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Transportation Electrification: The PEV Market, Environmental Impact, and Future Technology

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California Energy Commission

POU / IRP Workshop

Sacramento, California

October 05, 2016

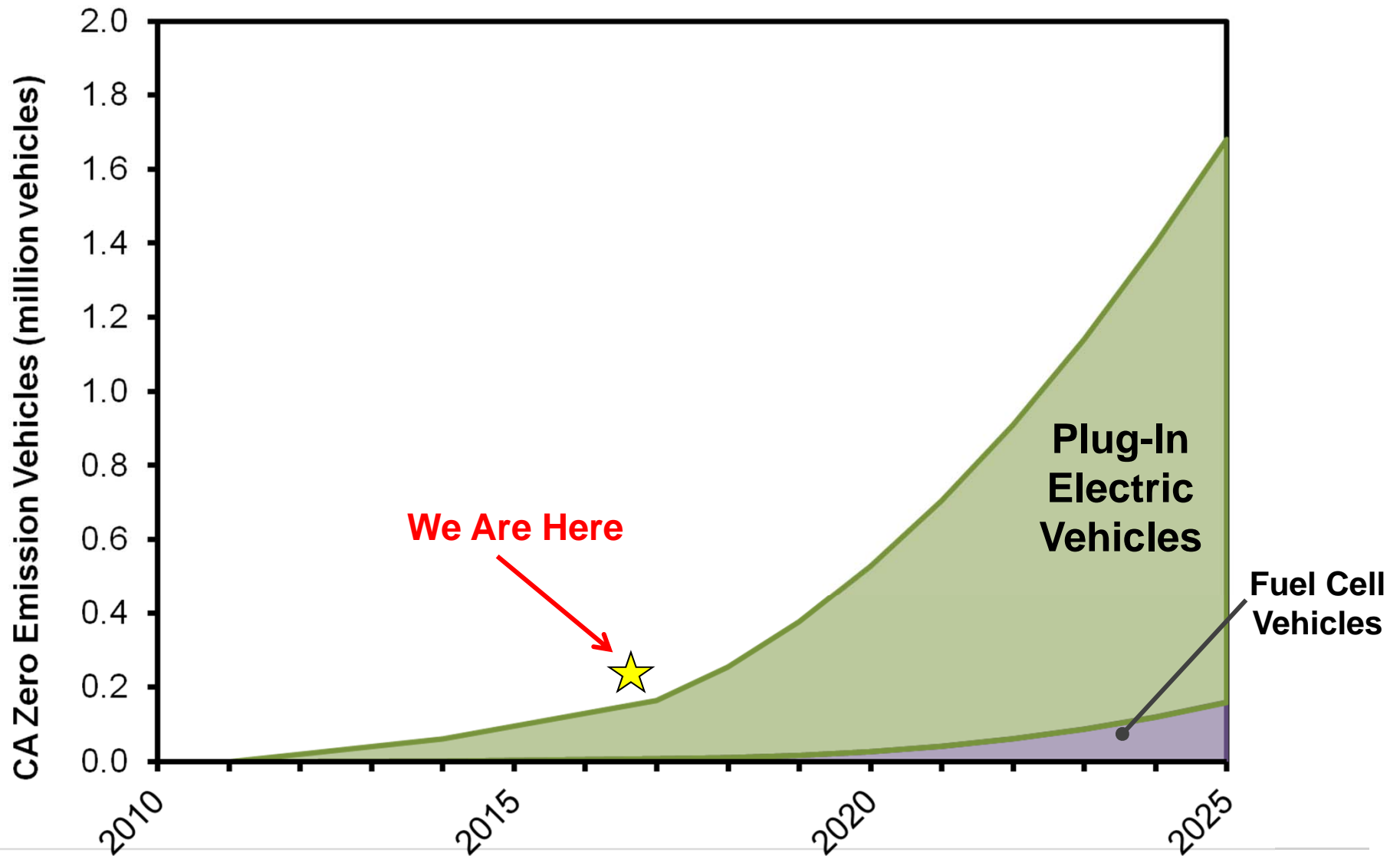


What is Electric Transportation?

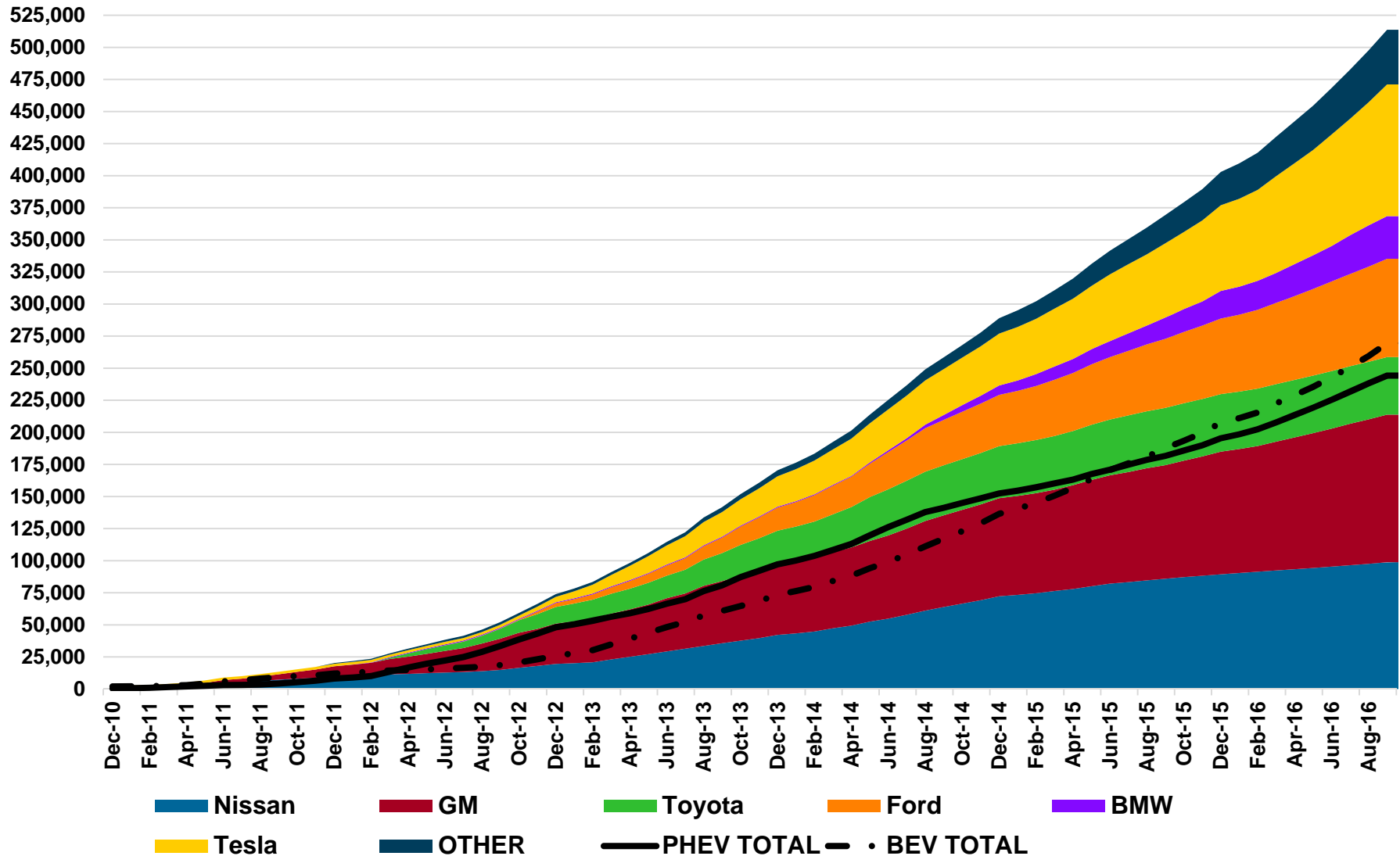
- Car
- Truck
- Bus
- Marine
- Airport
- Forklift
- Marine
- Motorcycle
- Scooter



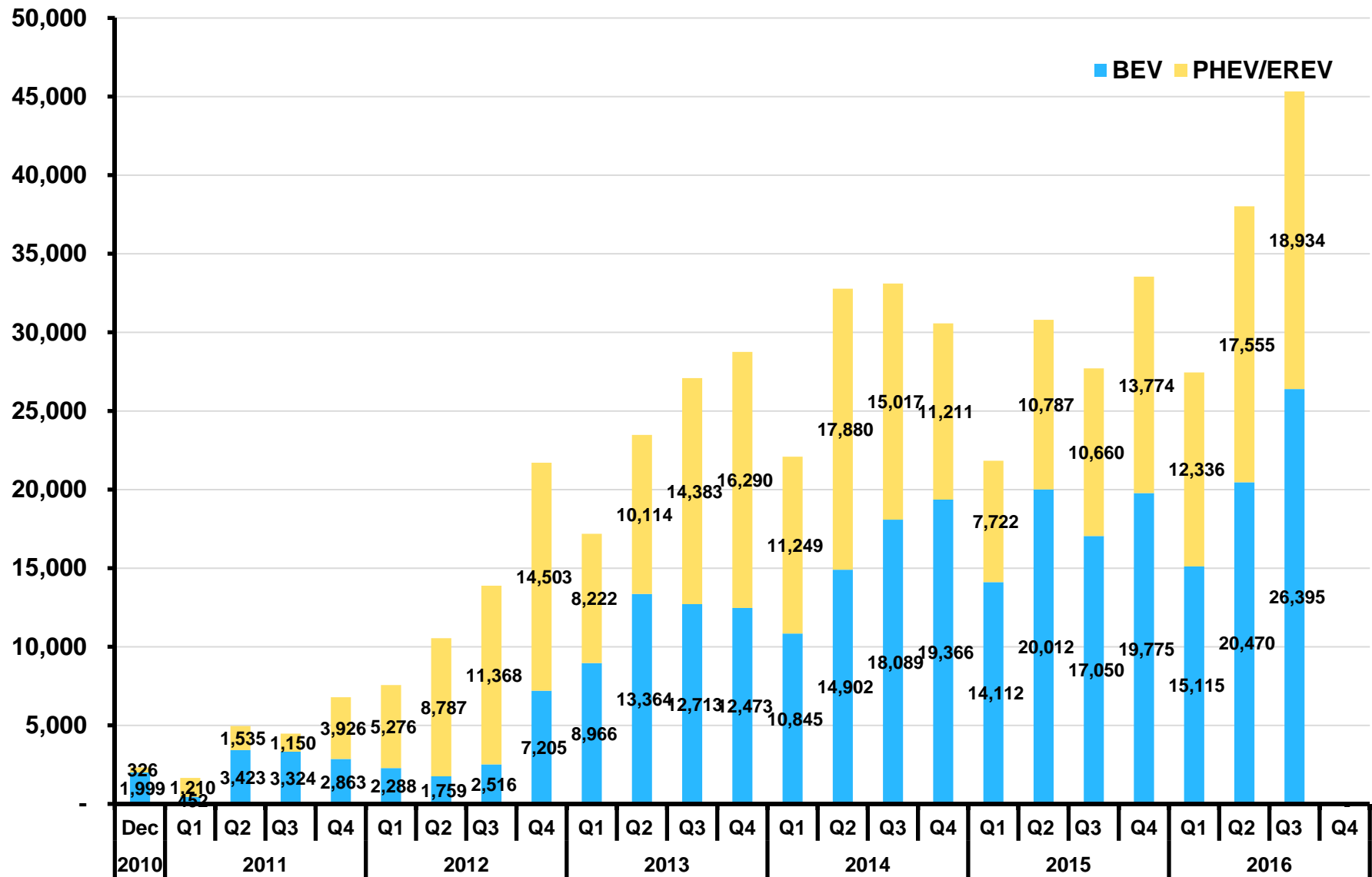
Regulatory Push – California has mandated 1.5M ZEVs by 2025 (3.3M including seven other states)



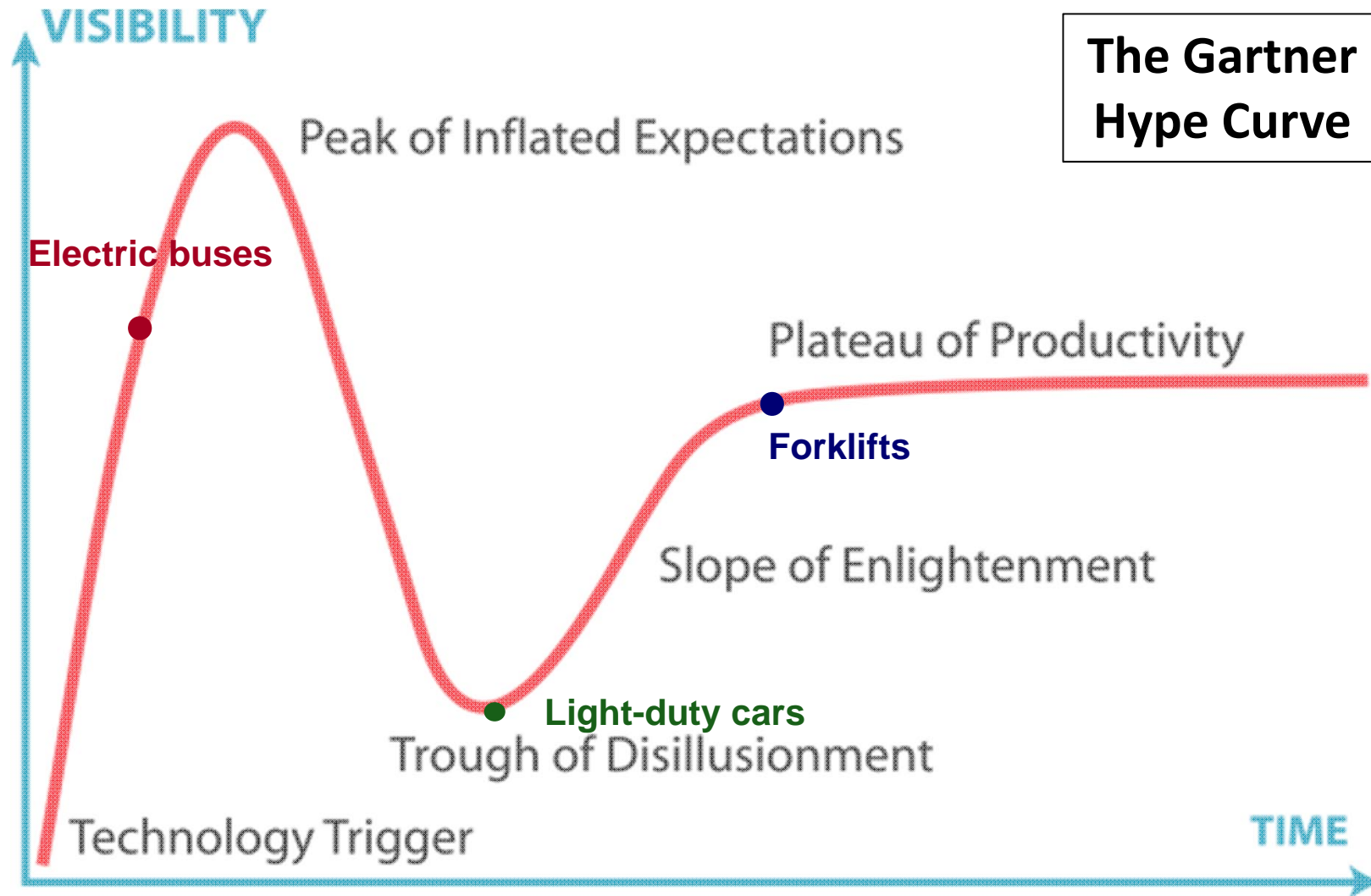
Cumulative US PEV Sales to Date > 513,000



PEV Sales 2016 YTD Up 34% Over 2015



Moving beyond the hype cycle...

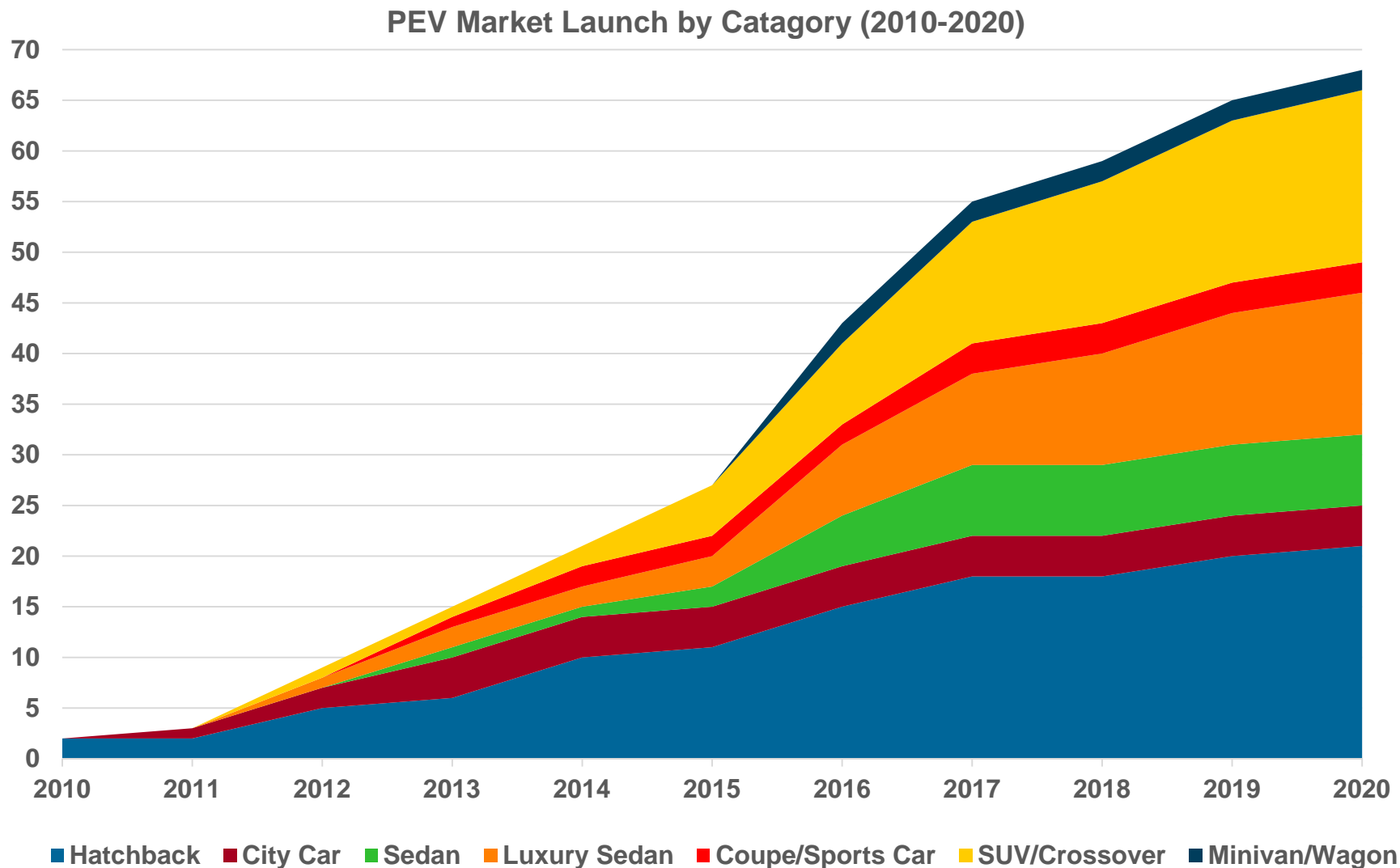


Focus on the real opportunity for electric transportation in the next 5 to 10 years

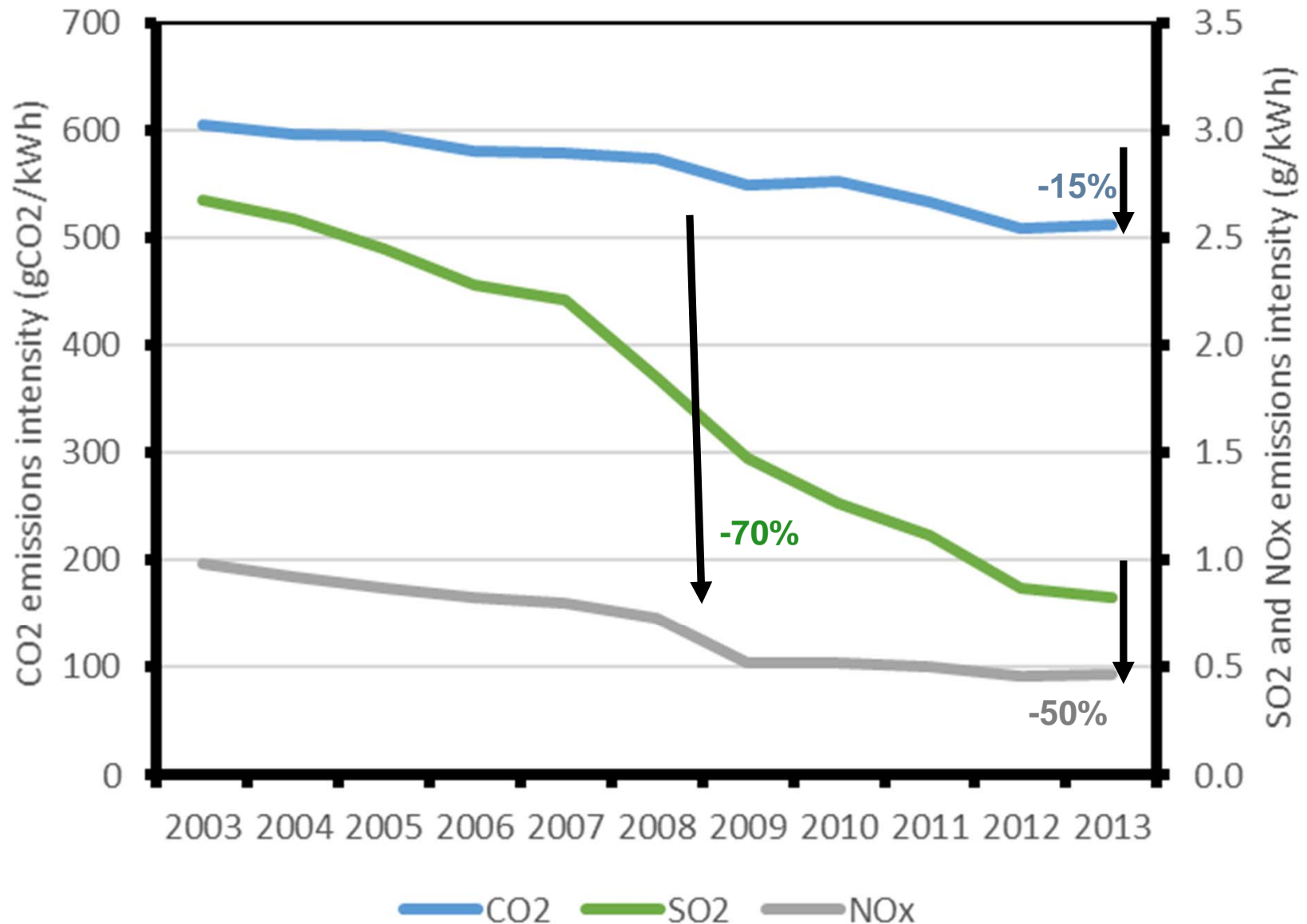
Customer choice is increasing ~41 new PEVs coming in 2016-2020



Customer choice increasing with 41 PEVs announced to hit market from 2016 – 2020

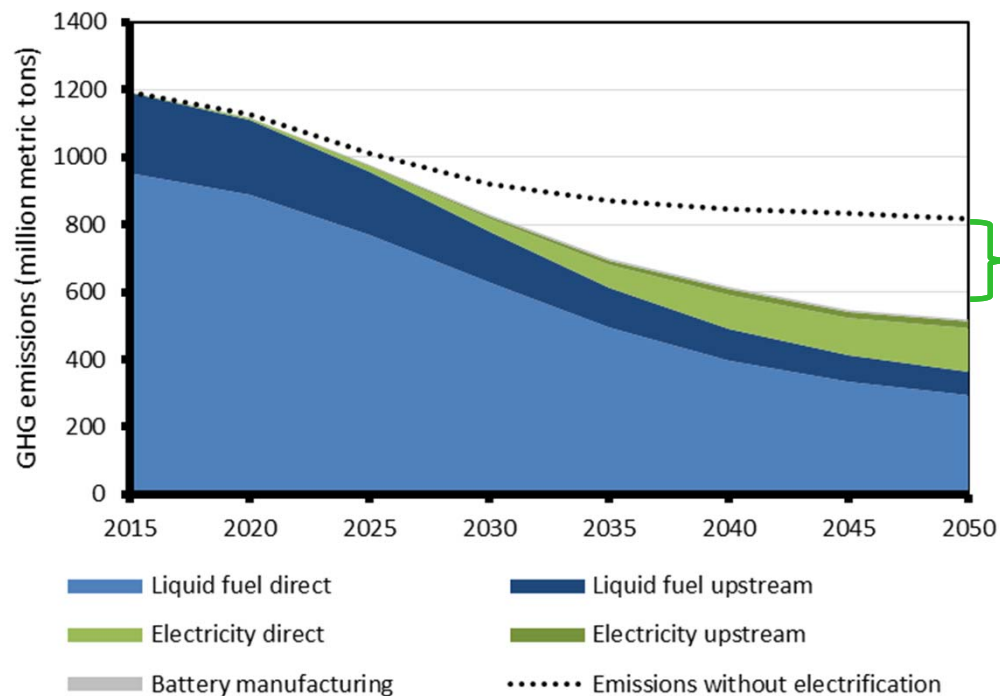


The electric grid is clean and getting cleaner – 15, 70, 50

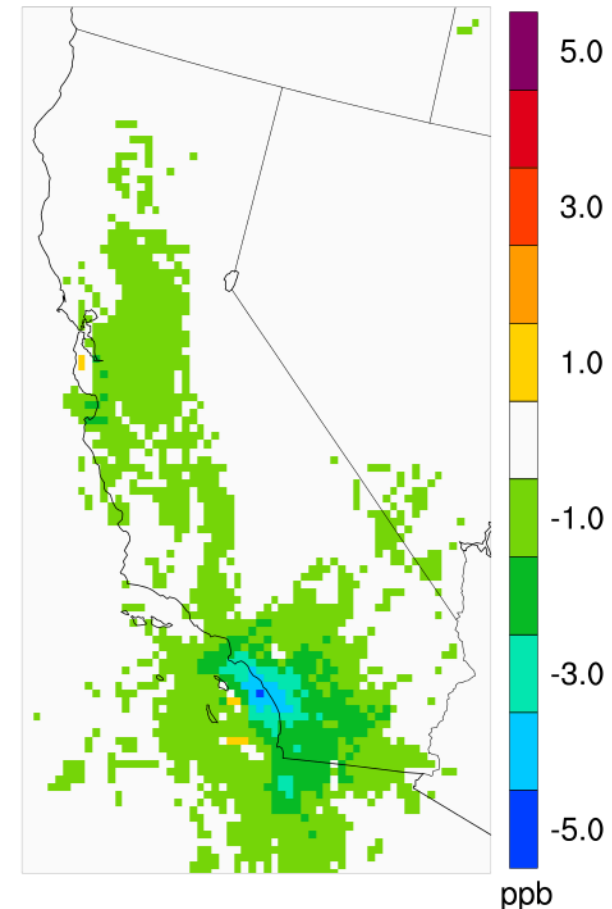


Electricity is also a clean transportation fuel

Reduction in GHG due to electrifying transportation through 2050

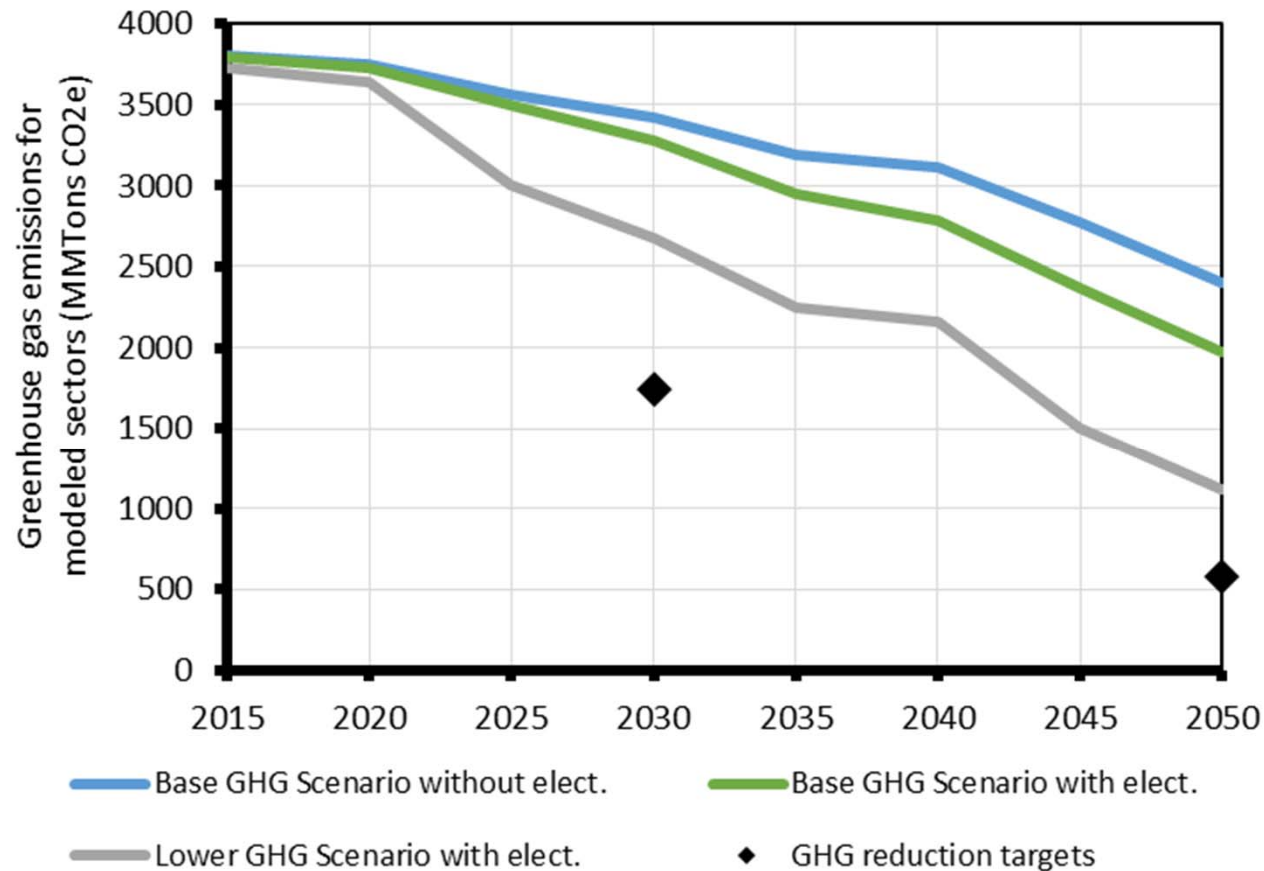


Improvements to air quality (human health) due to electrifying transportation through 2030



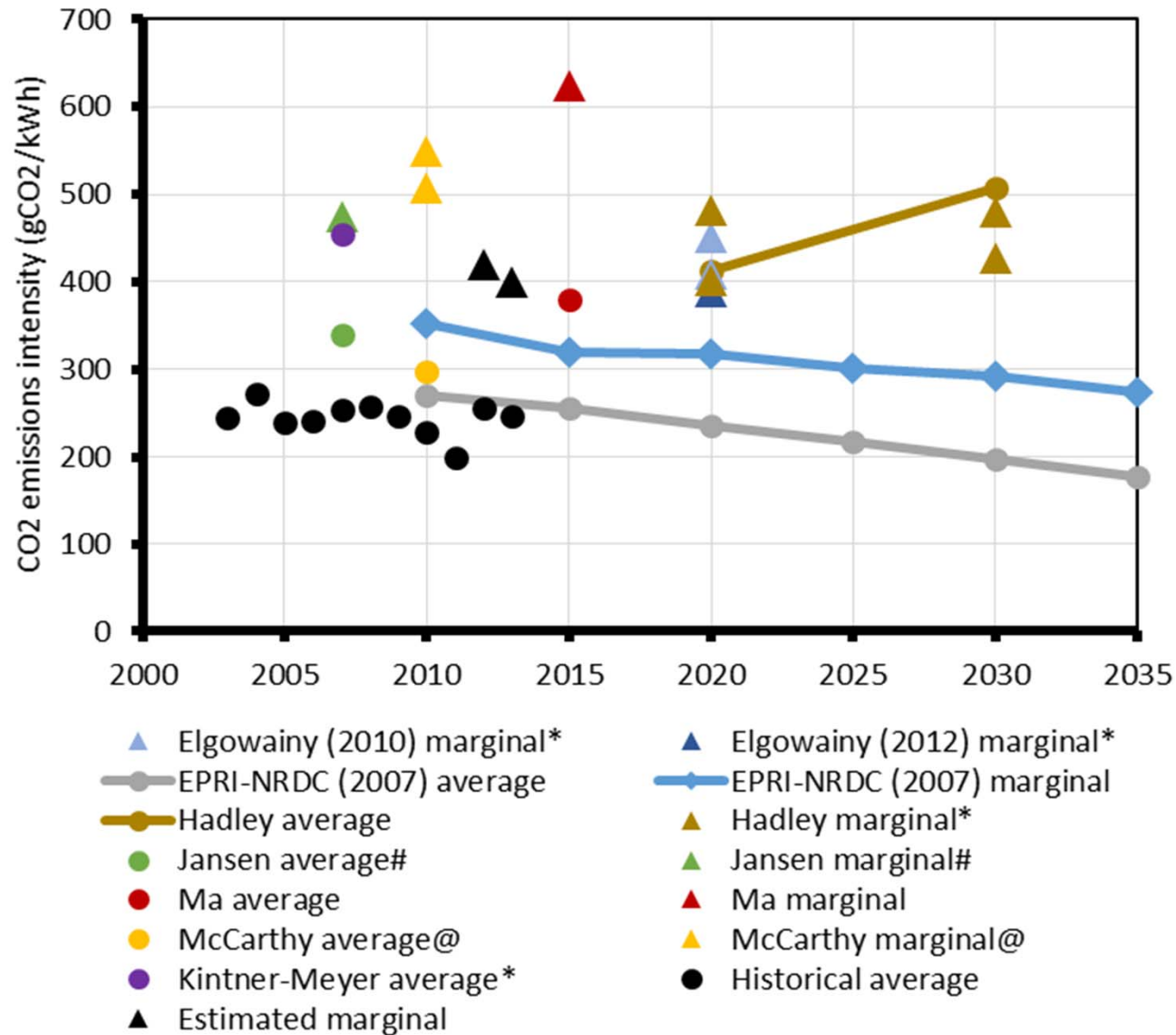
Min(33,24) = -4.74, Max(31,18) = 1.17

Transportation Electrification reduces California's greenhouse gas emissions but needs to move faster



- In our more aggressive scenario the electricity sector and transportation sector can approach California's targets, but there is still a significant gap

But what about those headlines that claim electric vehicles are bad for the environment?



Customer education - Charging is sometimes like getting gas, but more often like charging your phone or laptop



Public

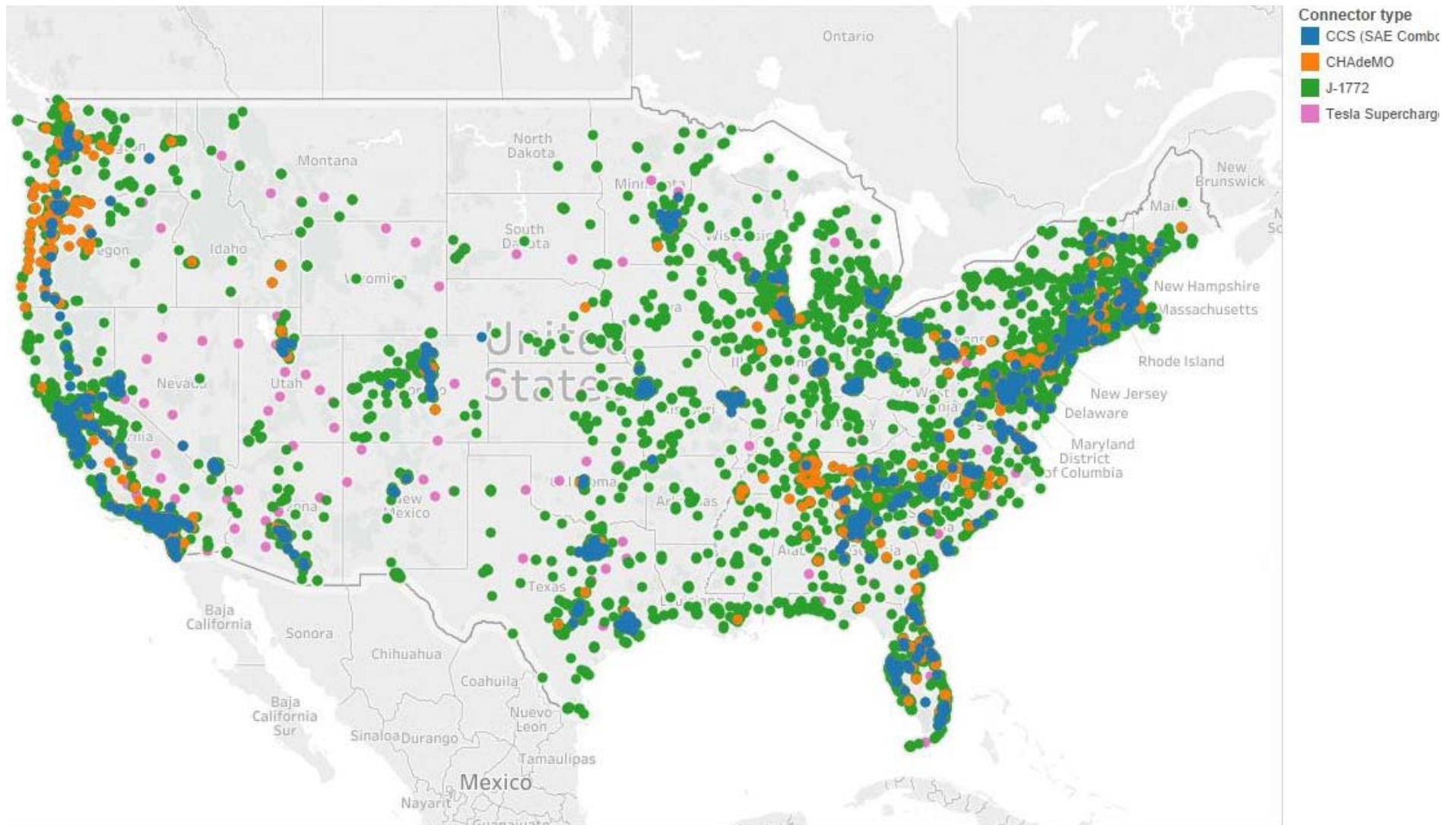


Workplace
or Retail

Residential

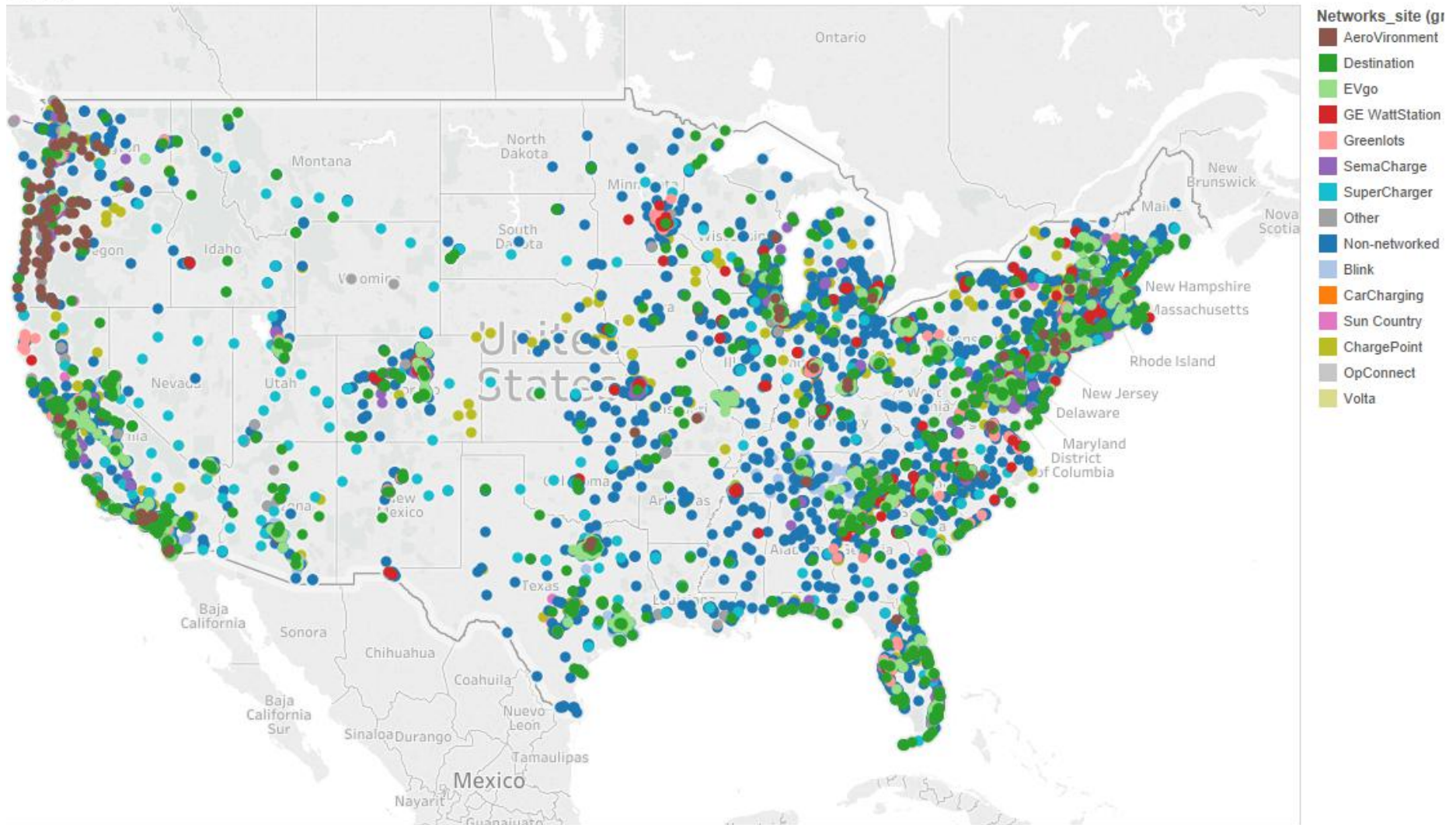


PEV charging infrastructure is increasing

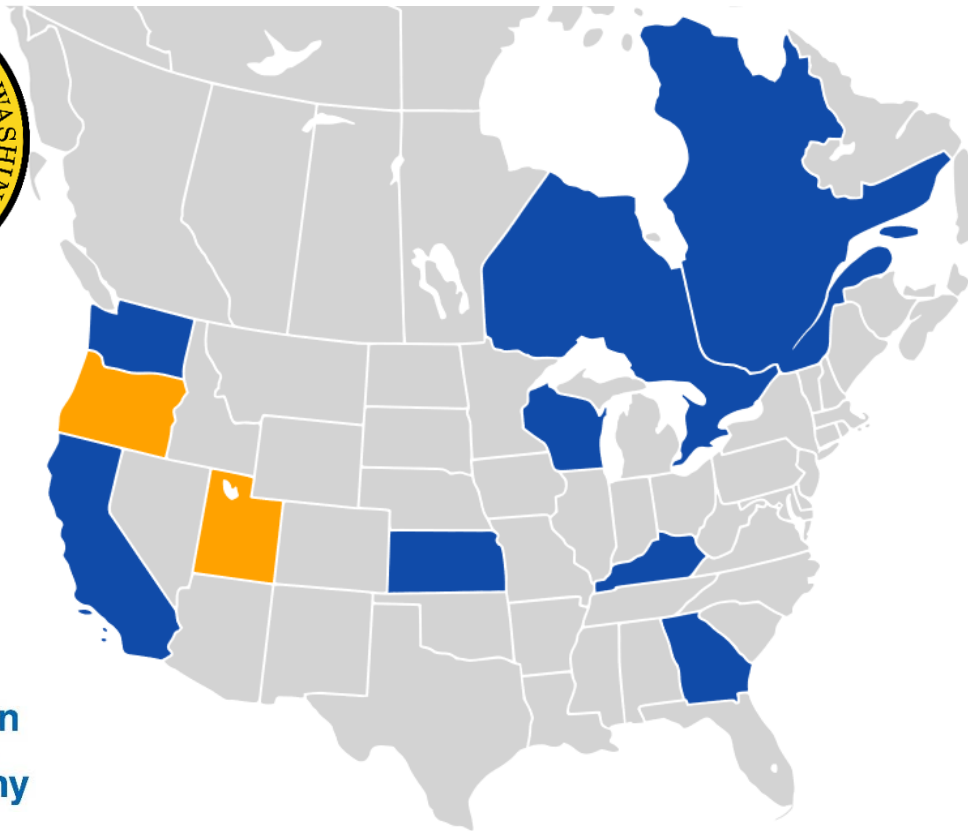


n Longitude and Latitude. Color shows details about Connector type. Details are shown for # locations. The data is filtered on Country, which keeps US. The view is filtered on pe, which keeps CCS (SAE Combo), CHAdeMO, J-1772 and Tesla Supercharger.

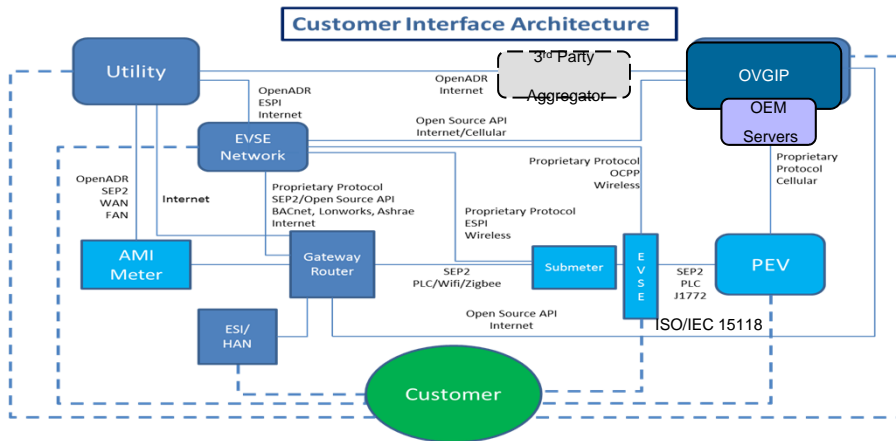
But most public charging networks remain fragmented



Map shows the distribution of public charging networks across the United States. The data is filtered on Connector type, Network and Country. The connector type filter keeps CCS (SAE Combo), CHAdeMO, J-1772 and Tesla Supercharger. The Network filter keeps 20 of 20 members. The Country filter keeps US.

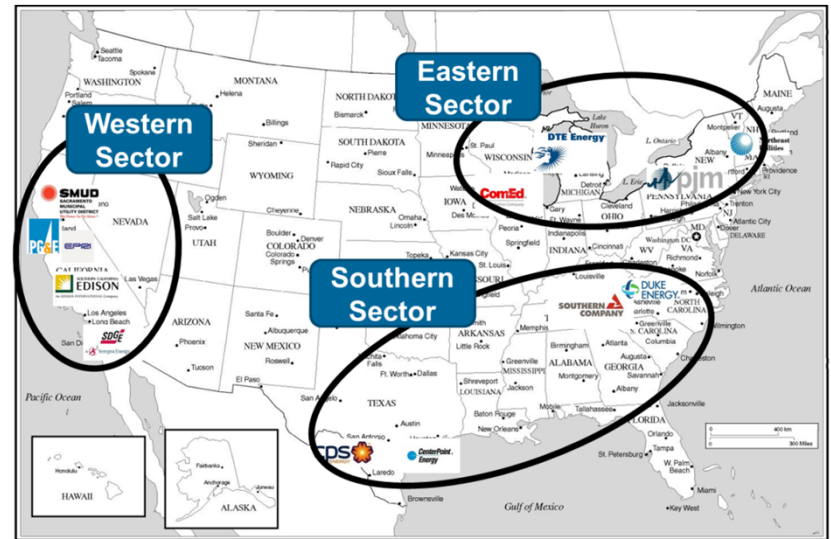
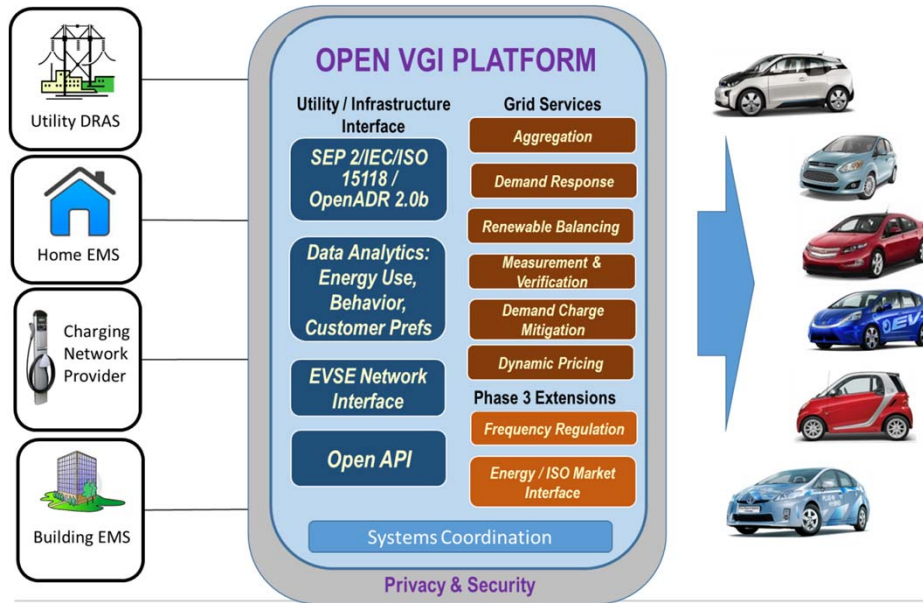


To help the PEV market scale, need to make the complex both simple and easy for the customer



Interface to Customer can be Smart Phone APP, Website, In-Home Display, EVSE Display, or In-Vehicle Display

OAGIP Intends to Resolve Business and Operational Rules with Multiple Stakeholders



What's next?

Now and in the future

- Autonomous driving
 - Tesla, Apple, Google
- High power charging
 - Current 50 kW; future 150 kW; goal 350 kW
- Long-distance (~200 mile) mass-market battery electric vehicles
 - Chevy Bolt
 - Tesla Model 3
 - Gen 2 Nissan LEAF
- Ownership Models / Transportation On-Demand
 - Car share / Lyft / Uber





Together...Shaping the Future of Electricity