

Future of Mobility and the Role of Electric Vehicles

GEAN 2019, Jeju

Ali Izadi

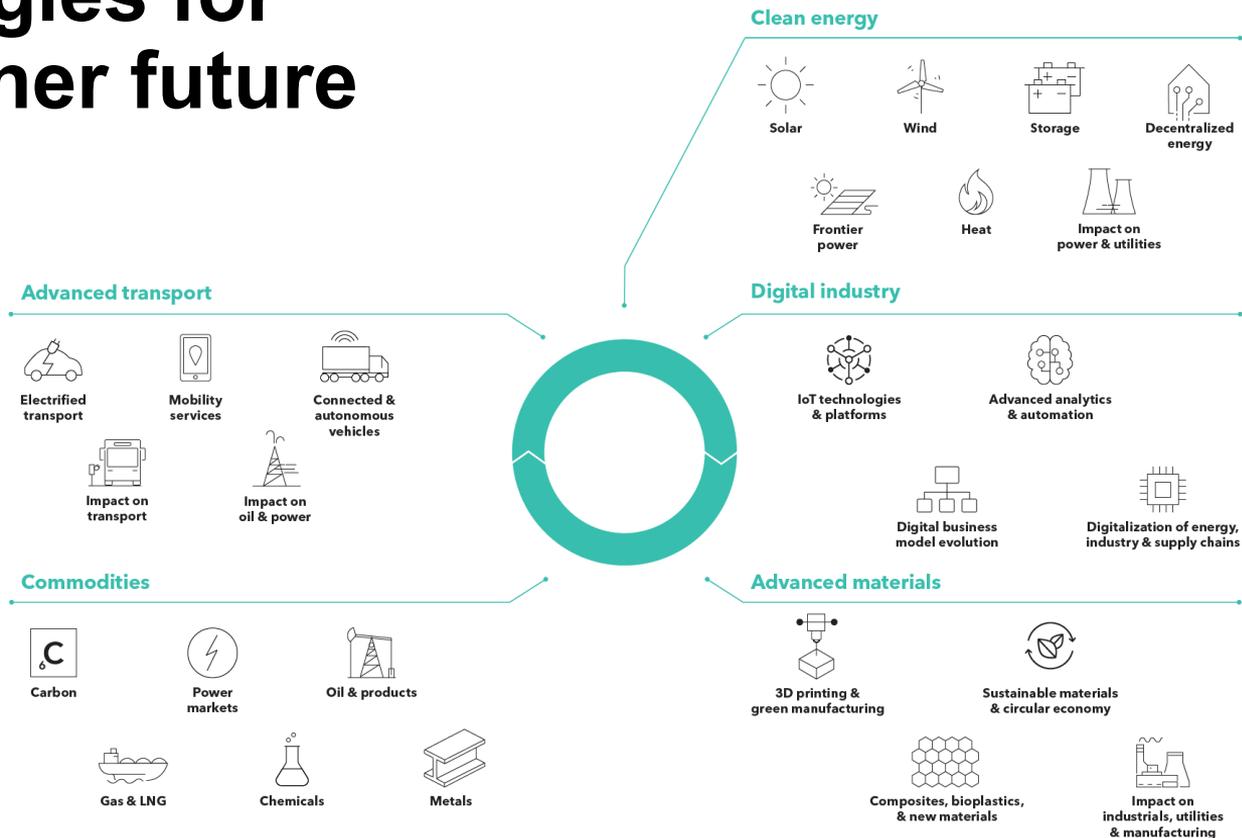
@AI_Energy

May 7, 2019



BloombergNEF

Strategies for a cleaner future



Consumers' top concerns around mobility

Air pollution



Congestion



Energy security



Convenience and
cool factor

trump everything else!

How are automakers trying to meet consumers' needs/wants: CASE



Connected



Autonomous



Shared



Electric

C - Connectivity
Comfort, safety, and entertainment in a new dimension.

A - Autonomous
Daimler is a pioneer in autonomous driving. Research vehicles already are en route on test tracks.

S - Shared & Services
The mobility of the future will be more flexible than ever before. Daimler offers a broad range of intelligent services.

E - Electric
At Daimler, we are convinced: The future is electric.

DAIMLER

Global automakers future of mobility strategies



ACES ARE A CORE ELEMENT OF STRATEGY NUMBER ONE > NEXT.



Nissan M.O.V.E. to 2022

- Mobility
- Operational Excellence
- Value to Customers
- Electrification



GM'S WORLD VIEW

GM is committed to a future of:

ZERO
CRASHES

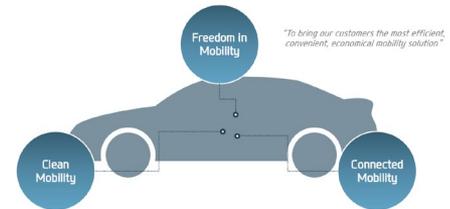
ZERO
EMISSIONS

ZERO
CONGESTION

TECHNOLOGY WILL
HELP UNLOCK THIS FUTURE



Hyundai Motor's Vision for Future Mobility



CASE at a glance: at the start of 2019

2019 YoY expected growth

~0%

~1%

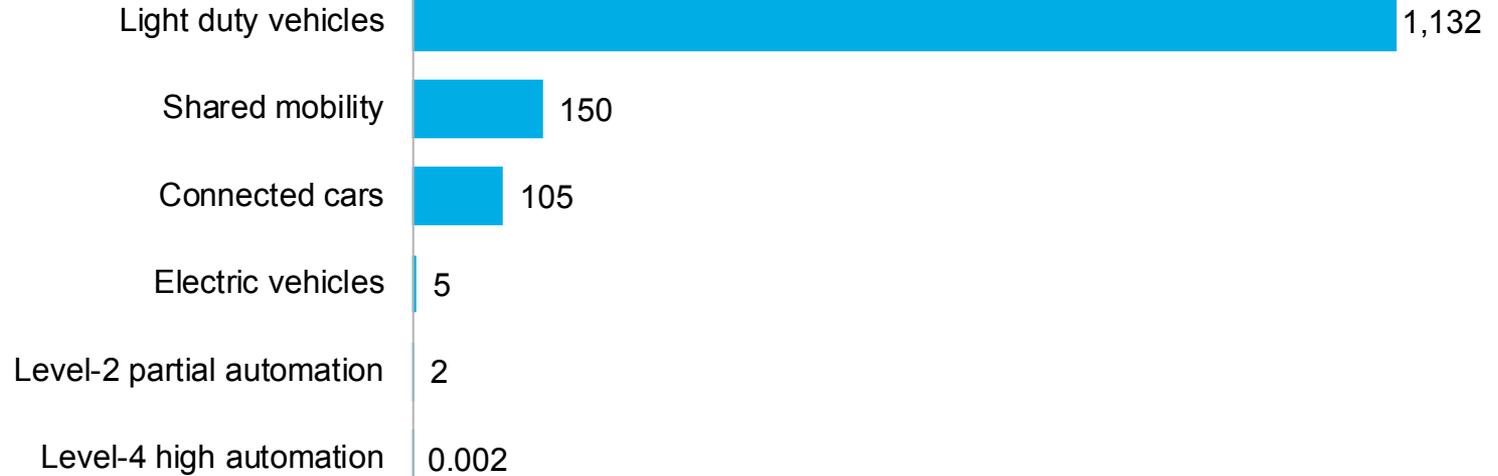
~25%

~40%

~100%

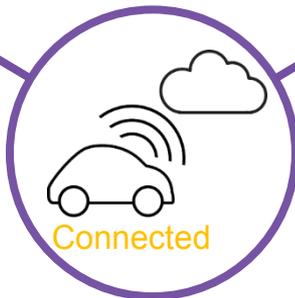
~1000%

Fleet size (millions)

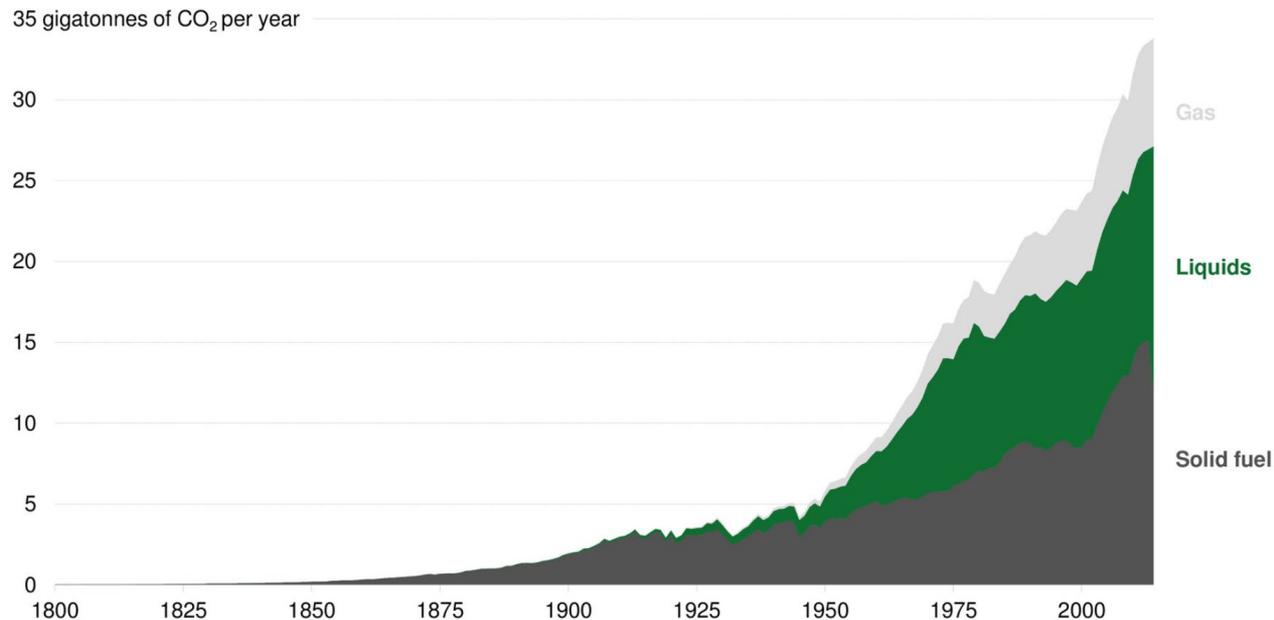


Source: BloombergNEF. Note: shared mobility fleet includes taxis, fleet-based car-sharing and vehicles used for digital-hailing. Connected cars refers to vehicles with built-in telematics.

Connectivity is central to CASE



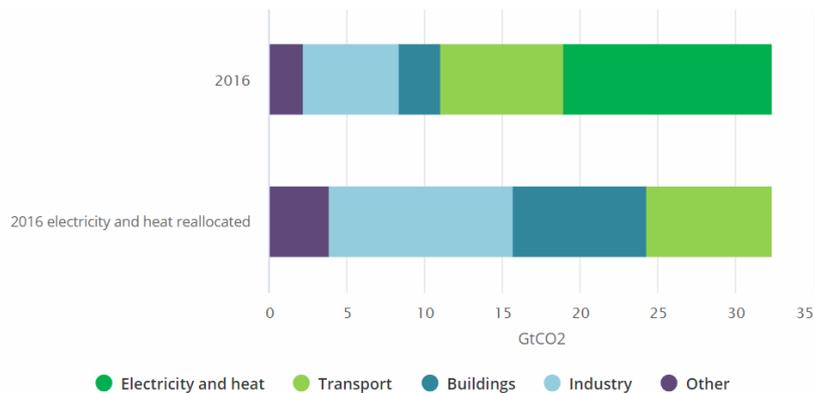
Global CO₂ emissions from fossil fuels



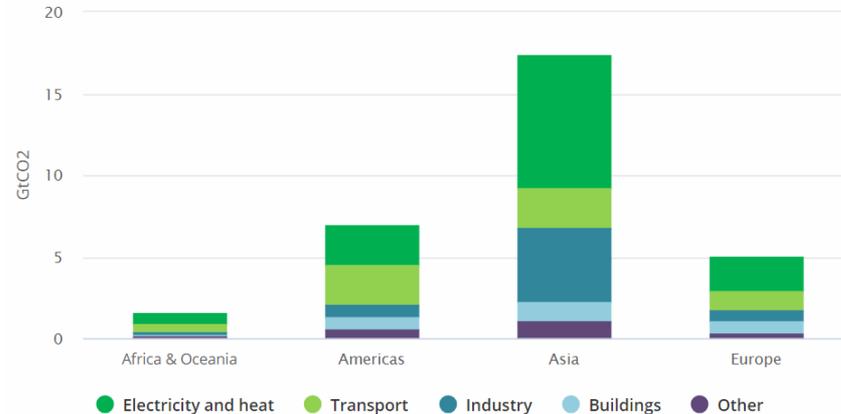
Source: Carbon Dioxide Information Analysis Center

Global CO₂ emission, 2016

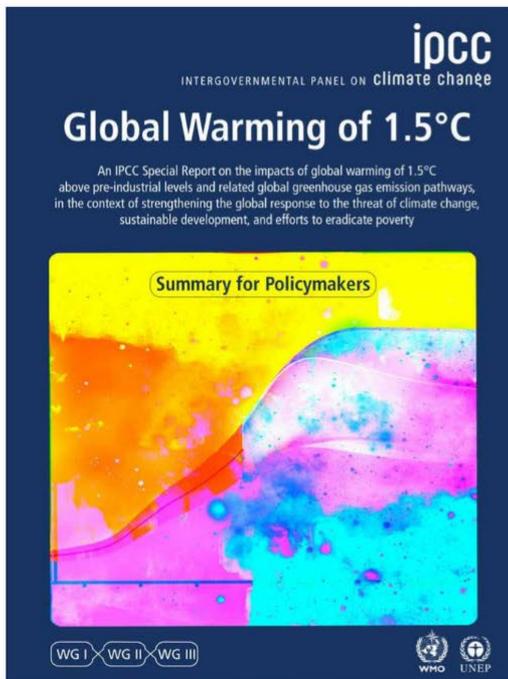
By sector



By region



Source: *International Energy Agency*

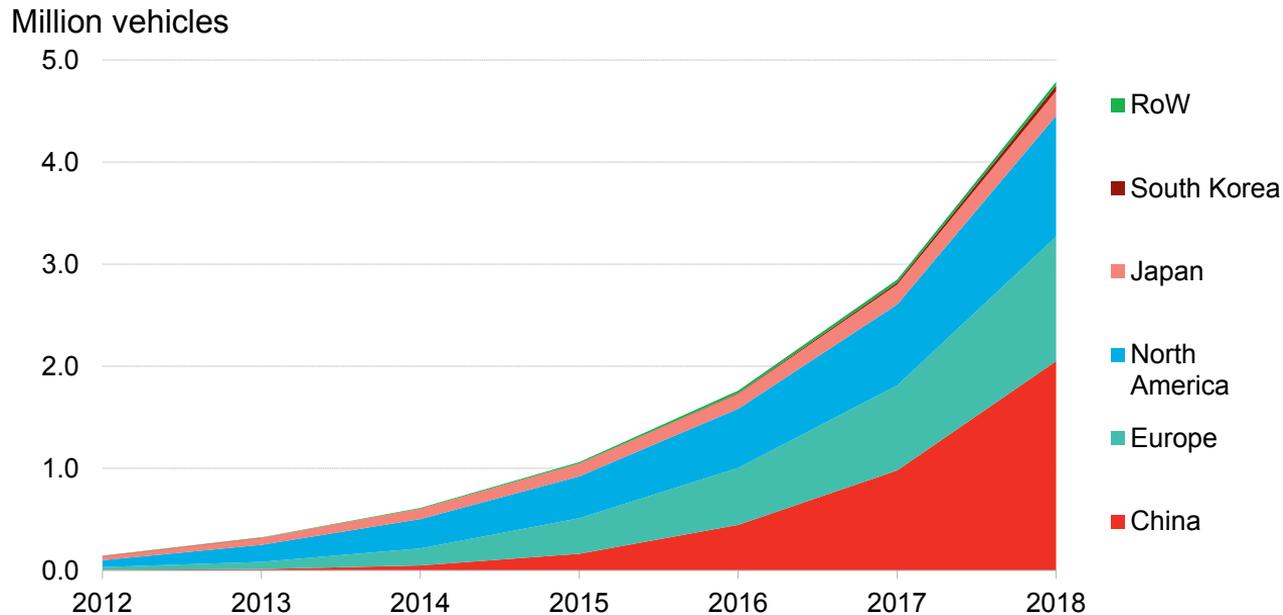


These systems transitions are unprecedented in terms of scale...

Intergovernmental Panel on Climate Change
Global Warming of 1.5°C, Summary for Policymakers, section C2
October 2018

Source: Intergovernmental Panel on Climate Change

Cumulative global passenger electric vehicle sales



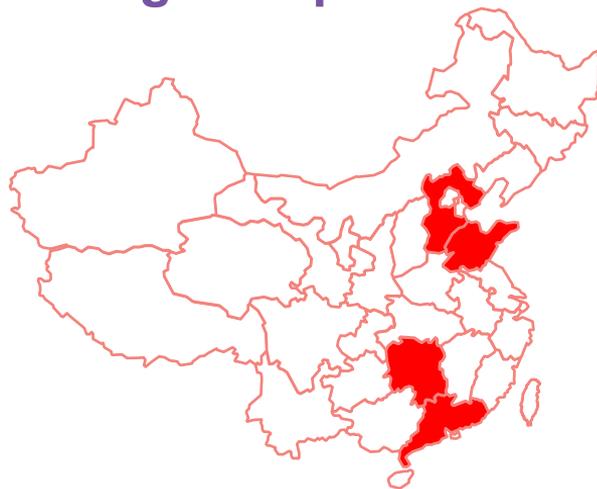
Source: BloombergNEF. Note: only includes highway capable four wheelers.

Main layers of EV policy support in China

National policies



Regional policies



City regulations

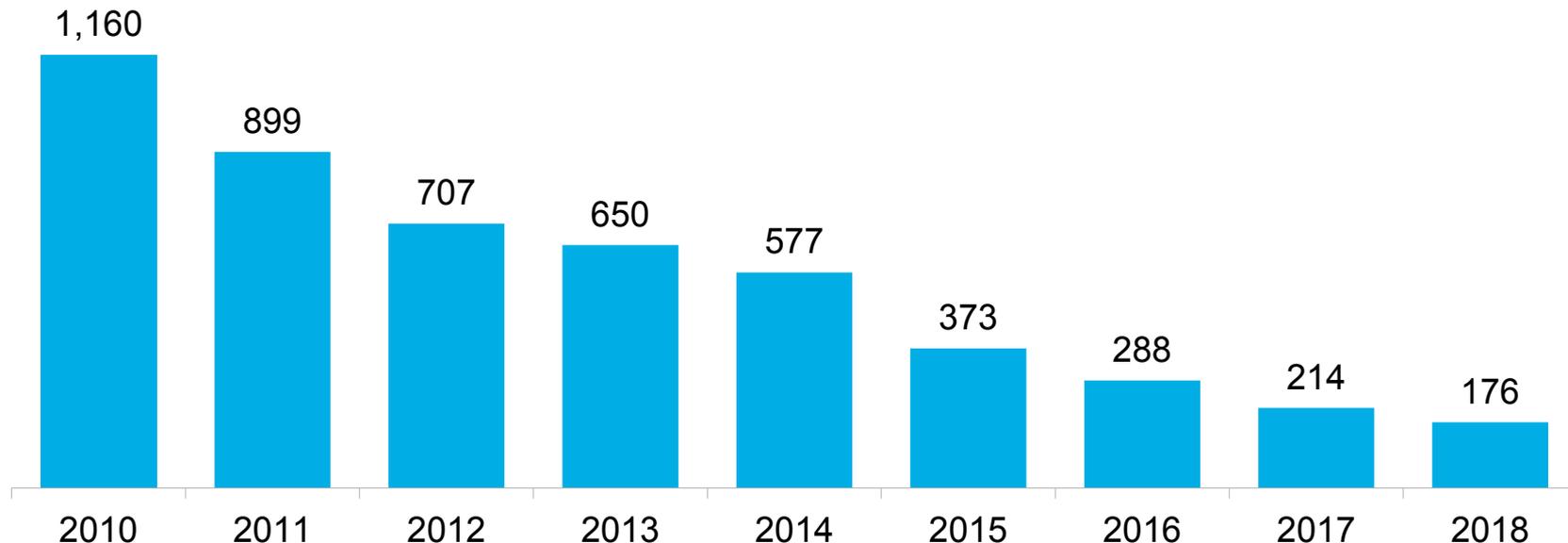


Image: Bloomberg Media, Wikipedia.

Average lithium-ion battery pack prices have fallen 85% since 2010

Battery pack price (real 2018 \$/kWh)

85%



Source: BloombergNEF Note: The data in this chart has been adjusted to show real 2018 dollars

The race is on



Automaker	2025 sales target
	25%
DAIMLER	20%
 北京汽车 BAIC MOTOR	100%
 长安汽车 CHANGAN	100%

Automaker	EV model target (year)
 TOYOTA	10 EV models (early 2020s)
	16 EV models (early 2020s)
	20 EV models (2023)

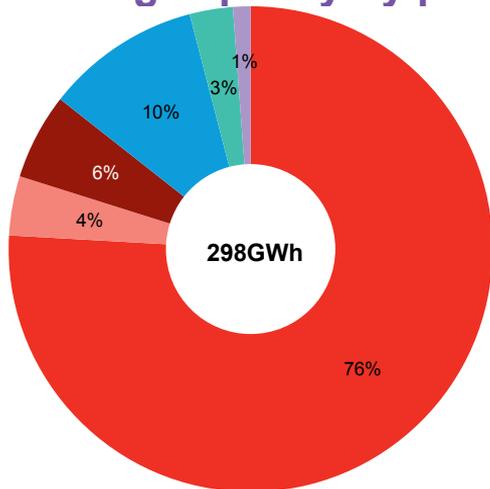
The race is on



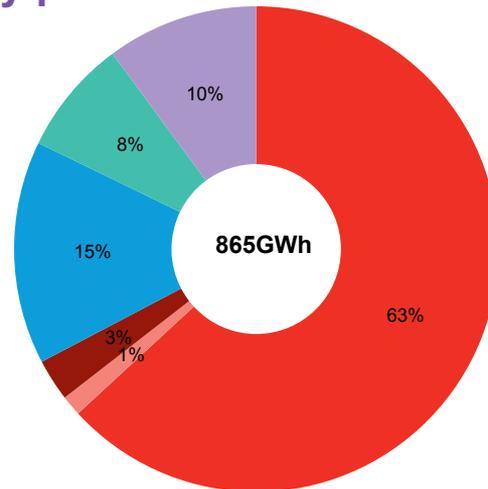
Image: ForoCochesElectricos

Li-ion battery cell manufacturing capacity may triple by 2023

2018YE commissioned cell manufacturing capacity by plant location



Capacity due to be commissioned by 2023 by plant location

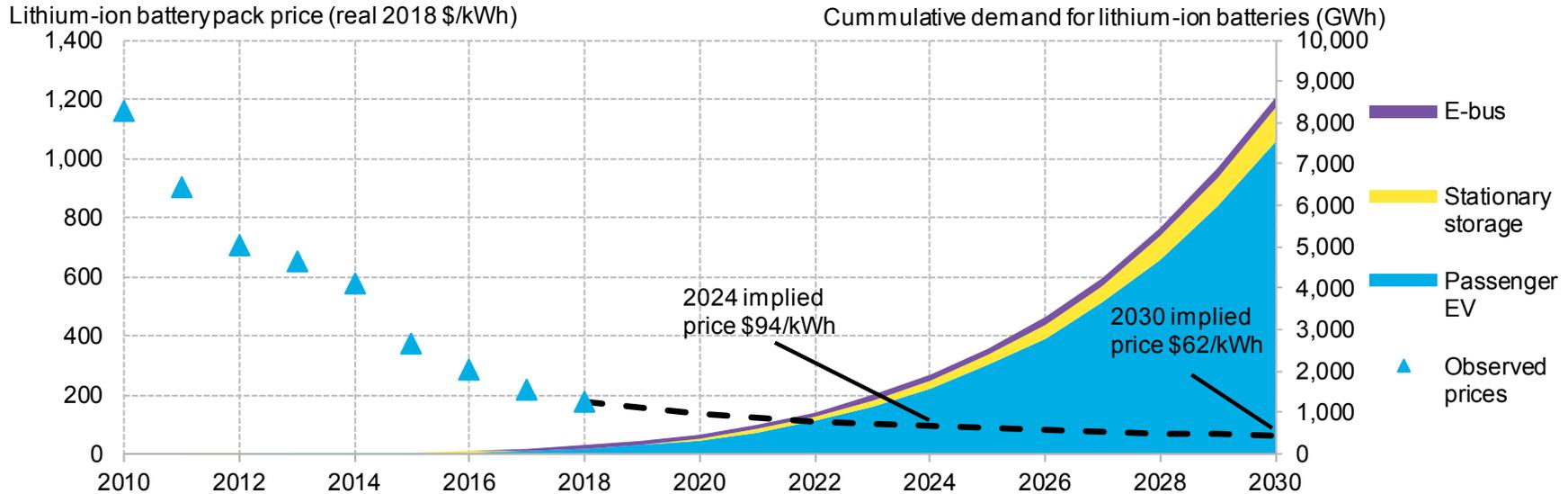


Source: BloombergNEF

■ China ■ Japan ■ Korea, Republic of ■ United States ■ Europe ■ Other

Battery prices are key to EV affordability

Volume-weighted battery pack prices have been falling



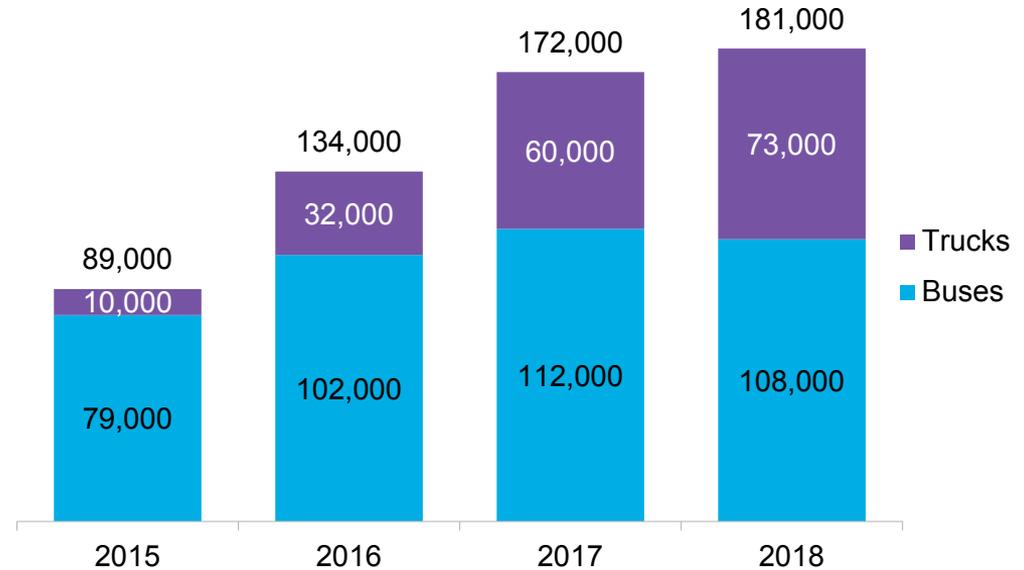
Source: BloombergNEF. Note: Prices have been changed to real 2018 dollars



Other vehicles are also going electric: trucks



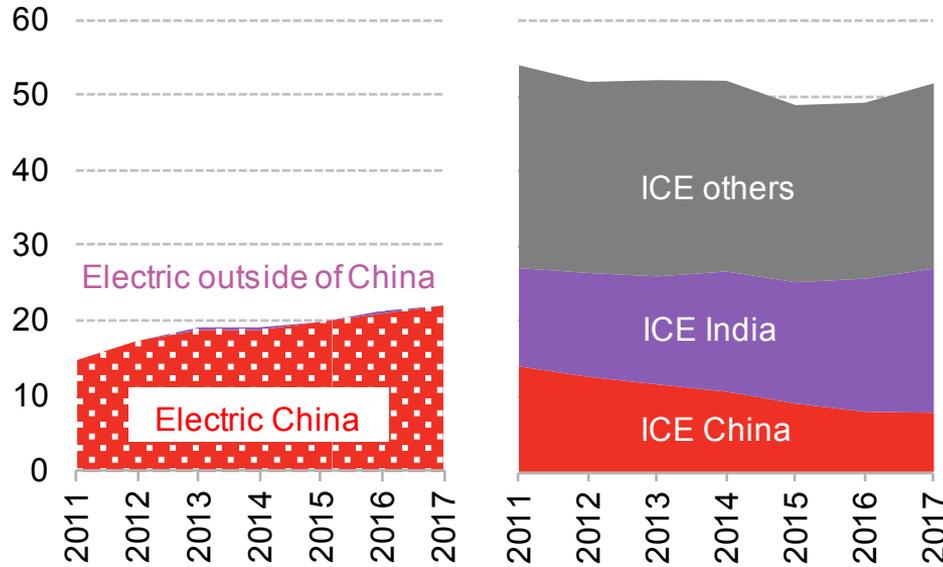
China commercial EV sales



Source: CAAM, Image: BYD, BloombergNEF. 2018 sales include ~900 fuel cell vehicles.

Other vehicles are also going electric: two-wheelers

Global sales of two-wheelers (millions)



+150 million

Number of electric two-wheelers on the road in China



Source: CAAM, BloombergNEF. Image: Jiangsu Xinxi Nanjue.

Electrification of digital-hailing



- Targeting one million EVs on its network by 2020.
- 10 million EVs by 2028.



- 10,000 electric three-wheeled rickshaws on the road by April 2019.
- One million battery powered vehicles by 2021.



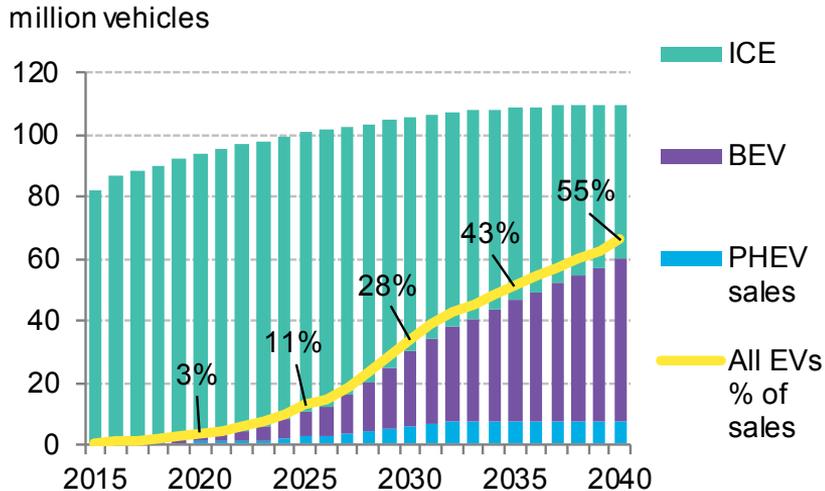
- Five million “electric rides” between July 2018 and July 2019.
- Targeting EV-only fleets in London by 2025.



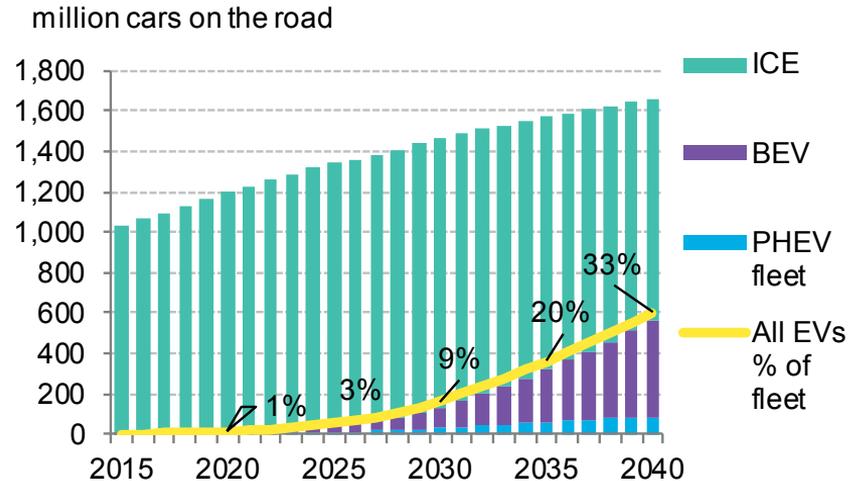
- Since September 2018, Carbon neutral taxi rides offered in the U.K. for 20p premium.
- Electric black cab drivers are charged no fees by Gett for their first 6 months.

EVO2018: By 2040, 55% of all new car sales and 33% of the global fleet will be electric

Annual light duty vehicle sales

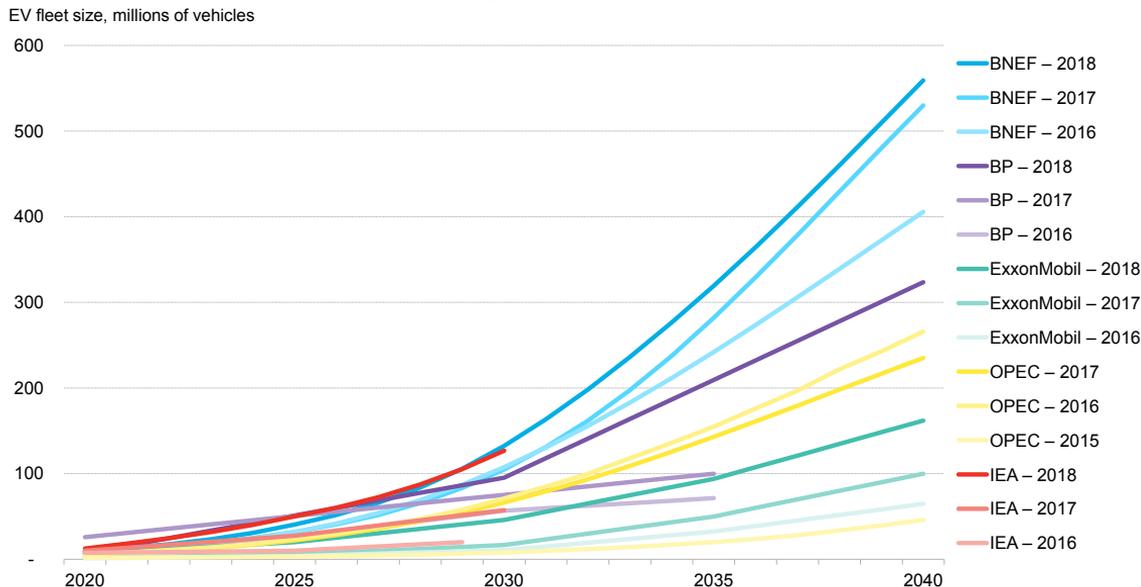


Global light duty vehicle fleet



Source: BNEF

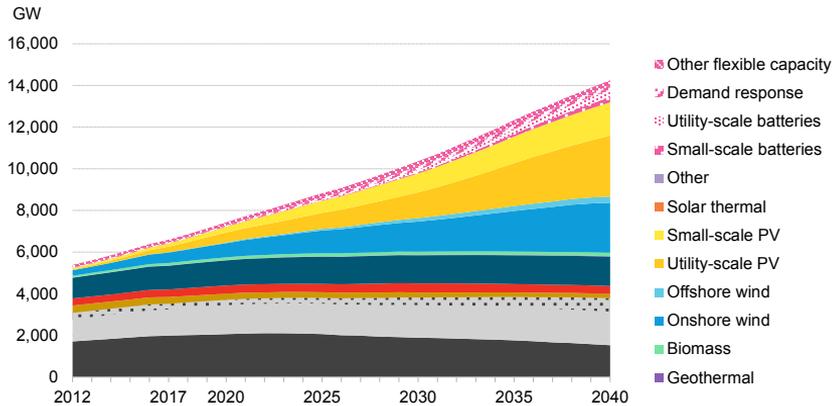
EV fleet size comparison



Notes: Values in black are taken directly from organization publications. Values in green are BNEF estimates based on organization charts, reports and/or data (estimates assume linear growth between known data points). Outlook assumptions and methodologies vary. BP only forecasted through 2035 in its 2016 and 2017 outlooks. The IEA only forecasts through 2030. The IEA forecasts multiple scenarios (base case values are shown here). OPEC's 2018 outlook not yet available. ExxonMobil and IEA forecasts prior to 2018 include BEVs, PHEVs and FCVs; all other forecasts include just BEVs and PHEVs. See organization websites for authoritative viewpoints.

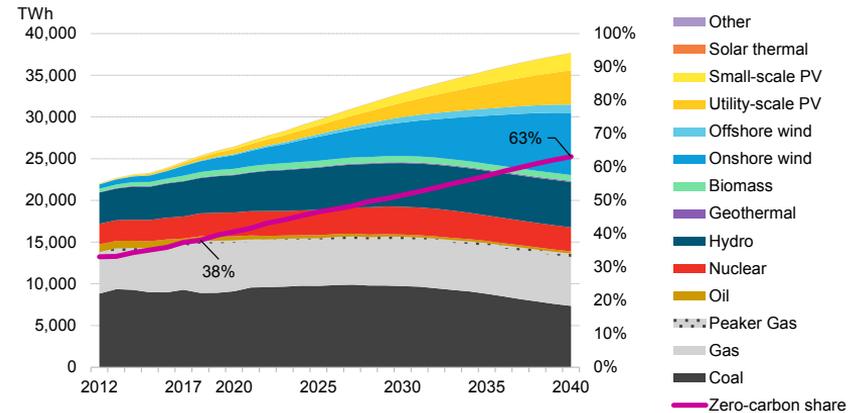
Global power generation mix

Global cumulative generation capacity



Source: BloombergNEF New Energy Outlook 2018

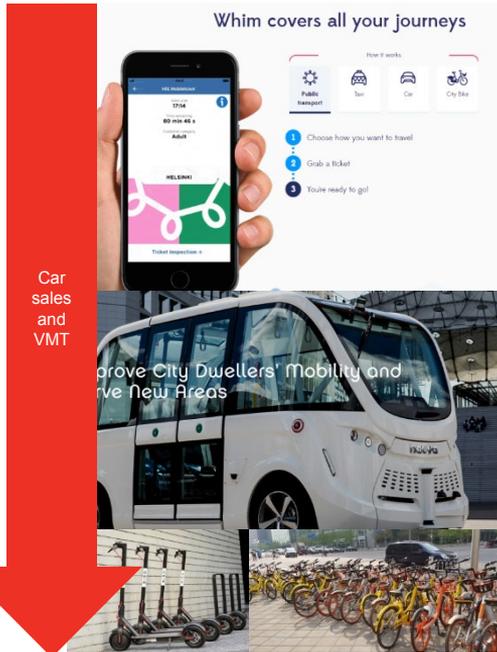
Global electricity generation and zero-carbon share



Source: BloombergNEF New Energy Outlook 2018

The future role of cars

On-demand multi-modal non-vehicle transport options



Car sales and VMT

Cars as a form of personal expression and art



Autonomous cars as living rooms on wheels



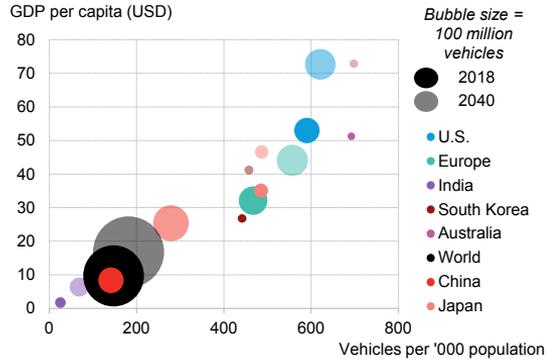
VMT= vehicle miles travelled

Car sales and VMT

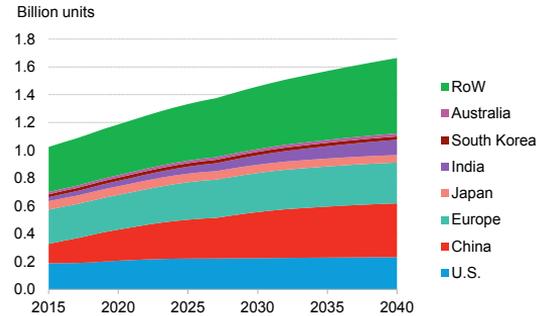
The future role of cars

BNEF EVO2018

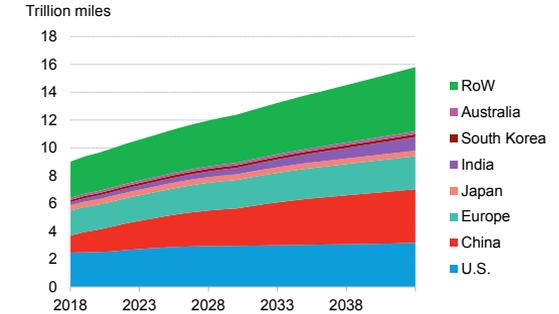
GDP vs motorization rate



Light duty vehicle fleet by region



Annual car miles travelled



Forecast

2040 passenger vehicle fleet size, billion cars

BNEF EVO2018	1.66
BP Energy Outlook 2018	1.97
OPEC World Oil Outlook 2018	1.98

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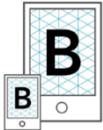
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