DAIMLER

Dr. Jörg Wind
Daimler´s road to FCEV market introduction

Eco-Mobility 2016

Wien, October 17, 2016

Daimler Roadmap to sustainable Mobility

High-tech
Combustion Engines

Consequent
Hybridization

Electric Vehicles
with Battery and Fuel-Cell

Success factors of Fuel-Cell Technology

>>H2-Infrastructure

>>Technology

>>Customer acceptance

>>Customer acceptance

Worldwide experience with Fuel-Cell Fleet for highest technological know-how

Mercedes-Benz B-Class F-CELL

- More than **10 Million Kilometers** of customer Experience
- More than **4.000 hours** F-Cell durability

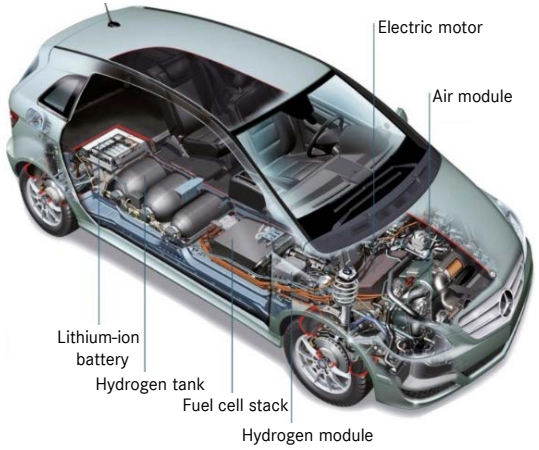
Citaro FuelCELL-Hybrid

- More than **4 Million Kilometers** of regular line operation
- More than **10.000 hours** F-Cell durability

14 Million km

The Current Generation of Fuel Cell Vehicles

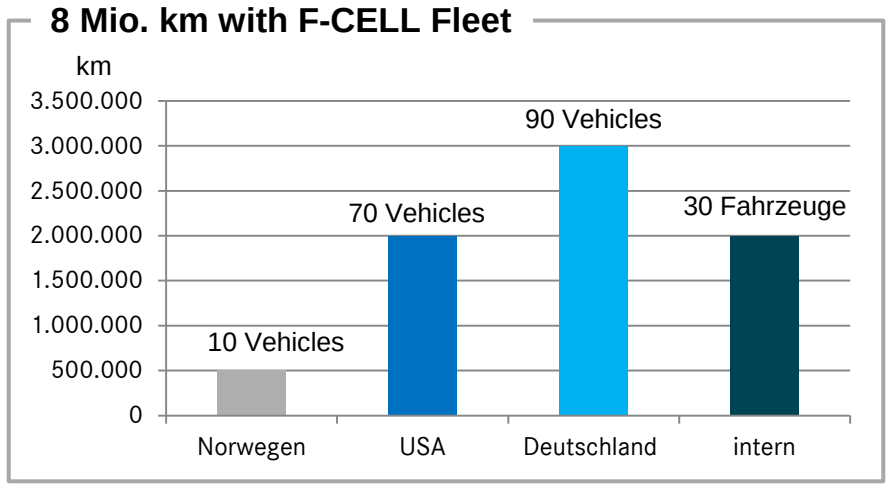
B-Class F-CELL:

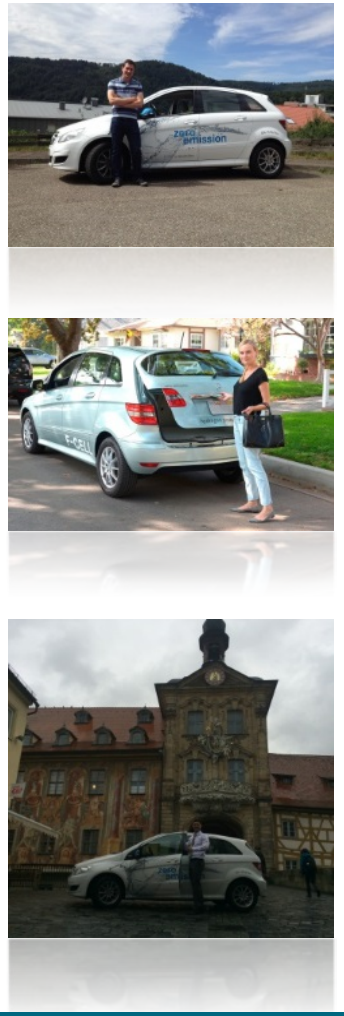


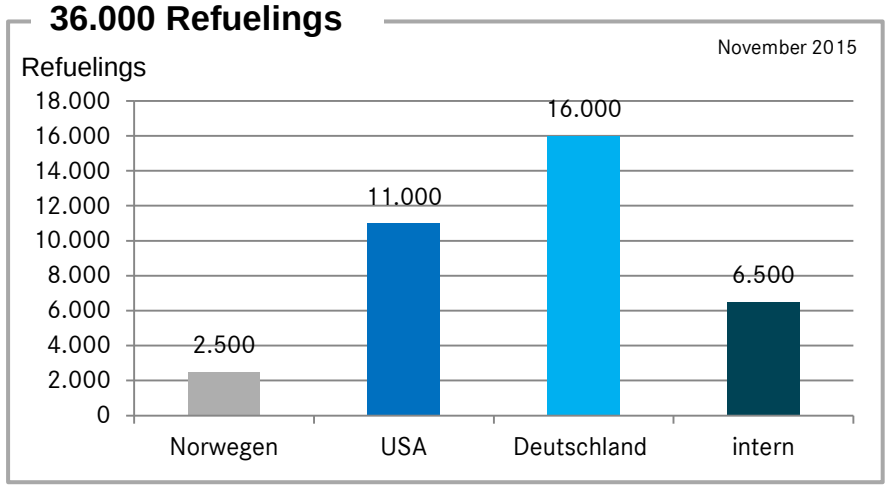
Specifications	
Vehicle	Mercedes-Benz B-Class F-CELL
Fuel Cell System	PEM (Proton Exchange Membrane) 90 kW
Engine	Output (cont./max.) 70 kW/100 kW Max. Torque: 290 Nm
Range	370 km (NEDC)
Top Speed	170 km/h (limited)
Acceleration 0-100 km/h (0-62 mph)	11.4 sec
Battery	Lithium-Ion; Output (Cont./ Peak): 24 kW / 30 kW (40 hp) Capacity: 6.8 Ah, 1.4 kWh

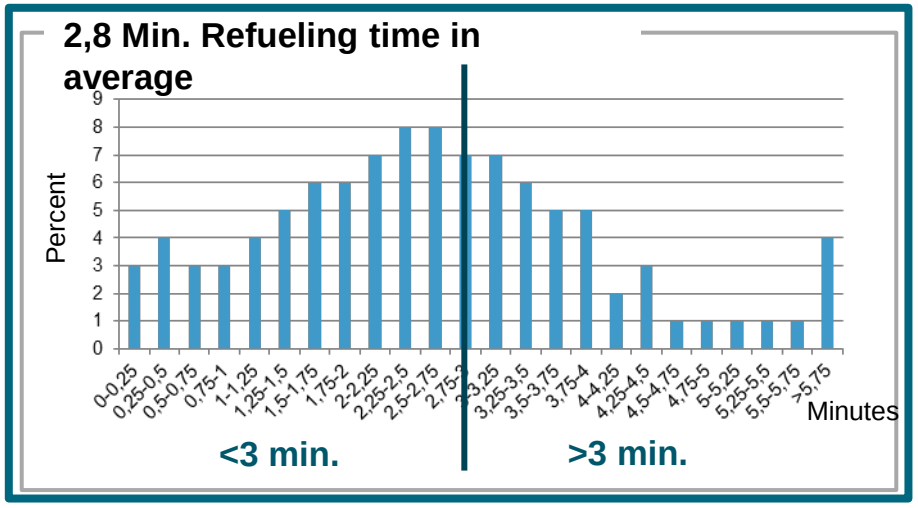
200 Mercedes-Benz B-Class F-CELL vehicles in customer hands since 2010

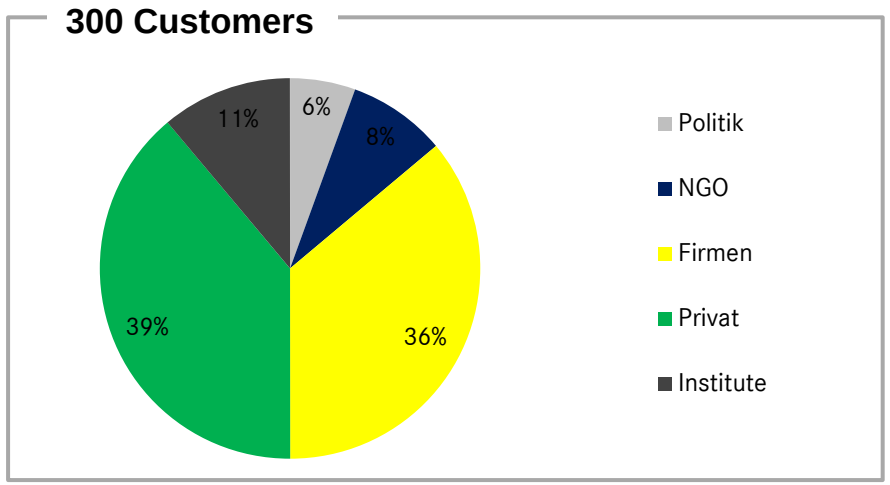
Lessons Learned with Daimler‘s Fuel-Cell Fleet (I)











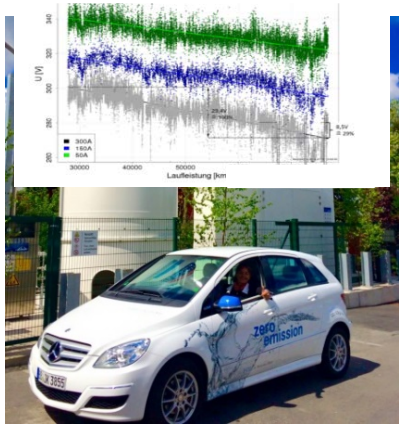
36.000 Refuelings with less than 3 minutes Refueling-time each in real life operation

Mercedes-Benz F-CELL World Drive 2011

3 B-CLASS F-CELL
125 DAYS
14 COUNTRIES
30,000 KM

Lessons Learned F-CELL Fleet Operation for Next Generation

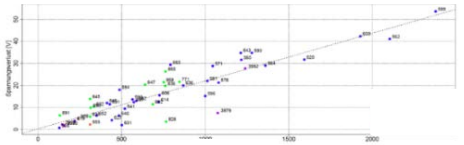
Fleet operation(Customers)



- Different customer profiles
- User behaviour
- Different climate
- Different H2-Infrastructure
- Reliability in daily use

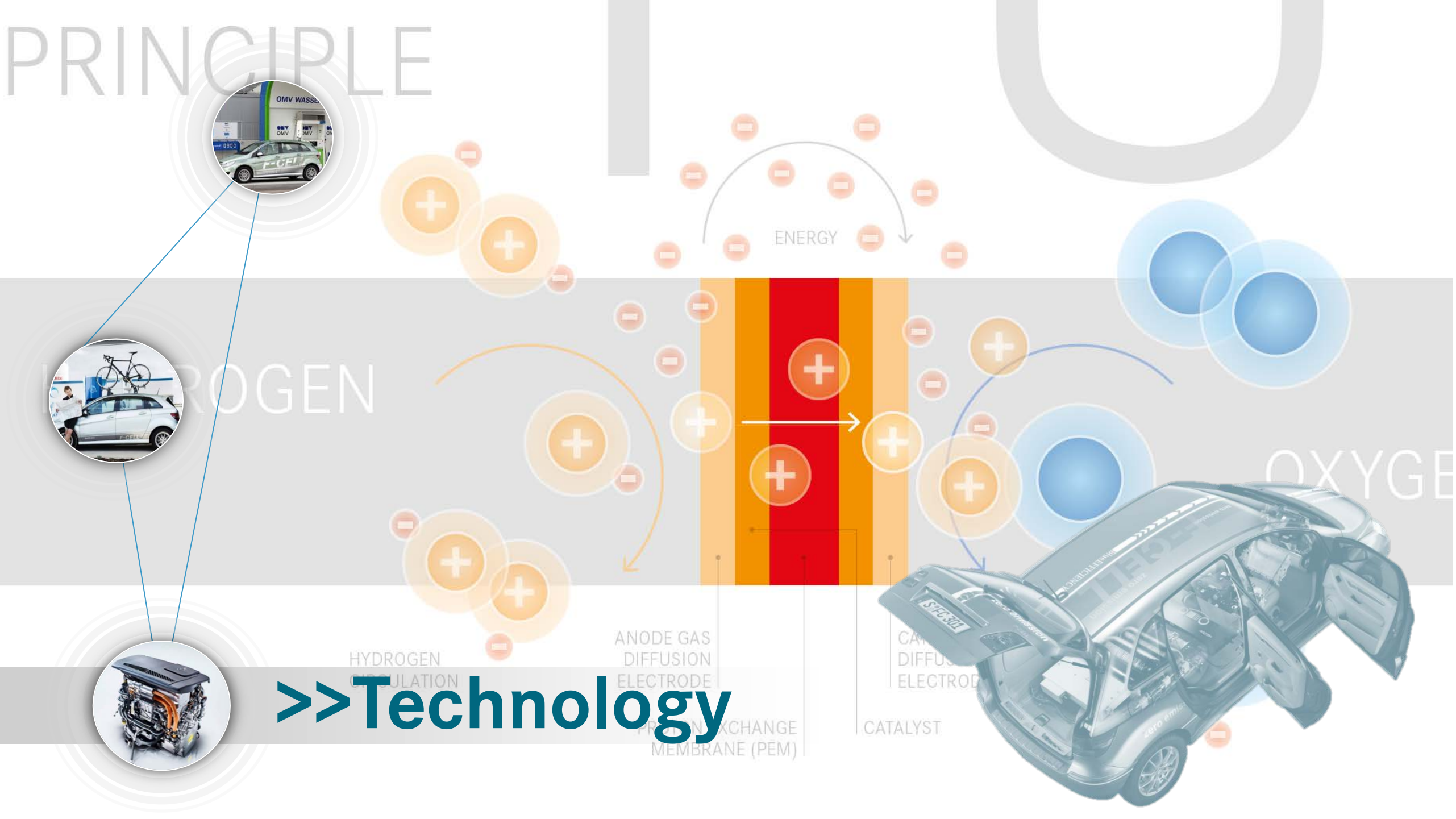
Powertrain-Testing

- Load distribution
- Degradation
- Statistics & Prognosis



GLC-Fuel Cell System Learnings

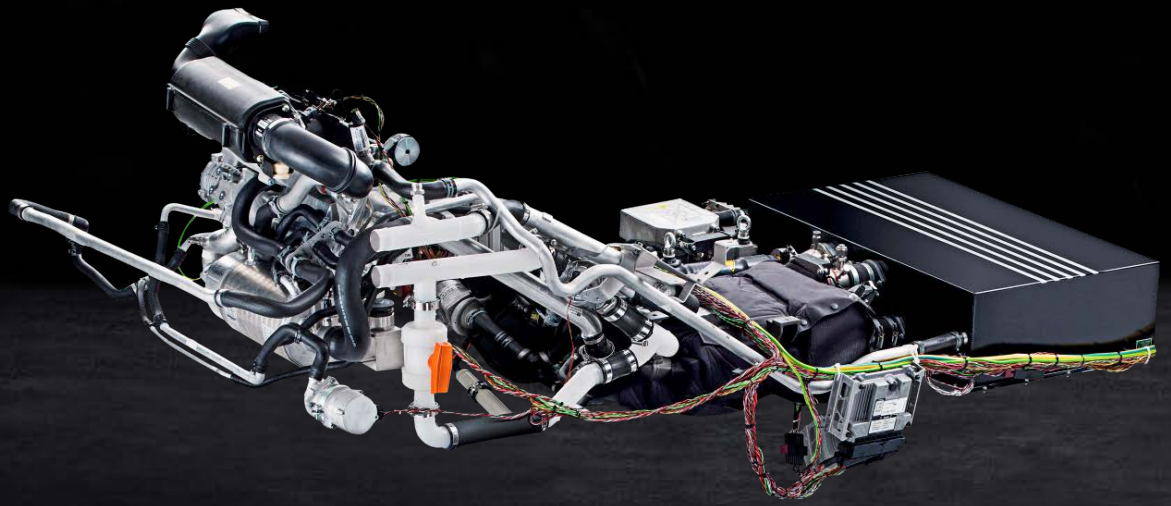
- Apply learnings from Fleet and test benches
  e.g. to reduce stress on stack components
- More stable components (e.g. catalysts)
- Implement recovery procedures
- Improved component specifications


PRINCIPLE
ENERGY
ANODE GAS
DIFFUSION
ELECTRODE
CATALYST
MEMBRANE (PEM)
HYDROGEN

>>Technology

The Next Generation Fuel-Cell System
Daimler made huge technological progress

2010: Underfloor package



2017: Engine compartment package

- 30% Reduction Fuel Cell engine size

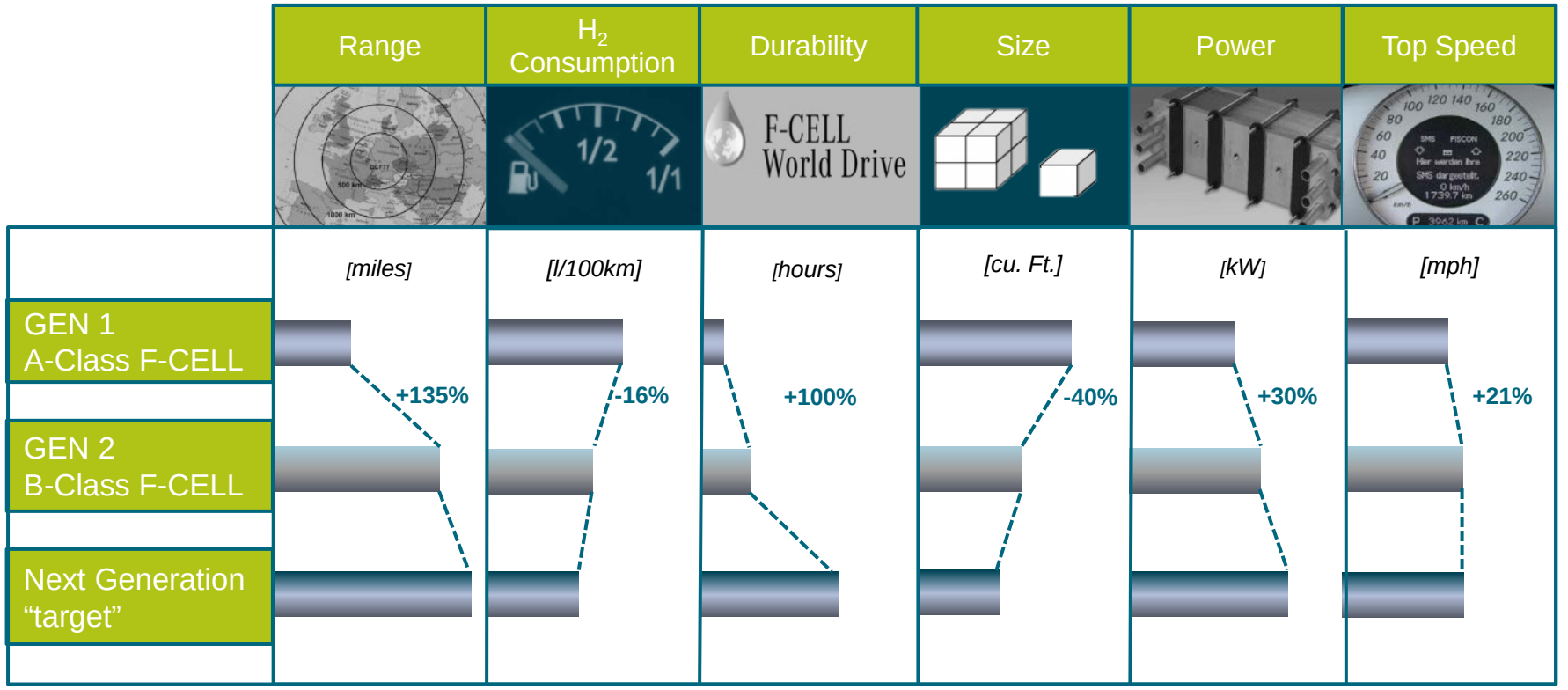
- 90% Reduction of Platinum

30% higher electric range in future vehicles

B-Class F-CELL meets its successor: GLC F-CELL

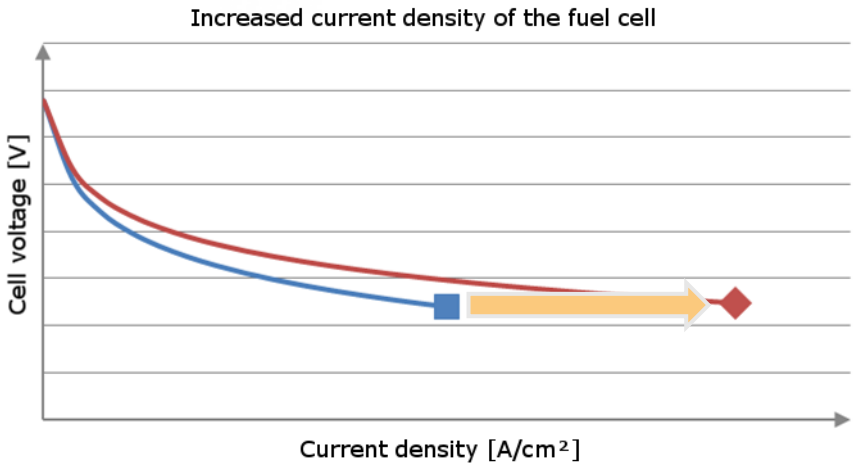
GLC F-CELL (FC-PlugIn) Powertrain:

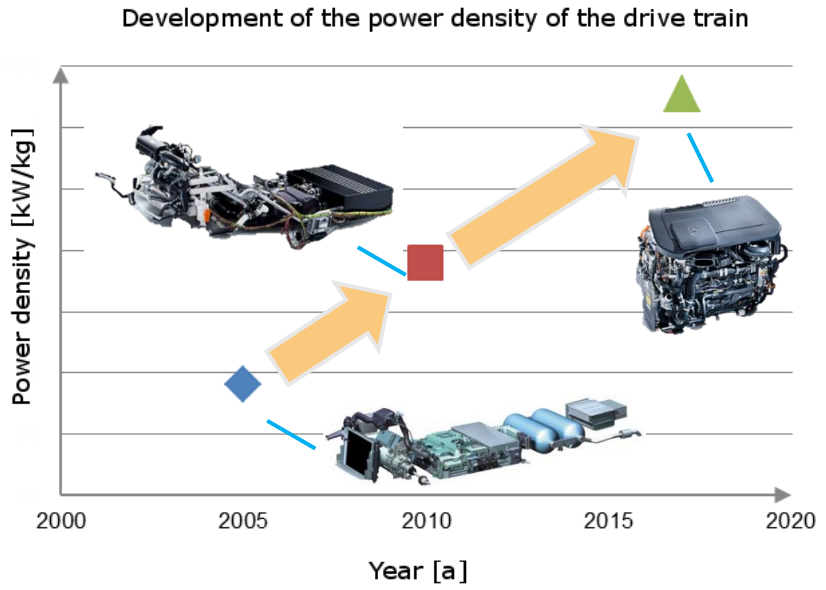
Technical Advancements of Daimler's Fuel Cell Vehicles

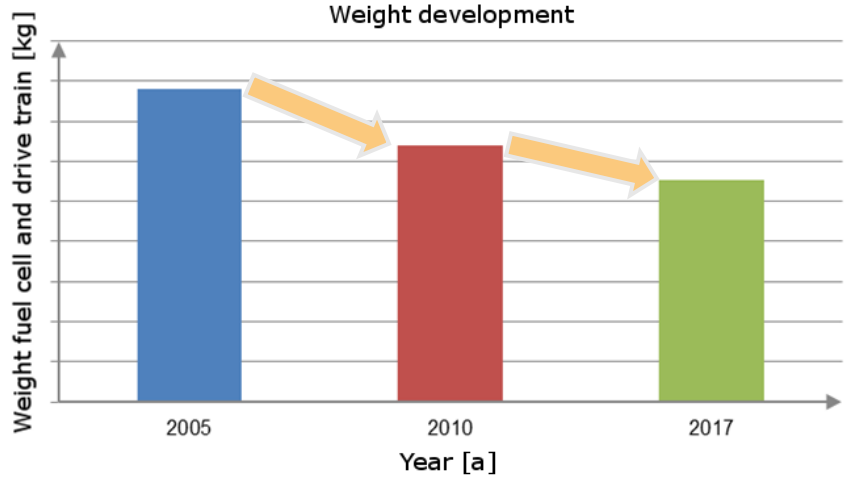


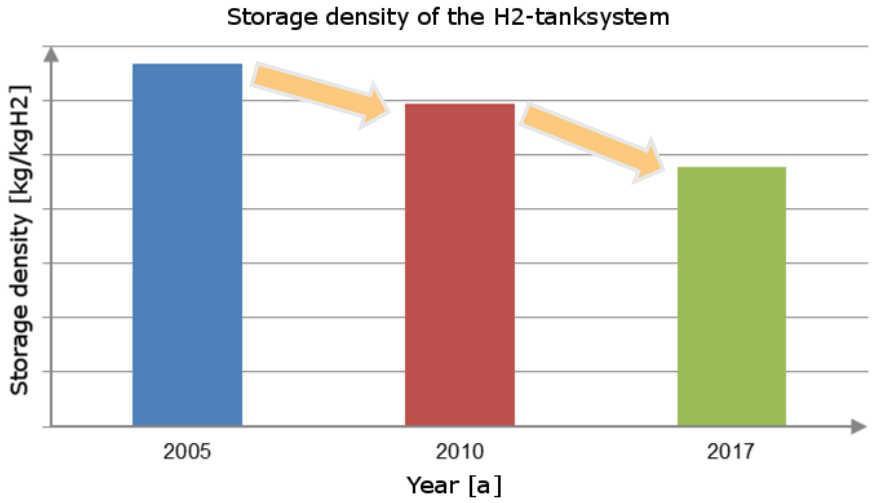
From generation to generation great technical improvements in numerous technical areas.

Power density of the fuel cell system significantly increased, weights significantly decreased

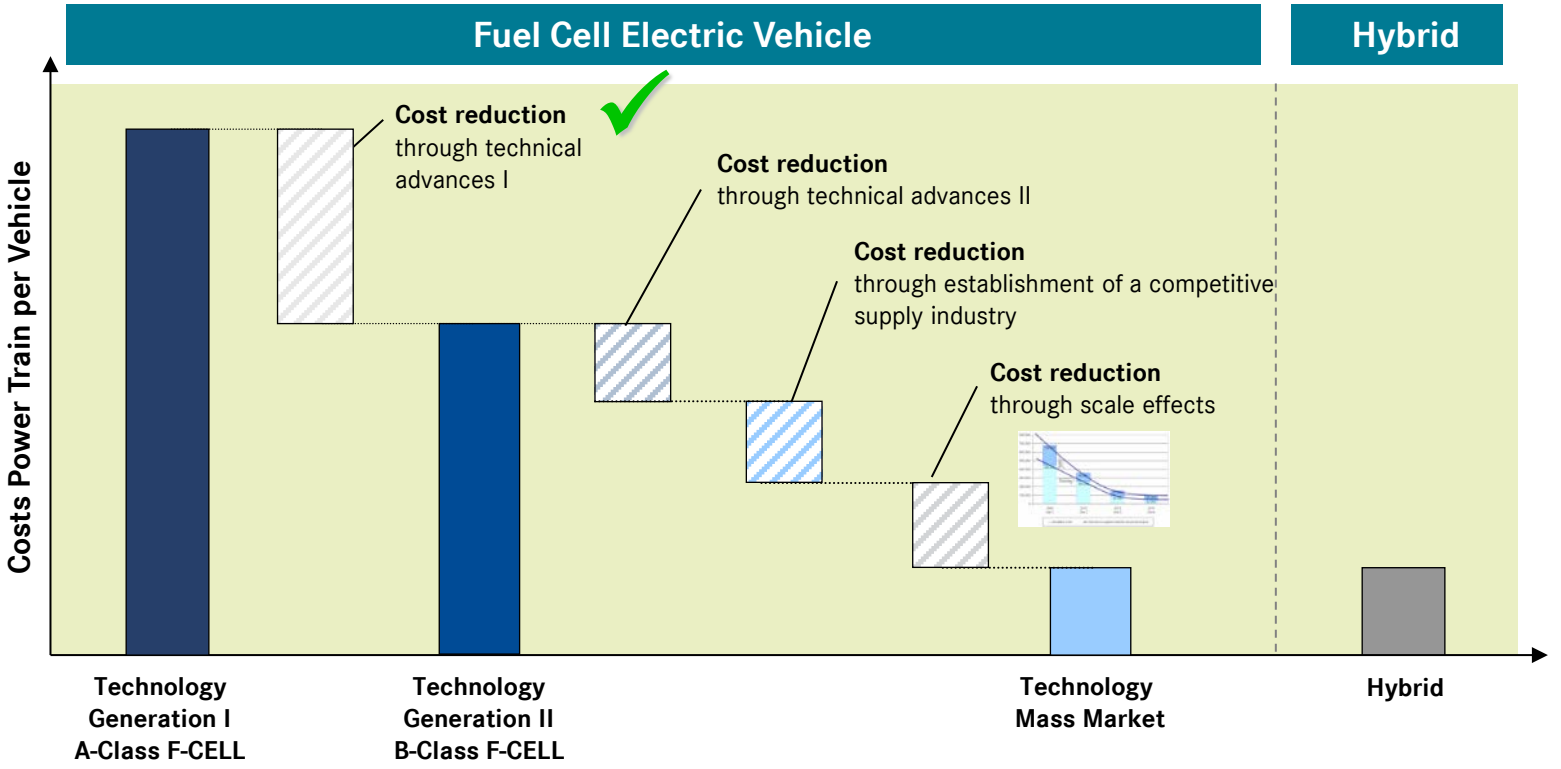








Cost Potentials of the Fuel Cell Technology



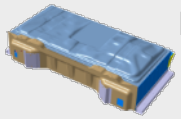
- The cost for the fuel cell power train are currently much higher than those from conventional drive systems. They can be reduced considerably through scale effects and technology advances.
- A reduction of the costs on the level of conventional drive trains is possible.
- Regarding the TCO[1] comparable values to conventional drive systems are reachable.

1) Total Cost of Ownership

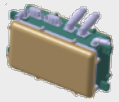
Modular Strategy for Different Propulsion Systems and Vehicles is the Basis for Economic Success!

smart fortwo electric drive

1x



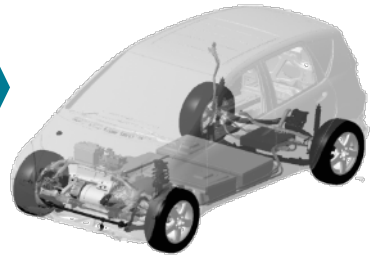
High Energy Battery
16,5 kWh / 30 kW



Onboard-Charger
3,3 kW

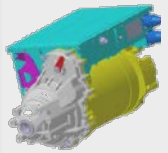
2x

A-Class E-CELL



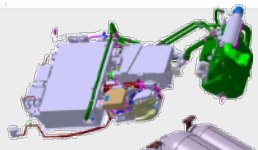
1X

Citaro FuelCELL-Hybrid



Integrated Powertrain (IPT)
E-Machine, Gearbox, Power-Electronics
100 kW / 290 Nm

2x FCS



Fuel Cell System (FCS)
80 kW

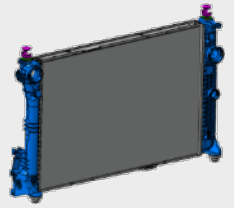
H_2 Tank System
Size-adaption (4kg / 35kg)

1X

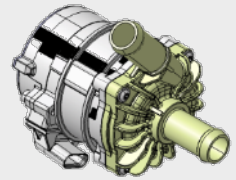
B-Class F-CELL

Further partially commonized parts

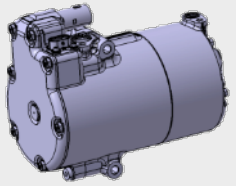
Main Radiator

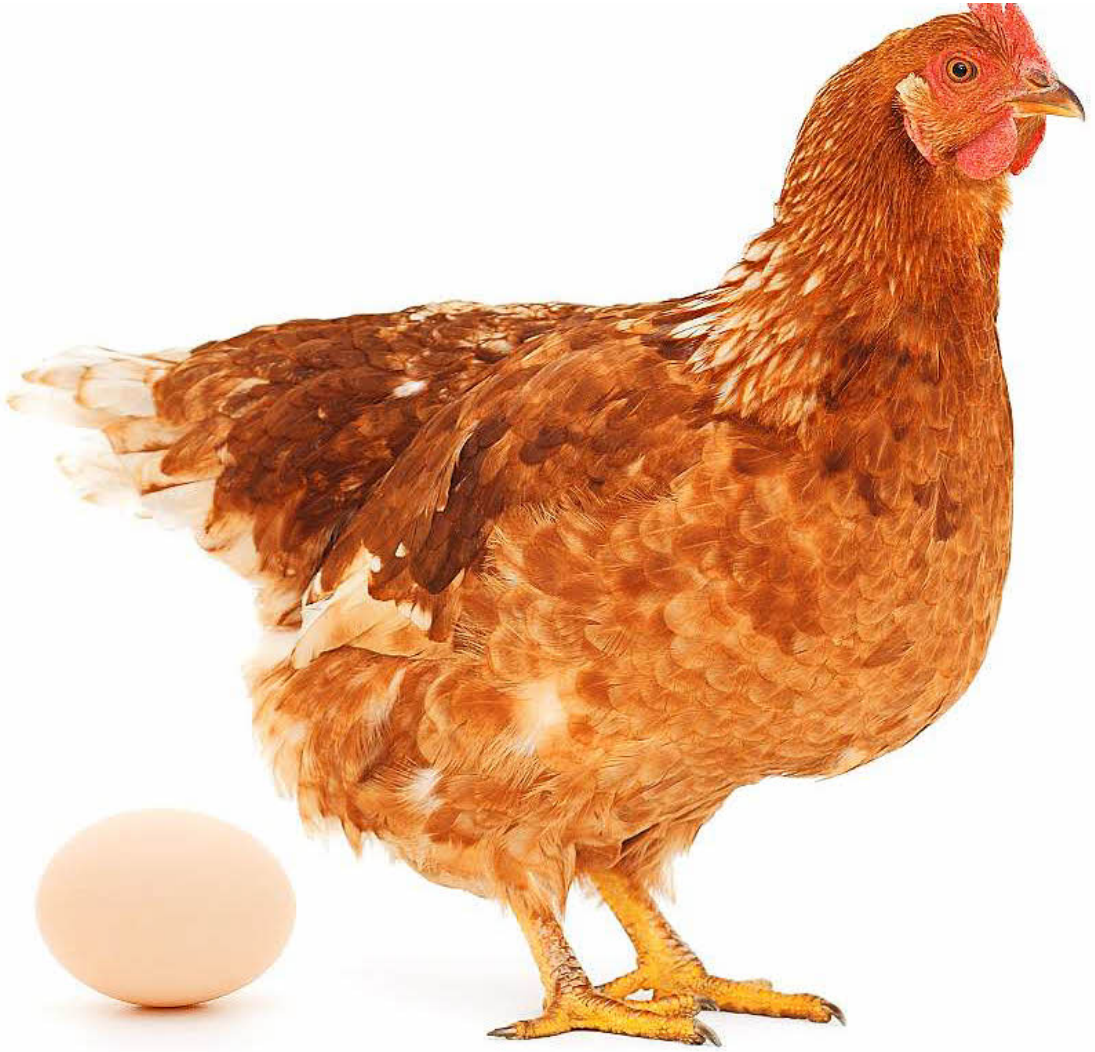


EE Cooling Pump



Electric AC-Compressor





>>H2-Infrastructure

Technical Configuration of a Hydrogen Fueling Station

Status quo of hydrogen filling stations:

- Pre-cooling down to -40° Celsius
- Pressure of hydrogen: 350 and 700 bar
- Standardized refueling process (SAE TIR J2601, ISO/TS 20100) using infrared data interface for communication vehicle <> filling station (SAE J2799)
- Refueling time: approx. 3 minutes for the B-Class F-CELL (ca. 4 kg hydrogen)
- Standardized hydrogen filling connector (SAE J2600, ISO/FDIS 17268)
- Hydrogen fuel quality (SAE J2719, ISO/FDIS 14687)
- Unitized construction / scalable

H2 Mobility Initiative in Germany
Build-up of a Hydrogen Refueling Station-Network until 2023

Partners (Shareholders) of Initiative

DAIMLER · Shell · TOTAL · Linde · OMV · AIR LIQUIDE

NIP-Contact

NOW Nationale Organisation Wasserstoff-

Implementation-Plan

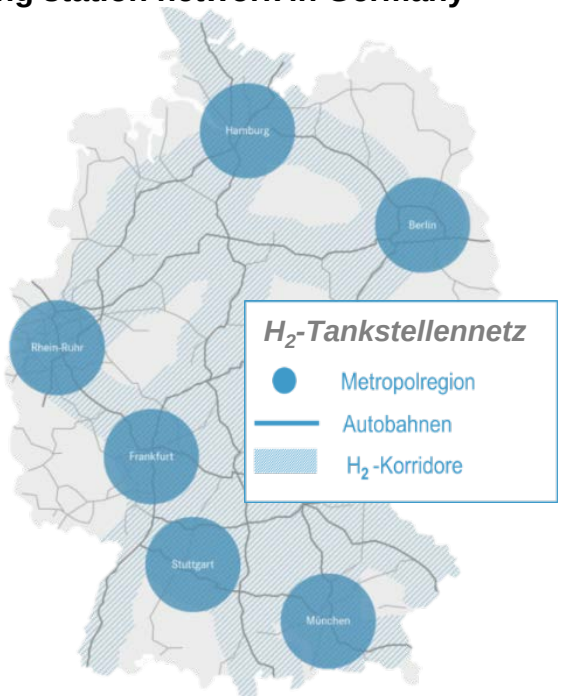
Build-up of a hydrogen refueling station network in Germany

Until 2023….

~ 400
public accessible HRS to be built-up in Germany

~ 90
km distance between HRS on the Highways & around the Lighthouse-Regions

> 10
HRS available in Metropolitan areas



H_2 Mobility Signing Ceremony
Berlin – October 13th, 2015

Associated Partners

Intelligent Energy · HONDA · BMW · TOYOTA · VW

Thank you for your attention