

Cost-Effectively Targeting EV Outreach and Incentives to "Rebate-Essential" Consumers

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Outline

- Research Purpose
- Background & Approach
- Results
 - Characteristics of highly-influenced "Rebate Essentials"
 - Comparison to pre-income cap results
- Summary: Target-Segment "Profiles"



Research Purpose

Question:

–Who is most influenced by incentives to join the EV market?

Purpose:

- -Make public and private investments in increasing EV awareness and EV adoption strategic and costeffective
 - Minimize free-ridership
 - Focus on true market additions





Background and Approach



Center for Sustainable Energy (CSE)





CSE Electric Vehicle Activities



Incentives Design, Administration & Evaluation

Consumer & Dealer Outreach

Plug-in Electric Vehicle Benefits

Individual, business, nonprofit or government entit based in California or has a California based affilia



California Environmental Protection Agency

Stakeholder Engagement



Fleet Assistance & Clean Cities



PEV, Alt.-Fuel, & ZEV Planning & Implementation



2nd Life Battery Research & Vehicle-Grid Integration



How can consumer research help us grow markets for electric vehicles?



1.

2.

3.

- "Adding fuel to the fire": understand existing, generally enthusiastic adopters to target similar consumers
- Segment: all-battery vs. plug-in hybrid EVs
- Characteristics, motivations, and trends
- Who is "pre-adapted" to adopt? (e.g., Williams and Kurani 2006)



- "**Tough nuts to crack**": understand and break down barriers faced by consumers targeted based on policy priorities
- Multi-unit dwellers
- Lower-income consumers
- Disadvantaged & other underserved communities



- "Expand market frontiers": understand the margins of the market to target consumers who can be induced to join
- Adopters with low initial interest in EVs -- "converts"
- Adopters most influenced by incentives -- "rebate essentials"



EV Incentive Programs: Rebate Design

| | CLEAN VEHICLE REBATE PROJECT" | MOR-EV Massachusetts Offers Rebates for Electric Vehicles | Connecticut Hydrogen and Electric Automobile Purchase Rebate | NEW YORK STATE |
|------------------------------|---|---|--|--|
| Fuel-Cell EVs | \$5,000 | \$2,500 | \$5,000 | <u>e-miles</u> |
| All-Battery EVs | \$2,500 | \$2,500 | <u>e-miles</u> ≥ 175 \$3,000 ≥ 100 \$2,000 | ≥ 120 \$2,000 ≥ 40 \$1,700 |
| Plug-in Hybrid EVs | \$2,500 (i3 REx) \$1,500 | ≥10 kWh \$2,500 <10 kWh \$1,500 | < 100 \$500 ≥ 40 \$2,000 < 40 \$500 | ≥ 20 \$1,100< 20 \$500 |
| Zero-Emission Motorcycles | \$900 | \$750 | | |
| | e-miles ≥ 20 only; Consumer income cap and increased rebates | MSRP ≥ \$60k = \$1,000 max., no fleet rebates | MSRP ≤ \$60k only; dealer assignment; \$150 | MSRP > \$60k = \$500 max.; point-of-sale |
| 8 | | | (\$300 previous) | Center for Sustainable Energy |

Majority Characteristics



| | Vehicle purchase | CVRP Consumer Survey 2016 – 17 edition | | |
|------------------------|----------------------------|---|------|-----|
| | "intenders" (СНТЅ 2012) | All | PHEV | BEV |
| White/ Caucasian | 76% | 56% | 58% | 54% |
| Male | 49% | 72% | 71% | 73% |
| ≥ Bachelor's degree | 66% | 79% | 76% | 81% |
| Detached homes | 75% | 77% | 75% | 78% |
| 40–59 years old | 52% | 50% | 48% | 51% |
| < \$150k HH Income | 79% | 80% | 83% | 77% |

CVRP Consumer Survey: 2016–17 edition, purchase dates Nov 2016–May 2017,

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

weighted n = 5,697

Income Distribution





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



*Personal correspondence, Prof. Bunch (UCD)

"Rebate Essentials"



Would not have purchased/leased their EV without rebate



Rebate Essentiality









| | Rebate Essentials | | |
|------------------------------------|--|--------------------------------|--|
| Research Objective | Identify characteristics associated with increased rebate influence | | |
| Strategic Purpose | Informs targeting resources at consumers who otherwise would not adopt | | |
| Model | Binary logistic regression | | |
| Outcome variable: | "Would you have purchased or leased your PEV without the CVRP rebate?" [yes, no] | | |
| Predictor variables: | Consumer, household, vehicle, and transactional data | | |
| Data Nov 2016 – May 2017 | Plug-in hybrid (PHEV) (n=2,235) | All-battery (BEV) (n=3,105) | |





Characterizing Highly Influenced "Rebate Essential" Consumers



Odds Ratios: Consumer Demographics

| Explanatory variable | PHEV | BEV |
|--|--------|--------|
| Younger | 1.099* | 1.099* |
| Male | 1.24* | 1.05 |
| Non-white | 1.54* | 1.12 |
| Postgrad. deg. (vs. Bachelor's) | 1.04 | 1.09 |
| Postgrad. deg. (vs. Associate's or less) | 1.32* | 1.61* |
| Lower income (bin) | 1.02 | 1.09* |
| < 300% of Federal Poverty Level | | |
| (+\$2,000 rebate) | 1.93* | 1.998* |



Odds Ratios: Household & Charging

| Explanatory variable | PHEV | BEV |
|--|-------|------|
| More people in household | 1.01 | 1.04 |
| Fewer drivers in household | 1.01 | 1.13 |
| More cars in household | 1.11 | 1.09 |
| More previous PEVs owned | 1.12 | 0.93 |
| Own home | 1.08 | 0.89 |
| Live in multi-unit dwelling | 1.15 | 1.08 |
| Solar - no, but planning (vs. yes) | 1.16 | 1.02 |
| Solar - no, not planning (vs. yes) | 1.32* | 1.05 |
| Charging at home | 1.08 | 1.04 |
| No WPC (vs. no workplace) | 1.099 | 0.94 |
| No WPC (vs. Workplace charging avail.) | 1.03 | 1.15 |

Analytical Regions: California





| Explanatory variable | PHEV | BEV |
|---|-------|-------|
| Central (vs. Bay Area) | 2.08* | 3.13* |
| Central (vs. Central Coast) | 1.17 | 2.78* |
| Central (vs. Far South) | 1.28 | 3.03* |
| Central (vs. North) | 1.69 | 2.33* |
| Central (vs. South) | 1.79* | 3.33* |
| Non-Disadvantaged Community (CES 2.0 def.) | 1.21 | 1.69* |



Odds Ratios: Interest and Reasons

| Explanatory variable | PHEV | BEV |
|--|-------|-------|
| Lower initial interest in a PEV | 1.09^ | 1.04 |
| More importance: Saving \$ on fuel costs | 1.14* | 1.30* |
| Less importance: Environment | 1.06 | 1.18* |
| More importance: Carpool lane access | 1.12* | 1.16* |
| More importance: Energy independence | 1.05 | 1.03 |
| Less importance: Vehicle performance | 1.03 | 1.06 |
| Less importance: Charging convenience | 1.01 | 0.91^ |

* p < 0.05

Odds Ratios: Information Gathering

| Explanatory variable | PHEV | BEV |
|--|--------|--------|
| More difficulty finding information online | 1.205* | 1.299* |
| More time spent researching (online) | 1.11* | 1.01 |
| Did not hear about rebate from the dealer | 1.32* | 1.52* |



| Explanatory variable | PHEV | BEV |
|-------------------------------|-------|--------|
| PHEVs: Chevrolet (vs. Ford) | 1.32* | (PHEV) |
| PHEVs: Chevrolet (vs. Toyota) | 1.39* | (PHEV) |
| PHEVs: Other (vs. Chevrolet) | 1.22 | (PHEV) |
| BEVs: Tesla (vs. Nissan) | (BEV) | 1.15 |
| BEVs: FIAT (vs. Nissan) | (BEV) | 1.44* |
| BEVs: Nissan (vs. Chevrolet) | (BEV) | 2.78* |
| BEVs: Nissan (vs. Other) | (BEV) | 1.22 |



Odds Ratios: Transactional Factors

| Explanatory variable | PHEV | BEV |
|---|---------|----------|
| Later date of purchase | 1.001^ | 1.001 |
| Lower price | 1.0001* | 1.00002* |
| Leased | 1.12 | 0.97 |
| Replaced household vehicle | 1.22 | 0.85 |
| More years of intended ownership | 1.02 | 1.03 |
| Less time btwn purchase & survey response | 1.003* | 1.0003 |
| Lower-income Increased Rebate | 1.93* | 1.998* |



^ "Marginally" significant (p < 0.10 in final model, significant in others)</p>

Rank-Ordered Factors: PHEV Consumers



X-Standardized Rebate Essentiality Odds Ratios

Central (vs. Bay Area) Central (vs. South) Lower price Non-white Lower-income Increased Rebate Difficulty finding information online More importance: carpool PHEVs: Chevrolet (vs. Toyota) Younger age Did not hear about CVRP from the dealer Solar - no, not planning (vs. yes) More importance: save on fuel costs Postgraduate degree (vs. Associate degree or less) PHEVs: Chevrolet (vs. Ford) Less time btwn purchase & survey response More time spent researching (online) Male

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All are significant factors (p < 0.05)

Rank-Ordered Factors: BEV Consumers

BEV only PHEV and BEV 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50

Central (vs. South) Lower price vehicle Central (vs. Bay Area) BEVs: Nissan (vs. Chevrolet) Central (vs. Far South) More importance: save on fuel costs Difficulty finding information online More importance: carpool Did not hear about CVRP from the dealer Lower-income Increased Rebate Central (vs. North) Central (vs. Central Coast) Postgraduate degree (vs. Associate degree or less) Less importance: environment BEVs: FIAT (vs. Nissan) Non-Disadvantaged Community (CES 2.0 def.) Lower income (bin) Younger age

X-Standardized Rebate Essentiality Odds Ratios



All are significant factors (p < 0.05)

Odds-Increasing Factors: PHEV and BEV



Central (vs. Bay Area) Central (vs. South) Lower price Lower-income Increased Rebate Difficulty finding information online More importance: carpool Younger age Did not hear about CVRP from the dealer More importance: save on fuel costs Postgraduate degree (vs. Associate degree...





Comparison to Pre-income Cap Results



| | PHEV '13-15 | PHEV '16-17 | BEV '13–15 | BEV '16-17 |
|--|-------------|-------------|------------|------------|
| Later date of purchase | - | - | 13 | - |
| Less time between purchase & survey response | - | 16 | - | - |
| Lower price | 11 | 17 | 14 | 11 |
| PHEVs: Chevrolet (vs. Ford) | 2 | 7 | n.a. | n.a. |
| PHEVs: Chevrolet (vs. Toyota) | - | 5 | n.a. | n.a. |
| BEVs: FIAT (vs. Nissan) | n.a. | n.a. | - | 6 |
| BEVs: Nissan (vs. Chevrolet) | n.a. | n.a. | 17 | 16 |
| Central (vs. Bay Area) | - | 1 | 2 | 2 |
| Central (vs. Central Coast) | - | - | 19 | 16 |
| Central (vs. Far South) | - | - | 18 | 18 |
| Central (vs. North) | - | - | 20 | 15 |
| Central (vs. South) | - | 3 | 1 | 1 |
| Non-Disadvantaged Community (CES 2.0 def.) | - | - | - | 14 |
| Solar - no, not planning (vs. yes) | - | 6 | 11 | - |
| Younger age | - | 15 | - | 10 |
| Male | 3 | 10 | 8 | - |
| Non-white | 4 | 4 | 6 | - |
| Postgraduate degree (vs. Associate degree or less) | 8 | 7 | 4 | 4 |
| Lower income (bin) | 12 | - | 15 | 12 |
| More importance: save on fuel costs | 5 | 12 | 3 | 7 |
| Less importance: environment | 12 | - | 16 | 13 |
| More importance: carpool | 10 | 13 | 12 | 9 |
| More importance: Convenience of charging | n.a. | - | n.a. | - |
| Lower-income Increased Rebate | n.a. | 2 | n.a. | 3 |
| Lower initial interest in a PEV | 1 | - | 4 | - |
| Did not hear about CVRP from the dealer | 9 | 7 | 10 | 5 |
| More time spent researching (online) | 6 | 14 | 7 | - |
| Difficulty finding information online | 7 | 11 | 9 | 8 |

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Summary: Target-Segment "Profiles"



The rebate is more essential to PHEV consumers:

- focused on the "financial and practical"
 - Buying lower-price vehicles, receiving substantial additional incentives (CVRP increased rebate and regional)
 - Driven by HOV lane access, saving money on fuel
- facing "greater contextual constraints"
 - Lower income, possibly less flexibility to await reimbursement, perhaps younger and less established,
 - Perhaps with less cultural and physical exposure to EVs
- with "challenging informational environments"
 - Greater difficulty finding information online, who did more research online,
 - Perhaps benefitted from higher education to navigate these complex informational environments and
 - Have found out about the rebate before showing up at the dealership for their acquisition



The rebate is more essential to BEV consumers:

- focused on the "financial and practical"
 - Buying lower-price/range vehicles, receiving substantial additional incentives (CVRP increased rebate and regional)
 - Driven less by the environment than HOV lanes and saving \$ on fuel
- facing "greater contextual constraints"
 - Lower income, possibly less flexibility to await reimbursement, perhaps younger and less established,
 - Perhaps with less cultural and physical exposure to EVs
 - But not necessarily in CES 2.0 "disadvantaged communities"
- with "challenging informational environments"
 - Greater difficulty finding information online
 - Perhaps benefitted from higher education to navigate these complex informational environments and
 - Have found out about the rebate before showing up at the dealership for their acquisition



Where can I get additional data?: Transparency Tools

Public dashboards facilitate informed action across multiple U.S. states and regions



How can we help?

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Presentation available at: <u>https://cleanvehiclerebate.org/</u>



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