FY16 Analysis of Plug-in Electric Vehicle and Charging Infrastructure Field Data

VSATT meeting
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Additional opportunities for PEV and charging infrastructure customer usage analysis

- More eVMT analysis
- Corridor DC fast charger usage
- Public charging usage by venues
- Workplace charging
- EV Everywhere “critical path” questions
- Other ideas?

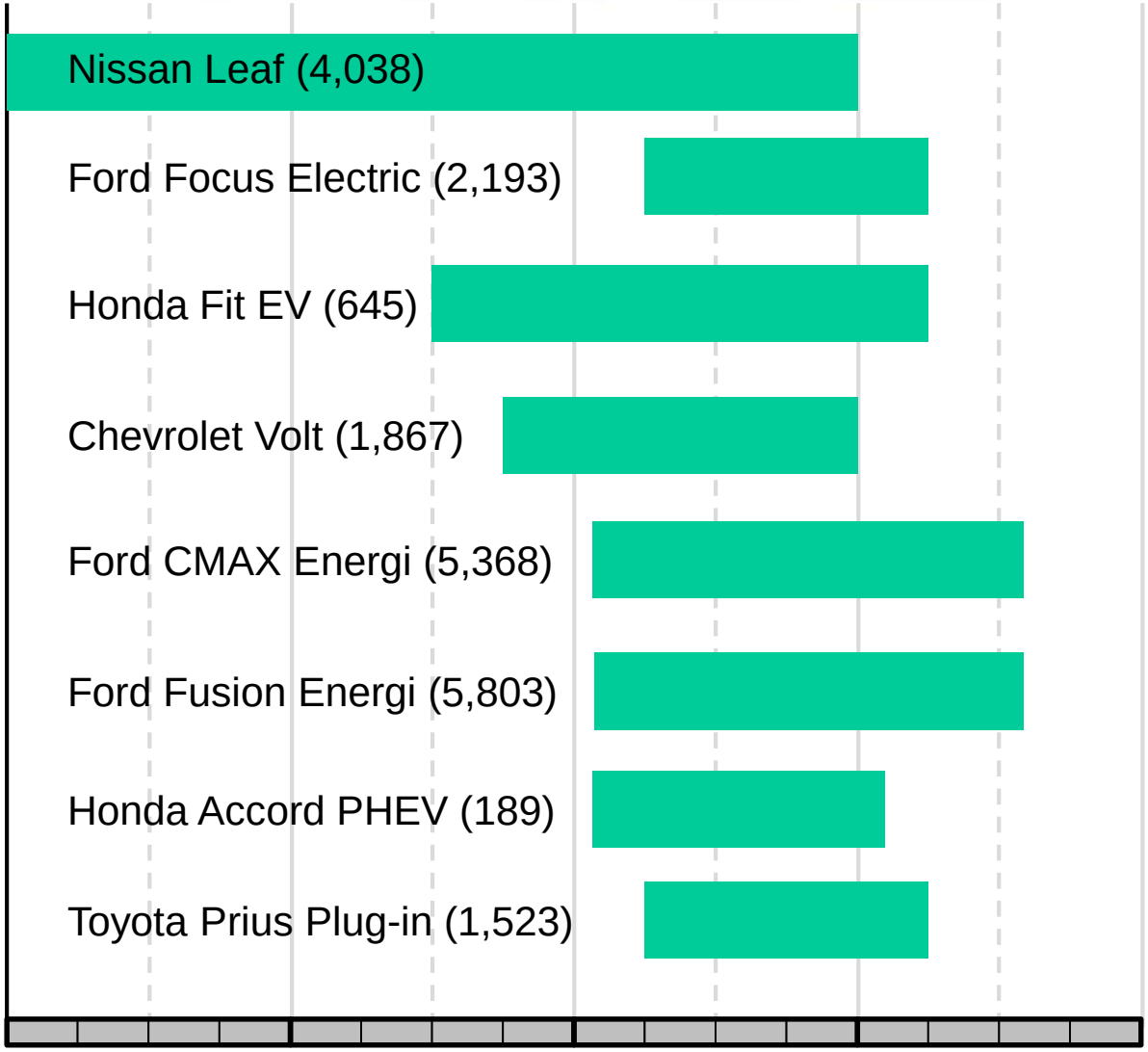
Vehicle Data Available*

* Publication of analysis results requires OEM approval

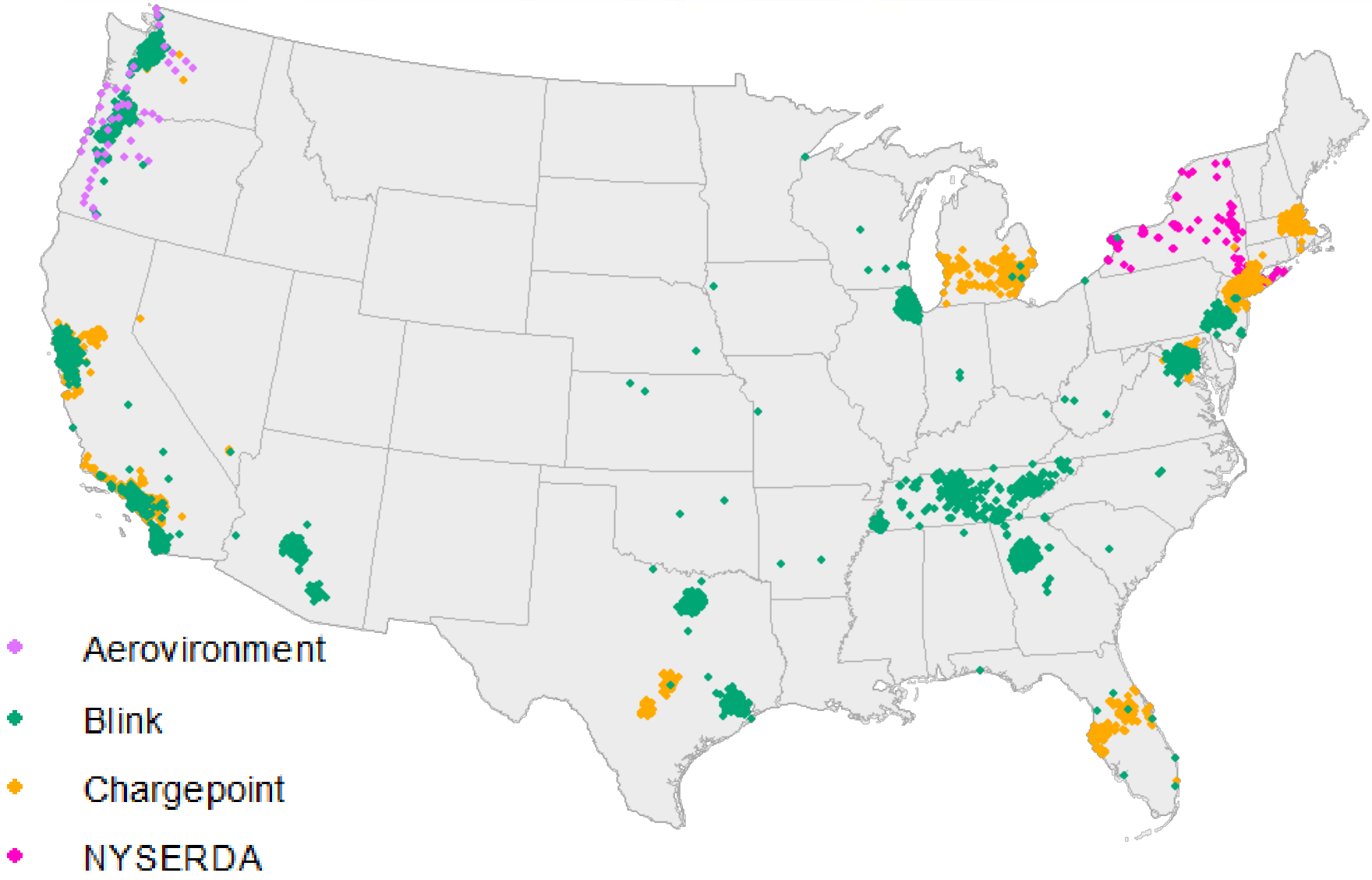




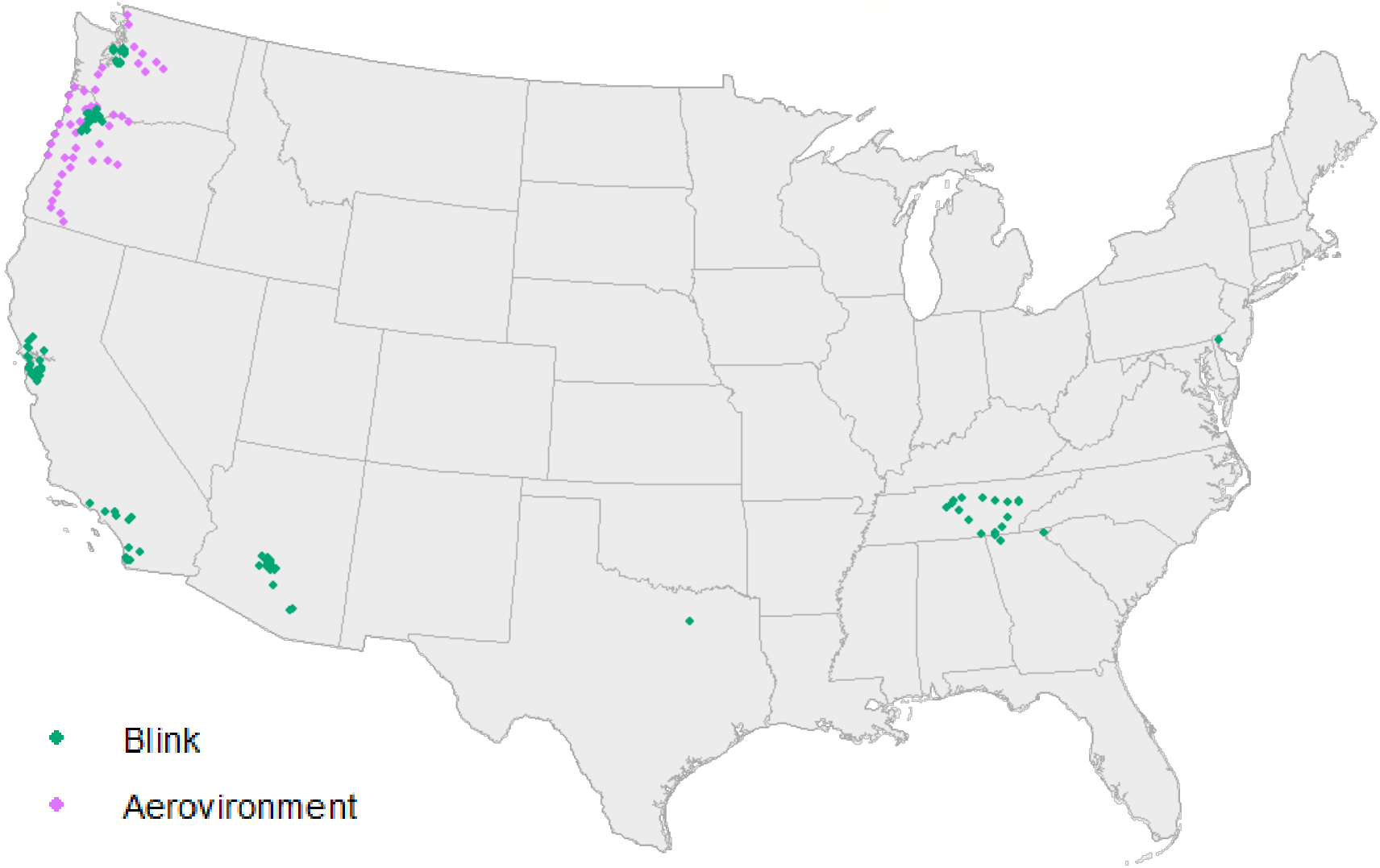


Public AC Level 2 EVSE



Public DC Fast Chargers



EVSE Data Available

Blink, Level 2 *Free* *80% Cost / 15% Free / 5% ?* (8,000)

ChargePoint America, Level 2 *XX% Cost / XX% Free* (4,700)

ChargePoint and others, NYSERDA, Level 2 *20% Cost / 80% Free* (600)

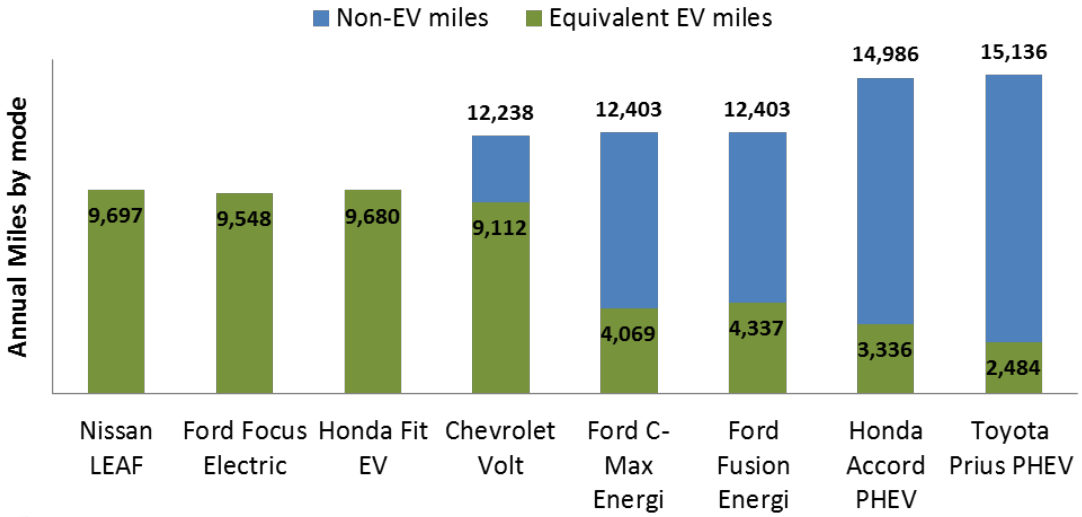
Blink, DCFC *Free* *Cost* (100)

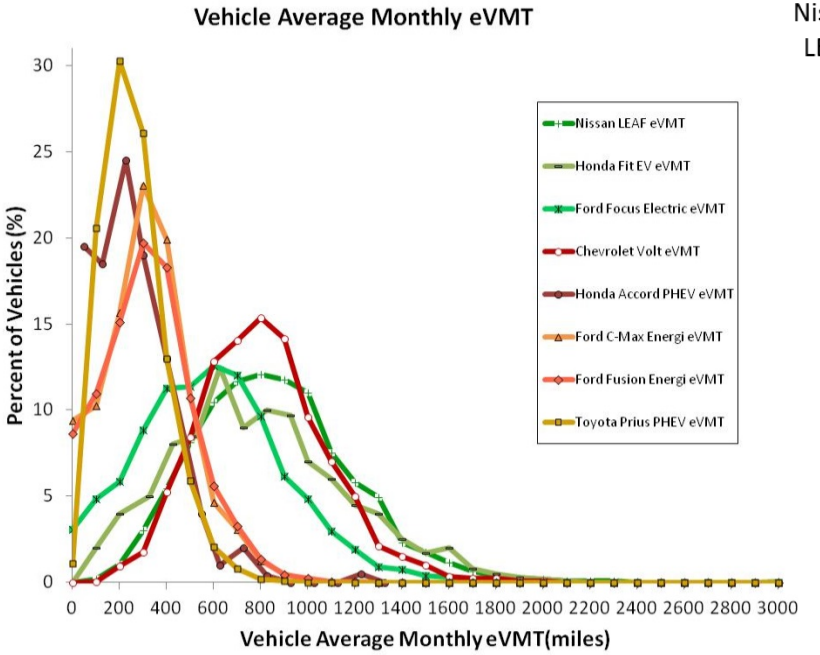
AeroVironment, WCEH, DCFC/Level 2 *Free* *Cost* (50/50)

2011 2012 2013 2014 2015

Real-world eVMT Analysis

- 8 vehicle models
- 158M miles from 21,600 vehicles

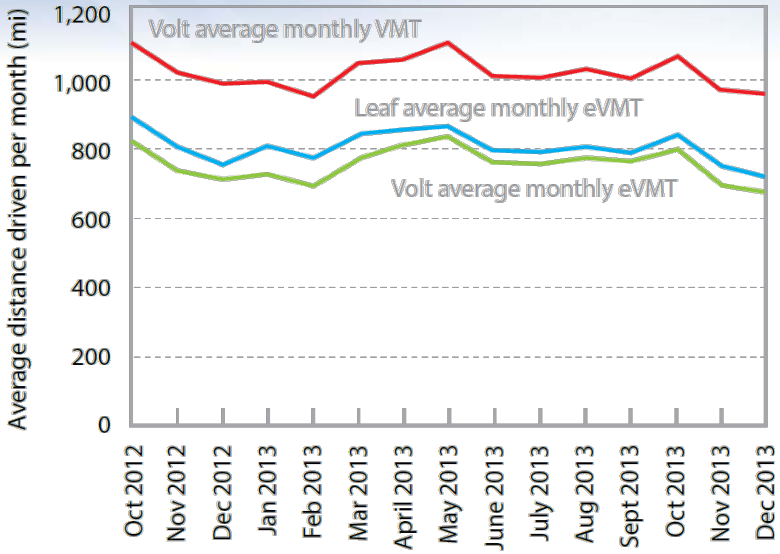


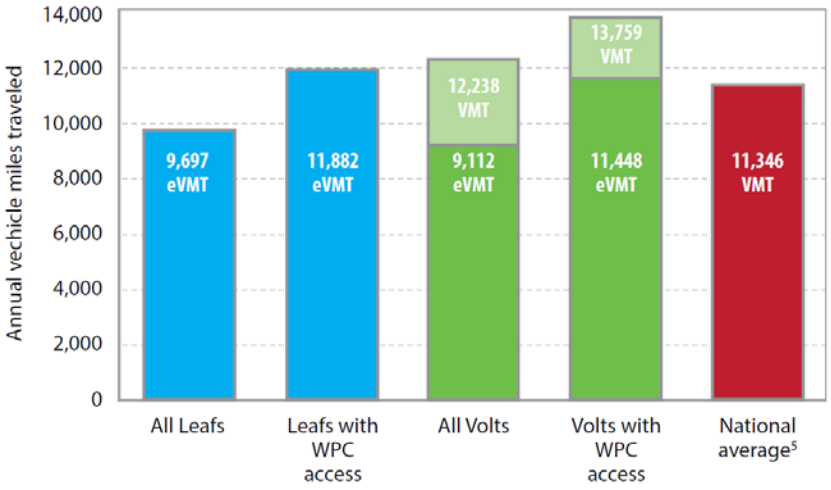


- Analysis performed at the request of some OEMs to support deliberations with CARB over ZEV credits

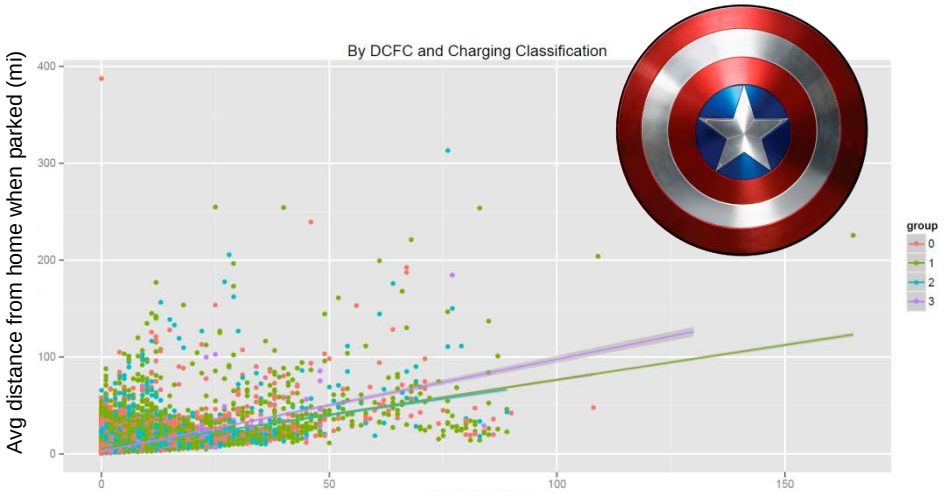
eVMT Analysis 2.0

- Seasonal variation
- Regional variation
- Variation with charging infrastructure availability
  - Public Level 2, DC fast chargers
  - Workplace charging





[5] Office of Highway Policy Information, Federal Highway Administration, "Highway Statistics 2013-Table VM-1," January, 2015, www.fhwa.dot.gov/policyinformation/statistics/2013/vm1.cfm



Number of DC fast chargers between mean + 1 sigma and mean + 2 sigma miles from home

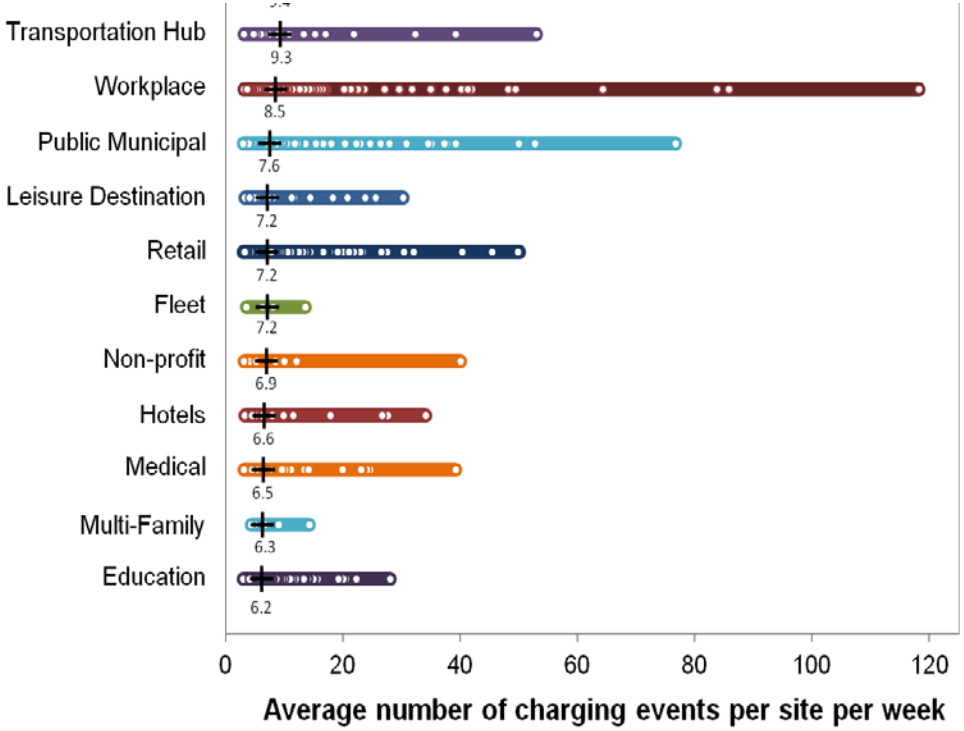
Corridor DC fast charger usage

- Where do DCFC users come from (long distance or local travel?)
- How do BEV driving/charging habits vary between those with and without access to corridor DCFCs
- Compare BEV, PHEV/EREV, and conv. vehicle travel behavior
- Consider other DCFC corridors?
  - BMW/VW/ChargePoint EV Express corridors:
  - San Diego-LA-San Fran-Portland
  - DC-NYC-Boston




Public charging usage by venues

- Deep dives to characterize hot spots
- Characterize usage at different venues
  - Time of day
  - Time connected, energy per charge
  - Most common vehicle types (i.e. charge rates), etc.

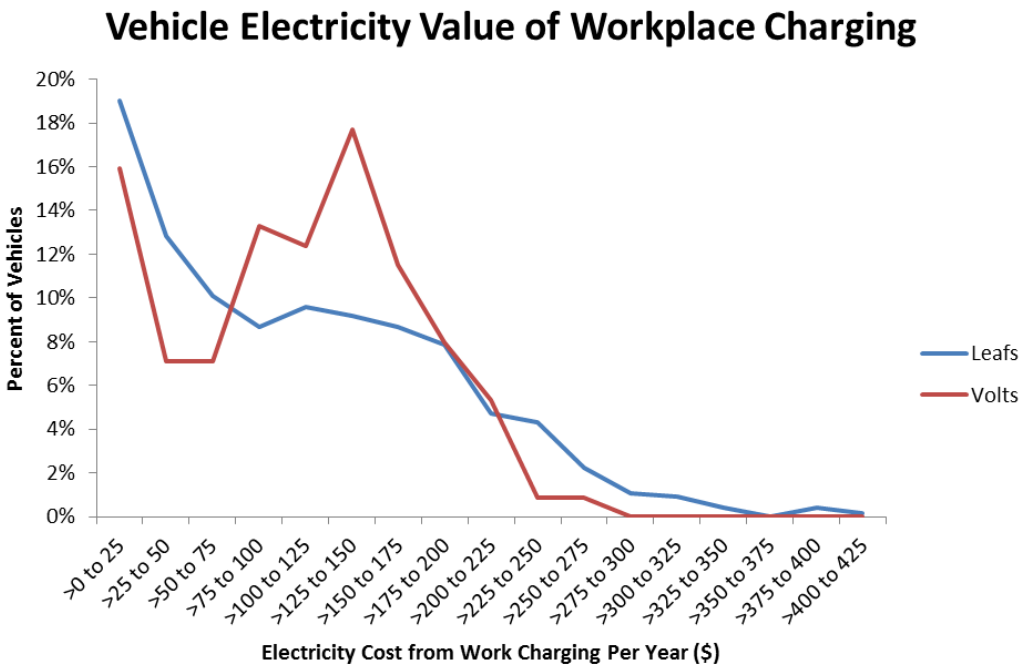


+ Median site usage frequency

Data from 9/1/2012 to 1/1/2014; includes all sites meeting minimum usage threshold

Workplace charging

- Energy per day – is AC Level 1 charging sufficient?
- Energy per year – IRS “de minimus” classification



	< $300 per year	< $250 per year
Percent of Volts	100%	99%
Percent of Leafs	98%	95%

Using the June 2015 national average commercial electricity rate of $0.11/kWh from EIA Electric Power Monthly

EV Everywhere "critical path" questions

1. What is the actual cost of operating BEV, PHEV - fuel, brakes, oil, tires etc. based on actual maintenance records?
2. What are the number of battery issues - battery failure, reduced charging time that have affected the performance of PEVs?
3. What is the actual energy efficiency and battery range of PEVs in varying weather conditions?
4. What is the impact of electric utility time of use rates? Are they necessary? Number of EV buyers that base decision on rates. What is the rate level that creates the need for time of use rates?
5. What is the Carbon reduction savings based on electric miles travelled? What is the carbon reduction based on the time of charge and the carbon emission signature at the time of charge? For example regional carbon emission average – Workplace AM, Night time 9 to 6AM
6. Average sales and sales tax revenue increase when charge systems have been placed at retail locations? How much of a difference does public-access charging at short-dwell and long-dwell locations make as far as increased sales, change in consumer perception and other benefits to the site host?
7. What do larger batteries mean for away-from-home charging stations (workplace, retail, destination centers) given a complex market of PHEVs, EREVs, short- and long-range EVs?
8. What are "typical" PEV drive cycles? How do they differ by driver? By PEV model? Versus ICE vehicle drivers of comparable models.
9. What is the total kWh consumed by PEV to date nationally, state, regionally, locally by zip code?
10. Based on kWh consumed data, what is the carbon reduction quantity by zip code, region, state and nation?

What else?