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**Daimler AG**

**Rosario Berretta**

**Fuel Cell Technology for  
Passenger Vehicles**

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## Daimler's Technology Portfolio for a Sustainable Mobility

Optimizing our vehicles with modern conventional power trains



*BlueEFFICIENCY*



*CGI BlueTec DIESOTTO*

Hybridization for further increase in efficiency



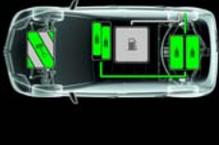
*HYBRID Plug-In Range Extender*

Emission free driving with fuel cell and battery vehicles



*Fuel Cell Battery-/E-Drive*

NGT



*Clean fuels for combustion engines*

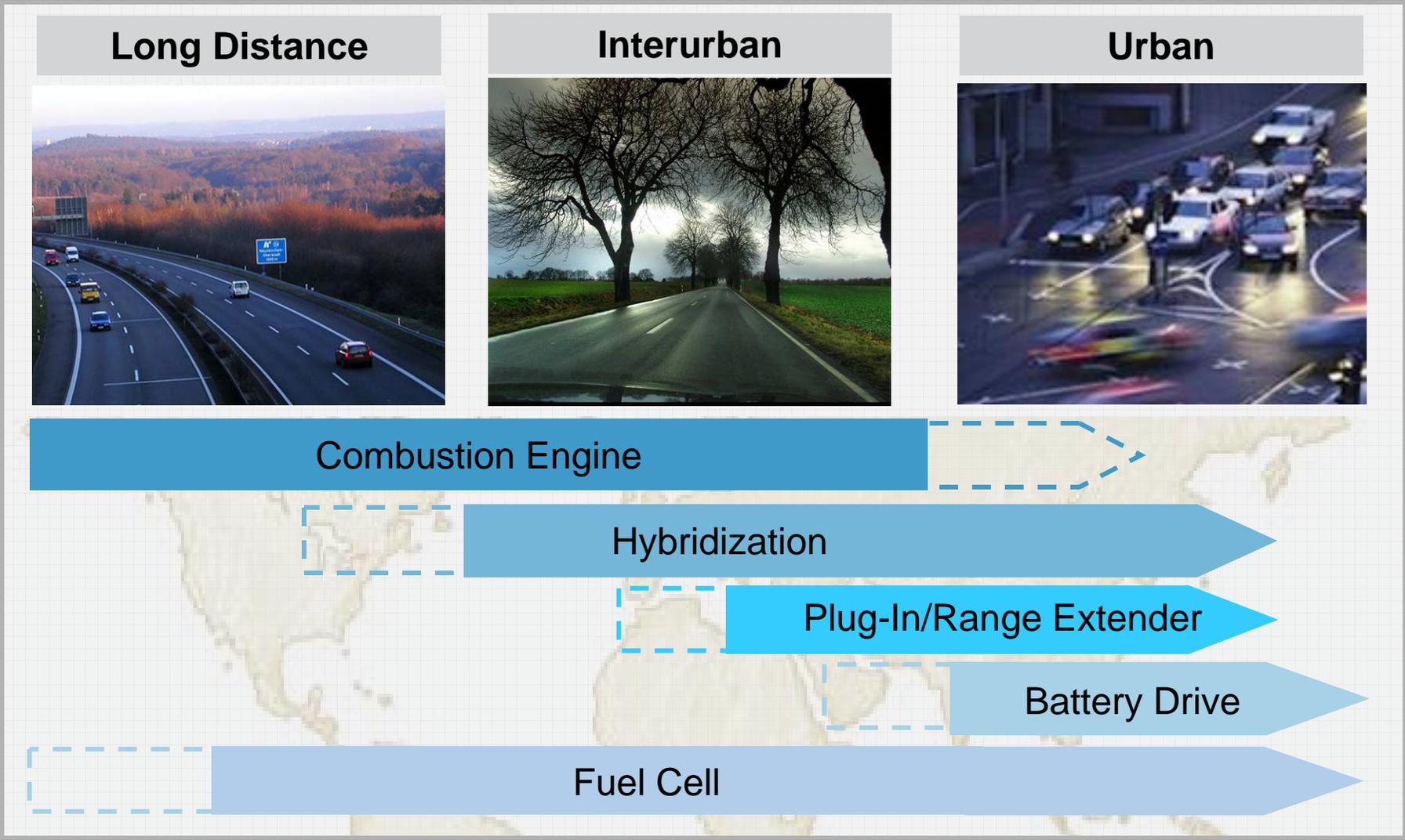
Energy for future mobility



*Emission-free driving*

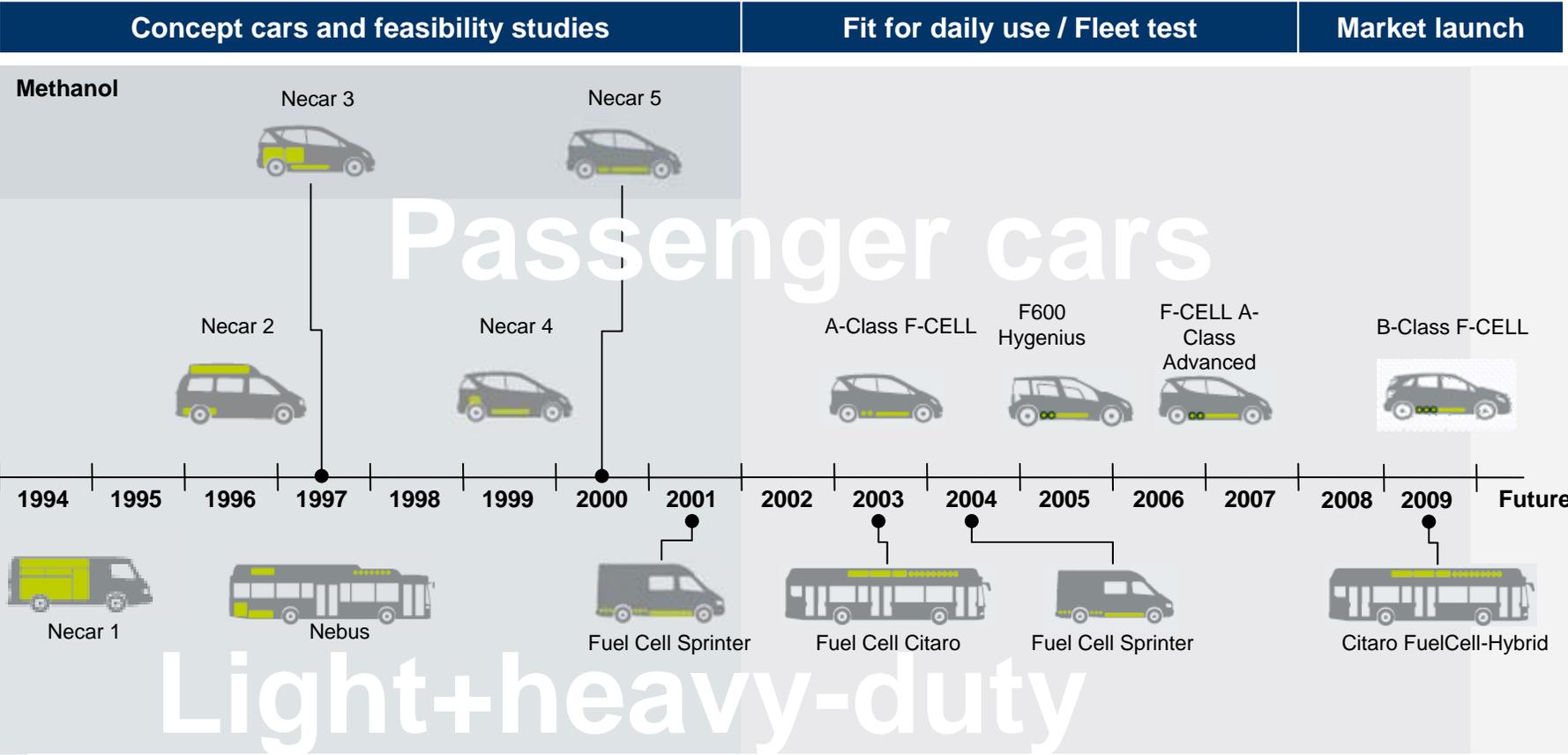
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## Optimal Mobility Scenarios – Call for an Innovative Powertrain Portfolio



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## History of Daimler's Fuel Cell Vehicles Almost 15 Years of Fuel Cell Development



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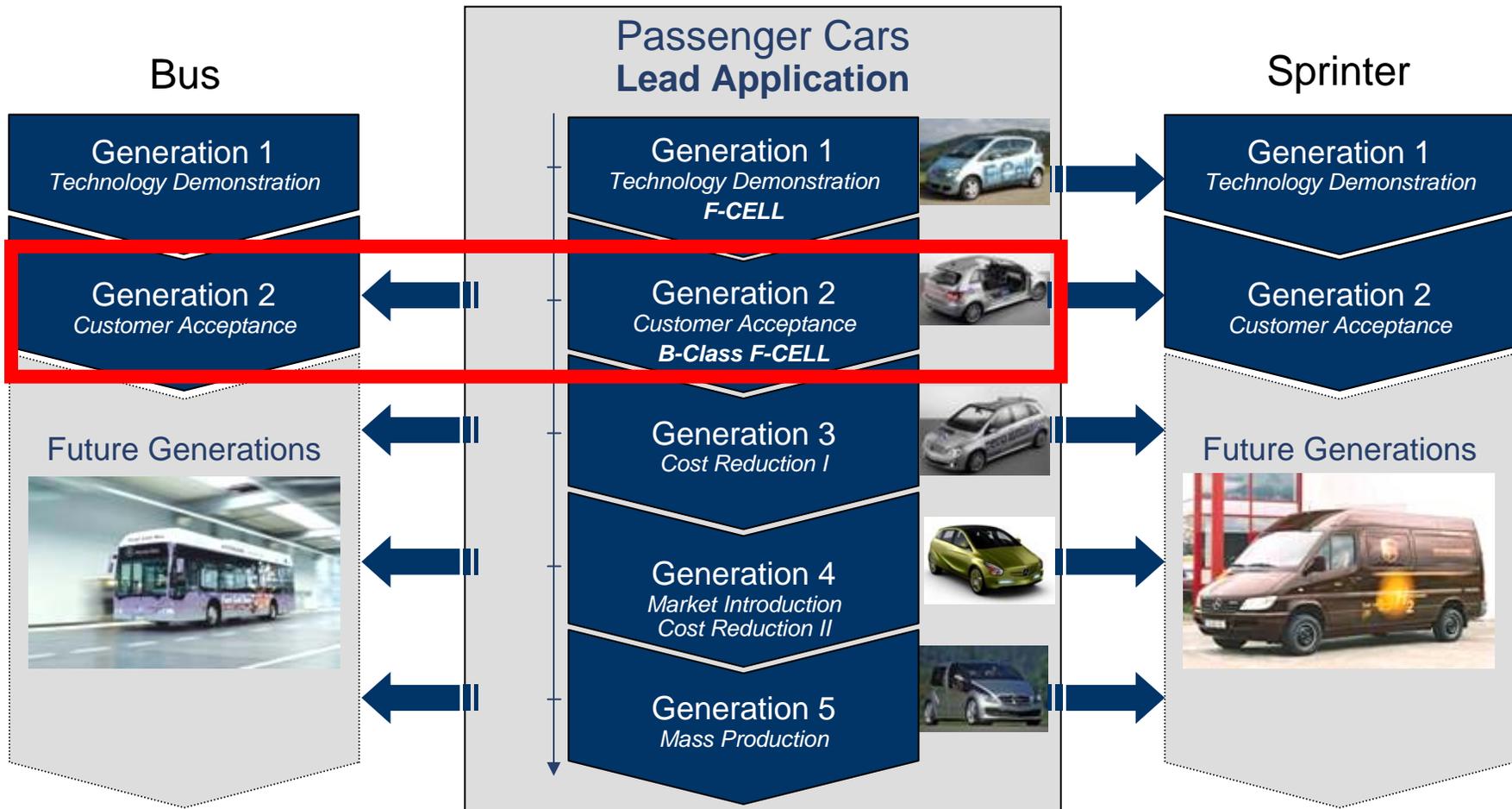
## Preparing the Market - Worldwide Fleet Operations



60 F-CELL Vehicles in customer operation	36 Buses (Citaro) in Europe, Australia, China	3 Sprinter Europe, USA
 <p>~ 2,100,000 kilometres* ~ 62,000 h</p>	 <p>~ 2,117,000 kilometres* ~ 139,000 h*</p>	 <p>~ 64,000 kilometres* ~ 2,400 h*</p>

\*Status: April 2009

## Daimler's Fuel Cell Technology Roadmap



- Daimler is dedicated to commercializing fuel cell vehicles
- The B-Class F-CELL will be the first series-produced fuel cell vehicle

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## The B-Class F-CELL: Sports Tourer with Fuel Cell Power Train Safety, Driving Pleasure, Dynamics, Ecology and Economy

The B-Class provides

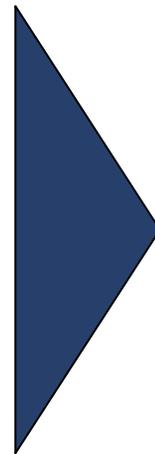
- the dynamic design of a sports cruiser
- the size of a compact car
- the space of a station wagon
- the versatility of a minivan
- the safety of a Mercedes-Benz



B-Class F-CELL - Main Technical Data	
<b>Power</b>	
Effective power fuel cell	80 kW
Effective power electric motor	100 kW
Maximum torque	290 Nm
Hydrogen pressure	700 bar
<b>Range &amp; Consumption (U.S. Combined)</b>	
Range	Approx. 400 km
Consumption adjusted	Approx. 3,3 l diesel equivalent/ 100 km*
CO <sub>2</sub> -emissions	0g/100 km
<b>Driving Performance</b>	
Acceleration 0-100 km/h	11.3 s
Top Speed	170 km/h

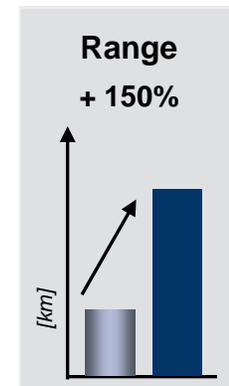
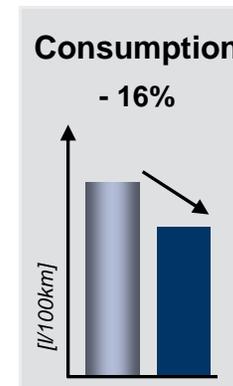
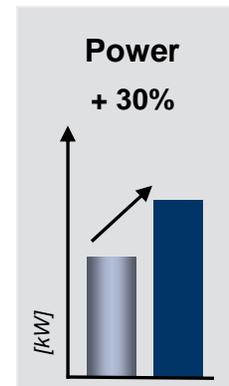
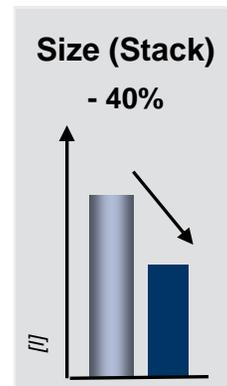
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## Mercedes-Benz B-Class F-CELL Next Generation Fuel Cell Vehicle



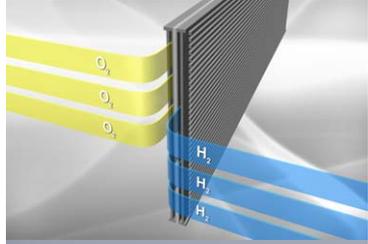
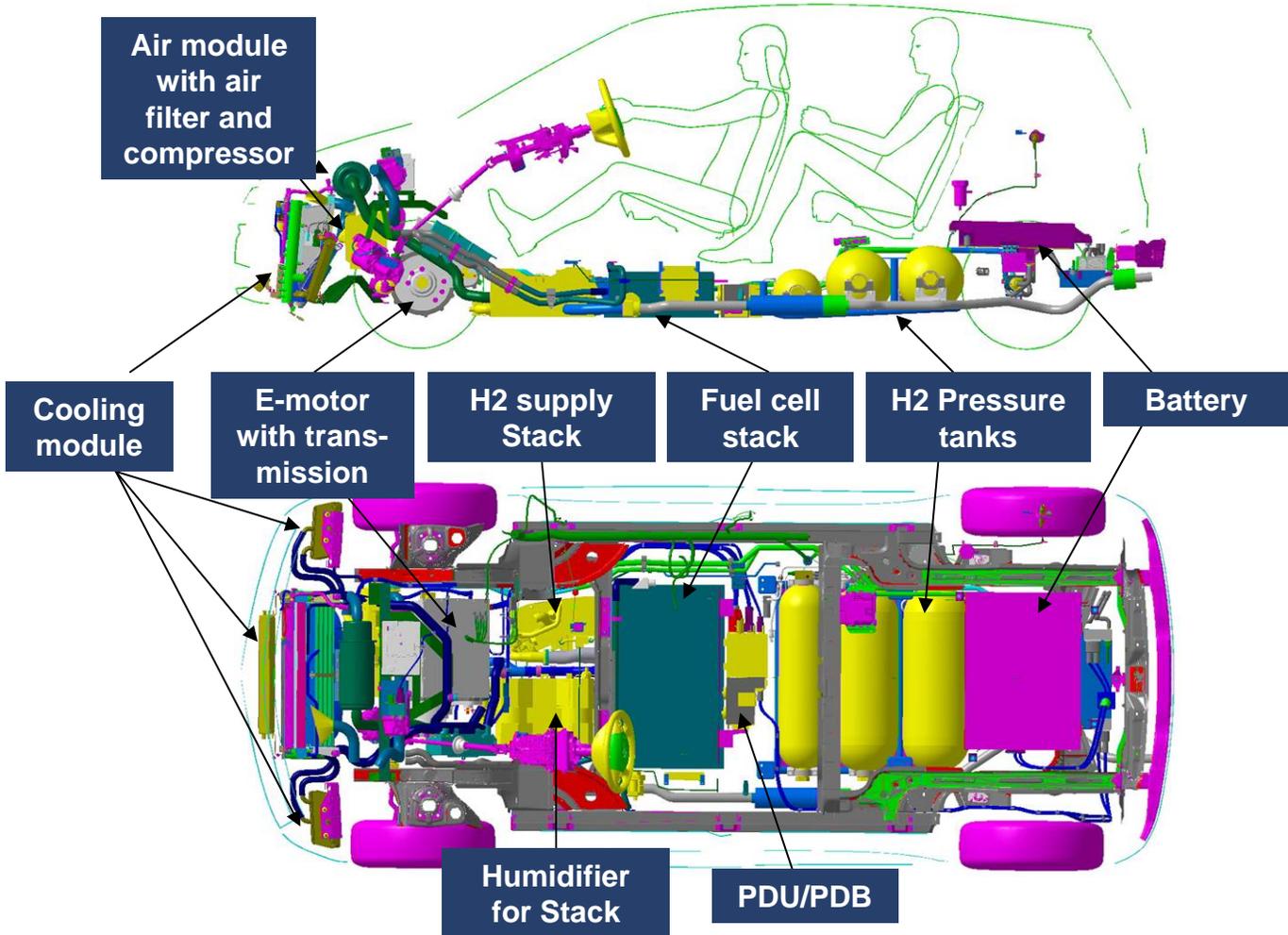
### **B-Class F-CELL:**

- Higher stack lifetime of >2000h
- More power (65kW → 100kW)
- High reliability
- Bigger range (160 km → approx. 400 km)
- Cold start capability -25° C
- Lithium-ion battery



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## B-Class F-CELL Drive Train



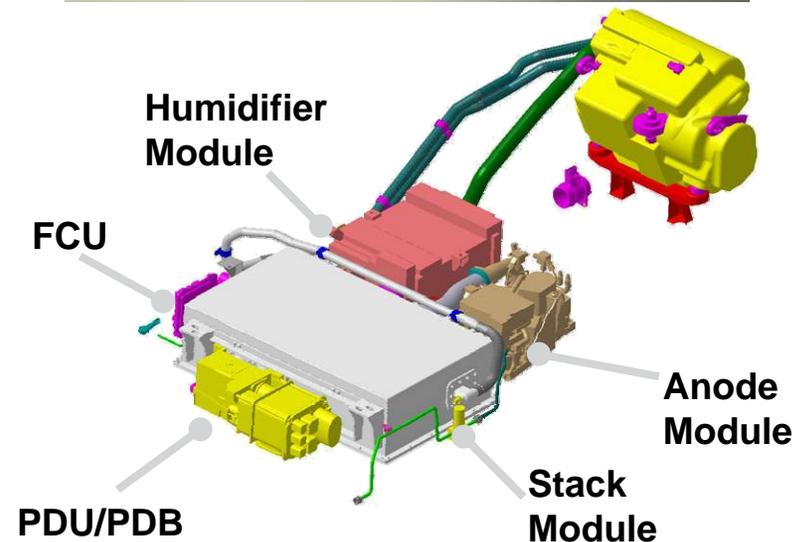
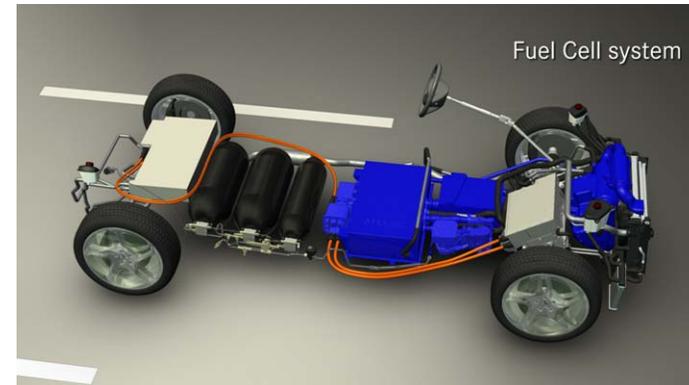
➤ Most components of drive train accommodated in sandwich floor

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## B-Class F-CELL Fuel Cell System

Technical Data / Key Figures		
	B-Class F-CELL	A-Class F-CELL
Air module	Screw with expander	Screw w/o expander
Humidifier	Gas-to-gas humidifier	Contact humidifier
Power	80/90 kW**	68,5 kW
# Cell rows	2	4
# Cells	396	440
Cold start ability	-25 °C	≥ 0 °C

\*\* Continuous/peak

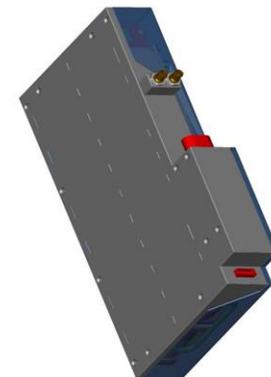
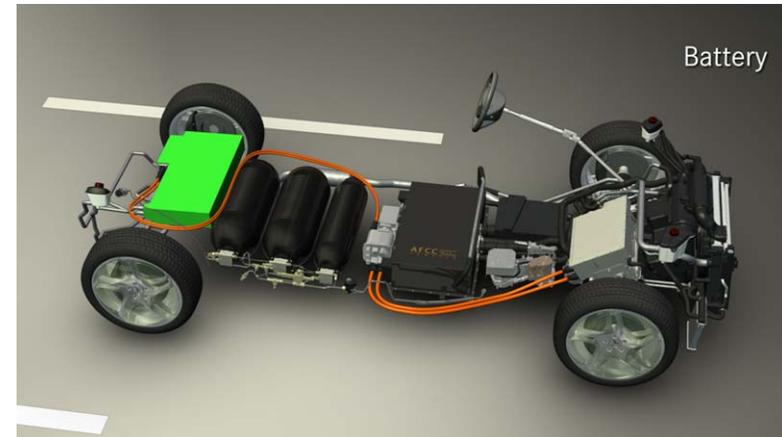


- More power, higher efficiency due to advanced fuel cell technology
- Less complex, modularised system architecture

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## B-Class F-CELL Battery System

Technical Data / Key Figures		
	B-Class F-CELL	A-Class F-CELL
Technology	Li-Ion-Battery, 60 Cells	NiMH, 168 Cells
Power (18 sec/ 5 sec)	30/34 kW	15/20 kW
Nominal voltage	212 V (3,54 V/cell)	200 V (1,2V/cell)
Nominal capacity	6.5 Ah	2 Ah
Energy content	1.4 kWh	1.2 kWh
Volume	44 l	40 l



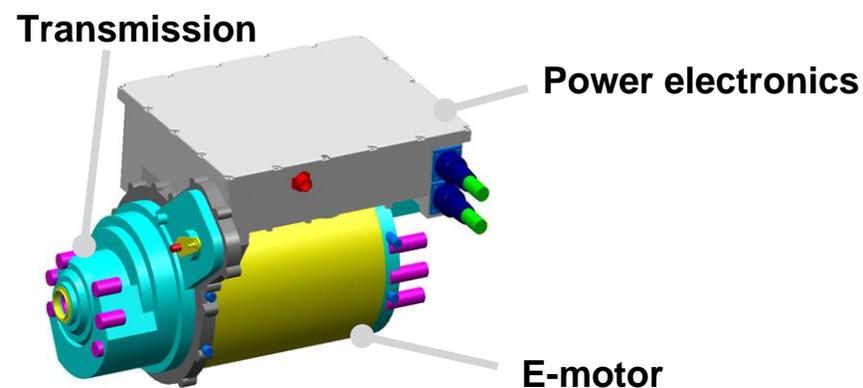
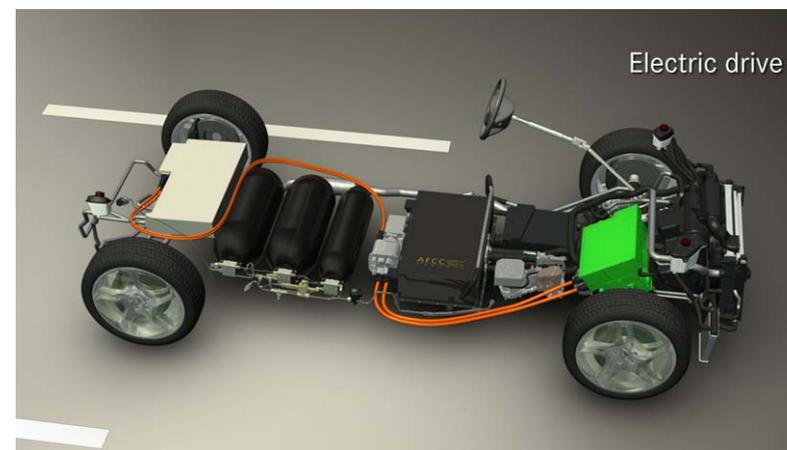
- Integration of battery into the air conditioner circuit: Long lifetime and optimum performance
- Change to Li-Ion-Battery from NiMH: Higher efficiency (energy density) and more power at low temperatures

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## B-Class F-CELL Electric Drive Train

Technical Data / Key Figures		
	B-Class F-CELL	A-Class F-CELL
Technology	PM (permanent motor)	ASM (asynchronous motor)
Transmission	compound-planetary with bevel gear differential	Coax, spur gears
Power (c/p*)	70/100 kW	45/65 kW
Torque	290 Nm	210 Nm
Efficiency	> 88 %	> 85 %

\*0.5 min



➤ Change to PM (permanent motor) form ASM (asynchronous motor): higher efficiency, more power and torque

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## The New Mercedes-Benz B-Class F-CELL Achievements, Specifics, Goals

- First **series-produced** vehicle with a zero-emission fuel-cell drive.
- The B-Class F-CELL has undergone the same **quality-ensuring processes** employed for other vehicles of Daimler.
- Packaging of the fuel cell drive train into the compact body of the Mercedes-Benz B-Class - **without any restrictions in regard to passenger and luggage space.**
- B-Class F-CELL offers **high driving performance** standards that surpass those of a standard two-litre gasoline engine.
- Ready for **customer acceptance & everyday use.**

➤ **The B-Class F-CELL is a milestone on the road to commercialization of fuel cell vehicles.**

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Road to the future – sustainable mobility is no science fiction but will become a reality



Thanks for your attention !