International Energy Agency

Secure • Sustainable • Together

Clean Vehicles: On the verge of scaling up?

Global EV Outlook 2015

www.iea.org/evi

For more information and for other reports go to: http://www.iea.org/evi

key takeaways

Electric Vehicles Initiative

The Global EV Outlook represents the collective effort of seven years of primary data gathering and analysis from the Electric Vehicle Initiative's 16 member governments. Below are key takeaways and insights from this work. Overall, EV and charging infrastructure deployment has continued growing since the 2013 Global EV Outlook. Battery costs have come down while energy density has climbed; vehicle electrification has gone multi-modal with 46,000 electric buses and 235 million electric two-wheelers deployed; and total EV spending by EVI governments equalled 16 billion USD between 2008-2014.

global EV stock

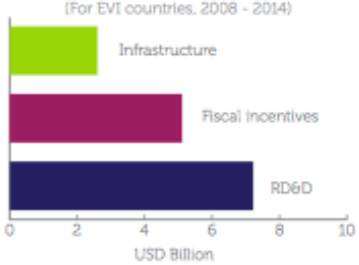
(through end of 2014)

represents 0.08% of total passenger cars

665,000+

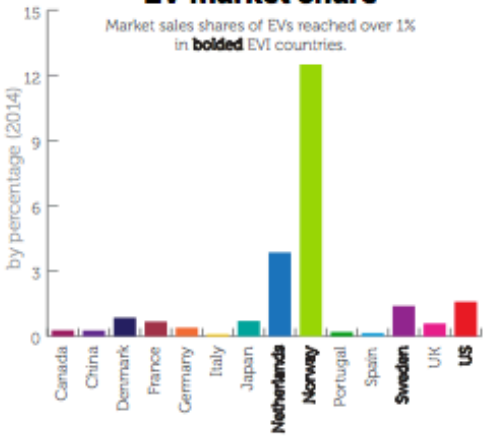
EV spending by category

(For EVI countries, 2008 - 2014)

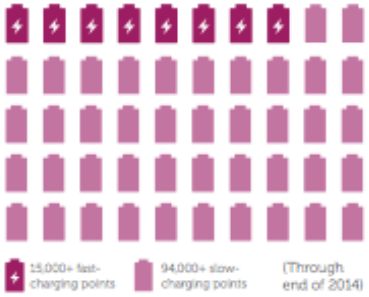


EV market share

Market sales shares of EVs reached over 1% in **bolded** EVI countries.

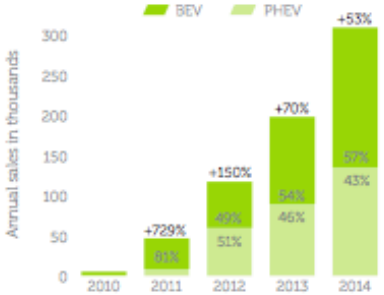


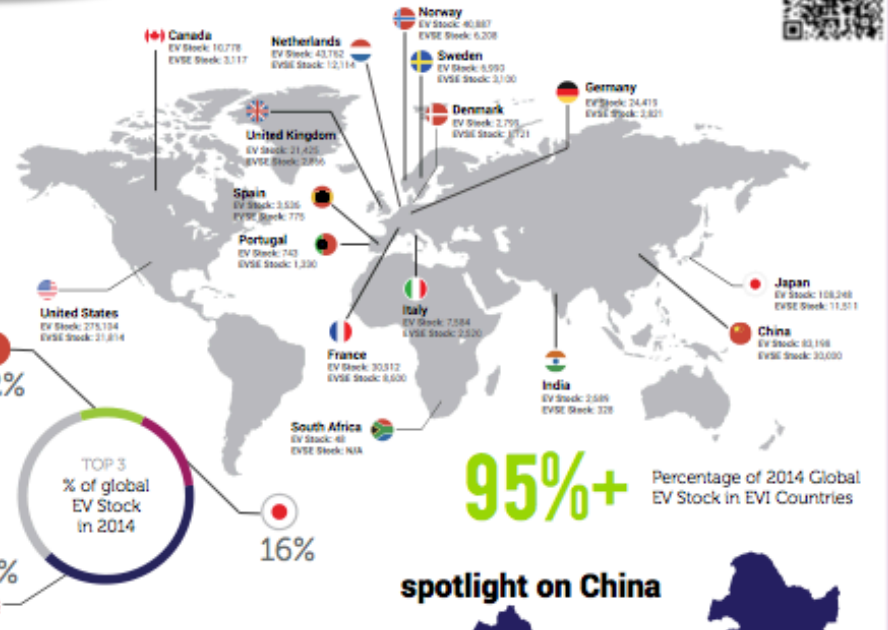
global EVSE stock



EVSE stock more than doubled for slow charging points between the end of 2012 and 2014, and increased eightfold for fast charging points.

global EV sales

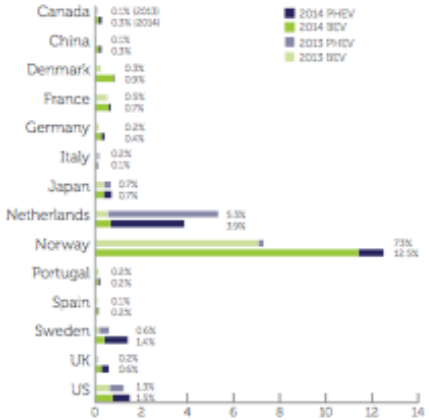




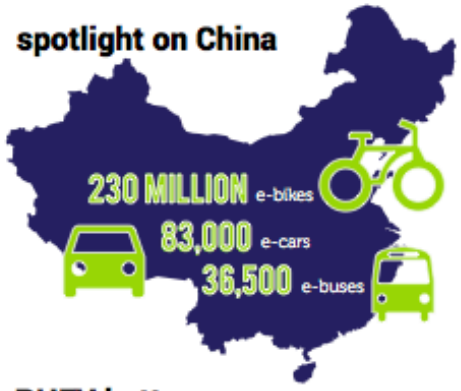
95%+ Percentage of 2014 Global EV Stock in EVI Countries

market share growth (%)

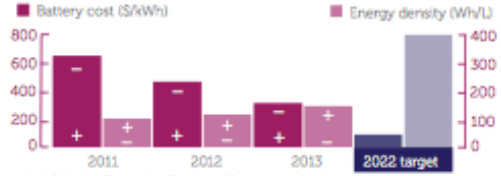
Market sales shares of EVs for 2013 (lighter colors) and 2014 (darker colors).



spotlight on China



PHEV battery progress



© 2015 Global EV Outlook (GEO 2015) OECD/IEA, 9 rue de la Fédération, 75739 Paris Cedex 15, France. GEO 2015 is subject to the IEA's terms and conditions at http://www.iea.org/t&c/.

The maps depicted here are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Clean Vehicles: On the verge of scaling up?

Program

I. Recent trends

Market and technology trends and future potential

II. Research findings

What works and where might we be headed?

III. What's needed for 2 degree scenario (2DS)?

IEA projections "In an era of urbanization"

IV. Resources & venues for cooperation

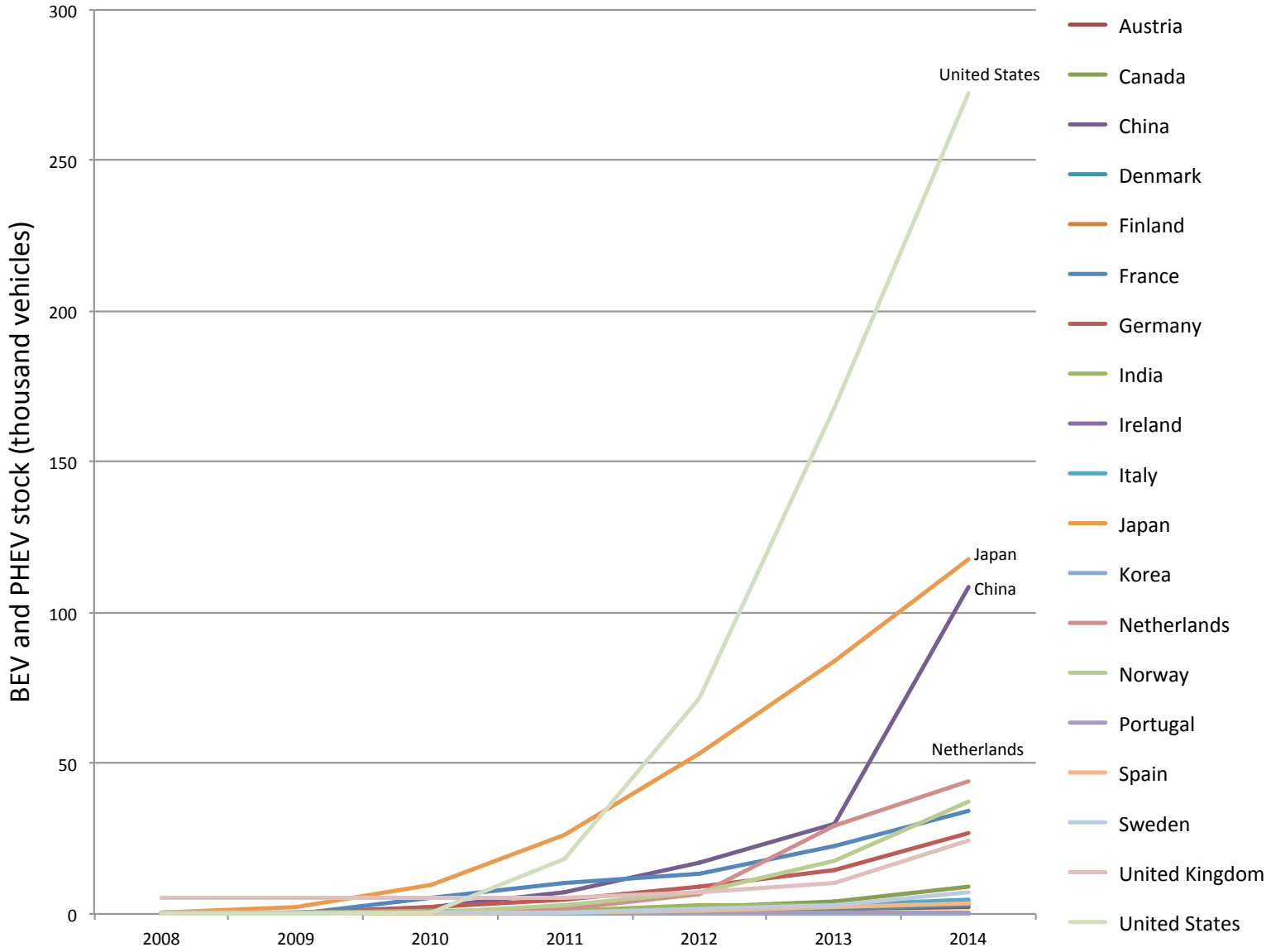
How do we get there from here?

GATE 21 PORTEN TIL GRØN VÆKST

CNCA CARBON NEUTRAL CITIES ALLIANCE

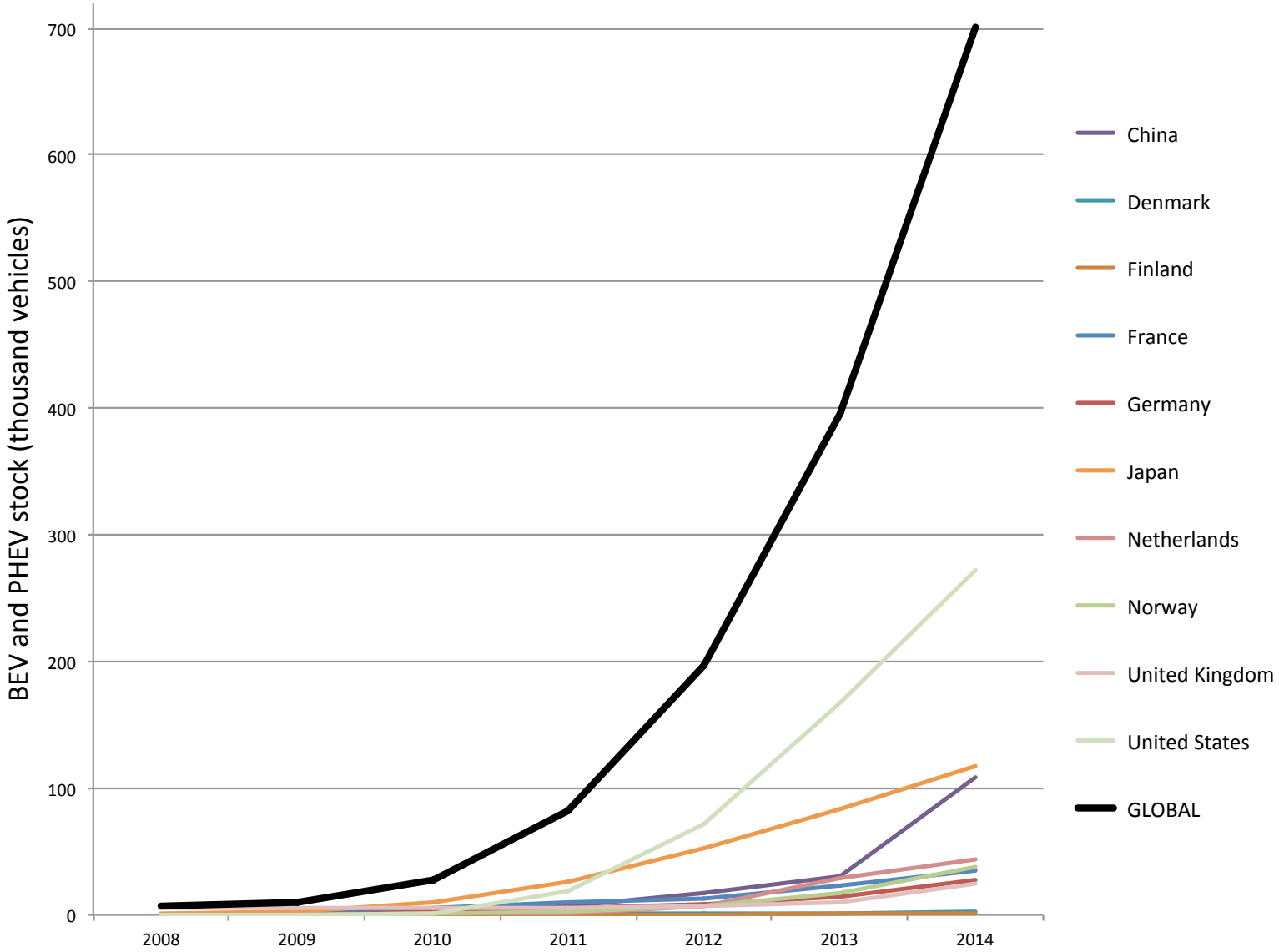
Jacob Teter
Energy Analyst
International Energy Agency

I. Recent Trends: a rapidly growing global market



Annual electric passenger light duty vehicle stock

I. Recent Trends: a rapidly growing global market



Annual electric passenger light duty vehicle stock

I. Recent Trends: ambitious targets

Annual electric passenger light-duty vehicle stock (BEVs and PHEVs), thousand vehicles

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Australia	0	0	0	0	0	0	0																
Austria	0	0	0	1	1	2	2	5	11	23	48	100	210	308	406	504	602	700					
Canada	0	0	0	0	2	4	9	25	67	183	500												
China	0	1	2	7	17	30	108	205	388	736	1394	2640	5000										
Denmark	0	0	0	1	1	2	3	6	13	25	50	100	200										
Finland	0	0	0	0	0	0	1	1	3	7	14	31	66	149	232	314	397	480					
France	0	0	6	10	14	23	34	68	133	262	516	1016	2000										
Germany	0	0	3	5	9	15	27	49	90	164	300	547	1000										
India	0	1	1	1	3	3	4	8	17	35	71	146	300										
Ireland	0	0	0	1	1	0	0	0	0	2	5	16	50										
Italy	0	0	0	1	1	3	5	130															
Japan	0	2	9	26	53	84	117	186	294	466	737	1166	1846	2661	3477	4292	5108	5923	6738	7554	8369	9185	10000
Korea	0	0	0	0	0	0	0	3	8	18	40	89	200										
Netherlands	0	0	0	2	7	29	44	57	73	94	121	155	200	360	520	680	840	1000					
Norway	0	0	1	3	7	18	37	50															
Portugal	0	0	0	0	0	0	1	2	5	12	31	79	200										
South Africa	0	0	0	0	0	0	0																
Spain	0	0	0	1	1	2	4	7	12	23	43	80	150										
Sweden	0	0	0	0	1	3	7	15	31	66	137	287	600										
United Kingdom	5	5	5	6	7	11	25	49	98	195	389	777	1550										
United States	0	0	0	18	71	168	273	342	429	538	675	847	1062	1332	1672	2097	2631	3300					
TOTAL	7	9	28	82	197	396	**702**	**1208**	1673	2848	5071	8077	**14634**										

Legend:

Actual stock (through 2014)

Target

Exponential interpolation

Linear interpolation

II. Research: Promising policies

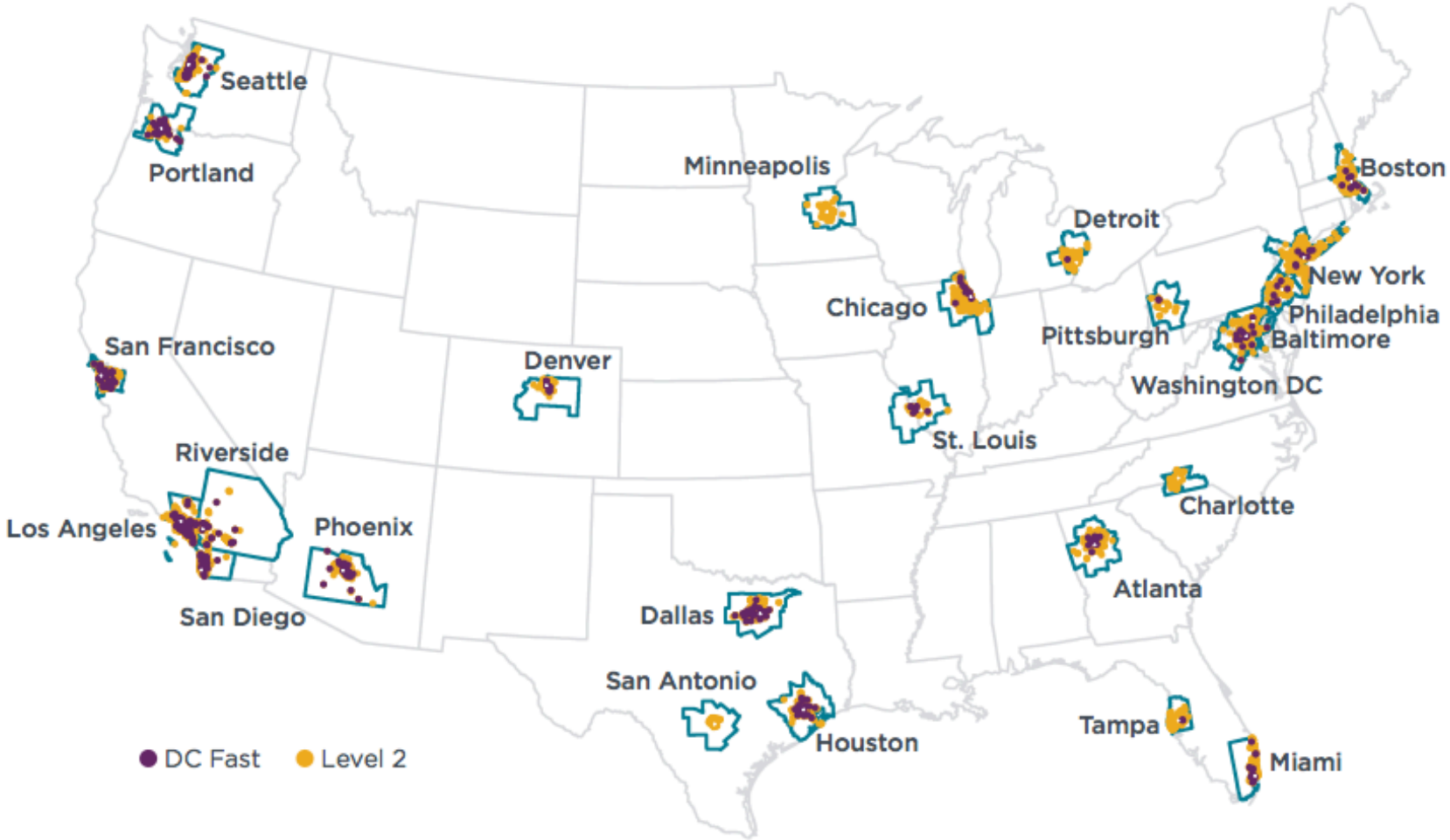
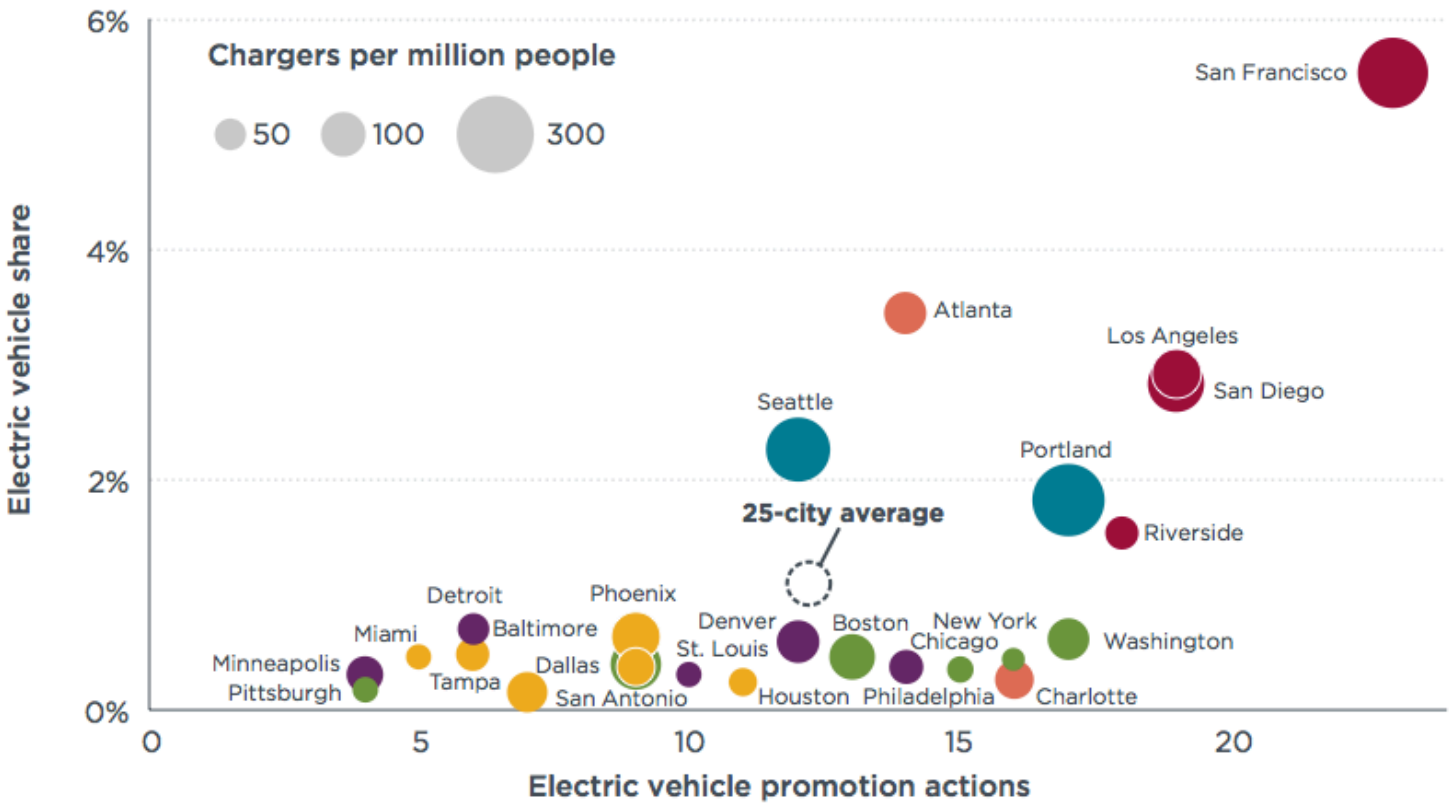


Figure 3. Illustration of public electric charge points, in 25 most populous U.S. cities

ICCT. (2015). *Assessment of Leading Electric Vehicle Promotion Activities in United States Cities.*
Authors: Nic Lutsey, Stephanie Searle, Sarah Chambliss, Anup Bandivadekar
Washington DC: The International Council on Clean Transportation (ICCT).

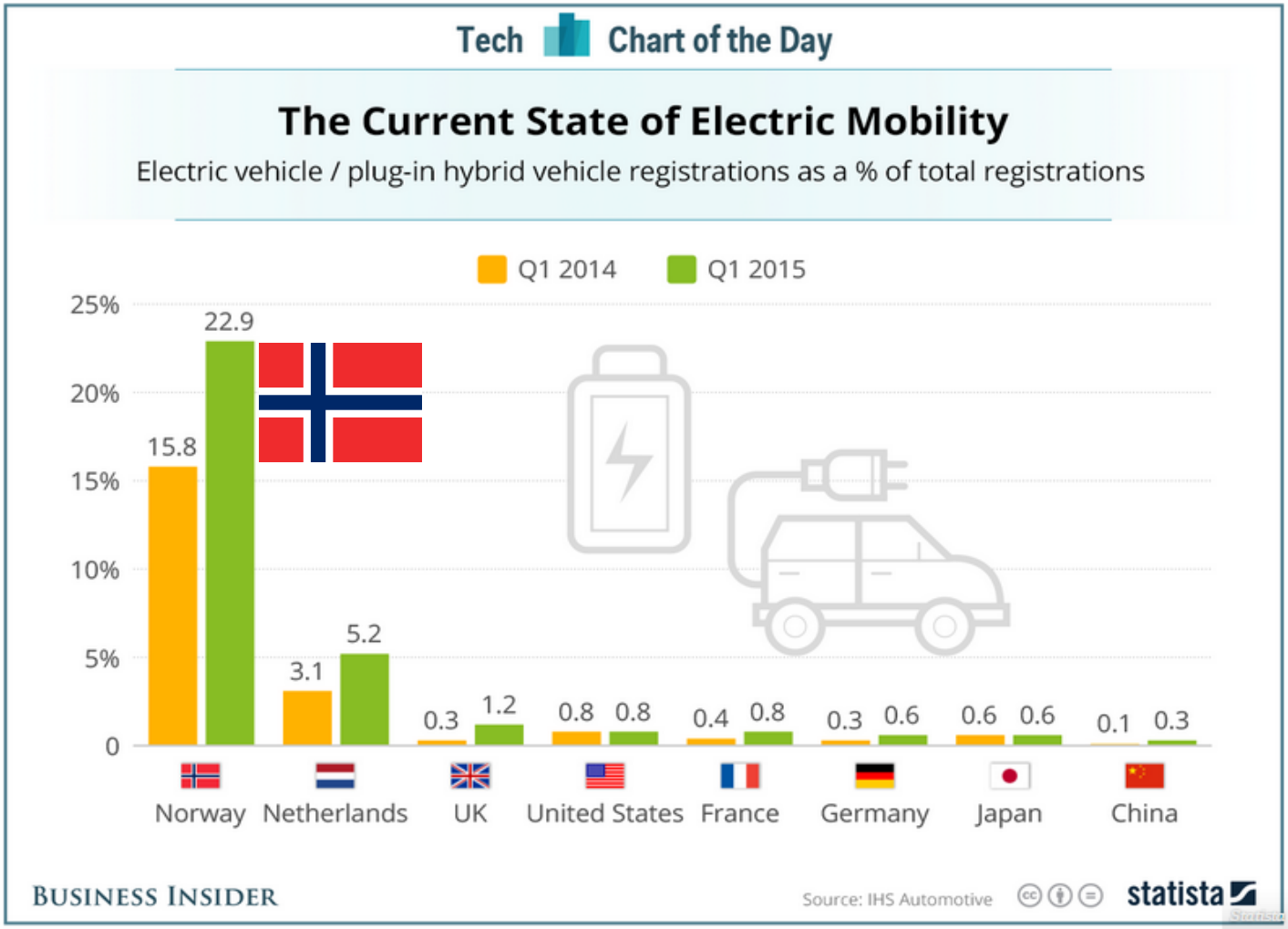
II. Research: Promising policies

- Best practices for driving EVs into the fleet are beginning to emerge.
- Cities are an important focal point for collaboration among governments, the auto industry, utilities, and advocacy.



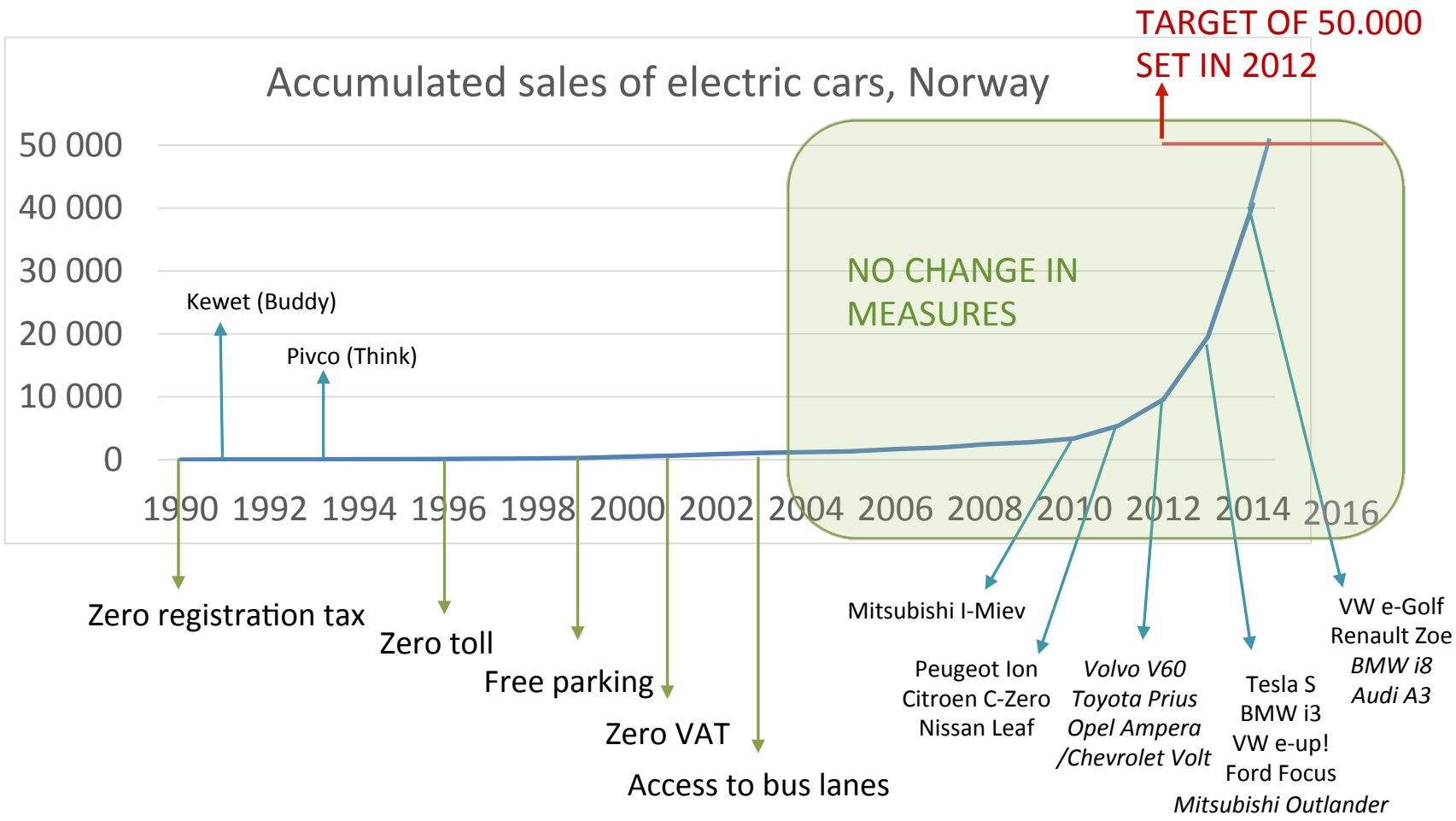
ICCT. (2015). *Assessment of Leading Electric Vehicle Promotion Activities in United States Cities.*
Authors: Nic Lutsey, Stephanie Searle, Sarah Chambliss, Anup Bandivadekar
Washington DC: The International Council on Clean Transportation (ICCT).

II. Research: Lessons from Norway



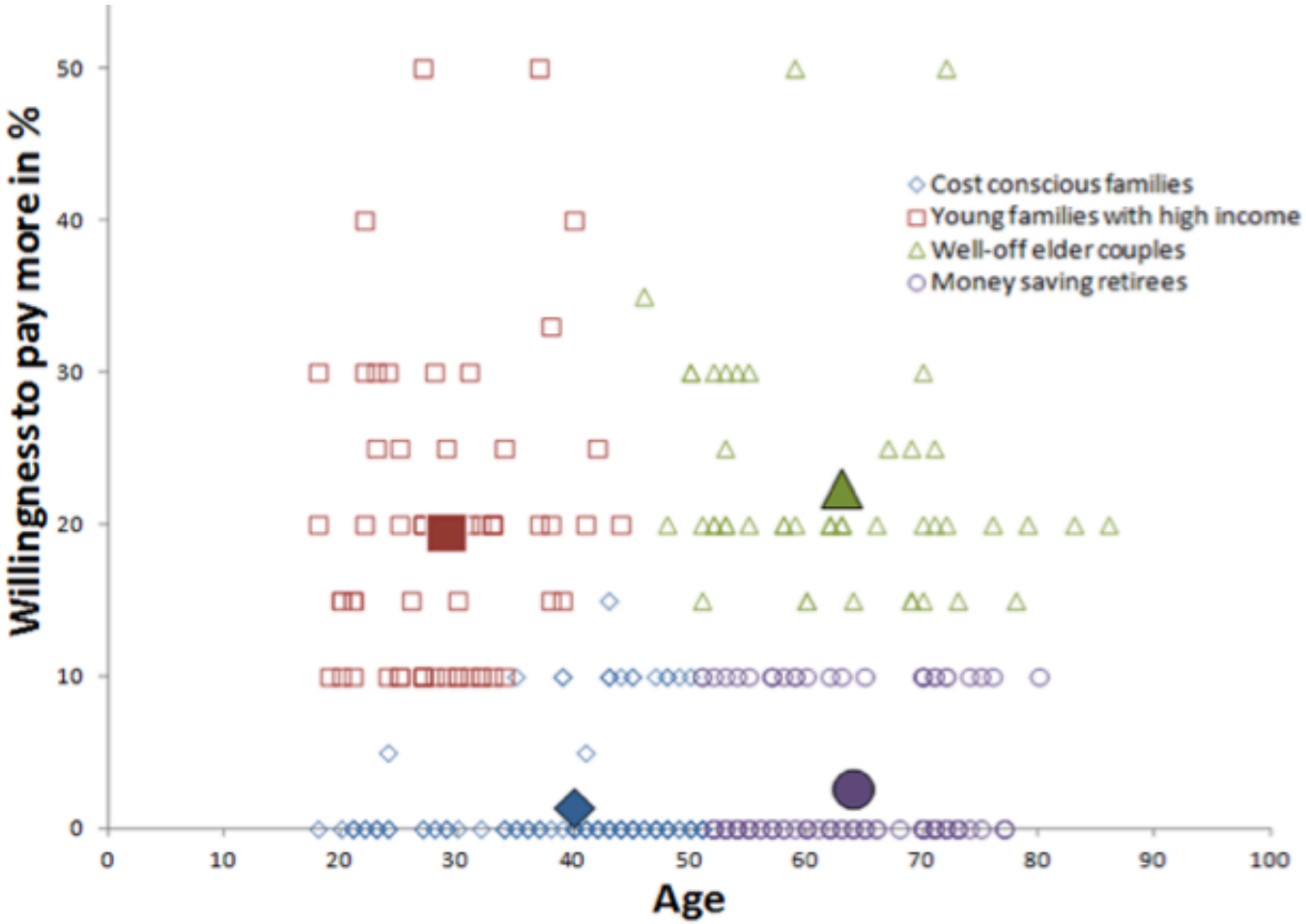
Source: Christina Bu, Secretary General, Norwegian EV Association
"Experience to date with EV policy in Norway", presentation at KAPSARC, November 9, 2015

II. Research: Lessons from Norway



Source: Christina Bu, Secretary General, Norwegian EV Association
"Experience to date with EV policy in Norway", presentation at KAPSARC, November 9, 2015

II. Research: Crossing the chasm

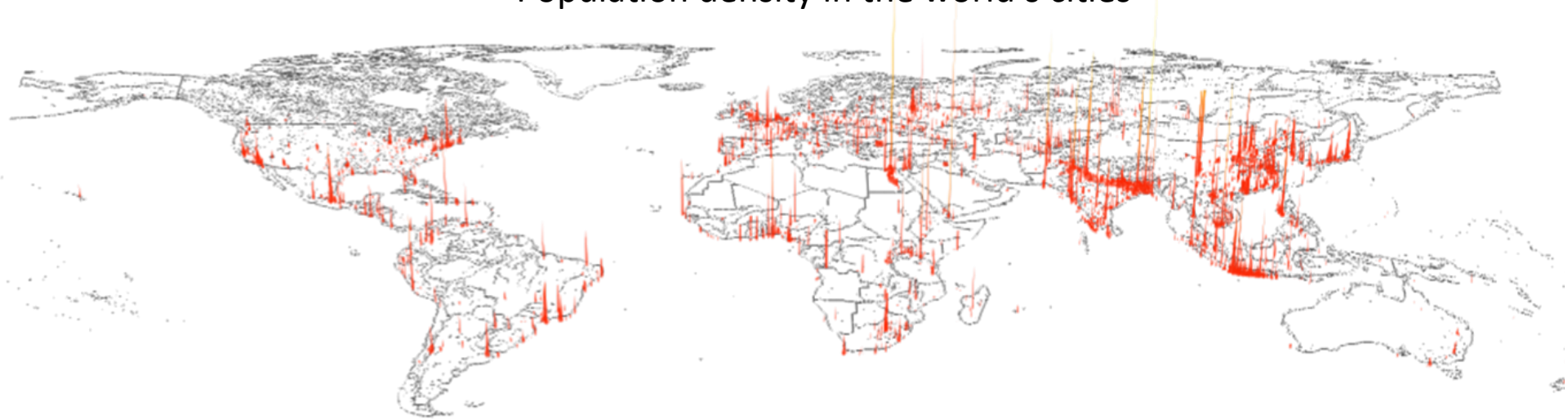


Need to transition to the **majority** *of car buyers*

How to trigger mass market adoption of electric vehicles? Factors predicting interest in electric vehicles in Germany
Julius P. Wesche, Patrick Plötz* and Elisabeth Dütschke
Submitted to: World Conference on Transport Research - WCTR 2016 Shanghai. 10-15 July 2016

III. What's needed to achieve the 2 degree scenario (2DS)?

Population density in the world's cities



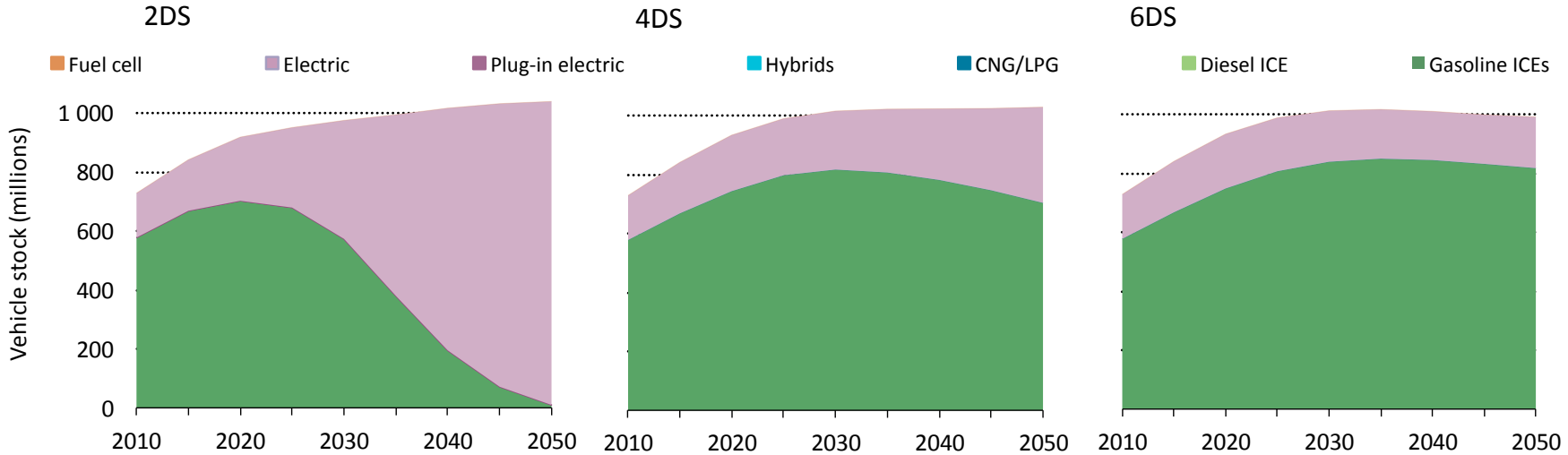
Energy Technology Perspectives 2016: The role of ***Urbanisation***
(Geographic Information Systems analysis)

Technologies and policies

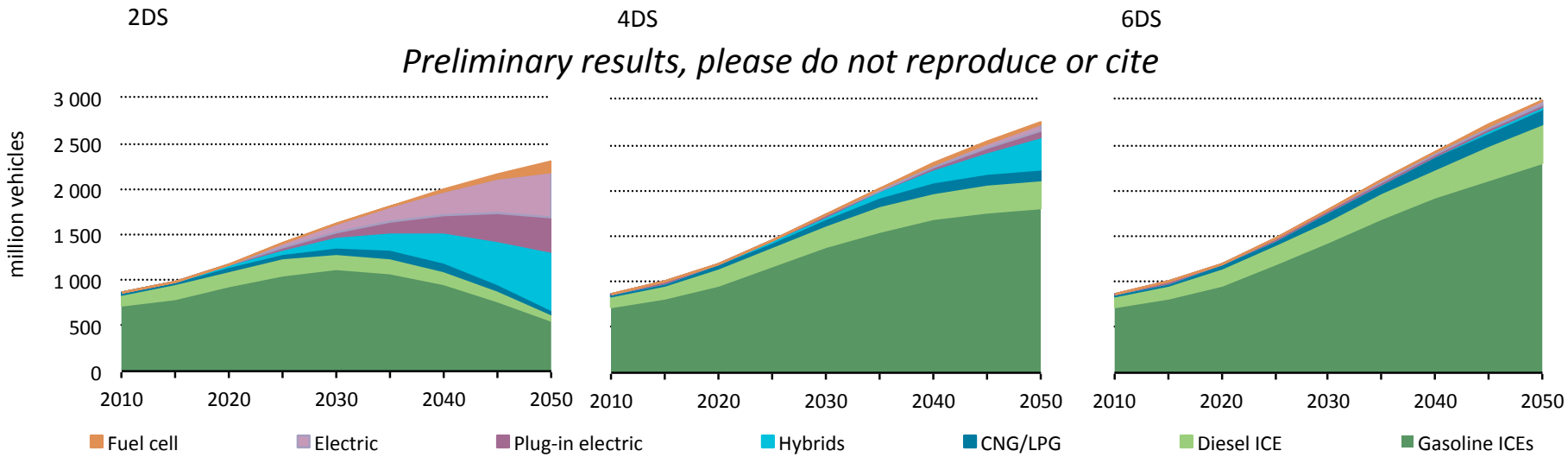
- *Avoid / shift / improve*
- *Electrification*
- *National policies that support local policies*
  (elasticities used to model policy impacts)

III. What's needed to achieve the 2 degree scenario (2DS)?

2-wheelers



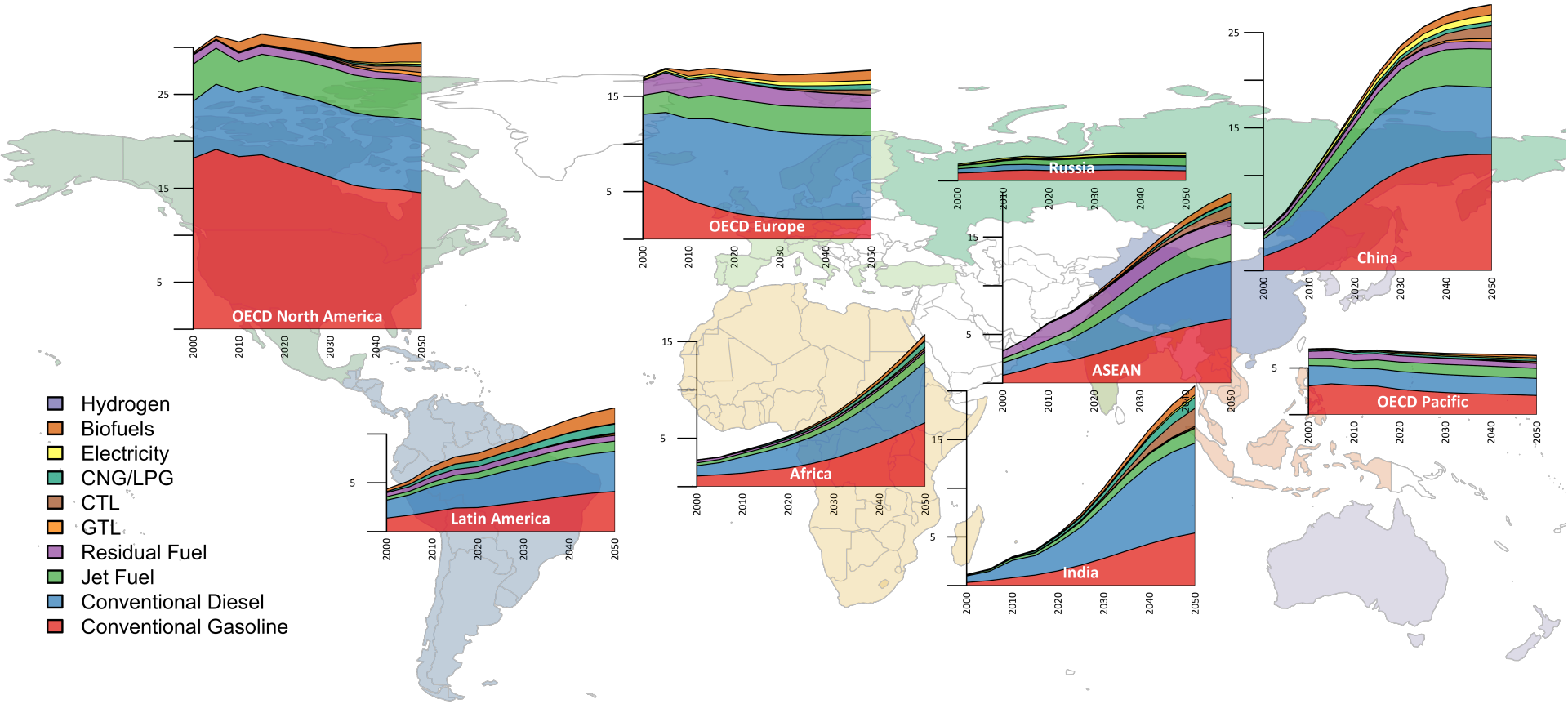
Passenger car technologies



IEA (draft – publication in May 2016), *Energy Technology Perspectives*, Chapter 5: Sustainable urban transport

III. What's needed to achieve the 2 degree scenario (2DS)?

Transport energy by fuel in major regions in **6DS**, EJ



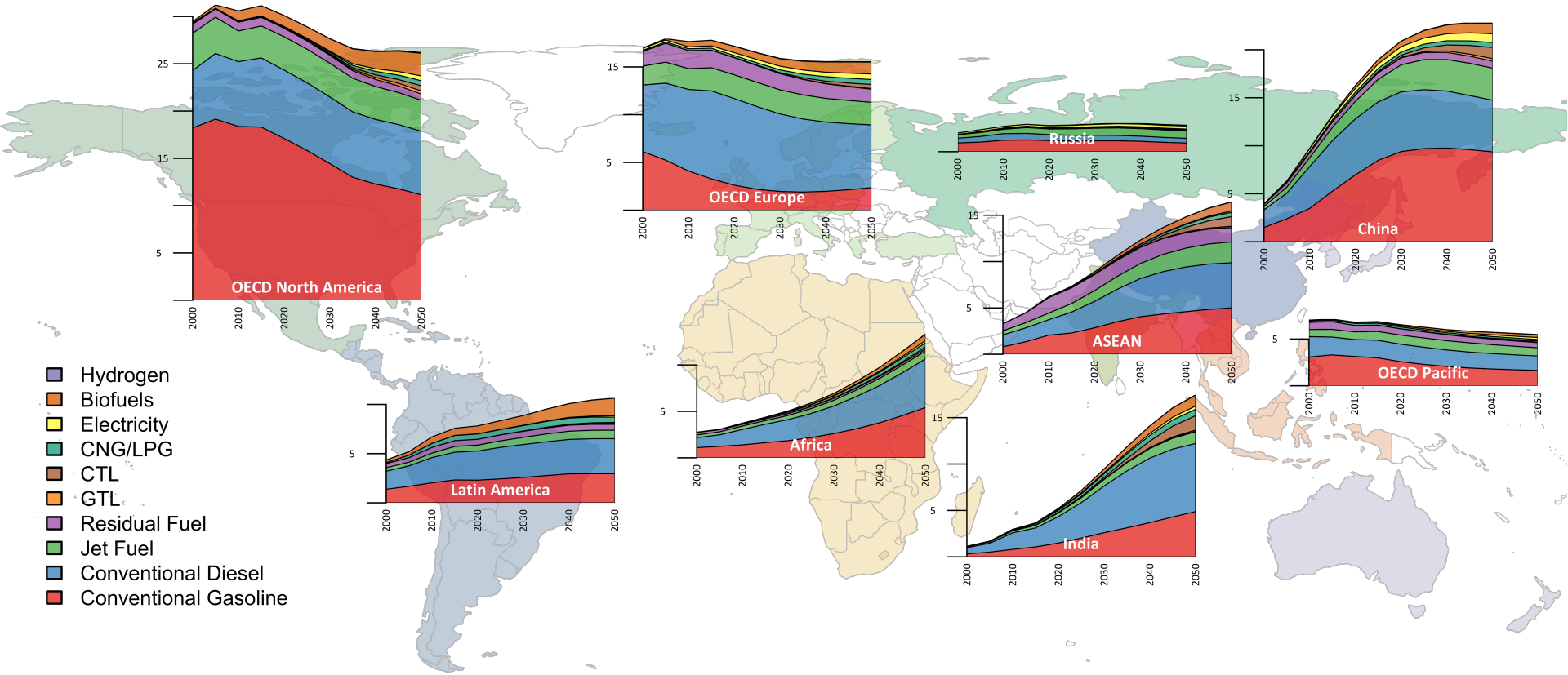
Preliminary results, please do not reproduce or cite

IEA (draft – publication in May 2016),

Energy Technology Perspectives, Chapter 5: Sustainable urban transport

III. What's needed to achieve the 2 degree scenario (2DS)?

Transport energy by fuel in major regions in **4DS**, EJ

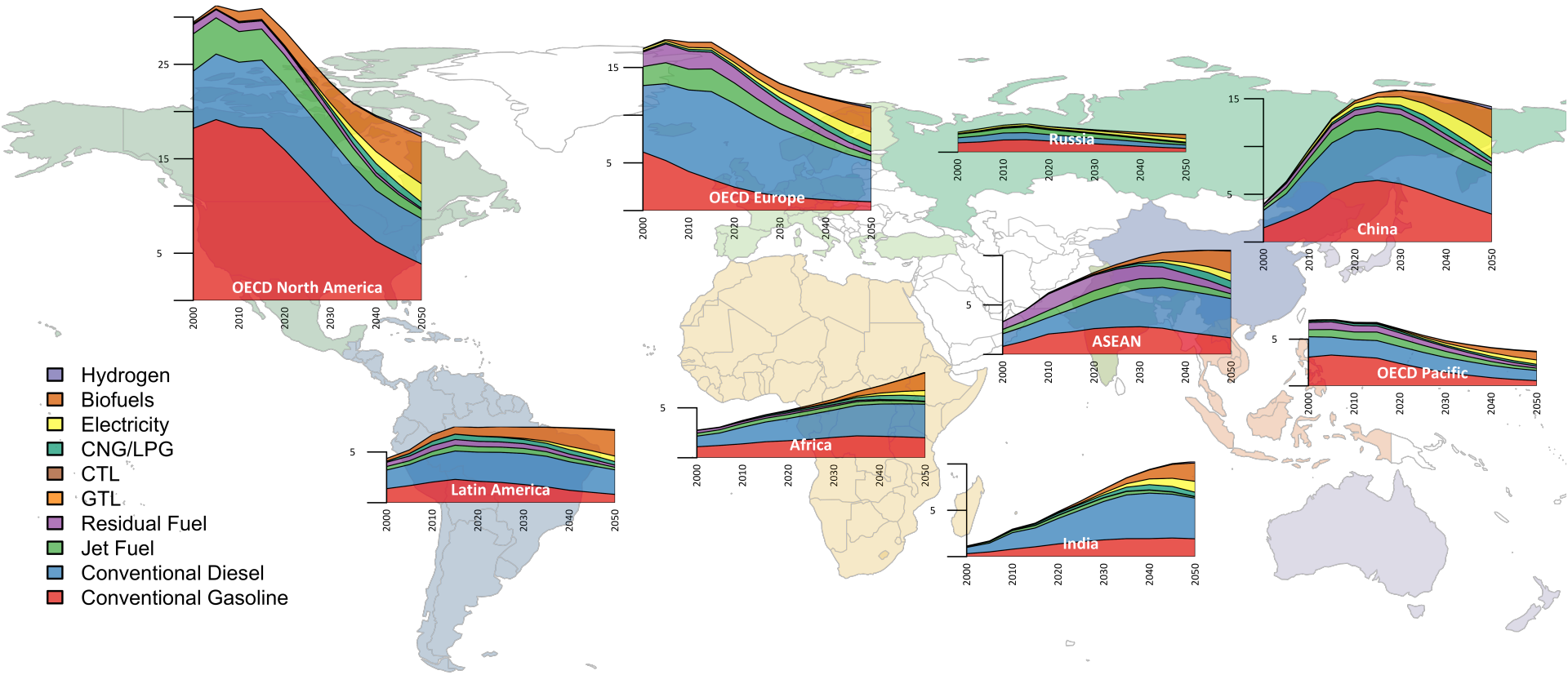


Preliminary results, please do not reproduce or cite

IEA (draft – publication in May 2016),
Energy Technology Perspectives, Chapter 5: Sustainable urban transport

III. What's needed to achieve the 2 degree scenario (2DS)?

Transport energy by fuel in major regions in **2DS**, EJ



Preliminary results, please do not reproduce or cite

IEA (draft – publication in May 2016),
Energy Technology Perspectives, Chapter 5: Sustainable urban transport

III. What's needed to achieve the 2 degree scenario (2DS)?

City-level policies

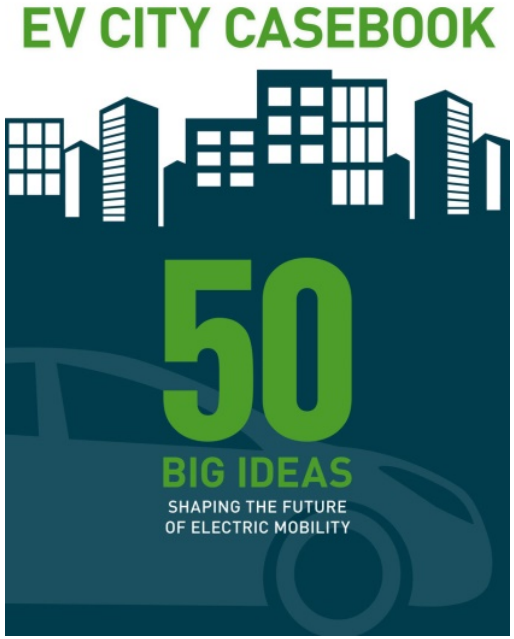
Pricing	***Regulatory Instruments***	***Investments***
Congestion charging / Cordon pricing / Tolls (e.g. Stockholm)	Access restrictions (e.g. "yellow label" restrictions in Chinese cities)	Transit infrastructure projects / extensions (e.g. the Paris metro; Bogota's *Transmilenio*)
Parking pricing (e.g. *SFPark*)	Low emission zones (e.g. time-of-day restricted access for freight trucks, as in many European cities)	Transit fare subsidies (e.g. local, regional and federal subsidies pay for roughly half of fares on systems in many European and Chinese cities)
	Registration caps (e.g. Singapore, Shanghai and other Chinese cities)	Purchase subsidies for low/zero-emission vehicles (or for electric vehicles – as in China, the Netherlands, and Norway)
	Parking restrictions / reductions in parking supply (e.g. progressive elimination of off-street parking in Copenhagen and Paris)	

IEA (draft – publication in May 2016),
Energy Technology Perspectives, Chapter 5: Sustainable urban transport

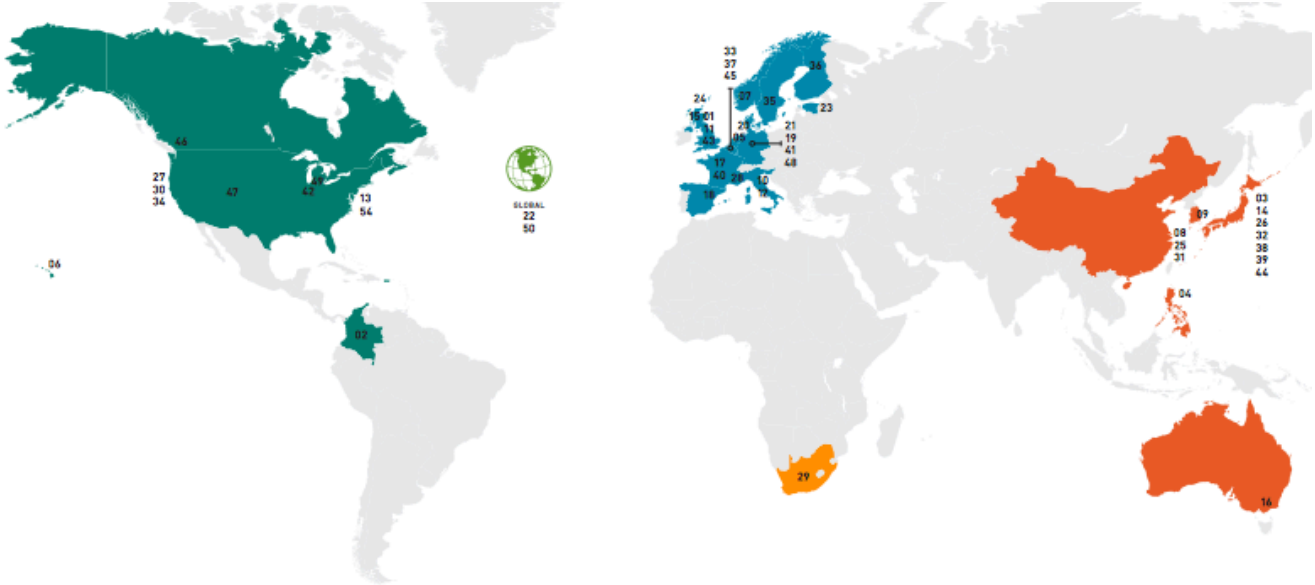
IV. Resources: EV City Casebook (2014)

EV City Casebook: 50 Big Ideas

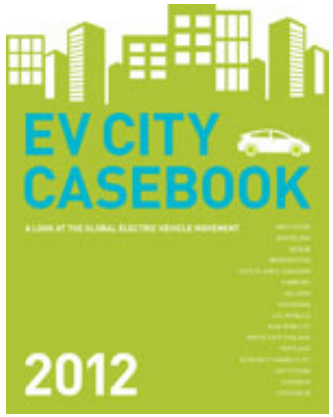
Second edition of the EV City Casebook



- Compendium of 50 world changing ideas expected to shape the future of EVs



- Builds on the idea of the 1st casebook, to collect qualitative & quantitative info on cities' EV goals, progress, policies, incentives, & lessons learned
- Aims to demonstrate the significance of what has been achieved to date
- Aims to show how innovative solutions can create new opportunities for electric mobility in the future



IV. Resources: EV City Casebook (2014)

Selected examples of ideas

- ULTRA LOW EMISSION ZONES (London)

  Start in 2020, same area as Congestion Charging; targeting cars, 2 wheelers, vans, minibuses and heavy vehicles; need to meet ULEZ standards or pay additional daily charge

- LOCAL INCENTIVES (Oslo)

  Exemptions from local taxes and charges, non-financial benefits (preferred parking, access to bus/HOV lanes)

- SHARED MOBILITY (Paris)

  all-electric car-sharing, Autolib', PPP launched in Dec. 2011

- EV VENDING MACHINES (Hangzhou)

  Automated multi-storey vertical garages are part of a city-wide car-sharing scheme

- CITY LOGISTICS (Brussels)

  Mobile depot tested by TNT in 2013 for parcel delivery operations in combination with electric tricycles

- PLUG SHARING (Berlin)

  Ubitricity: revenue-grade metering into the standard EV charging cable, opening up access to existing outlets for commercial charging

IV. Resources:
Next generation policy instruments (2015)

Driving renewable energy for transport
Next Generation Policy Instruments for Renewable Transport

- **Zero Emission Vehicle (ZEV) mandates**
  (obliging OEMs to meet a minimum share of ZEVs in their sales)
- **Financial incentives in vehicle registration taxes (VRT), and in company car taxation**
- **CO_2 regulations of road vehicles**,
  particularly when CO_2 targets are sufficiently ambitious
- Various **local incentives for Alternative Fuel Vehicles**

IEA-RETD (2015), Driving renewable energy for transport – Next generation policy instruments for renewable transport (RES-T-NEXT)
[Huib van Essen, Sanne Aarnink, Anouk van Grinsven, Arno Schroten, Matthijs Otten, Maarten 't Hoen, Bettina Kampman (CE Delft; Tammy Klein, Paul Niznik, Lucky Nurafiatin, Maelle Soares-Pinto (Stratas Advisors)], IEA Implementing Agreement for Renewable Energy Technology Deployment (IEA-RETD), Utrecht, 2015. Copyright © IEA-RETD 2015

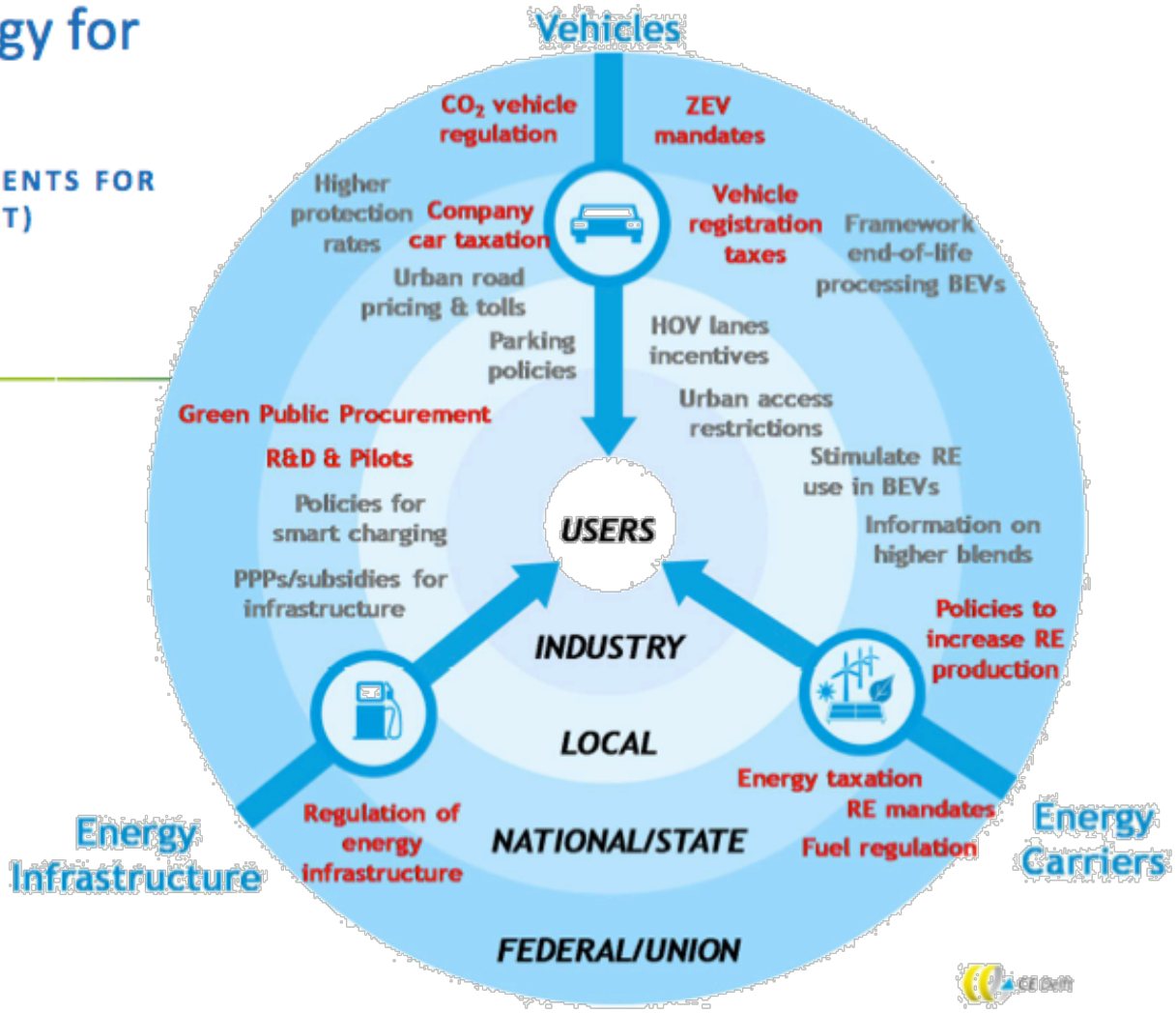
IV. Resources:
Next generation policy instruments (2015)

Driving renewable energy for transport

NEXT GENERATION POLICY INSTRUMENTS FOR RENEWABLE TRANSPORT (RES-T-NEXT)

November 2015

IEA-RETD
Renewable Energy Technology Deployment



IEA-RETD (2015), Driving renewable energy for transport – Next generation policy instruments for renewable transport (RES-T-NEXT)

[Huib van Essen, Sanne Aarnink, Anouk van Grinsven, Arno Schroten, Matthijs Otten, Maarten 't Hoen, Bettina Kampman (CE Delft; Tammy Klein, Paul Niznik, Lucky Nurafiatin, Maelle Soares-Pinto (Stratas Advisors)], IEA Implementing Agreement for Renewable Energy Technology Deployment (IEA-RETD), Utrecht, 2015. Copyright © IEA-RETD 2015

IV. Venues for cooperation:
Platforms for collaboration & upcoming events

Paris Declaration on Electro-Mobility and Climate Change & Call to Action

COP21: Lima – Paris Action Agenda

To learn more:
http://newsroom.unfccc.int/lpaa/transport/the-paris-declaration-on-electro-mobility-and-climate-change-and-call-to-action/

Transport & Behaviour: IEA workshop: May 10-11th, Paris France.

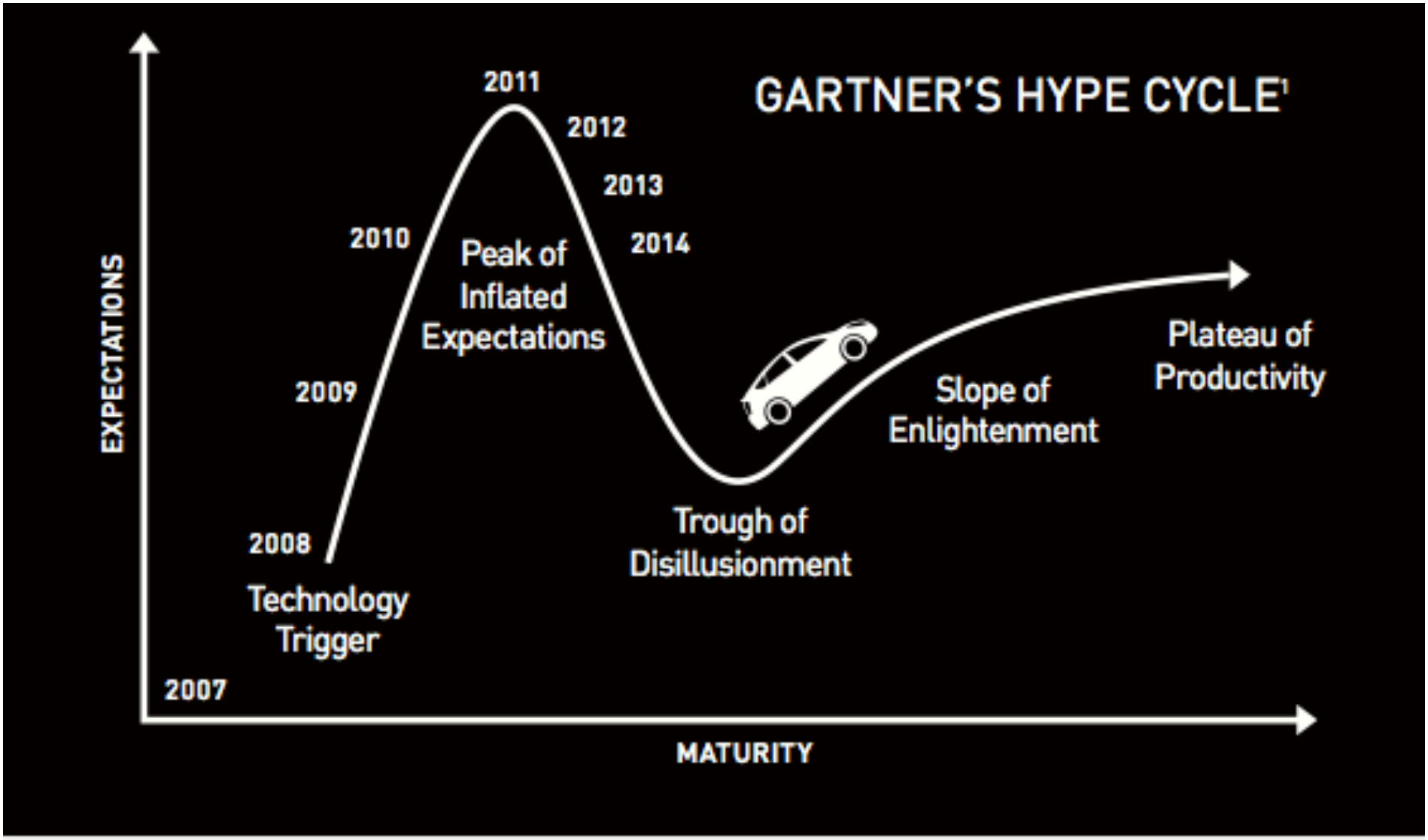
Topics:

- ecodriving campaigns and feedback instruments
- vehicle labelling programs
- the potential role of innovative business models (e.g. "Mobility as a Service")
- carrots and sticks for promoting public transport and cycling and walking
- raising awareness of and understanding consumer preferences for electric vehicles.

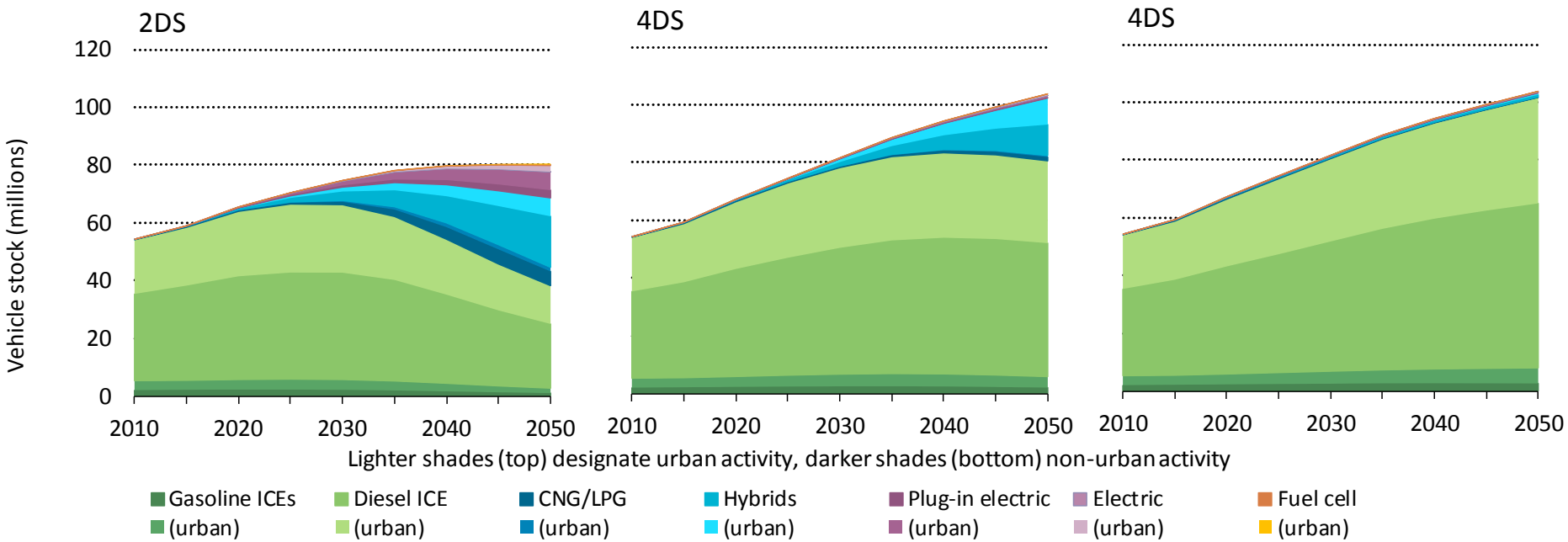
International Forum on EV Demonstration Cities and Industrial Development

Shanghai, China, Summer 2017 (Biannual – 2011, 2013, 2015)

Thank you


GARTNER'S HYPE CYCLE
EXPECTATIONS
MATURITY
2007
2008
2009
2010
2011
2012
2013
2014
Technology Trigger
Peak of Inflated Expectations
Trough of Disillusionment
Slope of Enlightenment
Plateau of Productivity

Vehicle technologies – Trucks

- 6DS: no new policies, no hybrids, NG remains marginal
- 4DS: Hybridization
- 2DS: Mode shifts and electrificiation

Lower stock due to shift to rail for intercity trucking,
larger shares of hybrids, PHEVs & some BEVs in light- to mid-duty trucking
Hybrids: 10% in 2030 & >40% in 2050; PHEVs: 3% in 2030 & 10% in 2050