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<th><strong>Docket Number:</strong></th>
<th>18-EVI-01</th>
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<td><strong>Project Title:</strong></td>
<td>California Plug-in Electric Vehicle Infrastructure Projections</td>
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<td><strong>Document Title:</strong></td>
<td>Plug-in Electric Vehicle Usage and Charging at the Household Level</td>
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<td><strong>Description:</strong></td>
<td>Powerpoint presentation</td>
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<td><strong>Filer:</strong></td>
<td>Tami Haas</td>
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<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
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<td>Commission Staff</td>
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Plug-in Electric Vehicle Usage and Charging at the Household Level

Melanie Zauscher, CARB
Research Contractor: Dr. Gil Tal, UC Davis
Contracts* co-funded by CARB and CEC

*The contracts are: 12-319 “Advanced Plug-in Electric Vehicle Travel and Charging Behavior” and 16RD009 “Emerging Technology Zero Emission Vehicle Household Travel and Refueling Behavior”
Study Motivation

• PEV usage impacts emissions, energy consumption, and electrical grid management

• Limited data on real-world driving and charging patterns

• CARB’s Board resolved to study consumers’ actual usage of PEVs
Study Design

Study household context to determine emissions

- Number of cars, drivers, household members

Long-term study to understand changes in behavior

- Due to seasonal differences
- Due to increased PEV experience
Importance and Challenges

Importance of studies
• No other source for this type of data!
• Because PEV infrastructure is an expensive investment, it needs to be well-informed

Challenges in this field
• Expensive methodology resulting in lots of granular data, but limited number of households
• Shift away from personally owned vehicles towards new mobility services?
Study Overview

New and used PEV owners recruited from Clean Vehicle Rebate Project and DMV registration data

Recruitment survey:
~14,000 completed

Logging of vehicles:
324 PEVs & 271 ICEs
~ 300 households

Interviews:
20 done
Survey: not all PHEVs are plugged in

In 2016, a third didn’t plug in their 10-mile range PHEV
Survey: a quarter without level 2 charger at home feel limited

How many days per month would using a level 2 charger at home increase your electric travel?

On average, they would increase their electric miles on eight days each month; some would everyday
Survey: only some BEVs are fast-charge-capable

Only 48-91% of recent model year BEVs can fast charge
5-12% don’t know if they can fast charge
Survey: only a fraction of BEVs capable actually fast charge

Only a fraction of BEVs capable actually fast charge
Logging: observe actual behavior, but context is missing.

Every household is unique and aggregating data smooths out individual patterns.
Lessons Learned

• Some PHEVs don’t plug in
  - Should we incentivize electric miles?

• Some folks feel limited by not having a level 2 charger at home
  - Should identify barriers and perhaps incentivize chargers in certain types of housing

• Some BEVs can’t fast charge
  - Should ensure modeling assumptions reflect this

• Most fast-charge-capable BEVs don’t fast charge
  - Are folks meeting their travel needs without fast charging or are they using other vehicles for longer trips?
Lessons Learned (continued)

- Surveys and interviews complement logged data and vice versa
  - Logged data lets us see current patterns, but surveys/interviews help inform how these patterns may change with time
  - People want more infrastructure than they use
Acknowledgments

Dr. Gil Tal and his research team at UC Davis
PEV owners that have participated in this research

More Information

Interim Report

Low Carbon Transportation Research
https://ww2.arb.ca.gov/research/research-program-transportation-choices

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Extra Slide: Percent Nissan Leaf Households that have L2 Charger

Fraction of Leaf households that have a Level 2 Charger at home different survey years

Leaf households rely less on L2 home charging over time.