



On the way to electric mobility:  
an international perspective on  
markets and EV charging

**Dr. Nic Lutsey**

Program Director, Electric Vehicles and fuels, ICCT

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# On the way to electric mobility: An international perspective on markets and electric vehicle charging

*Nic Lutsey*

*Agora Verkehrswende  
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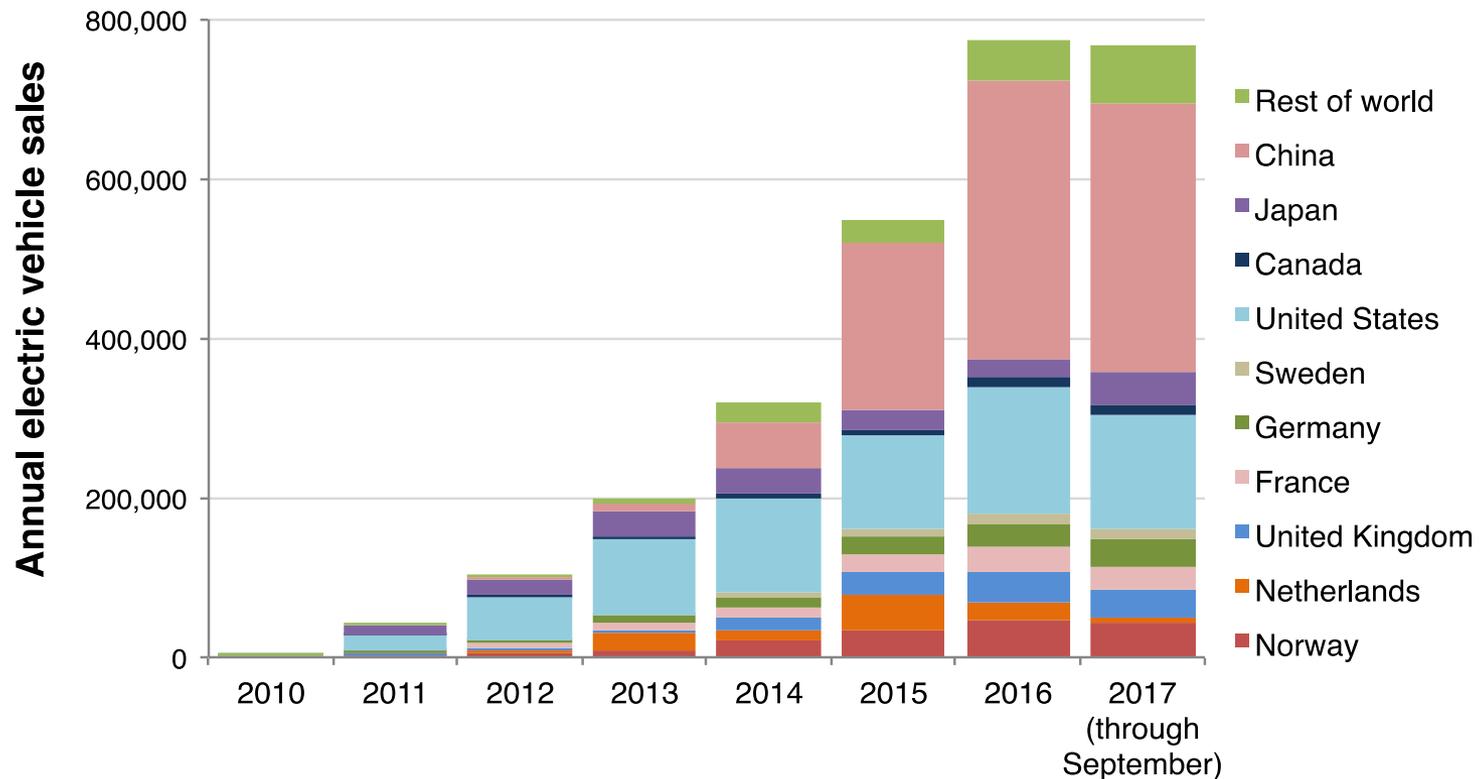
# Outline

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- Global developments
  - EV sales by region, by automaker; costs are dropping
- A few details from recent analysis
  - What is driving electric vehicle uptake in the U.S. markets?
  - How much public charging infrastructure is needed?
  - What can we learn from the top global EV markets?
- Reflections, lessons learned

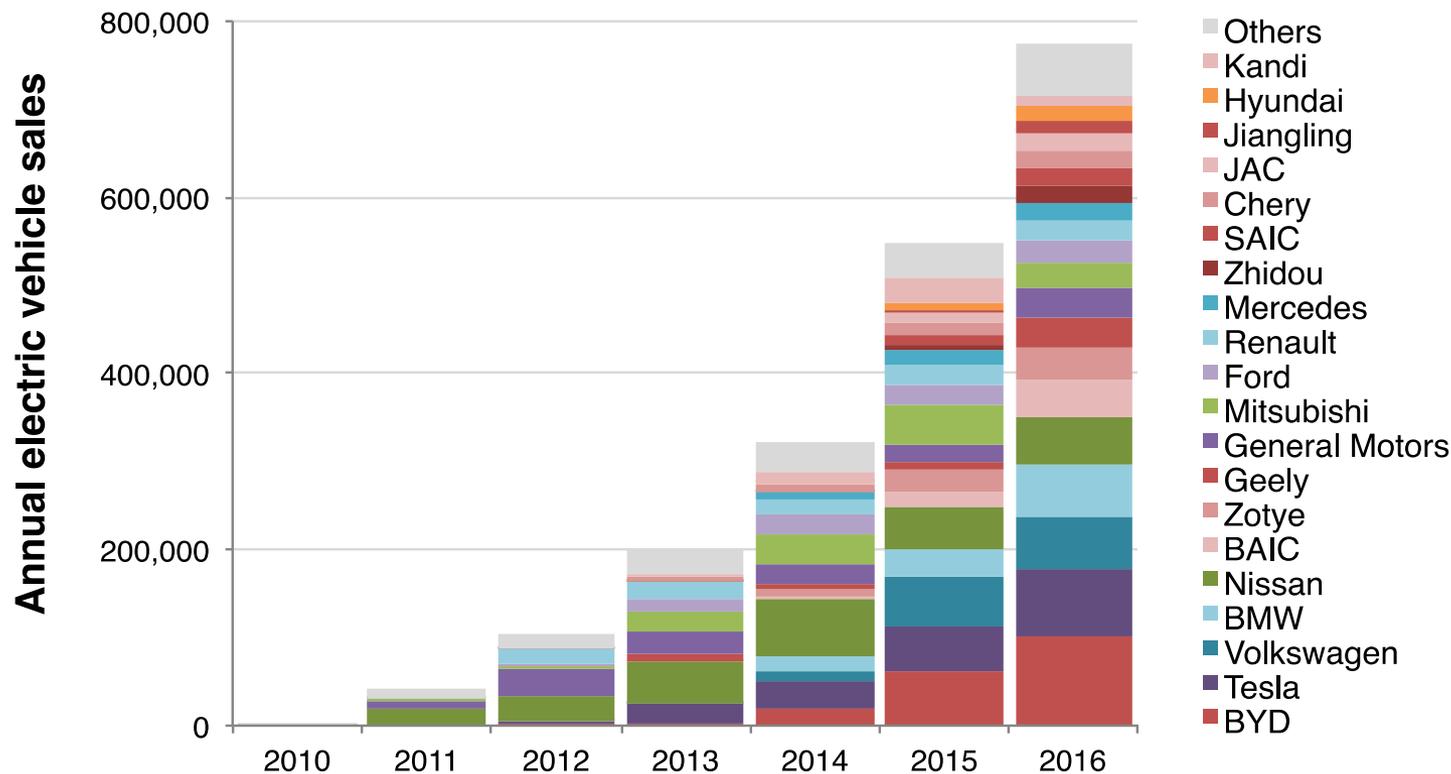
# Global electric vehicle sales

- Through September 2017, cumulative global EV sales passed 2.7 million
  - Mostly the sales are in China, U.S., and Europe
  - These markets have a complex system of regulation, incentives, charging, local action



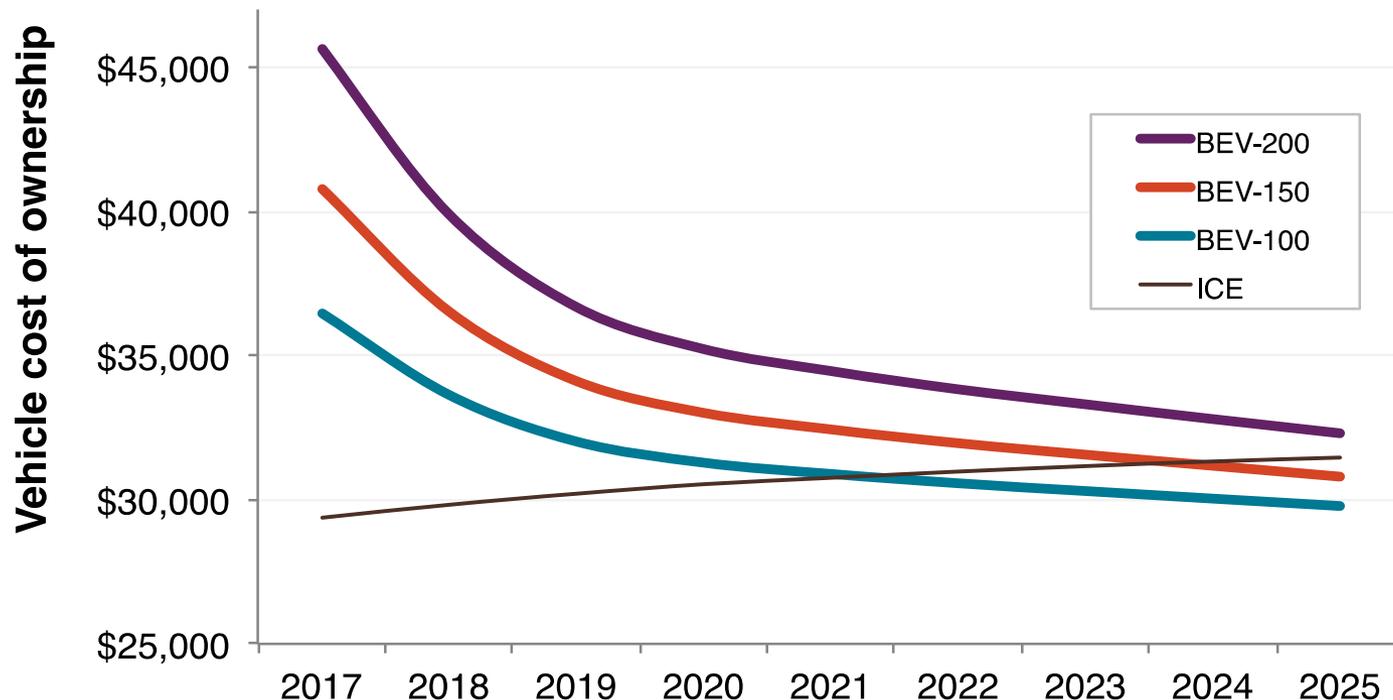
# Global electric vehicle sales, by automaker

- Most major automakers now in the game: 15 with 20k+ annual sales
  - Global annual 2015 to 2016 electric vehicle growth ~40%
  - Battery production more concentrated (5 companies make up 3/4 of production)



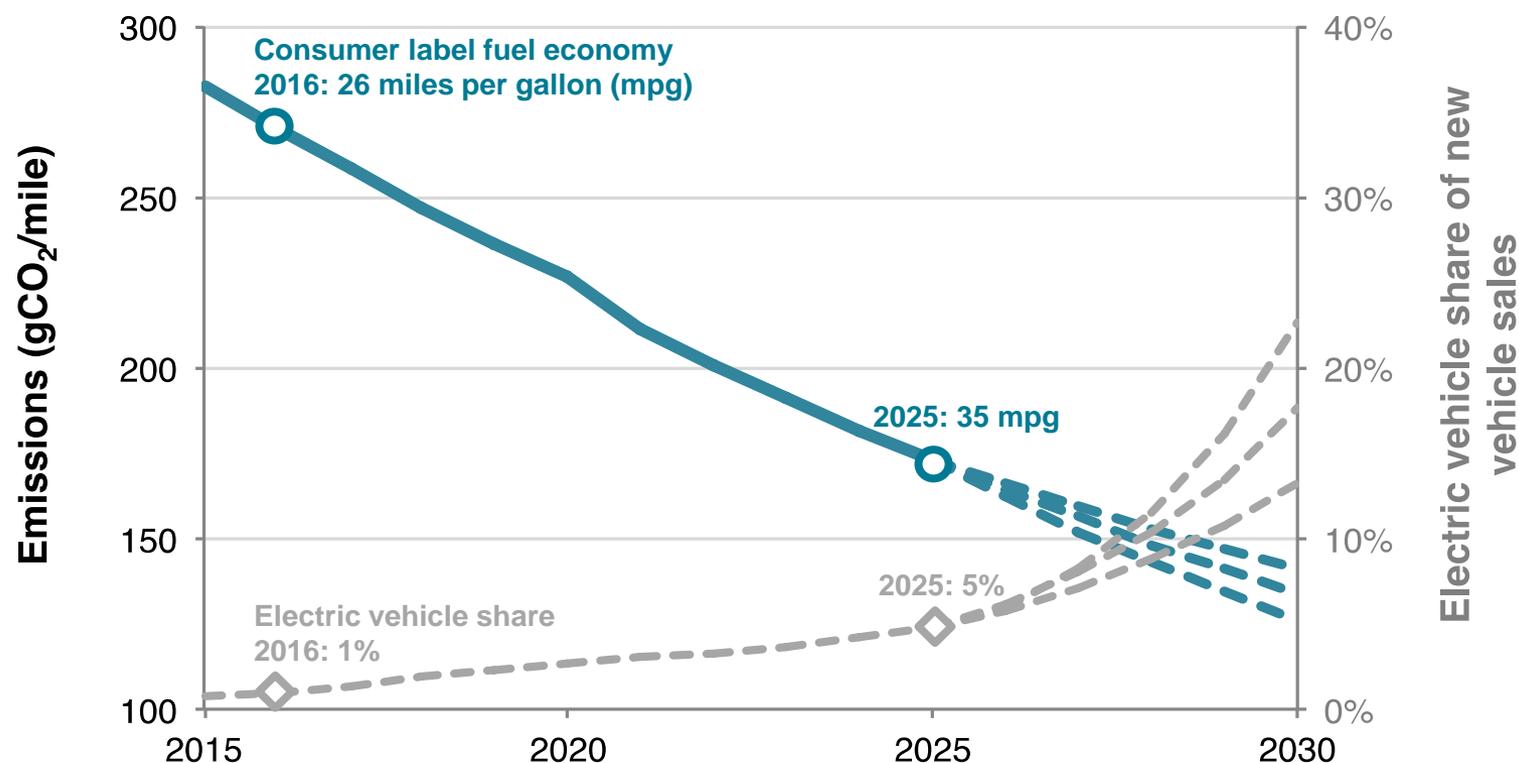
# Opportunity: Electric vehicle costs are dropping

- Supplier competition, innovation, and volume → cost are dropping
  - Short- (100 mi) and medium-range (150 mi) EVs become cost competitive before 2025



# Regulatory policy drives technology

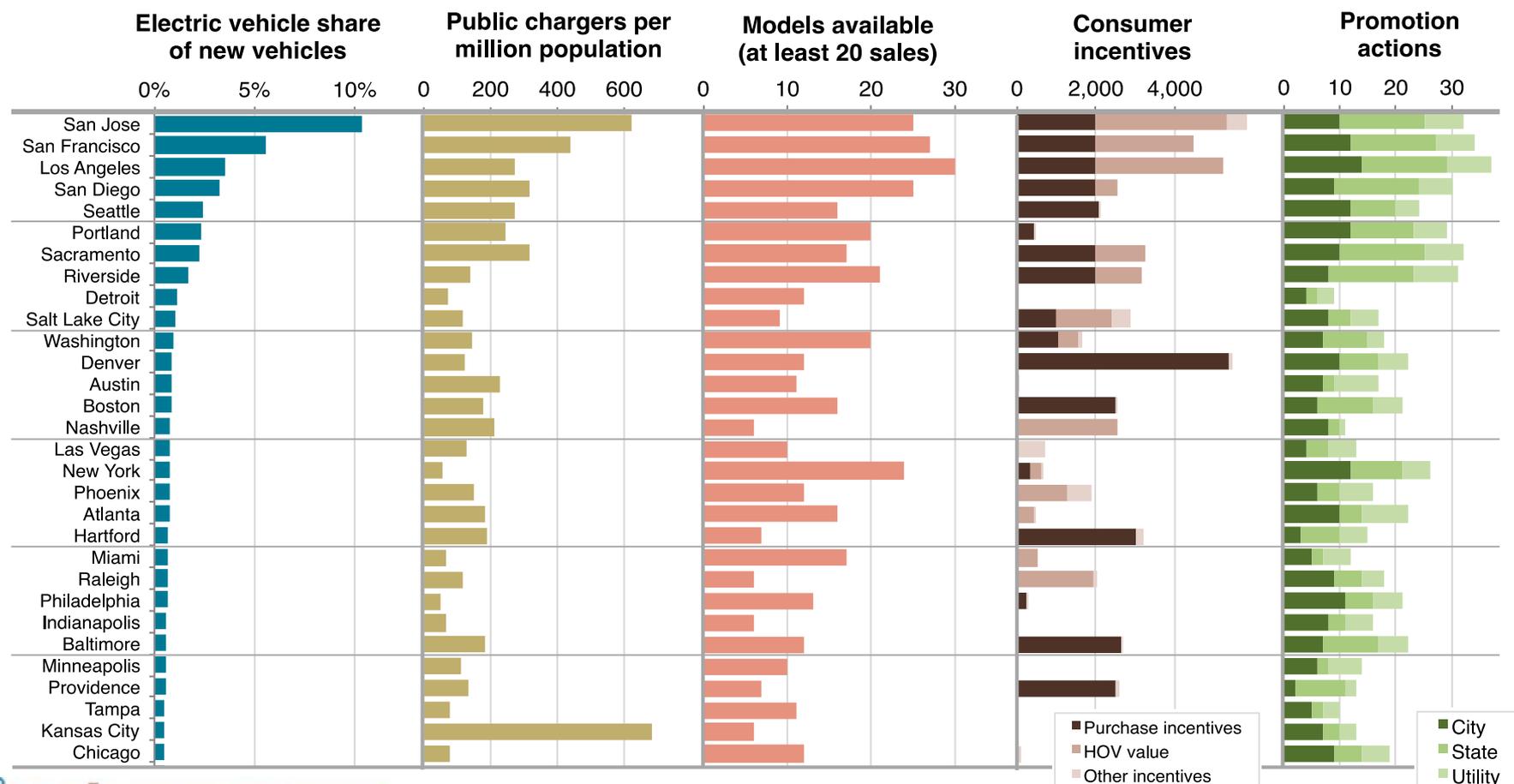
- CO<sub>2</sub>/efficiency regulations are essential for industry technology investments
- U.S. case: 5% electric vehicle penetration in 2025 → 13-23% in 2030





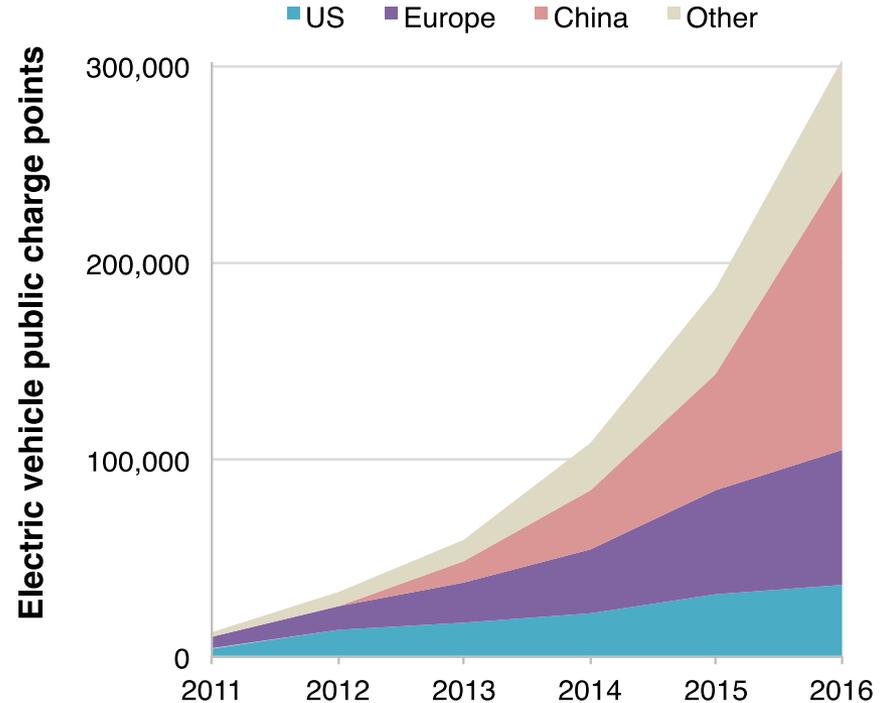
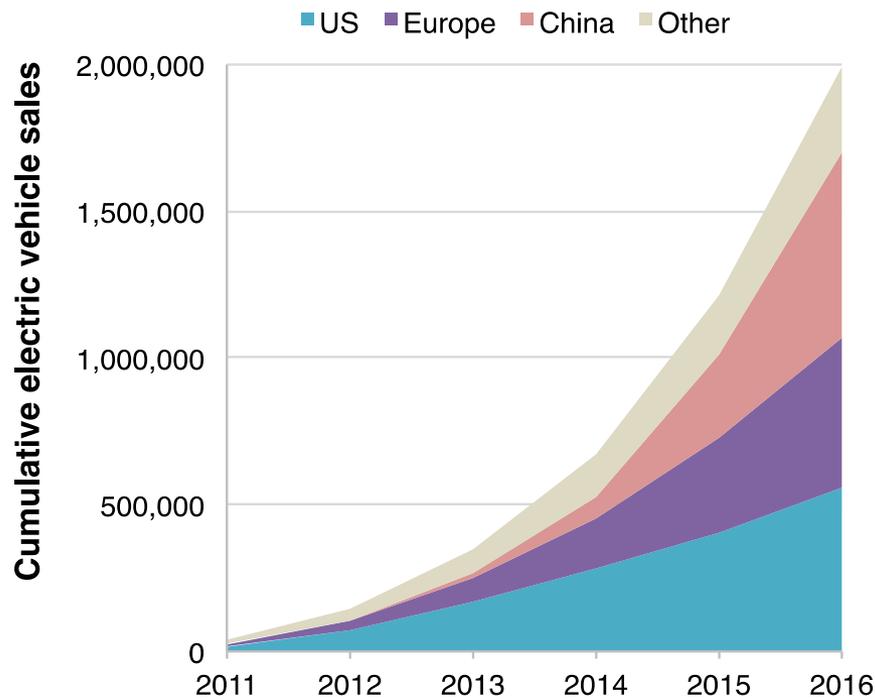
# Electric vehicle uptake and underlying factors in the U.S.

- Leading markets tend to have more extensive public charging, more EV models, greater consumer incentives, and more local promotion actions



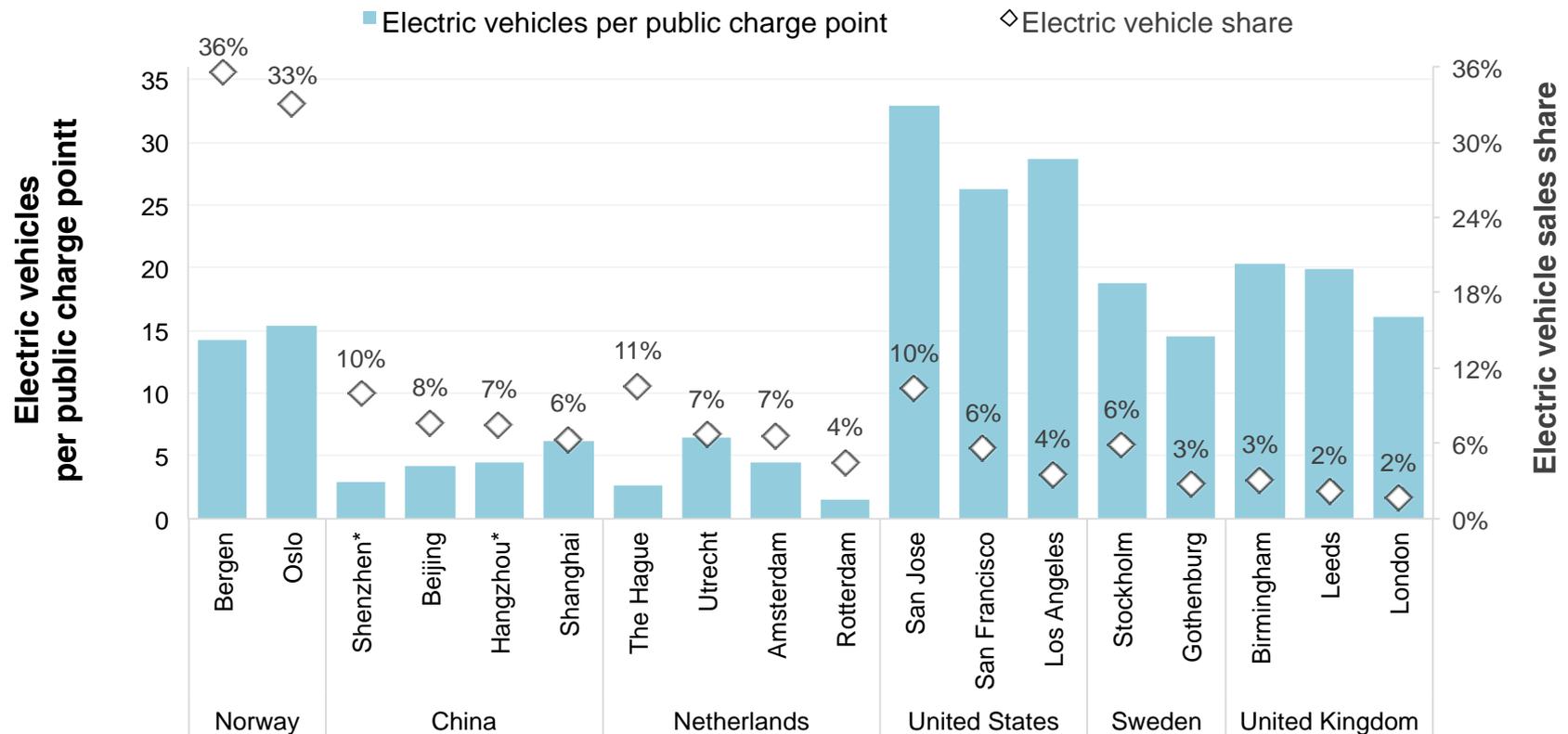
# Electric vehicles and public charging have grown together globally

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



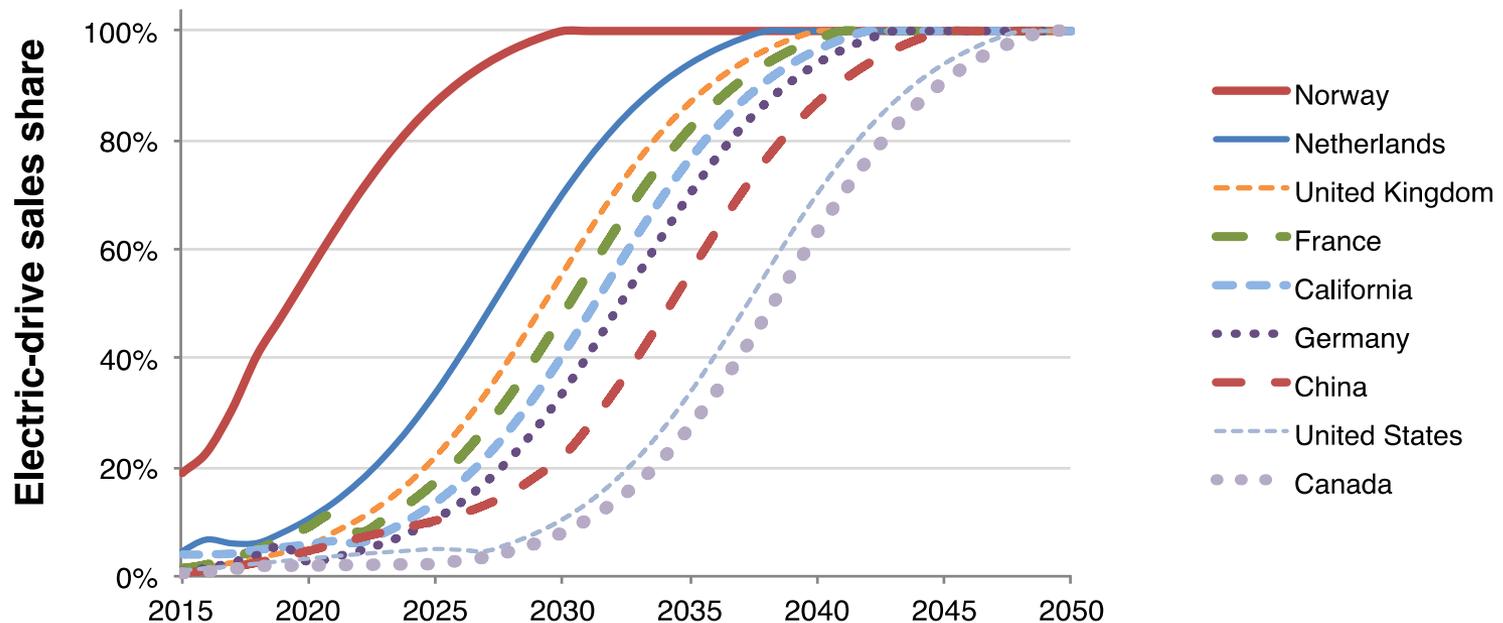
# Is there a global EV-per-public-charger benchmark?

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

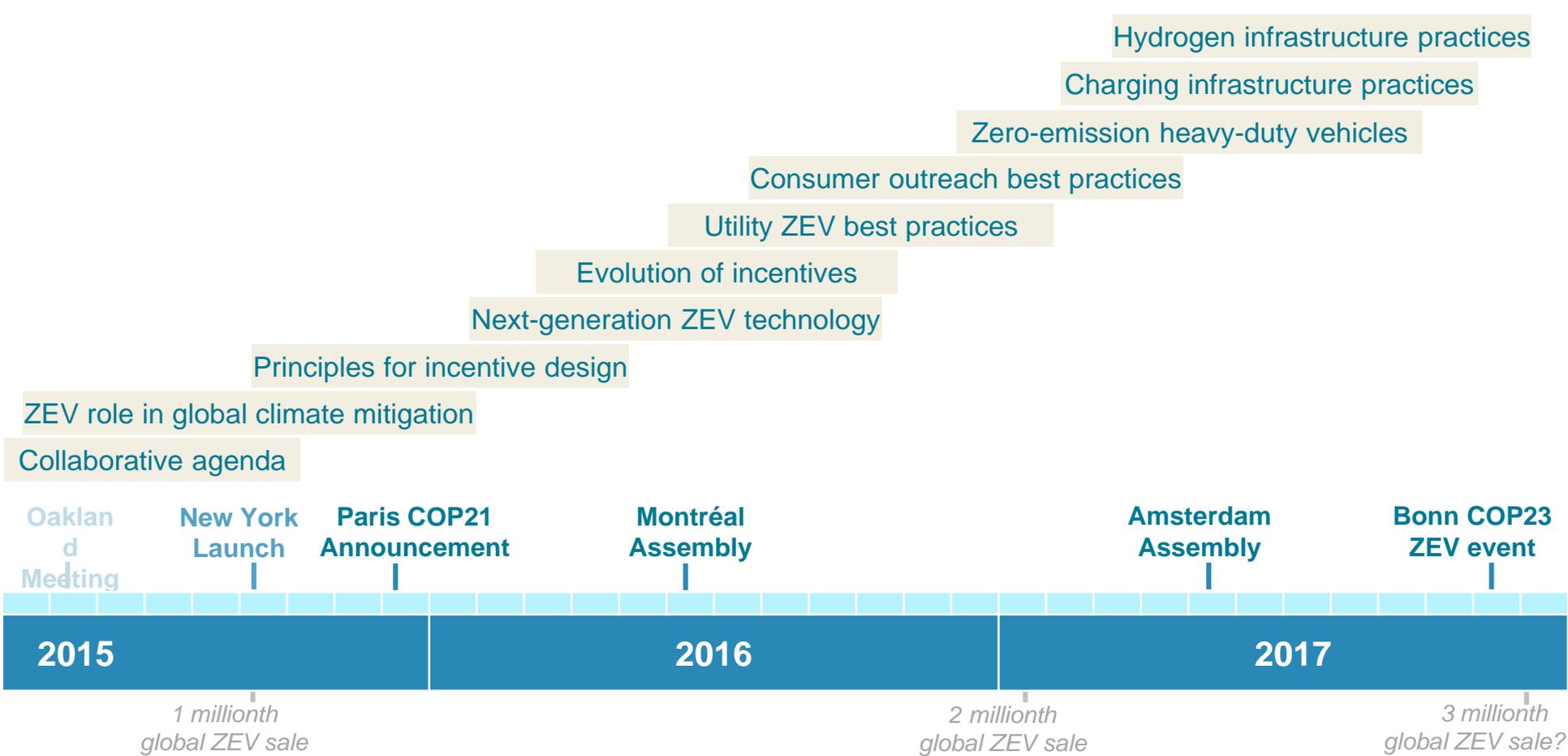


# The challenge: Transition to electric drive

- 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



# ZEV Alliance: International collaboration



# 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



# Reflections and lessons learned

- 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

Nic Lutsey: [nic@theicct.org](mailto:nic@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>

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# World EV capitals

**Analysis of top electric  
vehicle markets  
through 2016**

# Diverse local policies underway to meet EV goals

Policy or program	Model city	Details	Other cities
City fleet goal	Los Angeles	Half of city fleet electric as of 2017	Oslo, Amsterdam, San Jose, New York, San Diego, Shenzhen
Taxi electrification	Beijing	Replacing all 69,000 city taxis with NEVs through government subsidies	Taiyuan, London, Amsterdam, Hangzhou, Tianjin, Shenzhen
Electric car sharing program	Paris	Autolib' program contains 4,000 cars and 6,000 charge points	Shanghai, Los Angeles, Amsterdam, London, Hangzhou
Public bus electrification	Shenzhen	All buses zero-emission by end of 2017	Qingdao, Tianjin, Hangzhou, Los Angeles, London
Free public charging	Oslo	Free charging with renewable energy at all Level 2 charge points	Stockholm
EV-friendly building and parking codes	London	1 in 5 parking spaces must have an EV charge point	San Francisco, Los Angeles, New York, Hangzhou, Shenzhen
Carpool or bus lane access	San Francisco	Electric vehicles may use carpool lanes and do not pay bridge tolls	Los Angeles, San Jose, Oslo, Bergen, San Diego
Vehicle registration benefits	Shanghai	NEVs bypass expensive license plate lottery system	Beijing, Shenzhen
Parking benefits	Amsterdam	Electric vehicles obtain free parking spot in city center	Shanghai, Utrecht, Oslo, San Jose
Local purchase incentives	Shenzhen	Local subsidies of \$8,800 for BEVs, \$5,100 for PHEVs	Beijing, Shanghai, the Hague