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Schaeffler AG
dbAccess AutoTech Day

22nd June 2018; Winchester House, London

M. Zink & Dr. J. Schröder
CEO Automotive OEM Schaeffler AG |President Business Division E-Mobility

Today's speakers – Matthias Zink & Dr. Jochen Schröder

Matthias Zink (49)

CEO Automotive

Dr. Jochen Schröder (47)

President Business Division E-Mobility

Transformation continues – E-Mobility in focus

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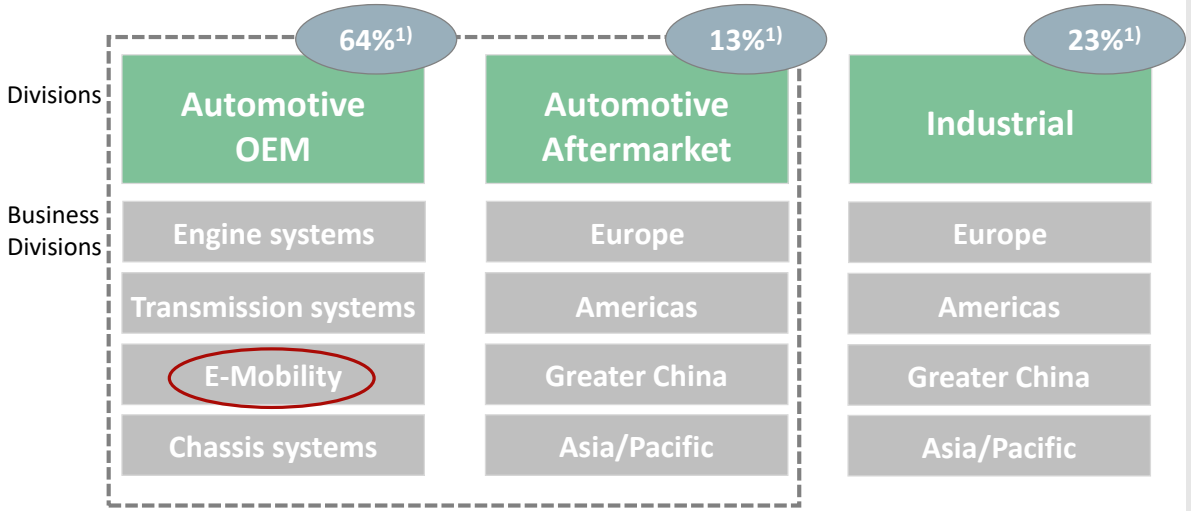
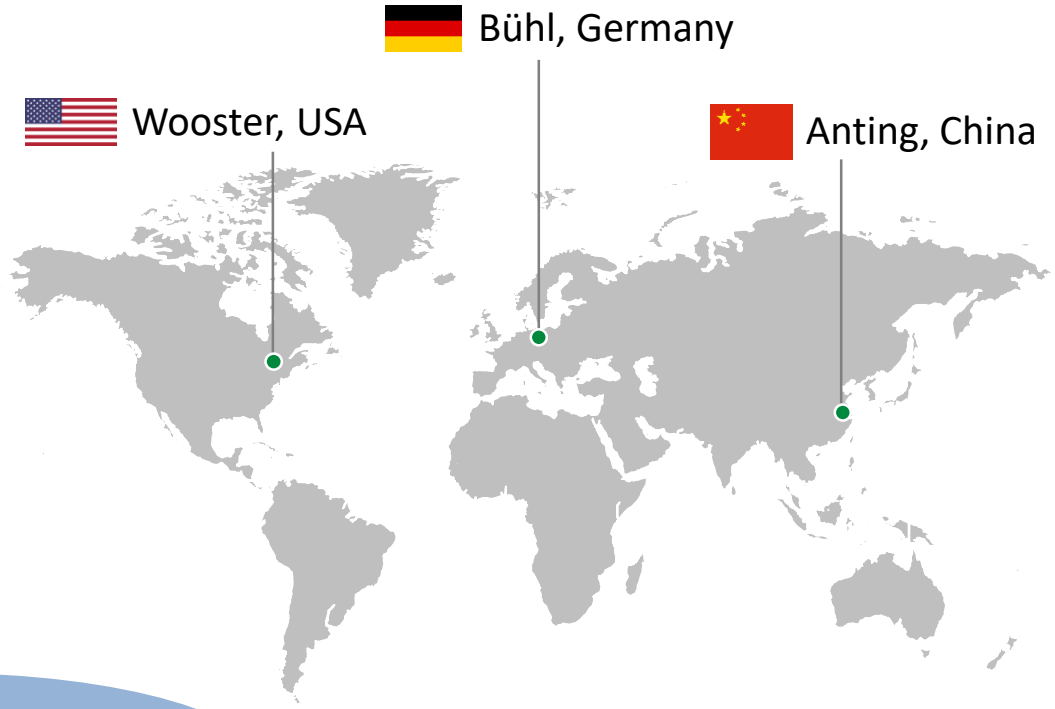
New business division E-Mobility



Three regional E-Mobility competence centers



Key aspects

- Automotive OEM with new business division E-Mobility
- Global approach with three regional E-Mobility centers of competence
- Dr. Schröder assumed leadership of the new business division on April 1st, 2018
- Automotive Aftermarket with separate reporting structure

Accelerate the transformation

1) in % of Group Sales 2017

Strong Automotive OEM Division – EUR 9bn sales, number 2 in patent registrations

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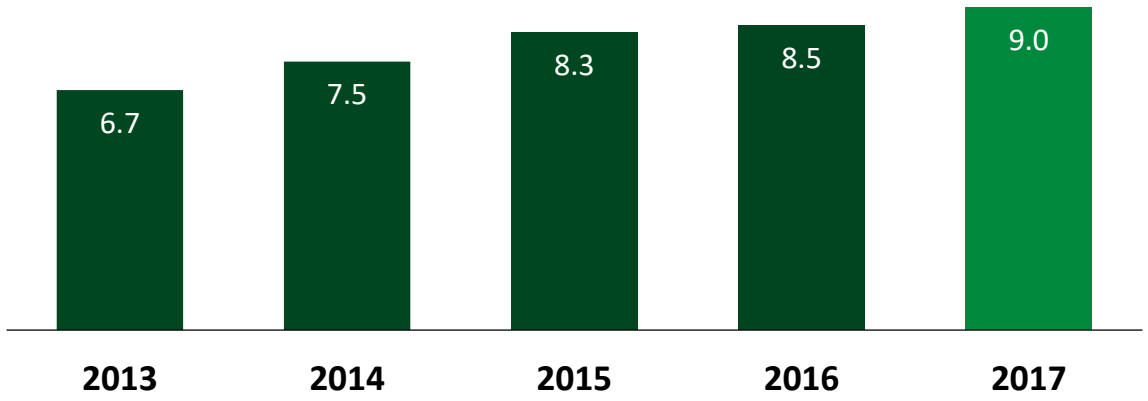
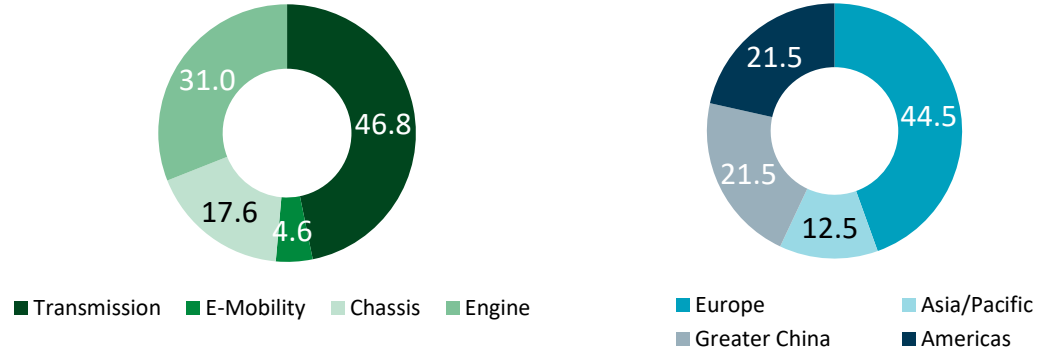
Continuous sales growth in Automotive OEM (in EUR bn)

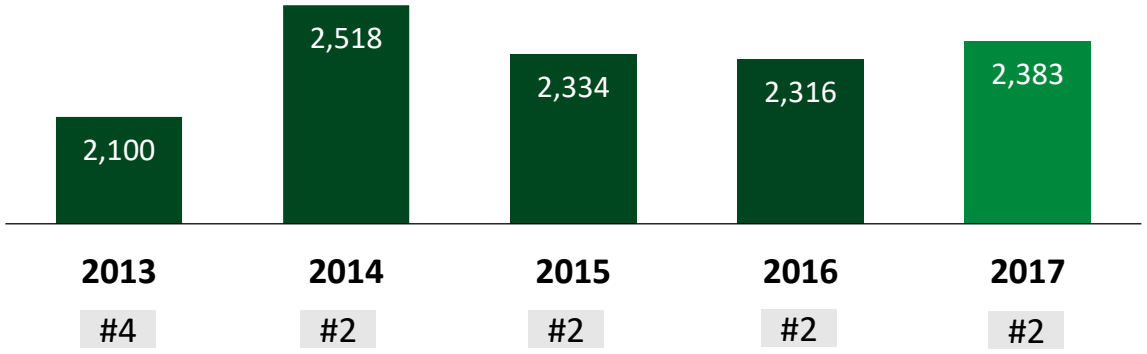


Sales by division and region in 2017 (in %)



EUROPE: Incl. Germany, Western, Southern and Eastern Europe, Middle East, Africa, Russia and India

Number of patent registrations in Germany[1)]



[1)] Entire Schaeffler AG; Source: Deutsches Patent- und Markenamt (DPMA)

Selected Quality Awards 2017

- Changan Automobile Co. Ltd.: Supplier of the year 2017
- Toyota Motor Europe: Achievement Award
- GAC Honda Auto. Corp.: Outstanding Quality – "Zero Flaw"
- Ford Motor Company "World Excellence Award"
- Fiat Chrysler Automobiles "Outstanding Quality" Award
- Great Wall Motors: Sincere Partnership Award
- Mazda Motor Corp.: Trade Performance Excellence Award
- Jatco Supplier Award-Quality 2017

Division Automotive – Broad product portfolio along the entire powertrain and chassis

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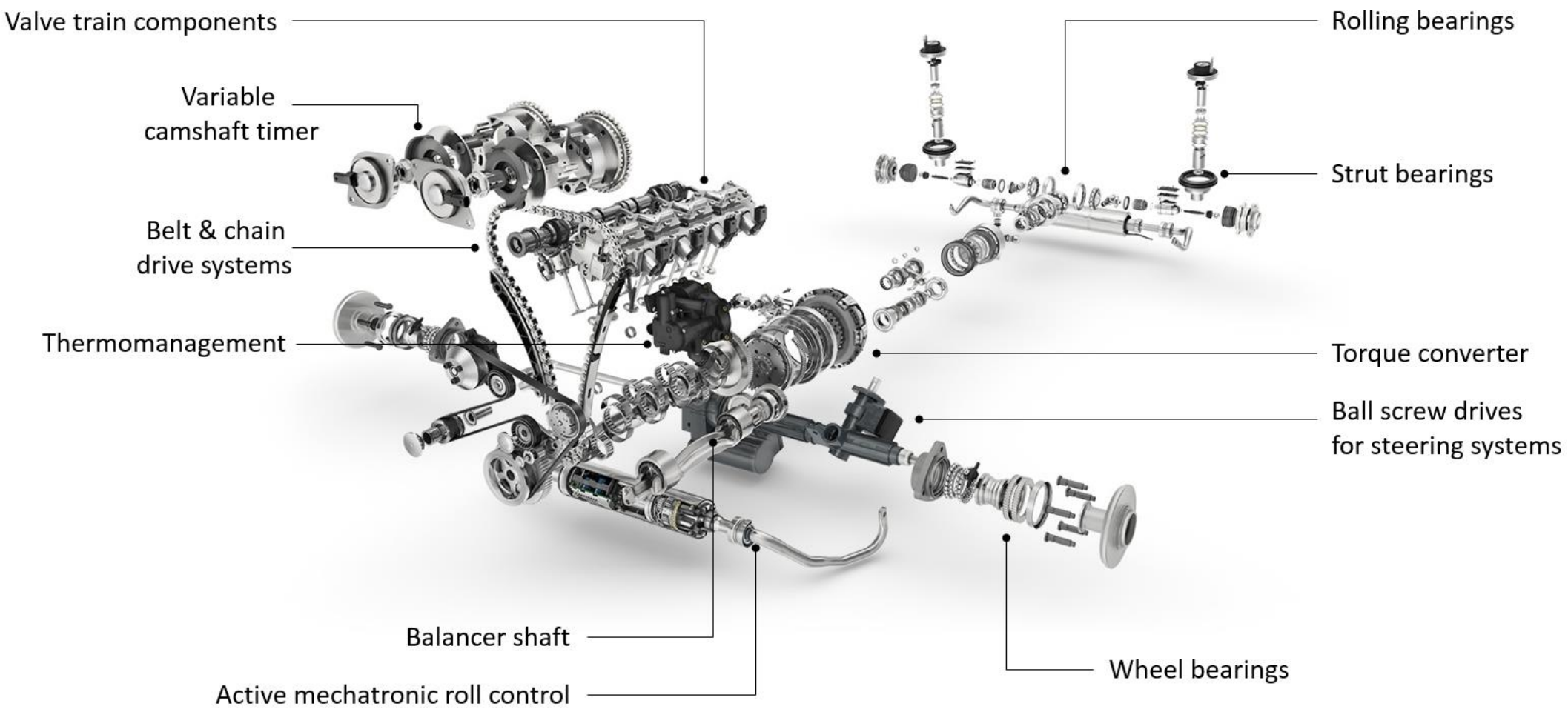

Holistic system understanding on powertrain and vehicle level

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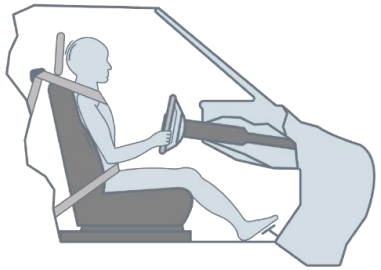


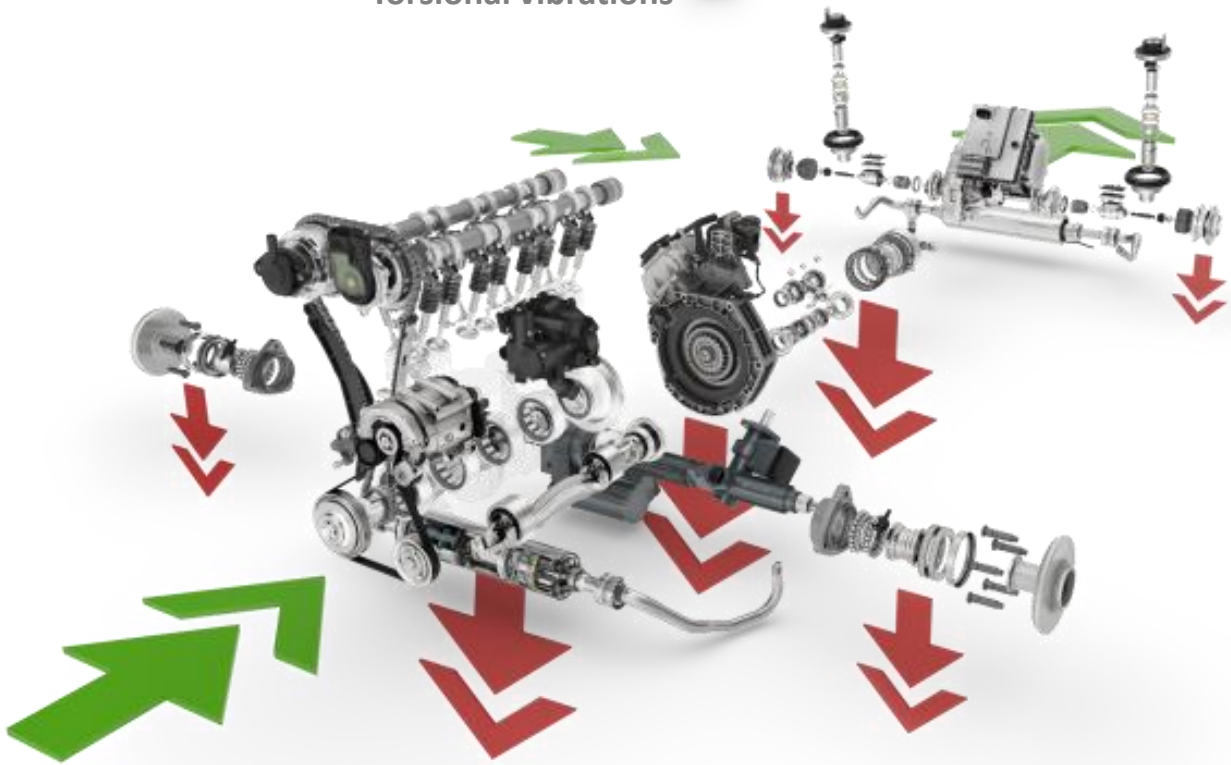
NVH & acoustics

Torsional vibrations

Virtual testing

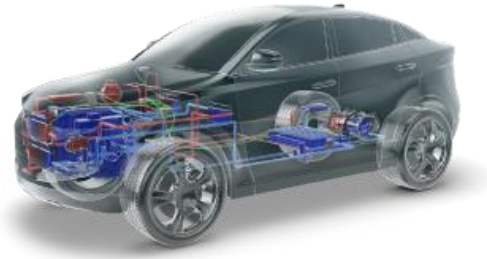
Driving dynamics & comfort

Fleet simulation



Fuel efficiency

Thermal management



Automotive OEM – Continuous expansion of competencies

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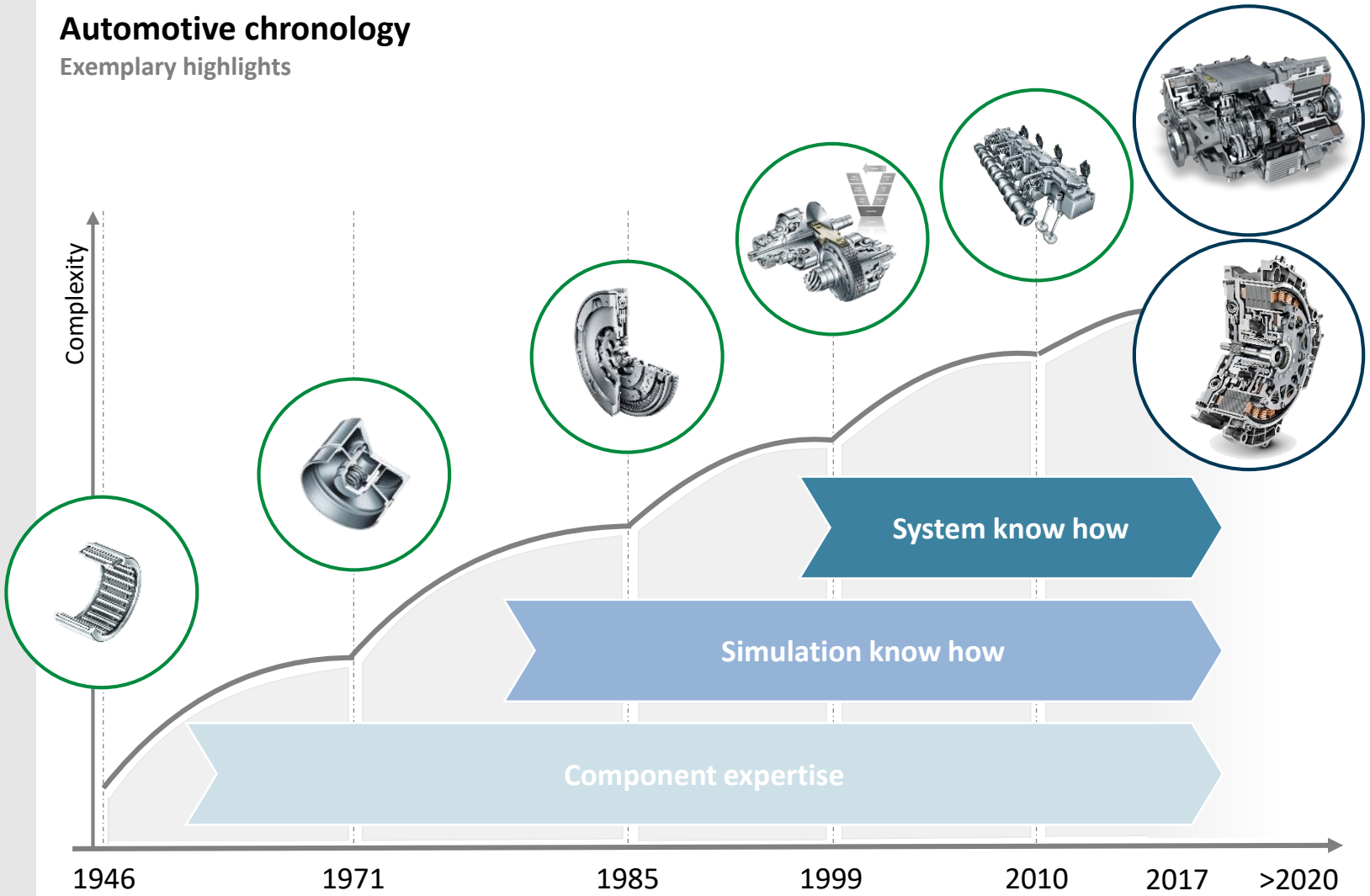
Automotive chronology

Exemplary highlights



Unique selling points

- Strong mechanical background with a high degree of vertical integration
- Operational and manufacturing excellence with a global production footprint
- Global R&D network and exceptional innovative spirit
- System expertise with outstanding powertrain and simulation competencies

Sustainable & profitable growth through innovation

Powertrain scenario – The market is moving towards the Accelerated scenario

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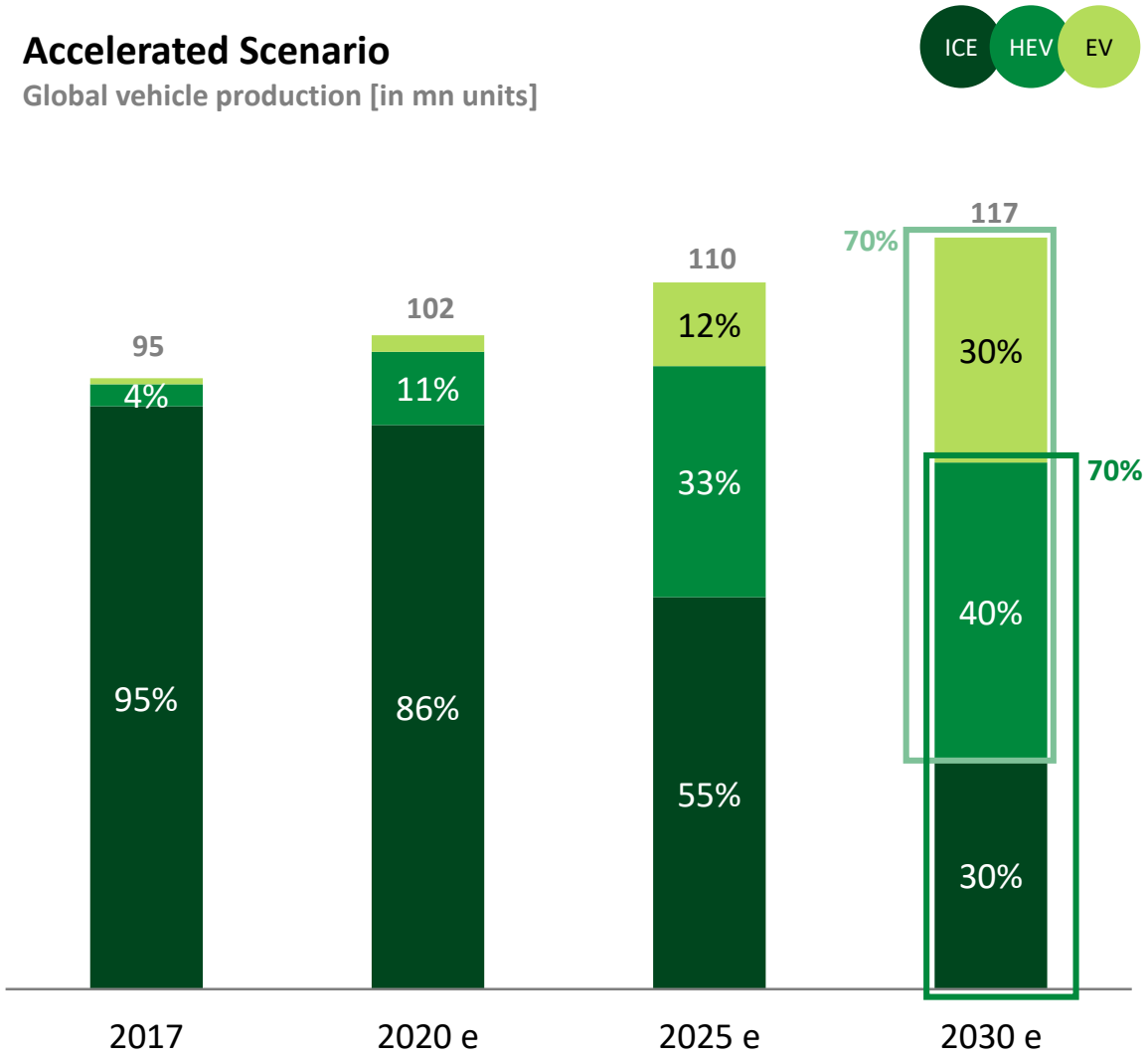
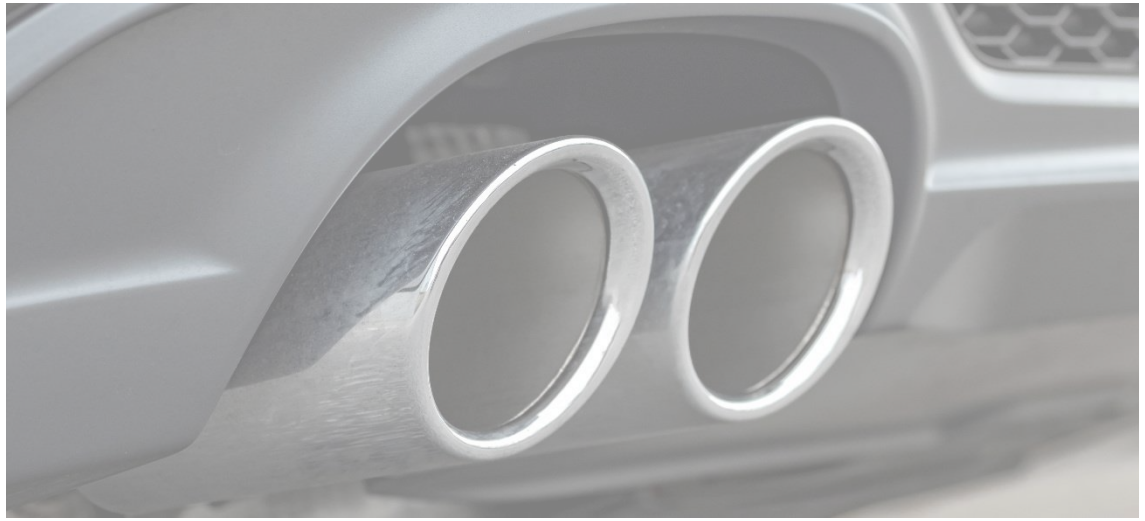
Accelerated Scenario

Global vehicle production [in mn units]



Source: IHS and Schaeffler Assumptions / Values based on Light Vehicles < 6 tons only, ICE = Internal Combustion Engine; HEV = Hybrid Electric Vehicles ranging from 48V Mild Hybrid to PHEV, BEV = Battery Electric Vehicles (incl. Fuel Cell Electric Vehicles)



Powertrain scenario – Well to Wheel aspects can't be ignored

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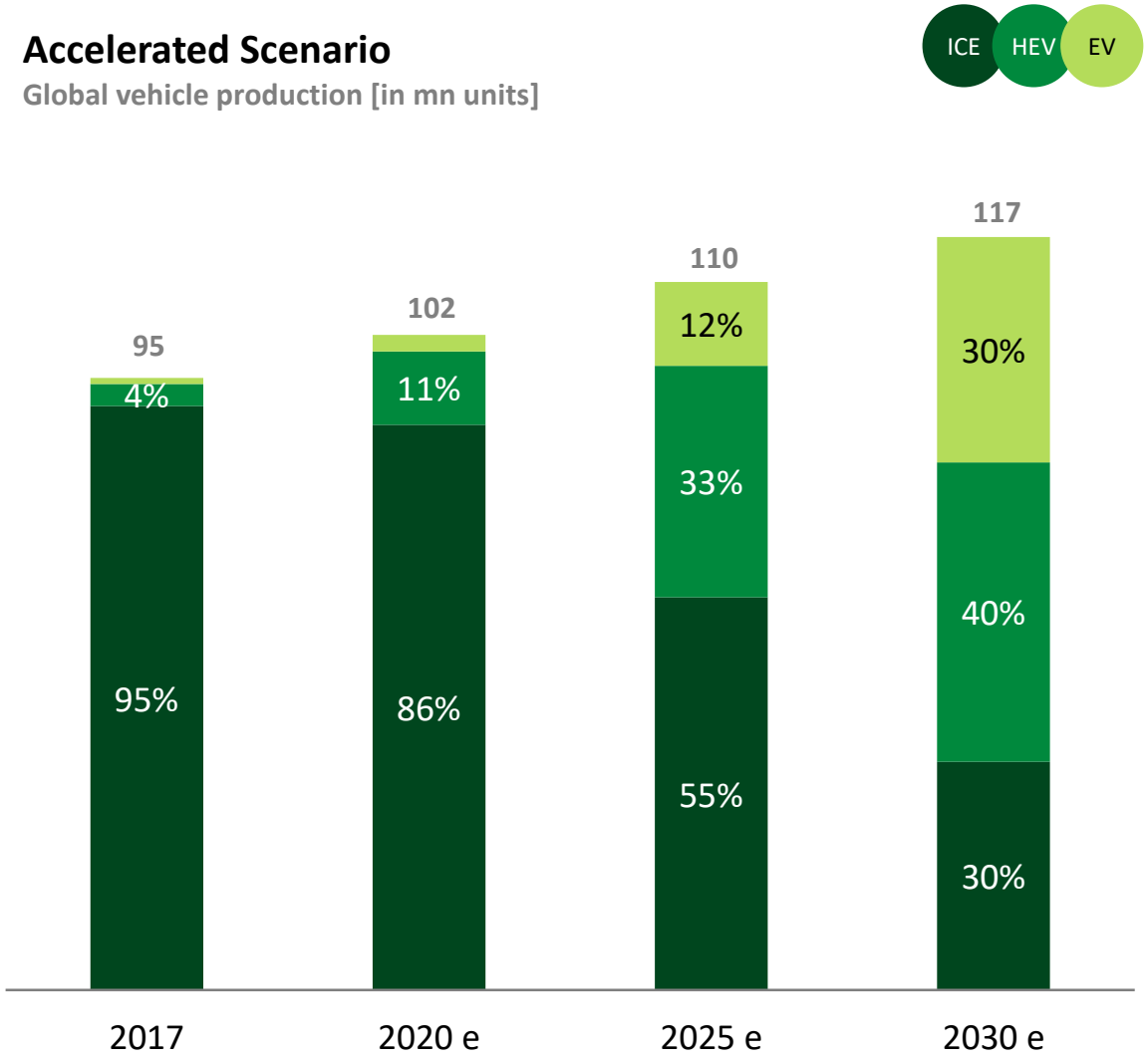
Accelerated Scenario

Global vehicle production [in mn units]



Source: IHS and Schaeffler Assumptions / Values based on Light Vehicles < 6 tons only, ICE = Internal Combustion Engine; HEV = Hybrid Electric Vehicles ranging from 48V Mild Hybrid to PHEV, BEV = Battery Electric Vehicles (incl. Fuel Cell Electric Vehicles)

Well to Wheel

New eco-systems require holistic competences across the entire energy chain from energy generation to energy consumption

Powertrain scenario – Regional developments will differ greatly

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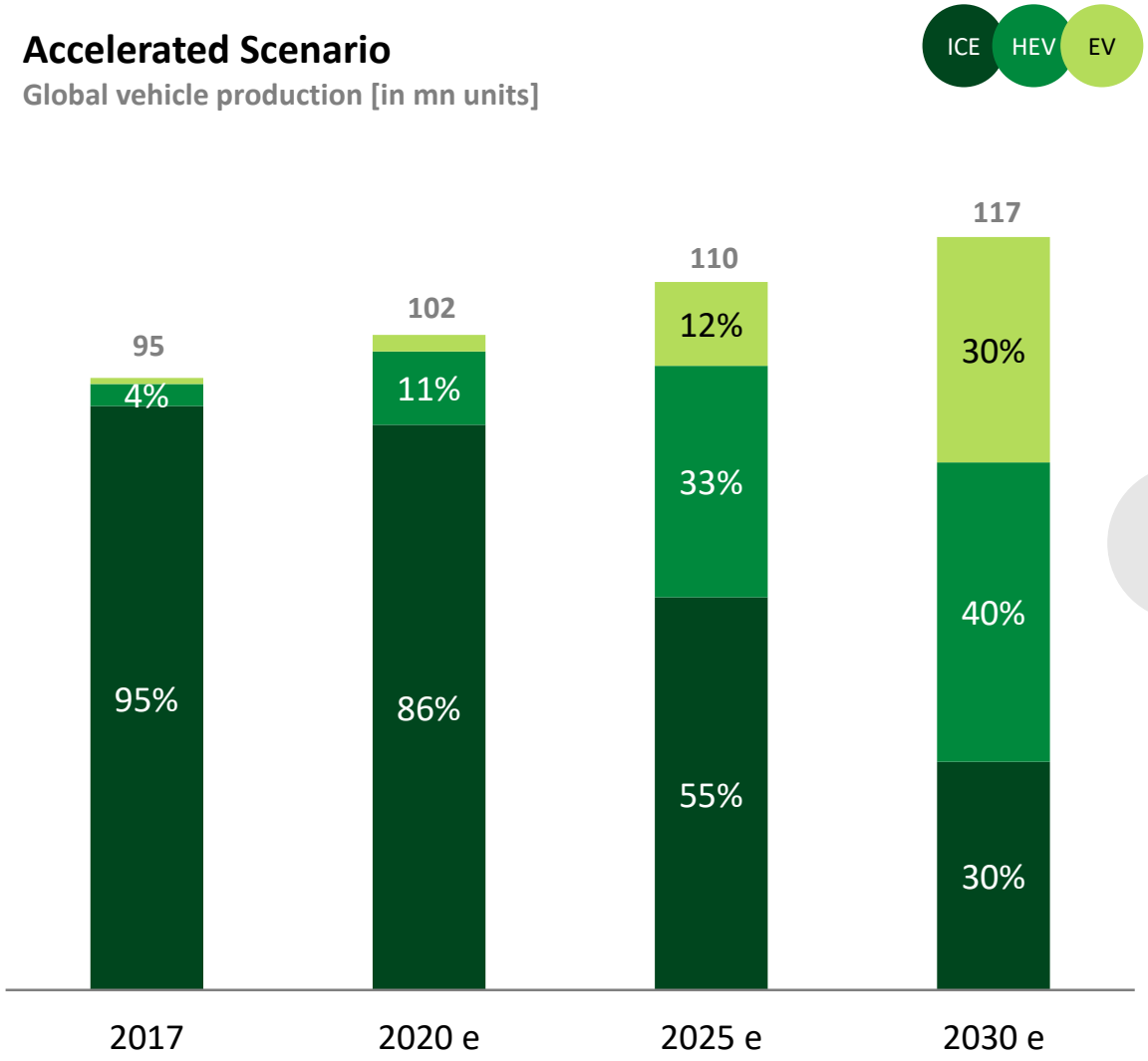
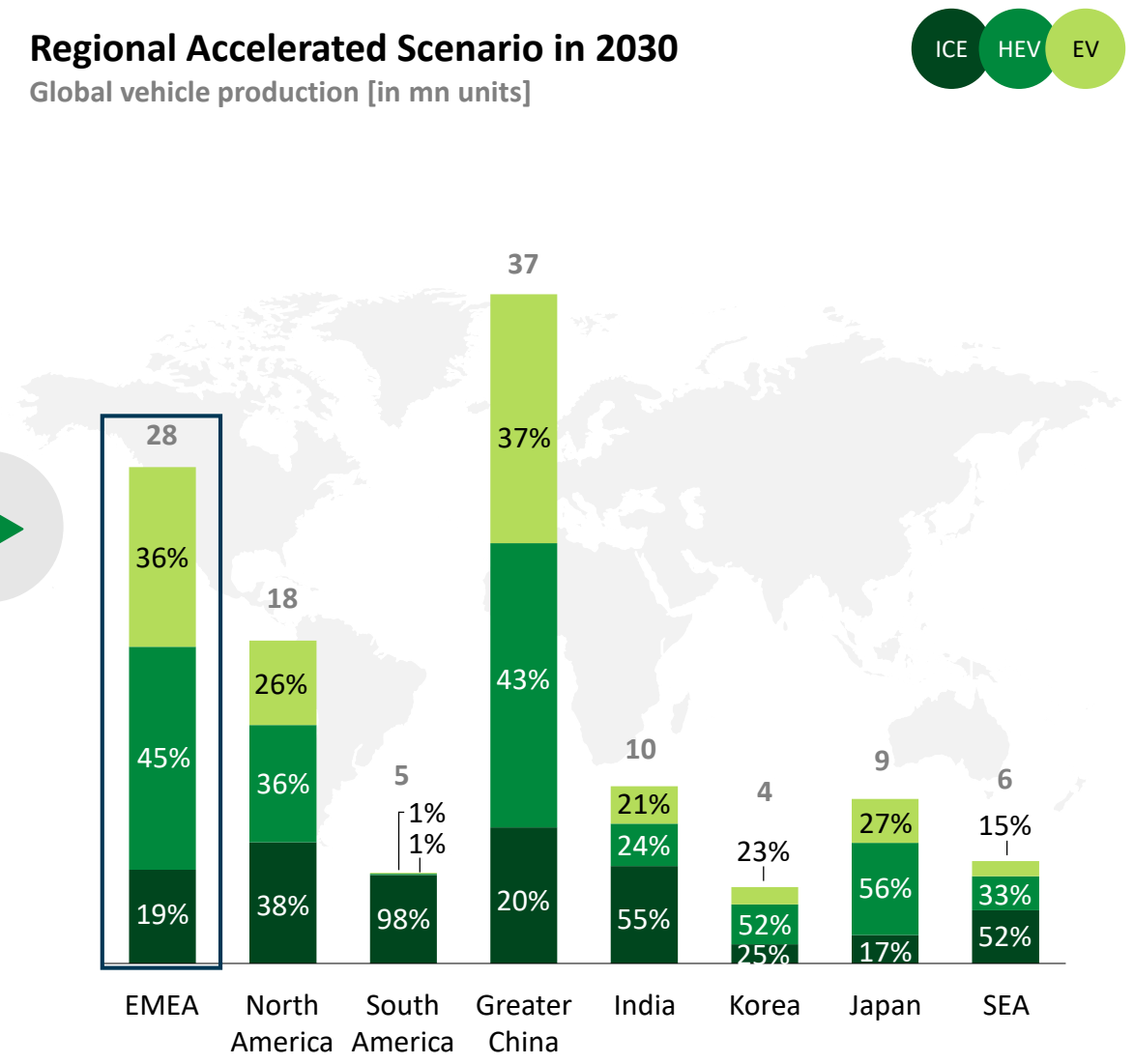
Accelerated Scenario

Global vehicle production [in mn units]



Regional Accelerated Scenario in 2030

Global vehicle production [in mn units]



Source: IHS and Schaeffler Assumptions / Values based on Light Vehicles < 6 tons only, ICE = Internal Combustion Engine; HEV = Hybrid Electric Vehicles ranging from 48V Mild Hybrid to PHEV, BEV = Battery Electric Vehicles (incl. Fuel Cell Electric Vehicles)

Powertrain scenario – More than just assumptions

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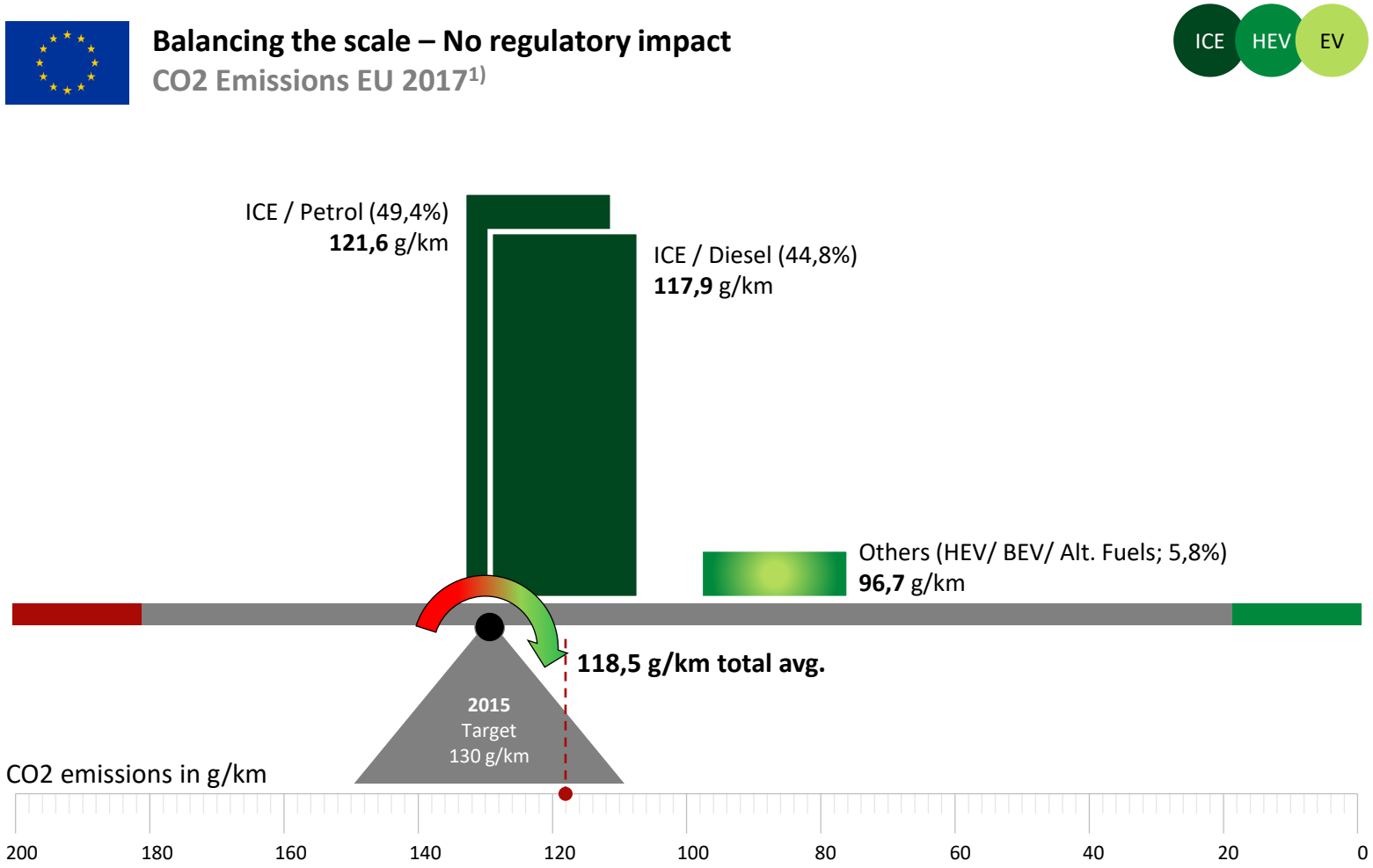
Balancing the scale – No regulatory impact

CO2 Emissions EU 2017[1)]



1) Data Source: EAA (European Environment Agency): "Monitoring of CO2 emissions from passenger cars - Data 2017 - Provisional data"

Key findings 2017[1)]:

- New cars sold emitted on average 118.5 g CO_2/km (+0.4 g/km compared to 2016)
- The average fuel efficiency of petrol cars has been constant in the last two years
- Due to growing SUV mix and higher weight of the cars, the fuel-efficiency of diesel cars has worsened in 2017 (+1,1 g/km versus 2016)

2015 target with no significant impact on HEV/BEV market

Powertrain scenario – Regulations in 2021 will accelerate the market change

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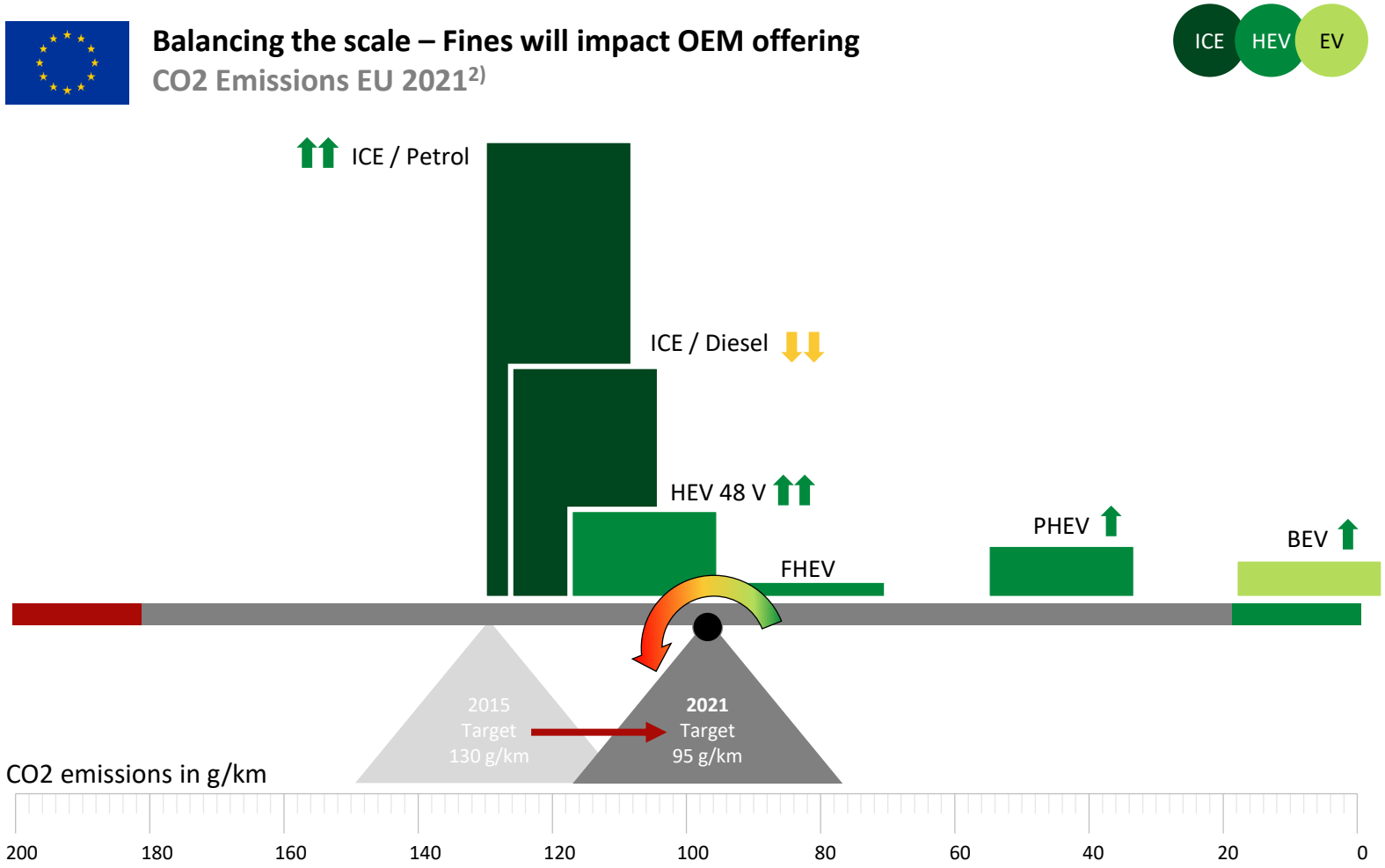
Balancing the scale – Fines will impact OEM offering

CO2 Emissions EU 2021[2)]



2) Qualitative presentation only

Key assumptions 2021:

- The average fuel efficiency of petrol & diesel cars improve but move above target, share of diesel vehicles likely to decline further
- 48 V Hybridization mainly driven by P0 systems ("quick win" solutions)
- Hybrid technology as major steering element to achieve emission targets

CO_2 regulation to impact electrification push

Powertrain scenario – Hybrid Technology will become key to achieve regulatory equilibrium

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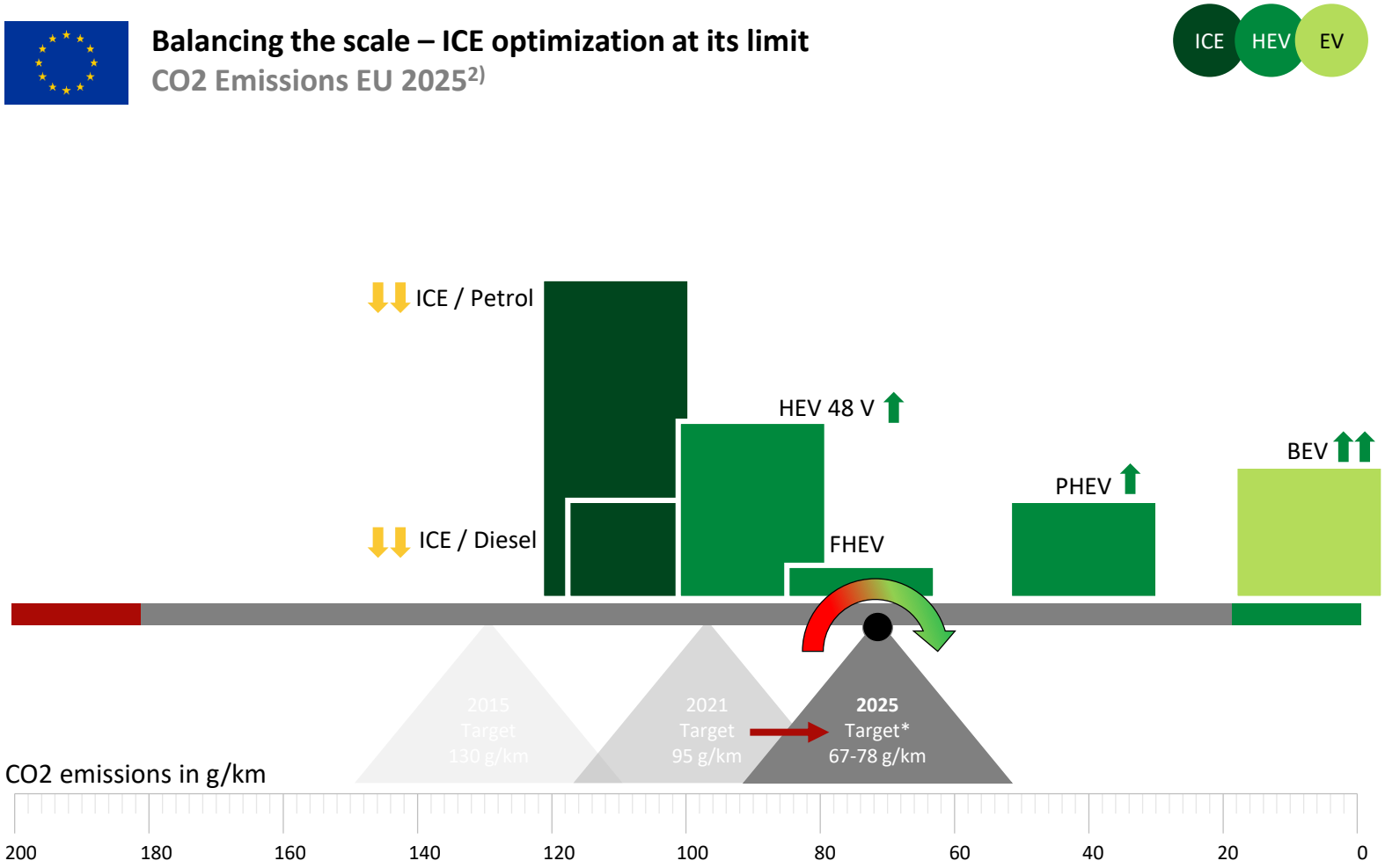
Balancing the scale – ICE optimization at its limit

CO2 Emissions EU 2025[2)]



2) Qualitative presentation only

*Target 2025 currently in discussion

Key assumptions 2025:

- Fuel efficiency of petrol & diesel cars remains above target – overall volumes to decrease due to PHEV/BEV uptake
- 48 V as the new standard: With increasing shares of higher degrees of hybridization (P2 systems), efficiency of this segment improves significantly
- Push of OEM's towards BEV to achieve CO_2 target

Electrification accelerates PHEV/BEV become key lever

Automotive OEM– Product portfolio adjusting to market demand

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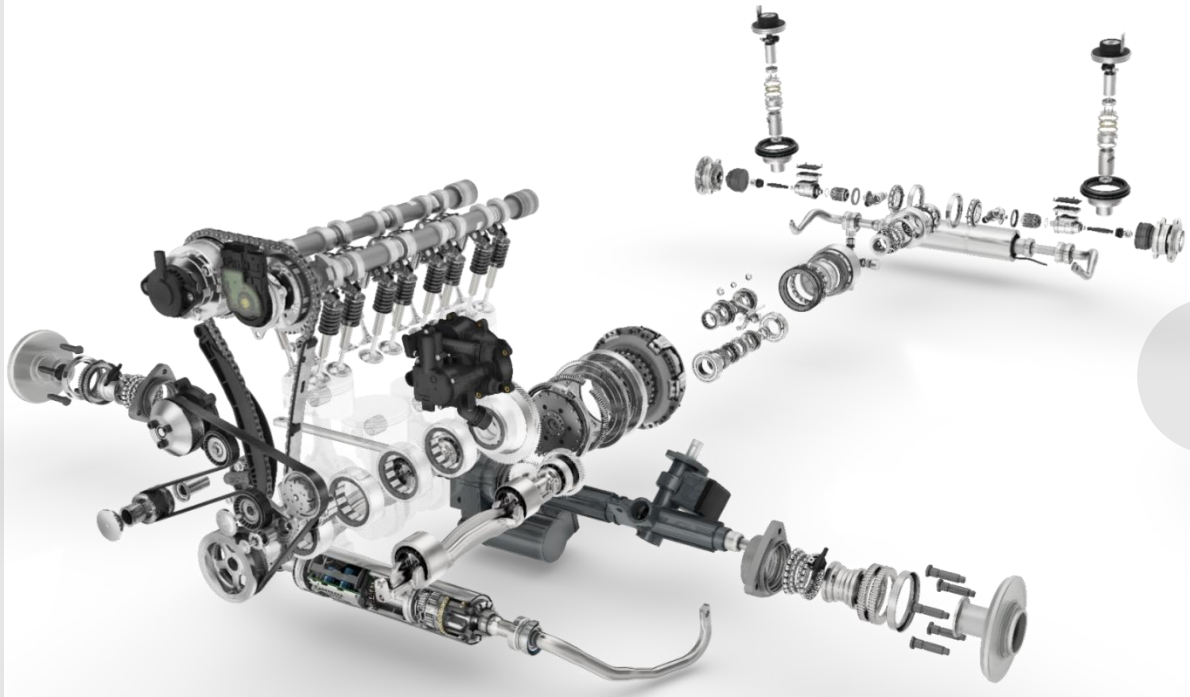
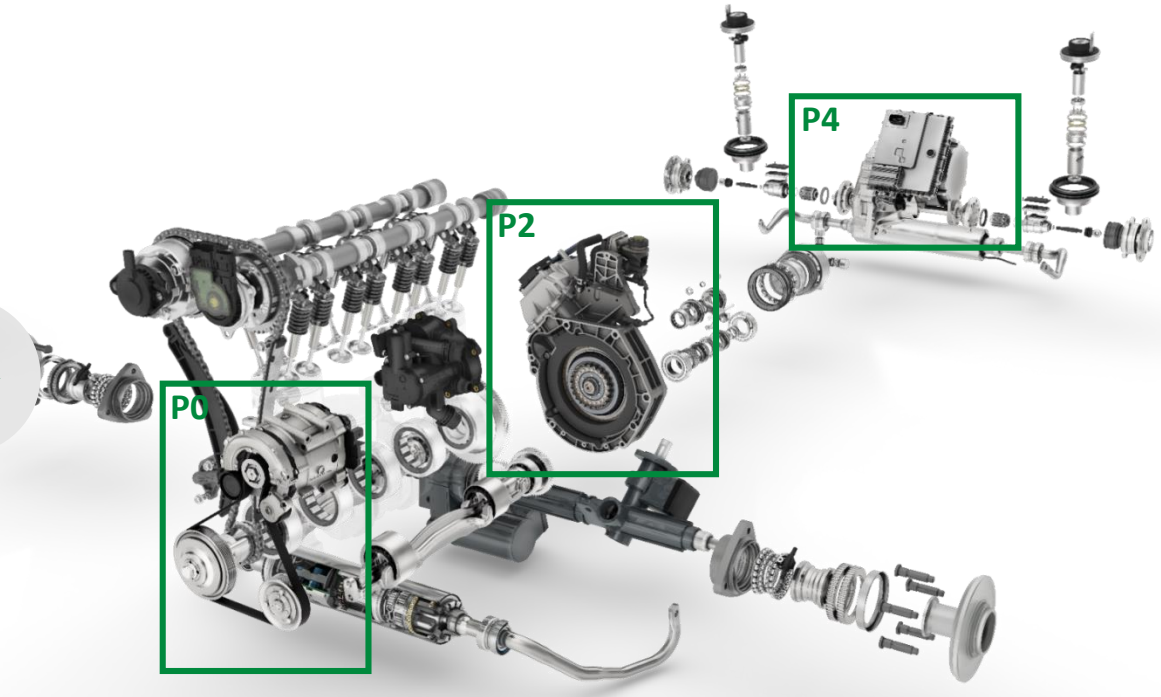
ICE Product Portfolio

ICE HEV BEV



HEV/BEV Product Portfolio

ICE HEV BEV



Mechanical and system knowhow remains key

Powertrain Matrix – Strong Position across all Powertrains

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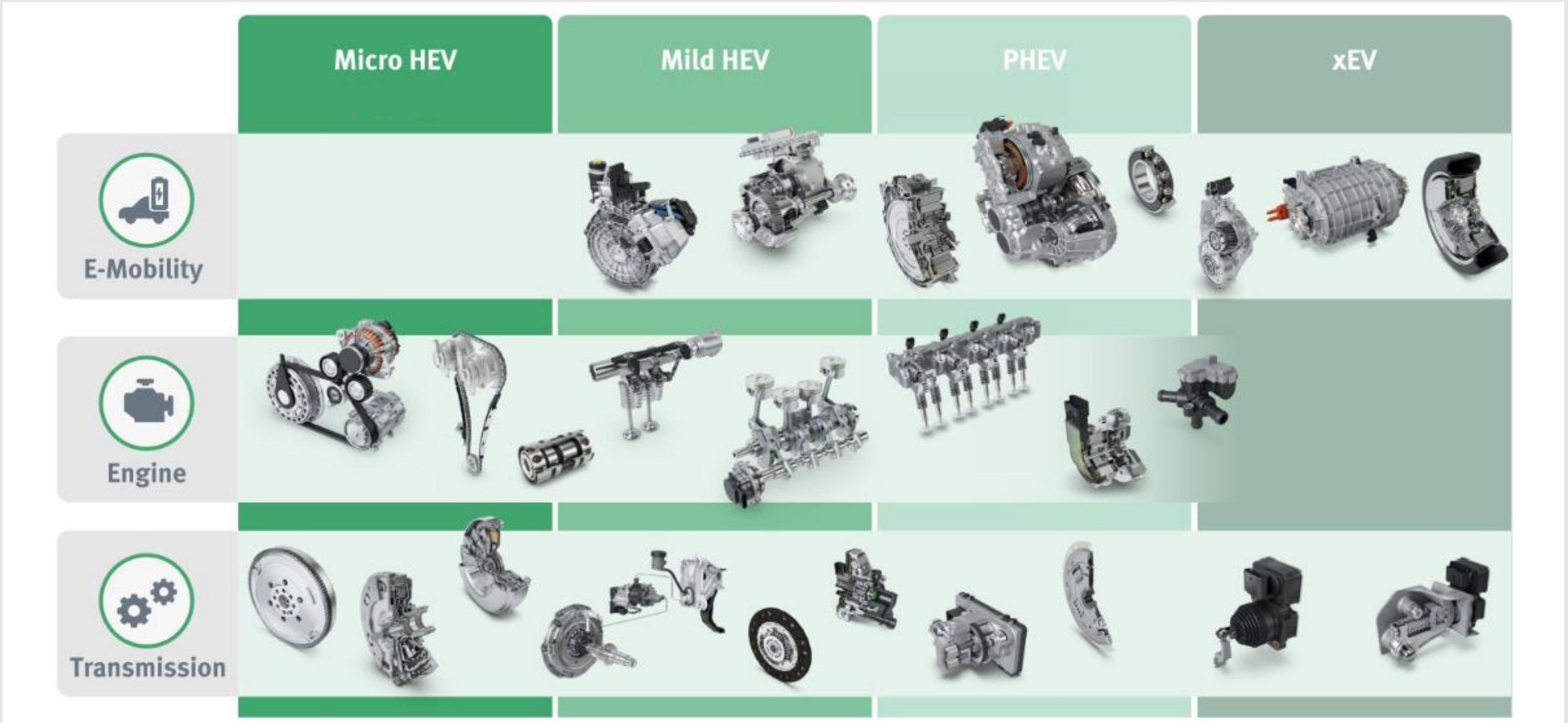

E-Mobility – Our key growth accelerator

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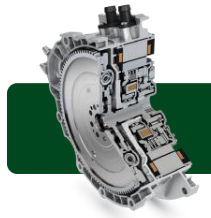
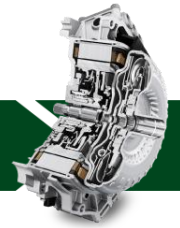
HEV/PHEV: P2 Hybrid modules (and hybrid transmissions)

ICE HEV BEV

Hybrid Module Gen. 2

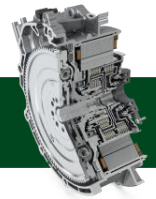


SOP 2017



SOP 2019

Hybrid Module Gen. 3
with integrated start-up element



SOP 2020

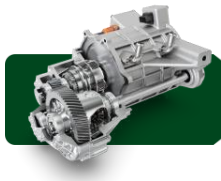
Hybrid Module Gen. 4
HV/48 V with integrated e-Drive

SOP 2022

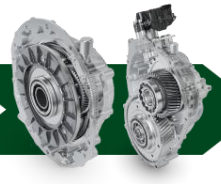
HEV/PHEV/xEV: E-Axle drives

ICE HEV BEV

Mech. Axle
2-speed, PHEV



SOP 2017

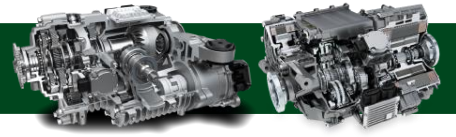


SOP 2018

Mech. Axle
1-speed, EV

SOP 2019

E-Axle systems incl. EM & PEU (and optional torque vectoring)
(HV 1-speed or 48 V 2-speed/3-in-1/integrated e-Drive)



SOP 2021+

Booked Target

E-Mobility – More than 30 customer projects and 8 series contracts

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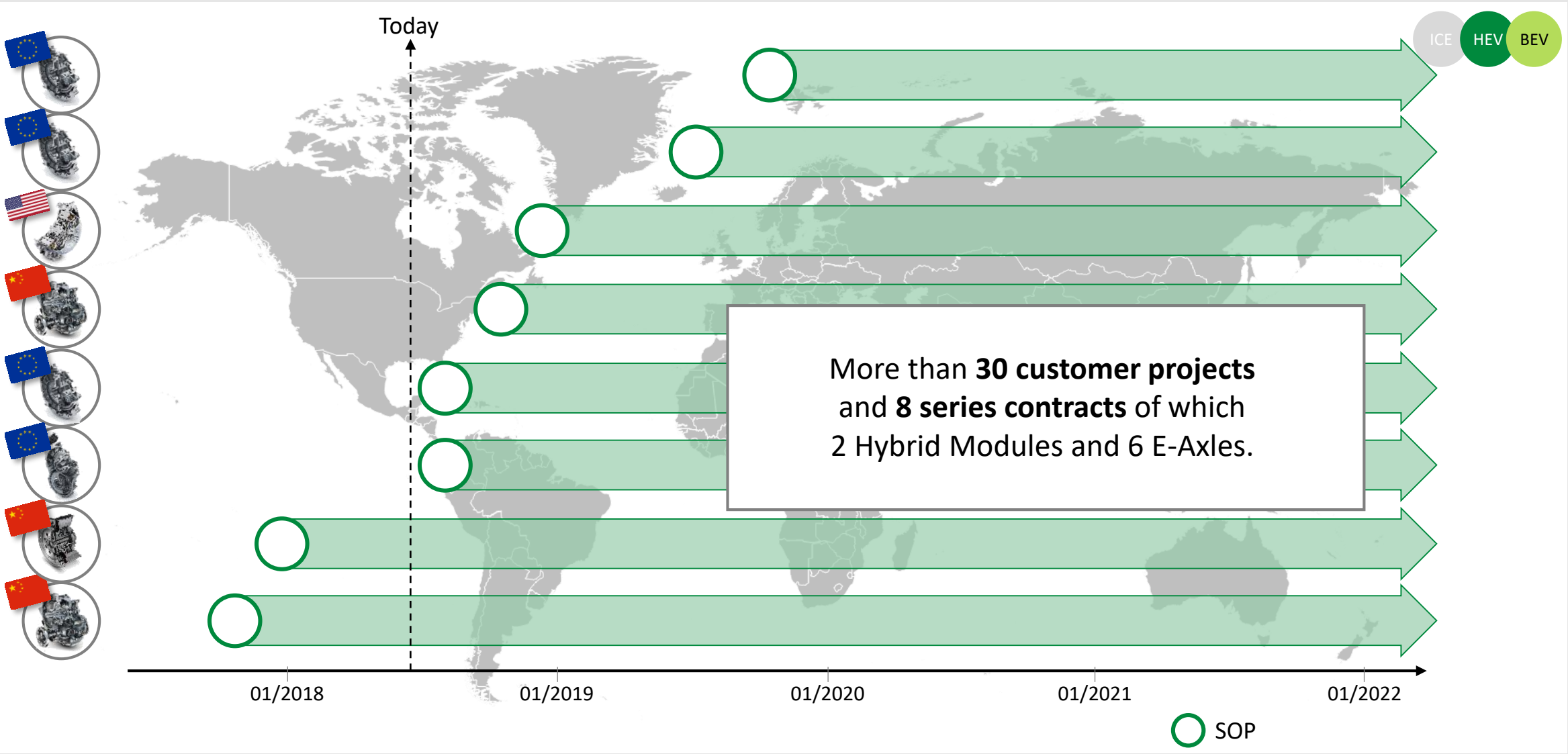

E-Mobility – Getting system ready

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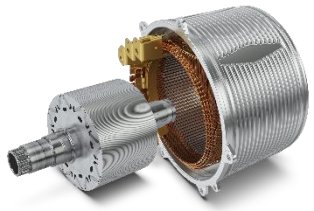
ICE HEV BEV

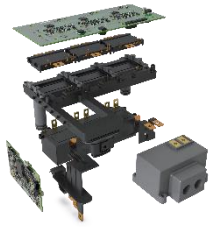
Systems

Subsystems

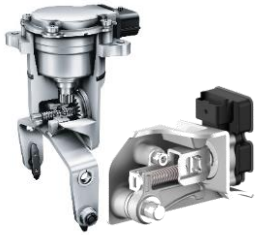
Axle Transmission



E-Machines



Power Electronics



Actuators

Software

Key aspects

- Strong mechanical background transfers to E-Mobility: First E-Axle Transmissions in SOP in 03/2018.
- Successfully established development and integration capabilities for E-Machines & Power Electronics.
- Bundled software and integration expertise from existing products in the business division E-Mobility (e.g. actuators & DCT)

Mechanical knowhow is key in system integration

Schaeffler E-Mobility – Electric Machines Development & Production

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SCHAEFFLER E-Motor
with wave-winding technology

Ready to produce by 2020

Stator Manufacturing Processes*

- **stamping**
  key expertise of Schaeffler
- **packetizing**
  today BUY, option for MAKE
- **Slot insulating**
  prototyping Compact Dynamics & IDAM
- **copper wire forming**
  ex. E-VCT, IDAM, …
- **Slot closure**
  prototyping Compact Dynamics & IDAM
- **mech. fixing & therm. conduction**
  ex. filament-wound industr. components
- **contacting**
  ex. Actuators
- **insulating of el. contacts**
  ex. Actuators
- **joining temperature sensors**
  ex. Actuators
- **joining stator / carrier**
  ex. P2 Hybrid Modules
- **testing Stator EOL**
  ex. IDAM industrial e-motors

Rotor Manufacturing Processes*

- **stamping**
  key expertise of Schaeffler
- **packetizing**
  today BUY, option for MAKE
- **joining magnets**
  ex. Actuators
- **joining rotor / shaft**
  ex. CVT
- **balancing**
  ex. Double Clutch
- **magnetizing incl. testing**
  ex. P2 Hybrid Modules
- **testing Rotor EOL**
  ex. IDAM industrial e-motors

in series production at Schaeffler today
prototyping machines available at Schaeffler
ext. supplier technology as of today

**example for possible production process*

Engine systems – Opportunity through Diesel decline

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Implications for Schaeffler (Engine content only)

Diesel engine

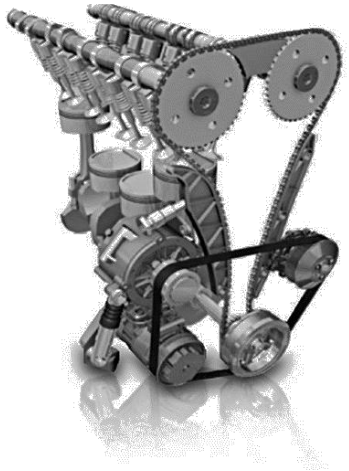
Emissions

- 117.9 g/km CO_2
- **141-684** mg/km NO_x [1)]

Technologies

- 2-stage variability
- Thermal management
- Standard ICE technology

Potential content **110 €**



Uncertainty due to driving bans

Gasoline engine

Emissions

- 121.6 g/km CO_2
- **60** mg/km NO_x

Technologies

- Variable valve train
- Dual variable cam timer
- Thermal management

Potential content **130 €**

Mild hybrid gasoline (48V)

Emissions

- ~105 g/km CO_2
- **50** mg/km NO_x

Technologies

- Belt alternator starter system (pulley decoupler, mechanical belt tensioner, pendulum design)
- Dual variable cam timer
- Variable valve train

Potential content **150 €**

[1)] According to RDE measurement of Euro-6-diesel in ADAC EcoTest 2017

Key aspects

- Due to driving bans in European cities, the market share of diesel vehicles is likely to decline further and faster than previously expected
- The necessity to produce more efficient and low-emission (CO_2) gasoline engines bears potential for the use of Schaeffler products
- +30% potential content in 2020 for every diesel engine less produced [2) 3)]

Further content per car growth potential in Engine Systems

[2)] Calculation for business division engine systems only
[3)] Without consideration of potential regarding hybrid modules and e-axles (48V, full hybrid)

Transmission systems – More rapid automization of the transmission offers additional potential

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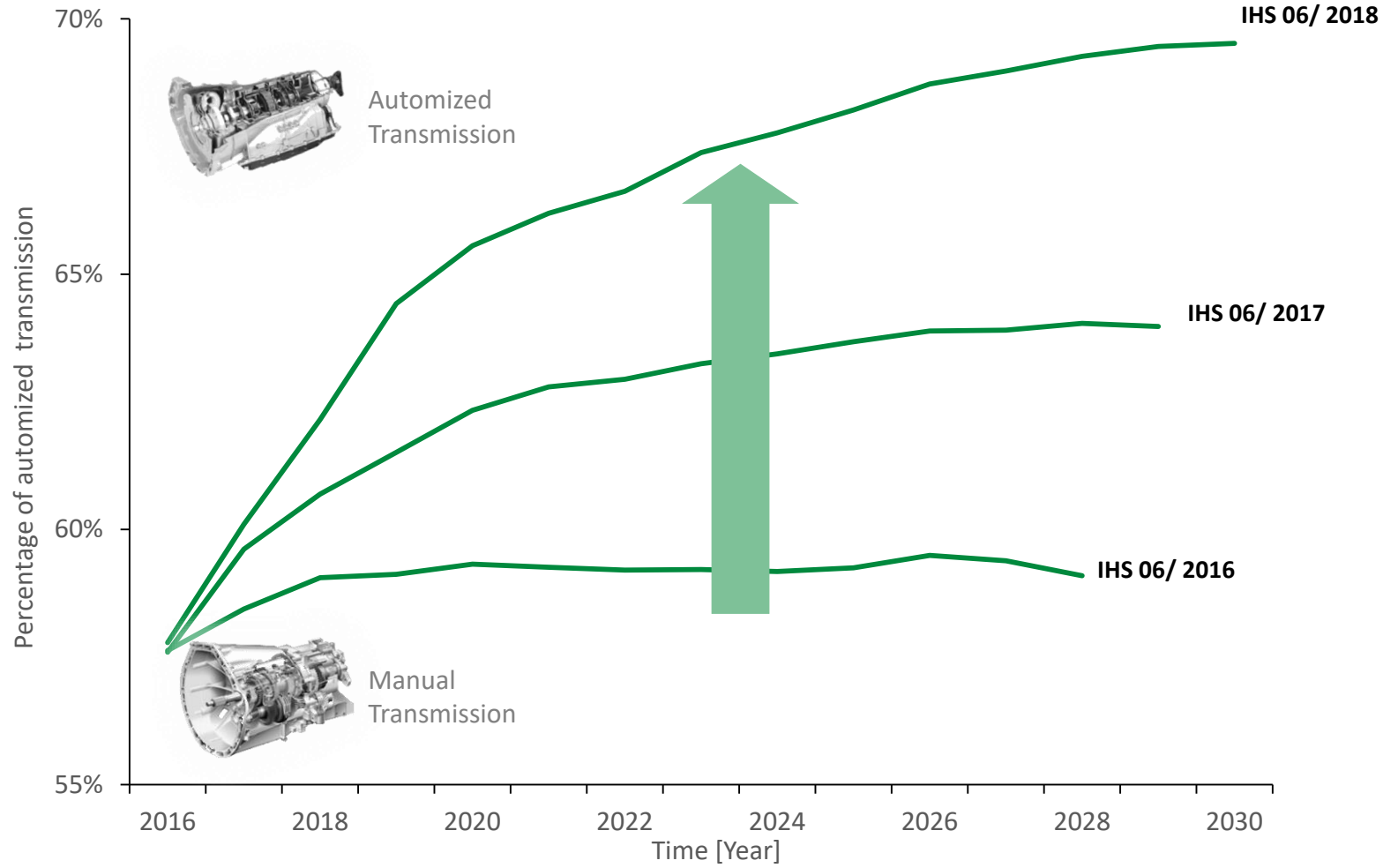
Transmission market development



Sources: IHS Transmission Forecast (w/o reduction transmissions)

Key aspects

- The rate of automization of transmissions is increasing rapidly, also due to more hybridization
- Significant higher potential content in every automized transmission
- Schaeffler's E-Clutch allows mild hybridization of manual transmissions and offers CO2 saving potential > 8% in conjunction with a P0 48V – First SOP in 2019

Further content per car growth potential in Transmission Systems

Schaeffler Symposium – Sharing innovation with our customers

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11th Schaeffler Symposium 2018 in Baden-Baden

Every four years Schaeffler invites industry specialists for an exclusive event of technical presentations with exciting insights into the technologies and mobility concepts being developed by Schaeffler.

Facts and figures

- ~ 400 customers
- 96 exhibits & 28 technical presentations
- 12 world debuts

Product Highlight – Schaeffler Mover

Chassis meets Powertrain

Key Facts

- Urban vehicle concept
- Flexible and zero-emissions platform for diverse vehicle concepts
- Drive and suspension modules installed in a single unit, "Schaeffler Intelligent Corner Module"
- Easily scalable (vehicle length and width)
- Based on Schaeffler's "Rolling Chassis"

Chassis systems – Autonomy adds value to our Chassis portfolio

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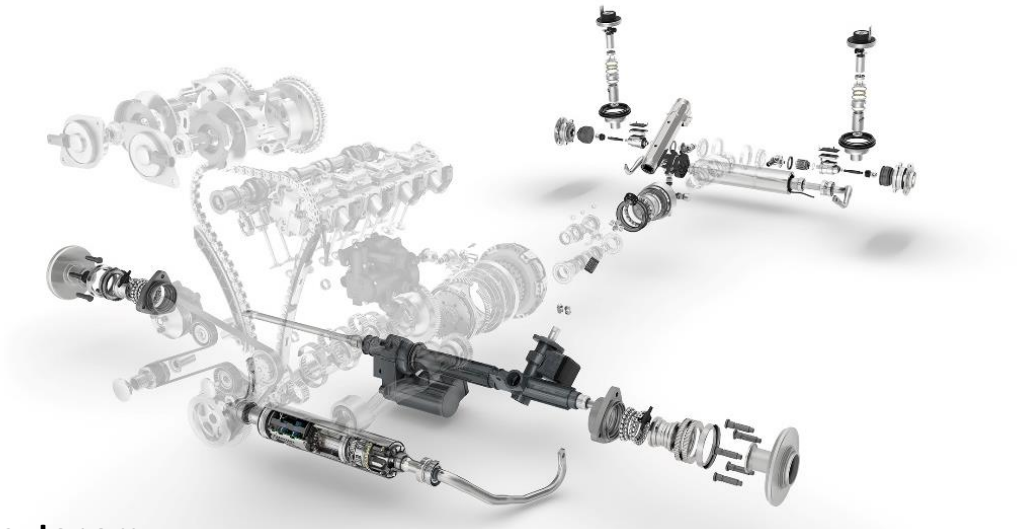
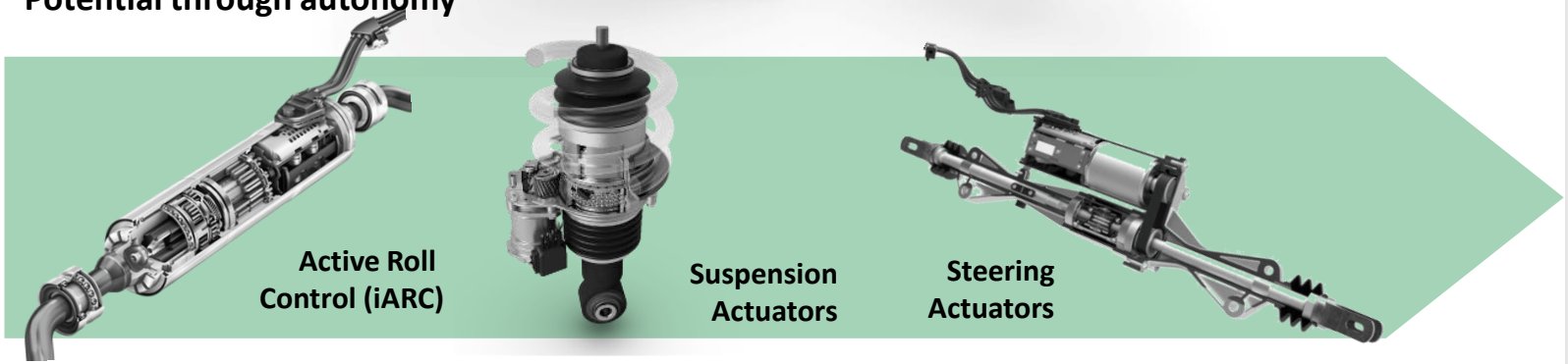
Chassis Product Portfolio



Potential through autonomy



Chassis Control Actuators → Drive-By-Wire Solutions → Full Driving Chassis

Key aspects

- Chassis megatrends include Autonomous Driving, Zero Fatalities, CO_2 reduction and demographics
- Schaeffler offers wheel and chassis bearings as well as chassis actuators
- Our actuators portfolio allows for Chassis Control, Drive-by-Wire Solutions and Autonomous Driving
- Growing complexity adds value

Further content per car growth potential in Chassis Systems

Summary – Key messages

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1. Schaeffler's Accelerated scenario for 2030 is gradually becoming a reference in the automotive industry
2. The CO_2 targets can only be achieved through the consistent optimization of the ICE as well as the widespread electrification of the powertrain
3. Our vehicle and powertrain expertise, our deep mechanical knowhow and our system/ integration understanding are the foundations of our push into electrification
4. Schaeffler is set to enter the market at the end of 2020 with its own electric motors
5. Automation of powertrains is a prerequisite for autonomous driving – Schaeffler has a higher content per car in this field
6. The mid-term future is electric and autonomous - both offer upside potential for Schaeffler

Strong position for upcoming market changes

IR Contact

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Thank you for your attention

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