

# E-MOBILITY A TIER1 PERSPECTIVE

EVS30 – Stuttgart 10-October-2017

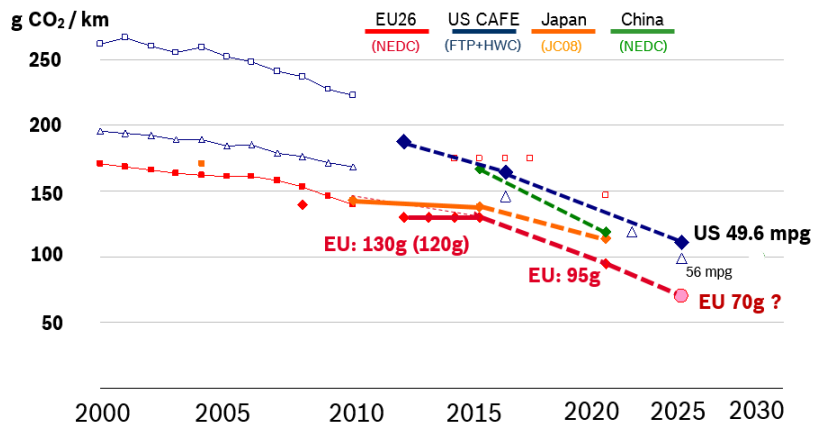
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# E-Mobility. A Tier1 perspective

## Electrified vehicles – a growing market

### Drivers of market development



Tight emission standards

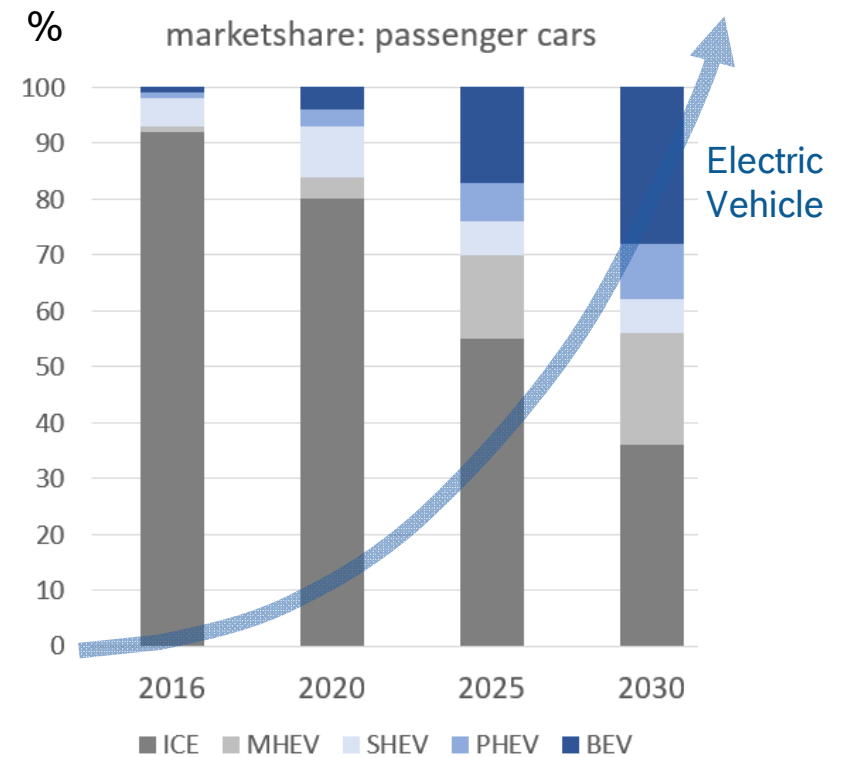
Increased global health consciousness

Discussion about driving bans in inner cities



Picture sources: City of London, Stadt Stuttgart, china.org

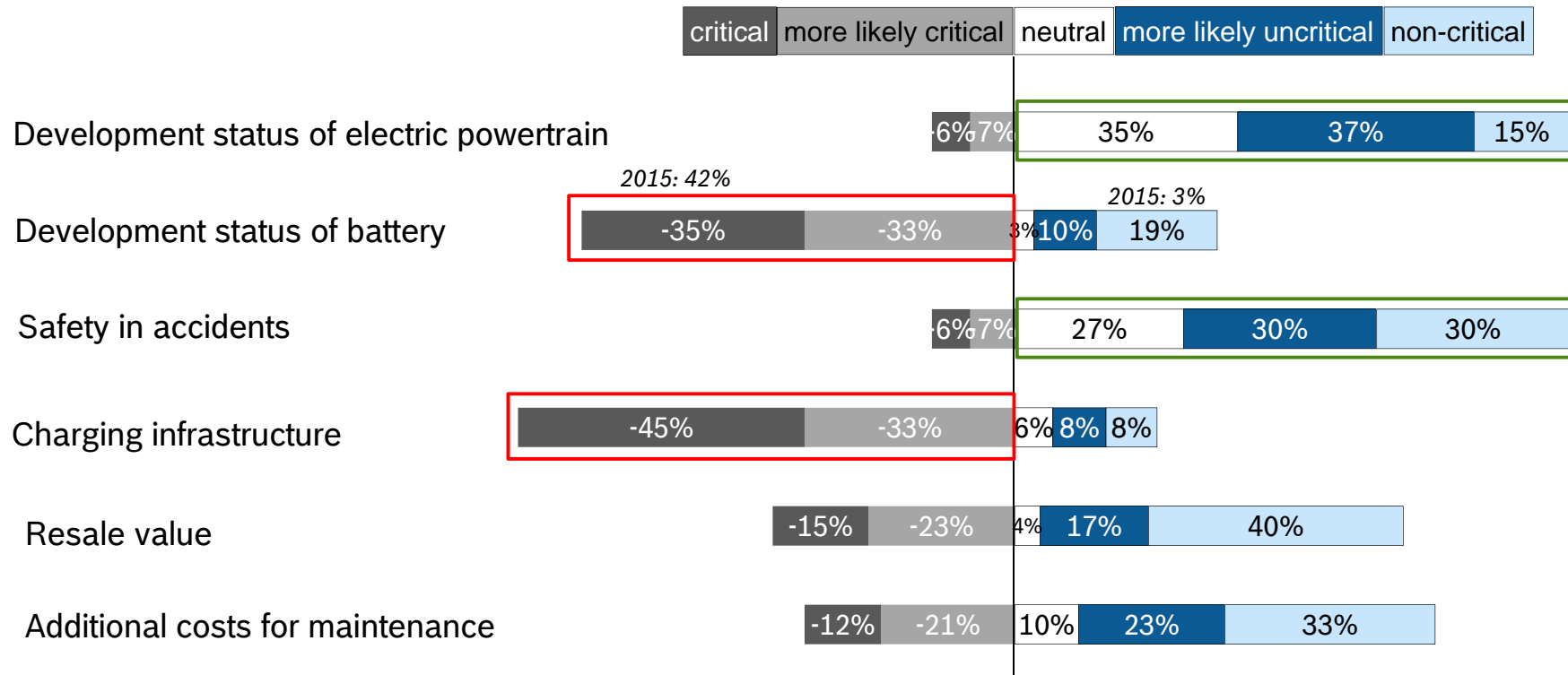
### Anticipated growth



Picture: internet research average values of various data sources

# E-Mobility. A Tier1 perspective

## Consumer's view on Electrified Vehicles



Bosch consumer survey

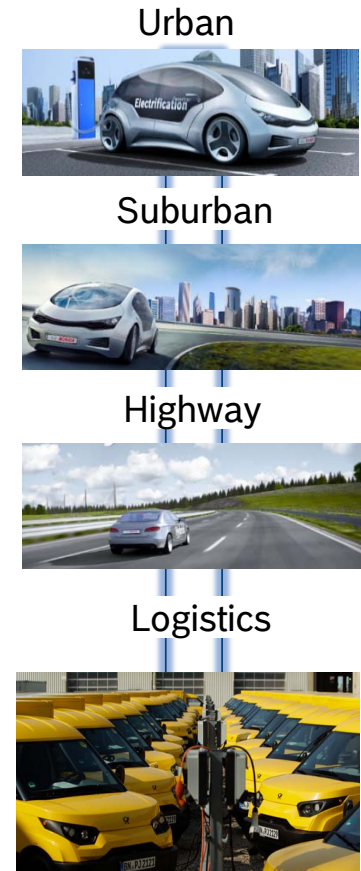
Consumers' acceptance of e-Mobility is increasing but still some challenges ahead

# E-Mobility. A Tier1 perspective

## E-Powertrain diversity and new vehicle segments

	Mild Hybrid	Strong Hybrid	Plug-In Hybrid	BEV w/REX	Electric Vehicle
Performance	5 – 20 kW	30 – 100 kW	40 – 140 kW	60 – 160 kW	60 – >300 kW
ICE Portion	████████	███████	███████	███	████████
	48V Systems & High Voltage System	Different Systems and Performance	Different Systems and Performance	Different Perform. and Requirements	Region Requirements, Performance, eRange

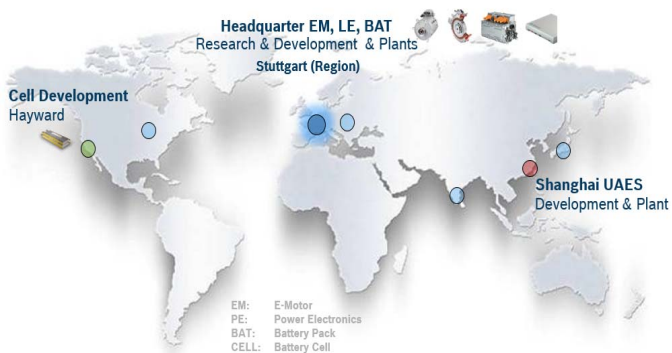
Big challenge for industry to manage complexity of powertrain and vehicle concepts



# E-Mobility. A Tier1 perspective

## Bosch's contributions to e-Mobility

### Global partner of the OEMs



### Excellence in all powertrain concepts for our customers

#### Electric vehicles



- ▶ Mobility will be electric Market will be growing strongly
- ▶ Technology is our differentiator

#### Passenger cars



- ▶ New emission regulations push today's technology
- ▶ Importance of hybrid techn.

#### Commercial vehicles & OH



- ▶ Diesel dominant technology
- ▶ Demand for alternative technologies, e.g. Hybrid, FC

### Expertise in all segments of electric mobility and related eco-systems



Global partner for all powertrain concepts with broad portfolio and experience for all aspects in E-Mobility

# E-Mobility. A Tier1 perspective

## Bosch contributions to e-Mobility → Efficiency

### Multi-target optimization of e-motor

Customized products with standard parts

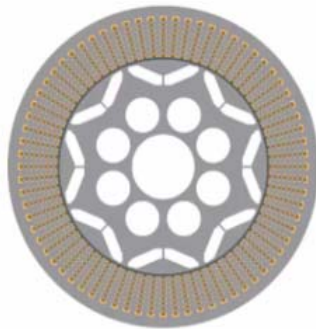
Permanent-magnet synchronous motor

**efficiency up to 97%**

Torque<sub>peak</sub> [Nm]

Power<sub>peak</sub> [kW]

Metal length<sub>min</sub> [mm]



Stator losses<sub>min</sub> [W]

Rotor losses<sub>min</sub> [W]

Torque ripple [Nm]

Torque<sub>max</sub> [Nm]

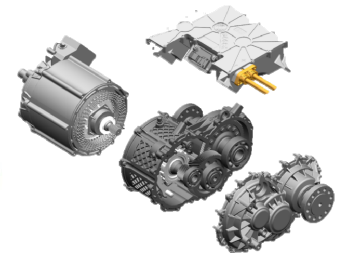
Material input<sub>min</sub> [kg]

► Multi-target optimization    ► Flexible lamella design    ► Copper-filling factor

### More than 93% system efficiency

**Electrified axle** – cost attractive powerful solutions for electric drives worldwide

- Permanent-magnet synchronous motor: efficiency up to 97%
- Power electronics: efficiency improvement leads to 1.5% lower vehicle cycle losses
- Fast lane concept: cost-attractive and fast industrialization
- Absolute position sensor for e-machines: the efficient sensor solution



### Inverter with advanced semiconductor technologies

Use of SiC semiconductors and advanced software algorithms planned leading to an increased electrical efficiency



We utilize advanced technologies to get more E-driving range out of a battery

# E-Mobility. A Tier1 perspective

## 48V Battery

### Market Drivers 48V BRS

Legislation: CO<sub>2</sub>, CAFC, Single vehicle regulation

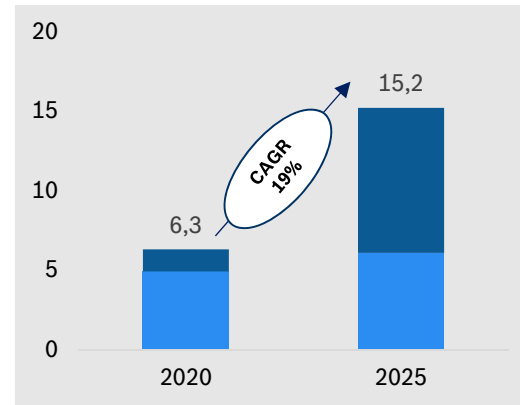
- ▶ **CO<sub>2</sub> targets** as **initial global driver** for 48V BRS
- ▶ **CAFC 5l/100km 2020 (NEDC)** as well as **single vehicle regulation** important drivers in **CN** as key 48V BRS market besides EUR

Comfort / additional functions & HAD

- ▶ In addition to CO<sub>2</sub>, **higher power requirements** for e.g. comfort functions, new consumers drive further 48V applications
- ▶ 48V is a relevant technology on ICE, **sustainable growth after 2020** expected

### 48V Battery Market [m veh]

Continuous growth of 48V BRS



- 48V Performance Battery
- 48V Standard Battery

### 48V Standard Battery

Enabler for Electrification

- ▶ **Compact design and minimal interfaces**
- ▶ **No additional cooling components**



Bosch targets market leadership for Standard Battery in 2020 - projects already awarded from various OEM

THANK YOU FOR YOUR ATTENTION

