



Edison Electric  
INSTITUTE

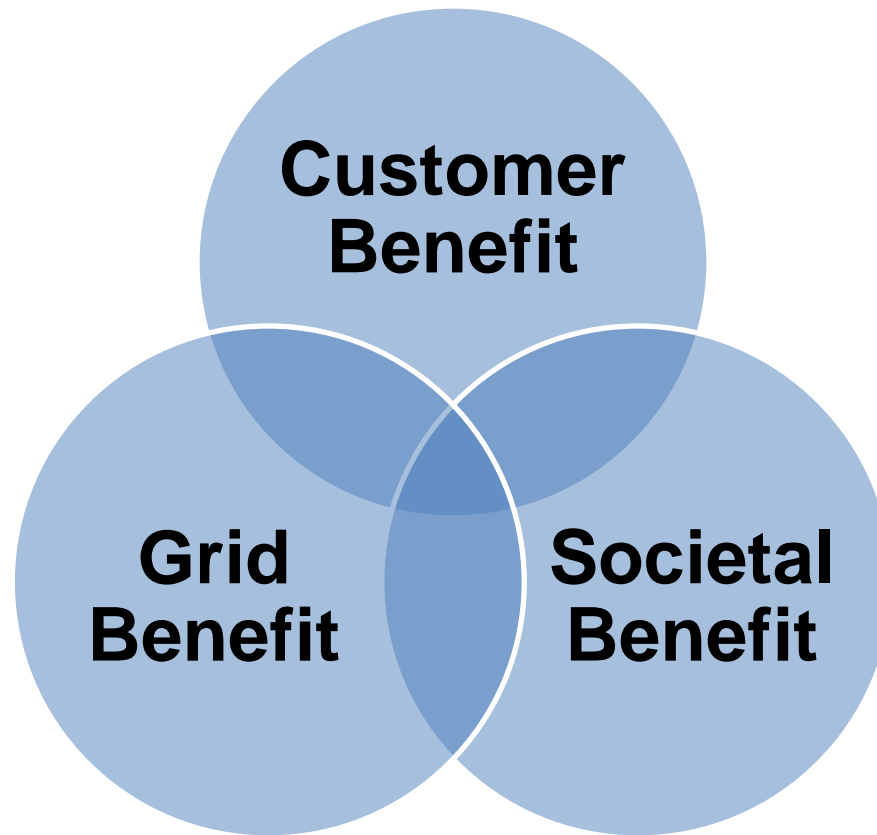
# Electric Companies and the EV Opportunity

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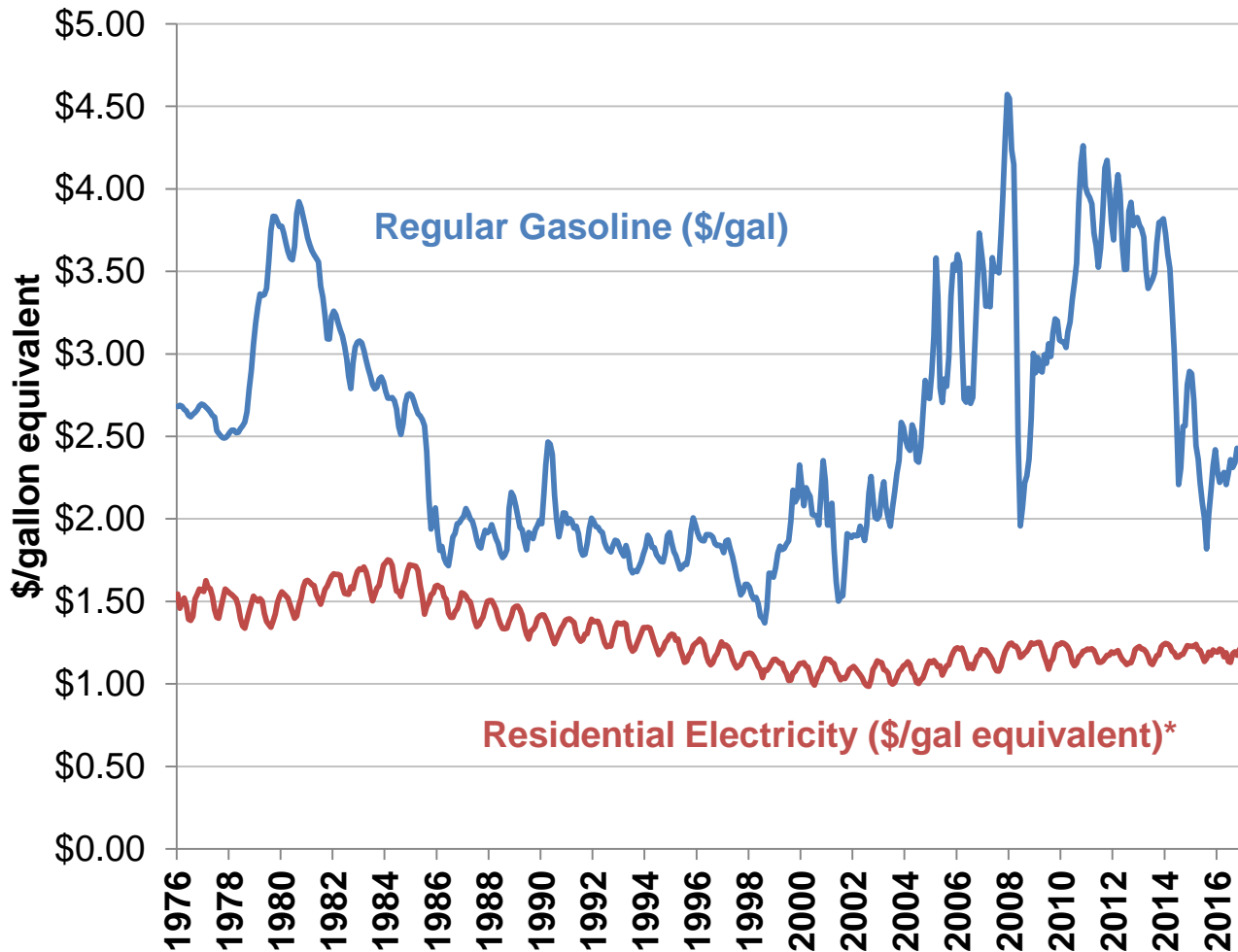
Florida Public Service Commission  
Electric Vehicle Charging Roundtable  
October 17, 2017

# Electric Transportation

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# Customer Benefit

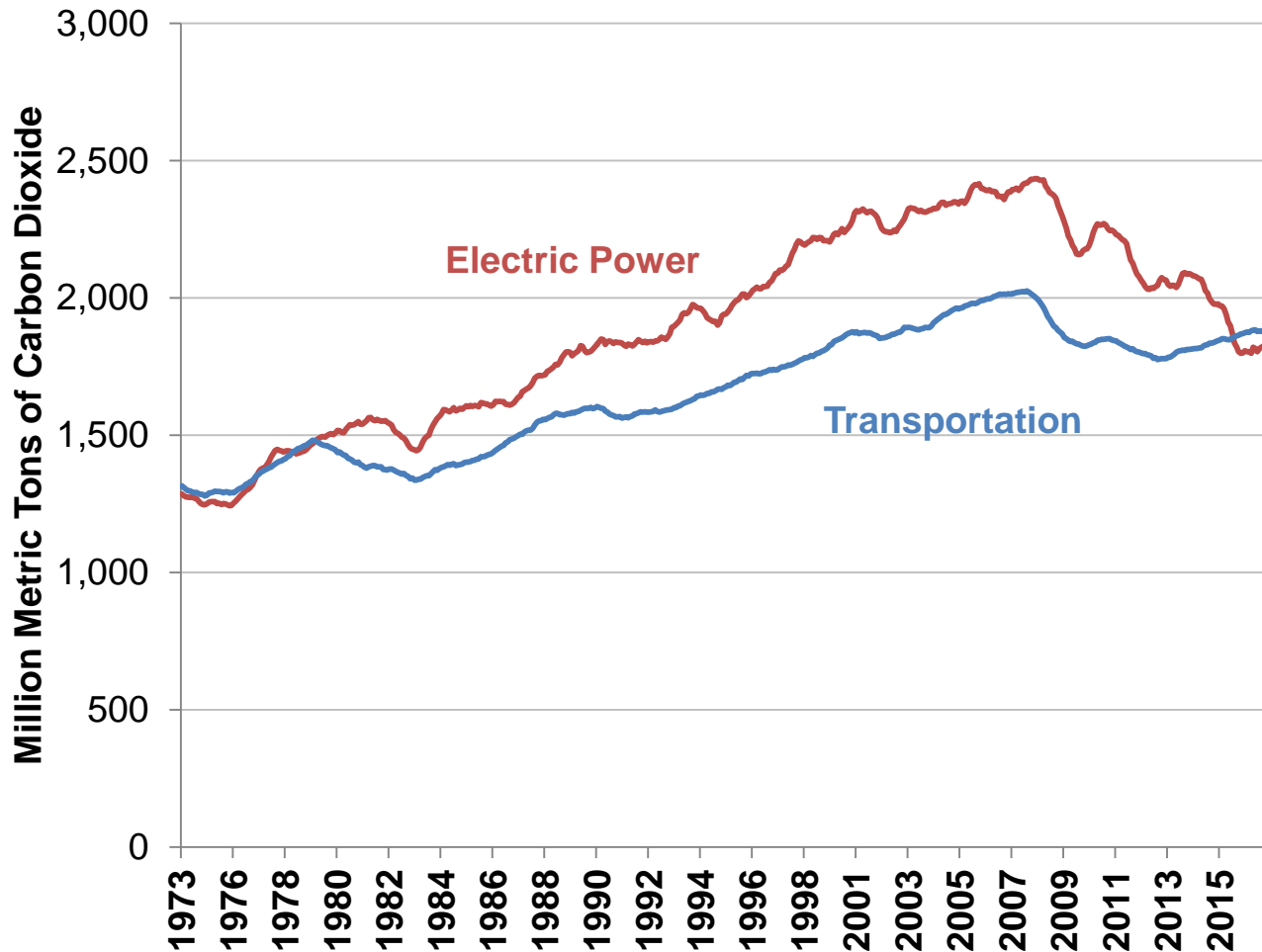


**Electric Power**  
approx. **2X** price  
advantage

**Gasoline**  
volatile, global  
commodity

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

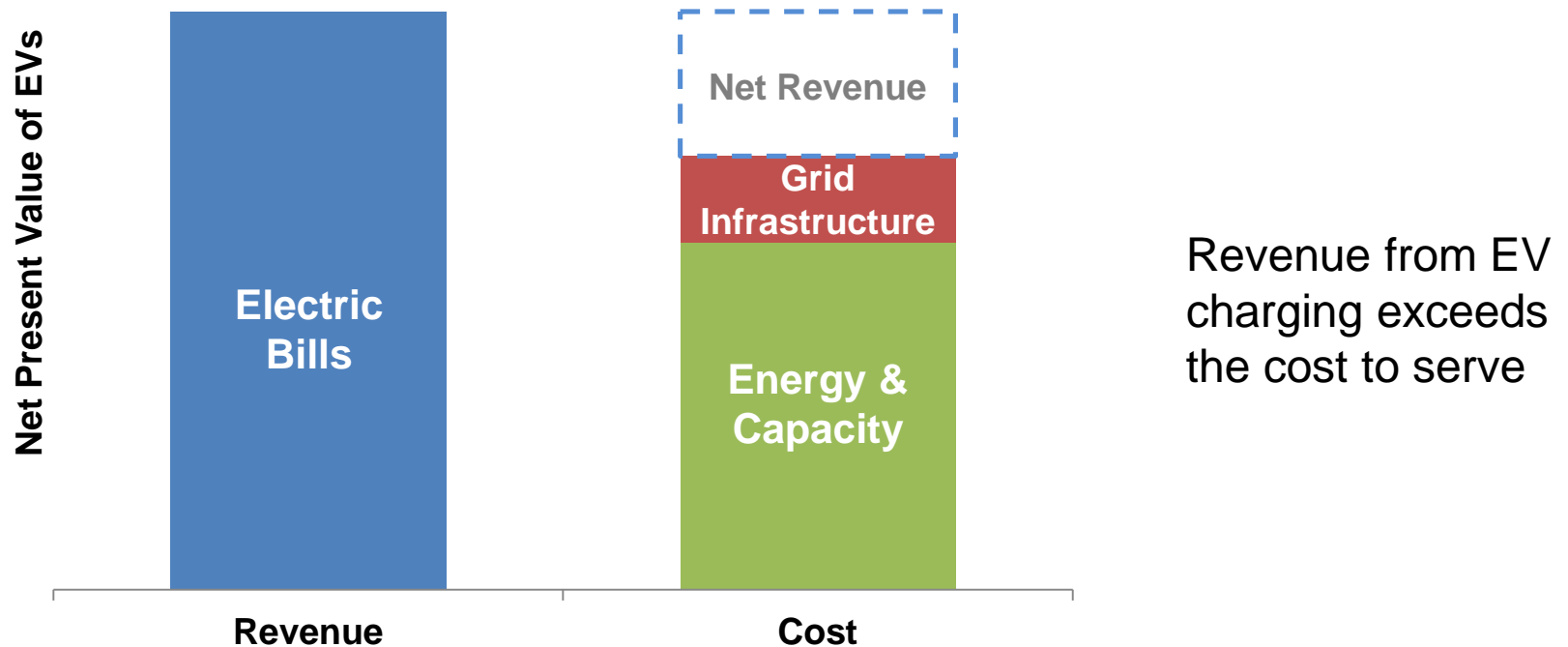
# Societal Benefit



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

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

# Grid Benefit



Revenue from EV charging exceeds the cost to serve

See: CalETC, *California Transportation Electrification Assessment, Phase 2: Grid Impacts*  
M.J. Bradley & Associates, *Plug-in Electric Vehicle Cost Benefit Analysis*  
EPRI, *The Value of Transportation Electrification: Three Preliminary Case Studies of Impacts on Utility Stakeholders*

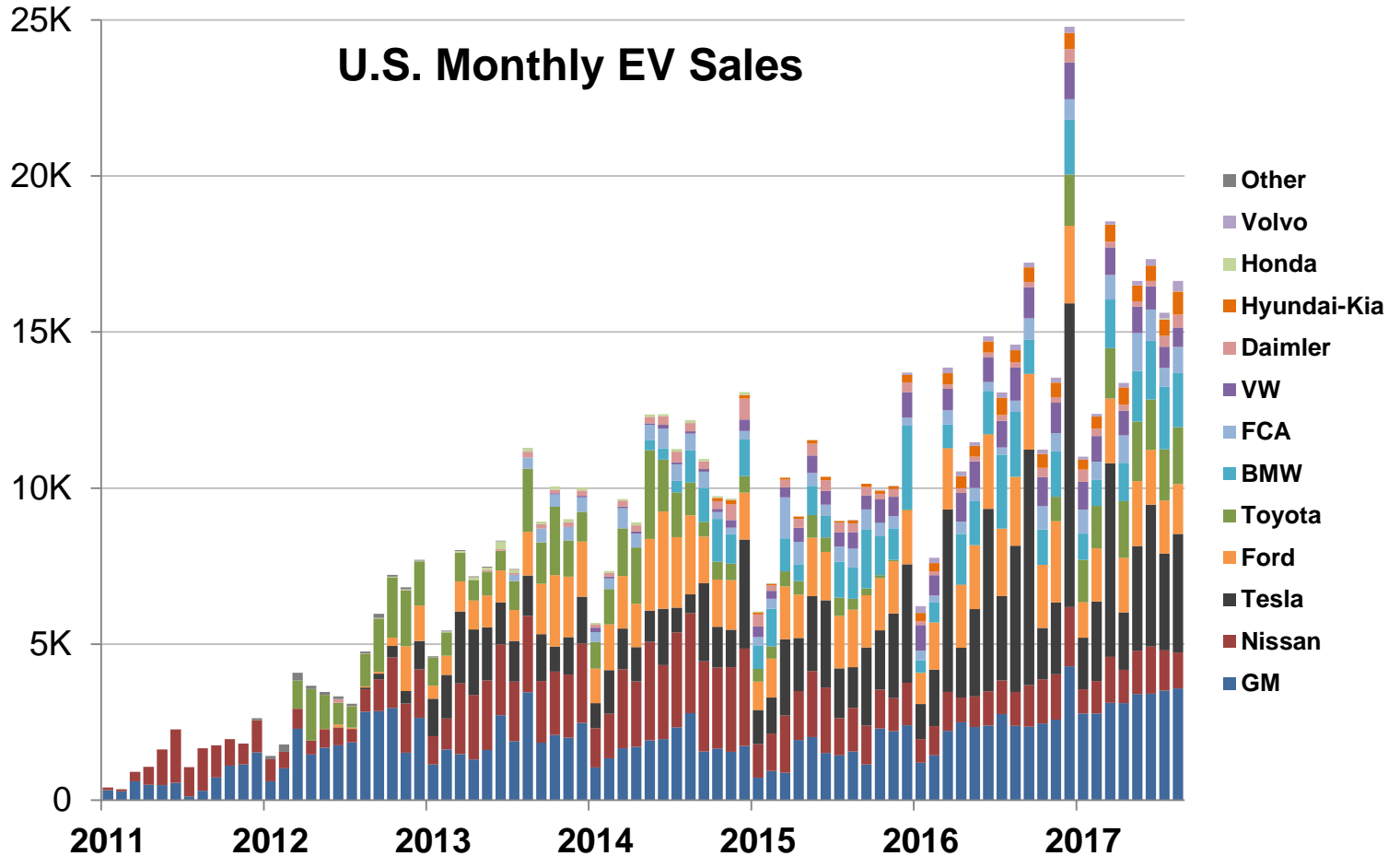
# Sales Progress

**690,000**  
sales since  
Dec. 2010

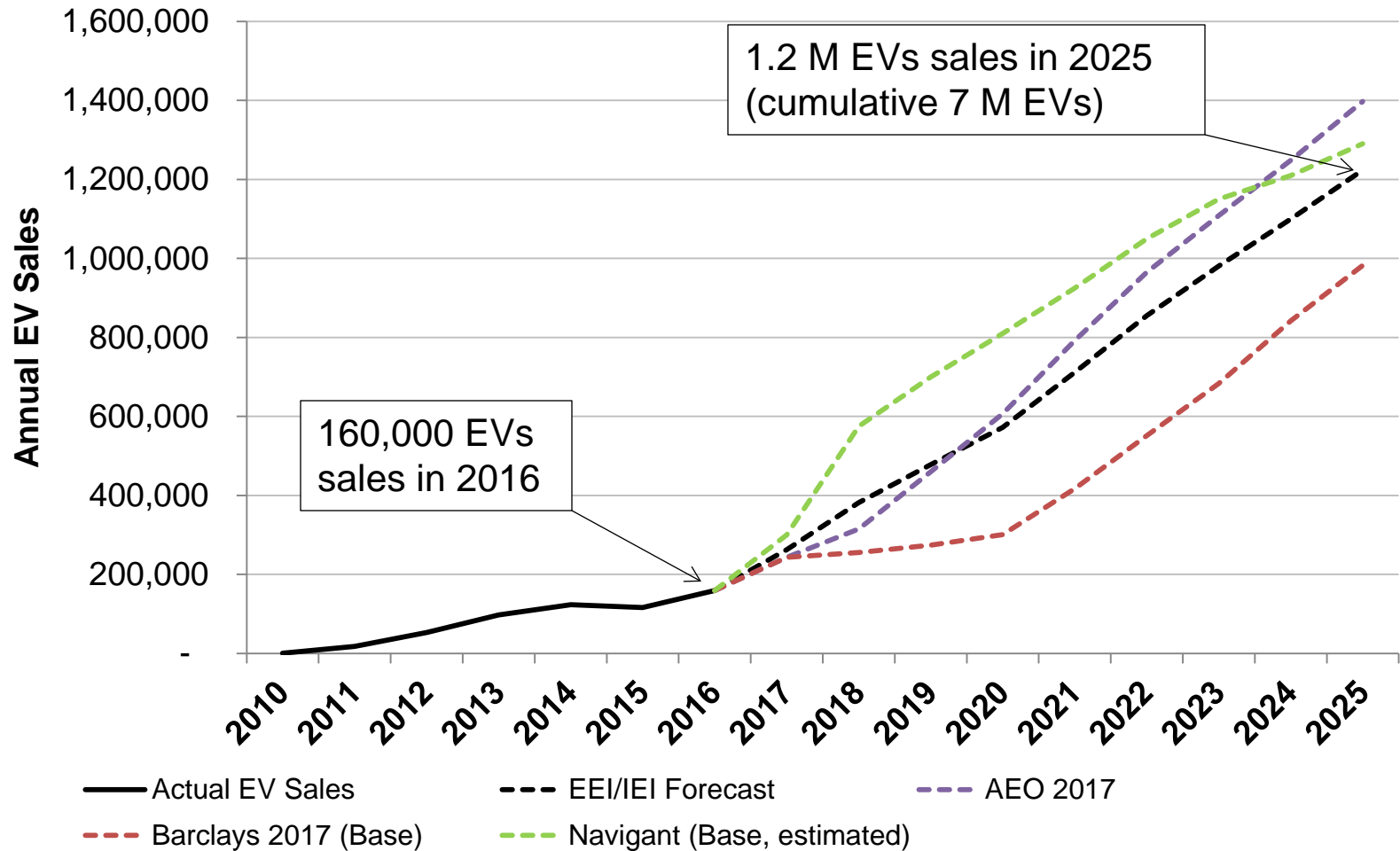
**+32%**  
2017 sales  
YTD vs. '16

**38**  
PEV models

**20**  
auto brands



# EV Forecast



# EV Forecast

*If these companies meet their stated EV sales goals...*

*...how many EVs would these companies need to sell to meet the forecast?*

	EV % in 2016	EV % in 2025	EV Sales in 2025	Total Sales in 2025
Tesla, BMW, Mercedes-Benz, Volkswagen, Volvo	5.5%	30+ %	520 K	1.8 M
Fiat-Chrysler, Ford, General Motors, Honda, Hyundai-Kia, Nissan, Toyota	0.5%	~ 5 %	710 K	14.8 M
	1.0%	7%	1.2 M	16.6 M



# Recent EV Announcements

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**GM** plans 20 new all-electric models by 2023

*Wired: General Motors is Going All Electric*

**Ford** creates “Team Edison” to lead EV development

*CNBC: Ford creates team to ramp up electric vehicle development*

**VW** to invest \$24 B by 2030; 80 new EVs by 2025

*Reuters: Volkswagen spends billions more on electric cars in search for mass market*

**BMW** plans 12 all-electric models by 2020

*CNBC: BMW readies mass production of electric cars, 12 models by 2020*

**Mercedes-Benz** to invest \$1 B in Alabama plant; 50 hybrid or electric vehicles by 2022

*USA Today: Mercedes-Benz makes a \$1B bet it can take down Tesla*

**Volvo**: all new models in 2019+ hybrid or electric

*NY Times: Volvo, Betting on Electric, Moves to Phase Out Conventional Engines*

**Jaguar-Land Rover** plans all new models in 2020+ to be available as hybrid or electric

*Reuters: All new Jaguar Land Rover cars to have electric option from 2020*

**Nissan-Renault** plans 12 all-electric models by 2022

*Bloomberg: A Spark for the Electric Car Revolution*

**China** phasing in EV quotas, ~ 5% of sales by 2020

*Bloomberg: China Gives Automakers More Time in World's Biggest EV Plan*

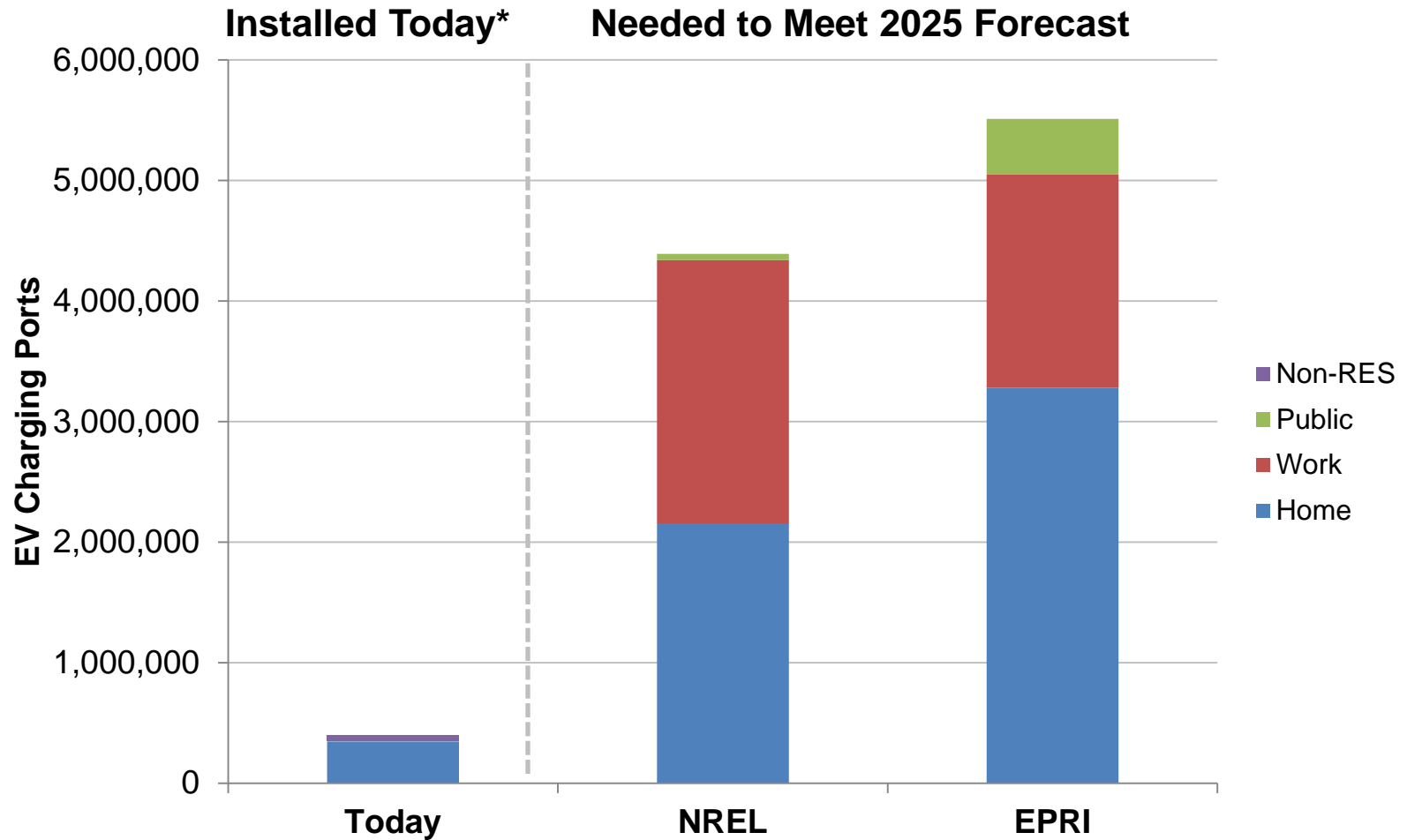
**France, Britain** plan to end ICE sales by 2040

*NY Times: Britain to Ban New Diesel and Gas Cars by 2040*

# Charging Infrastructure

Category	Use Case	Time Available to Charge	Charger Type
Home	Single-family home	Overnight (~12 hrs.)	L1, L2
	Multi-unit dwelling	Overnight (~12 hrs.)	L1, L2
Work	Workplace charging	Work day (~8 hrs.)	L1, L2
Public	Short/medium-dwell (e.g. retail)	1-2 hrs.	L2, DCFC
	Long-dwell (e.g. airports)	2-4 hrs. or longer	L1, L2
	Metro-based (intra-city)	~30 minutes or less	DCFC
	Long-distance (inter-city)	~30 minutes or less	DCFC
Fleet	Commercial fleets	Varies	Varies

# Charging Infrastructure

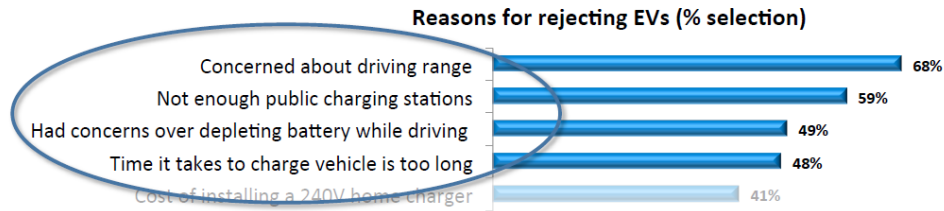


\*Non-RES data from DOE Alternative Fuels Data Center; assume 50% of current EV owners have home L2 charger

# Charging Infrastructure

## Lack of charging infrastructure is a barrier for buyers

- PG&E and RDA Group study of CA EV owners, intenders and rejecters (n=808)
- Survey question assessed reasons for rejecting EV purchase
- **Top 4 reasons respondents rejected an EV were related to infrastructure**



SOURCE: David Peterson, Nissan North America, Presentation: *1700 Fast Chargers by 2016*

## Consumers de-value PEVs if infrastructure is insufficient

### Stated Preference Estimates

Survey results suggest that household consumers may perceive the following (cumulative) purchase price penalties:

- **Local: \$750 to \$4,000** for retail station coverage at 1 to 10 percent of existing gasoline stations within metropolitan (urban) areas.
- **Regional: \$1,500 to \$3,000** for limited medium-distance coverage, defined as 5 to 100 stations within 150 miles of the metro area
- **Interstate: \$2,000 to \$9,000** for a lack of long-distance coverage along interstates connecting urban areas

SOURCE: NREL, *Vehicle Attributes and Alternative Fuel Station Availability Metrics for Consumer Preference Modeling*

# Integral Electric Company Role

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## *Grid Integration*

- Managed charging / rate design
- System-level planning

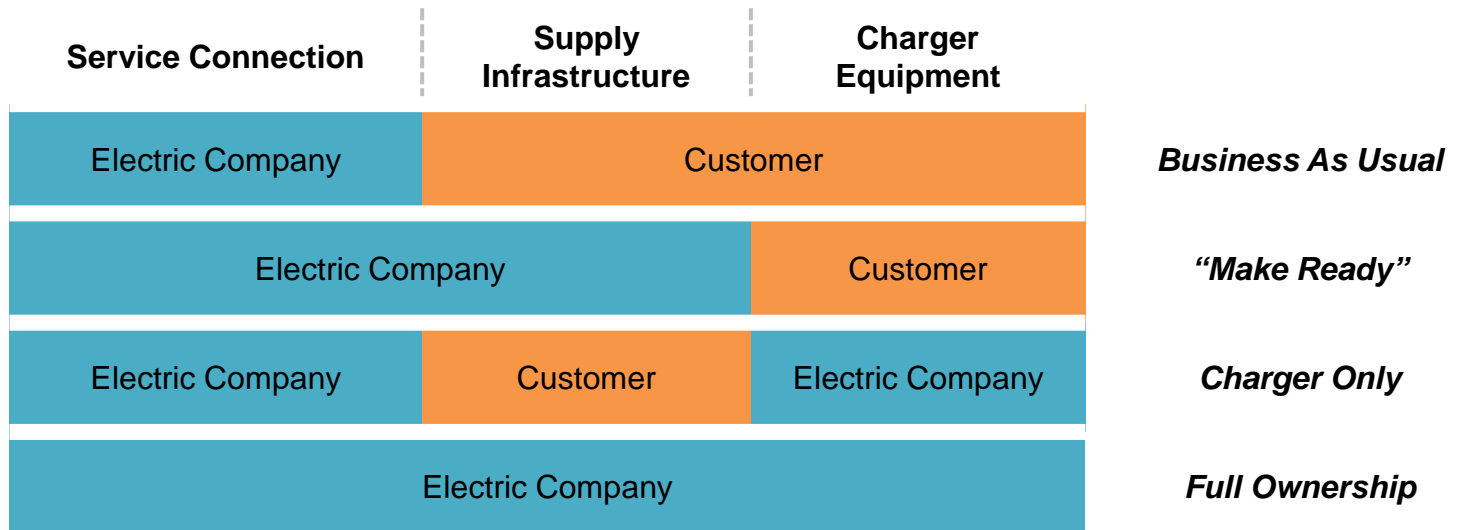
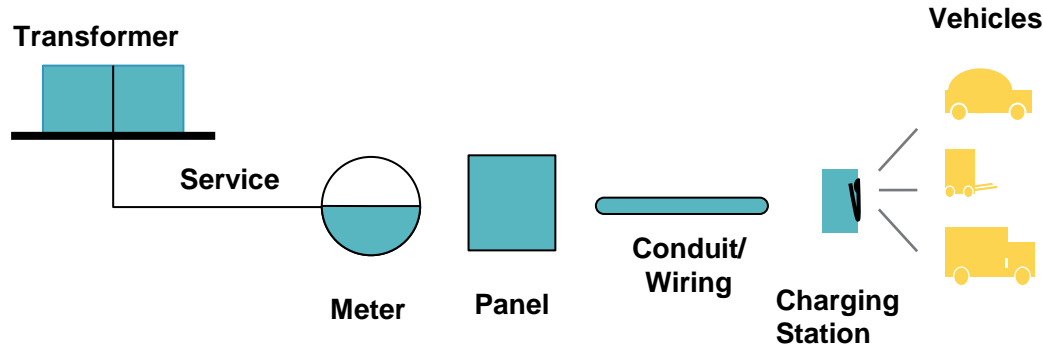
## *Customer Benefit*

- Access and equity
- Availability and reliability

## *Market Acceleration*

- Awareness and education
- Spur growth and investment

# Charging Infrastructure



# Policy Approaches

<b><i>Market acceleration to meet state-level goals (e.g., ZEV)</i></b>	<ul style="list-style-type: none"><li>▪ California (SDG&amp;E, PG&amp;E, SCE)</li><li>▪ Massachusetts (Eversource, National Grid)</li><li>▪ Maryland stakeholder process</li><li>▪ Rhode Island stakeholder process</li></ul>
<b><i>Legislative enabling policy</i></b>	<ul style="list-style-type: none"><li>▪ Utah (SB 115 → Rocky Mountain Power)</li><li>▪ Oregon (SB 1547 → Portland General Electric, Pacific Power)</li><li>▪ Washington (HB 1853 → Avista)</li><li>▪ California (SB 350 → SDG&amp;E, PG&amp;E, SCE)</li><li>▪ Nevada (SB 145)</li></ul>
<b><i>Customer need / market growth</i></b>	<ul style="list-style-type: none"><li>▪ Indiana (Indianapolis Power &amp; Light)</li><li>▪ Missouri (KCP&amp;L, Ameren)</li><li>▪ Kansas (KCP&amp;L)</li><li>▪ Georgia (Georgia Power)</li><li>▪ Michigan (Consumers Energy → technical conference)</li><li>▪ Hawaii (Hawaiian Electric)</li><li>▪ Kentucky (LG&amp;E and KU)</li><li>▪ Florida (Gulf Power, Duke Energy)</li><li>▪ Ohio (AEP Ohio)</li><li>▪ DC (Pepco)</li></ul>

# Takeaways

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- Electric transportation is coming – no longer a question of if, but how fast
- Many different actions can help accelerate this transition
  - Technology cost reduction and model availability
  - Market awareness and customer education
  - Infrastructure access and availability
- Electric companies are well positioned to deliver grid benefits, positive outcomes for customers, and accelerate the market



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