

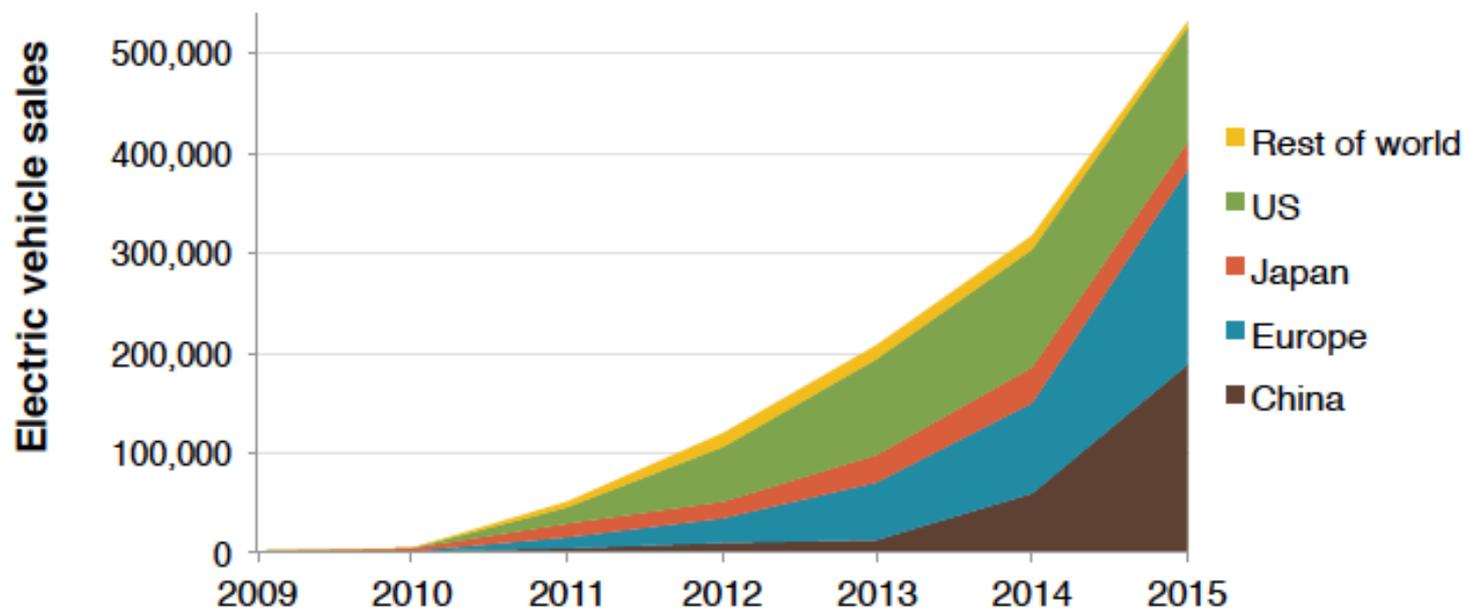
Best Practices to Promote Electric-Drive Vehicles

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Based on the Presentation by Nic Lutsey, ICCT at the
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Livermore, California
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Global electric vehicle sales since 2009

- Sales of electric vehicles through 2015
 - There were approximately 530,000 electric vehicle sales in 2015
 - The 1 millionth electric vehicle was sold in September 2015
 - Sales mostly in China, Europe, the U.S. (and concentrated in particular markets)



US city electric vehicle project overview

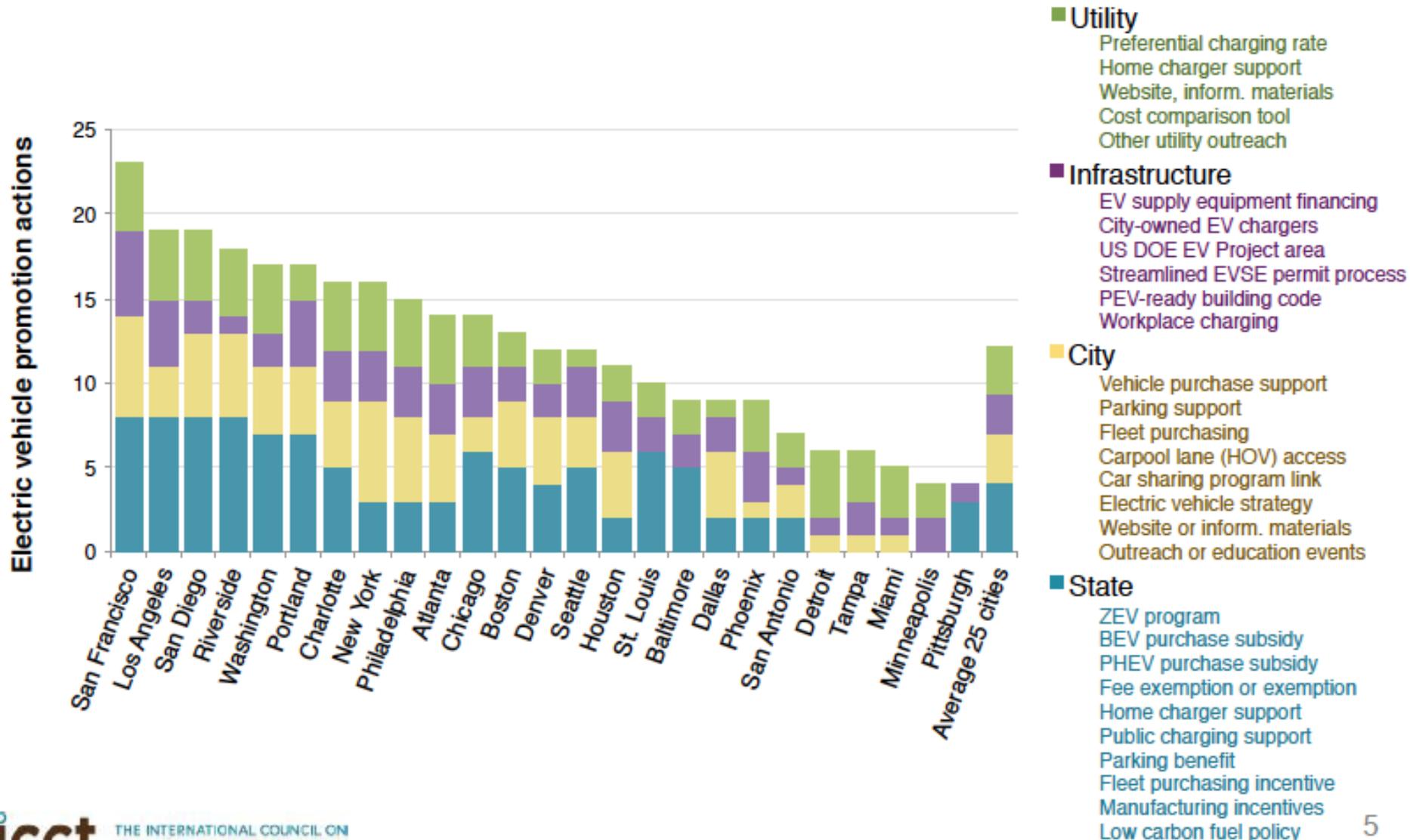
- Approach/scope
 - Include top 25 most populous US metropolitan areas
 - Catalogue EV actions on many different dimensions (local, state, electric charging infrastructure, utility support)
 - Evaluate consumer benefits from EV policies
 - Analyze EV sales of various types (BEV, PHEV)
 - Assess statistical connection between local action and EV sales
- Report, based on 2014 EV uptake and city/state policies
 - <http://theicct.org/leading-us-city-electric-vehicle-activities>
 - We continue to update the results

Electric vehicle (EV) activity across major US cities

- The top-25 metropolitan areas in 2014 in the US represent....
 - 42% of the population, 46% of auto sales, 67% of EV sales
 - 53% of public electric vehicle charging infrastructure
 - Diverse mix of incentive, market factors, and percent EV uptake

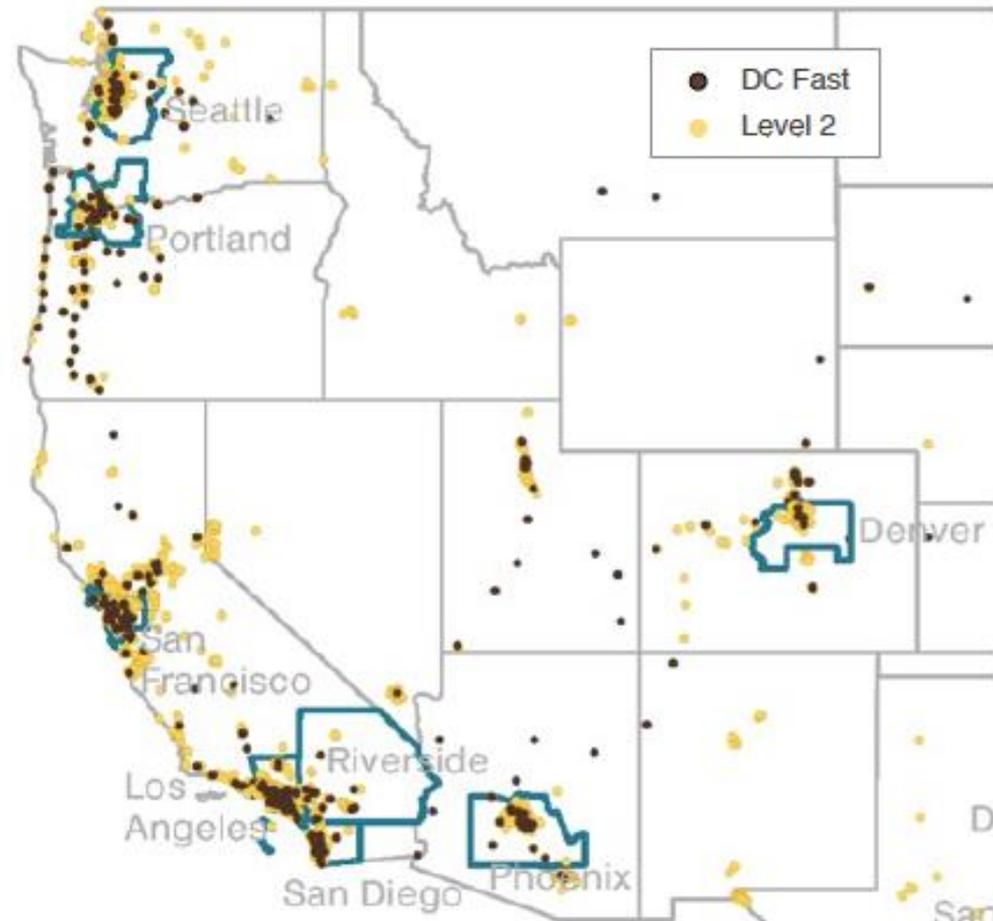
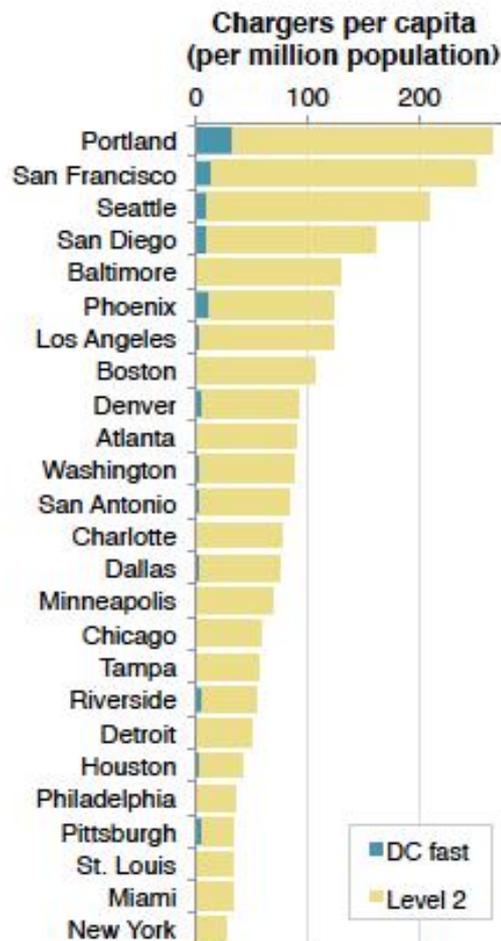


Actions to promote EVs across US cities are diverse



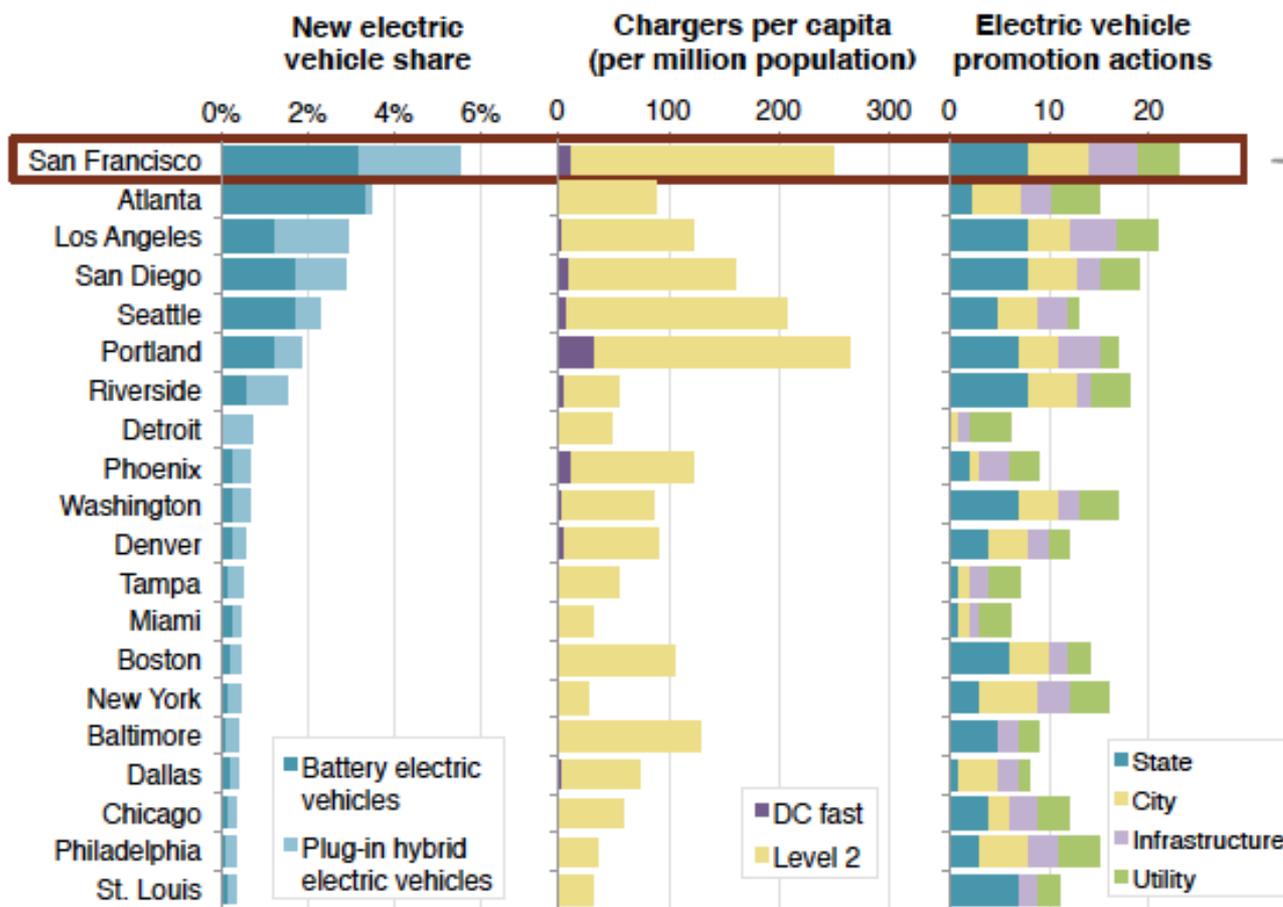
Charging infrastructure varies greatly

- Leading three cities have over 7-10 times the bottom-five cities' charging network -



Example: San Francisco metro area EV activity

- The San Francisco area has had a steady mix of consumer incentives, utility actions, and charging infrastructure support – and has 7x the US average EV uptake



San Francisco:

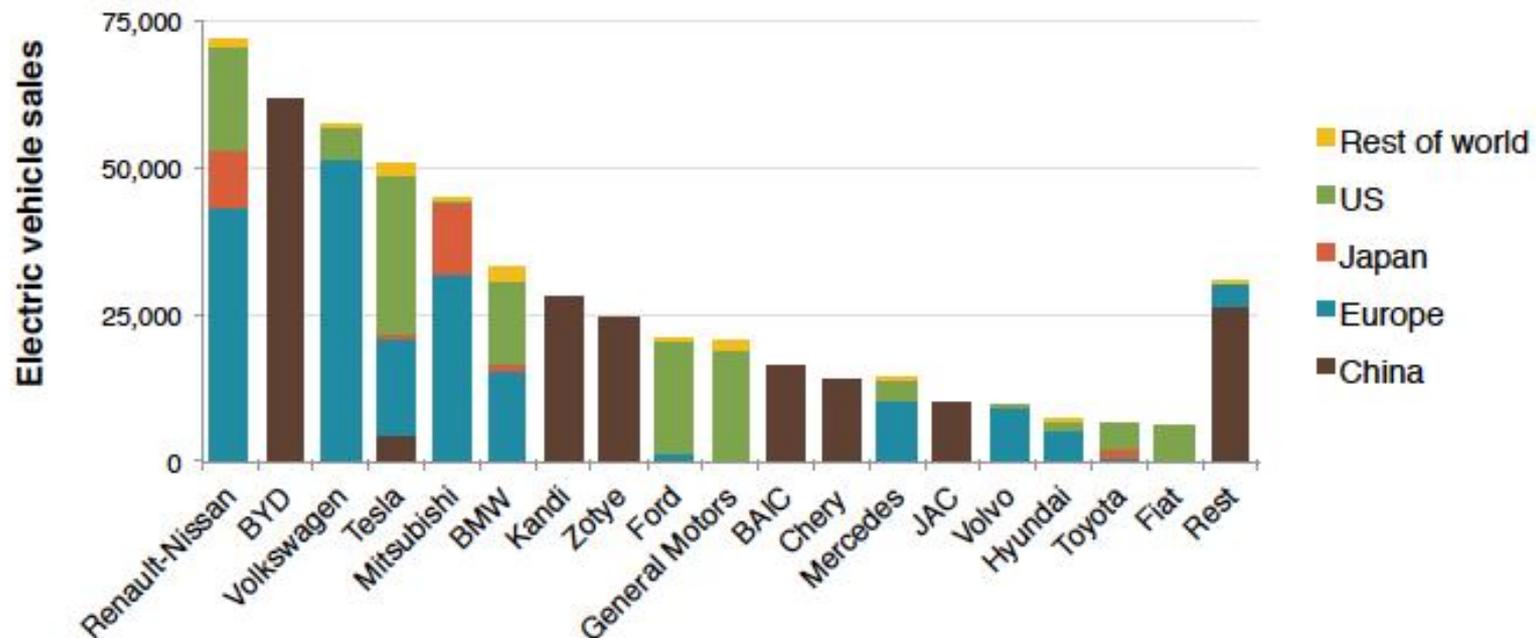
- Highest new electric-vehicle sales share
- 2nd most extensive public electric charging infrastructure
- 23 of the 30 electric-vehicle promotion actions

Findings: Various EV actions are accelerating uptake

- EV promotion actions are accelerating EV adoption
 - Strong and modest correlations from the U.S. state/city study: Consumer incentives, charging infrastructure, model availability, city non-monetary benefits
 - Our emerging Europe work indicates the same: Financial incentives, complementary local policy/incentives, charging infrastructure, etc.
- Analysis confirms importance of “ecosystem approach”
 - Public charging and consumer incentives work, but more diverse action needed
 - Engagement from cities, states, utilities, automakers, consumers, local businesses in each city is important

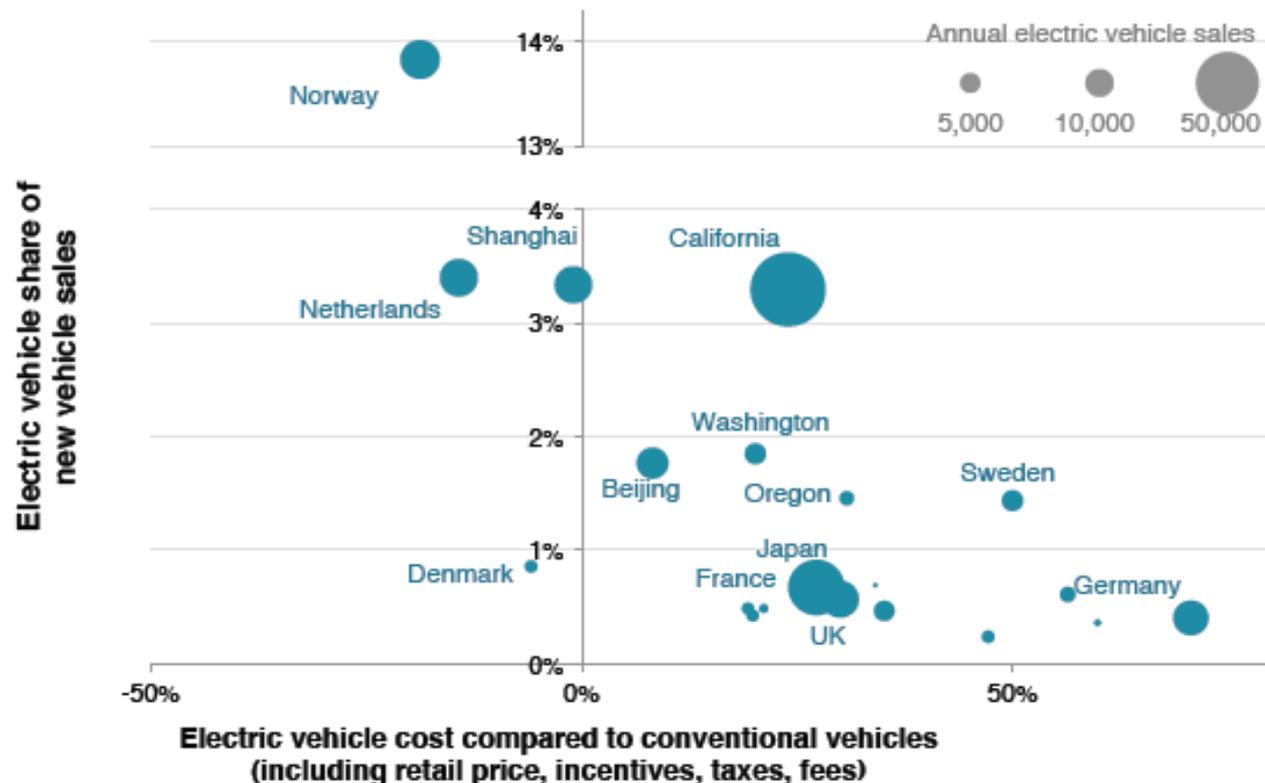
Global electric vehicle sales in 2015

- Most (i.e., 93%) of 2015 electric vehicle sales were in China, Europe, U.S.
 - 14 automaker groups at over 10,000 annual global sales
 - Deployment by automaker and by region:



EV uptake higher where incentives higher (generally)

- Preliminary findings on analysis of electric vehicle incentives
 - Ongoing analysis of electric vehicle sales (circle size) and shares in 2014 (vertical axis) versus the relative cost of electric vehicle as compared to comparable conventional gasoline vehicles after incentives (rebates, credits, tax exemptions) (horizontal axis)

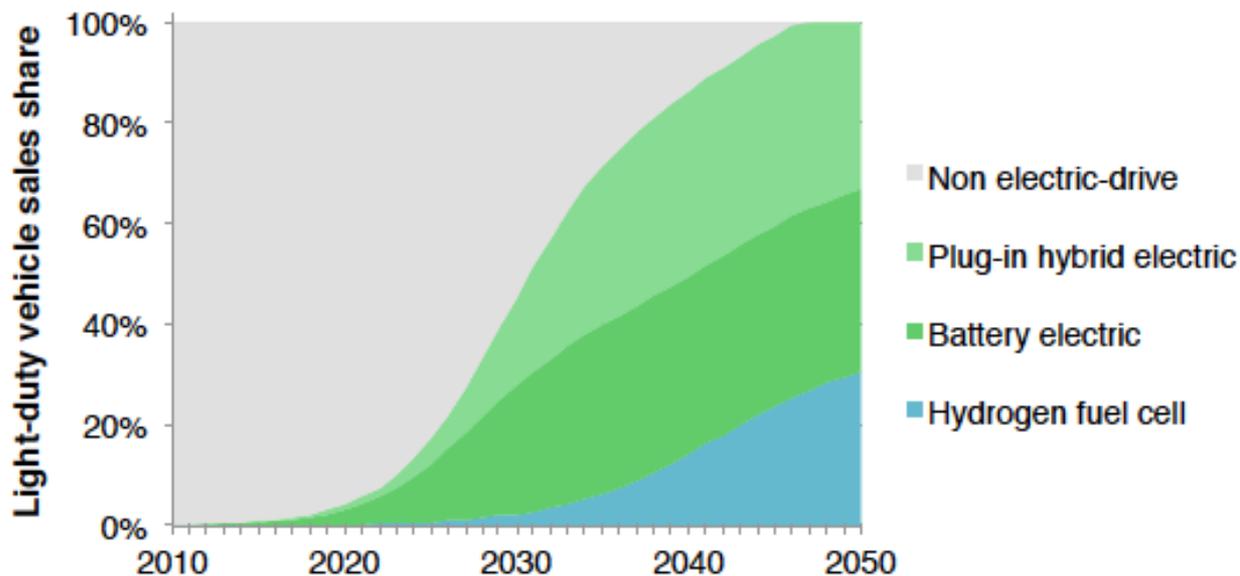


Electric vehicle sales tend to be highest where combination of national and regional support policies are in place

Area	Action	China	France	Germany	Japan	Netherlands	Norway	United Kingdom	US (excl. California)	California
		19%	5%	4%	11%	5%	6%	5%	19%	19%
Vehicle manufacturer	Research and development support	X	X	X	X	X	X	X	X	X
	Long-term efficiency standards	X	X	X	X	X	X	X	X	X
	Incentive provisions within efficiency regulations	X	X	X		X	X	X	X	
	Cumulative sales goal	X	X	X		X	X	X	X	X
Consumer purchasing	Vehicle purchase subsidy (tax credit, rebate, purchase tax exemption, feebate)	X	X		X	X	X	X	X	X
	Government fleet vehicle purchasing preferences	X	X		X			X	X	X
Consumer use	Annual vehicle fee exemption			X	X	X	X	/	/	
	Discounted/free electric charging				X	X	X		/	X
	Preferential lane (e.g., bus, carpool lane) access, parking, reduced road tolls/taxes	/	/	/	X	X	X	X	/	X
Fuel provider, infrastructure	Carbon pricing scheme	X	X	X	X	X	X	X	/	X
	Public charging network funding, incentives	X	X	X	X	X	X	X	X	X
Consumer awareness	Public outreach activities to educate on consumer benefits	X	X	X	X	X	X	X	X	X

Collaboration: International ZEV Alliance

- Collaborate on best-practice policies, action plans
- Set electric-drive vehicle target: All electric by 2050
 - To achieve climate stabilization goals
 - To set clear signal for policy and investment



British Columbia
California
Connecticut
Germany
Maryland
Massachusetts
Netherlands
New York
Norway
Oregon
Québec
Rhode Island
United Kingdom
Vermont

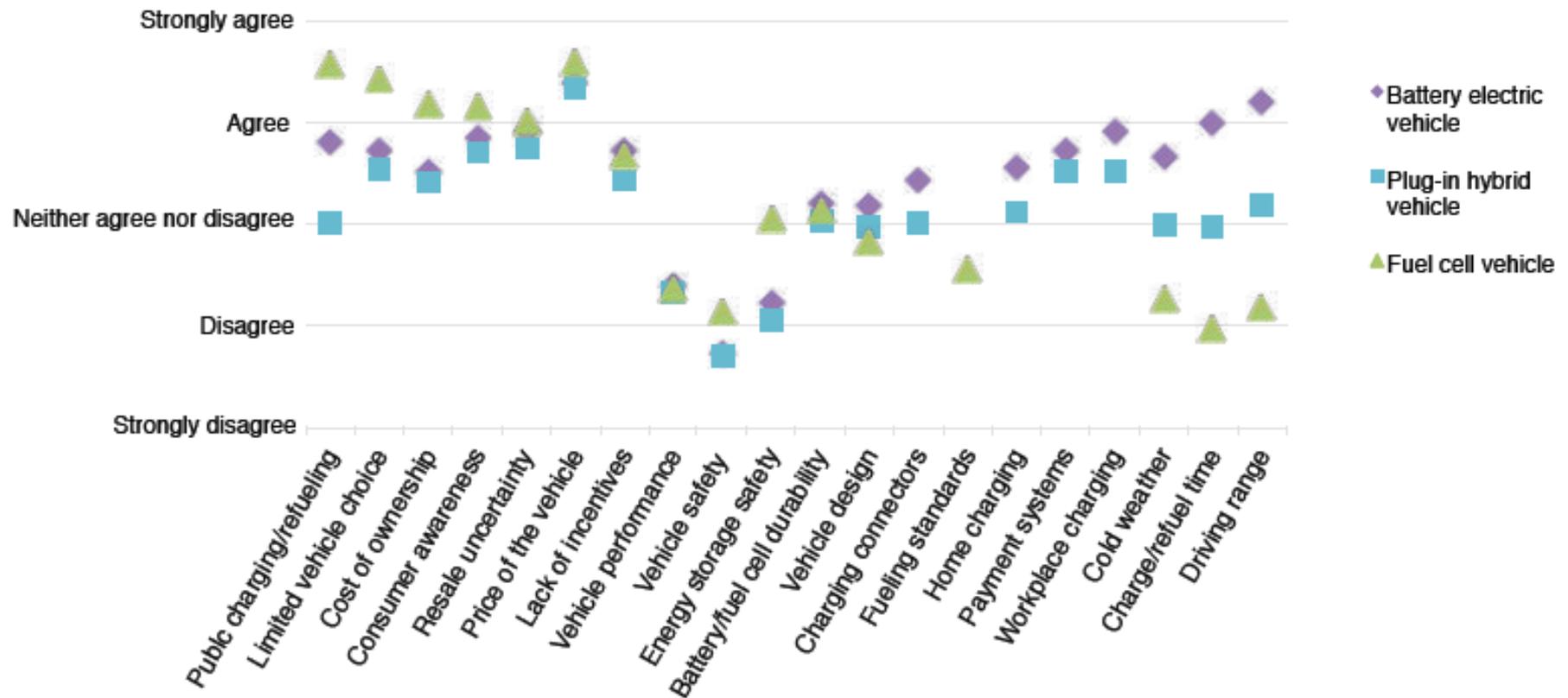
International ZEV Alliance: <http://zevalliance.org>

COP21 announcement: <http://zevalliance.org/content/cop21-2050-announcement>

Mitigation potential: <http://zevalliance.org/content/global-ev-2050-qhq-mitigation-potential>

Discussion: Obstacles for electric drive vehicles

- Survey: “The following are significant obstacles to the uptake of [electric-drive vehicles]”



- ICCT resources

- US city/state electric vehicle incentive analysis

- <http://theicct.org/info-tools/us-city-electric-vehicle-profile> (Dec 2015)
 - <http://theicct.org/leading-us-city-electric-vehicle-activities> (July 2015)
 - <http://theicct.org/supporting-electric-vehicles-US-city-total-cost> (October 2015)
 - <http://theicct.org/evaluation-state-level-us-electric-vehicle-incentives> (Oct 2014)

- International electric vehicle sales and incentives

- <http://theicct.org/global-ev-2050-ghg-mitigation-potential> (Dec 2015)
 - <http://theicct.org/transition-global-zero-emission-vehicle-fleet-collaborative-agenda-governments> (Sept 2015)
 - <http://theicct.org/driving-electrification-global-comparison-fiscal-policy-electric-vehicles> (May 2014)

- International Zero Emission Vehicle Alliance

- <http://zevalliance.org>
 - <http://zevalliance.org/content/cop21-2050-announcement>

Conclusions Relevant to FCEVs

- * What lessons from nascent BEV market can inform FCEV deployment?
- * BEVs and FCEVs are complimentary
- * Key lessons from the past FCEV promise-realistic assessment of challenges, competition, technology status, economics, and public awareness
- * Role of legislation, regulations and environmental drivers
- * Local, regional and global vision

Additional Concluding Remarks

- * Data for EVs to date indicate the importance of incentives and strong legislative and regulatory direction.
- * For FCEVs, hydrogen infrastructure is the key—and must come ahead of significant vehicle penetration. Additionally, technology readiness is an important ingredient to success. Earlier hopes ran ahead of technology readiness.
- * Education of all the stakeholders is critical.
- * BEVs and FCEVs are complementary—each have their sweet spots, but FCEVs cover a broader range of applications—witness the response to bad air in China and India by their respective governments.
- * The transition to electric drive vehicles will take decades—see NAS study in 2014.
- * Public Health and air quality continue to be more important drivers for action than even climate change. The recent VW outrage was driven by excess NOx emissions. Tightening emission standards for GHGs and criteria pollutants will lead to more electric drive vehicles and renewable energy.
- * Several countries are exploring a “Hydrogen Economy” which facilitate uptake of FCs and hydrogen across transportation, goods movement, industrial applications including refineries, agriculture etc. I think this is a key aspect to separate past hopes with real world applications.
- * Power to Gas (P2G) is a potential powerful application to link renewable energy with transportation.