Valuing ZEVs

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ZEV Policy Forum
6 June 2012
Dominant Frame: Electric vehicles’ (EVs) differences are problems

• Because EVs are different from conventional (internal combustion engine (ICE)) cars, people will not buy EVs
  – Short driving range
  – Long charge times
  – Lack of charging infrastructure
  – High vehicle prices

• To solve these problems we need the following
  – Advanced batteries
  – Public (and workplace) recharging infrastructure
  – Radical price reductions
Another Frame: EVs differences are sources of new values

• People learn and adapt; (some) people will buy EVs because EVs are different

• EVs give access to new values
  – Electric drivetrain
  – Charging
  – Environmental, social, and civic

• Benefits within each of these can be…
  • Private: accruing to the owner/operator
  • Social: no one can be excluded and require collective action
How long to access new systems of EV benefits?

Electric drivetrain benefits

- Accelerate from 0 to ~50mph—3 to 4 seconds.
- Turn evaluation of aggressive regenerative braking, i.e., one-pedal driving, from negative to positive—3 to 4 days.

Charging benefits

- Sense of independence from oil, no trips to gas stations, stable electricity prices vs. fluctuating gasoline prices—3 to 4 weeks
Social Benefits

• Hybrid vehicles (HEVs) changed what a car can do and mean

• Early HEV buyers bought a car that means…
  …the future
  …a less-consumptive lifestyle
  …they are a smart consumer
  …clean air, lower oil consumption, less terror
  …high fuel economy and high-tech, high-quality

• Important differences between EV drivers in different places
  – Los Angeles (MINI E): Clean air
  – San Diego (LEAF): Energy Independence
    • National independence from foreign oil producers
    • Personal independence from their electric utility
Developing new lifestyle sectors

Initial Household Fleet

A hypothetical household owns two cars to which they make routine trip assignments.

Car 1 (ICE)
- Trip a
- Trip b
- Trip c
- Trip d

Car 2 (ICE)
- Trip w
- Trip x
- Trip y
- Trip z
First, what does not happen?

Confronted by the idea of an EV, people imagine it must substitute for a gasoline car—and can’t imagine it is a good idea.

This is also not what happens in households that drive EVs.
Adaptation and Exploration

Household may reassign other vehicle’s trips (y’ and z’) to EV for a variety of reasons:

• EV driving performance (fun to drive)
• Lower fuel/operating costs
• Less polluting

Some may change destinations and create new trips.

Learning Process

EV lifestyle sector can expand and change as drivers get comfortable with the car, learn distances to destinations, and possibly as infrastructure is developed.
Is driving range a problem?

MINI E (Los Angeles)
~1/3: 100 miles of range and home charging easily covers all travel
~1/2: 100 miles of range and home charging covers more than 90% of their old driving PLUS with minimal adaptations they add trips
~1/6: Drive at or near ~100 miles a day on a weekly basis; must make adaptations like careful planning, charging at work, or eliminating trips

LEAF (San Diego)
• Everyone complains they get less than 100 miles range (per full charge);
• Most then only charge to 80 percent
  • Effective ranges of < 75 miles
  • Most only needing to charge only at home
But what about range anxiety?

• Are we turning responses to driving range into a medical-psychological condition, e.g. “anxiety”?
  • EV drivers response to range limits is specific and situational
    • Successfully completing a trip or set of trips at the range limit helps set boundaries
• Range Aspiration: EV drivers do not want more range because they are anxious; they want more range because they want to use the EV to access more of their lives
• Range anxiety—if it exists at all—may be experienced only by people who haven’t driven an EV
Will public charging expand EV markets?

• Dominant frame assumes so; EV drivers say no?
  • MINI E drivers in Berlin aren’t using public charge network
  • Similar results from 1990s EV demonstrations, e.g., La Rochelle and Mendrisio
  • LEAF drivers in San Diego: No one requires public recharging on a daily basis; Many use it
    • It is (was) free
    • To demonstrate demand for public charging
    • To experiment: a visit to Balboa Park

• Are these EV drivers benefiting even if they don’t use the public charging infrastructure?
  • Safety net—we don’t here much of this yet
  • Marker of progress toward the future—we do hear this
The “infrastructure problem” includes households who can’t recharge at home

55 to 65 percent of new car buying households who can plug-in a PEV during their day

It is still far from everyone
To facilitate transitions to ZEVs adopt a frame that emphasizes new values

• Provide access to, and facilitate the spread of, new values
  – Put more value into PEVs: Experience creates new values, benefits, behaviors, and lifestyle sectors
    • The intersection of public and private value: fun and clean
    • Mastery of energy use
      – Driving style, regenerative braking
      – Monthly electricity bill
    • EV territory
      – Lifestyle zones for clean, quiet vehicles
      – Geography of charging; topography of routes

• Storytelling leverages experience

• Demonstration projects placing ZEVs into households for a month at a time, tied to social marketing campaigns to tell the stories of ZEV owners.