

# U.S. EPA's State and Local Energy and Environment Webinar Series

## Electric Vehicle Trends and Projections

October 24, 2019  
2:00 – 3:30 PM Eastern

Two audio options:

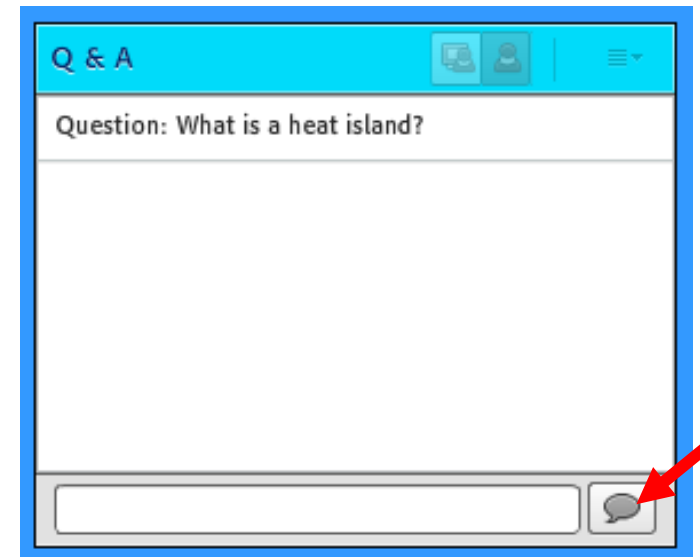
1. Listen via computer
2. Call in to 1-855-210-5748



# How to Participate

## Question and Answer

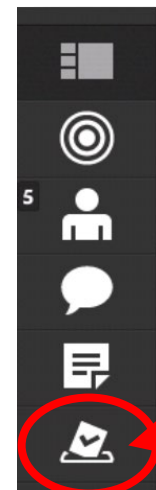
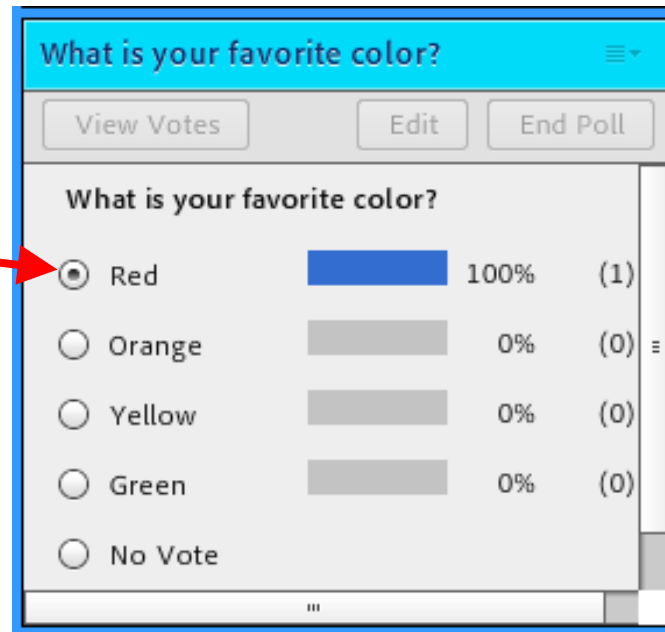
- Enter your question in the Q&A box
- Questions will be moderated at the end
- EPA will post responses to unanswered questions on the [State and Local Webinar Series page](#)



# How to Participate

## Polling

- We'll ask several poll questions during the webinar
- On mobile devices or tablets
  - ▶ Exit full screen mode
  - ▶ Tap the Poll icon



# Today's Agenda

- **Andrea Denny**, Local Energy and Environment Program Lead, Office of Atmospheric Programs  
**Jessica Daniels**, Environmental Protection Specialist, Office of Transportation and Air Quality  
U.S. Environmental Protection Agency
- **Dr. Rachael Nealer**, Transportation Chief of Staff  
U.S. Department of Energy
- **Michael Nicholas**, Senior Researcher  
The International Council on Clean Transportation
- **Garrett Eucalitto**, Transportation Program Director  
**Matt Rogotzke**, Policy Analyst  
National Governors' Association
- Question and Answer Session

**Andrea Denny**

Local Energy and Environment  
Program Lead

**Jessica Daniels**

Environmental Protection Specialist

U.S. Environmental Protection Agency



# U.S. EPA's State and Local Energy and Environment Program

- Investing in energy strategies that lower emissions can be an effective way for state, local and tribal governments to achieve multiple goals:
  - ▶ Improve air quality and public health
  - ▶ Strengthen energy systems
  - ▶ Reduce greenhouse gas emissions
  - ▶ Save money
- We offer free tools, data and technical expertise about energy strategies, including energy efficiency, renewable energy and other emerging technologies, to help state, local and tribal governments achieve their environmental, energy and economic objectives.
- Access all of these resources at the [Energy Resources for State, Local, and Tribal Governments site](#)



# U.S. EPA's State and Local Energy and Environment Program

- **Electrification Webinar Series**
  - ▶ Electric Vehicle (EV) Trends and Projections--today
  - ▶ Utility Perspectives of Vehicle Electrification—November/December
  - ▶ Additional Topics--2020
  - ▶ Get notifications by subscribing to our [newsletter](#)
  - ▶ Access all webinar materials at: [State, Local, and Tribal Webinar Series](#)
  
- **Past Webinar: State & Local Experience with Workplace EV Charging**
  - ▶ Highlighting state and local government efforts to encourage workplace charging within the government and in partnership with local stakeholders.
  - ▶ Featuring speakers from EPA's ENERGY STAR program; the Colorado Energy Office, and the City of Fort Collins, CO.
  
- **ENERGY STAR Certified EV Supply Equipment**
  - ▶ Level 1 and Level 2 Certified Chargers are available
  - ▶ Use 40% less electricity in standby mode
  - ▶ Buying guides and sample procurement language available

# U.S. EPA's State, Local, and Tribal Transportation Resources

- EPA's Office of Transportation and Air Quality (OTAQ) protects human health and the environment by reducing air pollution and greenhouse gases from mobile sources and the fuels that power them, advancing clean fuels and technology, and encouraging business practices and travel choices that minimize emissions.
- We help state, local, and tribal governments achieve their environmental and other objectives by providing expertise on:
  - ▶ State Implementation Plans
  - ▶ Transportation Conformity
  - ▶ Vehicle Emissions Inspection & Maintenance and state fuel programs
  - ▶ Travel Efficiency and Greenhouse Gas (GHG) Planning
  - ▶ MOVES, Calculators, and Tools
- Access all of these resources at the [State and Local Transportation Resources page](#)



# OTAQ's Voluntary Programs and Initiatives

- EPA's OTAQ also has several voluntary programs and initiatives for state, local, and tribal governments as well as other stakeholders
- [Clean Diesel Program](#)– To reduce diesel emissions that impact public health
  - ▶ Includes grants and rebates under the Diesel Emissions Reduction Act (DERA)
- [Ports Initiative](#)– To improve environmental performance near ports
- [SmartWay](#)– To advance sustainable transportation supply chains

- EPA Automotive Trends Report

- ▶ Public information about new light-duty vehicle greenhouse gas emissions, fuel economy data, technology data, and auto manufacturers' performance in meeting the agency's GHG emissions standards

- EVs, plug-in hybrid electric vehicles (PHEVs), and fuel cell vehicles (FCVs) are a small but growing percentage of new vehicles

## The 2018 EPA Automotive Trends Report: \_\_\_\_\_

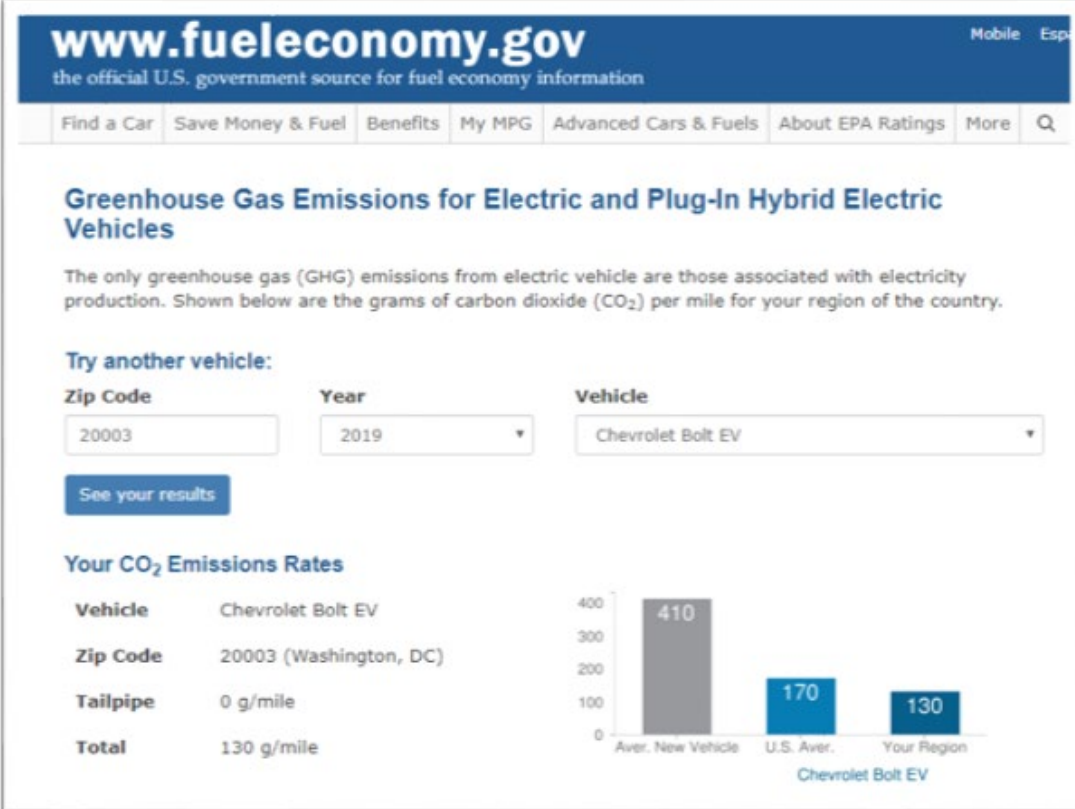
Greenhouse Gas Emissions,  
Fuel Economy, and  
Technology since 1975



**Executive Summary**



- [Beyond Tailpipe Emissions Calculator](#)
- [Green Vehicle Guide](#)
  - ▶ Learn more about EVs, PHEVs, and hydrogen fuel cell vehicles
  - ▶ Learn more about the EPA Fuel Economy and Environment Label
  - ▶ Find low-emitting vehicles and information on vehicle emissions



**www.fueleconomy.gov**  
the official U.S. government source for fuel economy information

Find a Car | Save Money & Fuel | Benefits | My MPG | Advanced Cars & Fuels | About EPA Ratings | More | Q

### Greenhouse Gas Emissions for Electric and Plug-In Hybrid Electric Vehicles

The only greenhouse gas (GHG) emissions from electric vehicle are those associated with electricity production. Shown below are the grams of carbon dioxide (CO<sub>2</sub>) per mile for your region of the country.

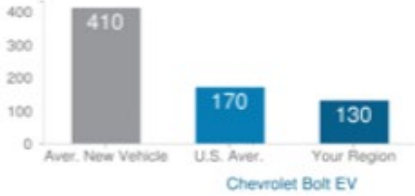
Try another vehicle:

Zip Code:  Year:  Vehicle:

[See your results](#)

#### Your CO<sub>2</sub> Emissions Rates

Vehicle	Chevrolet Bolt EV
Zip Code	20003 (Washington, DC)
Tailpipe	0 g/mile
Total	130 g/mile



410  
170  
130

Aver. New Vehicle U.S. Aver. Your Region

Chevrolet Bolt EV

Andrea Denny  
[denny.andrea@epa.gov](mailto:denny.andrea@epa.gov)

Jessica Daniels  
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**State and Local  
Energy and Environment Program**

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# Poll 1



# Overview of Department of Energy Sustainable Transportation and Trends

**Dr. Rachael Nealer**  
Transportation Chief of Staff  
U.S. Department of Energy



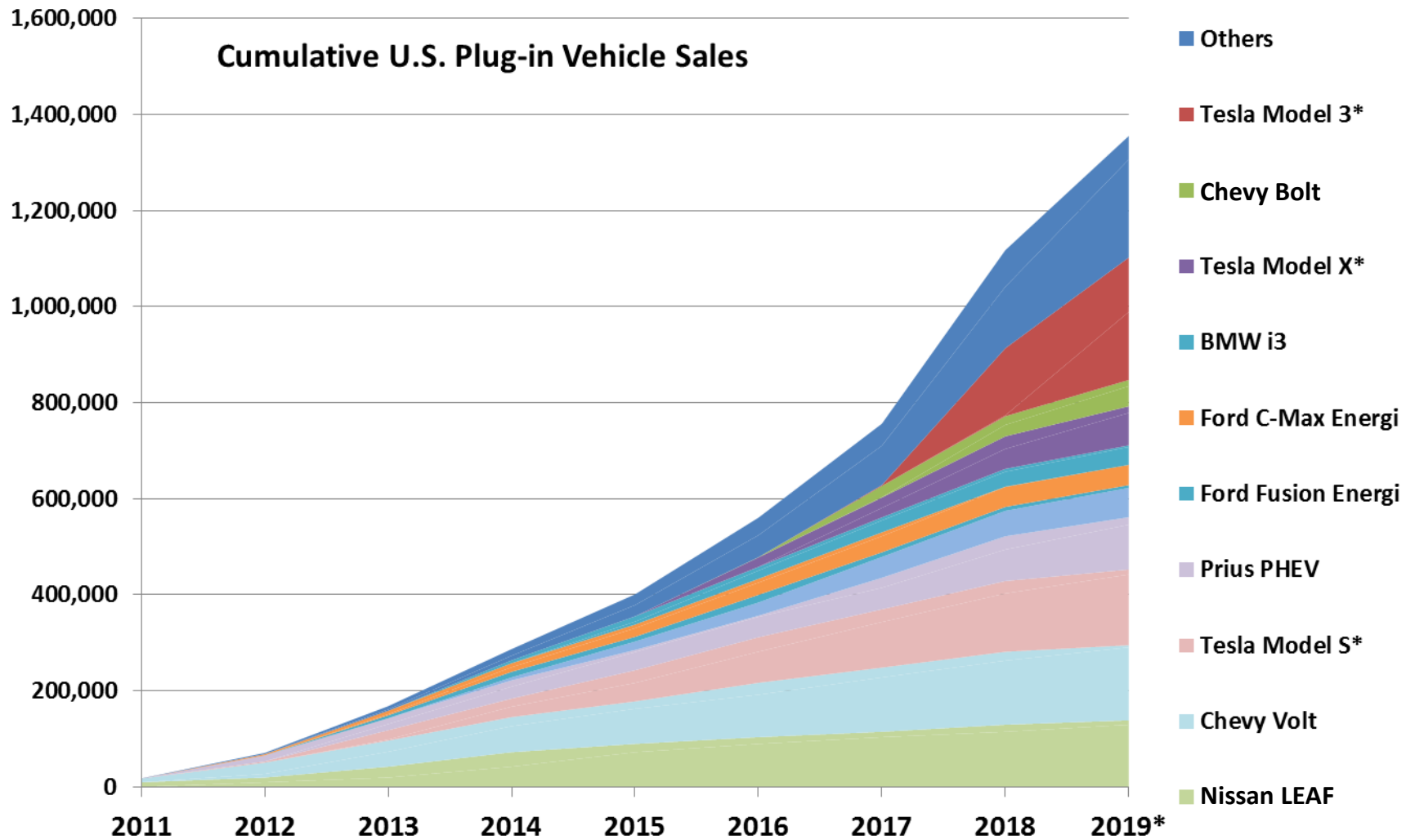
# Overview of DOE Sustainable Transportation and Trends

**Rachael Nealer, PhD**

Transportation Chief of Staff  
Department of Energy (DOE)



# Market Trends: Electric Vehicle (EV) sales



\*Note: 2019 is through August; Tesla sales are estimated

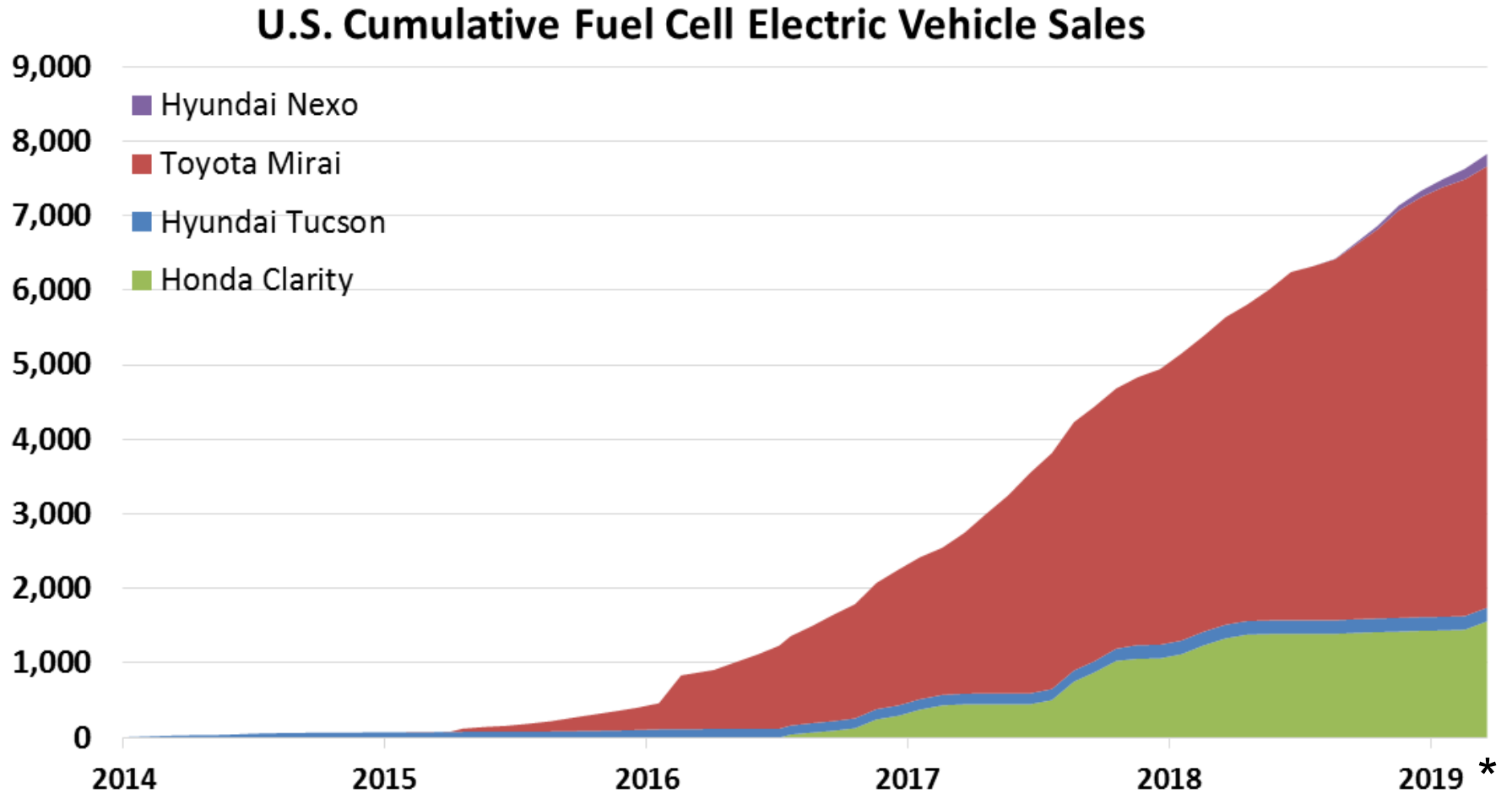
Source: ANL sales tracking

PHEV: Plug-in hybrid electric vehicle



# Market Trends: Fuel cell electric vehicle (FCEV) sales

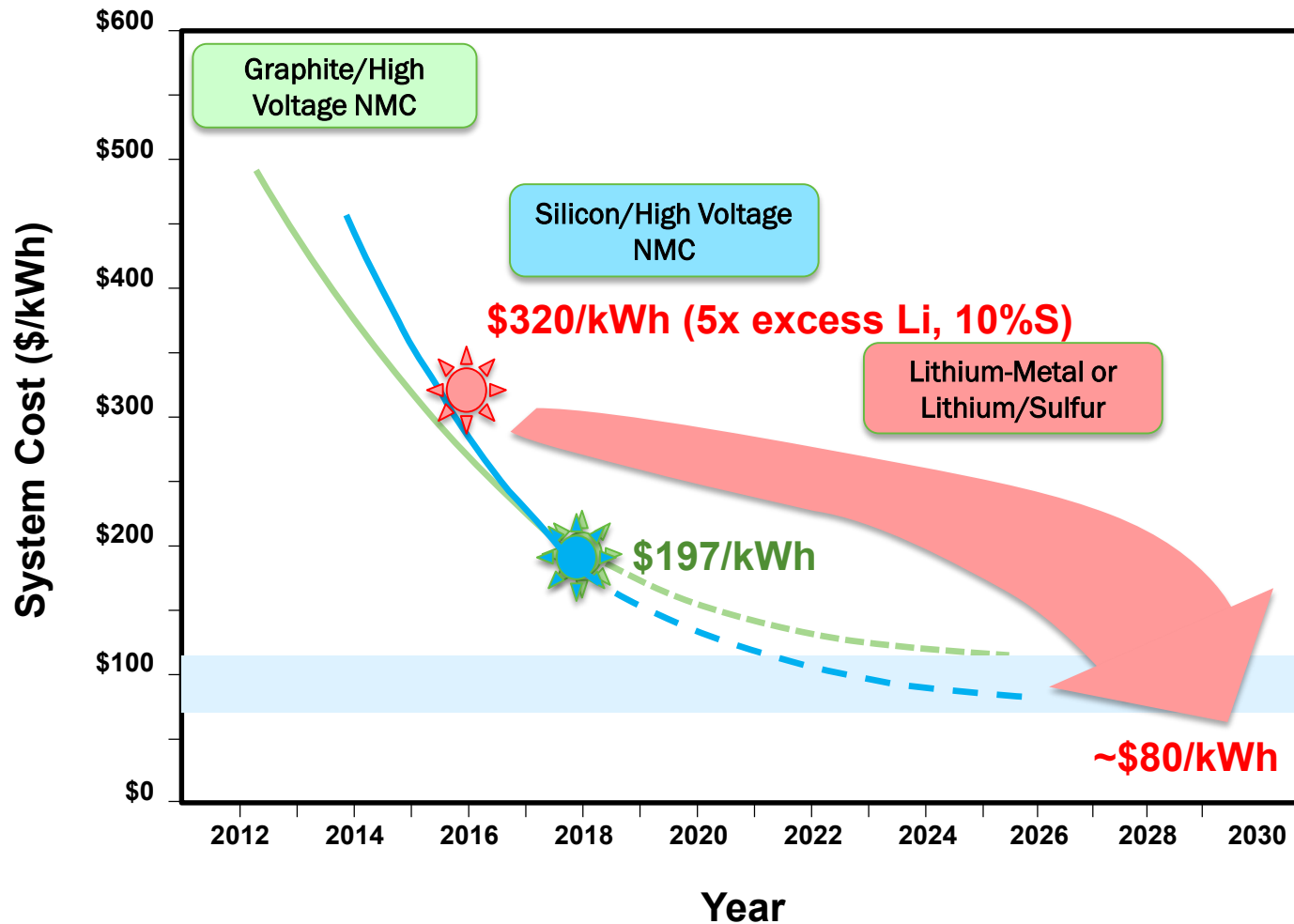
Note: Scale has changed



\*Note: 2019 is through August

Source: ANL sales tracking

# Cost Trends: Batteries

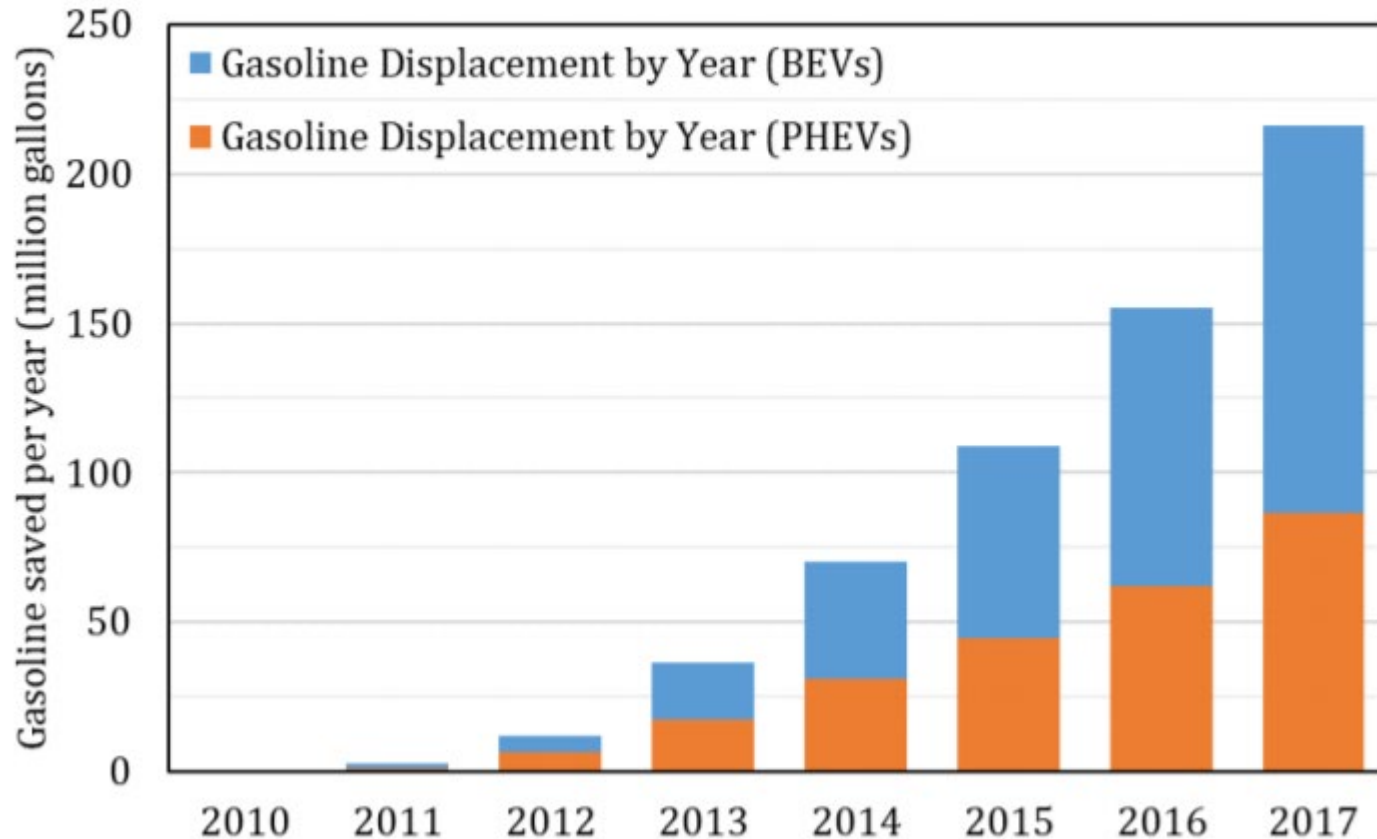


Source: VTO Annual Merit review, 2019

NMC: Nickel-manganese-cobalt

# Impacts of EVs on the Road

## Gasoline Displacement due to PEVs by Year



BEV: Battery electric vehicle  
PEV: Plug-in Electric Vehicle

Source: ANL, 2019 [Impacts of electrification of light-duty vehicles in the United States, 2010–2017](#)

# DOE Technical Goals

- Continue to lower the costs of EV and FCEV components
  - Ultimate goals:
    - Battery pack: \$80/kWh
    - Electric drive: \$4/kW
    - Fuel cell storage system: \$ 266/kg hydrogen (H<sub>2</sub>)
- Decrease refueling time for EVs and FCEVs
  - 10-15 min refueling for 200-300 miles of range for EVs
  - 3-5 min fill time for FCEVs
- Lower the cost to produce and deliver hydrogen
  - Ultimate goal: H<sub>2</sub> at \$4/gge
- Provide information to public about all technology solutions



# Clean Cities can help you ...

- Educate fleets and consumers about electric vehicles
- Coordinate regional EV charging infrastructure development
- Access data & information related to EV equipment and vehicle choices
- Identify funding opportunities and facilitate project partnerships
- Provide training for technicians, first responders, fire marshals, etc.
- Connect with technical experts from DOE national labs



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
ENERGY EFFICIENCY &  
RENEWABLE ENERGY

**Dr. Rachael Nealer**  
**Transportation Chief of Staff**  
**U.S. Department of Energy**  
[rachael.nealer@ee.doe.gov](mailto:rachael.nealer@ee.doe.gov)



# Poll 2





# Global Electric Vehicle Sales and Trends

**Michael Nicholas**

Senior Researcher

The International Council on Clean  
Transportation



# Global Electric Vehicle Sales and Trends

*Michael Nicholas, ICCT*

**Electric vehicle trends and  
projections webinar**

**October 24<sup>th</sup>, 2019**



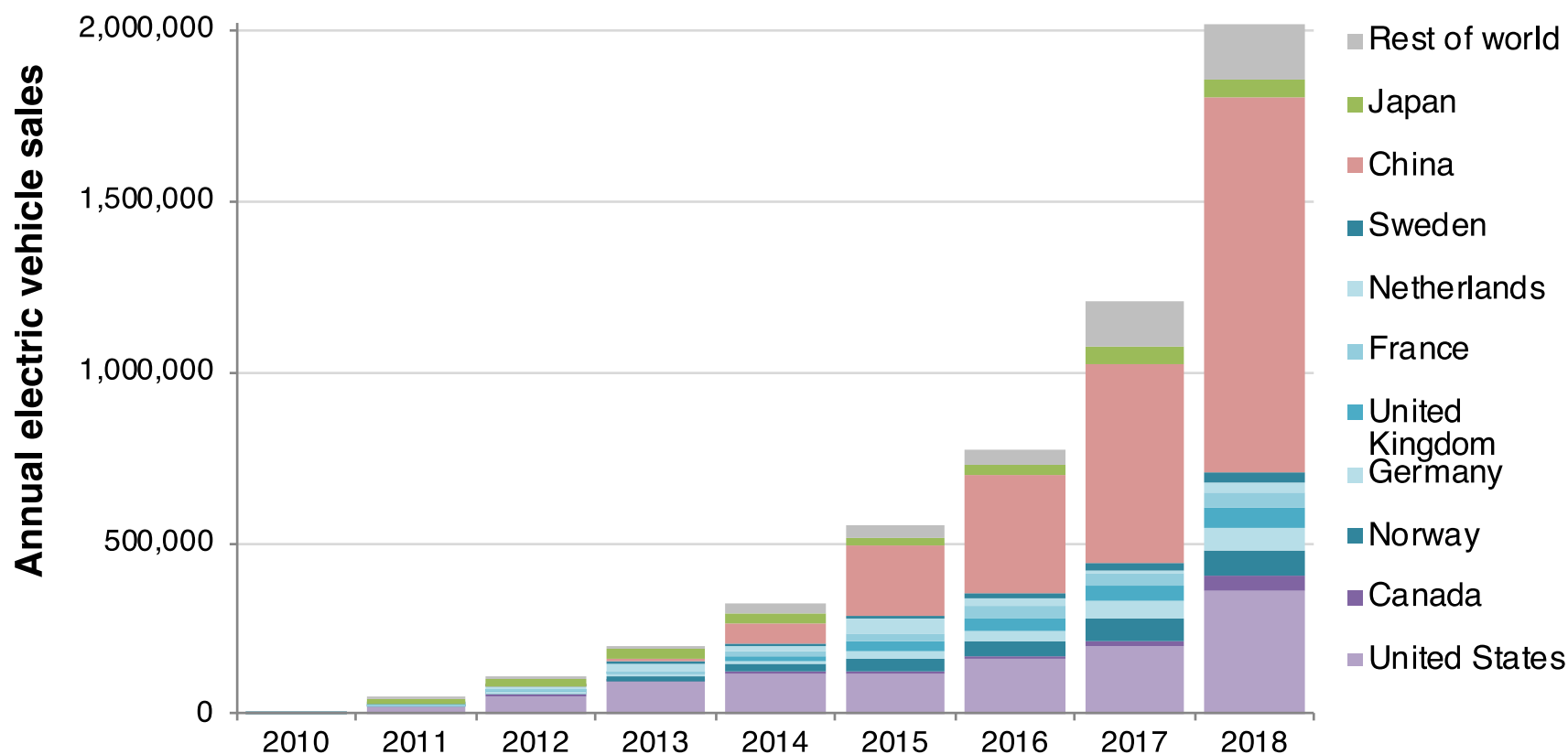
# Terms

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- Zero-emission vehicle (ZEV)
  - Refers to vehicles with zero tailpipe emissions; includes battery electric and hydrogen fuel cell vehicles.
- Battery electric vehicle (BEV)
  - Only has a battery and no gasoline engine.
- Plug-in hybrid electric vehicle (PHEV)
  - Has battery and electric powertrain capable of zero emissions; has a gasoline backup when the battery is depleted.
- Electric vehicle (EV)
  - Inclusive term for both BEVs and PHEVs.
- Internal combustion engine (ICE) vehicle
  - Any vehicle that derives all its energy from gasoline. Also called a conventional vehicle.

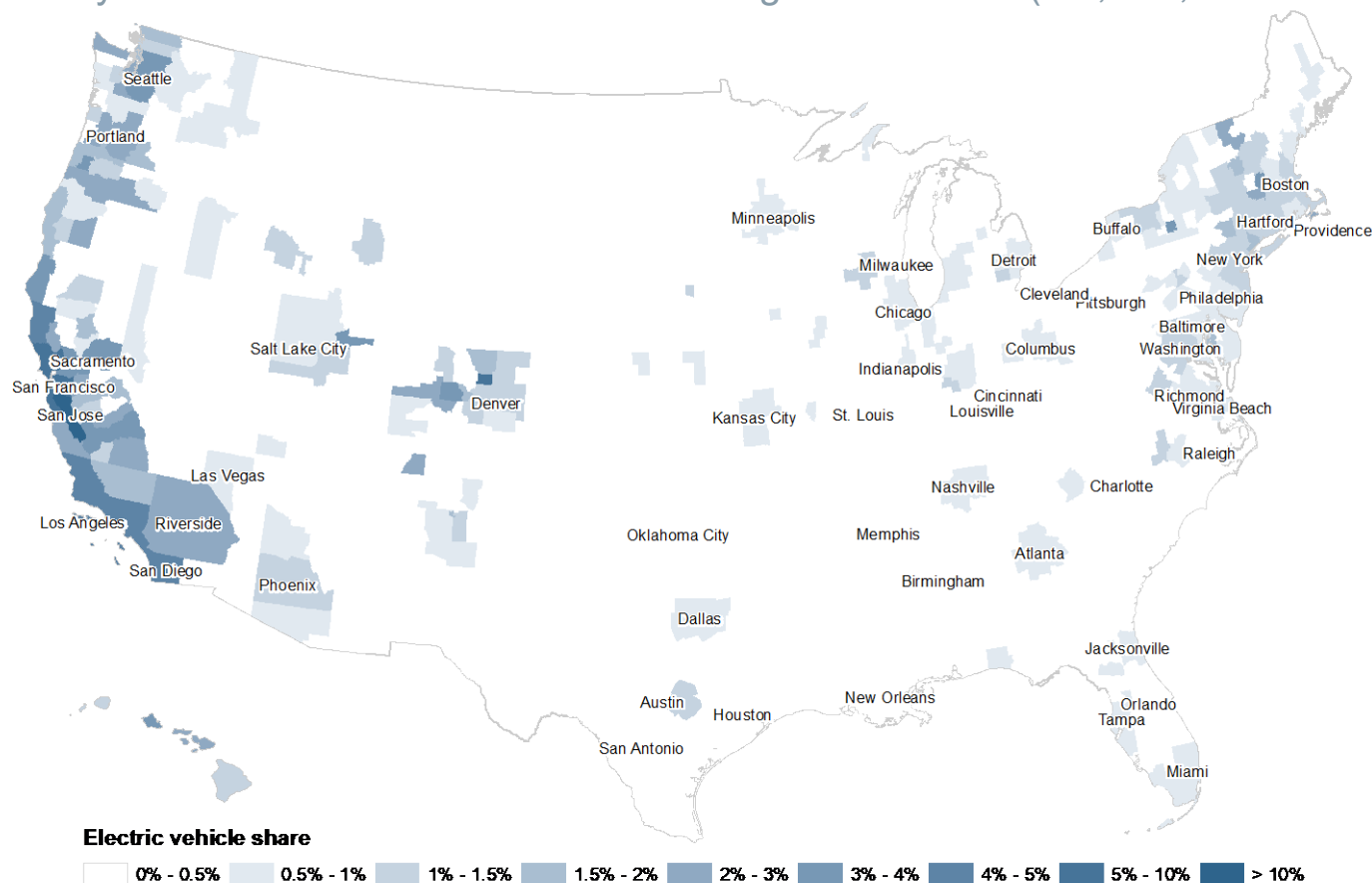
# Electric vehicles are rapidly gaining market share worldwide

- Through 2018, cumulative global EV sales passed 5 million
  - Mostly the sales are in China, U.S., and Europe
  - These markets have a complex system of regulation, incentives, charging, local action



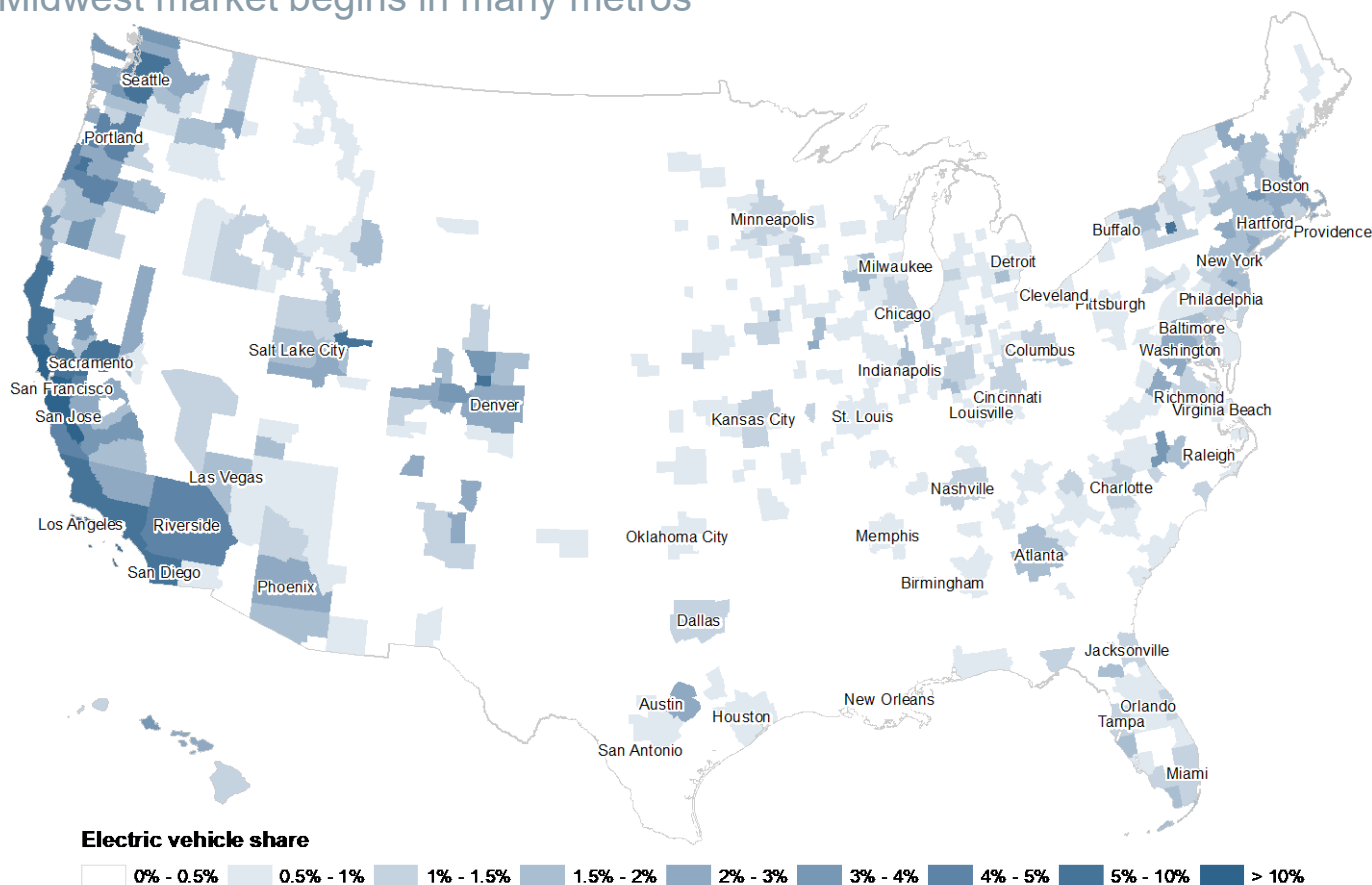
# Electric vehicle shares differ by region

- In 2017 EV uptake across 50 metro areas: Up to 13% of new vehicle sales
  - Uptake correlated with model availability, city/state policy, incentives, charging
  - Nearly two-thirds of EV sales are in ZEV regulation states (CA, OR, Northeast)



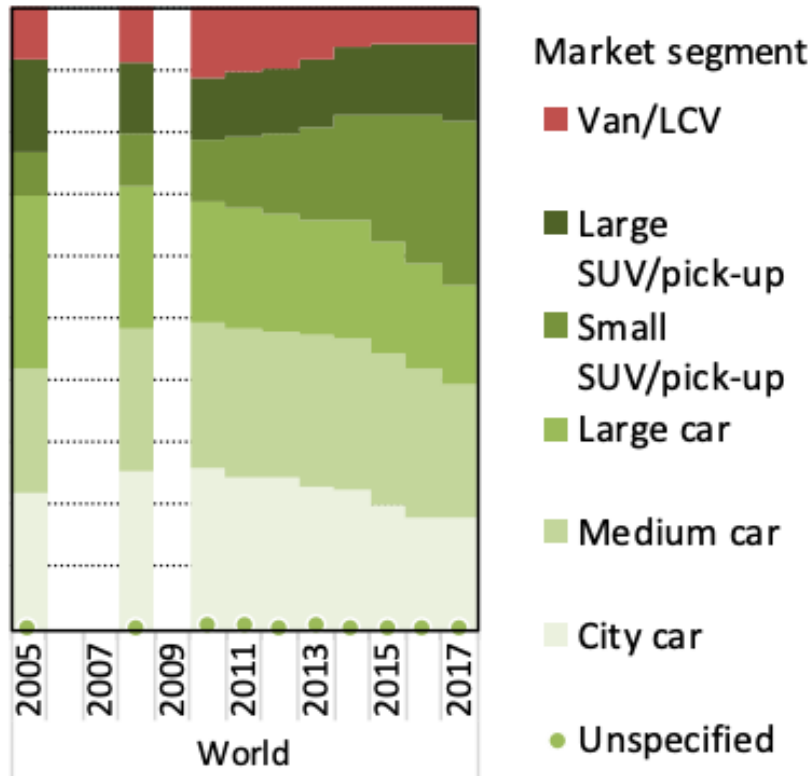
# Electric vehicle sales are reaching more markets in 2018

- In 2018 EV uptake across 50 metro areas: Up to 20% of new vehicle sales
  - Coasts continue to grow
  - Midwest market begins in many metros

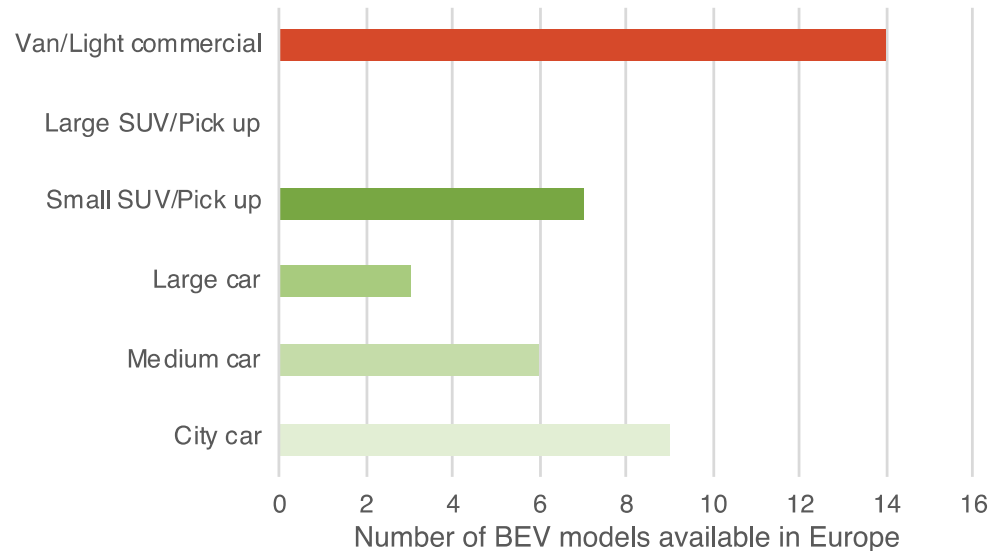


# The world is shifting to larger vehicles generally, but fully electric vehicles are mostly available in smaller segments

Conventional vehicle market sales share 2005 - 2017

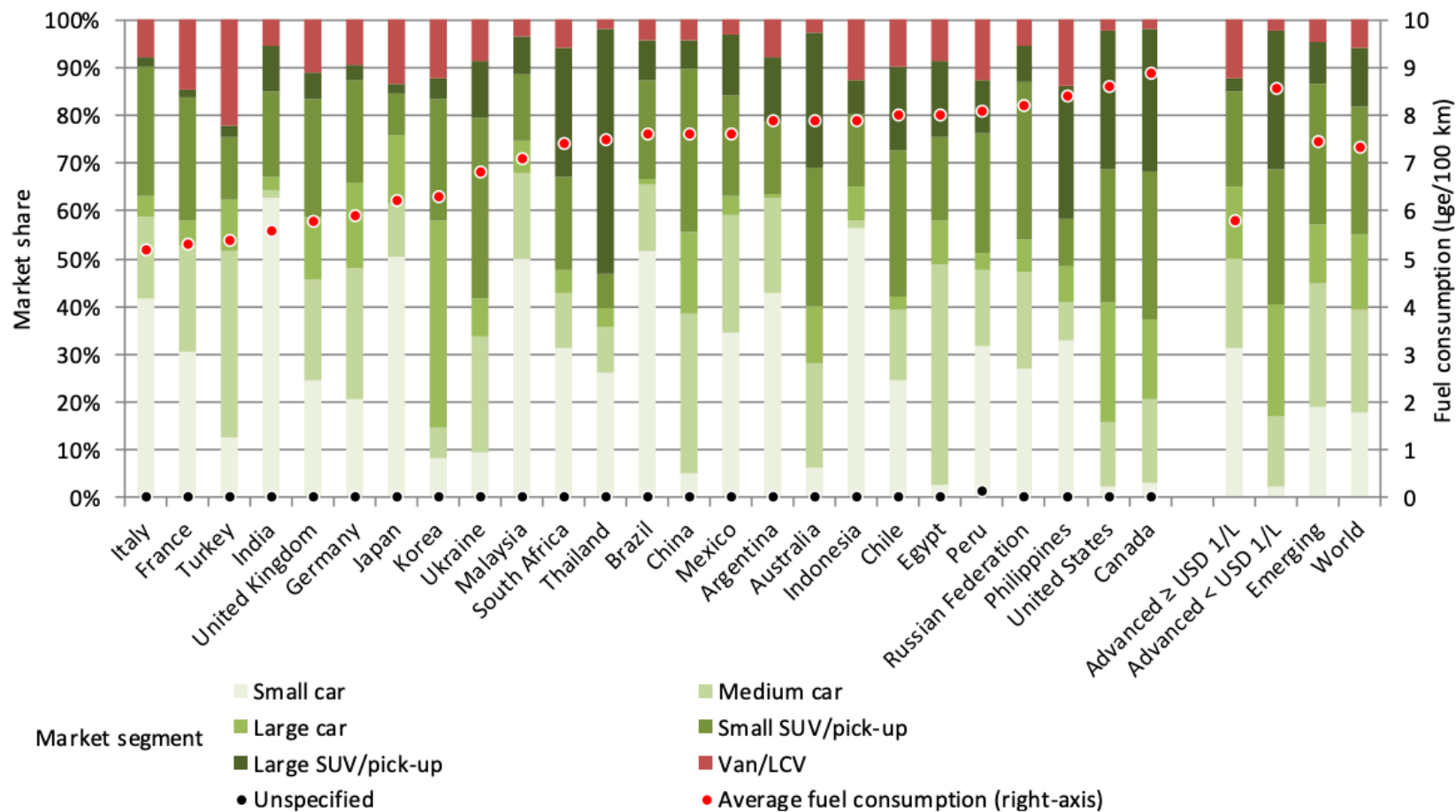


BEV models available in Europe 2018



International Energy Agency (IEA), 2019, (Fuel Economy in Major Car Markets: Technology and Policy Drivers 2005-2017). CC BY-NC-ND 3.0 IGO. ICCT, 2019, (Fuel Economy in Major Car Markets: Technology and Policy Drivers 2005-2017).

# Worldwide vehicle size preference differs by country making the transition to electric easier in countries with smaller vehicles



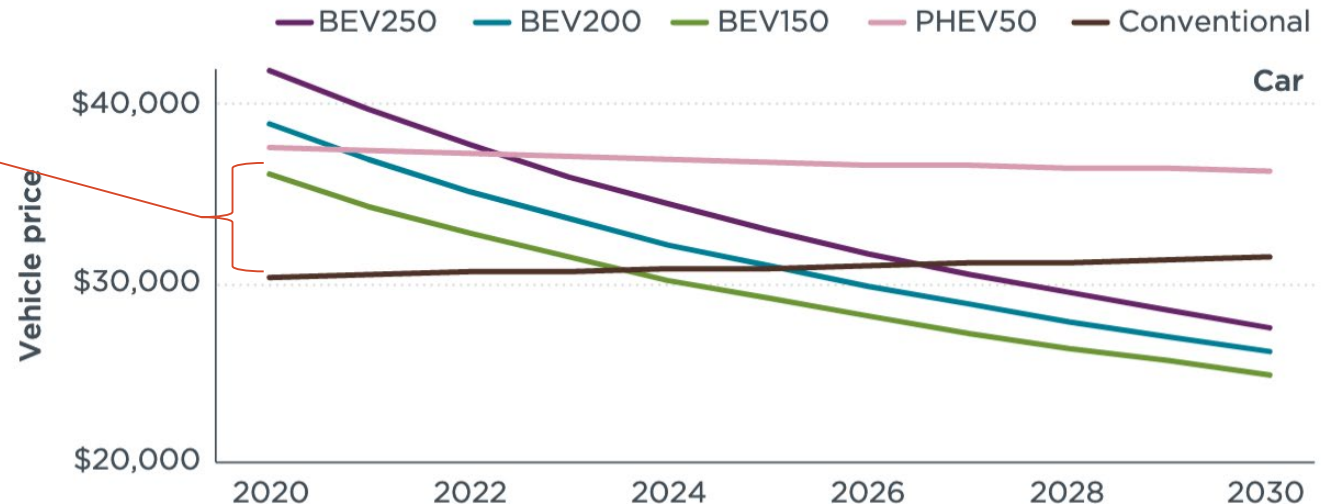
IEA, 2019, (Fuel Economy in Major Car Markets: Technology and Policy Drivers 2005-2017). CC BY-NC-ND 3.0 IGO.  
 IEA/ICCT, 2019, (Fuel Economy in Major Car Markets: Technology and Policy Drivers 2005-2017).



# When will EV costs reach purchase price parity with conventional gasoline vehicles?

- Purchase parity with conventional vehicle depends on vehicle range.
  - 150 mi (242 km) in 2023
  - 200 mi (323 km) in 2025
  - 250 mi (403 km) in 2027
- PHEVs will have a cost premium

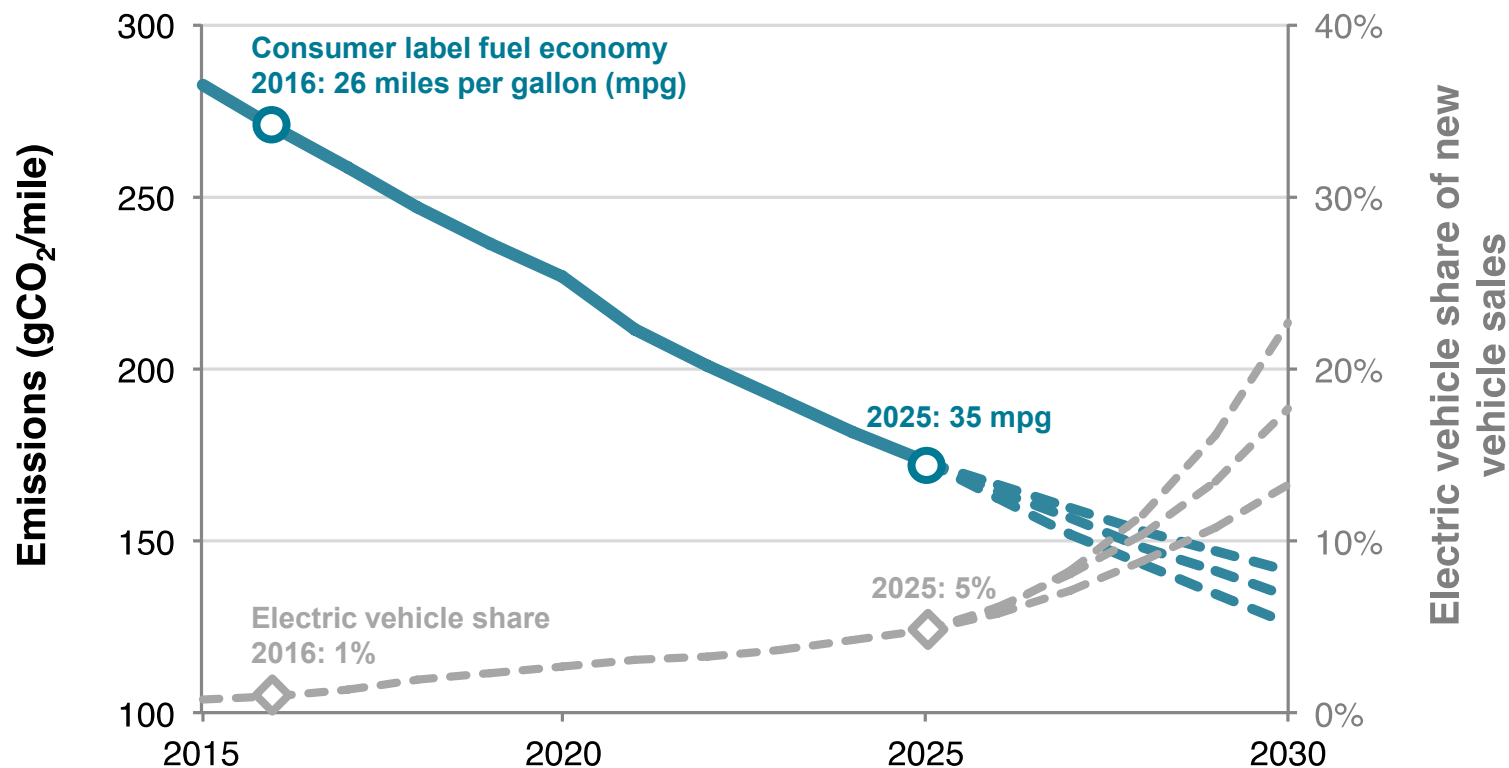
Role of incentives



Lutsey, N., and Nicholas, M (2019). [Update on electric vehicle costs in the United States through 2030](#) [Briefing]. Retrieved from the ICCT website.

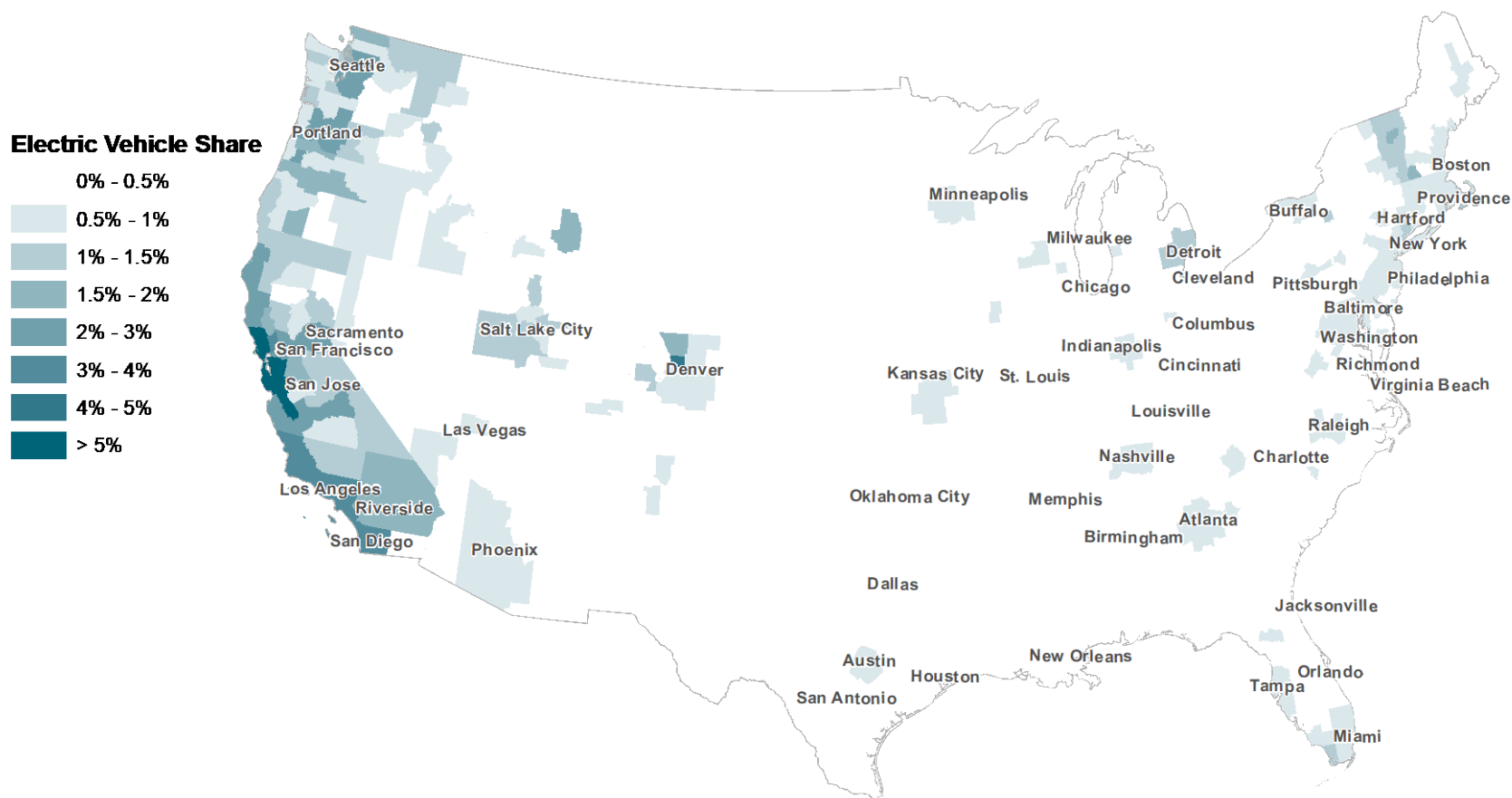
# Regulatory policy can drive technology

- Carbon dioxide (CO<sub>2</sub>)/efficiency regulations are essential for industry technology investments
- U.S. case: 5% electric vehicle penetration in 2025 → 13-23% in 2030

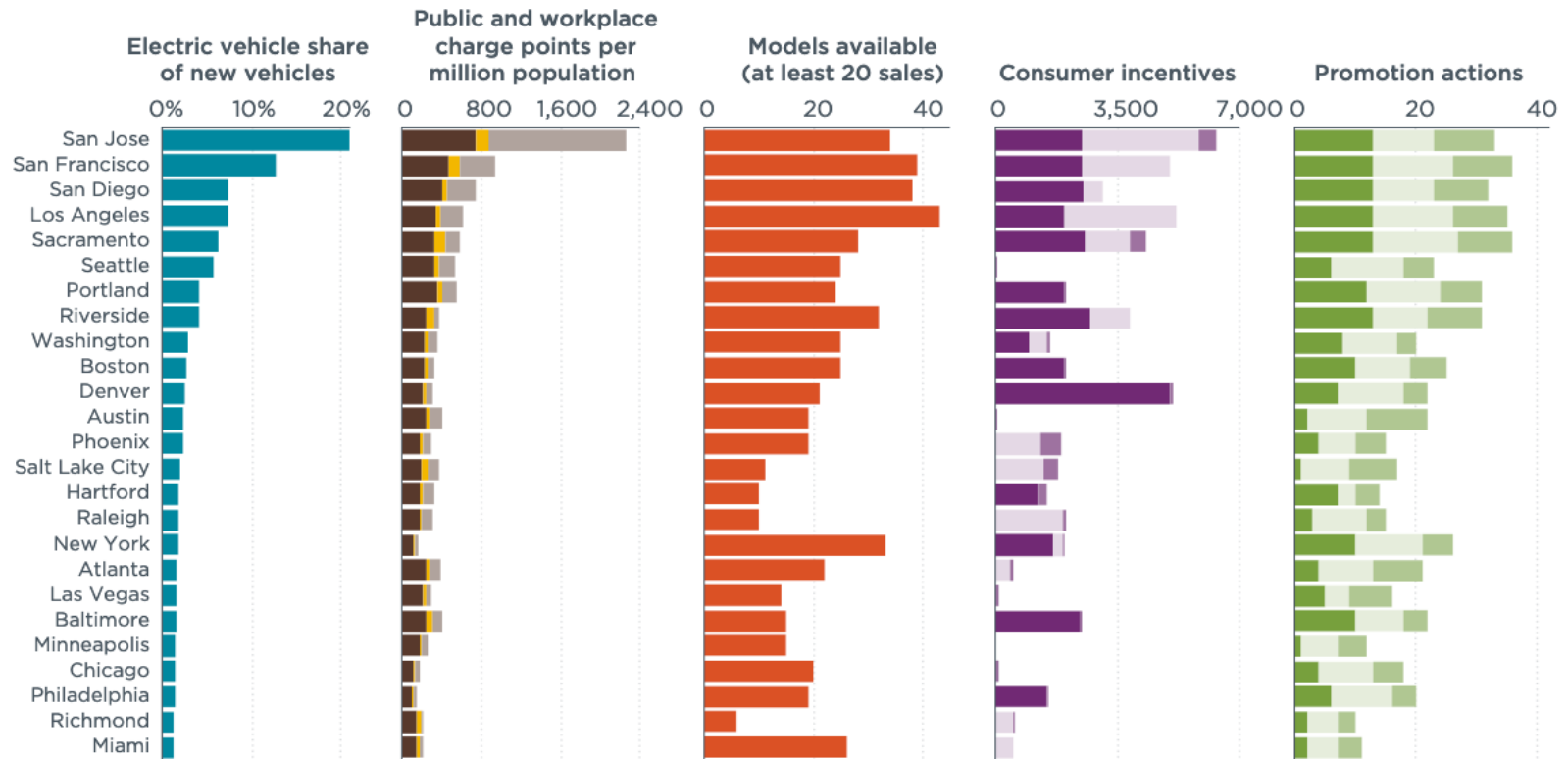


# What is driving electric vehicle uptake in the U.S.?

- California policies are working and increasingly getting adopted more widely
  - Top markets address prevailing barriers: Model availability (with ZEV regulation), cost (incentives), convenience (charging infrastructure), awareness (local actions)



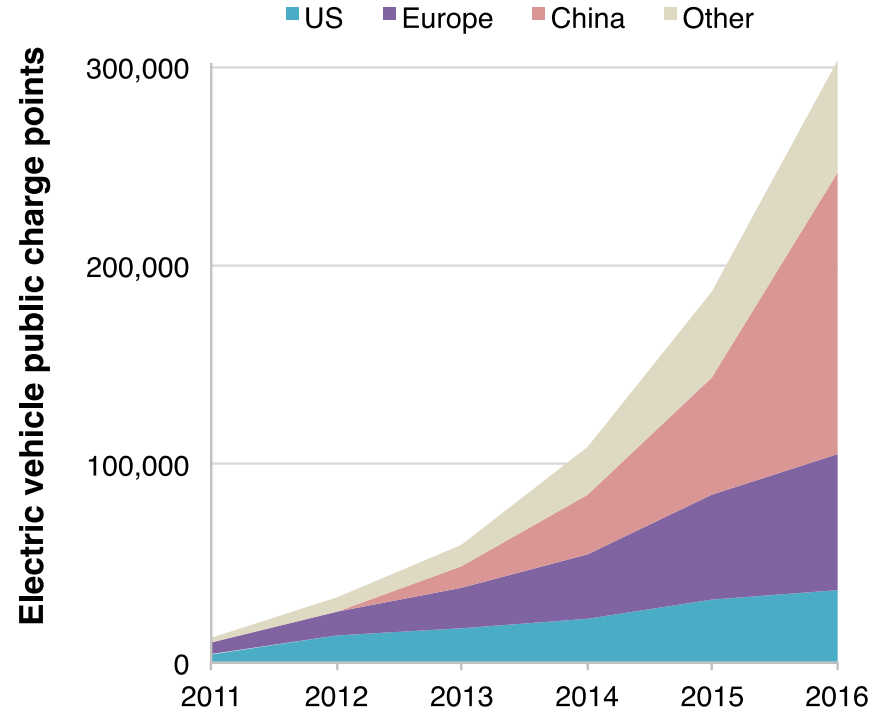
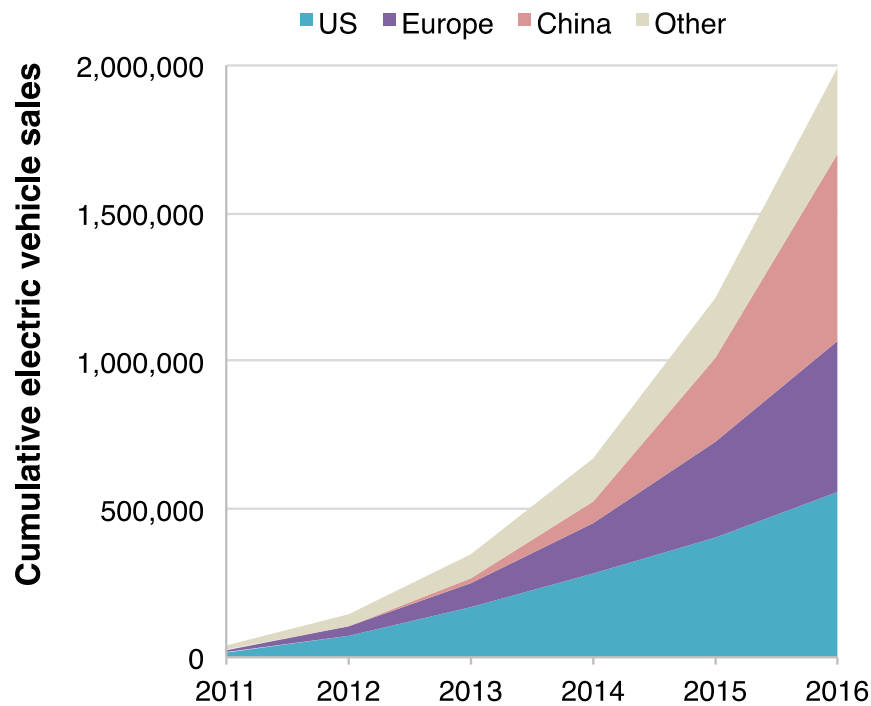
# Metropolitan areas with more EV sales share tend to have more chargers, EV models and promotion actions



**Figure 10.** 2018 electric vehicle uptake, charging infrastructure, model availability, incentives, and promotion actions in the 50 most populous U.S. metropolitan areas. (New vehicle registration data are from IHS Markit; charging infrastructure data are from PlugShare.)

# Electric vehicles and public charging have grown together globally

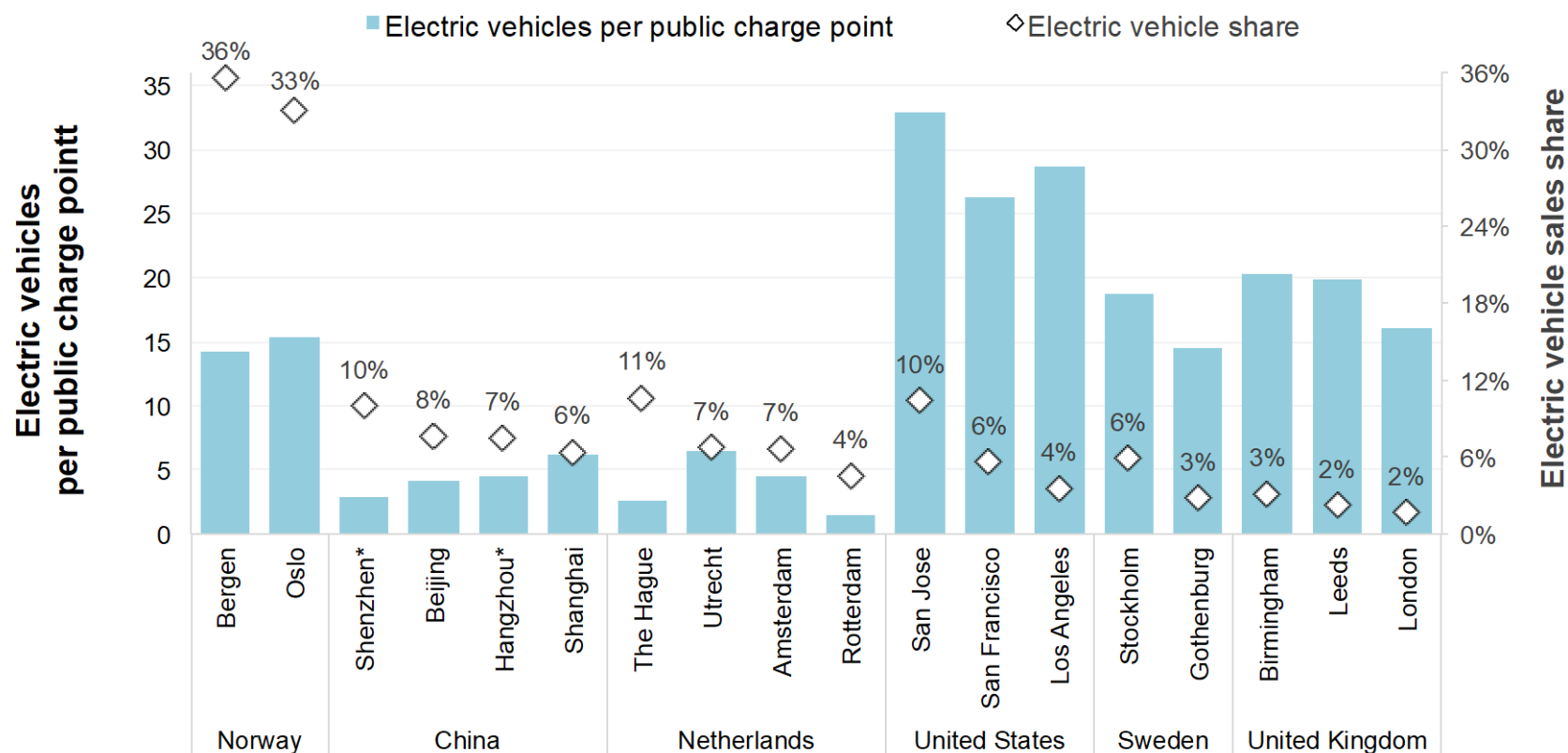
- At end of 2016: About 2 million electric cars and 300,000 public charge points





# Is there a global EV-per-public-charger benchmark?

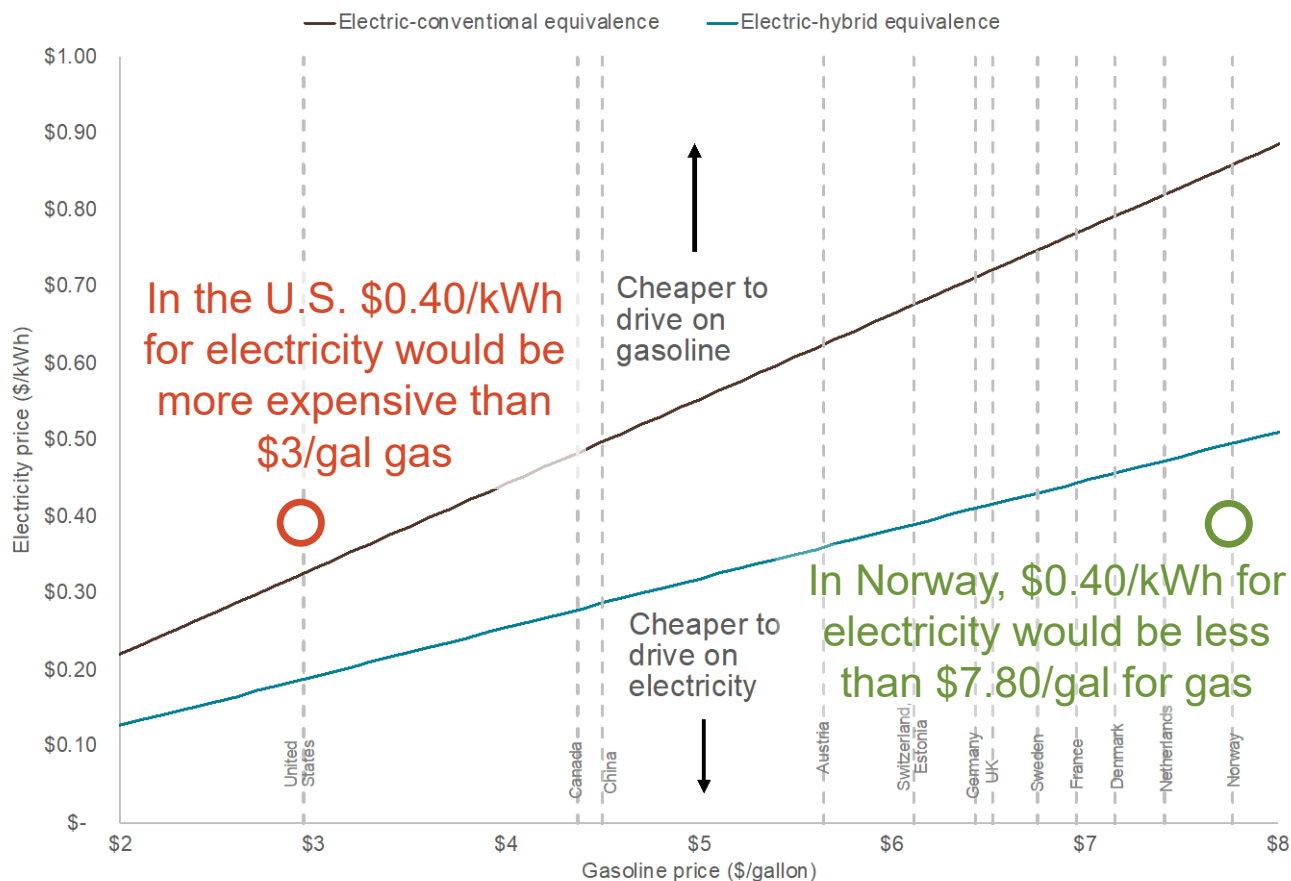
- Looking at the top EV markets, the EV-per-charger ratio varies greatly
  - China/Netherlands 2-7; Norway/Sweden/UK ~15-20; California ~30



# Utilities can charge more for electricity in countries with higher gasoline prices. Utilities must focus on energy cost reductions.

- Vertical lines indicate the price of gasoline by country
- Lines indicate the point at which driving on gasoline and electricity are equal
- The consumer value proposition depends on the price of difference of gasoline and electricity

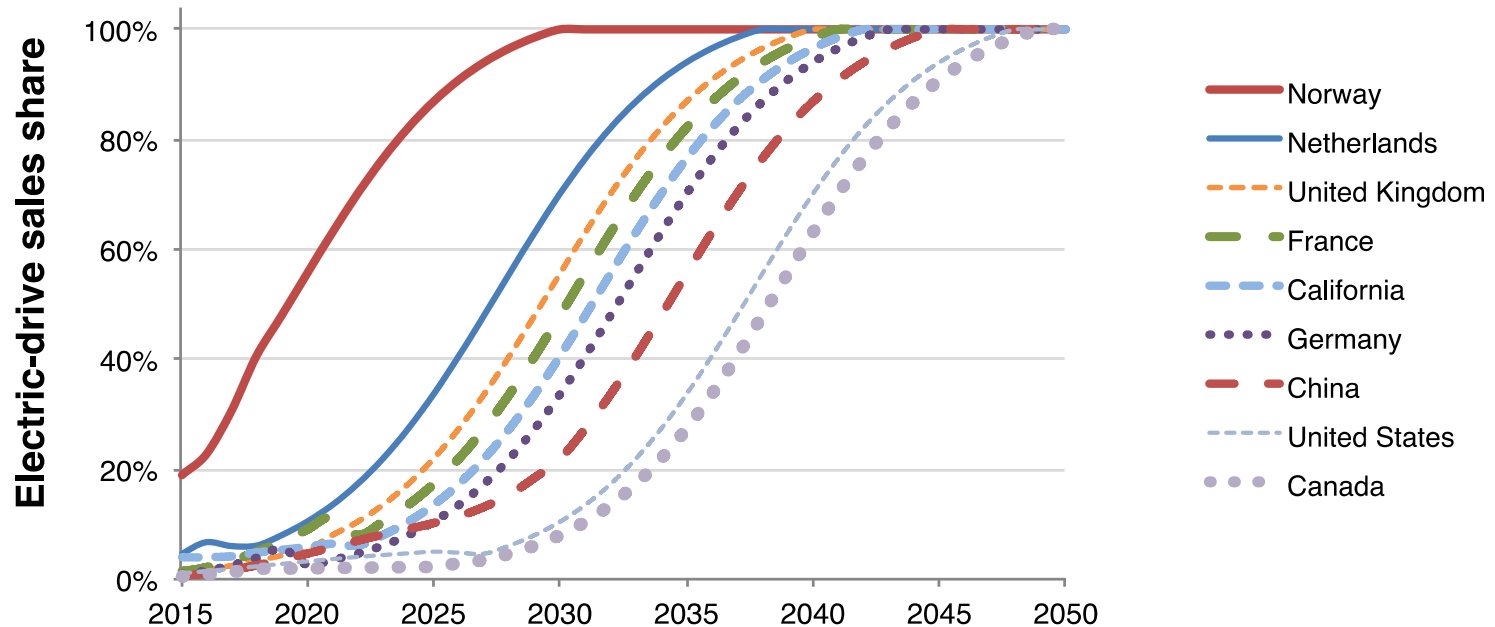
How much does electricity need to cost in order to be cheaper than driving a conventional or hybrid vehicle?





# The challenge: Transition to electric drive

- Major governments have signaled the need to fully transition to electric drive in the 2025 to 2050 timeframe to achieve climate, air quality, and energy goals
  - National: France, Germany, India, Netherlands, Norway, United Kingdom
  - States/Provinces: British Col., Calif., Conn., Maryland, Mass., New York, Oregon, Québec, Rh. Isl, Vermont
  - Cities: Many registration and circulation restrictions, low emission zones, discussions of bans



# Leading global EV markets keep innovating

- These 20 markets account for 40% of global electric vehicle sales
  - These areas represent just 3% of the world population and 8% of global vehicle sales
  - The markets have combination of national, state, city, and utility policies and actions



# Transformation is a combination of monetary and non-monetary actions across sectors and jurisdictions

Metropolitan area	State action														Local action														Utility action						Total actions (out of 40)										
	State ZEV program	State International ZEV Alliance participation	State low carbon fuel policy	State BEV purchase Incentive	State PHEV purchase Incentive	State Increased Incentive for low-income	State fee reduction or testing exemption	No state annual electric vehicle fee	State private charger Incentive, support	State public charger promotion	State parking benefit	State fleet purchasing Incentive	State manufacturing Incentive	State allows direct sales to consumers	City electric vehicle strategy	Streamlined EVSE permitting process	EV-ready building code	City vehicle purchase subsidy	City parking benefit	City EVSE Incentive, support	City carpool lane (HOV) access	City-owned EV chargers	Workplace charging	City electric carsharing program	City informational materials	City outreach events	City outreach events in low-income communities	City electric vehicle fleet target	City electric buses in public transportation	Utility charging pilot or other research	Utility public charging infrastructure	Utility public charging infrastructure in low-income communities	Utility time of use rates offered	Utility preferential EV rates		Utility EV or EVSE Incentive, support	Utility Increased Incentives for EVSE at multifamily properties	Utility info materials or outreach events	Utility EVSE informational materials for multifamily properties	Utility cost comparison tool	Utility electric vehicle fleet				
Los Angeles	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	34		
Sacramento	X	X	X	X	X	X		X	X	X	X	X	X		X	X		X			X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X			X	X	X	X	34
San Francisco	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X			X	X	X	X	34
San Jose	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X			X	X	X		X	X		X		X	X		X	X	X	X		X			X	X	X	X	32
Riverside	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X			X	X	X		X	X			X	X	X		X	X	X				X	X		X	X	X	31
San Diego	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X				X	X	X		X	X		X		X	X	X		X	X					X			X	X	X	29
New York	X	X		X	X		X	X	X		X		X	X	X	X		X			X	X	X	X	X		X		X			X	X					X			X		X	26	
Portland	X	X	X	X	X		X		X	X		X	X	X	X						X	X	X	X	X	X	X	X	X	X		X						X			X	X	X	26	
Boston	X	X		X	X		X	X	X		X		X		X		X		X			X	X	X	X	X			X	X		X							X			X	X	X	23

# Reflections and lessons learned

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- Global and U.S. experience show what it takes to launch the market
  - Regulation: Long-term CO<sub>2</sub> + EV regulations ensure investment, model availability
  - Incentives: Address short-term (~5 year) market cost barrier
  - Charging infrastructure: Provide convenience, consumer confidence, education
  - Utilities: Provide charging infrastructure (home, workplace, public) at low cost
  - Cities: Promote electric vehicles locally (urban restrictions, preferential access)
- Lessons learned on the transition to electric
  - Just one of the above actions is insufficient; comprehensive action needed
  - Stable regulatory/incentive policy is key; uncertain/shifting policy is disruptive
  - To grow charging infrastructure, encourage many stakeholders to engage

## Contact

Michael Nicholas: [m.nicholas@theicct.org](mailto:m.nicholas@theicct.org)

ICCT electric vehicle page: <http://theicct.org/electric-vehicles>

EV world capitals report: <http://www.theicct.org/publications/EV-capitals-of-the-world-2017>

U.S. city EV report: <http://www.theicct.org/leading-us-city-electric-vehicle-2016>

ZEV Alliance: <http://www.zevalliance.org>

## Acknowledgements

Work by Peter Slowik, Dale Hall, Hongyang Cui, Lingzhi Jin, Marissa Moultak, Nic Lutsey

Supported by ZEV Alliance governments, The 11th Hour Project of the Schmidt Family Foundation, the ClimateWorks Foundation, Josh and Anita Bekenstein

# Poll 3



# Transportation Electrification: States Rev Up

**Garrett Eucalitto**

Transportation Program Director

**Matt Rogotzke**

Policy Analyst

National Governors' Association





# Transportation Electrification: States Rev Up

EPA Webinar on Electric Vehicle Trends  
October 24, 2019

Garrett Eucalitto  
Program Director  
Energy, Infrastructure &  
Environment Division  
National Governors Association

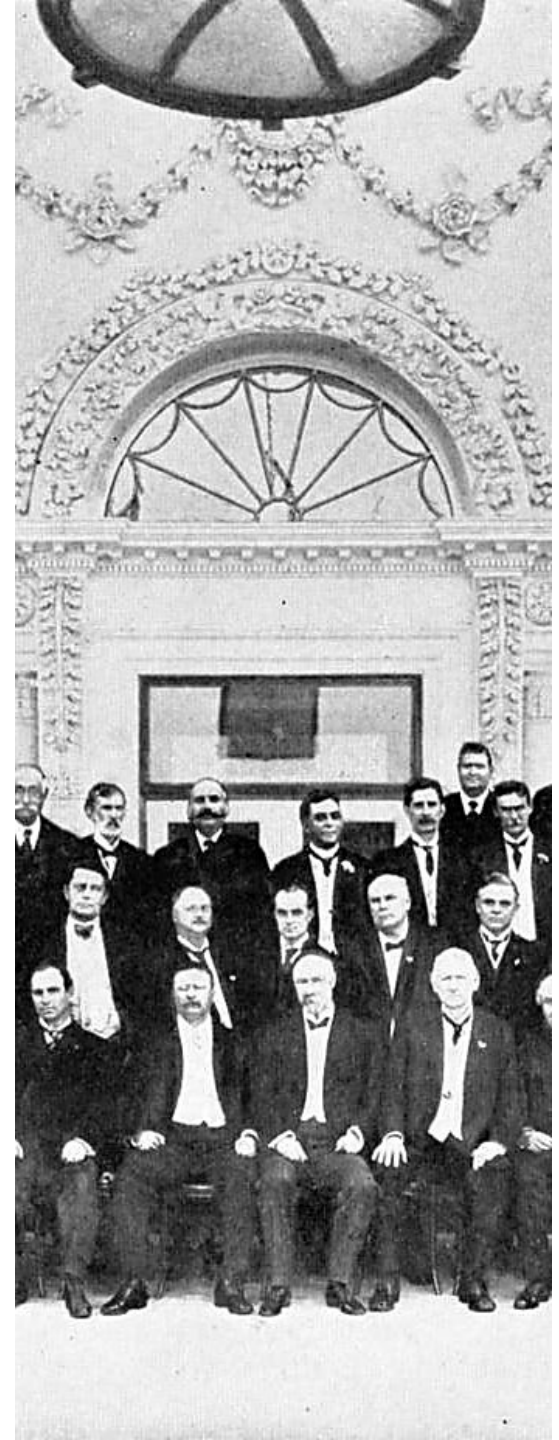
Matt Rogotzke  
Policy Analyst  
Energy, Infrastructure &  
Environment Division  
National Governors Association



# What is NGA?

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Founded in 1908, the National Governors Association (NGA) is the collective voice of the nation's governors. Our members are the governors of the 55 states, territories and commonwealths. NGA provides governors and their staff with services that range from representing states on Capitol Hill and before the Administration to developing and implementing innovative solutions to public policy challenges through the NGA Center for Best Practices.



# Energy, Infrastructure and Environment (EIE) Division



- Resource for Governors
- Research & Policy Analysis
- Technical Assistance
- Convenings and Workshops

[NGA | Energy, Infrastructure & Environment](#)

# Transportation Technologies of Focus



RIDE-HAILING AND  
CAR-SHARING



**ELECTRIC VEHICLES**



CONNECTED AND  
AUTONOMOUS  
VEHICLES



UNMANNED  
AERIAL  
VEHICLES  
/DRONES

# Why Governors Are Interested



# Benefits from Electrified Transportation



**LOWERING & SHIFTING EMISSIONS**



**ELECTRICITY MARKET BENEFITS**



**MINIMIZING HOUSEHOLD EXPENSES**



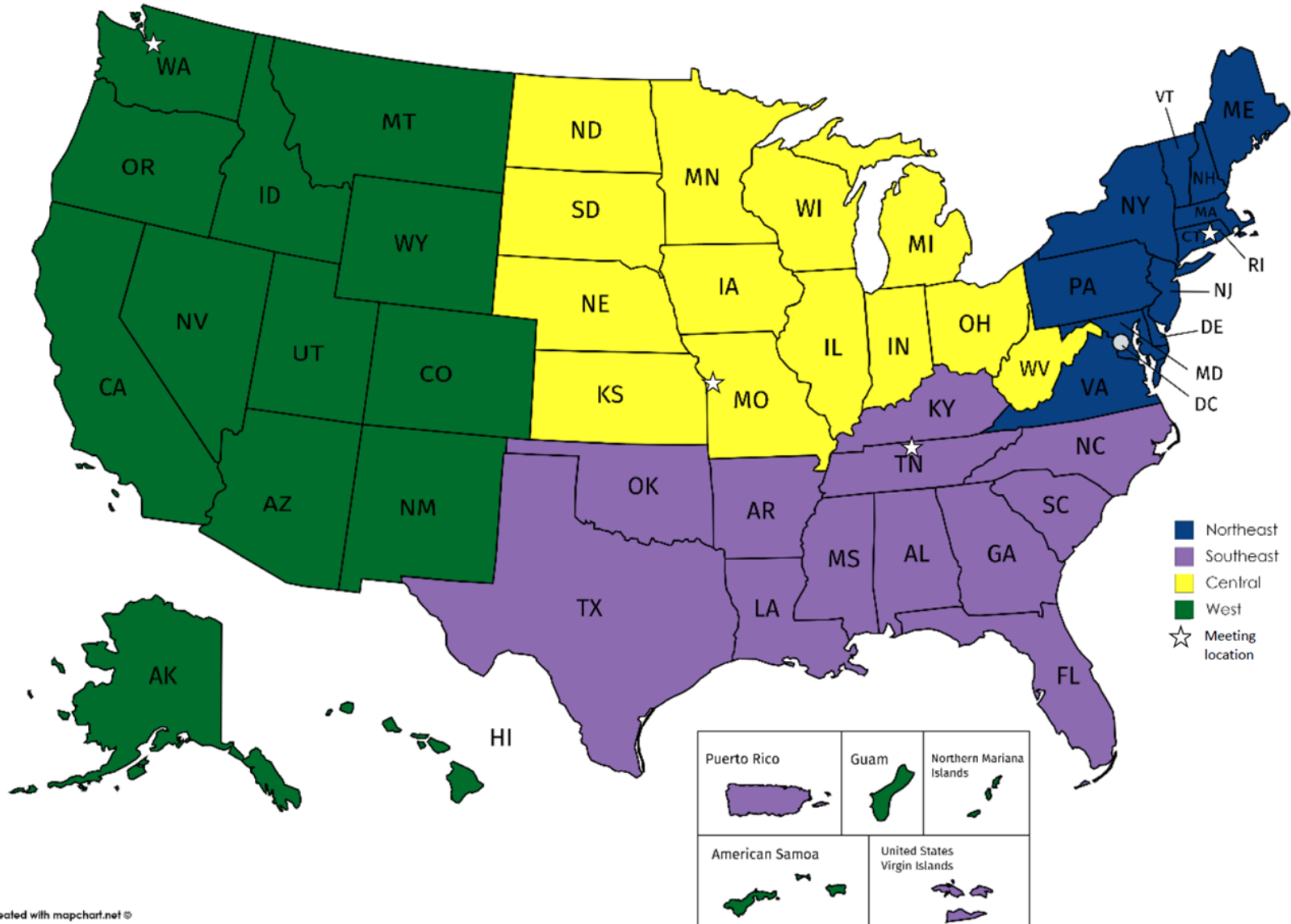
**REDUCING PETROLEUM DEPENDENCE**



# What We Did



# Regional Transportation Electrification Workshops



Created with mapchart.net ©

# State Policies to Encourage Electric Vehicles





# Terms

- CHEAPR – Connecticut Hydrogen and Electric Automobile Purchase Rebate
- EV – Electric vehicle
- EVSE – Electric vehicle supply equipment
- PHEV – Plug-in hybrid electric vehicle
- TOU – Time-of-Use
- VW – Volkswagen
- ZEV – Zero-emission vehicle

# State EV Incentives

State	Incentive
California	\$2,500 EV rebate, up to \$4,500 based on income eligibility
Connecticut	\$2,000 EV rebate
Colorado	\$5,000 tax credit
Delaware	\$3,500 EV rebate
Louisiana	\$2,500 income tax credit
Maryland	\$3,000 excise tax credit for new EV purchases
Massachusetts*	\$1,500 EV rebate
New York	\$2,000 EV rebate
Oregon	\$2,500 EV rebate
Pennsylvania	\$1,750 EV rebate

# California



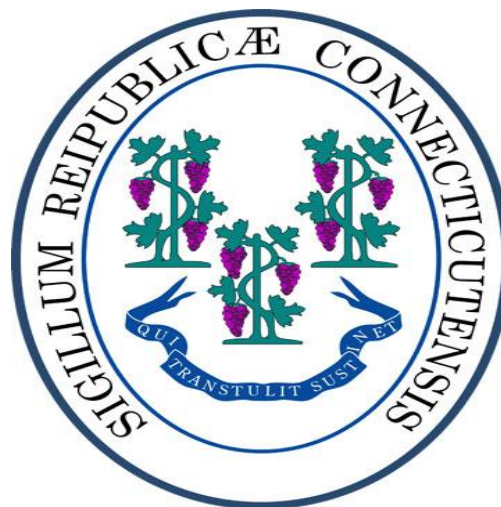
- \$2,500 EV purchase rebate, can increase to \$4,500 given income eligibility
- 5 Million EVs on the road by 2030 – 2018 Executive Order
- ZEV multi-state Task Force – mandates 1 million EVs on the road by 2023
- Many utilities offer EVs and charging rebates
- Incorporates EVSE into building standard codes

# Colorado



- Offers a \$5,000 tax credit for eligible EV purchases – the highest tax credit of any state
- Offers grants for EVs and EVSE – 80% of EV cost, up to \$8,260, 80% of EVSE cost, up to \$6,260
- Governor Polis issued his first Executive Order to advance EV adoption. Revises use of VW funds to focus investment on transportation electrification
- 940,000 EVs on the road by 2040

# *Connecticut*



- Up to \$2,000 EV rebate – depends on battery range
- Provides funding for 50-100% of EVSE costs (up to \$10,000 per site) depending on program alignment
- CT Green Bank offers low-interest loans up to \$30,000 for EV buyers. Also available for EVSE purchases
- New registration fee for all vehicles to help pay for the CHEAPR program



WHITE PAPER

# Transportation Electrification: States Rev Up

**NGA** NATIONAL GOVERNORS ASSOCIATION  
444 N. Capitol Street NW, Suite 267 | Washington, DC 20001 | 202.624.5300 | [NGA.org](http://NGA.org)

# EV White Paper



# *Crafting Incentives and Policies*

What's the priority?

- ▶ Engage automakers
- ▶ Build consumer awareness
- ▶ Meet ZEV targets
- ▶ Incentivize auto dealers
- ▶ Structure incentives equitably
- ▶ Utilize VW settlement funding

# *Enhancing State Fleet Electrification*

What can states do?

- ▶ Use VW funds to overcome high upfront costs
- ▶ Offer vouchers for EV deployment
- ▶ Establish action plans



# *Siting Charging Infrastructure*

What were states saying?

- ▶ Address range anxiety
- ▶ Engage Electrify America
- ▶ Identify charging needs

# *Improving Regional Coordination*

- ▶ Establish Alternative Fuel Corridors
- ▶ Participate in regional collaboratives
- ▶ Open rest areas for EVSE

# *Who Owns, Operates and Pays for EVSE*

- ▶ Deploy make-ready installations
- ▶ Own and operate installations
- ▶ Provide financial incentives
- ▶ Determine if EVSE should be regulated as a public utility

# *Managing the Grid*

- ▶ Shift energy peaks through TOU rates
- ▶ Explore vehicle-to-grid technology
- ▶ Engage utilities to ensure grid reliability

# *Electrification for All*

## How can everyone benefit?

- ▶ Design rebates through tiered-income structures
- ▶ Set aside VW funding for EVSE in low-income communities
- ▶ Support public awareness campaigns
- ▶ Include rural areas in charging buildout

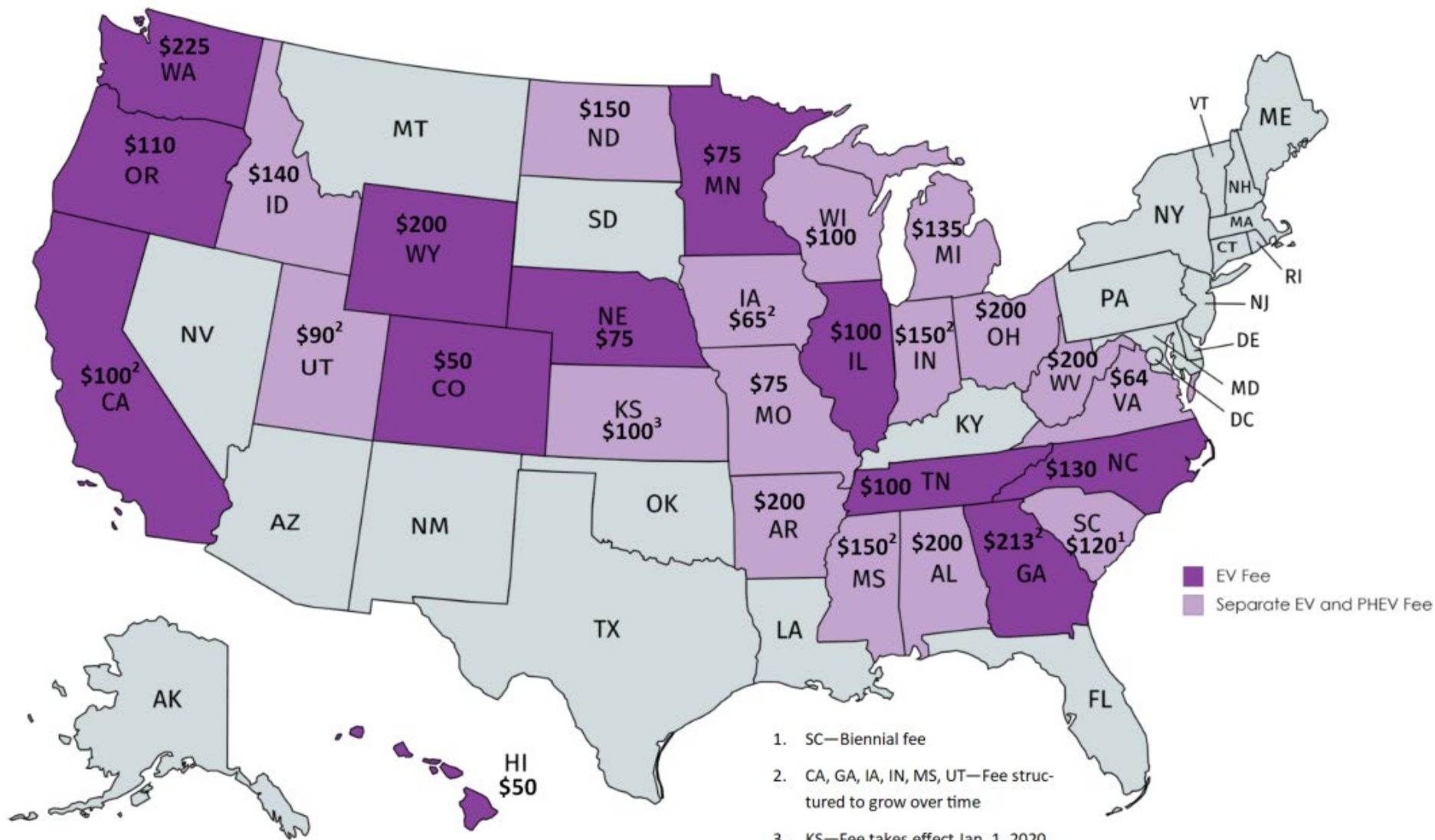
# *Addressing Impacts to State Revenue*

What's fair?

- ▶ 28 states have assessed EV fees
- ▶ Some are using fees to support EVSE
- ▶ Others are looking into road user charge

# State-Imposed Electric Vehicle Fees





Harto, C. & Baker-Branstetter, L. [“Rising Trend of Punitive Fees on Electric Vehicles Won’t Dent State Highway Funding Shortfalls but Will Hurt Consumers.”](#) Consumer Reports, Sep. 2019.



# Thank You

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# Question and Answer Session



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