Crafting Incentives, Developing Policies & Building Consumer Awareness

Nancy Seidman, Senior Advisor, Regulatory Assistance Project

#WeTheStates
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
Center for Sustainable Energy (CSE)

Building Performance
Clean Transportation
Distributed Generation
Energy Efficiency
Energy Storage
Renewable Energy
### EV Rebate Design (as of Jan. 2019)

<table>
<thead>
<tr>
<th>Category</th>
<th>Fuel-Cell EVs</th>
<th>All-Battery EVs</th>
<th>Plug-in Hybrid EVs</th>
<th>Zero-Emission Motorcycles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$5,000</td>
<td>$2,500</td>
<td>$2,500 (i3 REx)</td>
<td>$900</td>
</tr>
<tr>
<td></td>
<td>$1,500</td>
<td>$1,500</td>
<td>BEVx only: $1,500</td>
<td>$450</td>
</tr>
<tr>
<td>e-miles ≥ 20 only;</td>
<td></td>
<td>$1,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer income cap and increased rebates for lower-income households</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSRP ≤ $50k, no fleet rebates</td>
<td></td>
<td>MSRP ≤ $60k FCEVs, ≤ $50k BEVs, PHEVs; dealer assignment; $150 dealer incentive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSRP &gt; $60k = $500 max.; point-of-sale via dealer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e-miles</td>
<td>≥ 120 $2,000</td>
<td>≥ 40 $1,700</td>
<td>≥ 20 $1,100</td>
<td>&lt; 20 $500</td>
</tr>
<tr>
<td></td>
<td>≥ 200 $2,000</td>
<td>≥ 120 $1,500</td>
<td>≥ 45 $1,000</td>
<td>&lt; 45 $500</td>
</tr>
<tr>
<td></td>
<td>≥ 200 $2,000</td>
<td>≥ 120 $1,500</td>
<td>≥ 45 $1,000</td>
<td>&lt; 45 $500</td>
</tr>
<tr>
<td></td>
<td>≥ 120 $1,500</td>
<td>≥ 120 $1,500</td>
<td>≥ 45 $1,000</td>
<td>&lt; 45 $500</td>
</tr>
<tr>
<td></td>
<td>&lt; 120 $500</td>
<td>&lt; 120 $500</td>
<td>&lt; 45 $500</td>
<td>&lt; 20 $500</td>
</tr>
</tbody>
</table>

- e-miles ≥ 120: $2,000
- e-miles ≥ 40: $1,700
- e-miles ≥ 20: $1,100
- e-miles < 20: $500
50-State EV Sales and Market-Share Dashboard

Linked at zevfacts.com
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)

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum Rebate</th>
<th>Maximum Rebate</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel-Cell EVs</strong></td>
<td>$5,000</td>
<td>$2,500</td>
<td>$5,000 only; MSRP ≤ $60k; dealer assignment; $150 dealer incentive ($300 previous)</td>
</tr>
<tr>
<td><strong>All-Battery EVs</strong></td>
<td>$2,500</td>
<td>$2,500</td>
<td>$2,500 only; MSRP &gt; $60k = $500 max.; point-of-sale via dealer</td>
</tr>
<tr>
<td><strong>Plug-in Hybrid EVs</strong></td>
<td>$2,500 (i3 REx)</td>
<td>$2,500</td>
<td>≥ 10 kWh: $2,500; &lt; 10 kWh: $1,500</td>
</tr>
<tr>
<td><strong>Zero-Emission Motorcycles</strong></td>
<td>$900</td>
<td>$750</td>
<td>e-miles ≥ 20 only; Consumer income cap and increased rebates for lower-income households</td>
</tr>
</tbody>
</table>
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
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)*

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

<table>
<thead>
<tr>
<th>Vehicle Purchase/Lease Dates</th>
<th>Survey Responses (total n)*</th>
<th>Program Population (N)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2014 – October 2017</td>
<td>2,549</td>
<td>5,754</td>
<td>196,641</td>
</tr>
<tr>
<td>May 2015 – June 2017</td>
<td>819</td>
<td>1,583</td>
<td></td>
</tr>
<tr>
<td>March 2017 – Nov. 2017</td>
<td>817</td>
<td>3,937</td>
<td></td>
</tr>
</tbody>
</table>

* Total: 2,549 + 817 + 817 = 44,623

**Total Program Population (N):**

185,367 + 5,754 + 1,583 + 3,937 = 196,641
## Majority Characteristics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>White/Caucasian</td>
<td>76%</td>
<td>56%</td>
</tr>
<tr>
<td>Male</td>
<td>49%</td>
<td>72%</td>
</tr>
<tr>
<td>≥ Bachelor’s degree</td>
<td>66%</td>
<td>79%</td>
</tr>
<tr>
<td>Detached homes</td>
<td>75%</td>
<td>77%</td>
</tr>
<tr>
<td>40–59 years old</td>
<td>52%</td>
<td>50%</td>
</tr>
<tr>
<td>&lt; $150k HH Income</td>
<td>79%</td>
<td>80%</td>
</tr>
</tbody>
</table>

California Household Travel Survey, 2012: weighted, n = 42,431
Outcomes: Behaviors Influenced
Do EVs get used?

Replaced a vehicle with their rebated clean vehicle

- CVRP (2013–2017): 71%
- MOR-EV (2014–17): 76%
- CHEAPR (2015–17): 79%
- Drive Clean NY (2017): 81%

Datasets: 44,623 total survey respondents weighted to represent 196,641 participants
What vehicles types have rebates helped replace?

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

Total

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

Impacts: Market
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
Would **not** have purchased/leased their EV **without rebate**

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

X-Standardized Rebate Essentiaity Odds Ratios

- 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 or less)

- PHEV
- BEV

https://cleanvehiclerebate.org/eng/content/presentation-targeting-ev-rebates-and-outreach-%E2%80%9Crebate-essential%E2%80%9D-consumers
Percent of MOR-EV Respondents that are “Rebate Essential” by Household Income

As household income goes up, rebate influence diminishes

-less influenced by rebate

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

As MSRP increases, *rebate influence decreases*

<table>
<thead>
<tr>
<th>Average Base MSRP</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $30,000</td>
<td>64%</td>
</tr>
<tr>
<td>$30,000–$39,999</td>
<td>57%</td>
</tr>
<tr>
<td>$40,000–$49,999</td>
<td>56%</td>
</tr>
<tr>
<td>$60,000–$69,999</td>
<td>46%</td>
</tr>
<tr>
<td>$80,000 or more</td>
<td>43%</td>
</tr>
</tbody>
</table>

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
How is the dealer incentive working?

Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales

April 2017

Prepared by
Center for Sustainable Energy

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

- **Spend time learning about EVs**
  - Not at all motivated: 3.20
  - Slightly motivated: 3.75
  - Moderately motivated: 3.20
  - Very motivated: 3.88
  - Extremely motivated: 4.38

- **Spend time teaching other staff about EVs**
  - Not at all motivated: 3.20
  - Slightly motivated: 3.88
  - Moderately motivated: 3.20
  - Very motivated: 4.00
  - Extremely motivated: 4.38

- **Spend time with a customer to teach them about EV ownership and use**
  - Not at all motivated: 3.24
  - Slightly motivated: * (statistically significant difference, p < 0.05)
  - Moderately motivated: 3.85
  - Very motivated: 4.38
  - Extremely motivated: 4.00

- **Try to convert customers interested in conventional vehicles to EVs**
  - Not at all motivated: 3.15
  - Slightly motivated: 3.85
  - Moderately motivated: 3.15
  - Very motivated: 3.85
  - Extremely motivated: 4.00

- **In general, try to sell more EVs**
  - Not at all motivated: 3.33
  - Slightly motivated: 4.00
  - Moderately motivated: 3.33
  - Very motivated: 4.00
  - Extremely motivated: 4.00

† Fourth and fifth statements only appeared to sales employees; respondents=40
*Statistically significant difference (p < 0.05)

Respondents=57
Summary: Findings

• Some consumer differences, particularly gender, remain
  – Trending in the right direction
• \(~\frac{4}{5}\)ths of rebated EVs replace older, more polluting vehicles
• Rebate influence on purchase/lease:
  – moderately to extremely important to \(\frac{9}{10}\)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
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


California Household Travel Survey, 2012: weighted, n = 42,431
Rebate Recipients Look More And More Like Other Car Buyers


California Household Travel Survey, 2012: weighted, n = 42,431
Do EVs get used?: by Tech Type

Replaced a vehicle with their rebated EV

![Bar chart showing the percentage of respondents who replaced a vehicle with their rebated EV by tech type.]

- **Plug-in Hybrid EVs**
  - CVRP (2013–2017): 81%
  - MOR-EV (2014–17): 66%
  - CHEAPR (2015–17): 72%
  - Drive Clean NY (2017): 71%

- **Battery EVs**
  - CVRP (2013–2017): 83%
  - MOR-EV (2014–17): 65%
  - CHEAPR (2015–17): 84%
  - Drive Clean NY (2017): 78%

Datasets: 44,623 total survey respondents weighted to represent 196,641 participants.
## Vehicle-Life Emission Reductions (thru 9/17)

<table>
<thead>
<tr>
<th>Vehicle Category</th>
<th>Per-Vehicle Savings (metric tons of carbon-dioxide-equivalent emissions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assumes vehicle life = 11.6 years*</td>
</tr>
<tr>
<td>All (N=205,349)</td>
<td>&gt; 32 tCO₂e</td>
</tr>
<tr>
<td>BEV (N=122,969)</td>
<td>&gt; 34 tCO₂e</td>
</tr>
<tr>
<td>PHEV (N=82,380)</td>
<td>&gt; 30 tCO₂e</td>
</tr>
</tbody>
</table>

* 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):**

<table>
<thead>
<tr>
<th>Source</th>
<th>Metric</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenn et al. (2018)</td>
<td>Increase in CA EV sales due to rebates</td>
<td>62%</td>
</tr>
<tr>
<td>Narassimhan and Johnson (2018)</td>
<td>Increase in BEV sales per ~$2,500 increase in incentives (adapted)</td>
<td>23.5%</td>
</tr>
<tr>
<td>Sheldon et al. (2016)</td>
<td>Increase in CA EV sales due to rebates</td>
<td>7%</td>
</tr>
<tr>
<td>Clinton et al. (2015)</td>
<td>Increase in BEV sales for every ~$2,500 of incentives (adapted)</td>
<td>18% (+/- ~22%)</td>
</tr>
</tbody>
</table>
Rebate Essentiality is *Increasing* Over Time

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

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013–2015</td>
<td>46%</td>
</tr>
<tr>
<td>2015–2016</td>
<td>56%</td>
</tr>
<tr>
<td>2016–2017</td>
<td>58%</td>
</tr>
</tbody>
</table>

2016–2017 edition: weighted, n=9,261*
Rebate Essentiality Data Contradicts a Common Paradigm About Phasing Out Incentives


2016–2017 edition: weighted, n=9,261

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**Rebate Essentiality**

<table>
<thead>
<tr>
<th>Year Range</th>
<th>Rebate Essentiality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013–2015</td>
<td>46%</td>
</tr>
<tr>
<td>2015–2016</td>
<td>56%</td>
</tr>
<tr>
<td>2016–2017</td>
<td>58%</td>
</tr>
<tr>
<td>CVRP</td>
<td>Eligibility</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Filing Status</td>
</tr>
<tr>
<td><strong>Income Cap</strong></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td>&gt; $150,000</td>
</tr>
<tr>
<td>Head of Household</td>
<td>&gt; $204,000</td>
</tr>
<tr>
<td>Joint</td>
<td>&gt; $300,000</td>
</tr>
<tr>
<td><strong>Standard Rebate</strong></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td>300% FPL to $150,000</td>
</tr>
<tr>
<td>Head of Household</td>
<td>300% FPL to $204,000</td>
</tr>
<tr>
<td>Joint</td>
<td>300% FPL to $300,000</td>
</tr>
<tr>
<td><strong>Increased Rebate for Low-Income Applicants</strong>*</td>
<td></td>
</tr>
<tr>
<td>Household Income ≤ 300 percent of the federal poverty level (FPL)</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Activity</th>
<th>All Respondents</th>
<th>Sales Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spend time learning about EVs</td>
<td>3.37</td>
<td>3.41</td>
</tr>
<tr>
<td>Spend time teaching other staff about EVs</td>
<td>3.40</td>
<td>3.43</td>
</tr>
<tr>
<td>Spend time with a customer to teach them about EV ownership and use</td>
<td>3.67</td>
<td></td>
</tr>
<tr>
<td>Try to convert customers interested in conventional vehicles to EVs</td>
<td>3.39</td>
<td></td>
</tr>
<tr>
<td>In general, try to sell more EVs</td>
<td>3.54</td>
<td>3.58</td>
</tr>
</tbody>
</table>

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
Interactive data dashboards and downloads:

- Rebate statistics
- Rebate maps
- Survey results
Reports, analysis, infographics & presentations
brett.williams@energycenter.org
Related analysis available at energycenter.org/resources/transportation
Crafting Incentives, Developing Policies & Building Consumer Awareness

Britta Gross, Director of Advanced Vehicle Commercialization Policy, GM

#WeTheStates
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
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)

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**12 States offer vehicle incentives**

- **CA:** $2,500 BEV rebate ($1,500 PHEV); HOV lane access; EVSE grants
- **CO:** $5,000 tax credit; EVSE grants
- **CT:** $2,000 BEV rebate ($1,000 PHEV); EVSE rebates
- **DE:** $3,500 BEV rebate ($1,500 PHEV); EVSE rebates
- **GA:** HOV
- **MD:** $3,000 BEV rebate ($1,840 PHEV); HOV
- **MA:** $1,500 BEV rebate
- **NY:** $2,000 BEV rebate ($1,700 PHEV); HOV; EVSE tax credits
- **NJ:** $2,500 BEV rebate; EVSE rebates
- **PA:** $1,750 BEV rebate ($1,000 PHEV)
- **TX:** $2,500 rebate; EVSE tax credits
- **LA:** $2,500 tax credit; EVSE tax credits

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**OR:** $2,500 rebate; EVSE tax credits

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# of KEY EV-ENABLING POLICIES BY STATE

- 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 growth will significantly contribute to 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