



Plug-in Electric Vehicles

Exploring the Infrastructure Challenge

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Exploring the PEV Infrastructure Challenge

PEV Infrastructure Definitions

Assumptions

Diagramming the Potential Volume

Recommended Actions

Discussion

Charging Infrastructure Definitions

Charging Locations

Brief Description

Takeaways

Single Family Residential

- Electric Vehicle Service Equipment to support Level I (120) or Level II(240) in home environment

- Majority of initial market will have home charging access

Multi-unit Residential

- EVSE in parking locations with or without metering and billing options

- Regional infrastructure needed to reduce range anxiety

Business / Commercial

- Commercial sites that are publicly available with or without billing, employee parking & fleet “behind the fence”

- Workplace charging will be critical

Public / Street

- Public access on public property with or without billing options – meters required

- Public charging in demand when MUR is complex and expensive

- Metering and billing is a challenge

Questions to Drive a Discussion

- **What is the actual PHEV versus BEV percentage mix?**
- **Range anxiety exists but for how long? Six months, one year**
- **Will new market entrants have range anxiety after neighborhood conversations?**
- **What percentage of PHEV owners will plug in even if electricity cost is considerably higher in public versus at home?**

Assumptions to Drive Discussion

- **Forecasts show a majority of PHEVs by 2015 (70% of PEV market)**
- **70% of BEV owners will likely use every opportunity to plug in and recharge due to travel patterns and to mitigate range anxiety-**
- **PHEV owners should experience minimal range anxiety as they'll be able to refuel at any gas station – 20% will charge up when_ever possible.**
- **BEVs will require longer charge time (up to 5 hours for an empty battery on 240V) than PHEVs (up to 3 hours on 240V)**

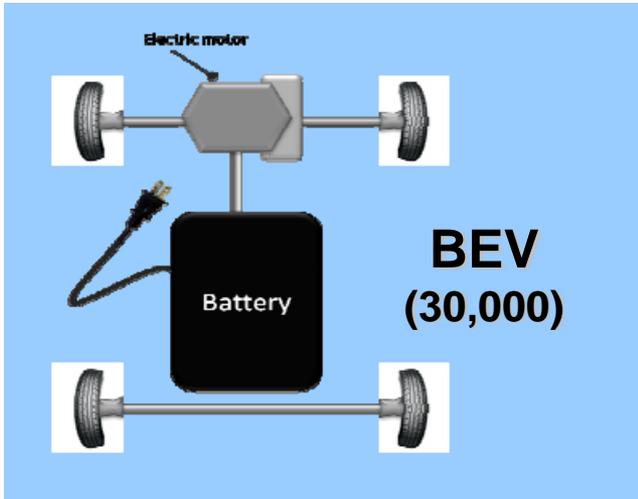
Assumptions to Drive Discussion

- **Deployment of public fast charging stations (i.e. DC) provides a level of security – usage is unknown due to cost**
- **Level 2 public charging will provide the ability to “top off” for short range trips/commutes with charge level dependent upon length of stay at a single location**
- **A single charge point is expected to cover an average of 2 vehicle charges per day (Example: 1/day workplace, 3/day big box retail)**
- **Charging sites will have an average of 2.5 charging points per location**

Potential Scenario

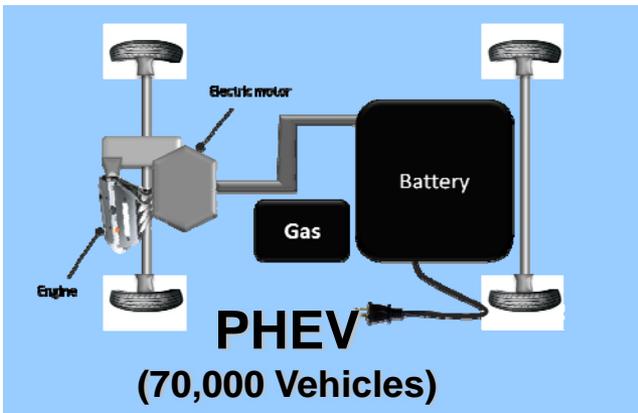
Charging Points and Charging Locations based on assumptions

100,000 PEVs*



70% Require External Charging:
21,000 BEVs

$$\frac{35,000 \text{ Vehicles}}{2 \text{ Vehicles per Charging Point}} = 17,500 \text{ Charging Points}$$



= **7,000** Charging Locations
(2.5 Charging Points/Location)

20% Require External Charging:
14,000 PHEVs

???

* Example for Discussion Only

Recommendations

- Review actual BEV driving habits from past and current demonstrations
- Interview individuals to understand “real” range anxiety. Is there a magic mileage number – 100 miles, 150 miles?
- Track accurately driving patterns of initial market entrants in the ECOTality, Coulomb and BMW MiniE projects
- Execute regional planning initiatives to understand “traffic generator” locations and analyze travel patterns to these locations – What is the typical driving distance to these destinations? What will drive BEV penetration?

For Example

- Visitors to the beach and ball parks may travel long distances – visitors to local neighborhood traffic generators may travel only short 10 miles distances?

Recommendations

- **Many believe workplace charging is critical? What is the willingness of workplaces/large employers to provide access? What is the typical travel distance to an employer? Industrial, schools, hospitals etc.**
- **Develop a review of fast charging systems and their potential impact? On home infrastructure needs? Public infrastructure levels? Cost to consumer?**



Thank you!

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