

Navigating Demand Charges

Current Options and Future Opportunities

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Technical Executive

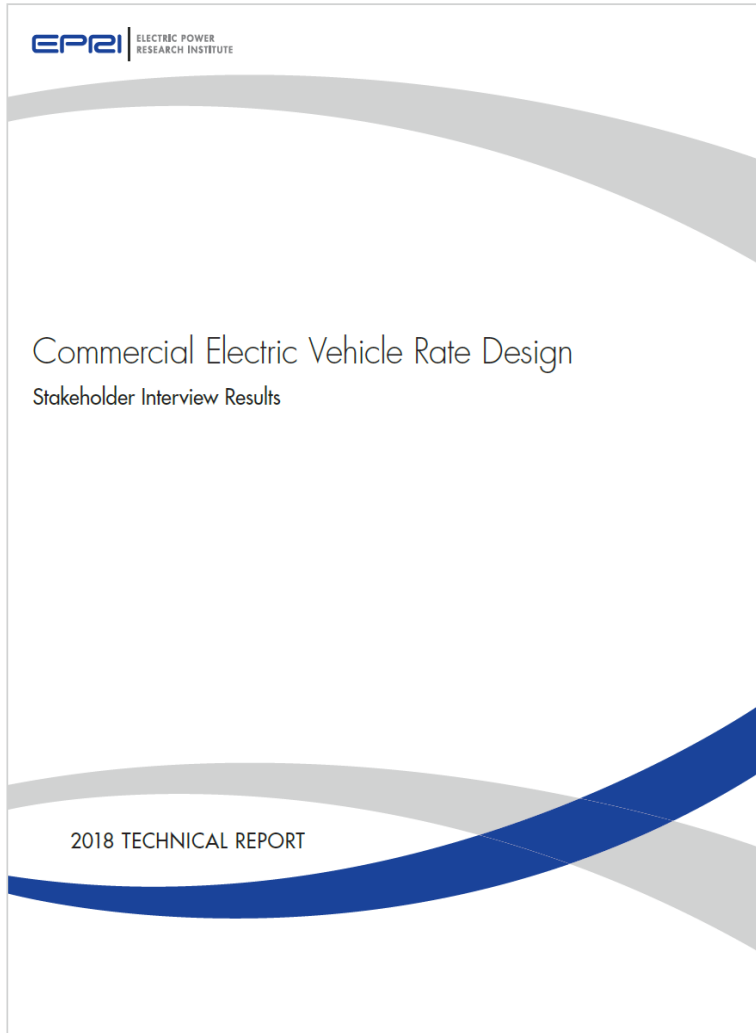
Connecticut EV Roadmap Technical Meeting
February 8, 2019



Agenda

- Discussion of EPRI's Survey-Based Research
- Discussion of EEI's Description of Options
- Discussion of EPRI's Analysis of PlugShare Data
- Technology Developments on the Horizon

EPRI's Has Performed Survey-Based Research on Commercial Electric Vehicle Rate Design



<https://www.epri.com/#/pages/product/3002014013/>

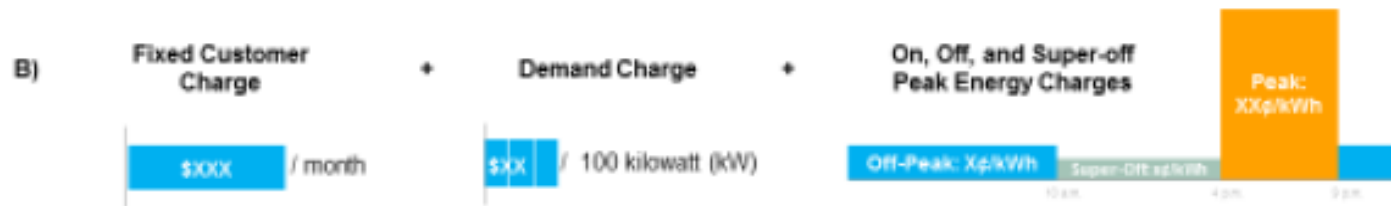
- Research formulated to answer the question ...
 “How important are different rate design options to commercial customers in their decision to electrify their fleets or install EV charging equipment?”
- Reached out to 35 stakeholders with 23 telephone interviews completed
- Grouped by:
 - Workplace/public charging (3)
 - Fleets and public transport agencies (9)
 - Vehicle and equipment manufacturers and software providers (8)
 - Environmental groups/NGOs (3)

Conceptual Rate Designs Shared with Survey Participants

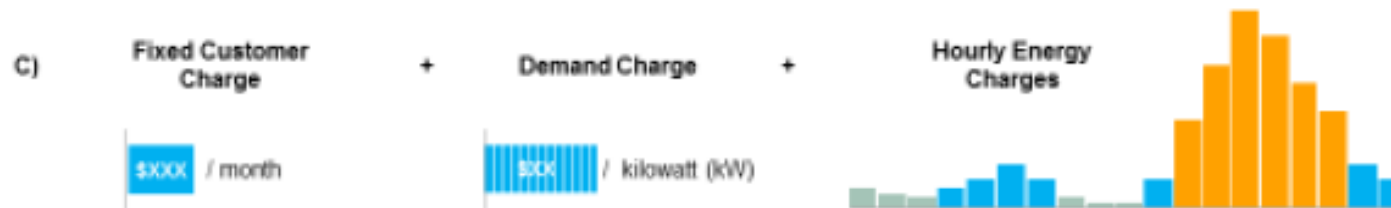
Two-part Tariff



Three-part Tariff

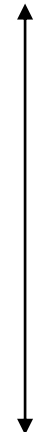


Three-part Tariff w/ Dynamic Energy Prices



Simpler, more consistent prices

Dynamic, more opportunity to save



Findings From the Study ...

- Rate design is an important topic to stakeholders
- Most stakeholders expressed strong concern about how demand charges may impact EV adoption
- Stakeholders were supportive of choice in commercial EV charging rate options
- Fleet operators and fast charging providers more consistently expressed concern with the ability to modify usage patterns to adapt to utility rate designs
- Most believe that the industry is early in the learning curve and that their ability to respond to more complex price signals would grow over time as more EVs are deployed, utilization rates grow, and load management software and charging infrastructure technology improves

This research reflects qualitative findings such that results can not be statistically extrapolated to the entire population, but may be indicative

Edison Electric Institute Recently Published a Report Describing a Range of Options to Increase the Deployment of DCFC Infrastructure

Increasing Electric Vehicle
Fast Charging Deployment

ELECTRICITY RATE DESIGN AND SITE
HOST OPTIONS

PREPARED FOR

Edison Electric Institute

PREPARED BY

Ryan Hledik

Jurgen Weiss

January 2019



THE **Brattle** GROUP

Rate Design Options

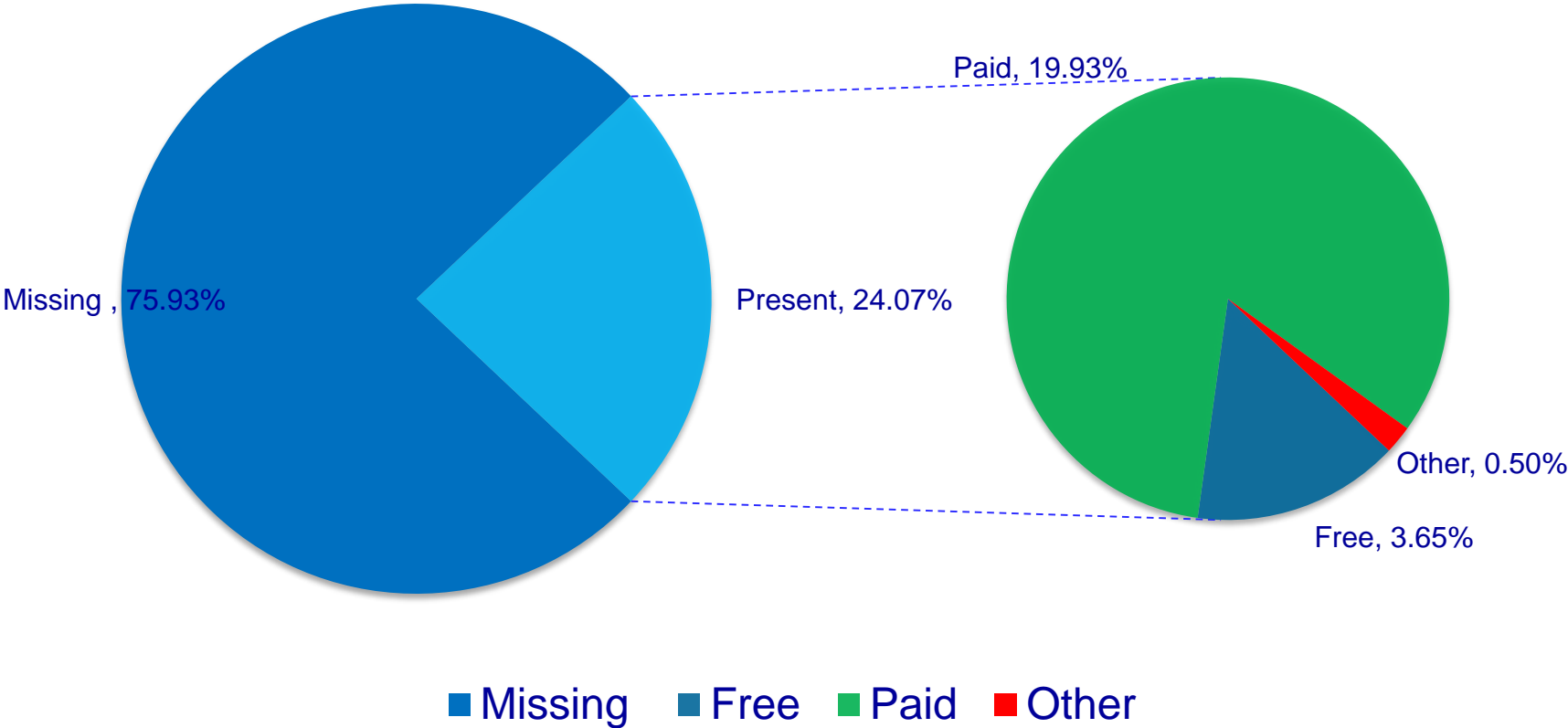
1. Create separate rate class for DCFC site host customer
2. Provide rate choices
3. Experiment
4. Place limits on demand-related charges
5. Temporarily reduce or replace demand charge with volumetric charge
6. Provide more detailed pricing signals

DC Site Host Customer Options

1. Install storage at DCFC station
2. Manage load to avoid demand-related charges
3. Develop stations for an existing user base
4. Site charging stations behind meter of large customer

EPRI's National Charging Costs – 2017 Analysis of PlugShare Data

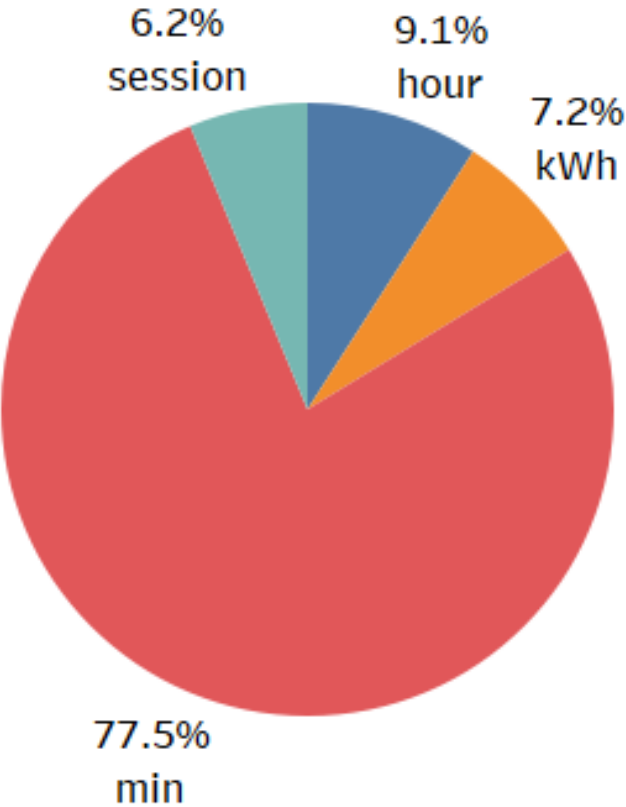
What percentage of connectors have payment information?



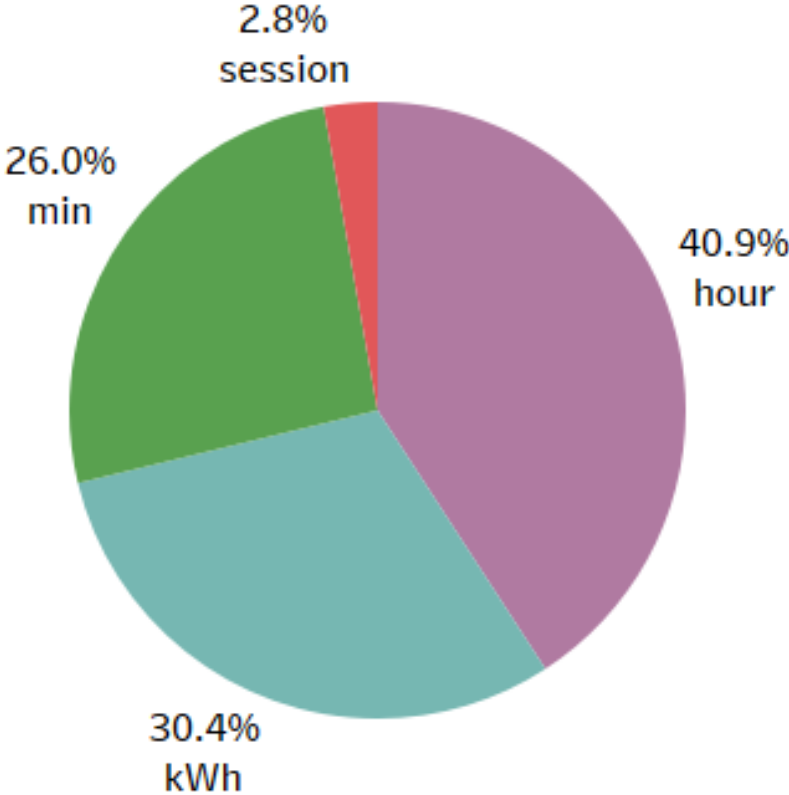
EPRI's National Charging Costs – 2017 Analysis of PlugShare Data

Billing Component

DCFC Units

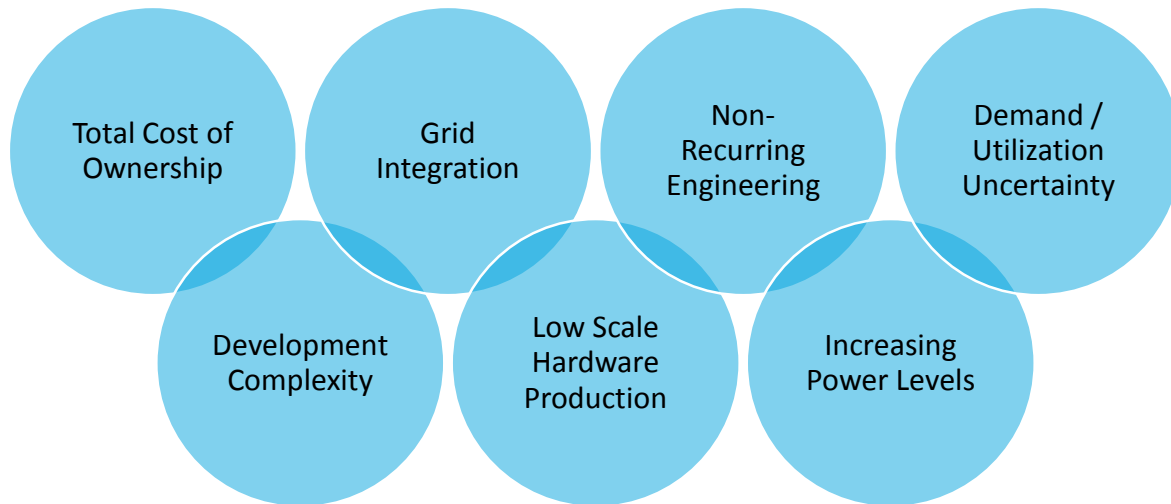


L2 Units



Opportunity for Development of Technological Solutions

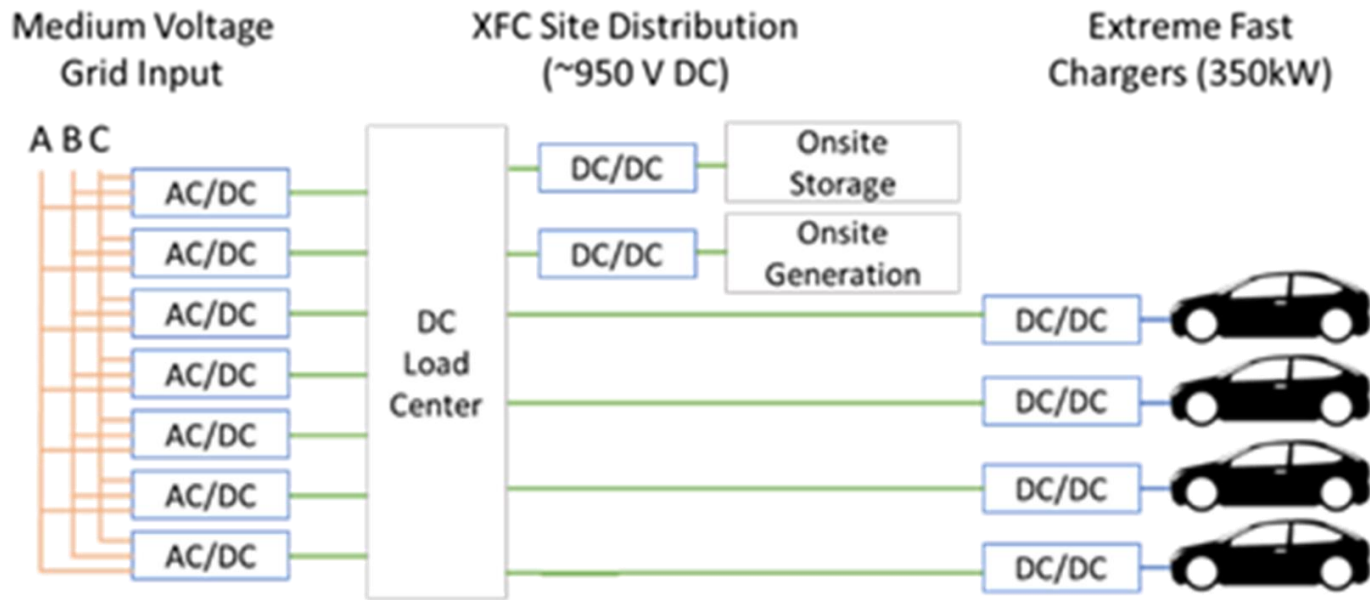
Potential Current State Pain Points For Site Hosts, Utilities, Service Providers and Hardware Vendors



A Solid State Architecture Can Potentially ...

- Reduce the Total Cost of Ownership (TCO) and enable innovative business models
- Improve efficiency and reduce losses
- Reduce footprint of equipment
- Be easier to transport for increased flexibility
- Improve ease of expansion
- Utilize swappable modules for redundancy
- Provide a single point of grid integration for distributed energy resources
- Provide new capabilities for grid integration (power factor correction, VAR compensation, Disturbance isolation, ...)

Solid State Architecture for DC Conversion Equipment Connected to the Medium-Voltage Grid for Extreme Fast Charging (XFC)



Project Description

The objective of the project is to develop and demonstrate medium voltage SiC-based AC-DC conversion equipment and the DC-to-DC head unit for use in extreme fast charging (XFC) equipment capable of simultaneously charging multiple light duty plug-in electric vehicles (PEV)s at rates of ≥ 350 kW and a combined power level of ≥ 1 MW while minimizing the impact on the grid and operational costs.

Team Member

Key Personnel

Electric Power Research Institute (EPRI)	Watson Collins
Eaton Corporation plc	Armen Baronian, NCSU (subcontractor to Eaton)
Tritium Pty Ltd	James Kennedy
National Renewable Energy Laboratory	Andrew Meintz
Argonne National Laboratory	Ted Bohn
Supporting Utilities	Duke, Southern California Edison, National Grid, Pacific Gas and Electric, Seattle City Light
Supporting Automakers	Hyundai America Technical Center Inc., FCA
Supporting States/Clean Cities Organizations	Clean Cities of Massachusetts

The DOE Selected Three XFC Projects For Funding

FY 2018 Vehicle Technologies Program-Wide Funding Opportunity Announcement Selections

DE-FOA-0001919

Applicant	Location (city, state)	Project Title/Description	Federal Share
Plug-In Electric Drive Vehicle Extreme Fast Charging Program (in support of EISA 131)			
Electric Power Research Institute, Inc.	Knoxville, TN	Modular, interoperable extreme fast charging system with direct connection to medium voltage grid	\$3,201,500
Missouri University of Science and Technology	Rolla, MO	Enabling Extreme Fast Charging with Energy Storage	\$2,915,377
North Carolina State University	Raleigh, NC	Intelligent, grid-friendly, modular extreme fast charging system with solid-state DC protection	\$2,675,952

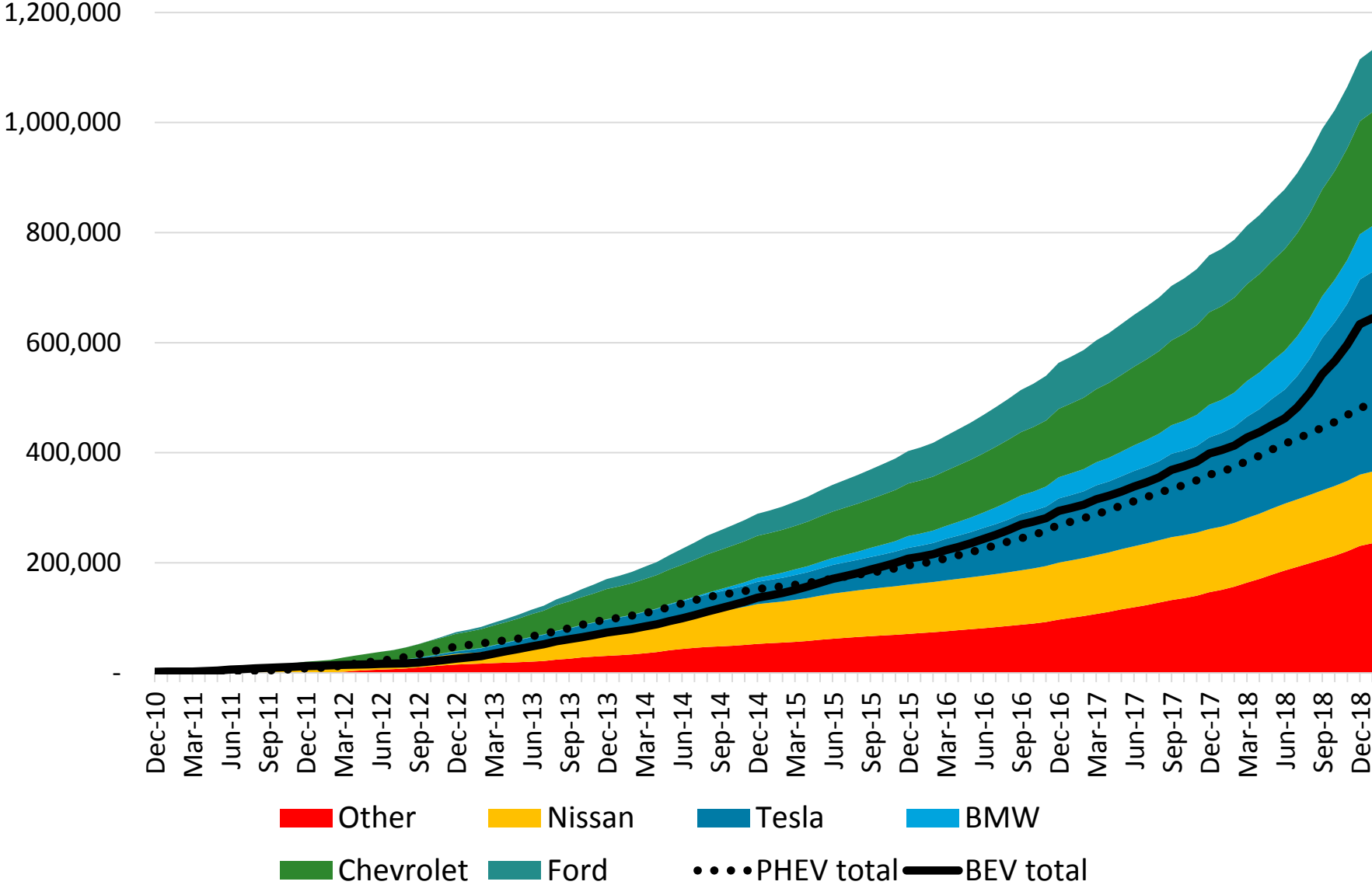
References

<https://www.energy.gov/articles/department-energy-announces-80-million-investment-advanced-vehicle-technologies-research>

https://www.energy.gov/sites/prod/files/2018/09/f55/FY18_DE-FOA-0001919_SelectionTable.pdf

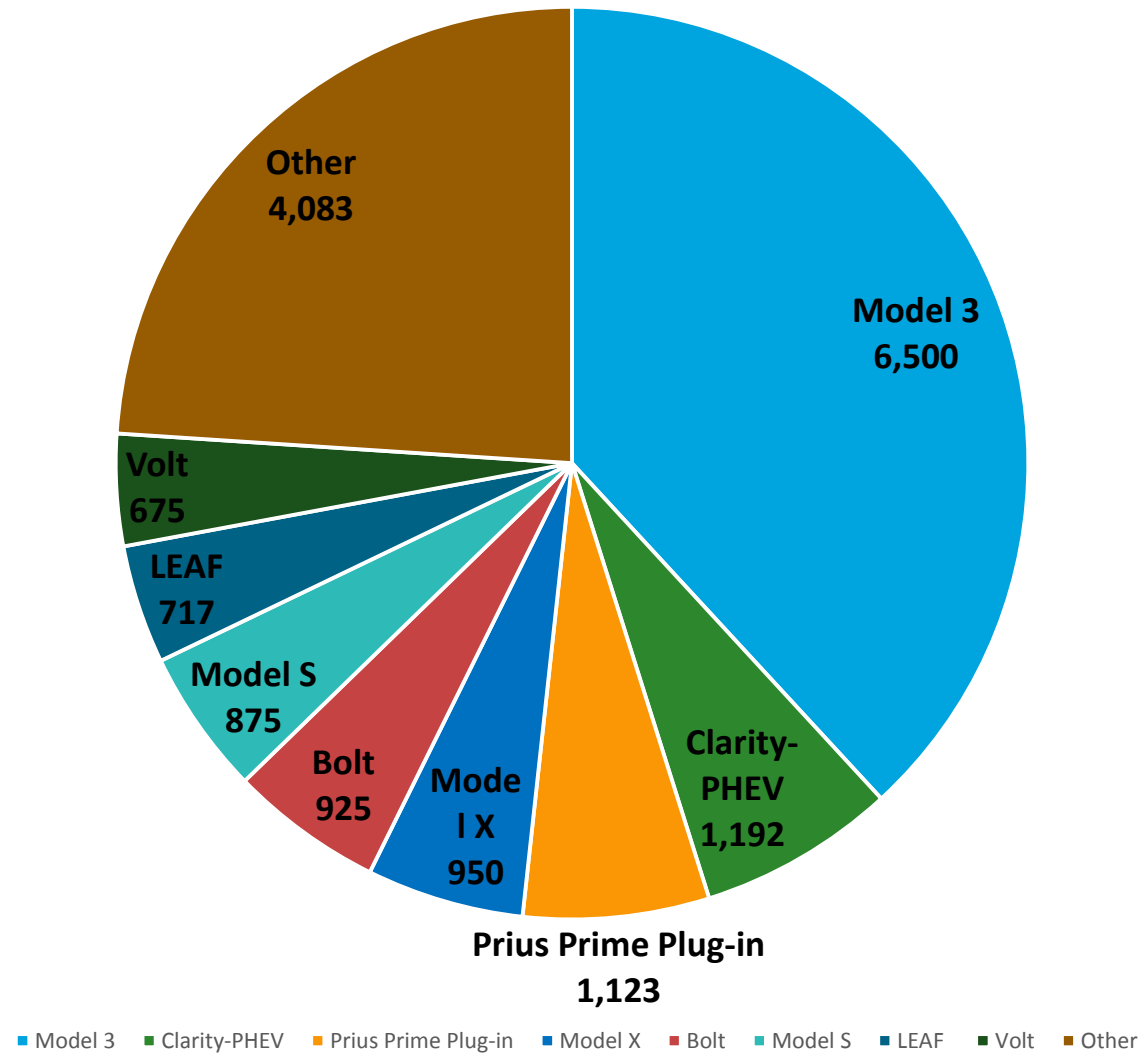
Together...Shaping the Future of Electricity

US PEV Sales to Date by Make



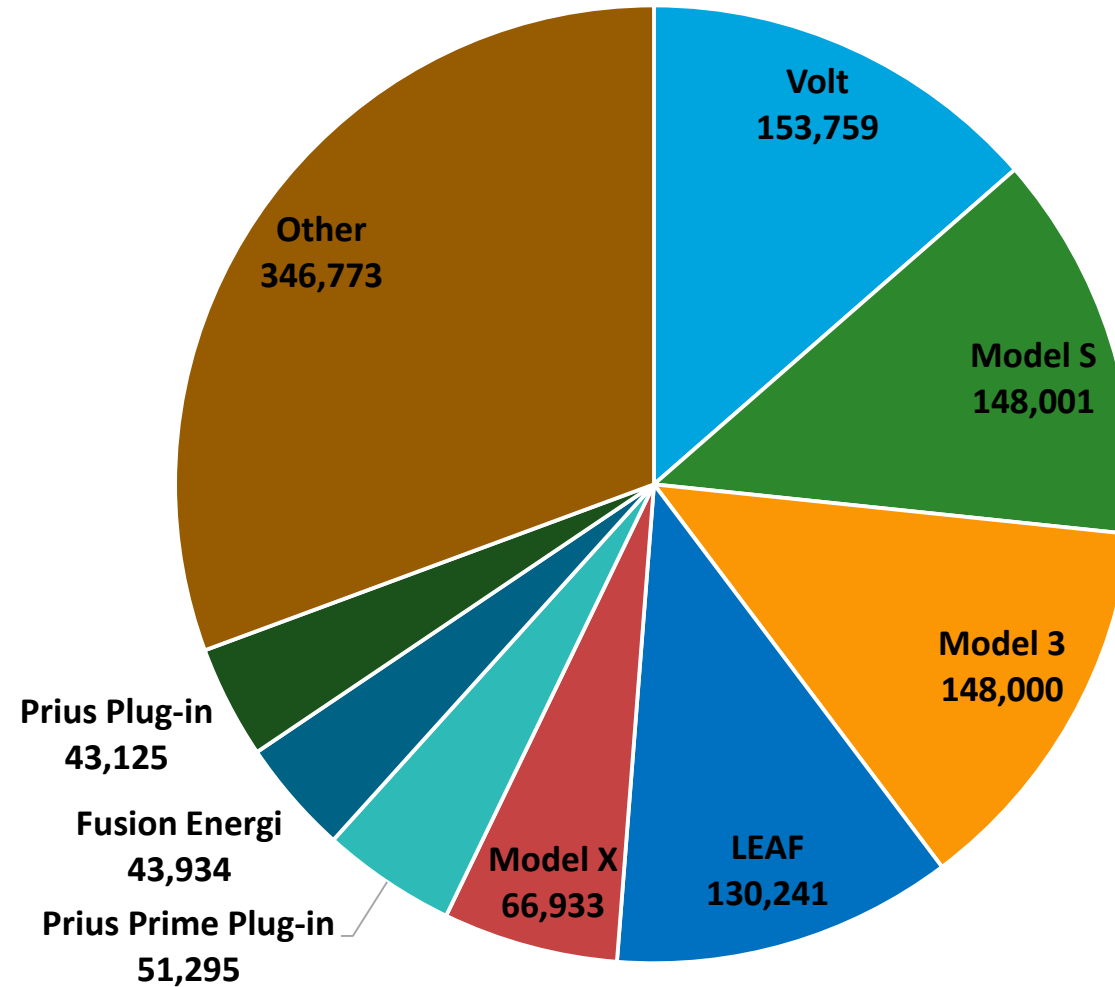
US PEV Sales to Date by Make

January-19



Cumulative Sales

January-19



Sales by Quarter – (ending) 2018

