






Robert Bosch AG Wien
Vice President Automotive Sales
Austria and Southeast Europe



Bosch – vier Unternehmensbereiche

Kenndaten 2013¹

Bosch-Gruppe gesamt	<ul style="list-style-type: none">→ 46,4 Mrd. EUR Umsatz→ 281 000 Mitarbeiter		
Kraftfahrzeug- technik	<ul style="list-style-type: none">→ Weltgrößter und technologisch führender Zulieferer von Kraftfahrzeugtechnik	66 % Umsatz- anteil	
Industrietechnik	<ul style="list-style-type: none">→ Führend in Antriebs- und Steuerungs- Technologie, Verpackungs- und Prozesstechnik	34 % Umsatz- anteil	
Energie- und Gebäudetechnik	<ul style="list-style-type: none">→ Führender Hersteller von Thermo- und Sicherheitstechnik→ Weltmarktführer bei Wärmepumpen		
Gebrauchsgüter	<ul style="list-style-type: none">→ Weltgrößter Elektrowerkzeughersteller→ Führend bei Hausgeräten		

¹ Voraussichtliche Zahlen Stand 01/2014

Vier Unternehmensbereiche, ein globaler Verbund

Märkte und Fakten 2013¹

Bosch-Gruppe gesamt

- 46,4 Mrd. EUR Umsatz
- 281 000 Mitarbeiter
- 264 Fertigungsstandorte



Europa

- 56 % Umsatzanteil
- 174 000 Mitarbeiter
- 164 Fertigungsstandorte



Amerika

- 20 % Umsatzanteil
- 34 000 Mitarbeiter
- 37 Fertigungsstandorte



Asien Pazifik²

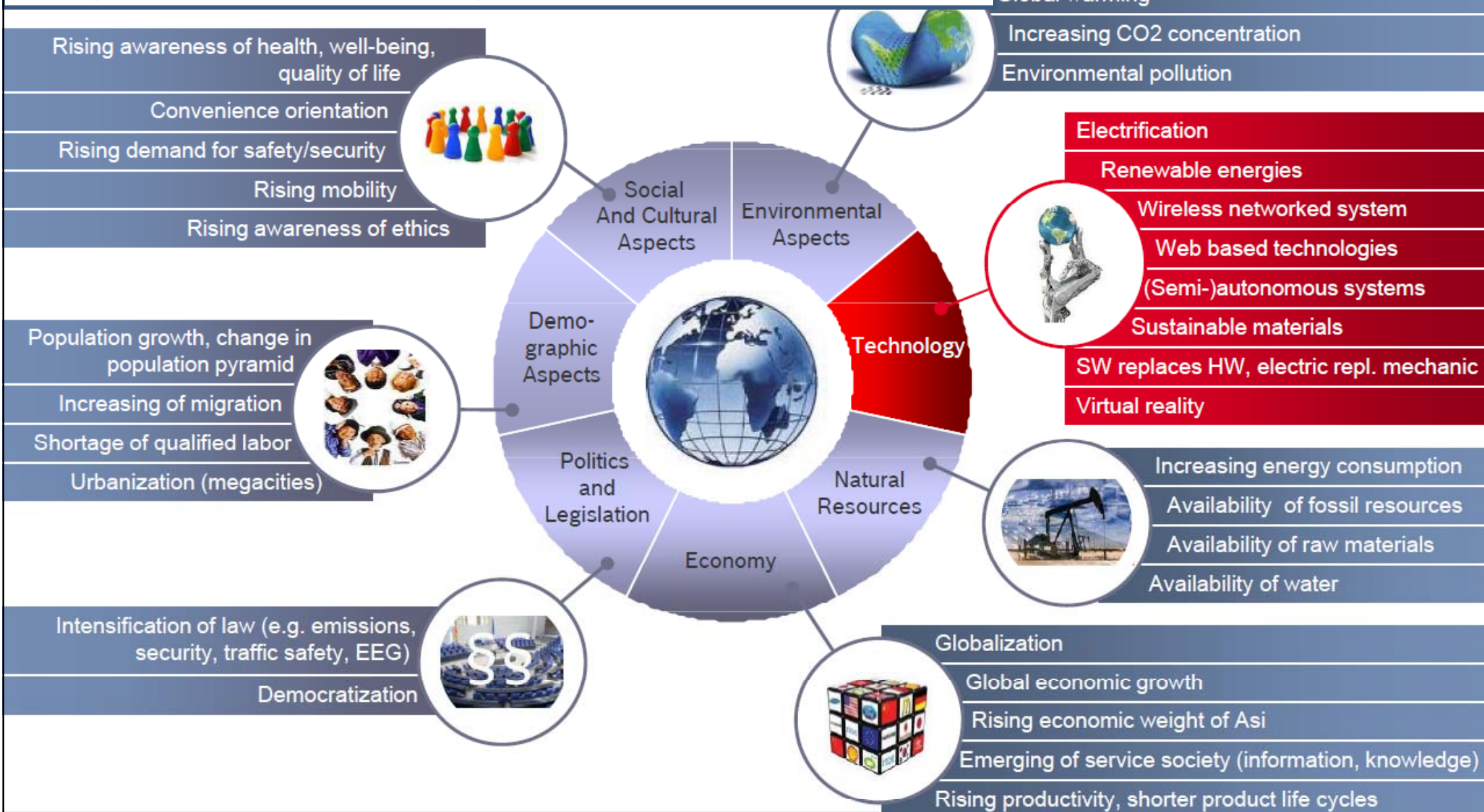
- 24 % Umsatzanteil
- 73 000 Mitarbeiter
- 63 Fertigungsstandorte



² einschließlich sonstige Regionen

¹ Voraussichtliche Zahlen Stand 01/2014

Mega-Trends driving Automotive Industry



Megatrends – great opportunities for Bosch



**CO₂-Reduction
and energy efficiency**



Changing mobility



Demography



Urbanization



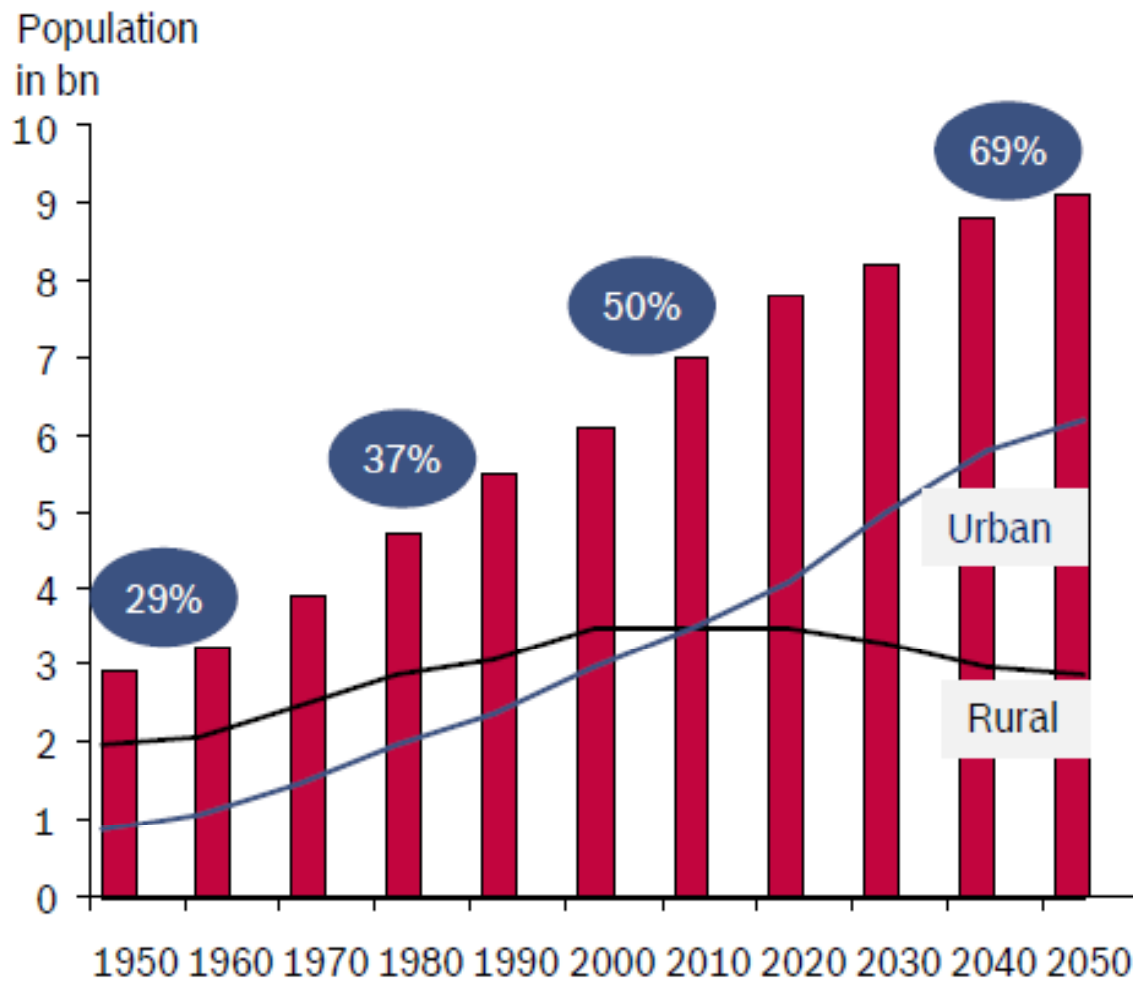
Connected world



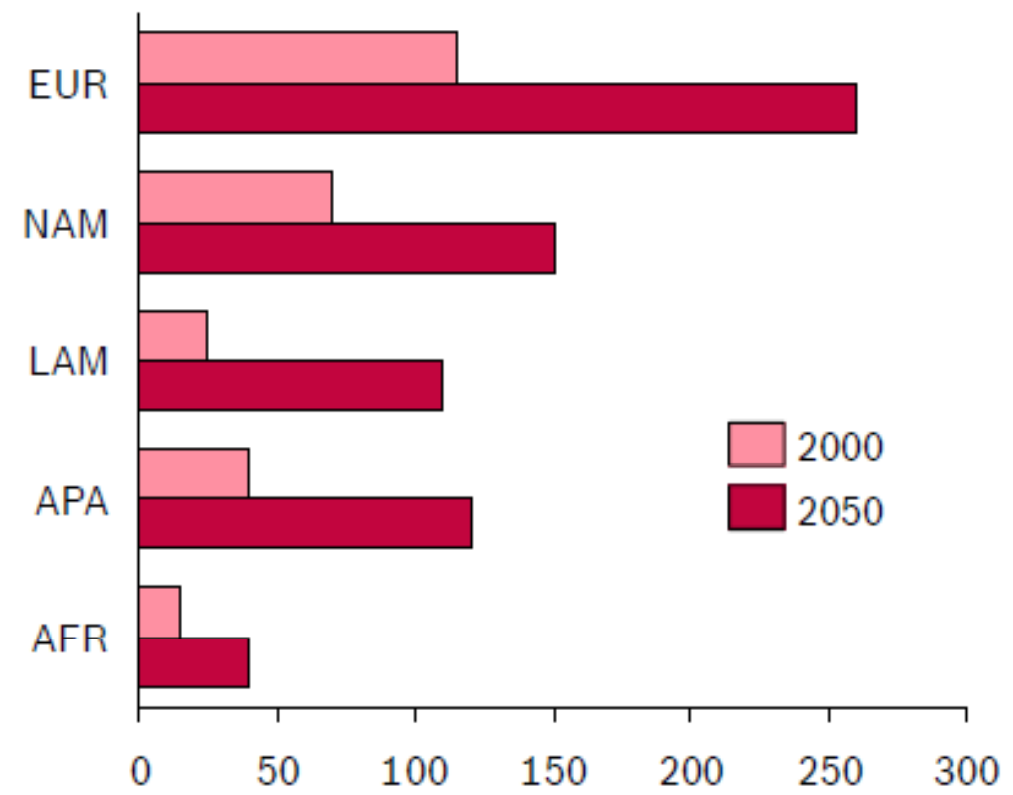
**Globalization: rise
of emerging markets**

Demography & Urbanization – older & more urban

World population and share of urban population

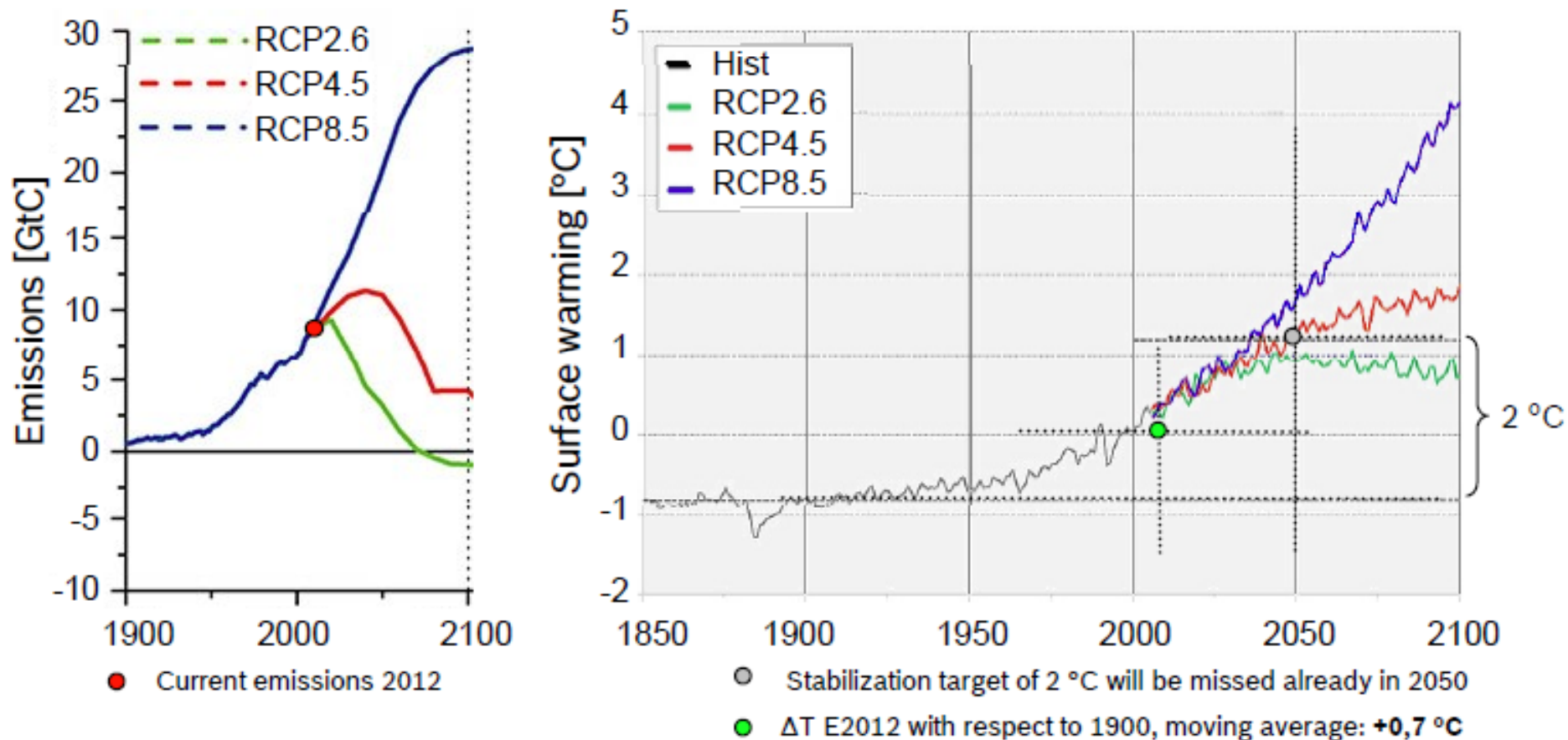


Number of people 65+ per 100 children (<15yrs)



Major trend – energy efficiency

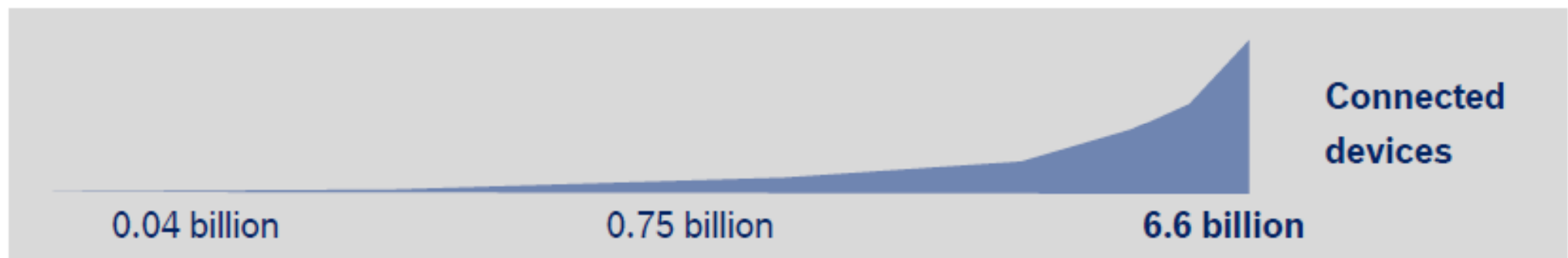
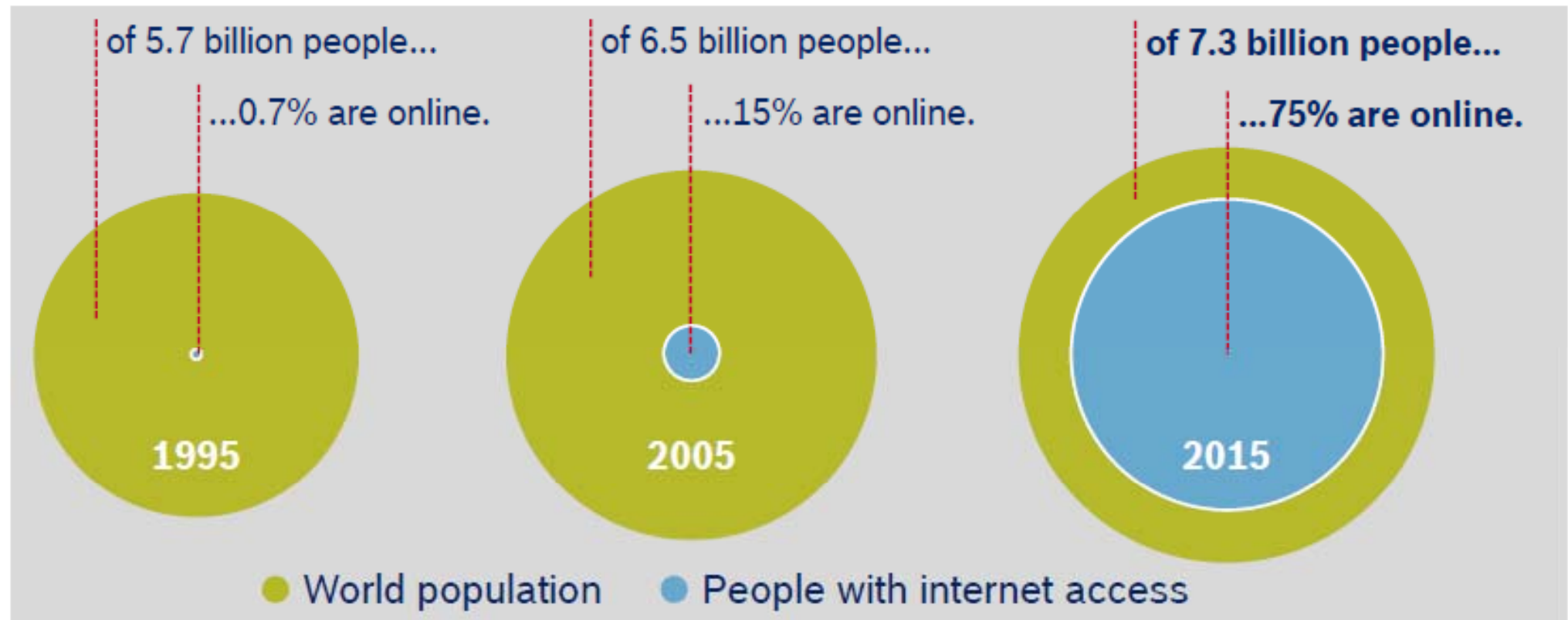
Scenarios for greenhouse gas emission from 2000 until 2100
(w/o additional climate change mitigation measures)



Source: IPCC AR5, 2014 (preliminary data)

RCP = representative concentration pathways
GtC = giga tons of carbon equivalent

Major trend – connected world



Megacities are the melting pot of Mega-Trends

Individualization
drives urban space
efficiency



Aging Society
requires local
infrastructure



Growing wealth
pushes high income
classes



Value changes
towards sustainability



- Globally household size decreases
- In mature cities number of single households reaches >40%, in Asian metropolitans >15%

- Globally, share of 65yr+ doubling
- Share 65yr+ in mature cities > 30%

- Emerging cities represents 60% of growth in high income* households
- Their number tripling to 60mio in 2030

- Growing re-urbanization - from “auto-cities to human-cities”
- New York: Dismantle industrial sights – building garden communities

2030

Source: McKinsey 2011, NYU 2012

* (>70k USD)

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Person Mobility Trends and Growth Fields 2020

Mobility Trends towards 2020

Mature Market (EU27)



Stagnating / Falling Personal Mobility Demand



Growth of High Speed Modes (Plane, High Speed Rail)



Stagnation & Diversification of "Low Speed" Modes (LV, PTW*)

Emerging Market (CN)



Strong Increase Personal Mobility Demand



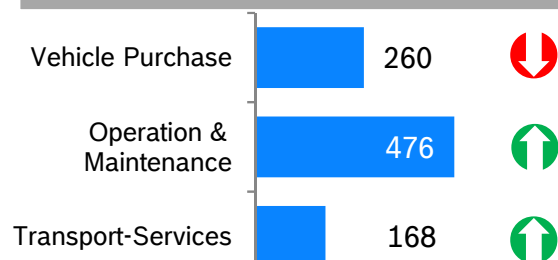
Growth of High Speed Modes (Light Vehicle, Plane, High Speed Rail)



Drop of Low Speed Modes (Foot, Bicycle, Bus)

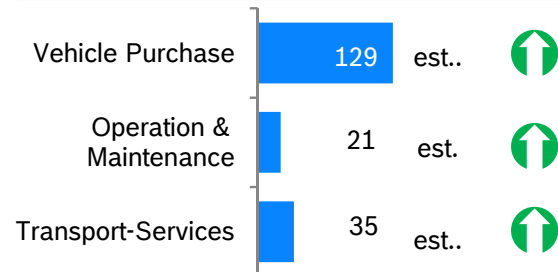
Mobility Expenditure towards 2020

Household Expenditure Mobility EU27 2010 in bn € Trend



Total 2010: 904 bn€

Household Expenditure Mobility CN 2010 in bn € Trend



Total 2010: 185 bn€

Good News:

Globally, expenditures for mobility are estimated to increase by 25% towards 2020.

Question:

Where is it going?

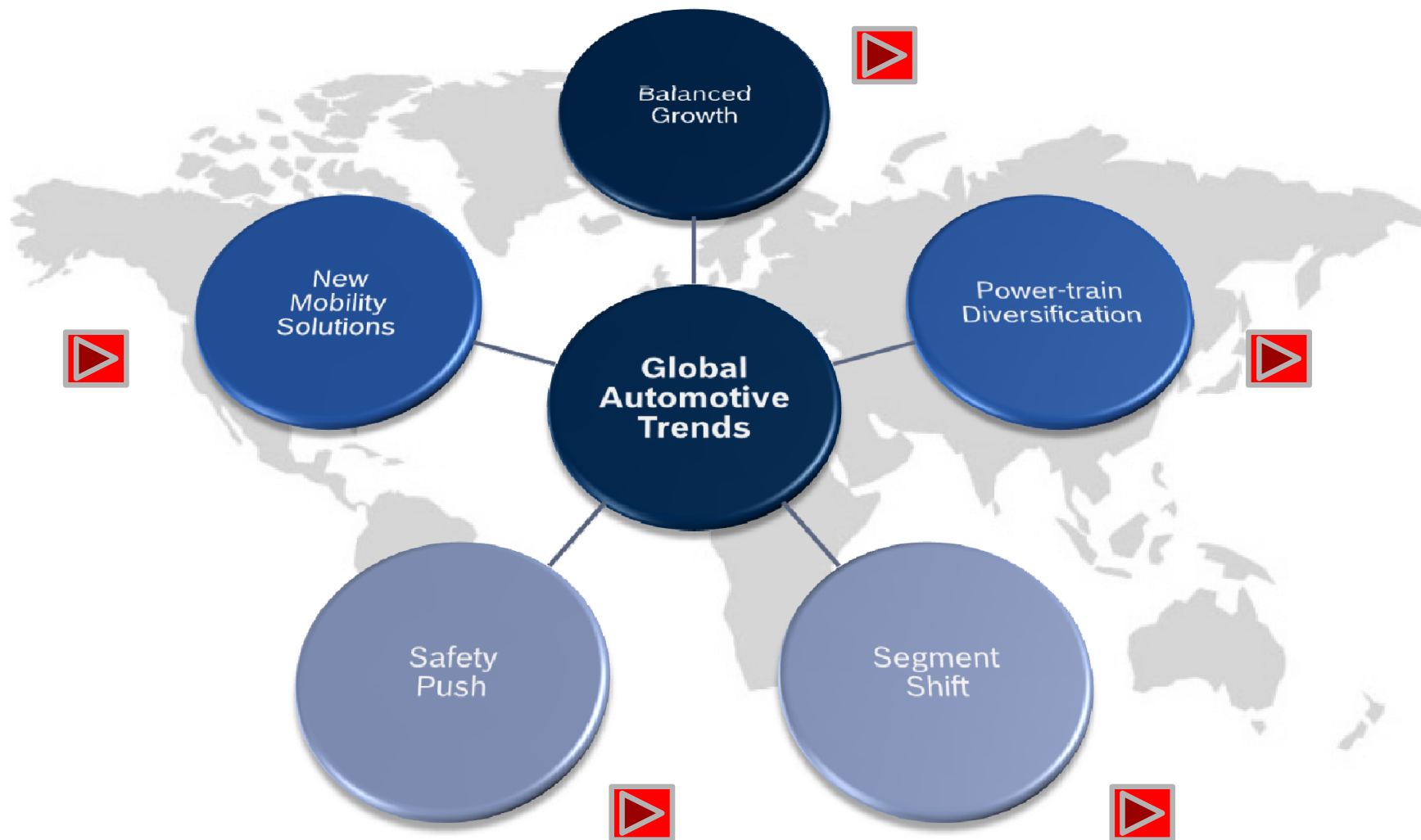
Sources: Mobility trends: OECD 2011, Mobility consumption: EUSTAT, NSB, McK, AT Kearney, Bosch estimates; Growth Fields: Roland Berger, Bosch estimates

*Powered Two Wheeler



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Overview Global Automotive Trends

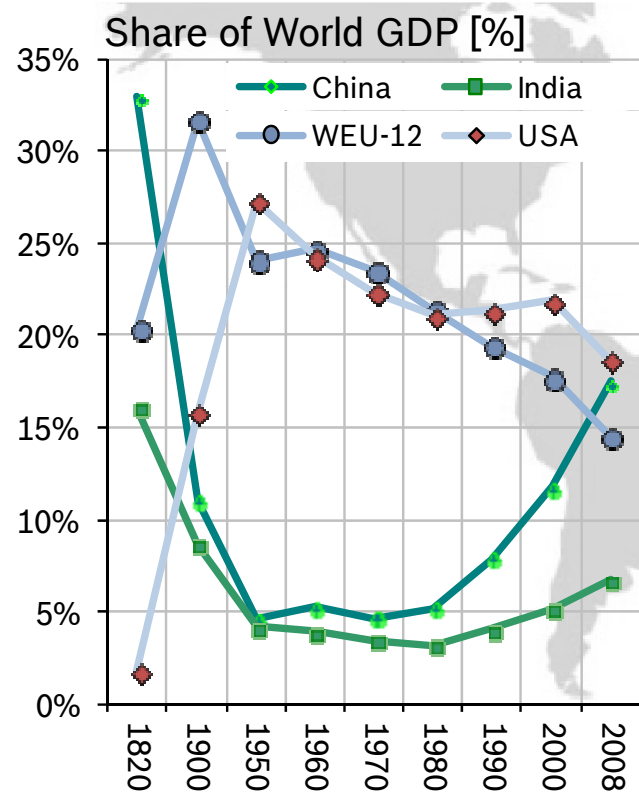


Global Automotive Trend: Balanced Growth

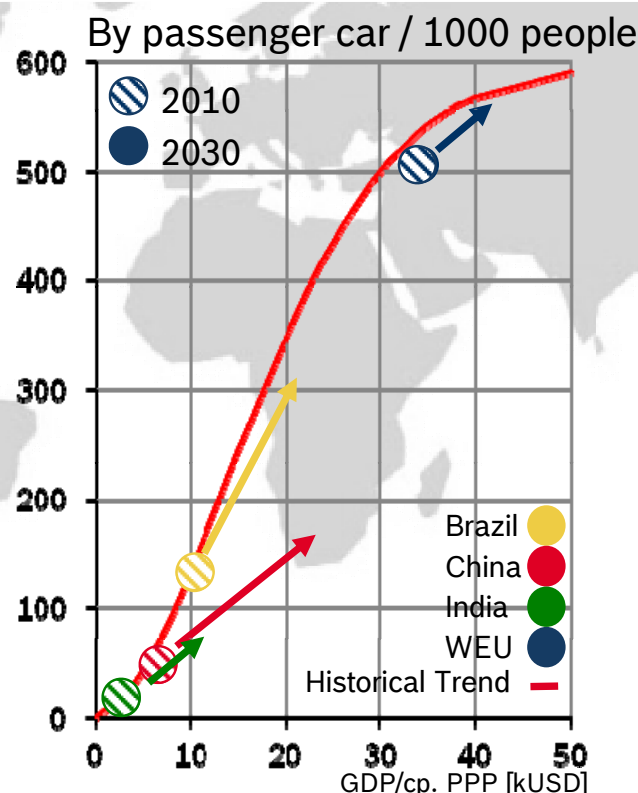
Balanced
Growth

Accelerated globalization leading to the re-balancing of world economy and technology change. Growth driven by strong vehicle demand in emerging markets and innovations in mature markets.

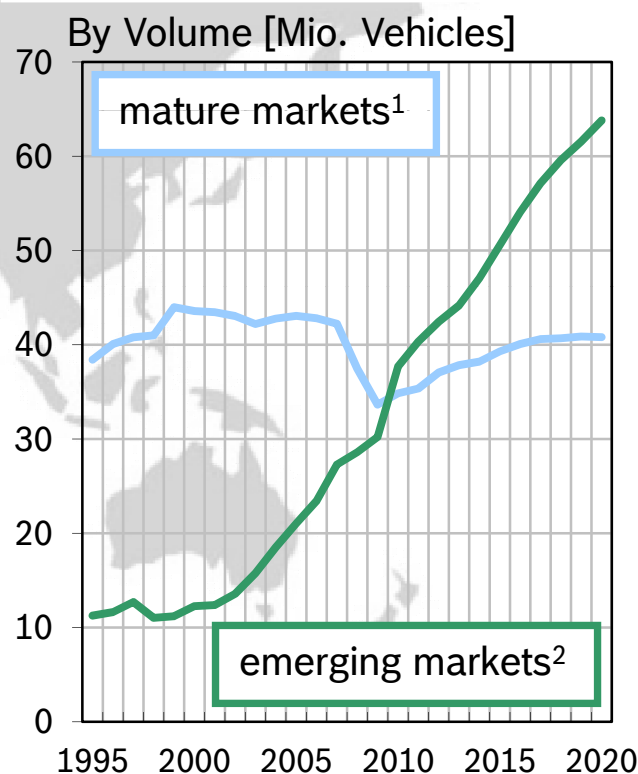
World Economy GDP



Motorization Demand



Light Vehicle Sales

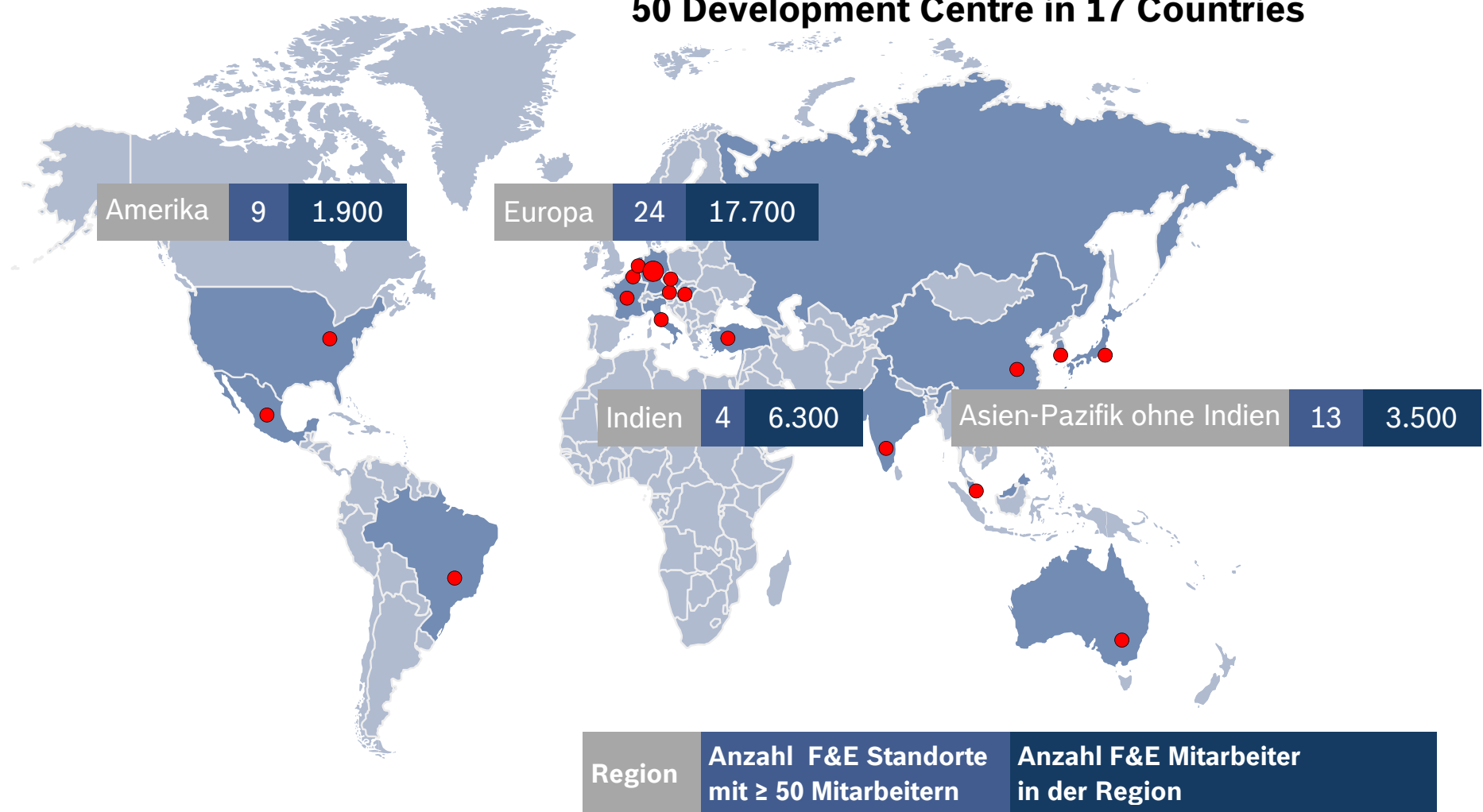


¹ NAM, WEU, JP/KR

² LAM, MEE, Asia w/o J/K, RoW

Close to the Customer – R&D Footprint of Bosch

**Bosch Automotive Technology:
50 Development Centre in 17 Countries**




















Global Automotive Trend: Segment Shift

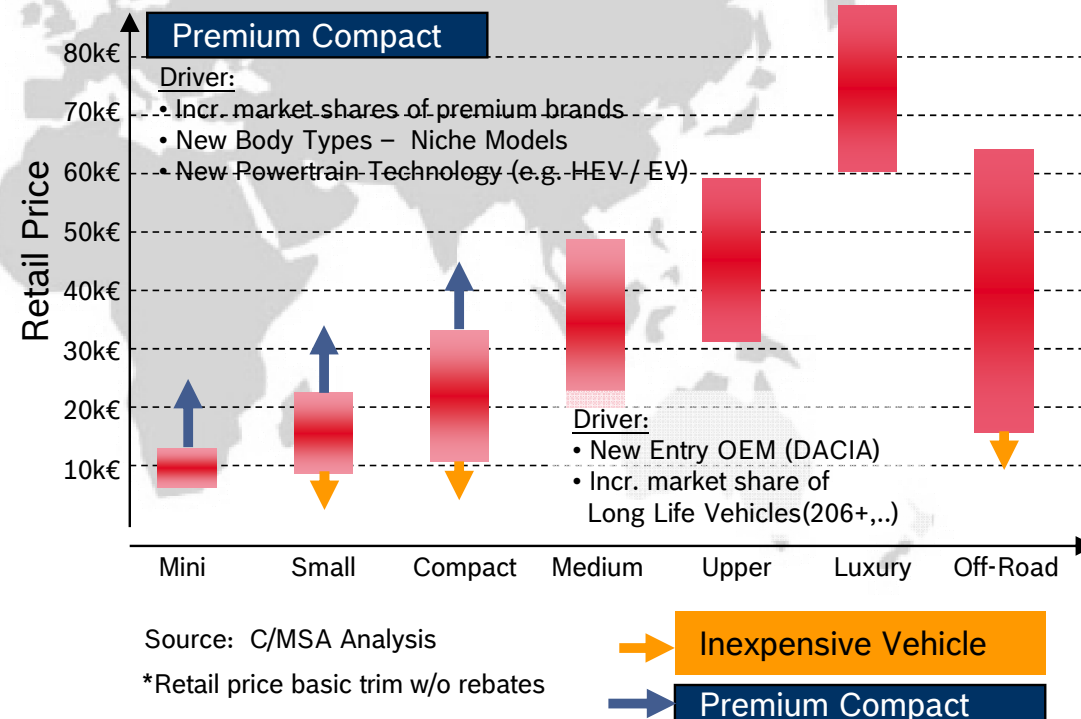
Segment Shift

Shift to smaller vehicles and diffusing segment definitions
Driver: Global demand for low price vehicles and compact premium cars

Low Price Vehicle – Global Overview

Price Range*	Models / Region
Low Price Vehicle – Mature Markets ~8500 €	  
Low Price Vehicle – Emerging Markets ~6000 €	     
Ultra Low Price Vehicle – Commercial Use ~4500 €	   
Ultra Low Price Vehicle – Private Use ~3500€	   

Market Structure – WEU



Compact Premium vs. Low Price Vehicle



Example Japan: Emerging ultra small (“Micro”) Mobility

Market Driver

- Stronger trend for higher transport efficiency (energy)
- Pressure to decrease CO2 emission
- Demand of new mobility in the downtown of big cities (to ease traffic jam)
- Increase of aged drivers (will be double in 2030 vs 2010)
- Government push to decrease fatalities of aged peoples

Potential customer benefits

- For aged people and mothers with children easy to handle
- Optimized for short distance driving
- Ecologically and economically sustainable individual mobility



Pico by Daihatsu



Micro Commuter Concept by Honda

Bosch Concept Study: Electric Self-Balancing Unicycle

Potential features



- 5" rim integrated 250 W geared drive
- Single EC motor with integrated ECU
- Limited to 6 km/h
- 1 gyro and 1 gravitational sensor
- Portable 36V/2,6 Ah Li-Ion battery
- Foldable alu/carbon frame
- 2 fold-away foot rests, kickstand, carrier
- < 10 kg

Potential customer benefits



- "Fun to drive", "Easy to handle" (also for elderly people)
- Sagittally self-balancing, laterally stable
- Very compact and portable
- Released for use in pedestrian areas
- Customizable frame

Bosch E-Bike Komponenten

Motor-Typ	Cruise 25 km/h	Speed 45 km/h
Schaltart	Nabenschaltung / Kettenschaltung	Kettenschaltung
Leistung nominal	250 Watt	350 Watt
Drehmoment	30 – 50 Nm	40 – 50 Nm
Unterstützung	30 % – 200 % / 30 % – 250 %	30 % – 250 %
Max. Unterstützung bis	25 km/h	45 km/h
Gewicht	< 4 kg	< 4 kg

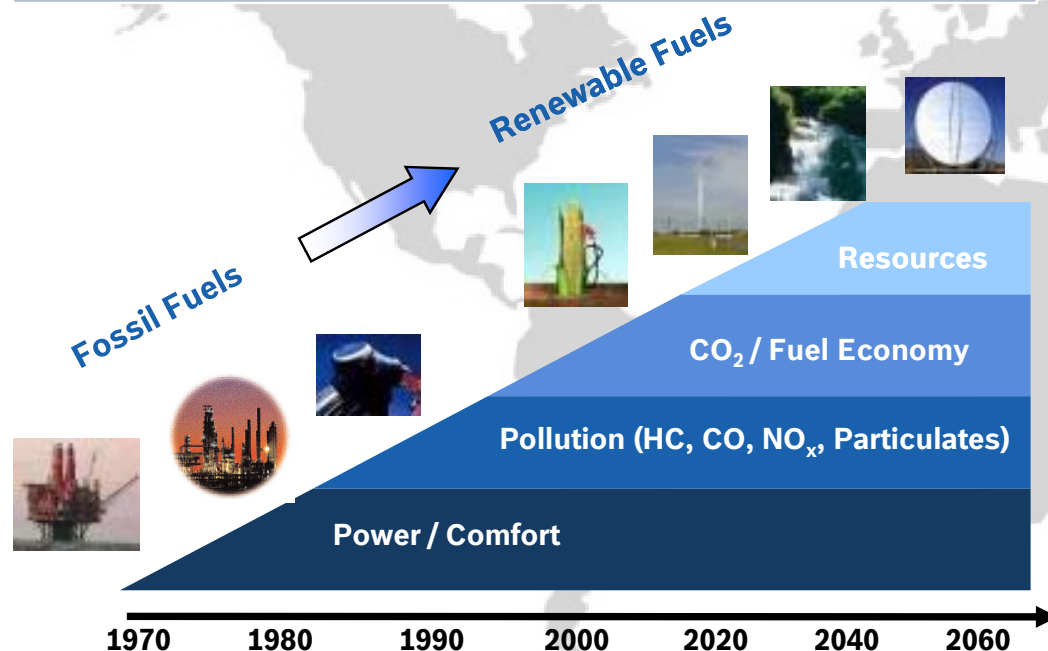


Global Automotive Trend: Powertrain Diversification

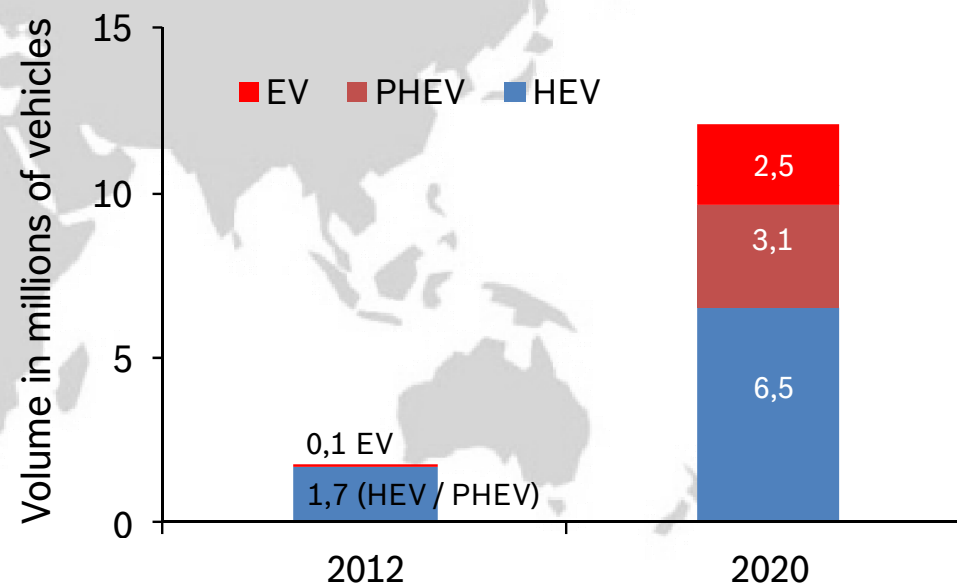
Power-
train
Diversity

Power-train technology towards alternative fuels & electrification.
Drivers: CO₂, fuel price, energy diversification, eco-awareness.
But optimized gasoline and clean diesel still dominant in 2020 !

Power-train Development

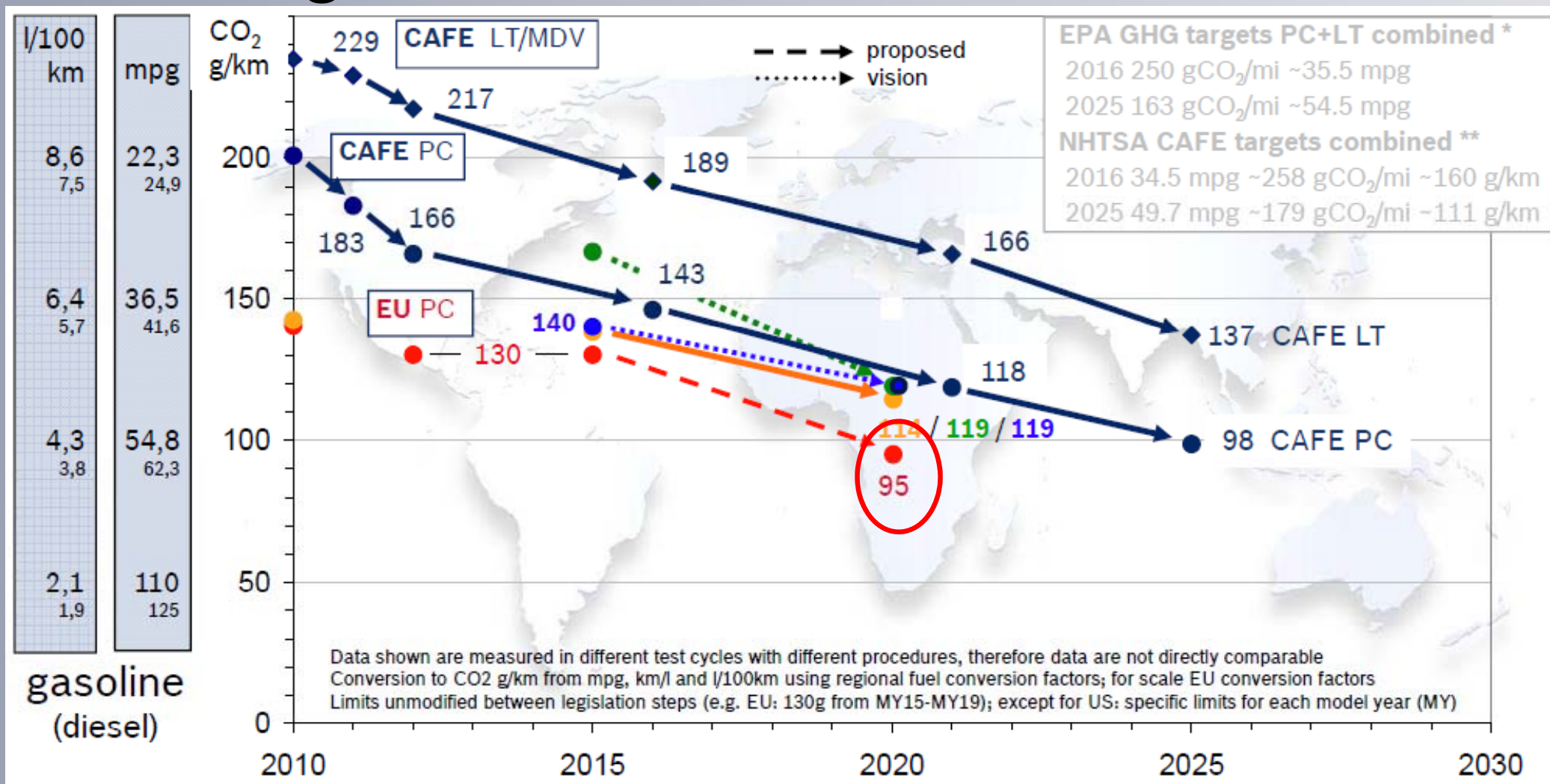


Market Scenario Electric Power-train



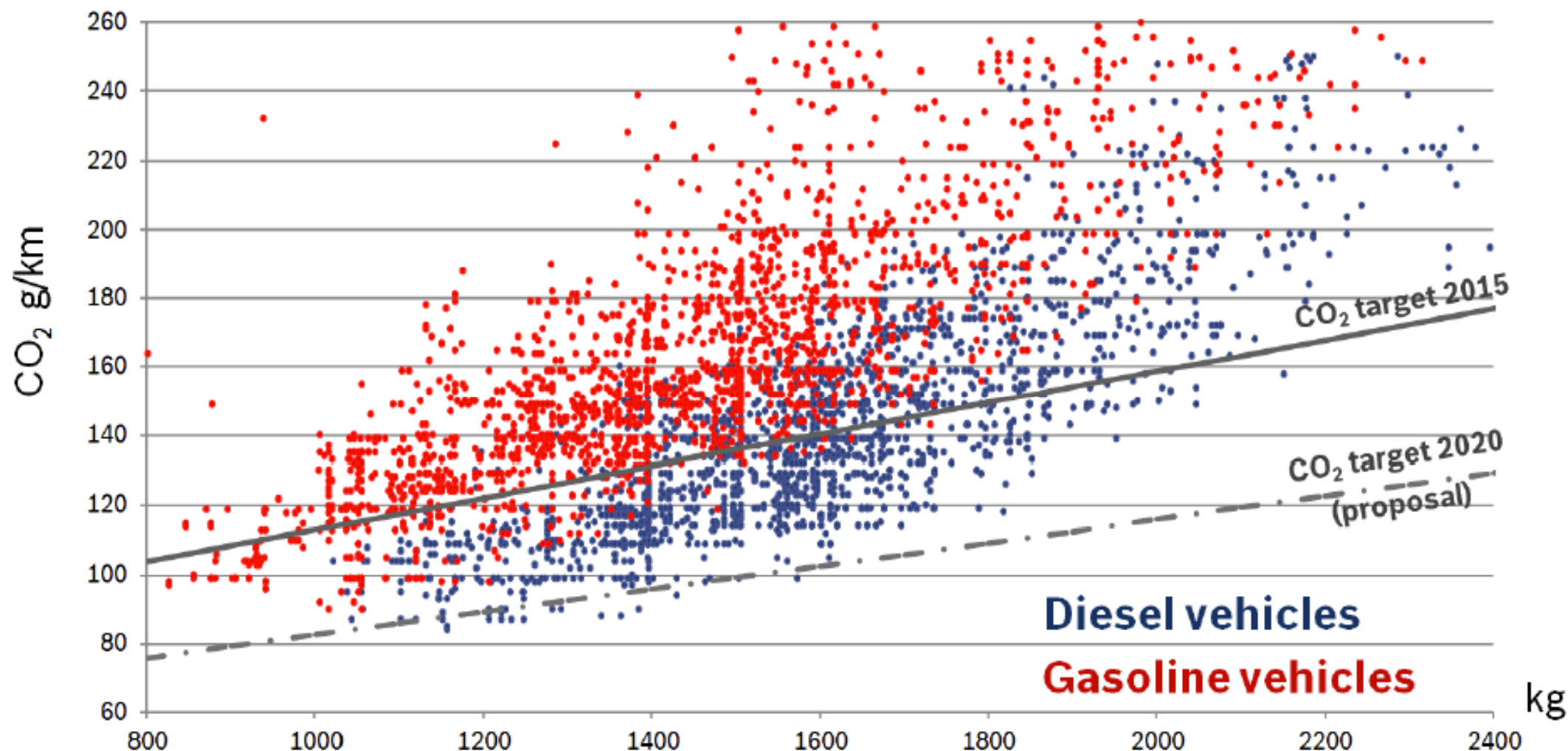
Source Bosch estimates

Global Legislation and Commitments

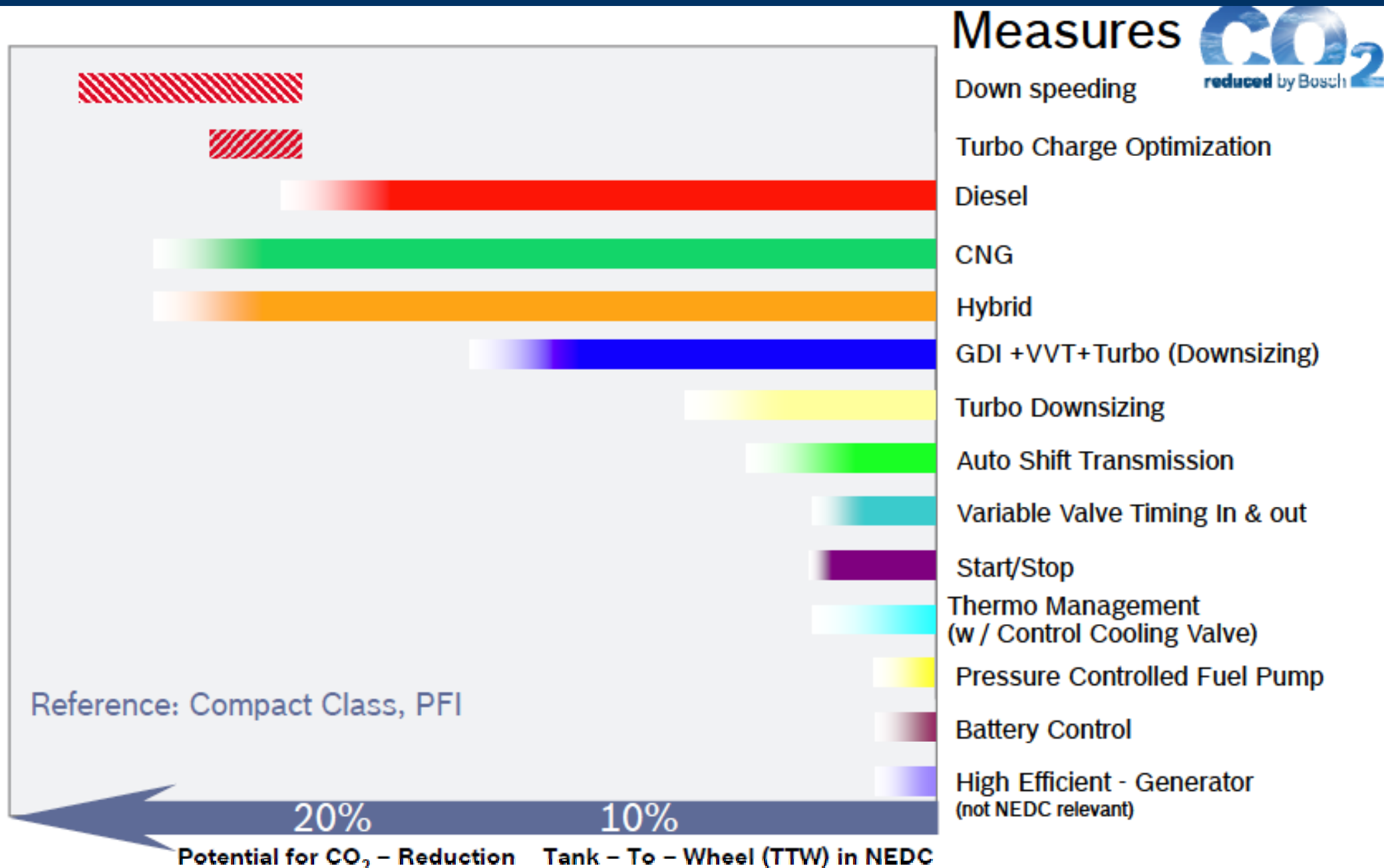


CAFE = Corporate Average Fuel Economy; US: PC = Pass. Cars LT / LDT = Light Trucks (pick-ups, vans, SUVs) MD(P)V = Medium Duty (Pass.) Vehicles; GHG = Greenhouse Gases
 EPA = US Environmental Protection Agency; NHTSA = US National Highway Traffic Safety Administration; EU: PC = Pass. Cars LCV = Light Commercial Vehicles; others PC data

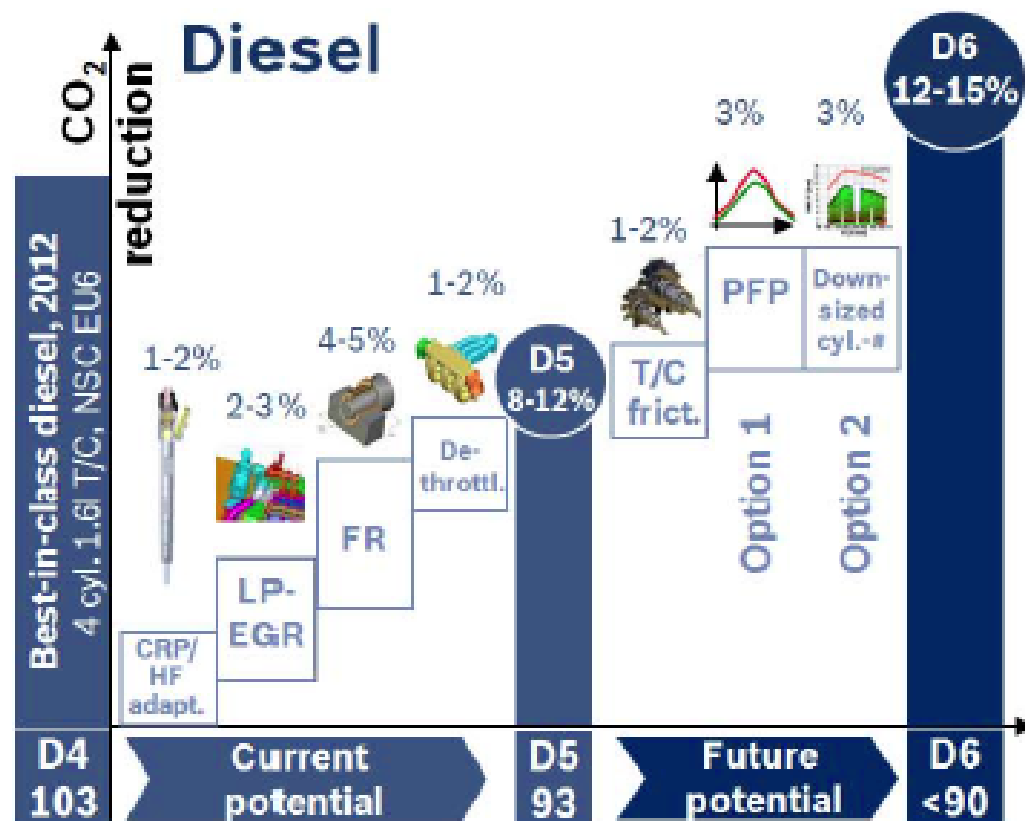
CO₂ Emissions of vehicles on sale in the EU 2012



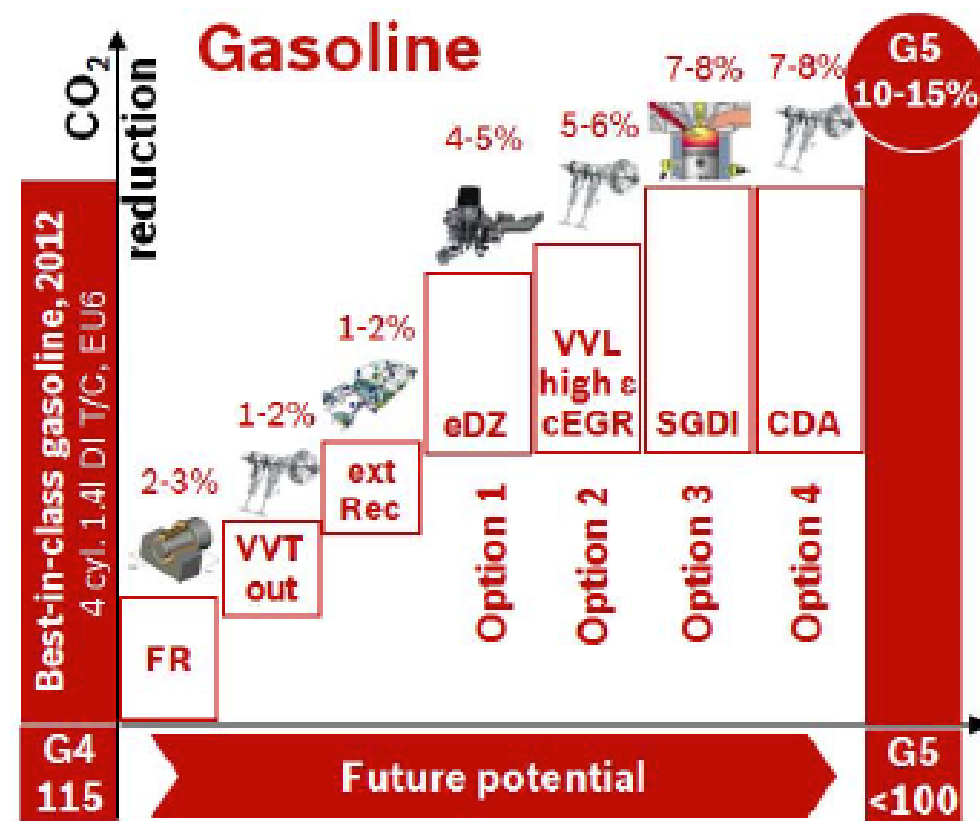
Data: ADAC 11.12



CO₂ Reduction Potential for Compact Class Vehicles

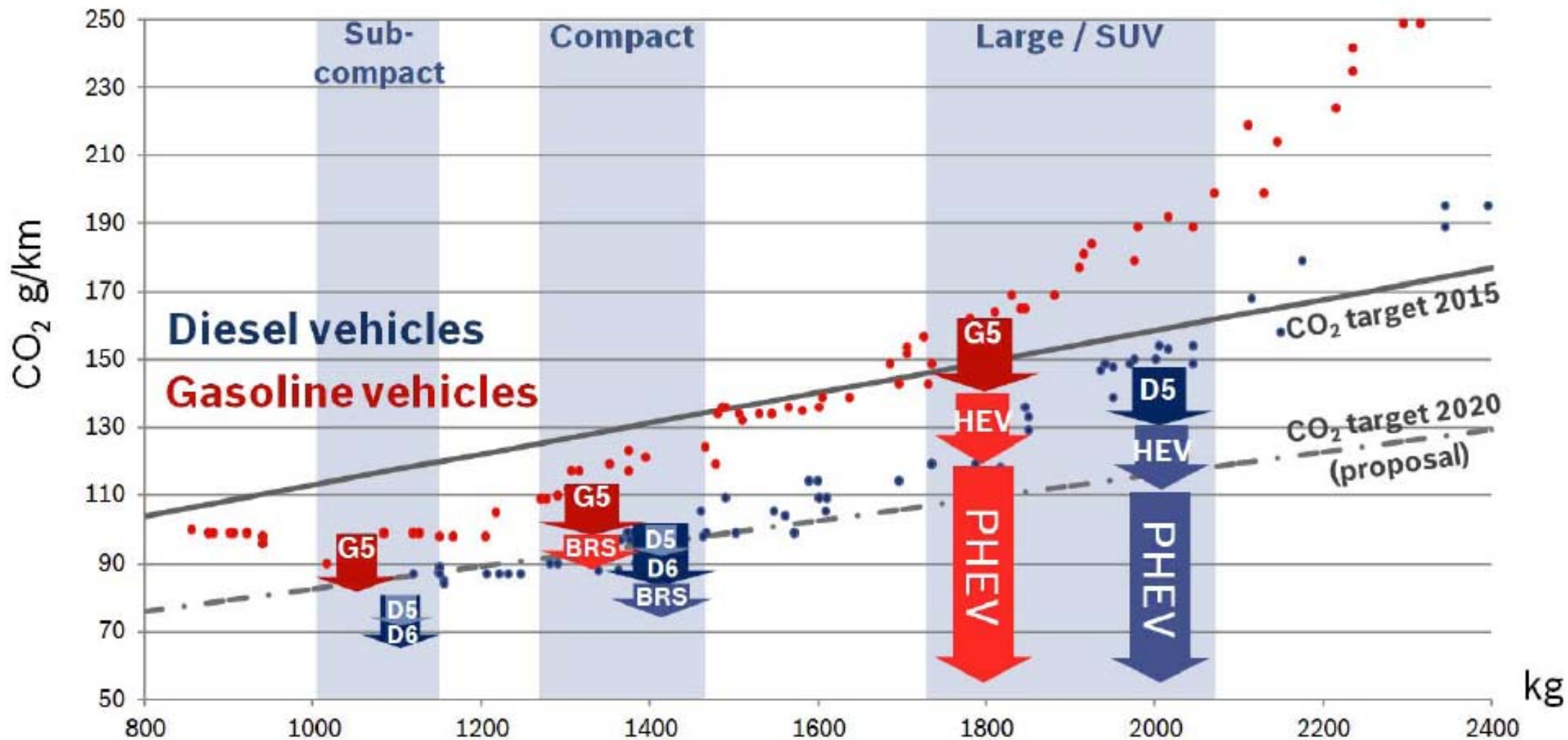


CRP/HF= common rail pressure/ hydraulic flow | LP-EGR= low-pressure EGR system
FR = friction reduction | De-Thrott. = de-throttling engine | PFP= low-peak firing pressure | T/C = turbocharger | NSC = NOx storage catalyst

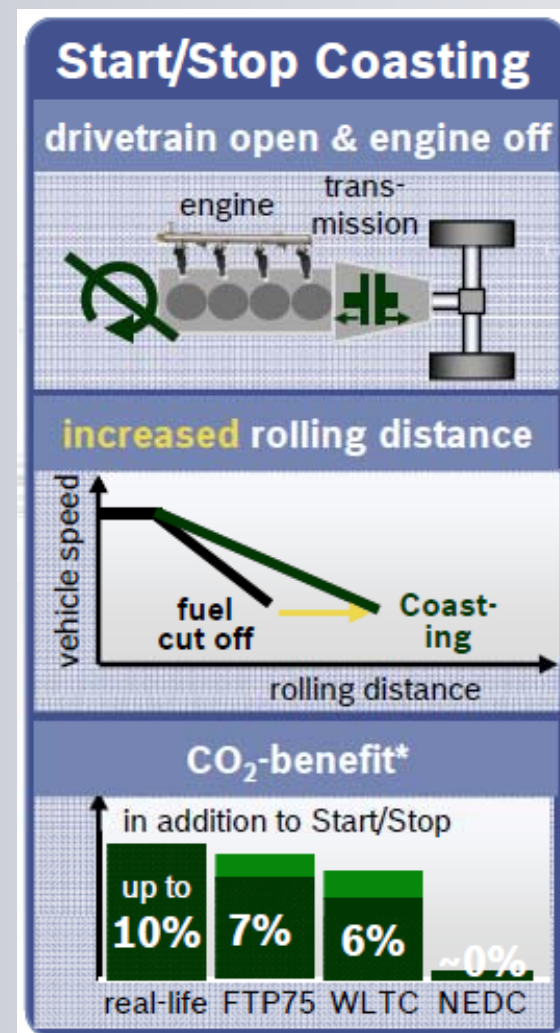
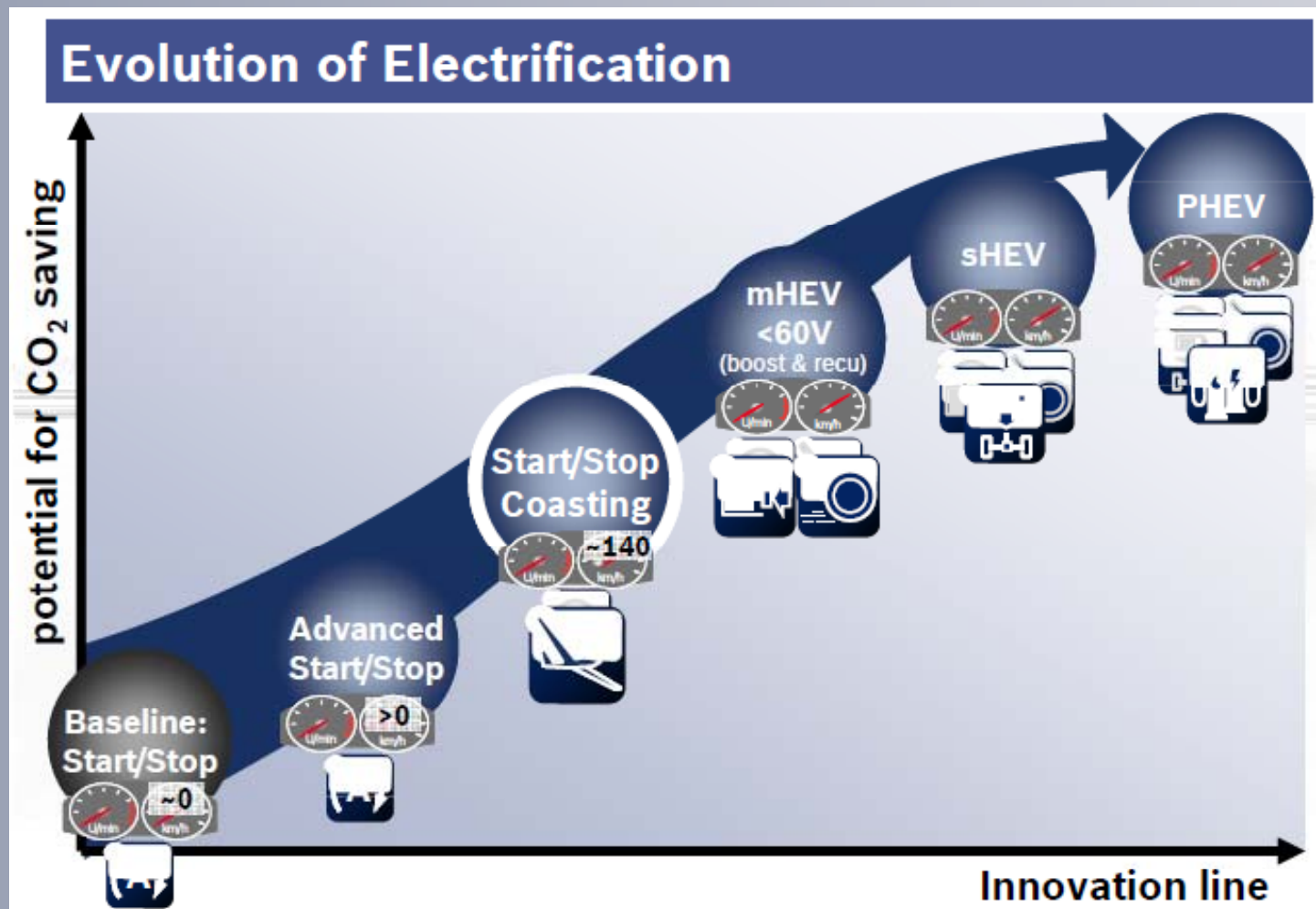


VVT= variable valve timing | SGDI = lean burn | FR = friction reduction engine
eDZ = extreme downsizing | VVL = variable valve lift | high ε = high compression
cEGR = cooled exhaust gas recirculation | CDA = cylinder deactivation
ext Rec = extended recuperation | DI = direct injection

Complying with CO₂ legislation 2020

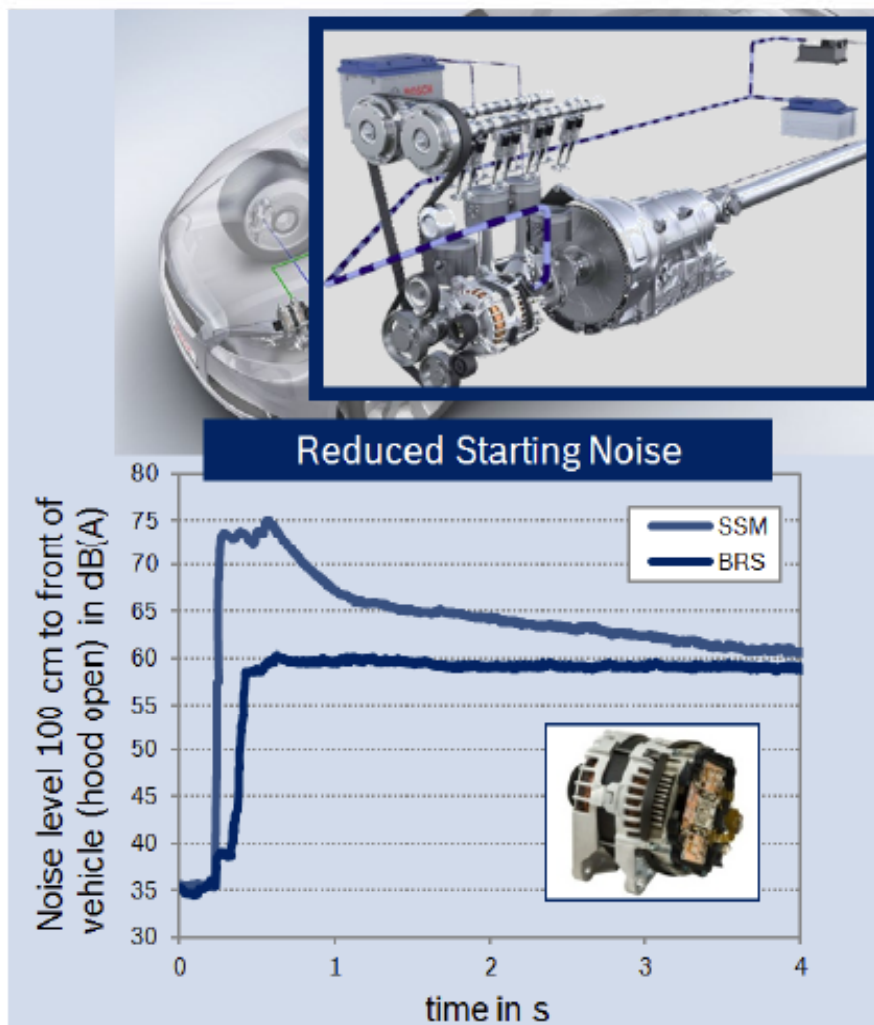


Bosch Hybrid Innovation Line



Bosch innovation line to support future market requirements.
Start/Stop Coasting (SSC) closes gap between Start/Stop and HEVs.

Automotive Technology



Features

- Electrical machine delivering up to 10 kW
- Energy supply from brake energy recuperation
- Electrical boost function

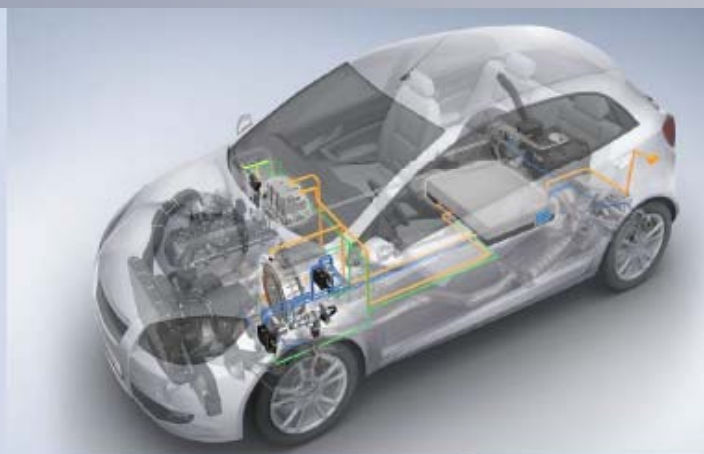
Customer benefits

- Approx. 7% fuel-efficiency improvement in NEDC (without coasting, basis: start-stop)
- Very short & comfortable ICE restart feasible, enabling start-stop and coasting
- Reduced starting time, noise and vibration
- Cost-efficient entry system for electrification
- Fun to drive (e-boost)

BRS: cost-effective CO₂ reduction combined with greater driving comfort in compact class

Boost Recuperation System (BRS) 48V

Plug In Hybrids



High-voltage battery

Lithium-ion battery
4 – 12 kWh



Power electronics module

DC link voltage 250 – 450 V
DC/DC converter 1.5 – 3 kW



Electric motor

traction drive
30 – 80 kW



Features

- Combination of efficient ICE* & electric driving (comfort)
- CO₂ reduction and driving enjoyment
- Attractive due to legislation and consumer expectations
- Electrical energy supply from charge spot (230/400 V)
- Optimal layout in terms of cost/ benefit and customer acceptance: 50 km el. range and 120 km/h max. el. speed
- Future: market penetration from upper vehicle segment

Customer benefits

- 50-90% fuel-efficiency improvement in NEDC (e-range)
- Electric driving ranges sufficient to allow access to low-emission zones
- Green image (electric drive) + driving enjoyment (e-boost)

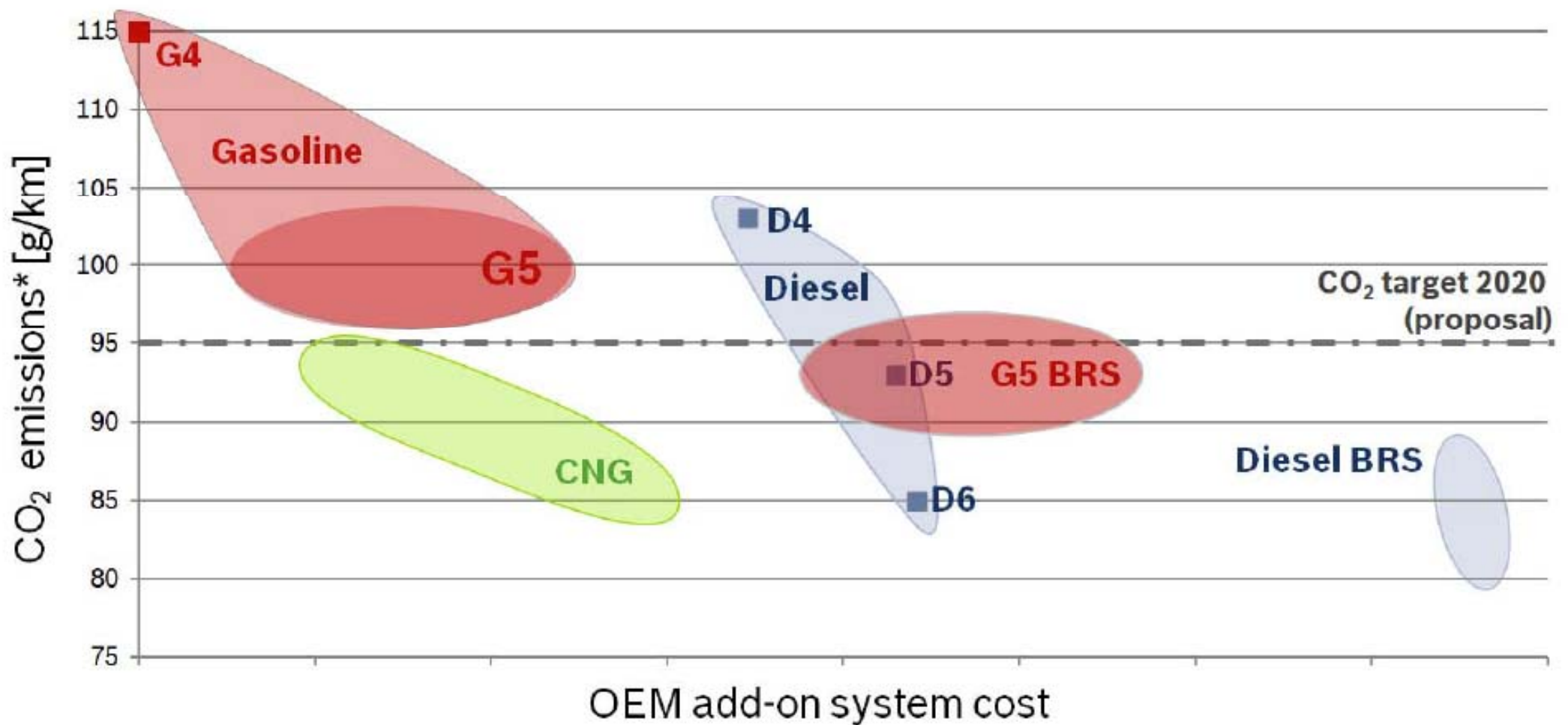
Concept combines advantages of ICE and EV at very low CO₂ emission level

Compressed Natural Gas (CNG)



Additional System Cost for Compact Class

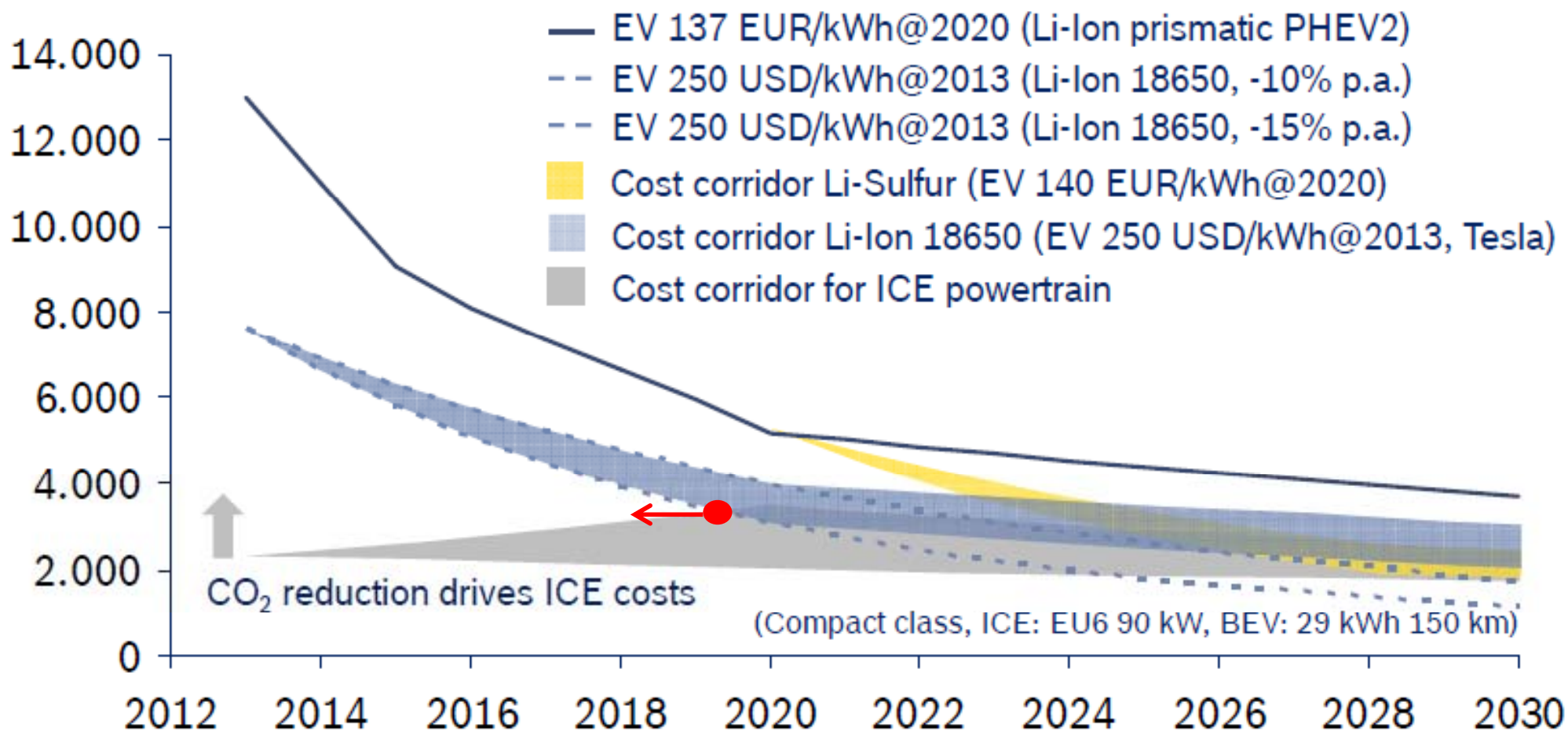
Compact class powertrains 2020 (1330-1400 kg)



Electric mobility – tipping point between 2020 and 2025?

Comparison: ICE¹⁾ and BEV²⁾ powertrain costs

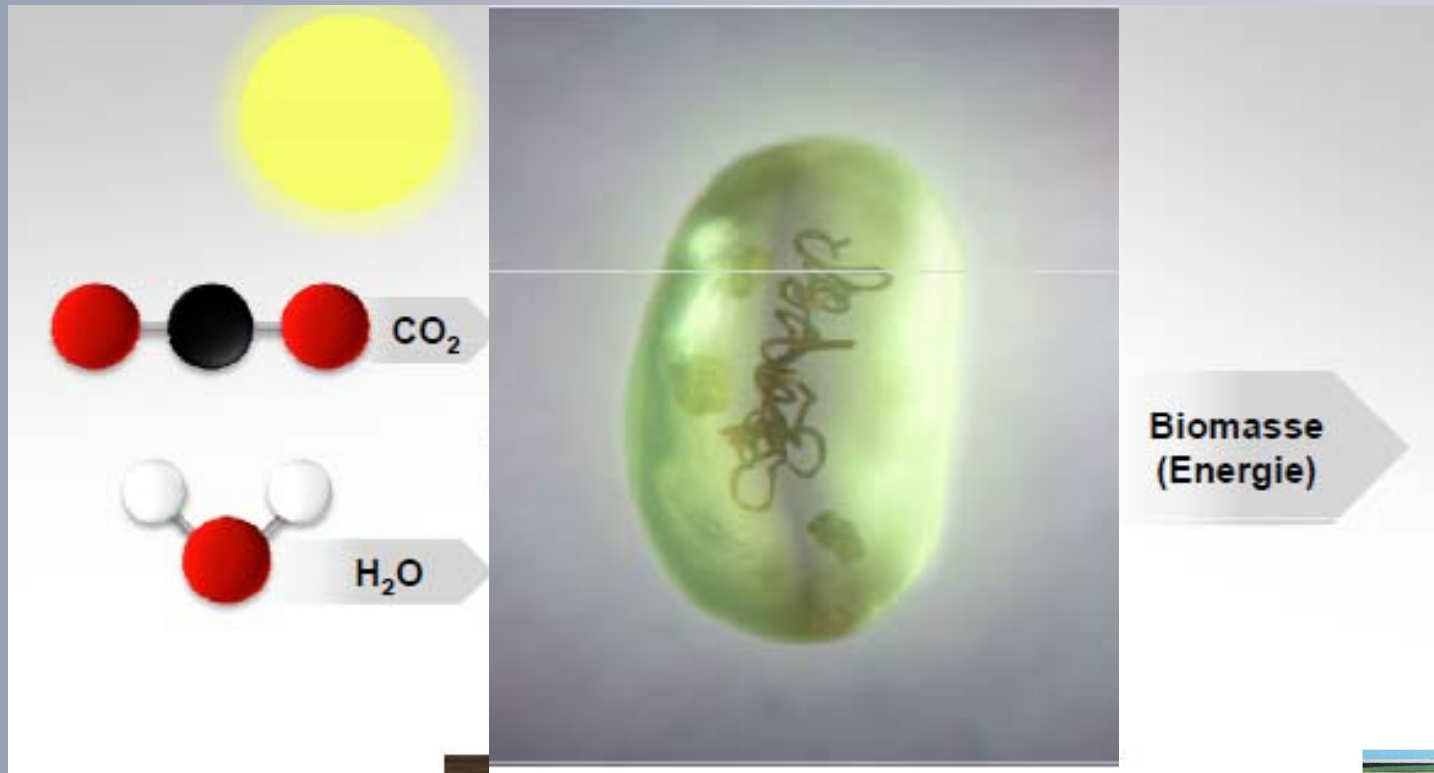
Powertrain costs (EUR)



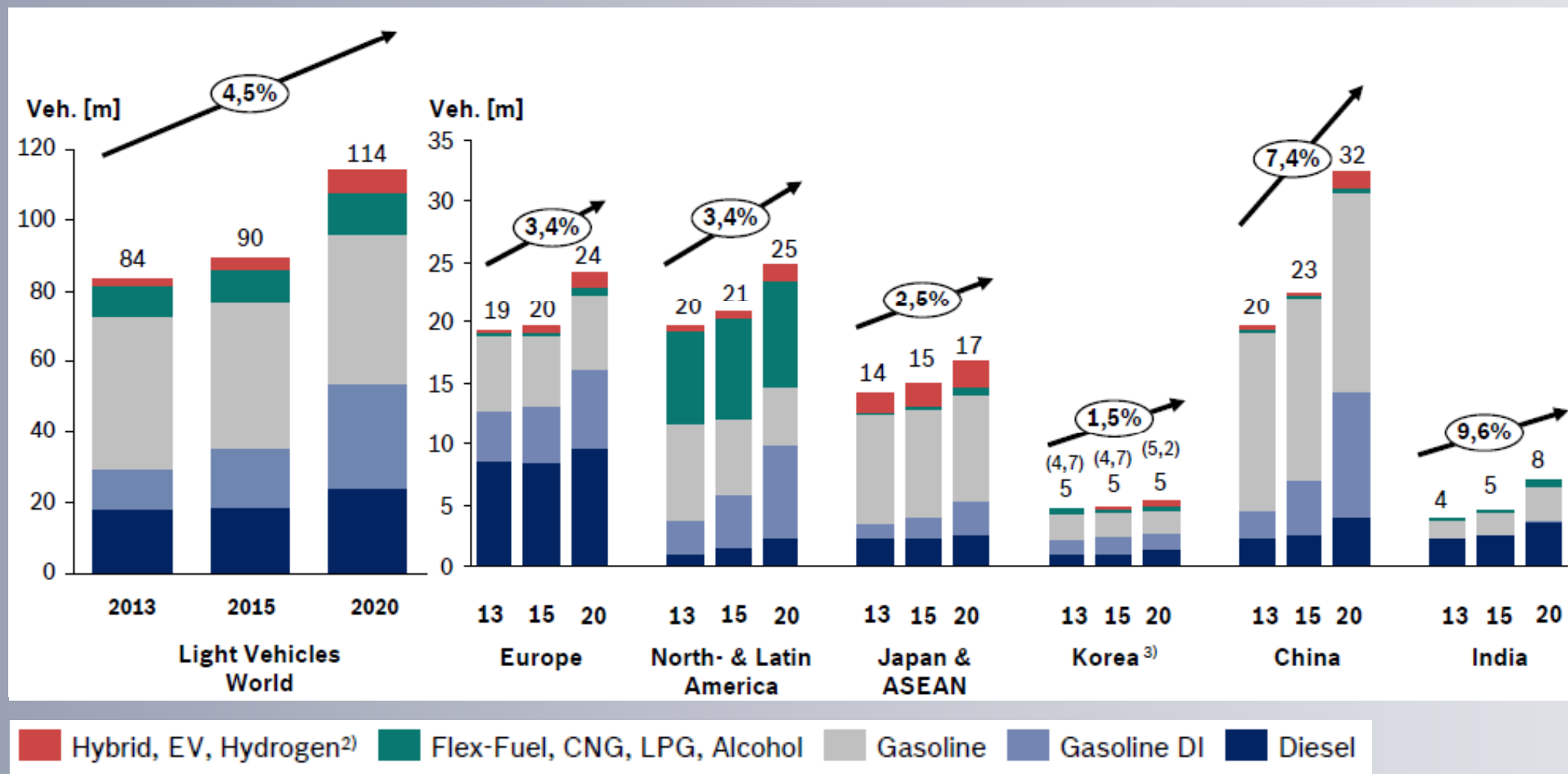
Bosch EV Components



Photosynthetic Fuel



Production: Light Weight¹⁾ Vehicles World by Region



¹⁾ Light Vehicles = Passenger Cars and LCV < 6t; ²⁾ includes Gasoline / Diesel Hybrid and BRS;

³⁾ without CKD production; (%) compound Annual Growth Rate 2013-2019

Source: LTFC 07.2013 Cycle I 2013 w/o 3-wheelers and Off-Highway







Automotive Technology

Global Automotive Trend: Safety Push

Safety
Push

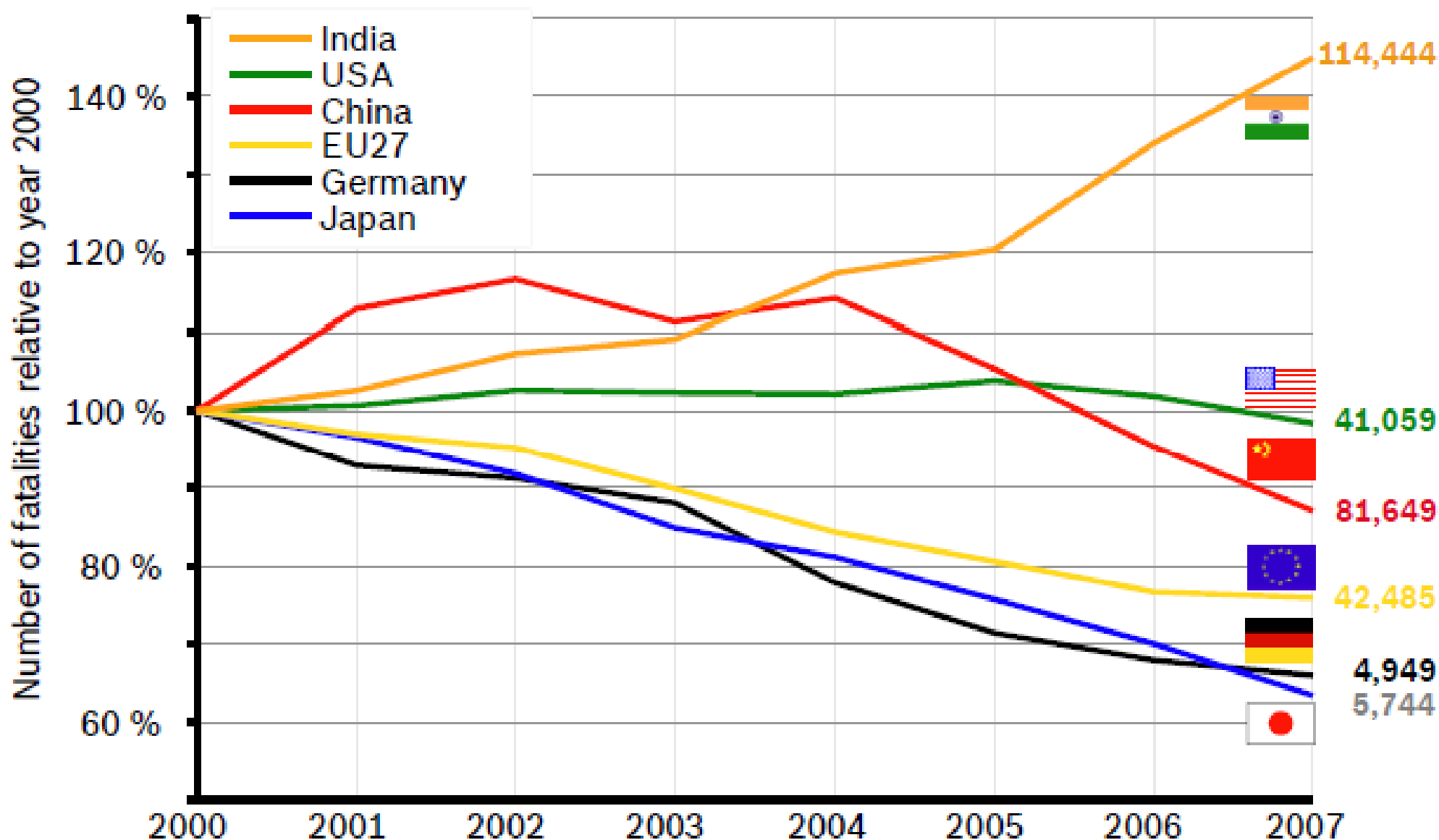
Safety requirements pushed by regulation and OEM brand positioning. Major Driver: Rising motorization in emerging markets, aging society in mature markets

Road Safety 2007

	Registered motor vehicles [Mio]	Fatalities (fatalities within 30 days after accident)	Fatality risk per vehicle
	91.2	6,639	1 : 13,700
	294.0	42,485	1 : 6,900
	255.7	41,059	1 : 6,200
	18.2	6,166	1 : 3,000
	159.8	81,649	1 : 2,000
	87.9	114,590	1 : 770

Sources: Bosch UFO

Road-death statistics compared



Evolution of Vehicle Safety Systems



Passive
Safety

Active
Safety

Driver
Assistance

Autonomous
Driving

Safety Belt
Combustible Zone
Airbag

ABS

ASR
ESP

Adaptive Cruise Control
Predictive Emergency Brake
Lane Keeping Assist

Traffic Jam Assist
Autom. Park Assist
Full Autonomic

1960

1978

1995

2000

2008

2014 2025

Automotive Technology

EU-NCAP approach



Threshold for each box requested to get 5 star overall rating



New!

Speed Assist Systems (SAS)

Lane Departure Warning/
Lane Keeping Assist (LDW/LKA)

Automatic Emergency
Braking (AEB-City, -Urban, -Ped.)

Driver Assistance Product Portfolio

Predictive Emergency Braking 	Evasion Assistance 	Lane Assistance 
Predictive Pedestrian Protection 	Turn and Crossing Assistance 	Travel Assistance 
Driver Monitoring 	Light and Sight Assistance 	Park and Maneuver Assistance 

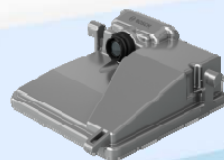


Long-Range Radar (LRR)	
Mid-Range Radar (MRR)	
Multi Purpose Camera (MPC)	
Stereo Video Camera (SVC)	
Infrared Night Vision Camera Night Vision	
Ultrasonic Sensors (USS)	
Near Range Camera (NRC)	
Head Unit Digital Maps	
Car-to-X Connected Vehicle	
Instrument Cluster Head-up Display	

Sensor Data Fusion for increased Safety

*Widened range
through video sensor*

**Video
Range**



Fusion



*Verification of object detection
through Video sensors*

**Radar
Range**



**Ultra Sonic
Range**



Bosch iBooster



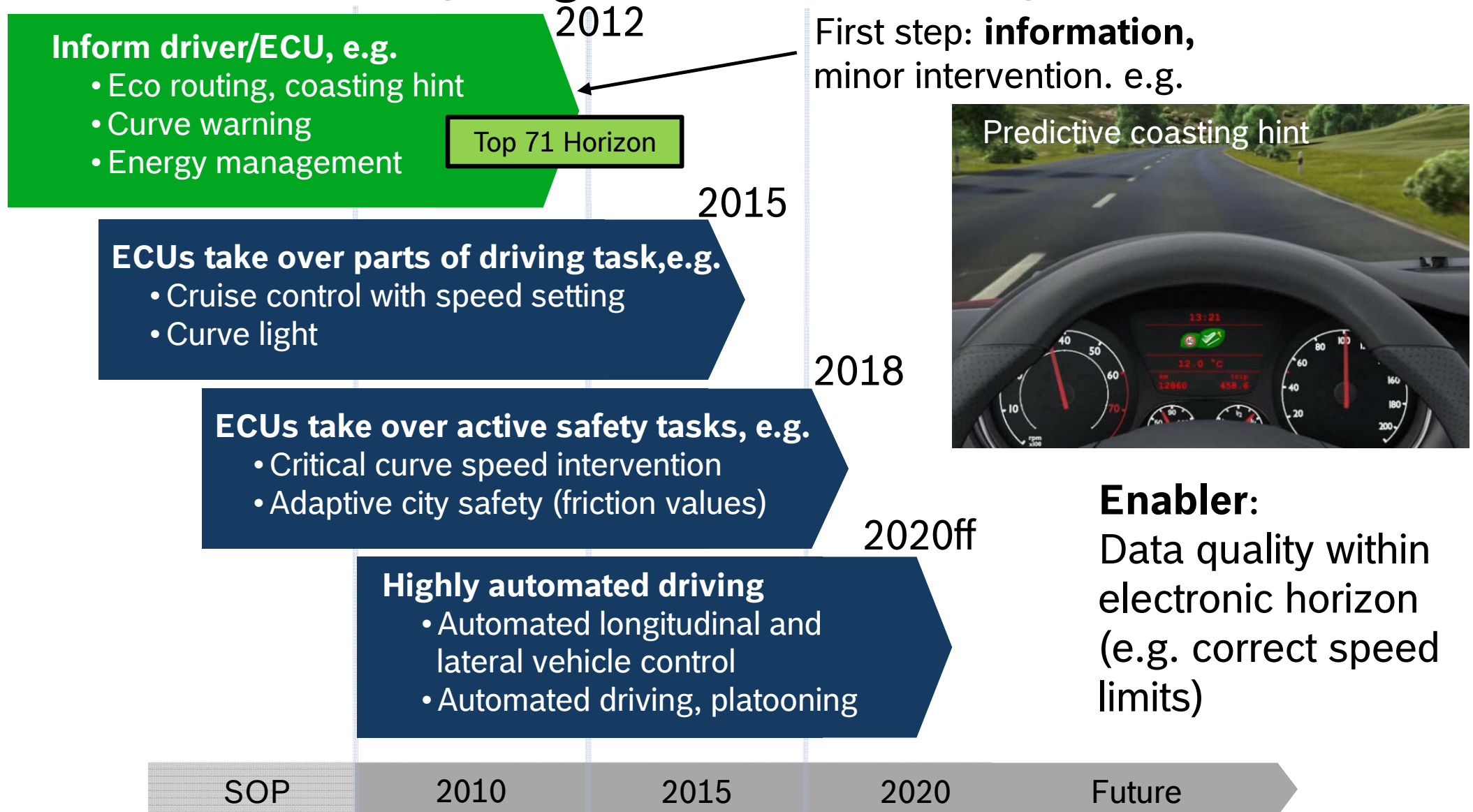
Faster pressure build up

Recuperation possibility

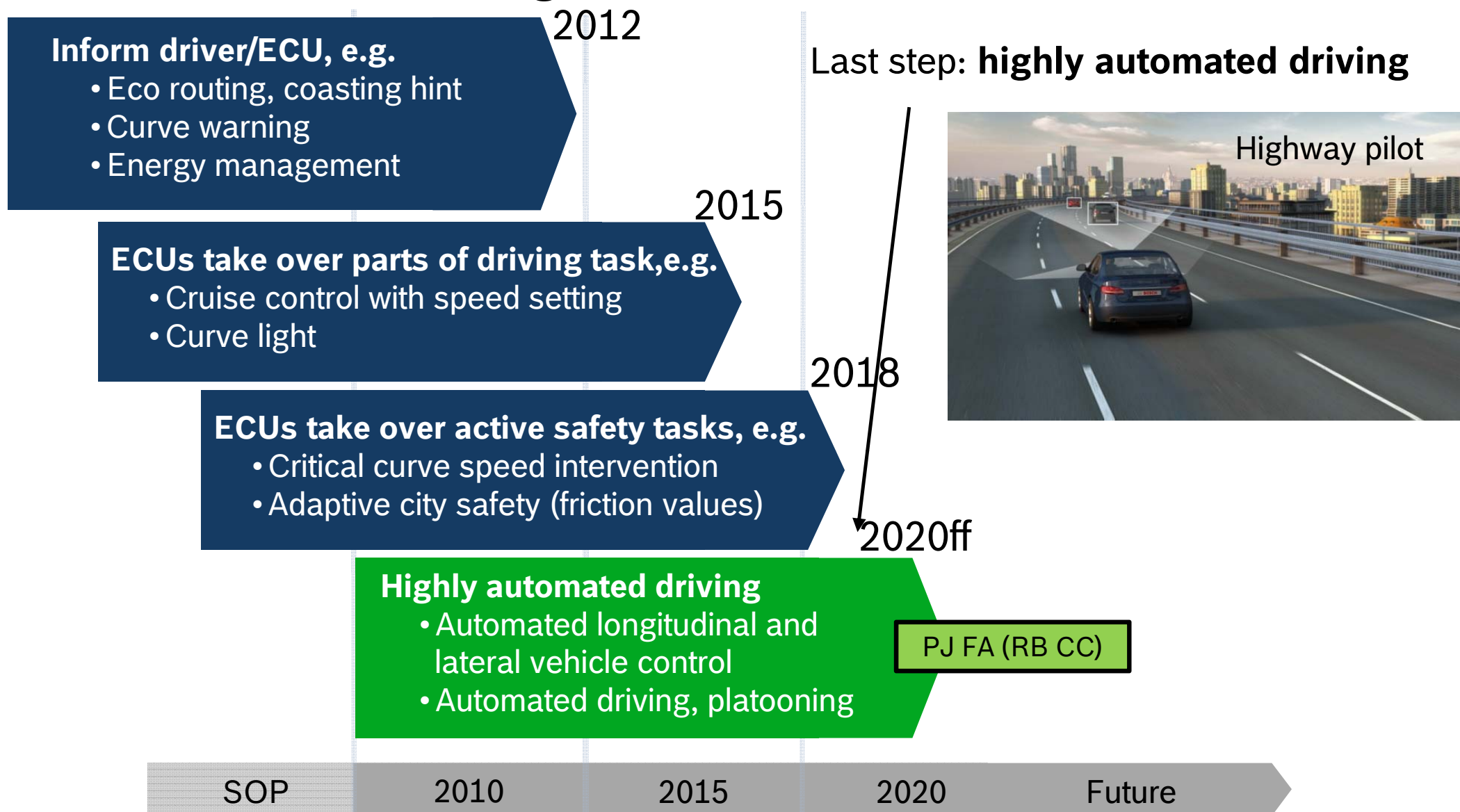
Adjustable brake feeling



ADAS* evolution (navigation based ADAS)



ADAS evolution (navigation based ADAS)



Driver Monitoring



Automated Park Assist



Automotive Technology

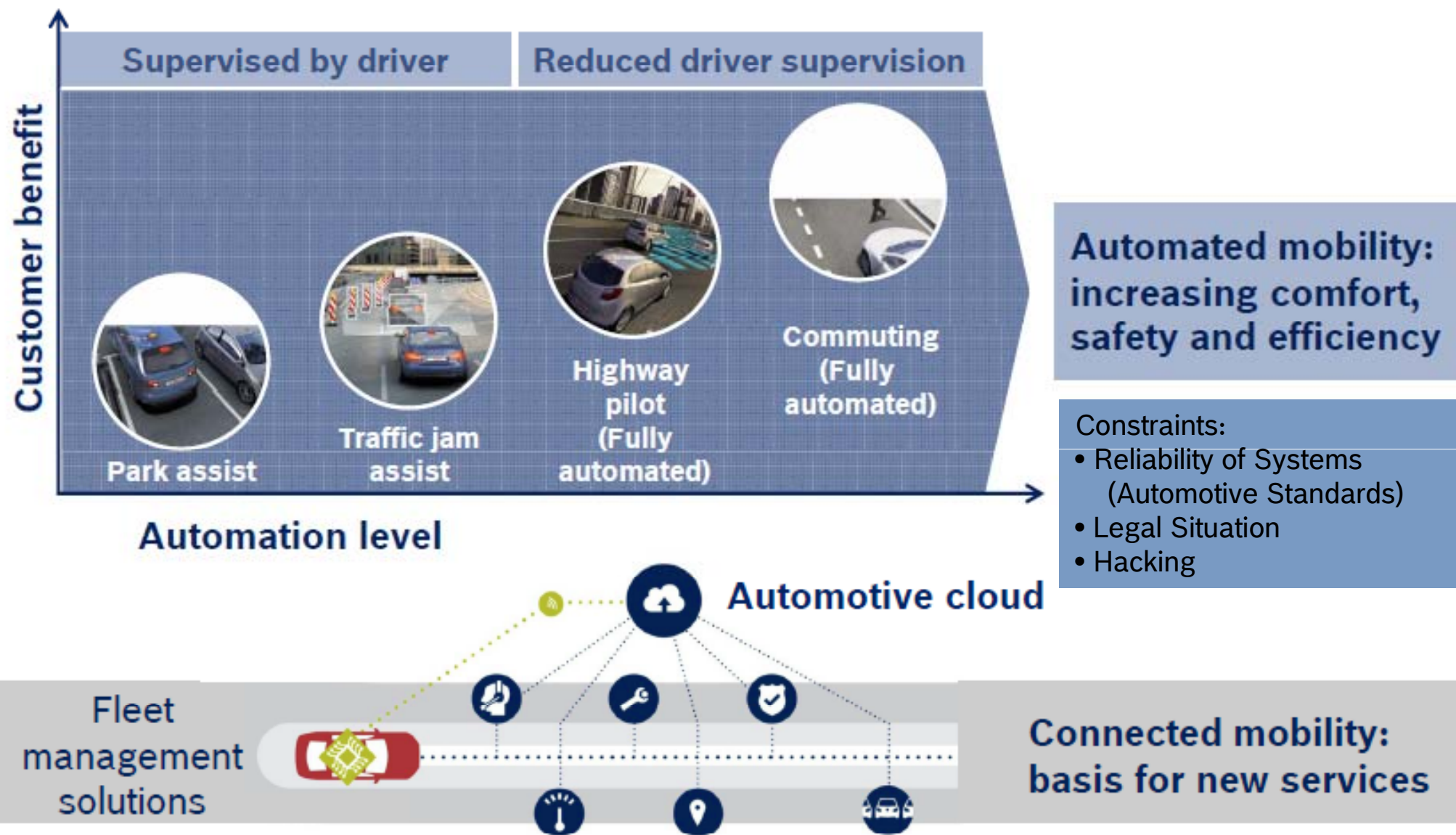
Traffic Jam Assist



Autonomous Driving



Automated and connected mobility – main drivers



“Internet in the Car” or “Car in the Internet”?



Consumer electronics –
Functions and web services
are now available in the car



- Car = Now a carrier of internet-enabled devices
- Car = Instrument cluster extended with consumer electronics displays

In-vehicle internet
allows cars to interact
with the web



Functions become
part of the cloud

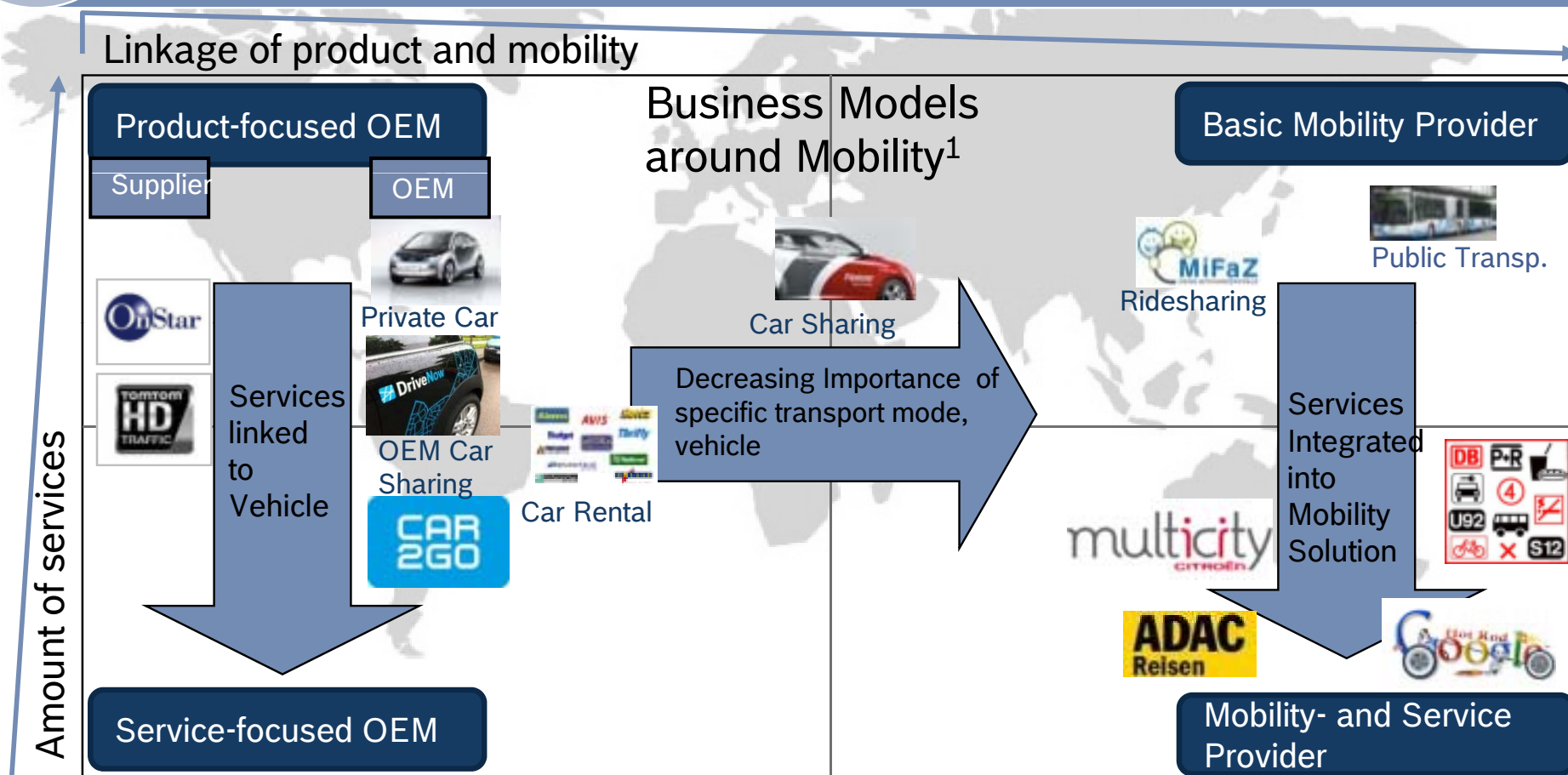


- Car = itself a part of a highly networked environment
- Thanks to networking, the car informs about the traffic situation

Global Automotive Trends

**New
Mobility
Solutions**

Increasing demand for seamless (intermodal) mobility, car rental / sharing, etc. by changing consumer demand and increasing restrictions on individual motorized mobility esp. in city areas.



Automotive Technology

¹ ADL; McKinsey = "Mobility for Automotive and Assembly 2030";
Roland Berger "Hat Mobilität Zukunft?"; C/CS Analyse;
World Business Council for Sustainable Development (WBCSD)

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Example City Transportation w/ Smart Vehicles

Connected
to Service



Smart vehicle



Intelligent Transport System



Connected to
Infrastructure



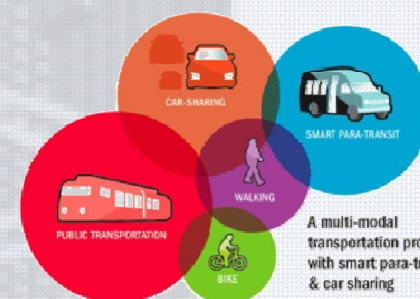
Automated & assisted
driving



Alternative transport energy



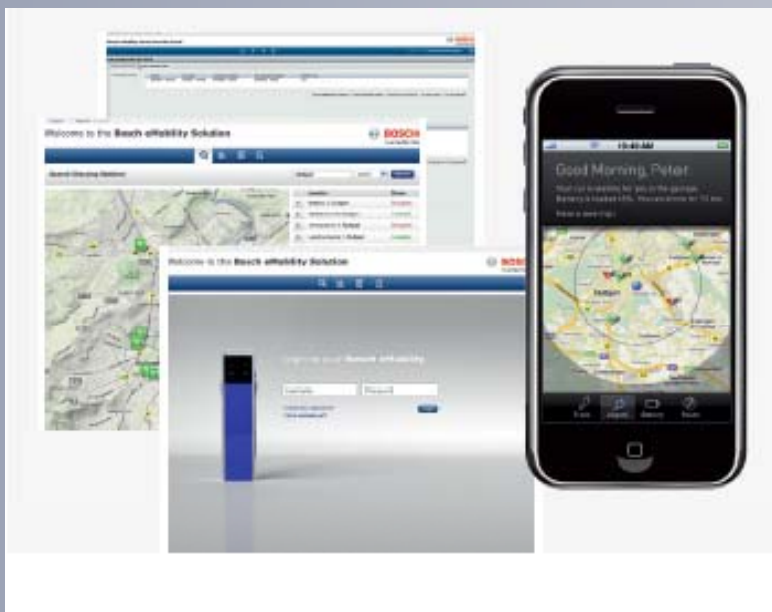
Parking management



Multimodal transport
systems

A multi-modal
transportation prog
with smart para-trai
& car sharing

Electric Vehicle Environment





Mobility Market 2020 Scenario: An Eco-System Paradigm Shift

Main Mobility Driver

- 1 Increasing mobility demand
- 2 Globalization / Emerg. Markets
- 3 Urbanization Mega-Cities
- 4 From owning to use - multimodal
- 5 Increasing energy efficiency
- 6 Connected life / technologies

Mobility Market

OEM

Mobility-Provider

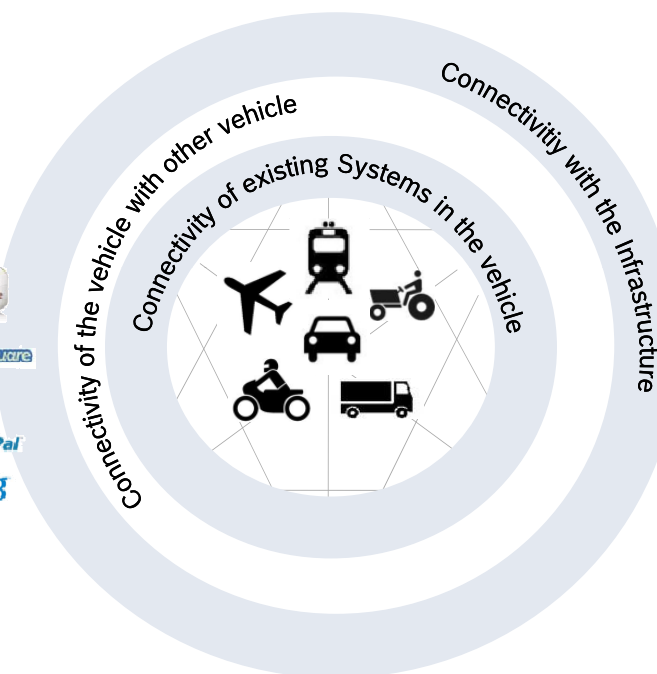
- Work-shops
- Public transportation
- Insurances
- Leasing-companies
- Rental-companies
- Car-Sharing provider
- IT-companies
- Organizations, NGO
- Infrastructure-provider
- Fleets (Private/Business use)
- Energy Service provider
- Travel companies
- Start-ups (new mobility offers)
- Call-Center provider

Mobilitäts-User

- Private persons
- Fleets (Privat /Business)



Growing market complexity and mobility products



Emerging new players from other industries





Automotive Technology



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