encapsulates a complex array of factors
• Keep marching toward an even more conservative metric
  – Difficult to avoid truthfulness bias in stated-preference data, but do have a metric that is:
    – Even less subject to recall bias
    – More clear cut
    – More “counterfactual”…
What are indicators of rebate influence?: Essentiality

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

- **2013–2015:** 46%
- **2015–2016:** 56%

Rebate essentiality is growing; phase-out appears premature.

Rebate Essential Consumers are Different

- 2016 BECC talk
- 2017 TRB paper and poster...

### Target Consumers: "Rebate Essentials"
Consumers most influenced by the rebate:
- **Demographics**: male, non-white, higher education, lower household income, perhaps younger and larger households
- **Motivations and interest**: less motivated by environmental impacts, more motivated by saving money on fuel, carpool lane access, and perhaps energy independence; lower initial interest in EVs
- **Information gathering**: found it more difficult to find info on EVs, spent more time researching online, learned about the rebate before going to the dealer
- **Vehicle characteristics**: lower price, bought (vs. lease)

### PHEV Odds Ratio vs. BEV Odds Ratio

<table>
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<tr>
<th>Explanatory Variable</th>
<th>PHEV Odds Ratio</th>
<th>BEV Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer demographics</td>
<td>Male</td>
<td>1.38</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>Non-white</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td>Graduate degree (vs. 2nd-highest: Bachelor’s)</td>
<td>1.05</td>
</tr>
<tr>
<td></td>
<td>Bachelor’s degree (vs. 2nd: some college or less)</td>
<td>1.007</td>
</tr>
<tr>
<td></td>
<td>Younger (years)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>More people in household (4)</td>
<td>-</td>
</tr>
</tbody>
</table>

### Housing and region
- **Multi-unit dwelling (vs. non-MUD)**
- **No solar (vs. 2nd-highest: planning solar)**
- **No workplace charging (vs. 2nd-highest: WPC)**
- **Central CA (vs. 2nd-highest: Far South CA)**
- **Central CA (vs. 2nd-highest: South CA)**

### Reasons and interest
- **More motivated by saving money on fuel**
- **More motivated by carpool lane access**
- **Less motivated by reducing environmental impacts**
- **More motivated by energy independence**
- **More motivated by vehicle performance**
- **Lower initial interest in EVs**
- **Rebate essential**

### Information gathering
- **Found it more difficult to find info on EVs**
- **Spent more time researching EVs online**
- **Did not hear about the rebate from the dealer**

### Transactional factors
- **Vehicle price is lower (5)**
- **Buy (vs. lease)**
- **Chevy PHEV (vs. 2nd-highest: Toyota)**
- **Nissan BEV (vs. 2nd-highest: FIAT)**
- **Ford (vs. 2nd highest other)**
- **FIAT (vs. 2nd-highest: Nissan)**
- **Acquisition date (days)**
- **First EV**
- **Replacing a vehicle**

[https://cleanvehiclerebate.org/eng/content/infographic-characterizing-california-electric-vehicle-consumer-segments-trb-poster](https://cleanvehiclerebate.org/eng/content/infographic-characterizing-california-electric-vehicle-consumer-segments-trb-poster)
Program Implications

Market and Emissions
Literature: Market Impacts
<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Variables Examined</th>
<th>Effect/Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sierzchula et al. (2014)</td>
<td>Country financial incentives – Global PEV market share</td>
<td>+ **</td>
</tr>
<tr>
<td>Jin et al. (2014)</td>
<td>Monetized non-financial BEV incentives – BEV sales</td>
<td>+ ***</td>
</tr>
<tr>
<td></td>
<td>BEV financial subsidies – BEV sales</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Monetized non-financial PHEV incentives – PHEV sales</td>
<td>Not significant</td>
</tr>
<tr>
<td>DeShazo et al. (2014)</td>
<td>CA state rebate design – PEV sales</td>
<td>+</td>
</tr>
<tr>
<td>Narassimhan &amp; Johnson (2014)</td>
<td>Purchase rebate – BEV registrations</td>
<td>+ *</td>
</tr>
<tr>
<td></td>
<td>Purchase rebate - PHEV registrations</td>
<td>Not significant</td>
</tr>
<tr>
<td>Lutsey et al. (2015)</td>
<td>Monetized BEV benefits - BEV share</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>Monetized PHEV benefits - PHEV share</td>
<td>Not significant</td>
</tr>
<tr>
<td>Clinton et al. (2015)</td>
<td>State rebate - BEV sales (Tesla &amp; LEAF)</td>
<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>State rebate - BEV sales (LEAF)</td>
<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>State rebate - BEV sales (Tesla Only)</td>
<td>- **</td>
</tr>
<tr>
<td>Zhou et al. (2016)</td>
<td>Purchase incentives - BEV: Total Market</td>
<td>+ ***</td>
</tr>
<tr>
<td></td>
<td>Purchase incentives - BEV: Mass Market (&lt;$40,000)</td>
<td>+ ***</td>
</tr>
<tr>
<td></td>
<td>Purchase incentives - BEV: Mid Market ($40-50,000)</td>
<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>Purchase incentives - BEV: Luxury (&gt;60,000)</td>
<td>- ** ***</td>
</tr>
<tr>
<td></td>
<td>Purchase incentives - PHEV: Total Market</td>
<td>+ **</td>
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<td></td>
<td>Purchase incentives - PHEV: Luxury (&gt;60,000)</td>
<td>Not significant</td>
</tr>
<tr>
<td>Lutsey et al. (2016)</td>
<td>State incentive (top 50 MSA) - BEV vehicle shares</td>
<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>State incentive (top 50 MSA) - PHEV vehicle shares</td>
<td>+ **</td>
</tr>
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<td></td>
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<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>State incentive (top 200 MSA) - BEV vehicle shares</td>
<td>+ **</td>
</tr>
<tr>
<td></td>
<td>State incentive (top 200 MSA) - PHEV vehicle shares</td>
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<td>+ **</td>
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<tr>
<td>Jenn et al. (2017)</td>
<td>Individual credit (rebate or tax credit) - EV registrations</td>
<td>Not significant</td>
</tr>
<tr>
<td></td>
<td>Individual credit (rebate or tax credit) w/ knowledge of incentives - EV registrations</td>
<td>+ **</td>
</tr>
</tbody>
</table>
External vs. Internal Perspectives on Rebate Impact

- **U.S.: Rebate Impact on Non-Tesla Battery EV Sales** (Clinton et al. 2015)
- **CA: Rebate Essentiality for Non-Tesla Battery EVs** (CVRP 2015–2016)

Bar chart showing:
- 72% for U.S. Rebate Impact on Non-Tesla Battery EV Sales
- 18% for CA Rebate Essentiality for Non-Tesla Battery EVs
Why are added vehicle volumes important?

Volume is a proxy for a variety of market benefits, e.g.:

• For producers
  – Economies of scale
  – OEM learning-by-doing
  – Supply-chain creation

• For consumers
  – Consumer awareness and understanding
    • Parking lots as “second showrooms”
  – Information spillovers
  – Consumer learning-by-doing
    • Charging confidence
  – Adoption network effects

• For society
  – Use potential
    • Positive environmental externalities
How many vehicles has CVRP induced into the market?

Rebated, rebate-“important,” and rebate-essential
How many EVs did CVRP rebate? *(during this period)*

Total number of vehicles rebated corresponding to Consumer Surveys 13–15 & 15–16 [purchase/lease dates Sep 2012 thru May 2016] = 136,779
How many EVs has CVRP enabled in a moderately to extremely important way? (calc. by tech. type, during this period)

Total number of vehicles rebated corresponding to Consumer Surveys 13-15 & 15-16 [with purchase/lease dates Sep 2012 thru May 2016] = 136,779
For how many vehicles has CVRP been essential? (calc. by tech. type, *during this period*)

Total number of vehicles rebated corresponding to Consumer Surveys 13–15 & 15–16 [purchase/lease dates Sep 2012 thru May 2016] = 136,779

- 65,661

Would not have purchased/leased without the rebate
What vehicles have rebates removed from the market?

Replacing older, more polluting vehicles
What vehicles have rebates helped replace?

- Gasoline
- Conventional hybrid
- All-battery electric
- Plug-in hybrid
- Diesel
- Flex-fuel/E85
- Compressed natural gas
- Hydrogen fuel cell
- Alternative fuel

Total

1994–1999
2000–2005
2006–2010
2011–2016

CVRP Consumer Survey. 2015–2016 edition: weighted, n=8,532
How many emissions has CVRP reduced?

Greenhouse-gas savings
**Carbon prepared three ways**

<table>
<thead>
<tr>
<th>Approach</th>
<th>1. CARB FP</th>
<th>2. CARB in AFLEET</th>
<th>3. Enhanced AFLEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle emissions factor (EF) difference</td>
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<tr>
<td>Rebated Vehicle</td>
<td>Average by tech. type</td>
<td>Average by tech. type</td>
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<tr>
<td>Comparison Vehicle</td>
<td>Ave. new 2016 gasoline (EMFAC)</td>
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AFLEET: [https://greet.es.anl.gov/afleet](https://greet.es.anl.gov/afleet)

CA-GREET 2.0: [https://www.arb.ca.gov/fuels/cfs/ca-greet/CA-GREET2.0-supppdoc-060415.pdf](https://www.arb.ca.gov/fuels/cfs/ca-greet/CA-GREET2.0-supppdoc-060415.pdf)

Electric Grid:
- CA - GREET
- CA - GREET 2.0

Gasoline:
- CA - GREET
- GREET 1_2015
- GREET 2.0:
  - [https://www.arb.ca.gov/fuels/cfs/ca-greet/CA-GREET2.0-supppdoc-060415.pdf](https://www.arb.ca.gov/fuels/cfs/ca-greet/CA-GREET2.0-supppdoc-060415.pdf)
  - [https://greet.es.anl.gov/afleet](https://greet.es.anl.gov/afleet)
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<td>Counterfactual fleet – rebated fleet</td>
<td></td>
</tr>
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<td>Rebated Vehicle</td>
<td>Average by tech. type</td>
<td>Actual CVRP models</td>
<td></td>
</tr>
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<td>Ave. new 2016 gasoline (AFLEET)</td>
<td>MY-specific, sales-weighted ave. new gasoline</td>
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<td>CA-GREET ?</td>
<td>CA-GREET 2.0</td>
<td>CA-GREET 2.0</td>
</tr>
<tr>
<td>Gasoline</td>
<td>CA-GREET CaRFG?</td>
<td>GREET 1_2015</td>
<td>GREET 1_2015</td>
</tr>
</tbody>
</table>

[CA-GREET 2.0: https://www.arb.ca.gov/fuels/cfs/ca-greet/CA-GREET2.0-supppdoc-060415.pdf](https://www.arb.ca.gov/fuels/cfs/ca-greet/CA-GREET2.0-supppdoc-060415.pdf)

The 2016-2017 AQIP Funding Plan provides a description of their quantification methodology for emissions reduction calculations at: [https://www.arb.ca.gov/msprog/aqip/fundplan/proposed_fy16-17_fundingplan_appa.pdf](https://www.arb.ca.gov/msprog/aqip/fundplan/proposed_fy16-17_fundingplan_appa.pdf)

AFLEET: [https://greet.es.anl.gov/afleet](https://greet.es.anl.gov/afleet)
## Per-vehicle Year-1 Reductions by Model

**Metric tons of CO$_2$e reductions** (percent change from 1., percent change from 2.)

<table>
<thead>
<tr>
<th></th>
<th>1. CARB FP</th>
<th>2. CARB in AFLEET</th>
<th>3. Enhanced AFLEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average PEV savings</td>
<td>2.56</td>
<td>2.41 (-6%)</td>
<td>2.67 (4%, 11%)</td>
</tr>
</tbody>
</table>

Based on 136,779 rebated vehicles (55,307 PHEV: 81,472 BEV)
## Per-vehicle Year-1 Reductions by Influence

Metric tons of CO$_2$e reductions (percent change from Rebated)

<table>
<thead>
<tr>
<th></th>
<th>Rebated</th>
<th>Rebate “Important”</th>
<th>Rebate Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average PEV savings</td>
<td>2.67</td>
<td>2.68 (0%)</td>
<td>2.72 (2%)</td>
</tr>
<tr>
<td>Average BEV savings</td>
<td>2.80</td>
<td>2.82 (1%)</td>
<td>2.84 (1%)</td>
</tr>
<tr>
<td>Average PHEV savings</td>
<td>2.48</td>
<td>2.48 (0%)</td>
<td>2.49 (1%)</td>
</tr>
</tbody>
</table>

Survey Data = 31,071 responses (12,462 PHEV: 18,609 BEV), scaled to represent 136,779 participants
### Year-1 Emissions Reductions

Thousand metric tons of CO$_2$e *reductions* (percent change from CARB in AFLEET)

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Low GHG Savings</th>
<th>CARB in AFLEET</th>
<th>High GHG Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT</td>
<td>245 (-26%)</td>
<td></td>
<td>379 (15%)</td>
</tr>
<tr>
<td>PHEV eVMT%</td>
<td>302 (-8%)</td>
<td>330</td>
<td>368 (12%)</td>
</tr>
<tr>
<td>Electric Grid</td>
<td>295 (-11%)</td>
<td></td>
<td>483 (47%)</td>
</tr>
</tbody>
</table>

**Enhanced AFLEET**

365 (11%)

Based on 136,779 rebated vehicles (55,307 PHEV: 81,472 BEV)
Summary and Next Steps
Summary

- Participant demographics are *similar* to car buyers, but...
  - Less frequently white, more frequently male, and changing
- >3/4th of rebated EVs replace *older, more polluting vehicles* (more so for PHEVs)
- Rebate influence may be significantly higher than indicated in literature to date, is growing
- Utilizing program-specific data:
  - Increases market impacts significantly
  - Increases emissions reductions 11+%  
    • So far; more to come (next slide)
- Emissions reduction sensitivity to individual inputs examined range -26% to 15%
  - Upside potential of 100% renewable grid is 47%
Next Steps: Conservatisms to Address

• Pre-income-cap
• Majority demographic summary (segments elsewhere)
• Vehicle volumes used as a proxy for other benefits that could be quantified
• Counterfactual fleet assumed all rebated consumers would have bought new “comparison vehicle” rather than kept old vehicle
• Lower-C gasoline
• No cleaning of grid over time
• Focused on Year-1 benefits, not 30-month program requirements, or 6–15-year vehicle lifetimes
• Other inputs based on conservative CARB inputs
Other Next Steps, Program Data to Utilize

• Finish harmonization with latest CARB inputs to establish consistent baseline
• Explore
  – Time-dependent gasoline content
  – Gasoline substitute for BEV VMT make-up
• Incorporate
  – 2016–2017 survey data when available
  – Specific vehicles replaced
  – Continue reducing aggregation with case-specific values
• Use Monte Carlo analysis to prioritize areas with greatest uncertainty
We work nationally in the clean energy industry and are always open to collaboration.
## Sensitivity Testing: Details

<table>
<thead>
<tr>
<th>Low GHG Reductions</th>
<th>CARB in AFLEET</th>
<th>High GHG Reductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT</td>
<td>BEV: 7,916</td>
<td>BEV: 11,059</td>
</tr>
<tr>
<td></td>
<td>PHEV: 11,778</td>
<td>PHEV: 14,855</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BEV: 13,494</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHEV: 15,283</td>
</tr>
<tr>
<td>PHEV eVMT%</td>
<td>15% Electric</td>
<td>40% Electric</td>
</tr>
<tr>
<td></td>
<td>74.5% Electric</td>
<td></td>
</tr>
<tr>
<td>Electric Grid</td>
<td>WECC</td>
<td>CA-GREET 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100% renewable</td>
</tr>
</tbody>
</table>

### Electricity Mix

<table>
<thead>
<tr>
<th>Electricity Mix</th>
<th>WECC</th>
<th>CA-GREET 2.0</th>
<th>EIA - CA</th>
<th>100% renewable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>25.4%</td>
<td>7.15%</td>
<td>0.16%</td>
<td></td>
</tr>
<tr>
<td>Oil (Residual oil)</td>
<td>0.2%</td>
<td>1.38%</td>
<td>0.05%</td>
<td></td>
</tr>
<tr>
<td>Gas (Natural gas)</td>
<td>32.5%</td>
<td>50.75%</td>
<td>49.00%</td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td>0.2%</td>
<td>2.62%</td>
<td>3.05%</td>
<td></td>
</tr>
<tr>
<td>Nuclear</td>
<td>7.9%</td>
<td>15.18%</td>
<td>9.50%</td>
<td></td>
</tr>
<tr>
<td>Renewable</td>
<td>33.8%</td>
<td>22.92%</td>
<td>38.24%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Additional Online Resources
Additional Participant Evaluation Examples

- **Progress in Disadvantaged Communities** *(AEA pres 2016)*
- **Information Channels** *(EV Roadmap pres, 2016)*
  - Exposure & importance of various channels, consumer time spent researching various topics
- **Infographics**
  - Overall *(CVRP infographic, 2016)*
  - Disadvantaged Communities *(CVRP DAC infographic, 2017)*
- **Characterization of Participating Vehicles and Consumers** *(CVRP research workshop pres, 2015)*
- **Program Participation** by Vehicle Type and County *(CVRP brief 2015)*
- **Dealer services**: Importance and Prevalence *(EF pres 2015)*

http://energycenter.org/resources?combine=&resource=All&technology=248&target=All
Zero Emission Vehicle Dashboard


<table>
<thead>
<tr>
<th>ZEV Sales</th>
<th>ZEV Market Share</th>
<th>ZEV Goals</th>
</tr>
</thead>
</table>

Filters

- ZEV Regulation Region
  - All
  - California
  - East Coast
  - West Coast
  - Other

- Registration Type
  - Retail
  - Other Fleet
  - Government Fleet

- Registration Month
  - Jan 2011
  - Jul 2017

ZEV Sales by State

- BEV: 318,487
- FCEV: 2,048
- PHEV: 314,675
- All: 635,210

Monthly Sales by ZEV Category

Top States by ZEV Market Share