

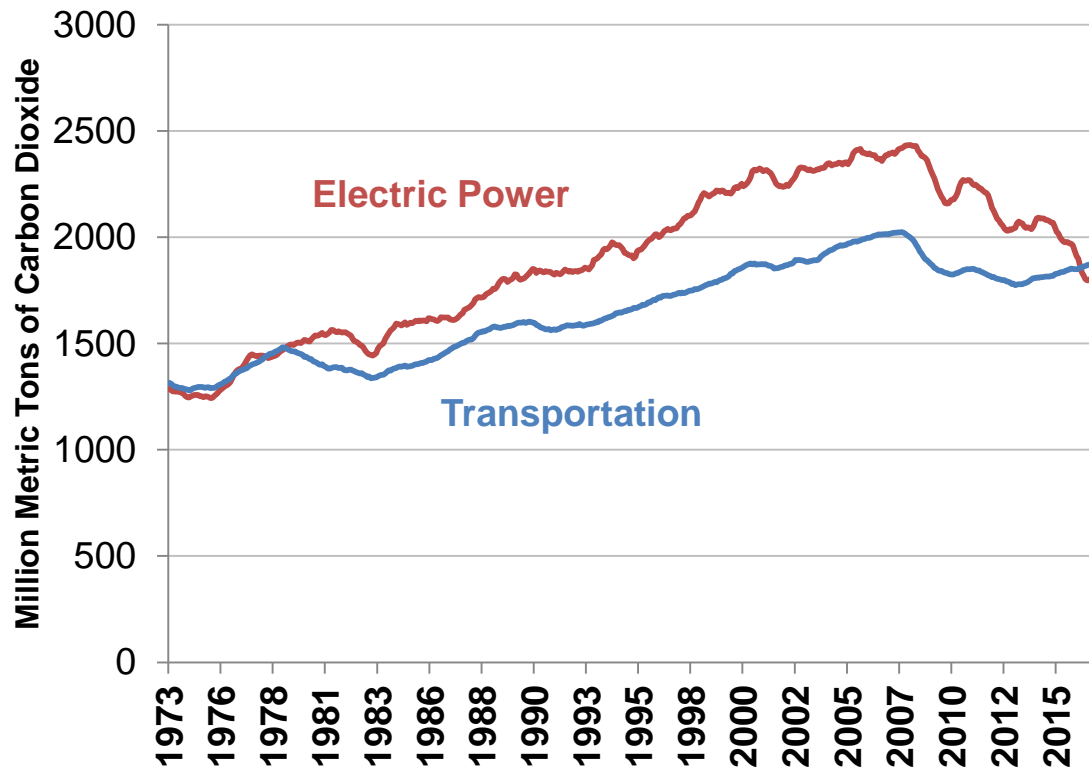


Edison Electric
INSTITUTE

Electric Transportation Update and Outlook

MADRI Working Group Meeting
Tuesday, June 6, 2017
Philadelphia, PA

CO₂ emissions by sector



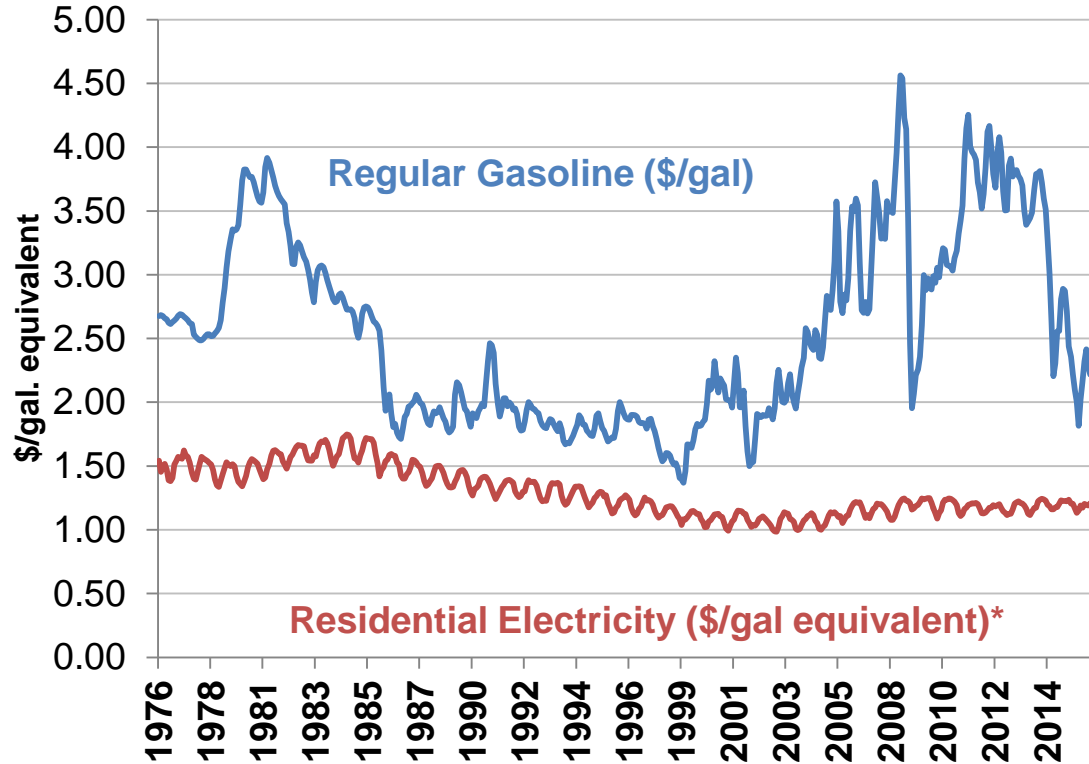
Electric Power

nearly **25%** reduction from 2005 levels by end of 2016

Transportation

decreased 10% 2005-2012, but increased 6% through 2016

Gasoline vs. electricity



Electric Power

approx. **2X** price advantage

Gasoline

volatile, global commodity

*Equivalent electricity price assumes average vehicle fuel economy of 27.9 mpg, PEV efficiency of 0.33 kWh/mi

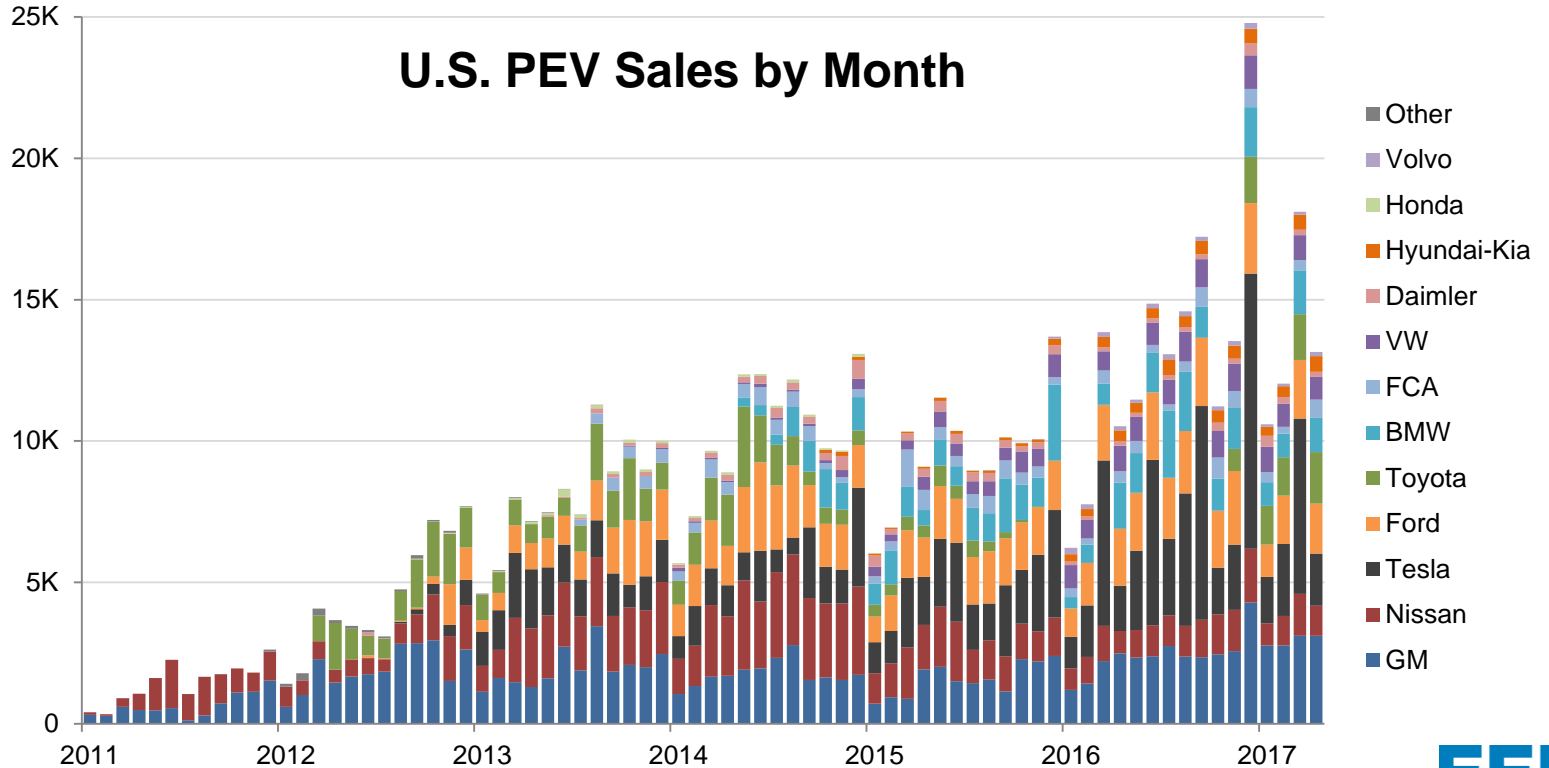
Sales momentum

620,000
sales since
Dec. 2010

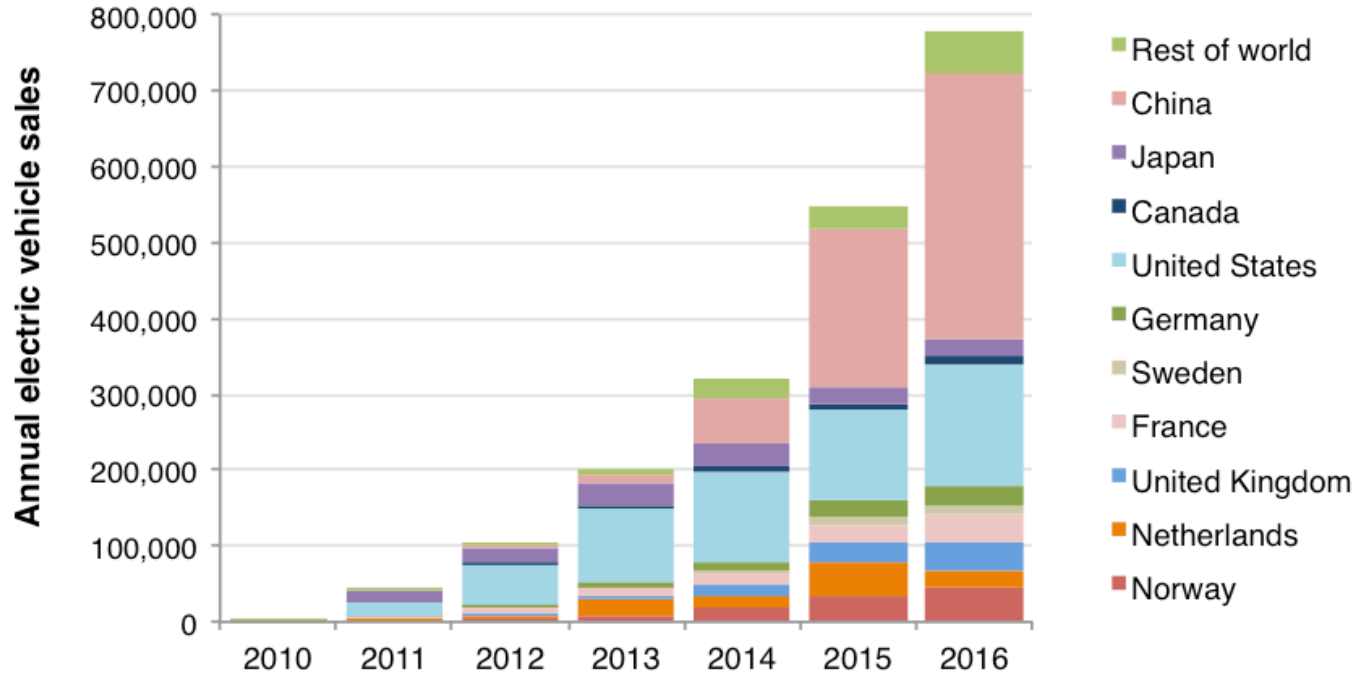
+40%
2017 YTD
sales vs. '16

33
PEV models

18
auto brands

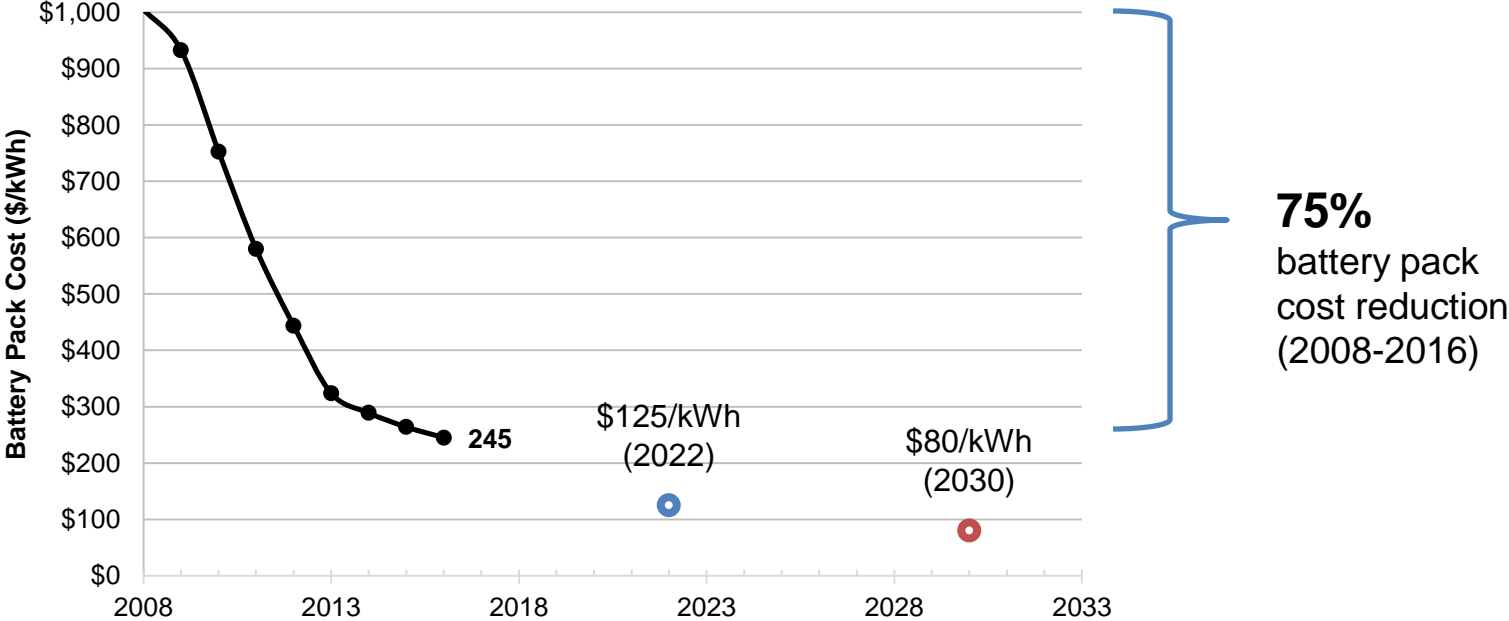


China, Europe surpass U.S.



Cost reductions enable longer range

Battery Cost (Modeled)



SOURCE: U.S. Department of Energy, Vehicle Technologies Office

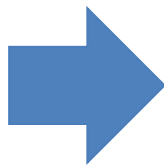


Improving cost, capability

BEV



2014 Spark
MSRP: \$27,495
Range: 82 miles

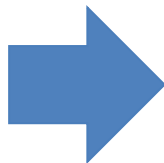


2017 Bolt EV
MSRP: \$37,495
Range: 238 miles

PHEV



2011 Volt
MSRP: \$41,000
Range: 380 mi. total
(35 mi. electric)



2017 Volt
MSRP: \$33,220
Range: 420 mi. total
(53 mi. electric)

Outlook: EV product

More models, across more segments



SOURCE: Chrysler

More long-range BEVs



SOURCE: Tesla

More announcements and investment

- Ford: \$4.5 billion investment in electrified vehicles by 2020, including electric SUV with at least 300 miles of range
- Hyundai: 4 plug-in hybrids and 4 all-electric cars on the market by 2020
- Audi: committed to achieve at least 25% of U.S. sales from electric vehicles by 2025; launching electric SUV in 2018

Outlook: charging infrastructure

- Trend: higher power charging
- Targeted to needs:
 - Home/workplace
 - Communities
 - Corridors
- New players and partnerships:
 - States
 - Automakers
 - Electrify America
 - Electric companies
 - EV charging companies
 - ***All of this is needed, and more***

*350 kW-capable DCFC
deployed in Fremont, CA*



SOURCE: EVgo

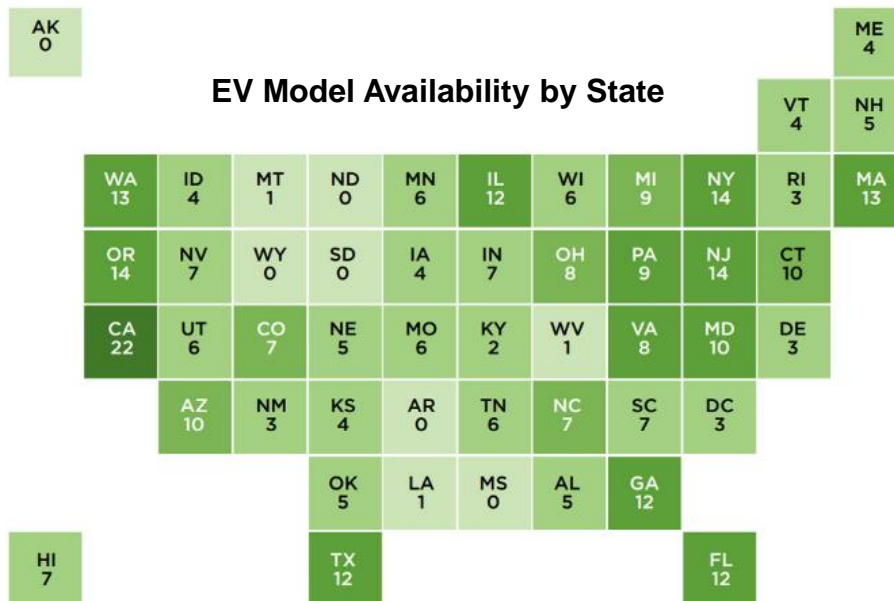
Uneven distribution

Monthly ZEV Market Share (All ZEV States)



SOURCE: Auto Alliance

EV Model Availability by State



SOURCE: IHS AUTOMOTIVE.

© Union of Concerned Scientists

SOURCE: Union of Concerned Scientists

Not just cars



Transit

Electric buses are in service in 35+ transit agencies



Airports

Seattle Sea-Tac electrification saves \$2.8 million in fuel per year



Seaports

Long Beach Terminal electrification is equal to 5,000 homes



Fleet

In 2016, electric companies invest more than \$128 million

Technology disruption

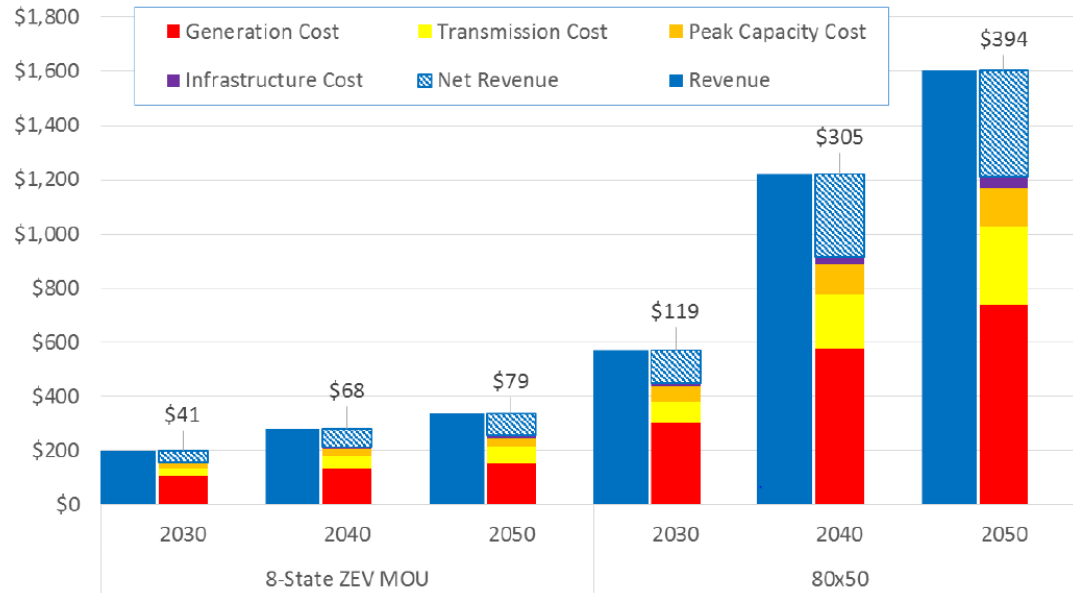
*Autonomous (AV), Electrification (EV),
Shared, Connected*



- New mobility models
 - Ride-hailing, car-sharing, TaaS, autonomous fleets
- Synergy with electrification
 - Design, platform, total cost of ownership
- Priorities for electric companies
 - How do we ensure new mobility models drive electrification?
 - What are the infrastructure needs?

Opportunity for electric companies

Massachusetts: NPV Utility Costs & Net Revenue from PEV Charging
Baseline Charging
 (\$ millions)



PEV Penetration Scenario

- Revenue from EV charging exceeds cost to serve
- Downward pressure on rates
- Similar findings in CA, Northeast states, others

Expanding role



Readiness

Grid impact
Connecting customers
Education



Market Transformation

Infrastructure deployment
Proactive education & outreach
Policy/regulatory framework



Vehicle-Grid Integration

Grid services
Smart charging
Advanced load management

Key takeaways

- Electric transportation is in public interest
- The question isn't if, but how quickly can we scale
- Electric companies uniquely suited to accelerate
 - Improved system utilization puts downward pressure on rates
 - Break the “chicken or egg problem,” grow market for all players
 - Deploy at scale with expected safety, reliability, affordability, for all
- Now is the time to build on the momentum

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Edison Electric Institute
701 Pennsylvania Avenue, NW
Washington, D.C. 20004-2696
202-508-5000 | www.eei.org