

# Future of Mobility and the Role of Electric Vehicles

GEAN 2019, Jeju

Ali Izadi

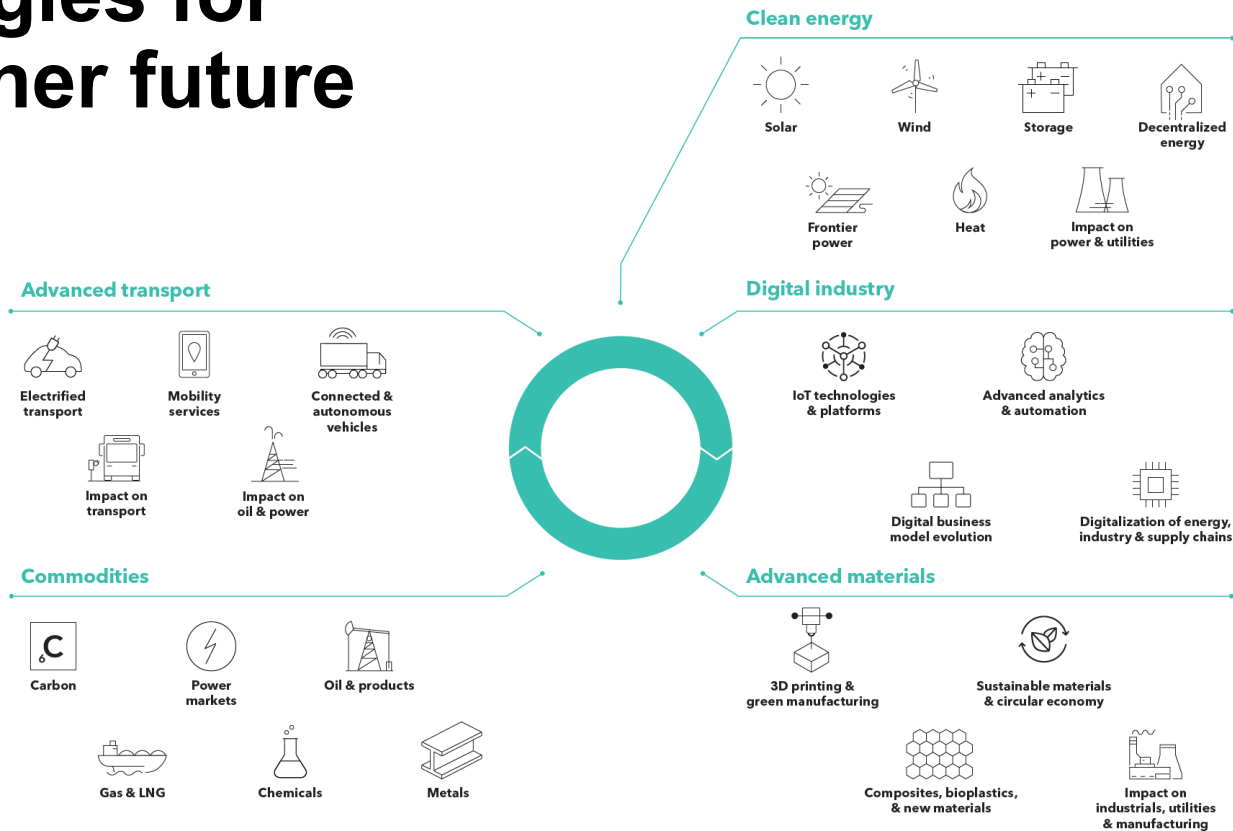
@AI\_Energy

May 7, 2019



BloombergNEF

# Strategies for a cleaner future



# Consumers' top concerns around mobility

## Air pollution



## Congestion

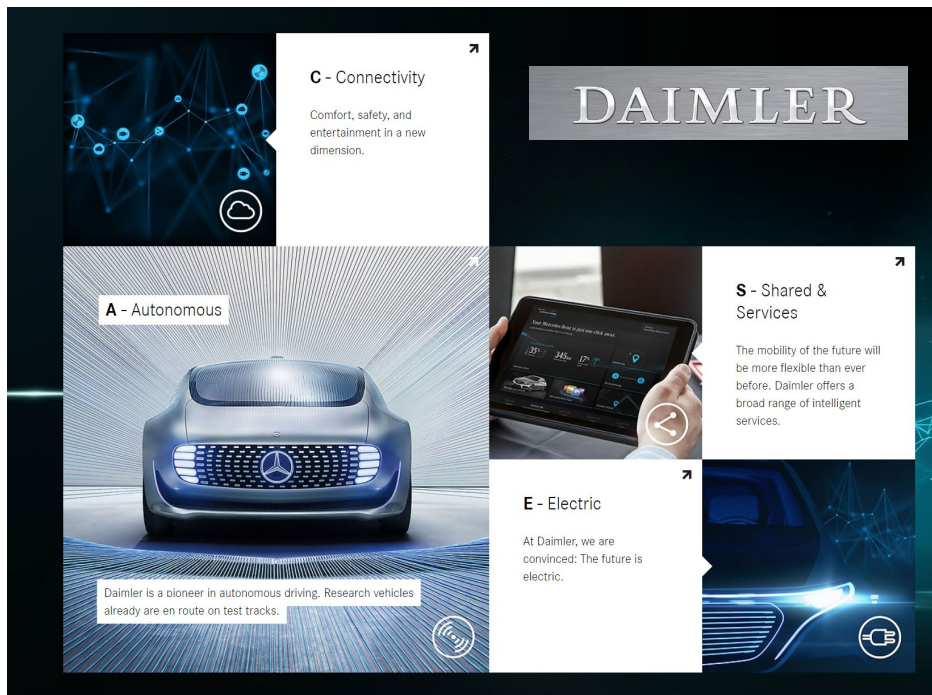


## Energy security



Convenience and  
*cool factor*  
trump everything else!

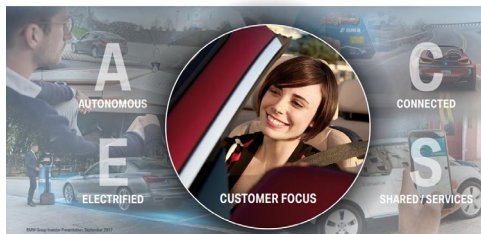
# How are automakers trying to meet consumers' needs/wants: CASE



# 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

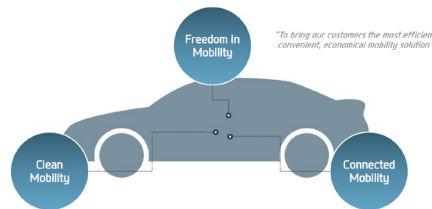
**ZERO**  
EMISSIONS

**ZERO**  
CONGESTION

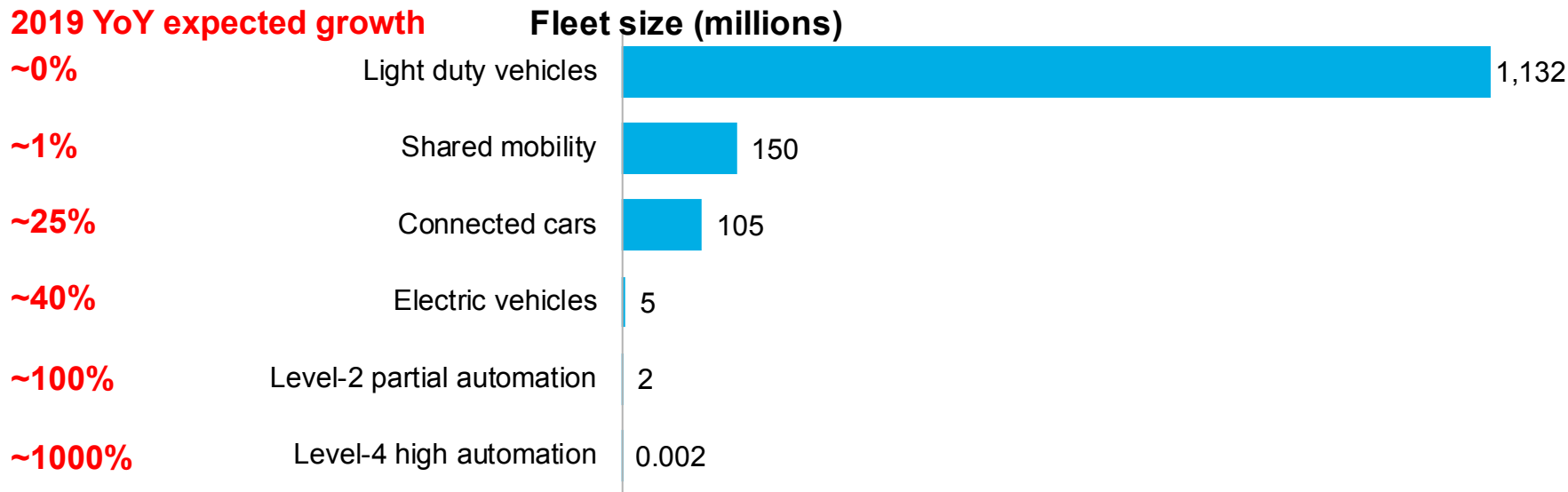
TECHNOLOGY WILL  
HELP UNLOCK THIS FUTURE



Hyundai Motor's Vision for Future Mobility

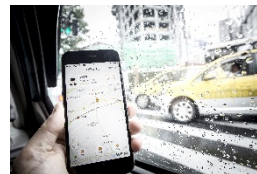


# CASE at a glance: at the start of 2019

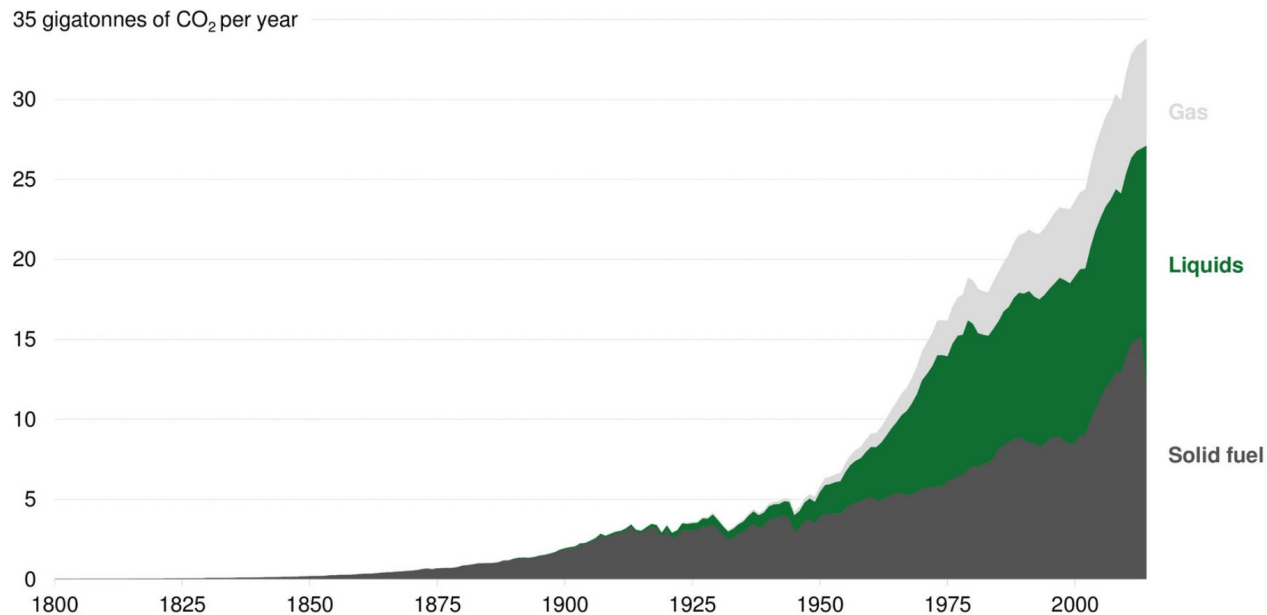


Source: BloombergNEF. Note: shared mobility fleet includes taxis, fleet-based car-sharing and vehicles used for digital-hailing. Connected cars refers to vehicles with built-in telematics.

# Connectivity is central to CASE



# Global CO<sub>2</sub> emissions from fossil fuels

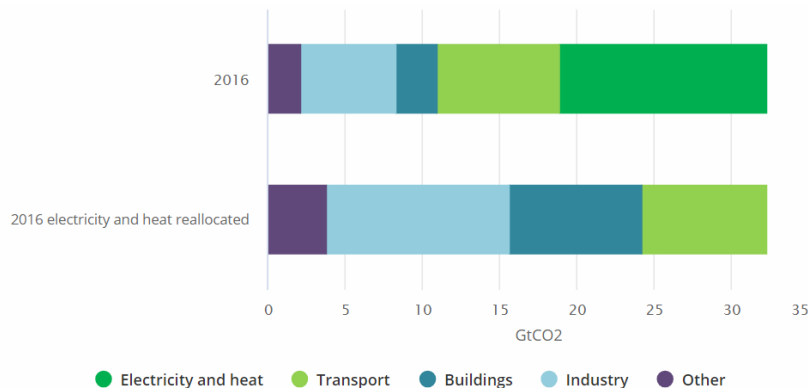


Source: Carbon Dioxide Information Analysis Center

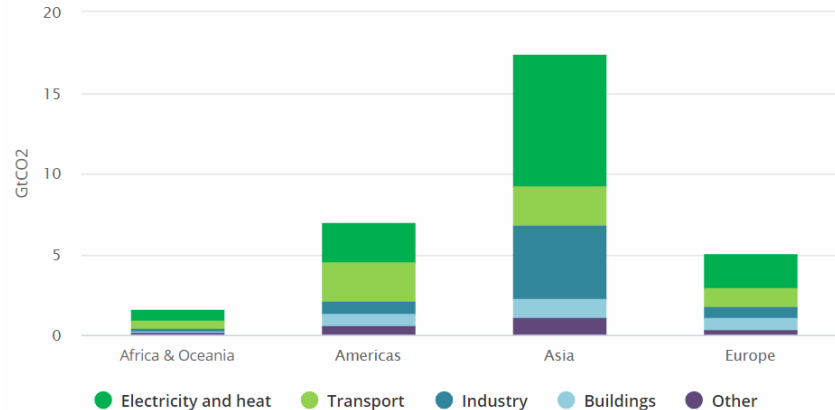


# Global CO<sub>2</sub> emission, 2016

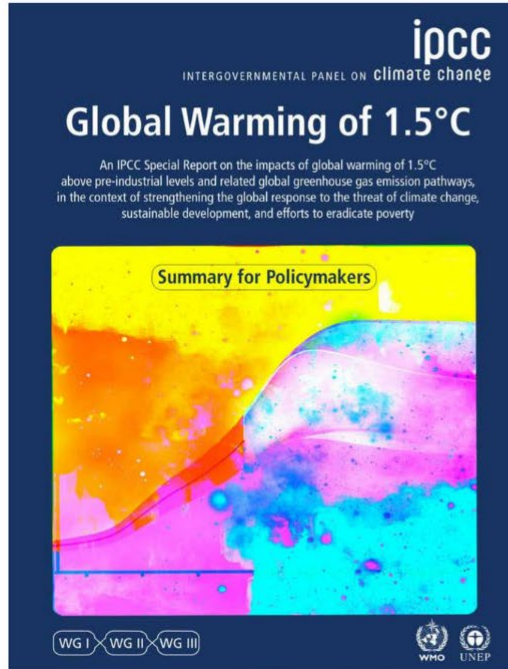
## By sector



## By region



Source: International Energy Agency

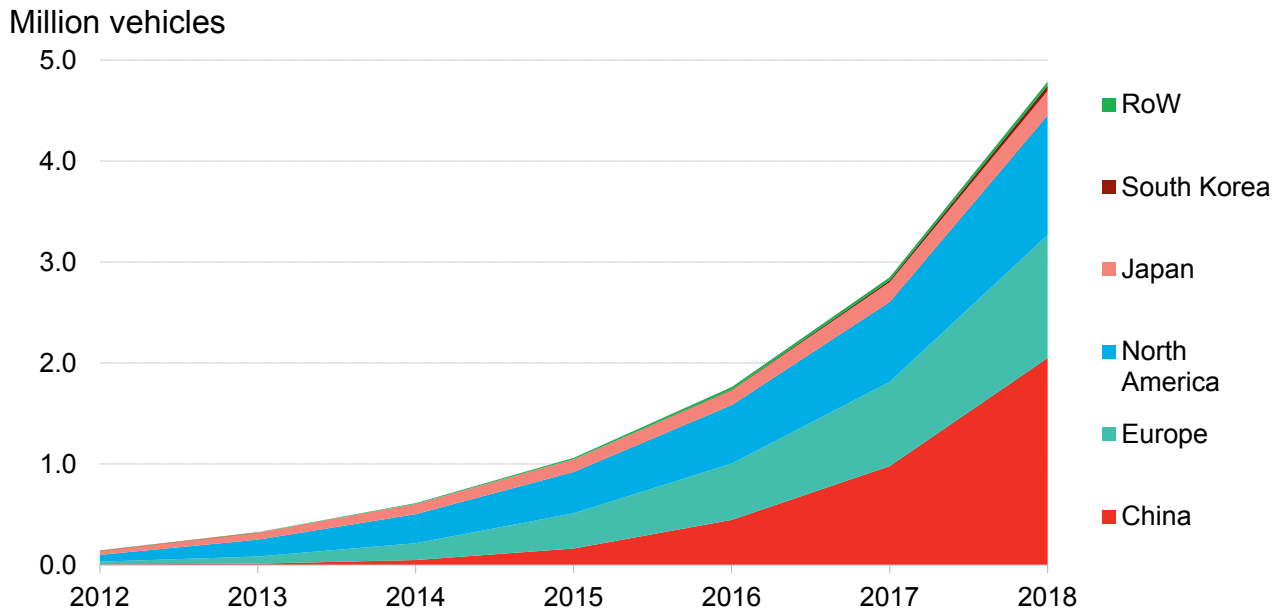


These systems transitions are unprecedented in terms of scale...

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

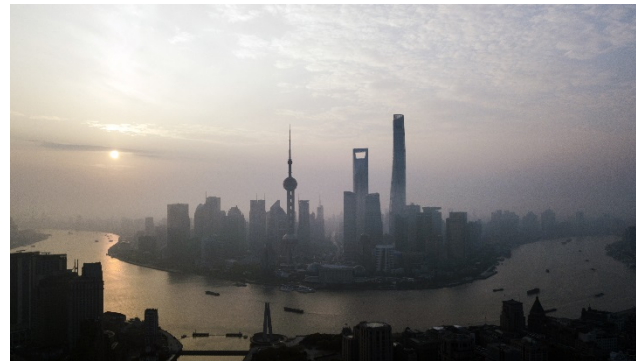
## National policies



## Regional policies



## City regulations

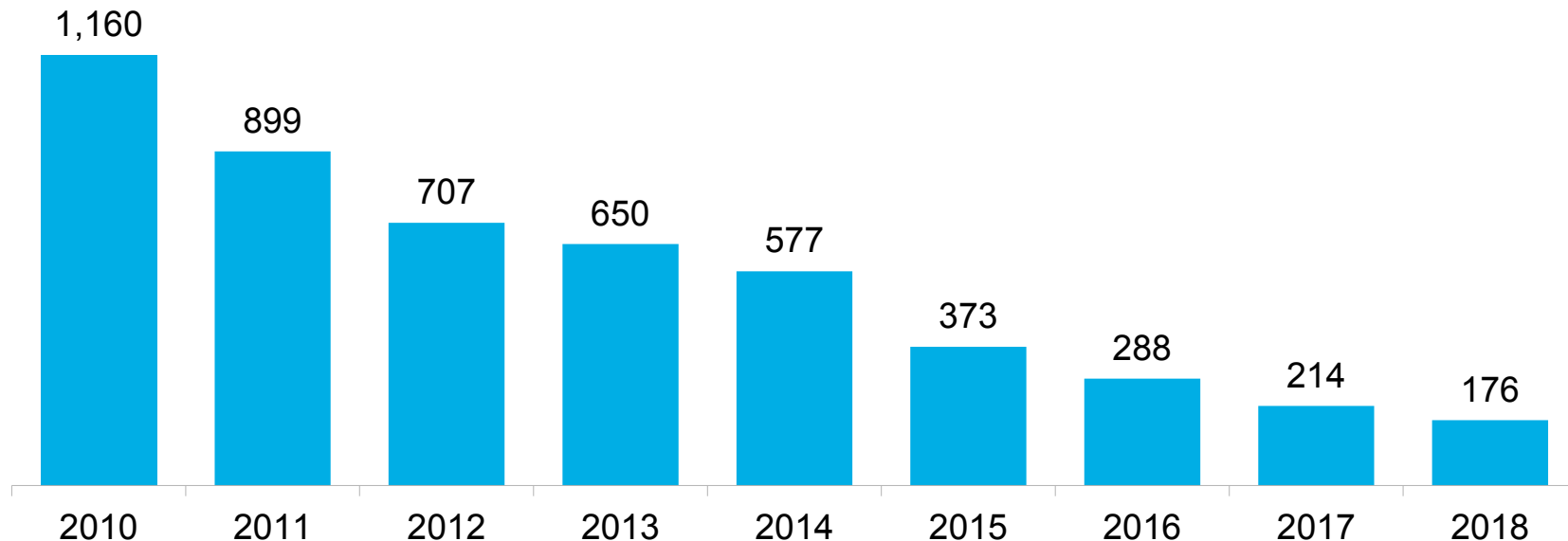


*Image: Bloomberg Media, Wikipedia.*

# 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%               |
|  | 20%               |
|  | 100%              |
|  | 100%              |

| Automaker   | EV model target (year)        |
|---|-------------------------------|
| <br>TOYOTA | 10 EV models<br>(early 2020s) |
|            | 16 EV models<br>(early 2020s) |
|            | 20 EV models<br>(2023)        |

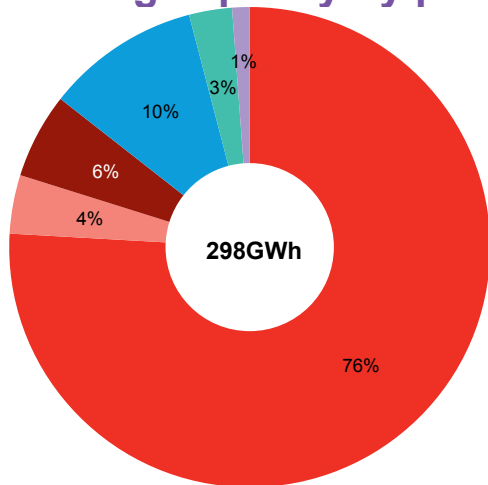
# The race is on



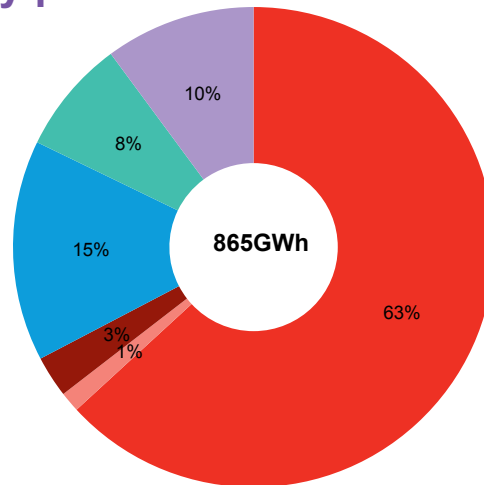
Image: ForoCochesElectricos

# 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



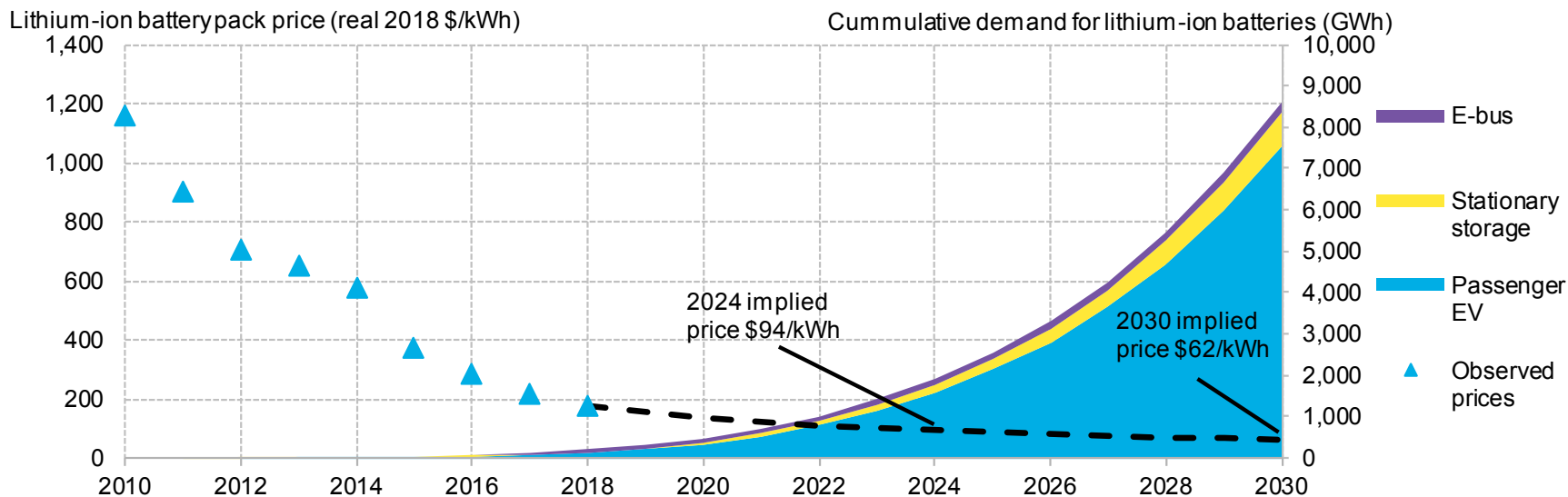
Source: BloombergNEF

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



# Battery prices are key to EV affordability

## Volume-weighted battery pack prices have been falling



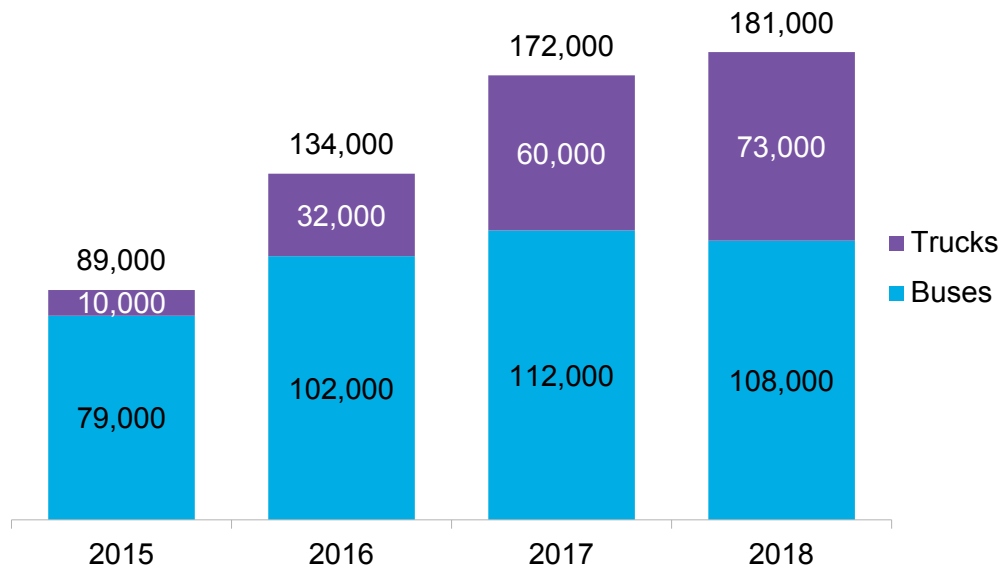
Source: BloombergNEF. Note: Prices have been changed to real 2018 dollars



# Other vehicles are also going electric: trucks



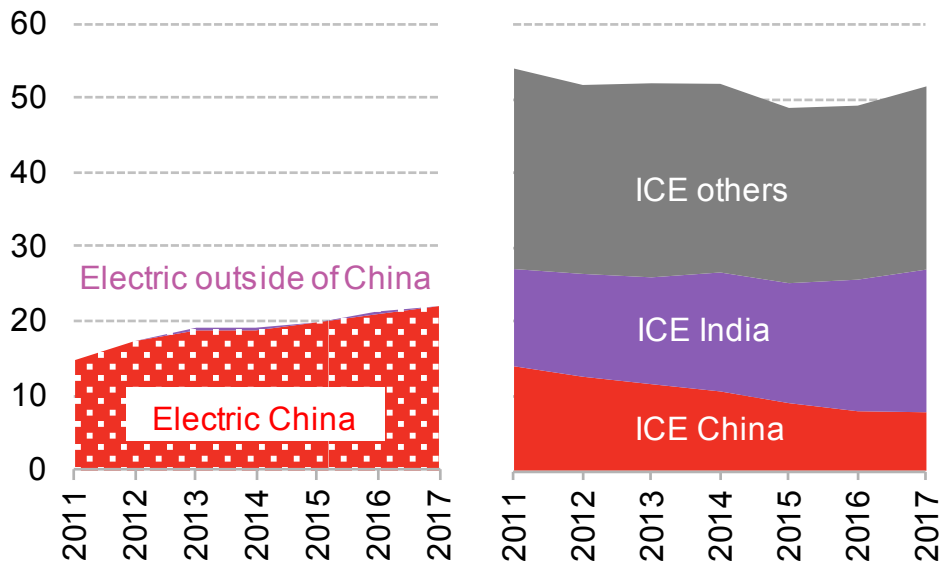
China commercial EV sales



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.



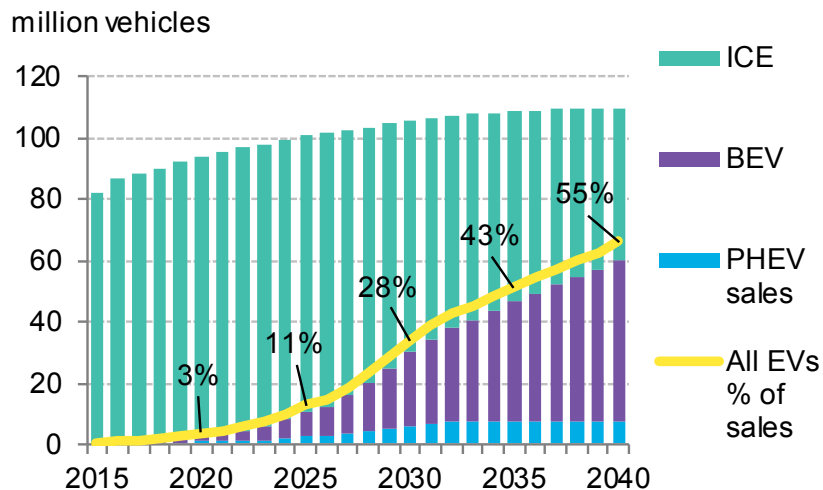
- Five million “electric rides” between July 2018 and July 2019.
- Targeting EV-only fleets in London by 2025.



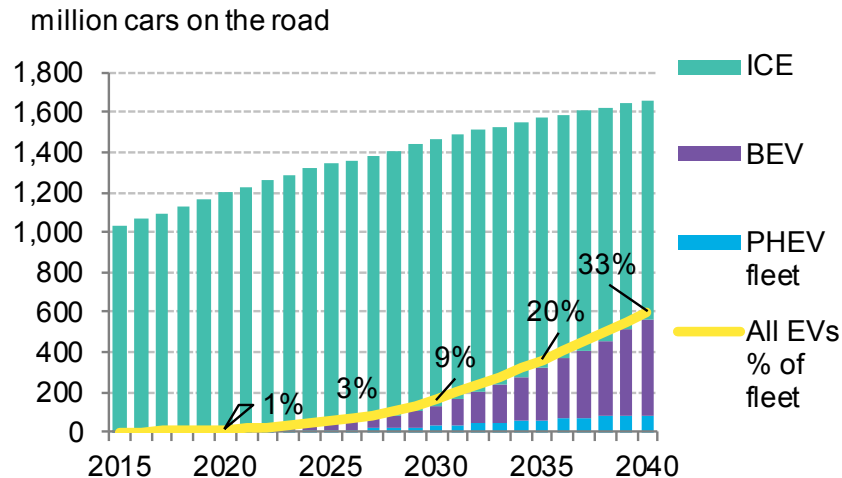
- Since September 2018, Carbon neutral taxi rides offered in the U.K. for 20p premium.
- Electric black cab drivers are charged no fees by Gett for their first 6 months.

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

## Annual light duty vehicle sales



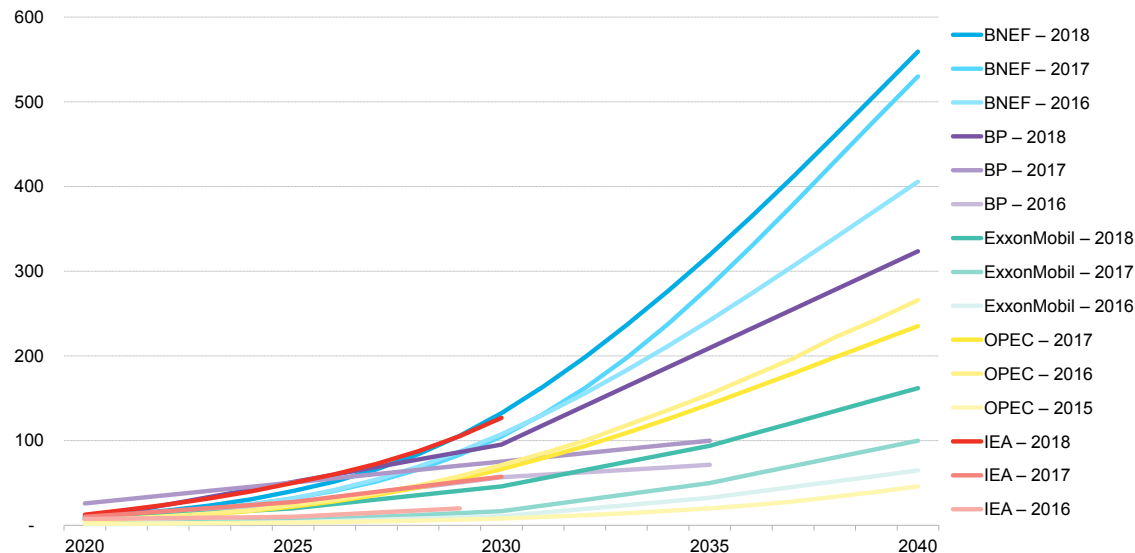
## Global light duty vehicle fleet



Source: BNEF

# EV fleet size comparison

EV fleet size, millions of vehicles

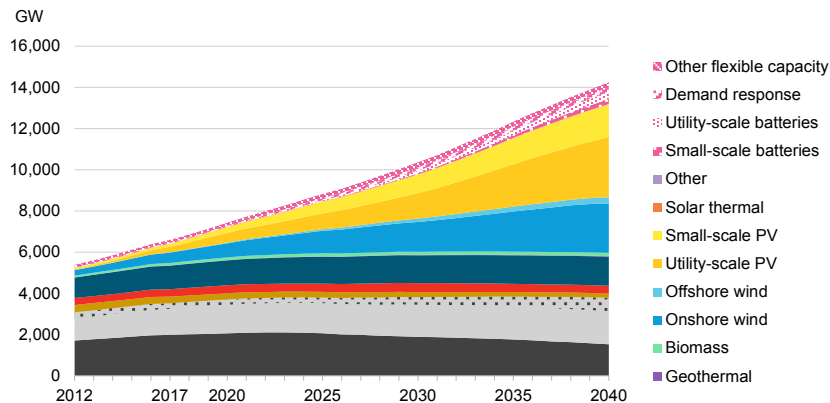


Notes: Values in black are taken directly from organization publications. Values in green are BNEF estimates based on organization charts, reports and/or data (estimates assume linear growth between known data points). Outlook assumptions and methodologies vary. BP only forecasted through 2035 in its 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.



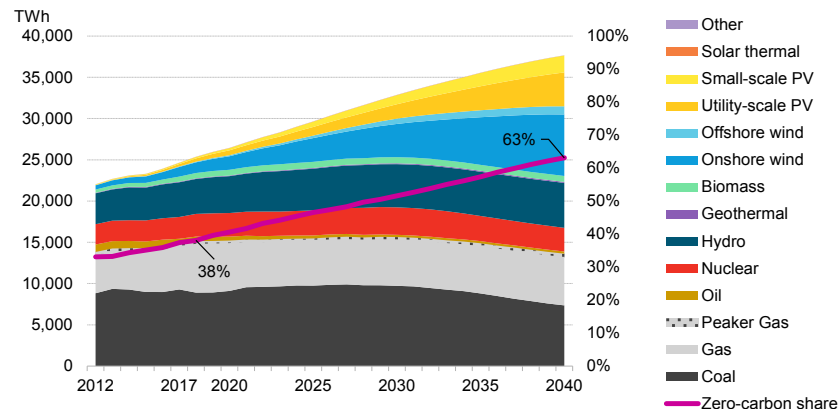
# Global power generation mix

## Global cumulative generation capacity



Source: BloombergNEF New Energy Outlook 2018

## Global electricity generation and zero-carbon share

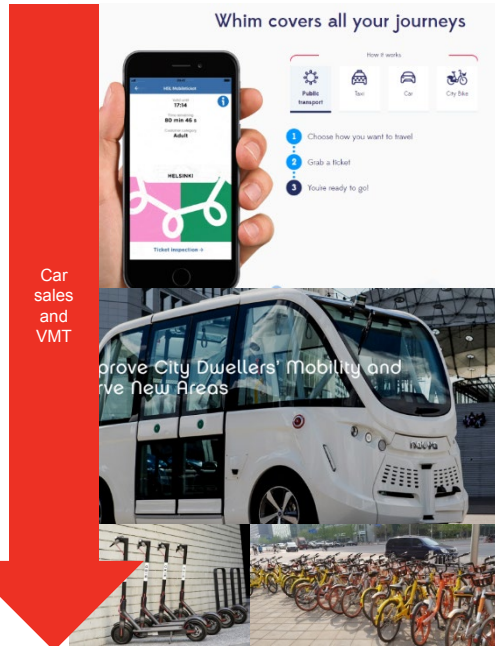


Source: BloombergNEF New Energy Outlook 2018



# The future role of cars

## On-demand multi-modal non-vehicle transport options



## Cars as a form of personal expression and art



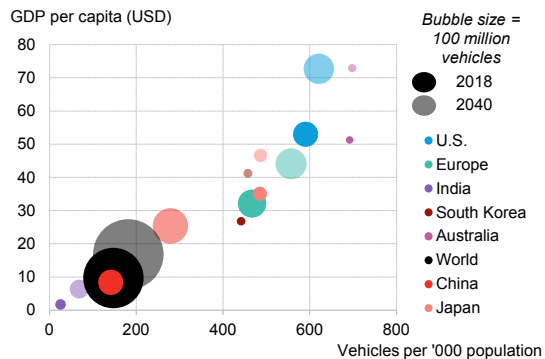
## Autonomous cars as living rooms on wheels



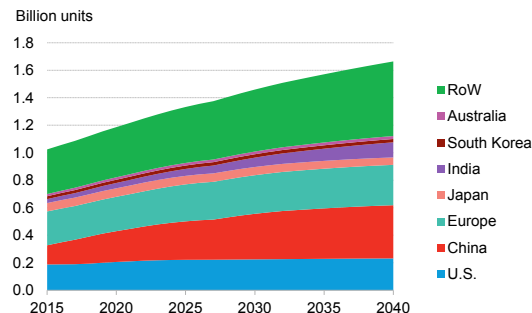
# The future role of cars

**BNEF EVO2018**

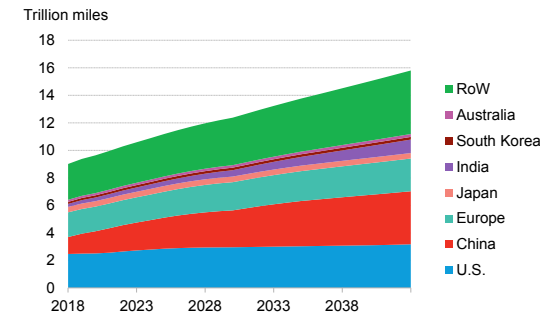
## GDP vs motorization rate



## Light duty vehicle fleet by region



## Annual car miles travelled



### Forecast

### 2040 passenger vehicle fleet size, billion cars

|                                    |             |
|------------------------------------|-------------|
| <b>BNEF EVO2018</b>                | <b>1.66</b> |
| <b>BP Energy Outlook 2018</b>      | <b>1.97</b> |
| <b>OPEC World Oil Outlook 2018</b> | <b>1.98</b> |

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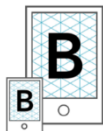
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