Promoting Plug-in Vehicles
Reduce GHG and electric rates
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State Interest in EVs

+ 2013 ZEV Action Plan
  • 1.5 million by 2025

+ ZEVs are necessary to meet the 2050 GHG targets

+ State needs utility support of plug-in vehicle policies

+ E3 believes there is now an opportunity to really push the plug-in market
  • Viable PEVs on the market
  • Electricity getting cleaner
  • Utilities need off-peak load
Reducing carbon in 2050

Carbon Savings for 2050 Reductions

Zero-carbon electricity generation is the dominant energy source in this 2050 economy. The constraints on other low-carbon resources drive low-carbon electricity to be the fuel of choice.

Source: Energy and Environmental Economics, Inc 2009
How do we transform the market?

#1 Provide incentives to reduce the upfront cost of the plug-in vehicles to the consumer

- Incentives that can be funded by utility ratepayers fall into three categories which can be used in combination
  - Ratepayer benefits (incentive is collected back from grid benefits)
  - Participant funding (upfront incentive is collected back over time in the plug-in vehicle rate)
  - Market transformation subsidies (similar to CSI)

#2 Encourage the availability of charging

- Develop multi-family infrastructure strategy
  - Building standards, incentives to landlords, or utility construction
Benefits of EVs to Ratepayers

<table>
<thead>
<tr>
<th>Revenues</th>
<th>Costs</th>
<th>Net Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug-in Vehicle Rate $/kWh</td>
<td>Cost of Generation</td>
<td>Can be used for…</td>
</tr>
<tr>
<td>Can be adjusted through rate design (Sub-metering would dramatically improve flexibility)</td>
<td>Can be decreased by…</td>
<td></td>
</tr>
</tbody>
</table>

- Incentives
- Infrastructure
- Rate reductions for all customers

- Charging off-peak, e.g. TOU pricing
- Controlled charging strategies
At plug-in charging rates of $0.10/kWh to $0.20/kWh, revenue neutral ratepayer costs can range from $1,000 to $3,000 per vehicle.

At this electricity charging cost, plug-in vehicles still save plug-in owners ~$1,000.

<table>
<thead>
<tr>
<th></th>
<th>Low Rate</th>
<th>Med Rate</th>
<th>High Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-peak Rate $/kWh</td>
<td>$0.10</td>
<td>$0.12</td>
<td>$0.20</td>
</tr>
<tr>
<td>Off-peak Cost $/kWh</td>
<td>$0.05</td>
<td>$0.05</td>
<td>$0.05</td>
</tr>
<tr>
<td>Difference $/kWh</td>
<td>$0.05</td>
<td>$0.07</td>
<td>$0.15</td>
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<tr>
<td>CTF $/Year</td>
<td>$183</td>
<td>$256</td>
<td>$548</td>
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<tr>
<td>7 year NPV $</td>
<td>$950</td>
<td>$1,330</td>
<td>$2,850</td>
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<tr>
<td>Gasoline Savings</td>
<td>$1,579</td>
<td>$1,579</td>
<td>$1,579</td>
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<tr>
<td>Plug-in Electric Cost</td>
<td>$365</td>
<td>$438</td>
<td>$730</td>
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<tr>
<td>Plug-in Savings</td>
<td>$1,214</td>
<td>$1,141</td>
<td>$849</td>
</tr>
</tbody>
</table>

**Assumptions**

- Discount Rate: 8%
- Gasoline Cost: $3.75
- miles/kWh: 3
- conventional miles/gal: 26
- kWh/day: 10
- kWh/year: 3,650
Transformation in Phases

**Early Path**
- Provide ratepayer funded incentive to reduce upfront cost of vehicles to increase adoption, funded by net system benefits
- Use TOU pricing (or a simple load-control signal) to encourage super-off peak charging with simple timers or onboard charge controllers in the vehicles

**Mid Term**
- Expand charging availability for multi-family and workplace charging through (a) new construction standards, (b) incentives and (c) possibly utility ‘make ready’ construction
- Transition to using system benefits to lower retail electric rates

**Long term**
- Expand charging infrastructure for ‘range anxiety’ of pure EVs
- Create dynamically controlled charging for additional grid benefits after significant plug-in vehicle penetration is achieved
Plug-in Hybrids in Early Phase

**In near-term PHEVs ideal transition strategy**
- No range anxiety
- Need only level 1 charging
- Very low cost of infrastructure upgrades with off-peak charging

**Infrastructure needed for PHEVs**
- Existing distribution largely can accommodate PHEVs, particularly with night time charging
- Multi-family charging locations (landlord / tenant problem)
- Public charging stations helpful, but not as critical for vehicle purchase
Plug-in vehicles are important to achieve California’s long-term CO2 goals.

Increased use of existing electricity grid in the off-peak produces benefits that can be used to transform the market or reduce rates for all customers.

Implementation: Keep it simple

- Upfront incentives, TOU pricing and/or simple load control in the near term
- Expand charging access, in particular in the multi-family segment