

# DAIMLER

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Transformation of the powertrain and implication for business strategy

Dr. Bernd Hense, Daimler AG

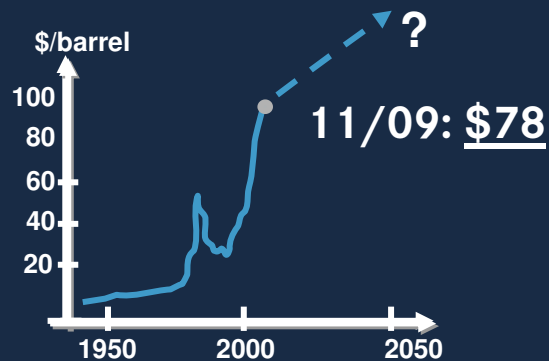
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## The Global Challenge

### Limited Resources



E.g.: Oil Price



### Creeping Mobility



### Megacities Top 5 Ranking

	1900	2003	2015
London	6.5	Tokio 35.0	Tokio 36.2
New York	5.5	Mexico City 18.7	Bombay 22.6
Tokio	5.2	New York 18.3	Delhi 20.9
Paris	4.0	Sao Paulo 17.9	Mexico City 20.6
Berlin	2.4	Bombay 17.4	Sao Paulo 20.0

Source: Bronger (1996)

### Law / Legislation

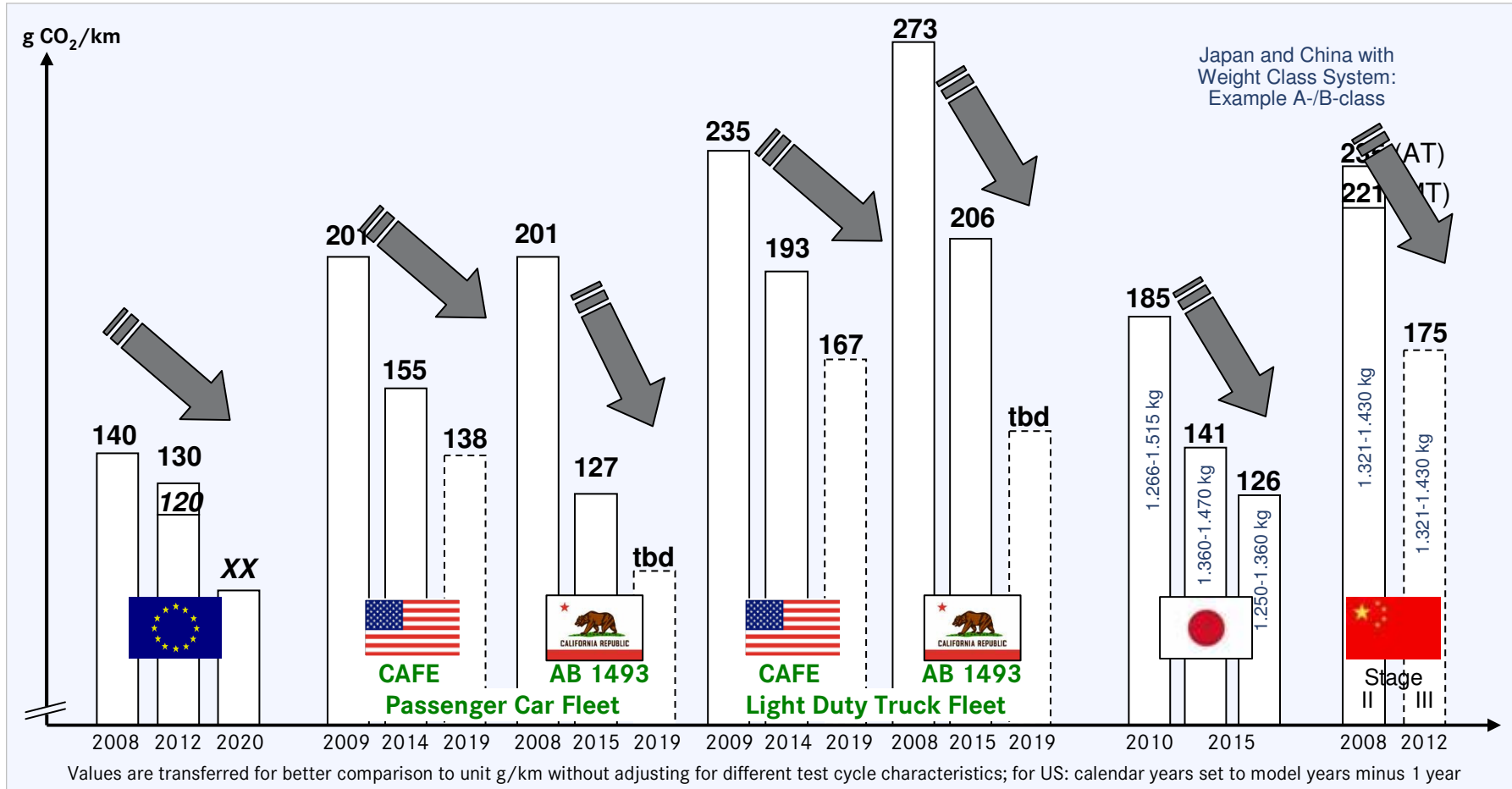


### City-Maut London

Daily Fee:

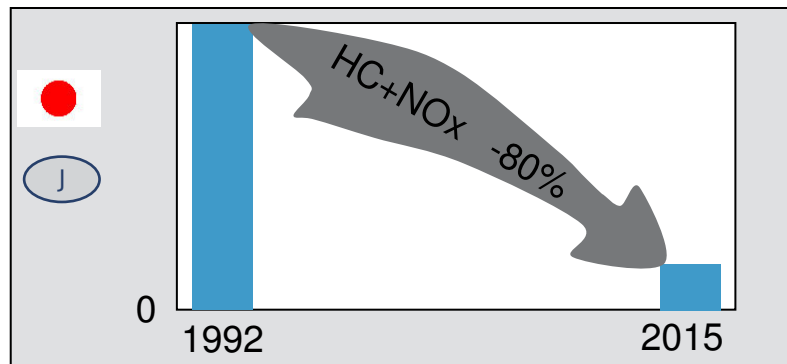
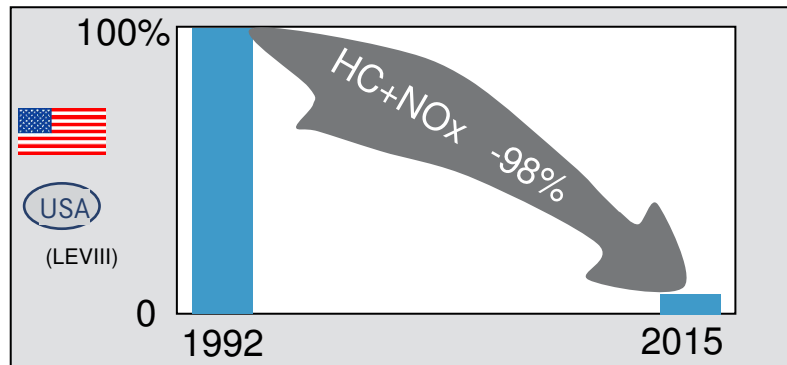
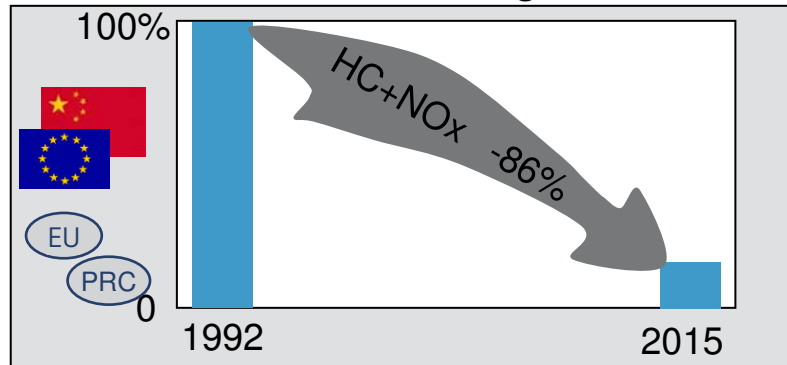
£ 8

## The Global Challenge: Fuel economy limits in major markets

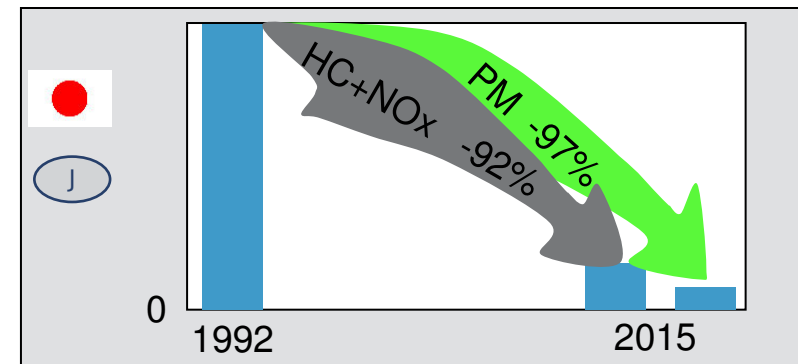
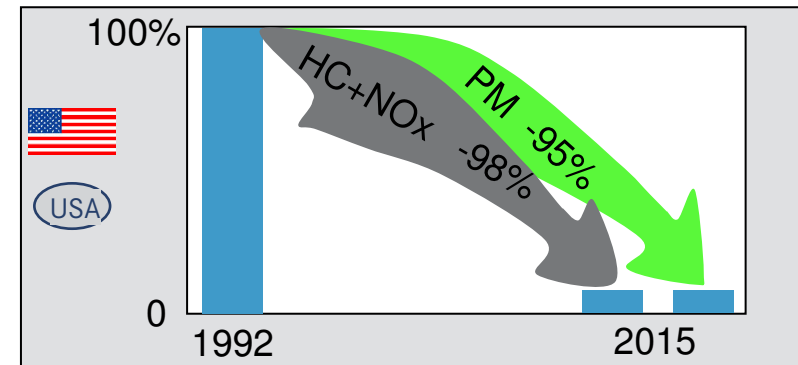
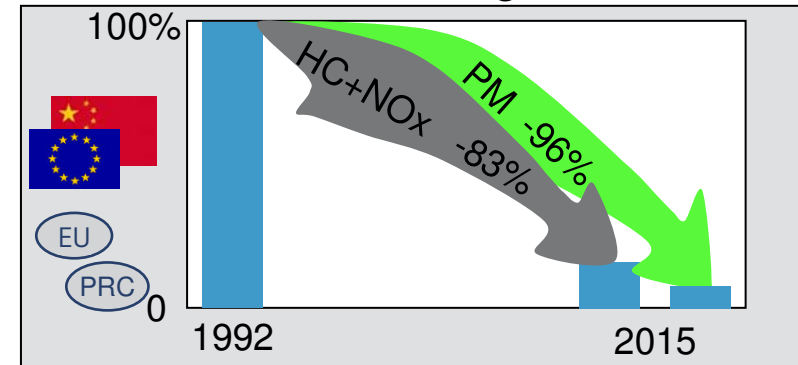


## The Global Challenge: Emission Limits in the Triade

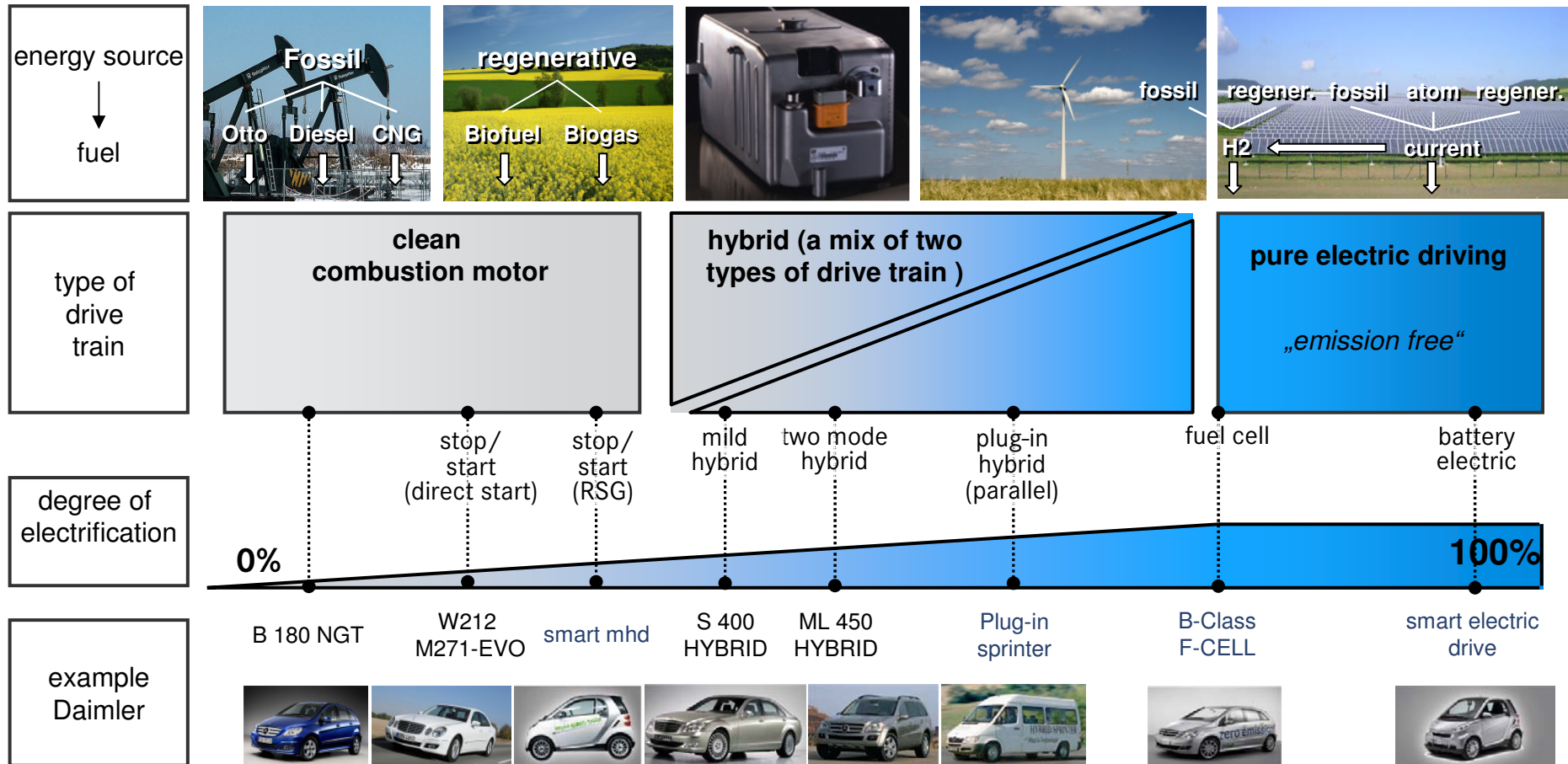
### Gasoline Passenger Cars



### Diesel Passenger Cars



## Competitive Answer: Optimized vehicles with high-tech power trains





## Competitive Answer: Daimler roadmap for sustainable mobility

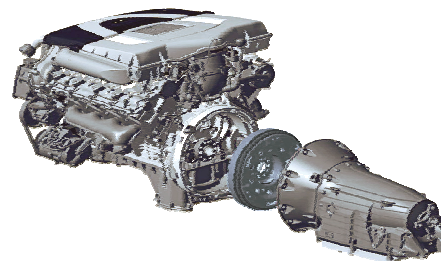
Maximum efficiency  
for vehicles with  
combustion engines

**BlueEFFICIENCY**  
CGI, BlueTEC  
DIESOTTO



Hybridization for  
further increase  
in efficiency

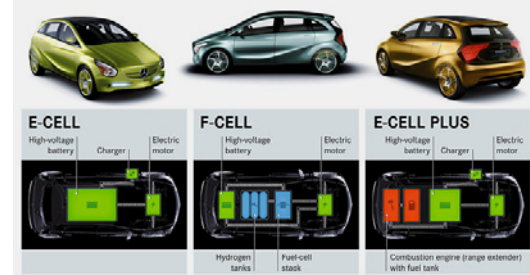
**HYBRID**  
Plug-In



Emission-free driving  
with Electric vehicles  
fuel cell / battery

**Electric Vehicles with  
Battery or Fuel Cell  
Drive, Range Extender**

Concept BlueZERO – Modular concept for electromobility



## Daimler roadmap for sustainable mobility

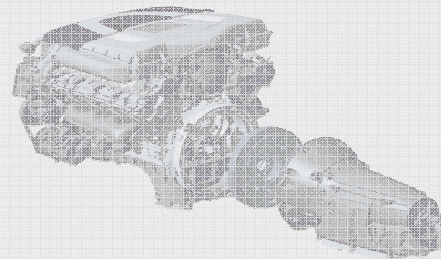
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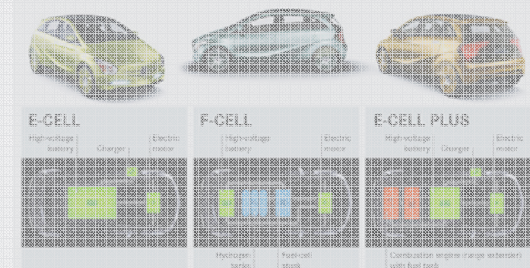
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Plug-In**



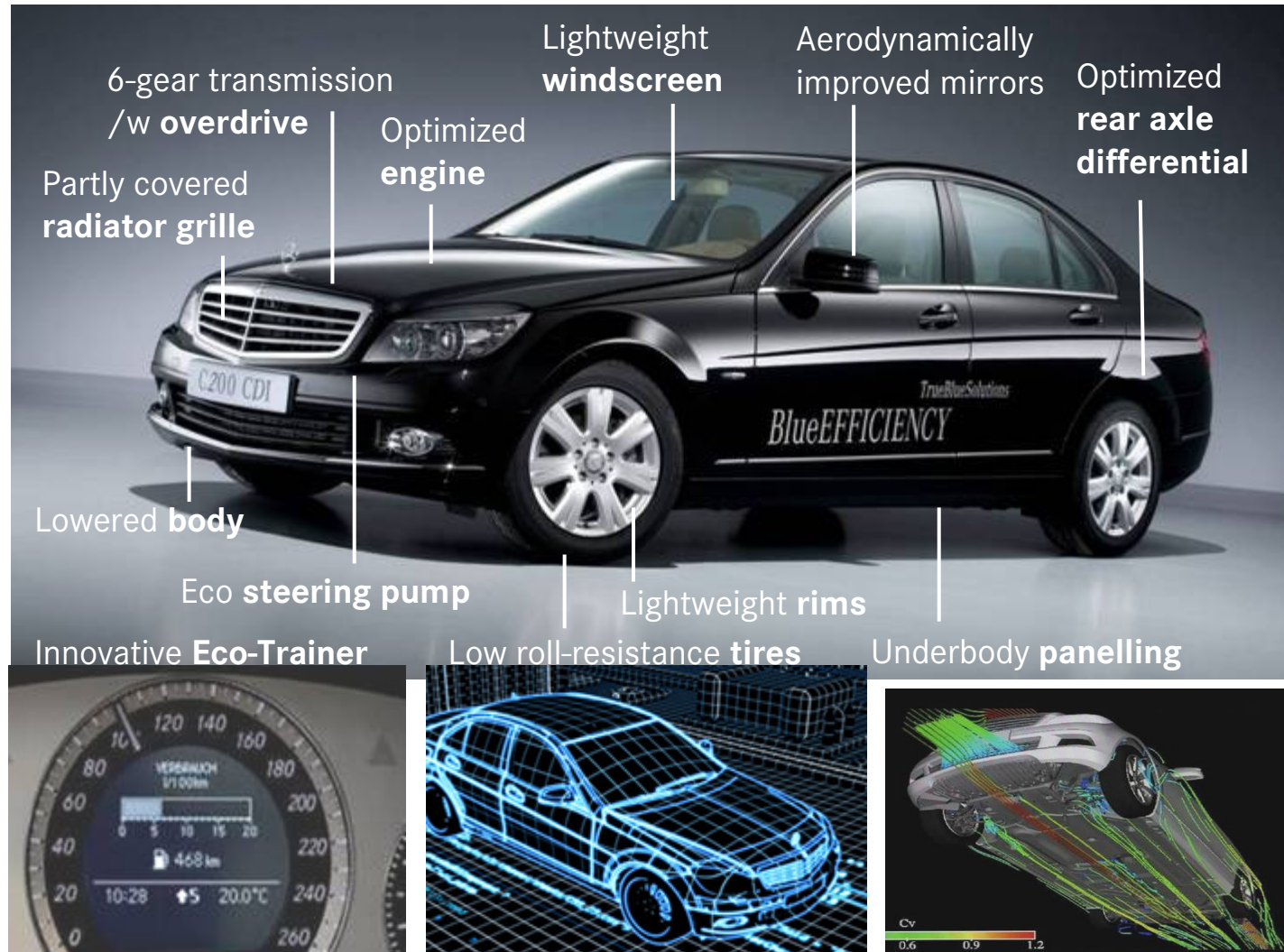
Emission-free driving  
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Concept BlueZERO – Modular concept for electromobility



## Maximum Customer Benefit - with BlueEFFICIENCY





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Daimler's Product Portfolio 2009 (ECE):  
58 BlueEFFICIENCY models until the end of 2009

Examples:



S-Class BlueEFFICIENCY



E-Class BlueEFFICIENCY



C-Class BlueEFFICIENCY



A and B-Class BlueEFFICIENCY

## High-tech Powertrains: Potentials for diesel and gasoline engines

### Diesel engine



#### Characteristics

- 😊 Consumption
- ☹️ Emissions

#### Key technologies:

- Injection system
- Combustion process
- Homogenization
- Turbocharger
- Exhaust gas after-treatment

### Gasoline engine



#### Characteristics

- 😊 Emissions
- ☹️ Consumption

#### Key technologies:

- De-throttling
- Direct Injection
- Charging
- Reduction of friction
- Engine cooling management

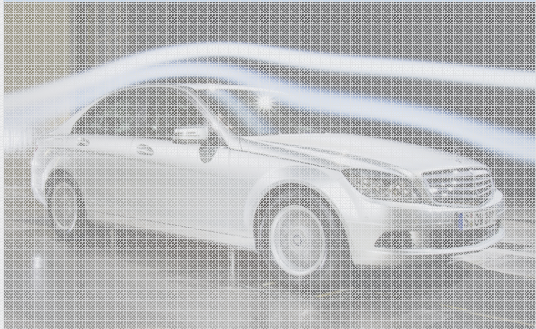
**Target**

**Gasoline cars as efficient as diesels;  
Diesel cars as clean as gasoline cars**

## Daimler roadmap for sustainable mobility

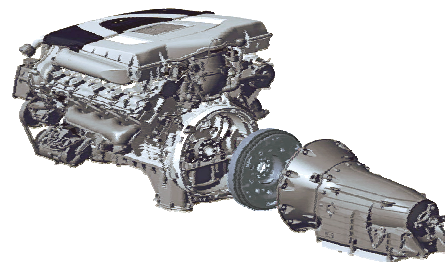
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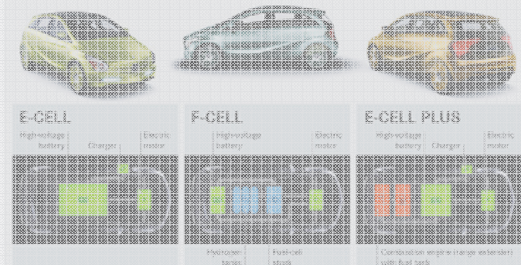
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## HYBRID modules for individual powertrain solutions

HYBRID technologies are an integral part of our strategy



smart mhd



S 400 HYBRID with lithium-ion battery



HYBRID light truck



HYBRID city bus

→ Pooling expertise and resources



energy storage battery



power electronics



hybrid transmission



powertrain integration



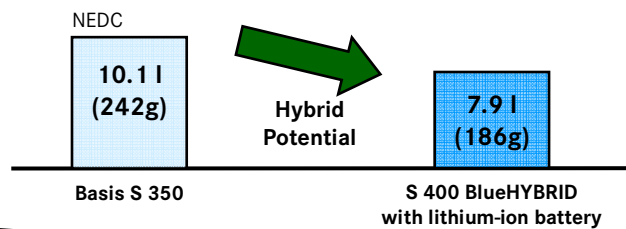
## Mercedes-Benz S 400 HYBRID

Advantage for hybrid vehicles:  
*mainly in interurban & urban traffic*

### S 400 HYBRID



#### fuel economy



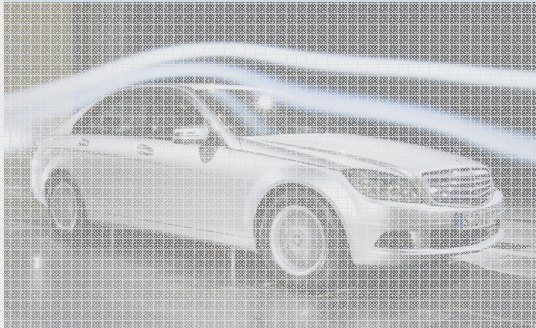
### Key benefits

- comfortable start-stop technology
- better performance
- recuperation of braking energy
- better energy management
- improved fuel efficiency

## Daimler roadmap for sustainable mobility

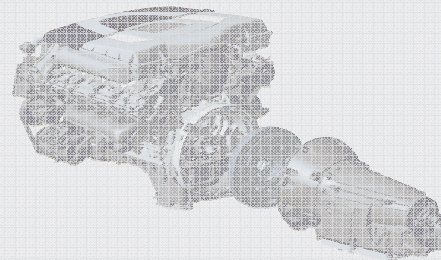
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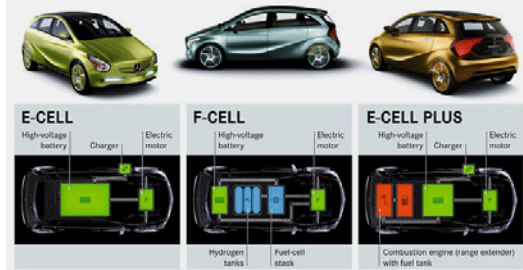
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Concept BlueZERO – Modular concept for electromobility



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smart fortwo electric drive, test fleet in London:  
Due to the excellent feedback, we will continue!





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## 'e-mobility' projects – Daimler introduces a new era of E-Mobility



- E-mobility Berlin



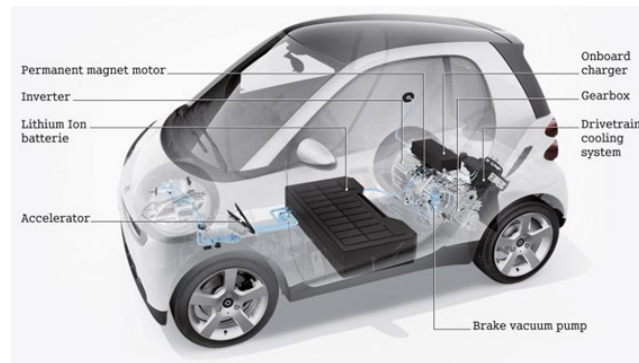
- E-mobility Italy



## Battery Electric Vehicle (BEV) Technology

### Next Challenges

#### Technology



- Power Density
- Energy Density
- Fast charge capability
- Low temperature performance

#### Infrastructure

- Reliable, easy to use technology
- Competitive cost
- In-time Availability
- Sufficient Coverage



#### Costs

- Battery
- Electric Drive
- Infrastructure

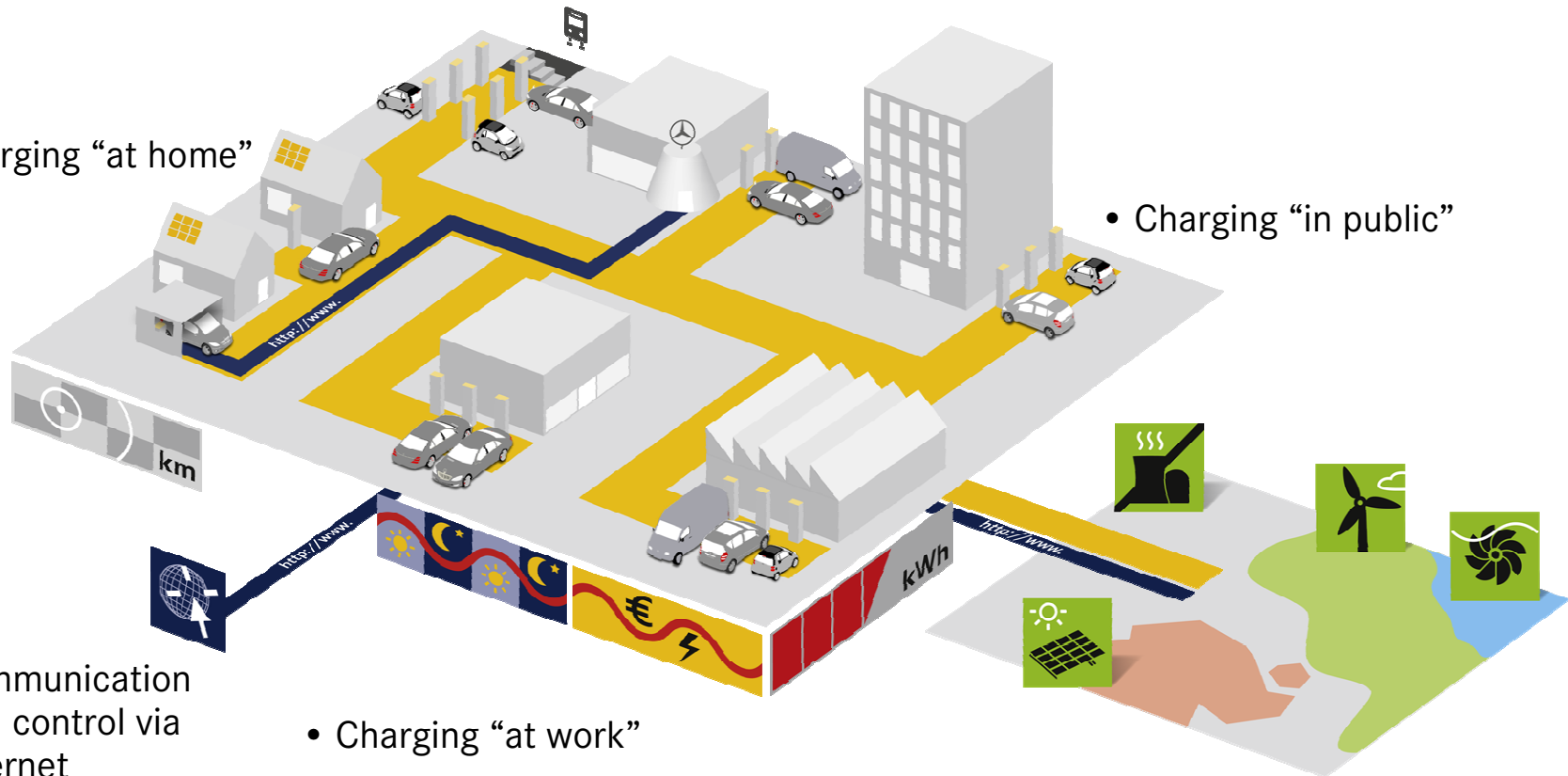
## Charging possibilities

- Charging “at home”

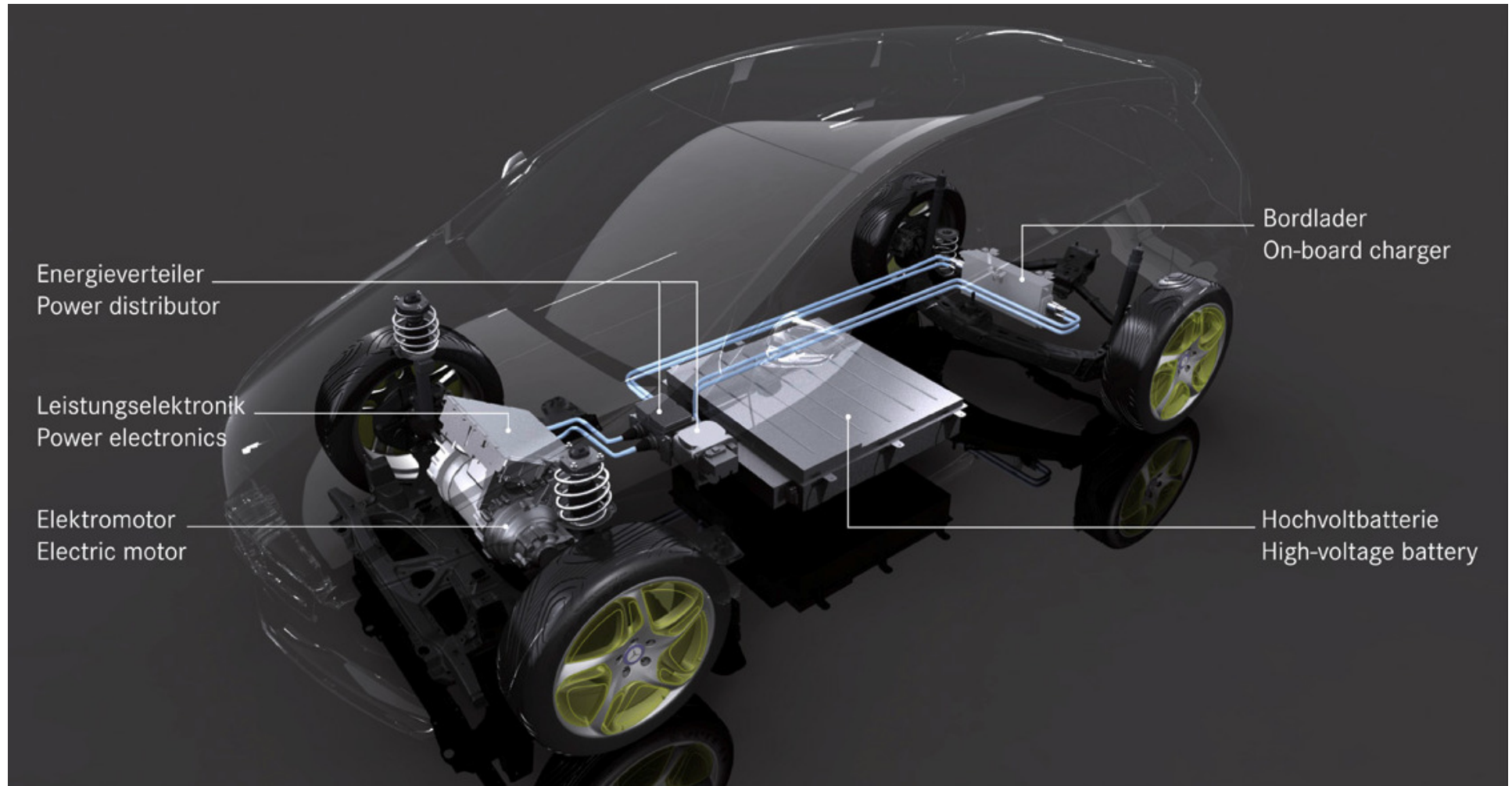
- Charging “in public”

- communication and control via internet

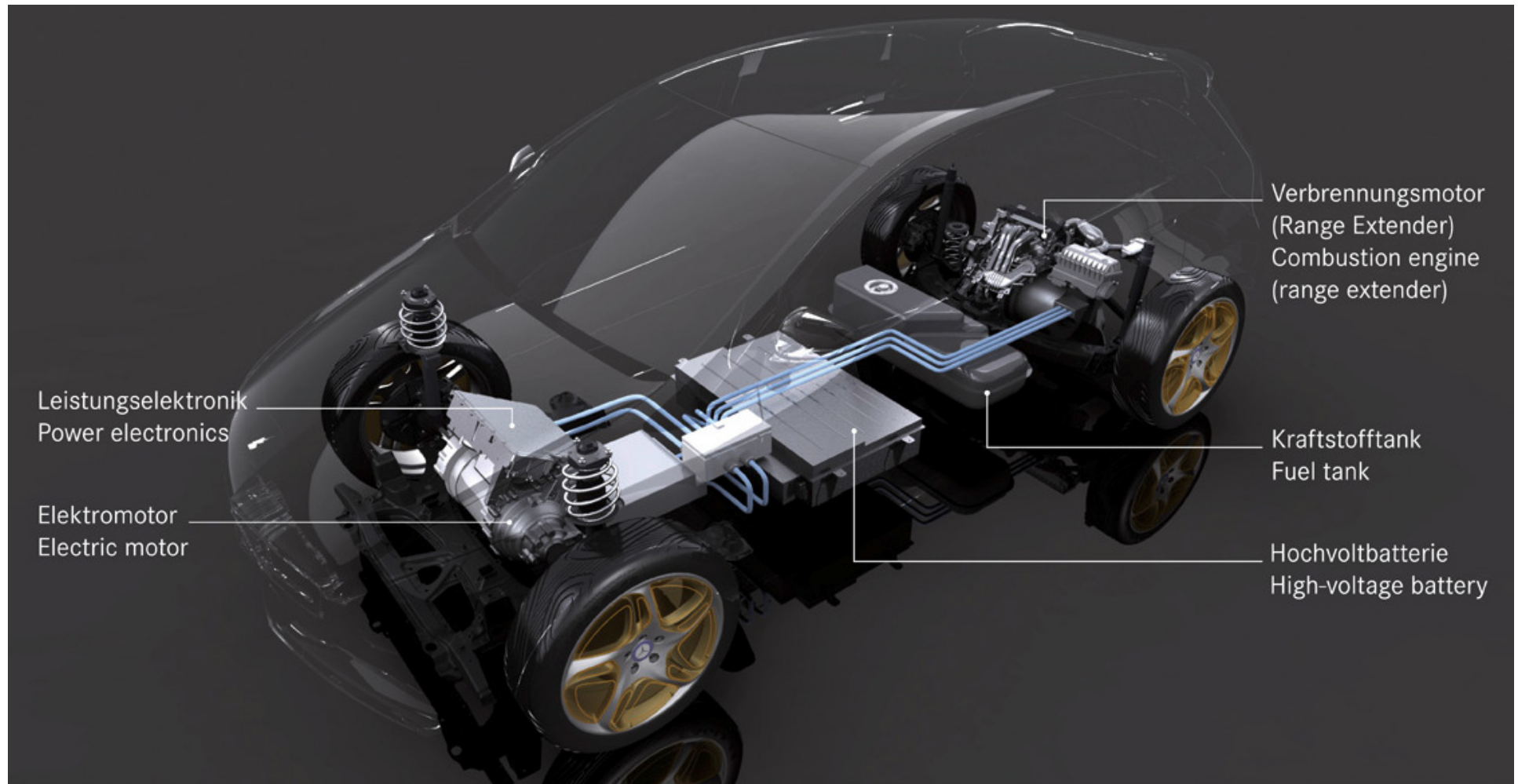
- Charging “at work”



## Concept BlueZERO E-CELL

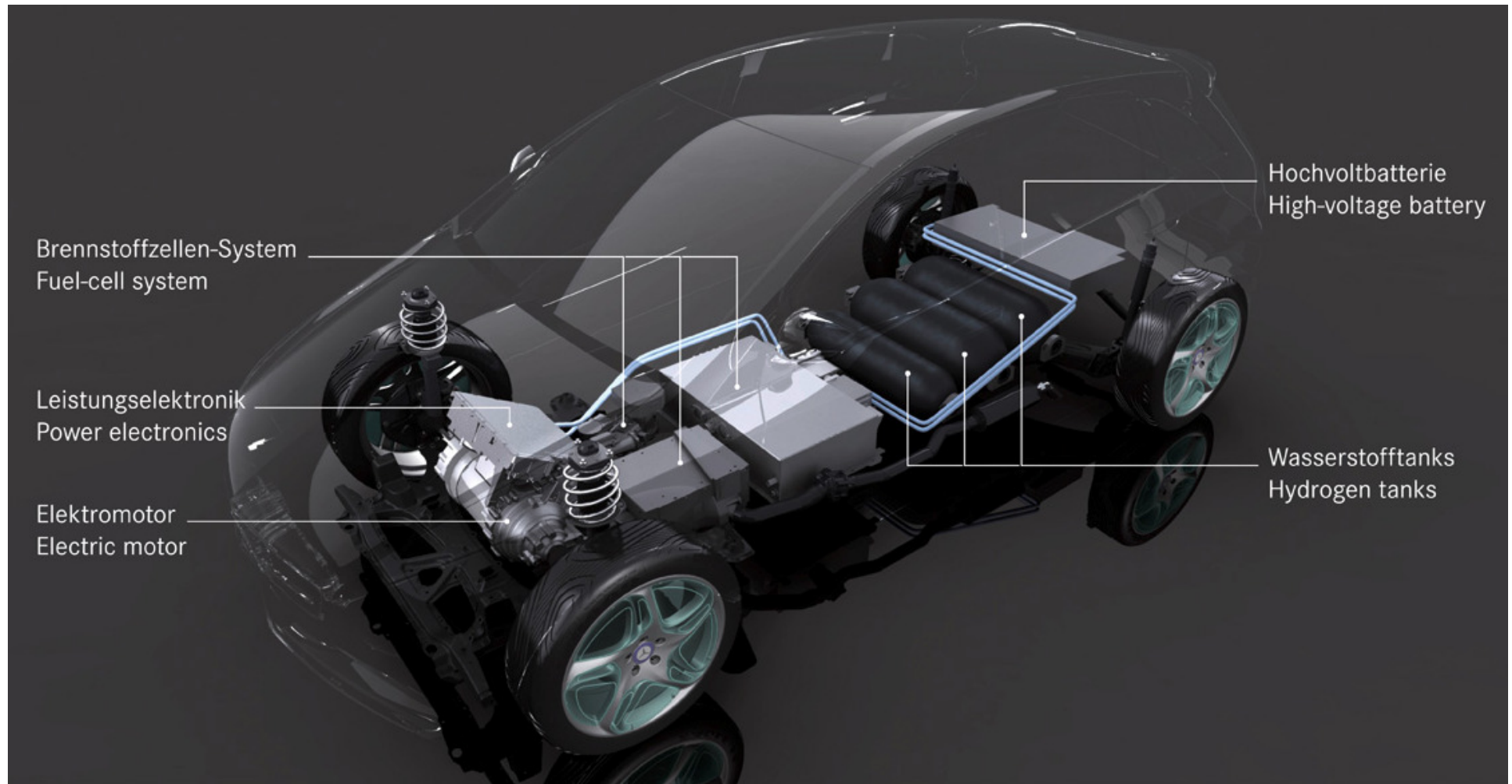


## Concept BlueZERO E-CELL PLUS



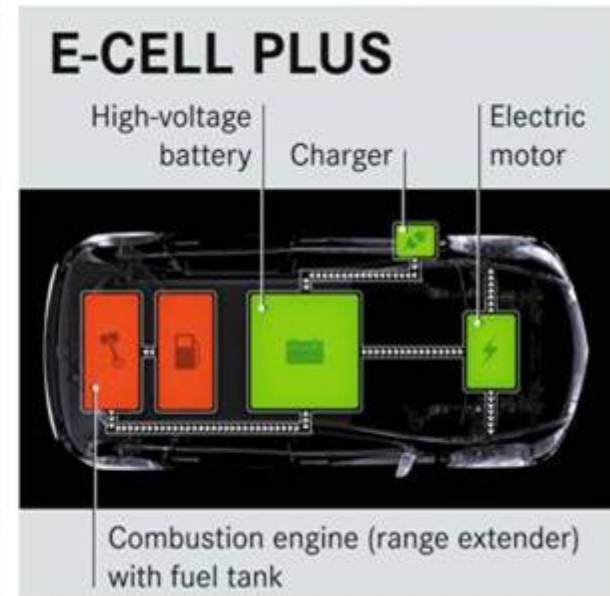
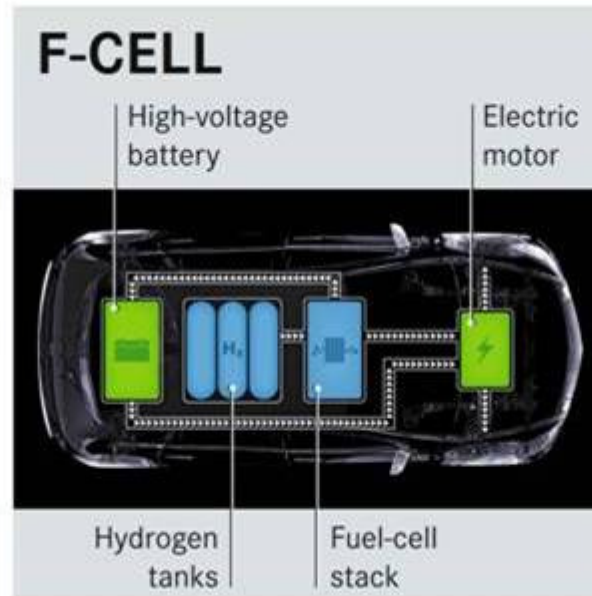
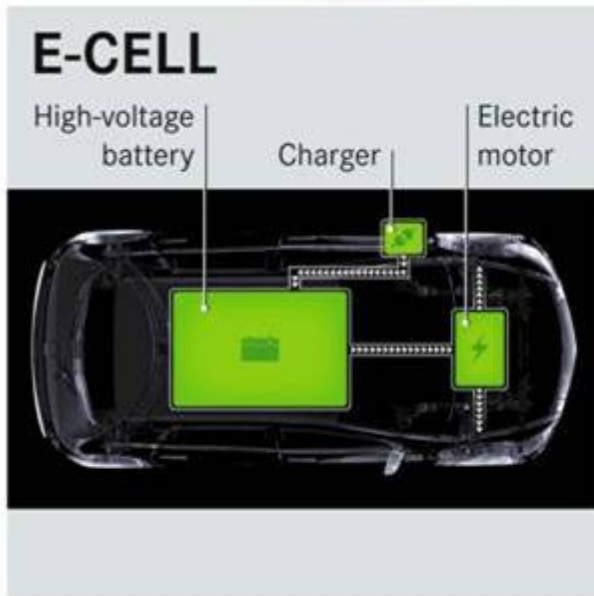


## Concept BlueZERO F-CELL



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## BlueZERO: Modular Concept for E-Mobility



## Concept BlueZERO – electro mobility for every requirement

Modular concept for electromobility:

- Battery-electric drive (BlueZERO E-CELL)
- Fuel-cell drive (BlueZERO F-CELL)
- Battery-electric drive with range extender (BlueZERO E-CELL PLUS)



Urban use



Extra-urban use



Long-distance use



E-CELL

F-CELL

E-CELL PLUS



## Daimler Experience with fuel cell vehicles

**60 F-CELL vehicles in customer hands (since 2004)**



**~ 2.200.000 km\***

**37 buses (Citaro) Europe, Australia & China**



**~ 2.200.000 km\***

**3 light duty vehicles at UPS Europe & USA**



**~ 64.000 km\***

\* Data November 2009

- Daimler is a pioneer of the Fuel Cell Vehicle (FCV)
- Daily operation of more than 100 FCV's all over the world
- Long experience with FCV's (first FCV in 1994)
- End of 2007: F-Cell A-class reached 150.000 km and 2500 operating hours with 1st fuel cell stack
- Operation of FCV's at customers in different climate zones with varying ambient temperatures



## Fuel Cell Technology

### Next Challenges

#### Technology



- Energy density
- Cooling (performance)
- H<sub>2</sub> storage (range; currently ~400km)

#### Infrastructure

- Sufficient number of refueling stations
- Reliable and easy to use technology
- Cost efficiency
- Hydrogen produced by regenerative energy sources



#### Costs

- FC System & Stack
- H<sub>2</sub>-Tank
- Battery

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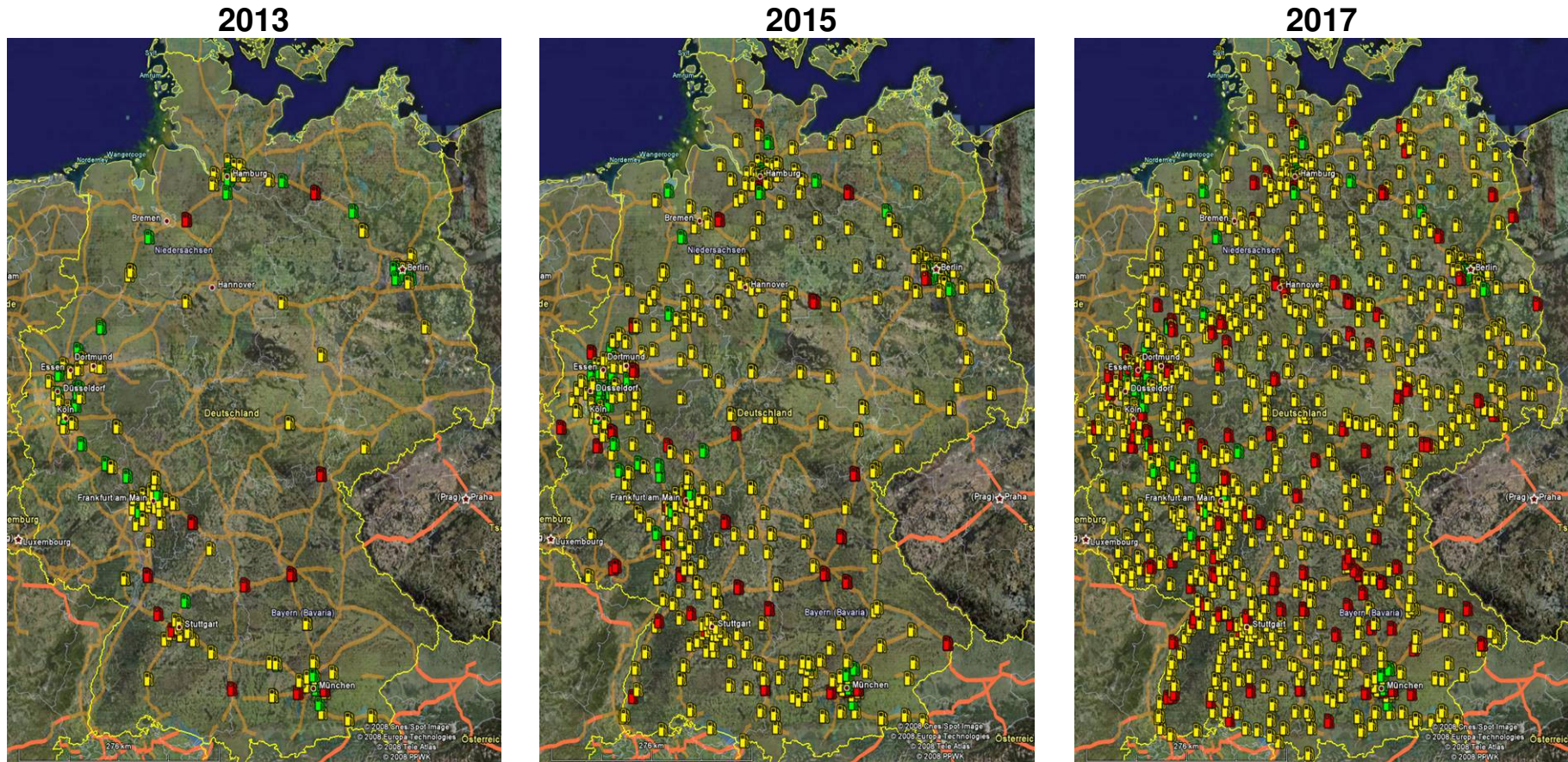
## Initiative “H2 Mobility” in the lead market of Germany

Daimler together with infrastructure partners is making sure that the nationwide construction of the infrastructure is ensured.





## Possible roll-out scenario of H2-gas stations 2010 – 2017 (H2-Station density comparable to natural gas station density)



# of TS                      159

500

1,000

■ Big    ■ Medium    ■ Small

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**Thank you for your attention!**





## Disclaimer

This document contains forward-looking statements that reflect our current views about future events. The words “anticipate,” “assume,” “believe,” “estimate,” “expect,” “intend,” “may,” “plan,” “project,” “should” and similar Expressions are used to identify forward-looking statements. These statements are subject to many risks and uncertainties, including a lack of or a considerable delay in improvement or a further deterioration of global economic conditions; a continuation or worsening of the tense situation in the credit and financial markets, which could result in ongoing high borrowing costs or limit our funding flexibility; changes in currency exchange rates and interest rates; the introduction of competing, fuel-efficient products and the possible lack of acceptance of our products or services, which may limit our ability to adequately utilize our production capacities or raise prices; price increases in fuel, raw materials and precious metals; disruption of production due to shortages of materials, labor strikes, or supplier insolvencies; a further decline in resale prices of used vehicles; the effective implementation of cost-reduction and efficiency-optimization programs at all of our segments, including the repositioning of our truck activities in the NAFTA region and in Asia; the business outlook of companies in which we hold an equity interest, most notably EADS; changes in laws, regulations and government policies, particularly those relating to vehicle emissions, fuel economy and safety; the resolution of pending governmental investigations and the outcome of pending or threatened future legal proceedings; and other risks and uncertainties, some of which we describe under the heading “Risk Report” in Daimler’s most recent Annual Report and under the headings “Risk Factors” and “Legal Proceedings” in Daimler’s most recent Annual Report on Form 20-F filed with the Securities and Exchange Commission. If any of these risks and uncertainties materialize, or if the assumptions underlying any of our forward-looking statements prove incorrect, then our actual results may be materially different from those we express or imply by such statements. We do not intend or assume any obligation to update these forward-looking statements. Any forward-looking statement speaks only as of the date on which it is made.