UC Davis STEPS Workshop:
PEV Infrastructure

GENERAL MOTORS

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MANY FLAVORS OF PEV TODAY…   AND MORE TOMORROW

Chevy Volt

- 53 mile EV range

- No compromise, no range limitations

- Charging: home (L1 and L2), workplace

Chevy Spark

- 82 mile range

- Theoretically meets most needs…but people want more
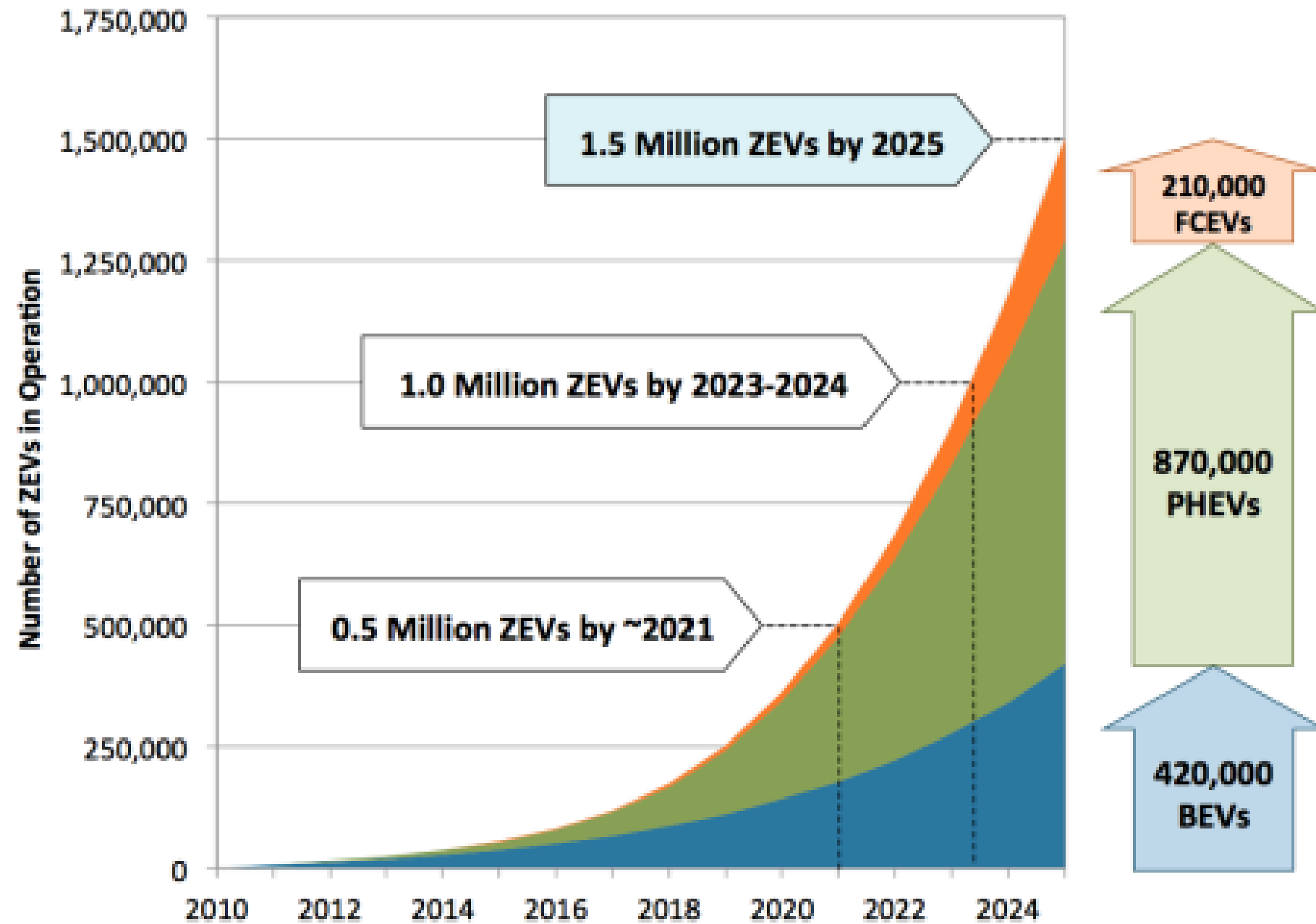
- Charging: home, workplace, DCFC

Chevy Bolt EV

- 200+ mile range

- First mass-market long range BEV

- Charging: home, workplace, DCFC

WHAT MIGHT 1.5 MILLION ZEVs LOOK LIKE?
ONE SCENARIO...NOTE THE STEEP RAMP UP!
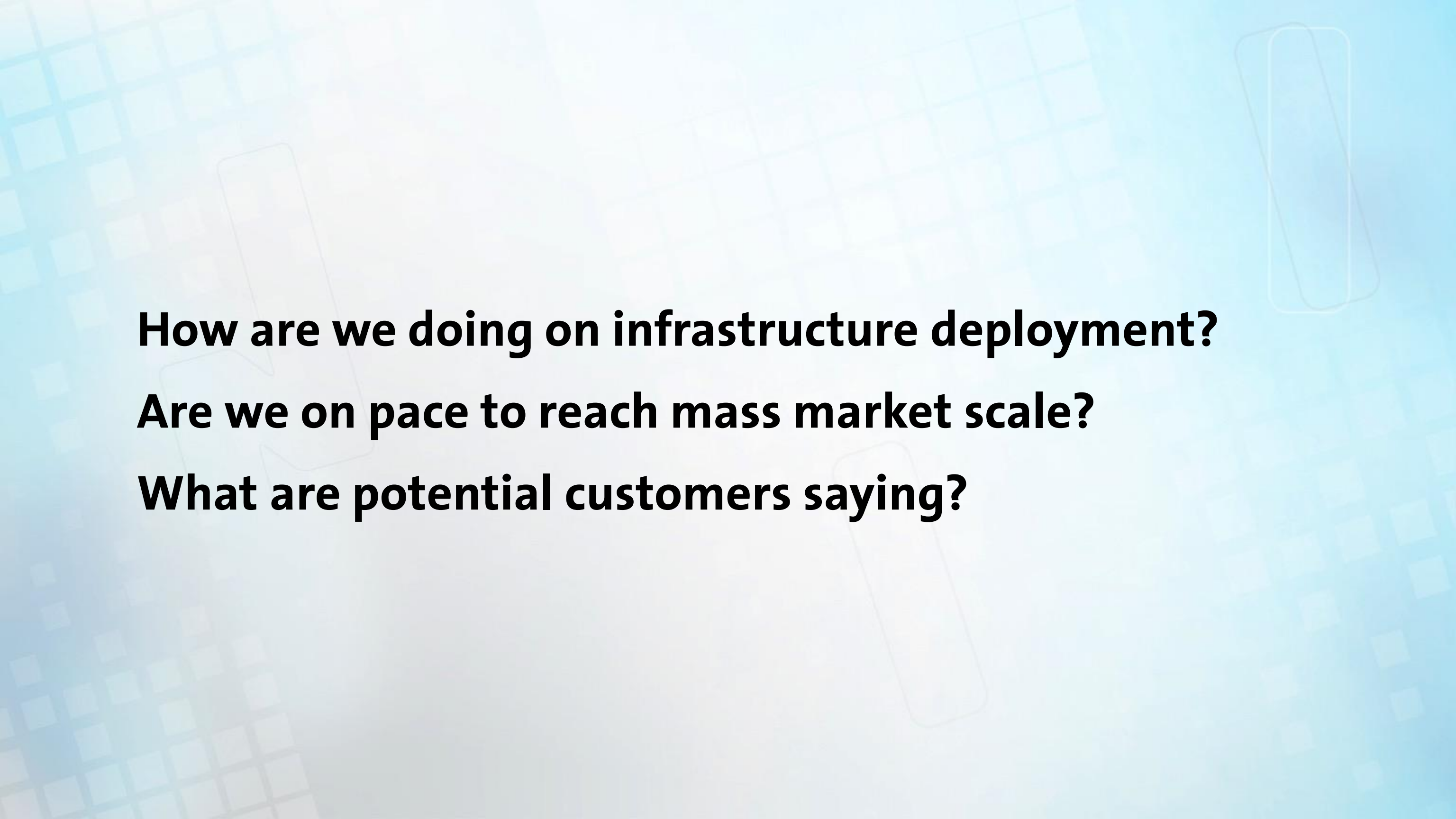

Source: NREL analysis

CHARGING NEEDS – TODAY AND TOMORROW

TODAY

- **Home: majority – almost a prerequisite**
  - Both L1 and L2
  - Really only single family homes

- **Workplace: 2nd most important**
  - Limited availability
  - Builds awareness/sales, increases eVMT

- **Public: least used, but still needed**
  - DCFC especially important
 - Increases range, comfort

TOMORROW???

- *Home: Still majority*
  - *Both L1 and L2*
  - *Solving MUD problem*

- *Workplace: Still valued highly*
  - *Ubiquitous and easy*
  - *Extend eVMT for EREV/PHEV*

- *Public: Most learning to occur!*
  - *Synergies with above (e.g. DCFC, on-street)*
  - *New usage patterns emerge*

How are we doing on infrastructure deployment?

Are we on pace to reach mass market scale?

What are potential customers saying?

PEV REGISTRATIONS PER NON-RESIDENTIAL OUTLET

(Chargers Source: DOE AFDC / Vehicles Source: R. L. Polk)
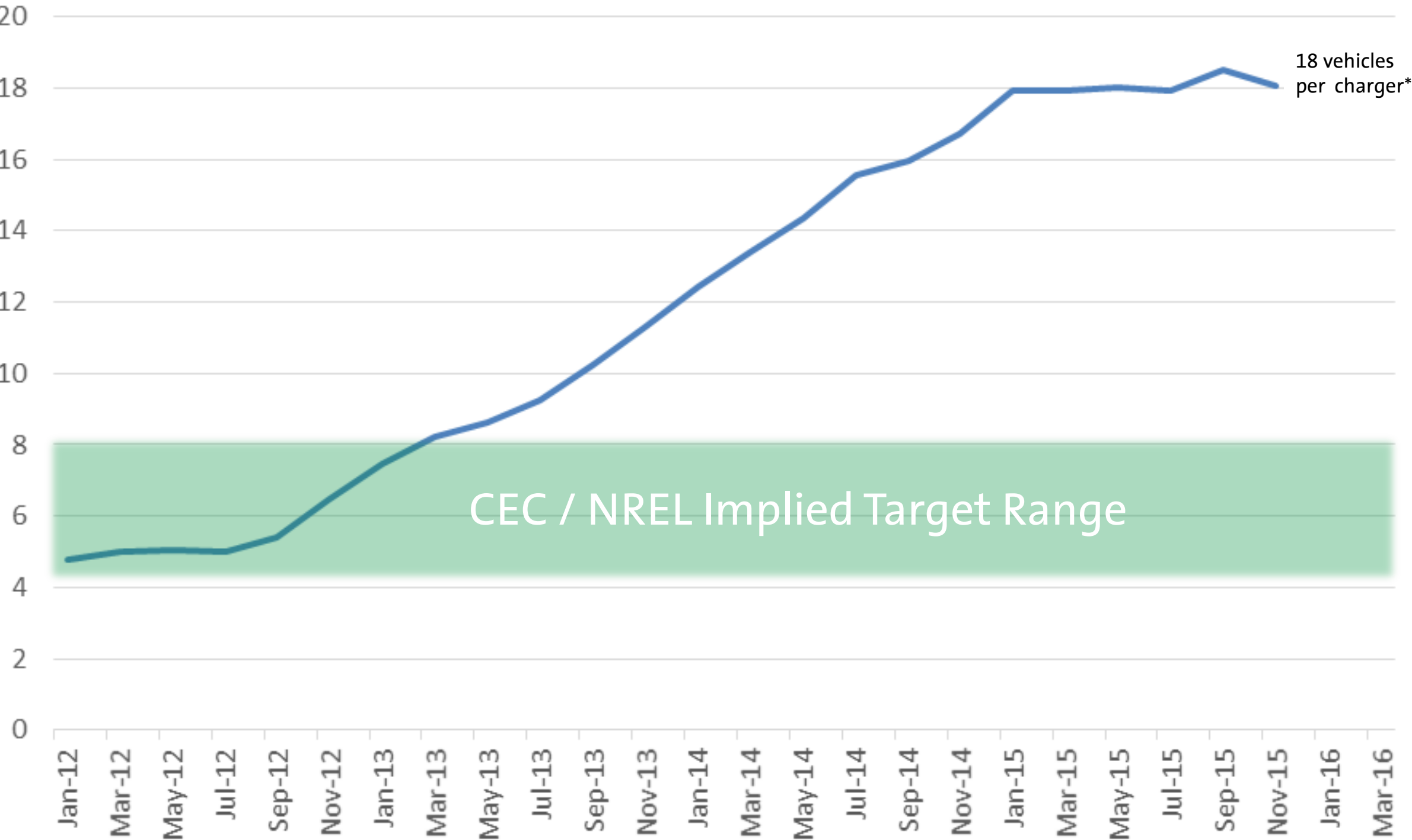
18 vehicles per charger*

CEC / NREL Implied Target Range

* It is generally acknowledged that AFDC does not account for the full extent of nonresidential charging stations; however, to date, there is no publicly-available assessment of these differences.

NON-RESIDENTIAL CHARGING OUTLETS IN CA

(Source: DOE Alternative Fuels Data Center / NREL implied ratios from home-dominant and work-dominant scenarios in 2020)

Illustrative Target (NREL infrastructure Assessment for CEC)

Estimated actual*

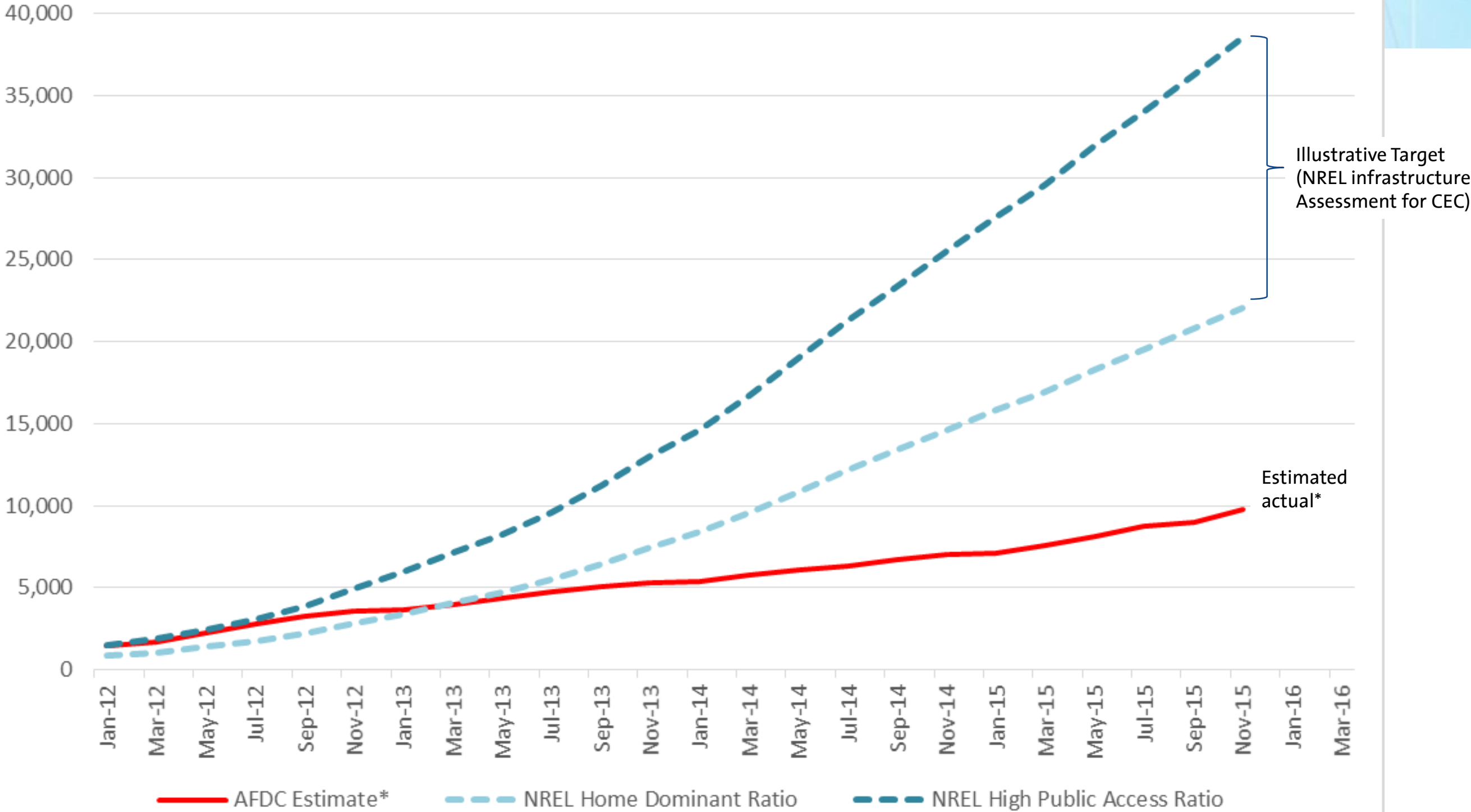Legend: — AFDC Estimate*   - - - NREL Home Dominant Ratio   - - - NREL High Public Access Ratio

* It is generally acknowledged that AFDC does not account for the full extent of nonresidential charging stations; however, to date, there is no publicly-available assessment of these differences.

CONVENIENCE AND PERCEPTIONS MATTER

The Telegraph

London's electric car infrastructure falling into ruin

Infighting and neglect are causing London's prized network of electric car charging points to fall into disrepair, with some areas now offering little to no coverage

'Charge rage': Too many electric cars, not enough workplace chargers

By Dana Hull | dhull@mercurynews.com

The New York Times | http://nyti.ms/1NxWfNI

SCIENCE

In California, Electric Cars Outpace Plugs, and Sparks Fly
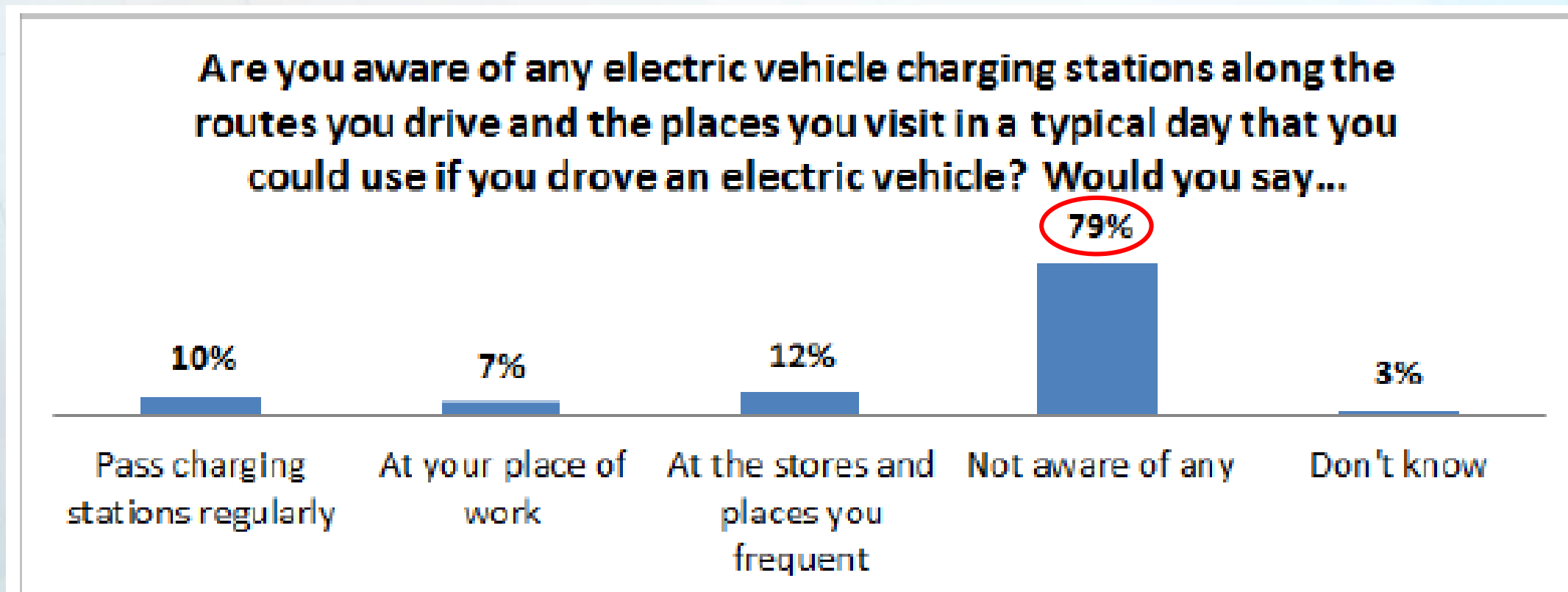
By MATT RICHTEL   OCT. 10, 2015

Observations

- Charging shortages, whether real or perceived, hinder PEV adoption
- Stories of broken chargers can damage perception of reliability
- **Charging needs to be widespread, easy, and reliable**

What does mass market scale look like?

How do we get there?

Are you aware of any electric vehicle charging stations along the routes you drive and the places you visit in a typical day that you could use if you drove an electric vehicle? Would you say...

Pass charging stations regularly	At your place of work	At the stores and places you frequent	Not aware of any	Don't know
10%	7%	12%	79%	3%

NREL – Consumer Views on Plug In Electric Vehicles – National Benchmark Report

TO BUILD AN EFFECTIVE, USEFUL SYSTEM, MORE IS NEEDED

- **Home Charging**
  - This is where most charging is done; need to make it easier for all

- **Workplace Charging**
  - Drives EV adoption; a highly-valued enabler; has potential to increase eVMT

- **Public Charging** (especially DC fast-charging)
  - Provides an insurance policy; raises awareness, can enable longer range travel

- **Outreach and Education**
  - Most people are not paying attention

TO GET TO SCALE, NEED UTILITIES AS PARTNERS

Near Term

- Establish sustainable, scalable infrastructure deployment models
- Conduct EV-related outreach and education
- LCFS is a real value that needs to get to PEV drivers

Longer Term

- Continue to support scale up of grid-integrated infrastructure
- Investigate more advanced vehicle-grid integration

Need utility engagement if we want to meet goals

SOME OPEN QUESTIONS ABOUT SCALING UP INFRASTRUCTURE

- **Consumers:** How will the <u>next wave of consumers</u> differ from today's early adopters? Will any of today's infrastructure concerns (real or perceived) be magnified as we scale up and reach more mainstream consumers?

- **Utilities and EVSPs:** What does a <u>sustainable, scalable partnership</u> for infrastructure deployment and vehicle-grid integration look like? Do we have enough real-world experience and data to know what the best model is?

- **Site Hosts:** Will the <u>next wave of landlords</u> want to be in the business of owning and maintaining charging infrastructure? Could a low-cost turnkey solution make it easier for some potential site hosts to say "yes" to charging?