

**eMobility –  
Passing the baton from fossils to electrons**

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Program Manager, eMobility



## FOSSIL FUELS



1885

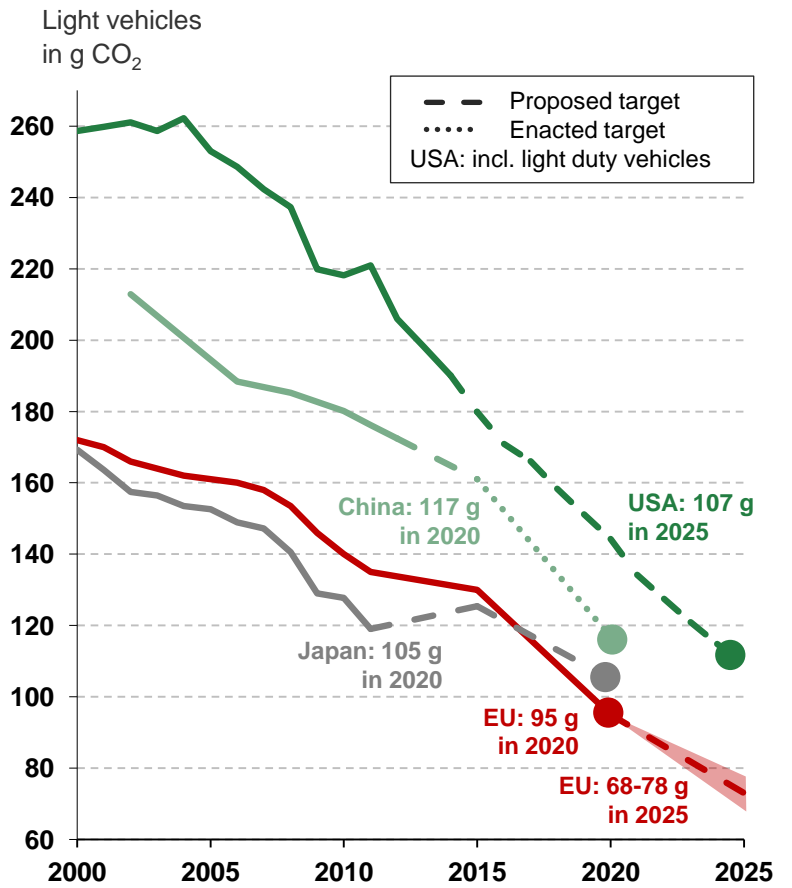
- 1) High energy density
- 2) Cost
- 3) No air pollution concerns

## ~~ELECTRIC~~





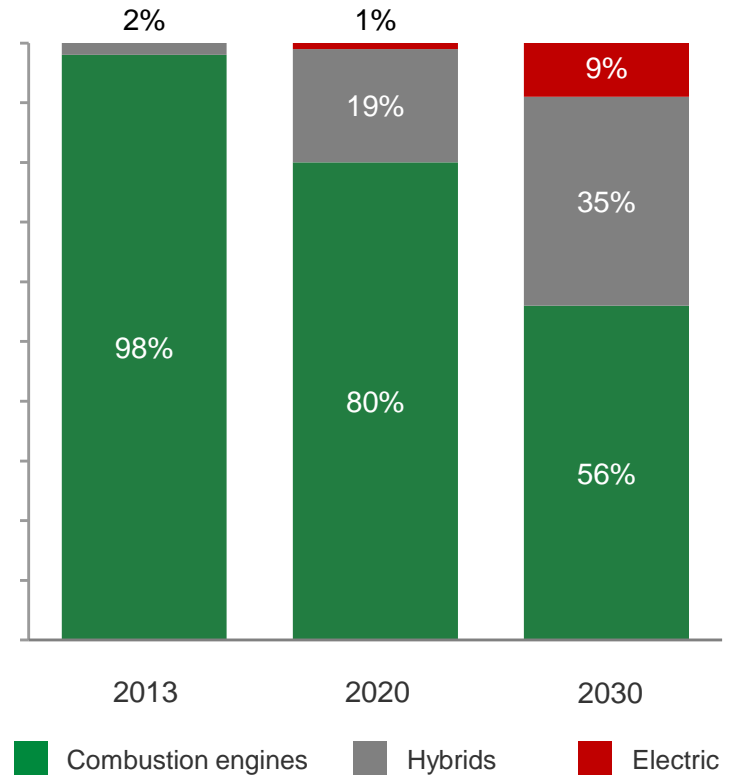
## CO<sub>2</sub> legislation worldwide



Source: icct 2013

## Powertrain concepts

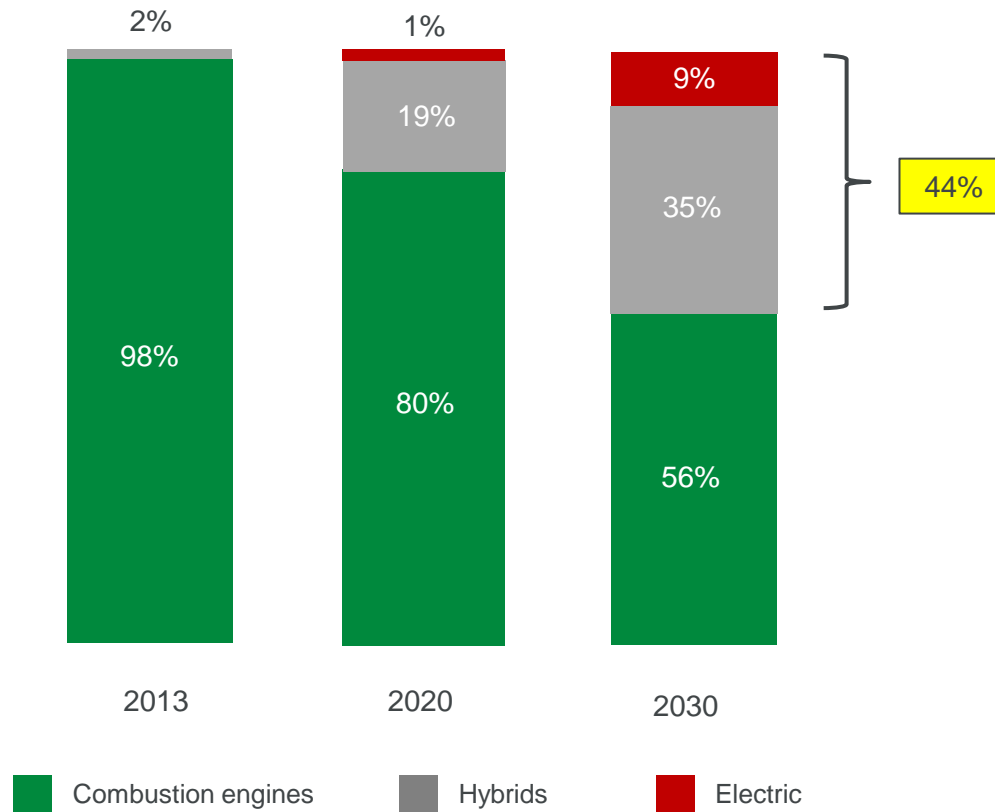
### Light vehicle production



Source: IHS 2013; University of Duisburg-Essen 2012

## Powertrain concepts

Light vehicle production

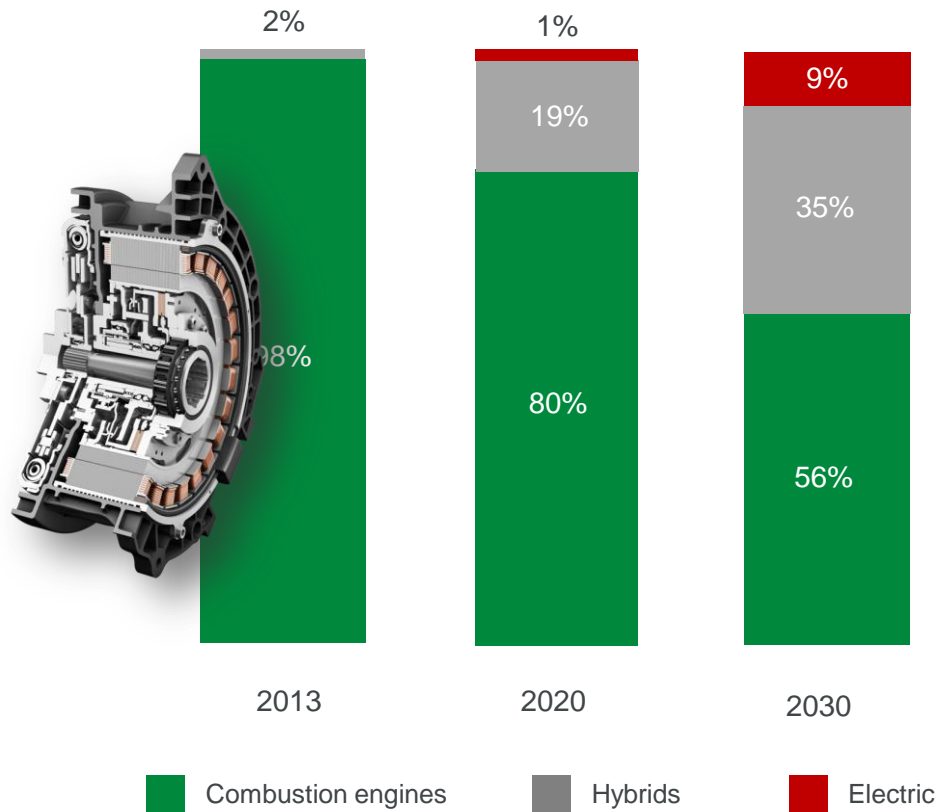


Source: : IHS 2013; University of Duisburg-Essen 2012



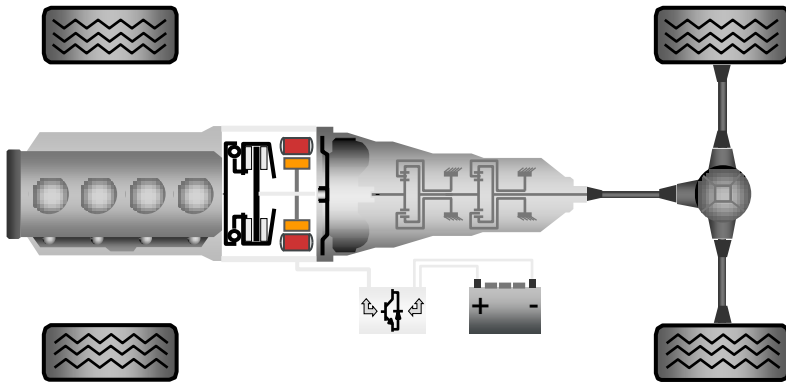
## Powertrain concepts

Light vehicle production

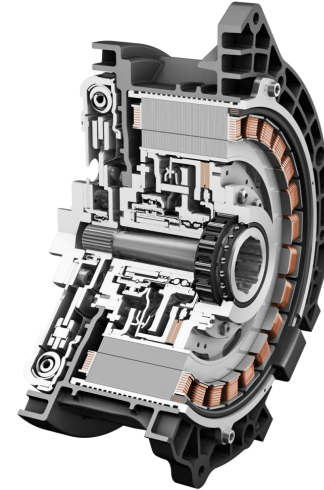


Source: : IHS 2013; University of Duisburg-Essen 2012

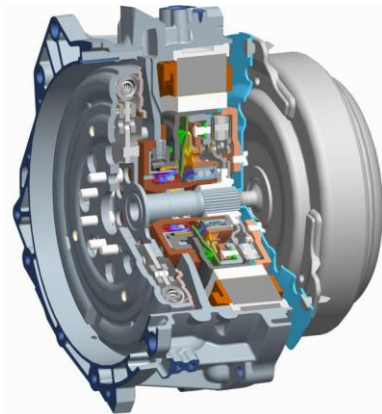
### Between engine and transmission



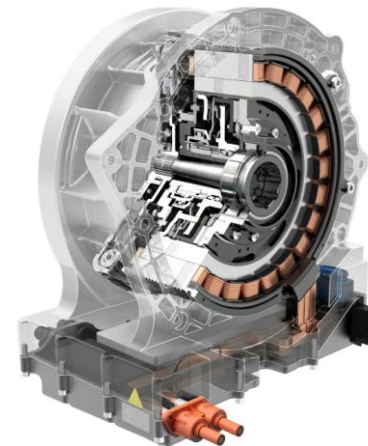
### Hybrid Module 2<sup>nd</sup> Gen with dry clutch

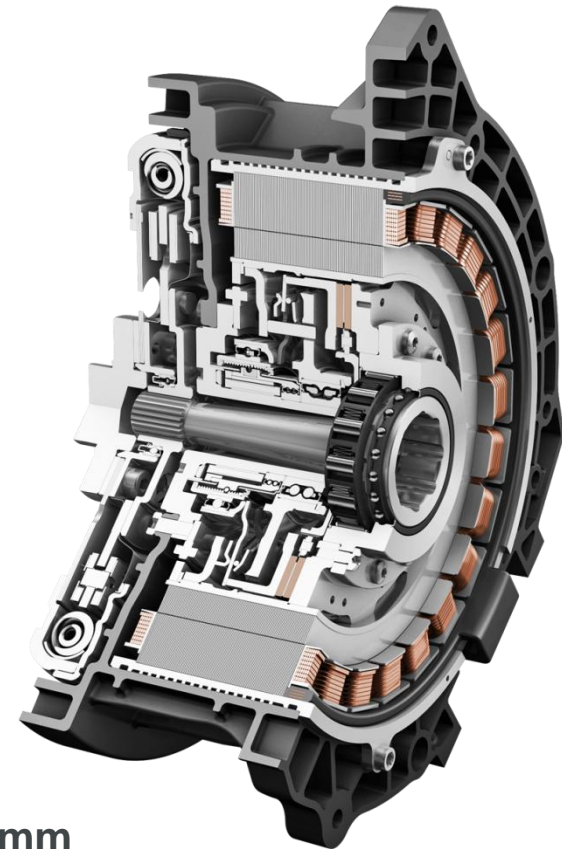
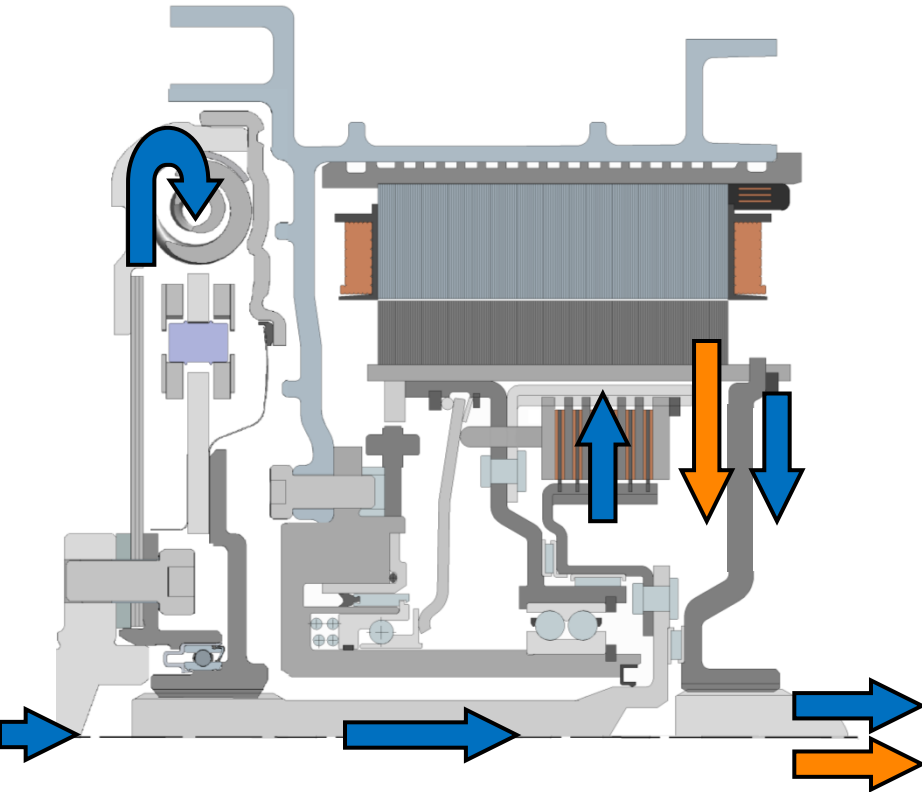


### P2-hybrid module 1st generation



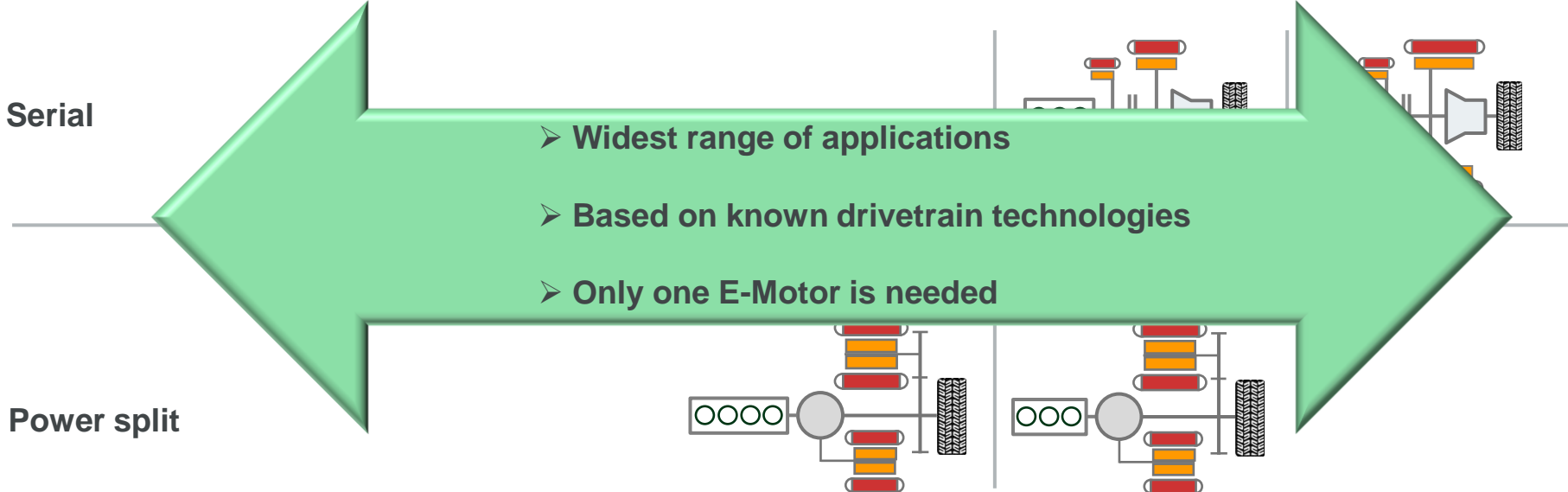
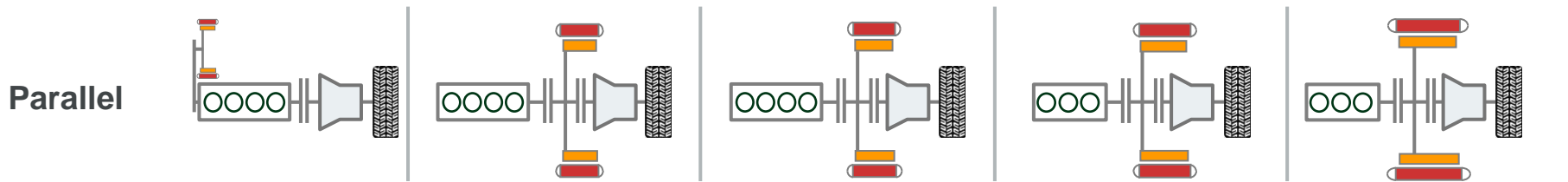
### Hybrid module 2<sup>nd</sup> gen with integrated electronics

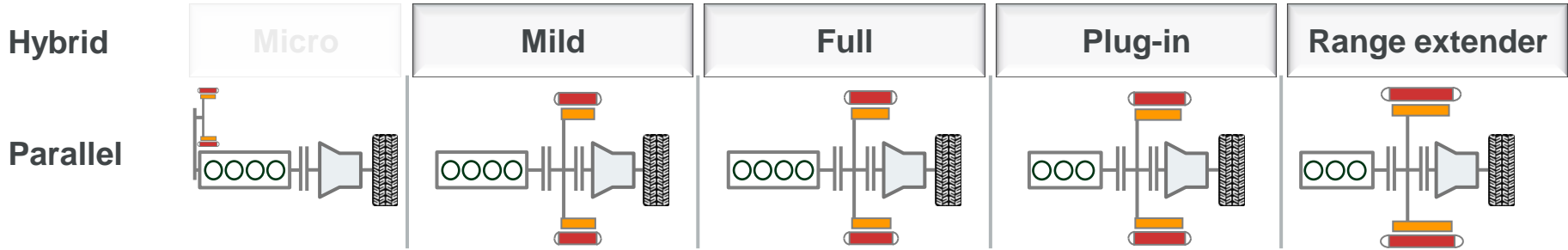




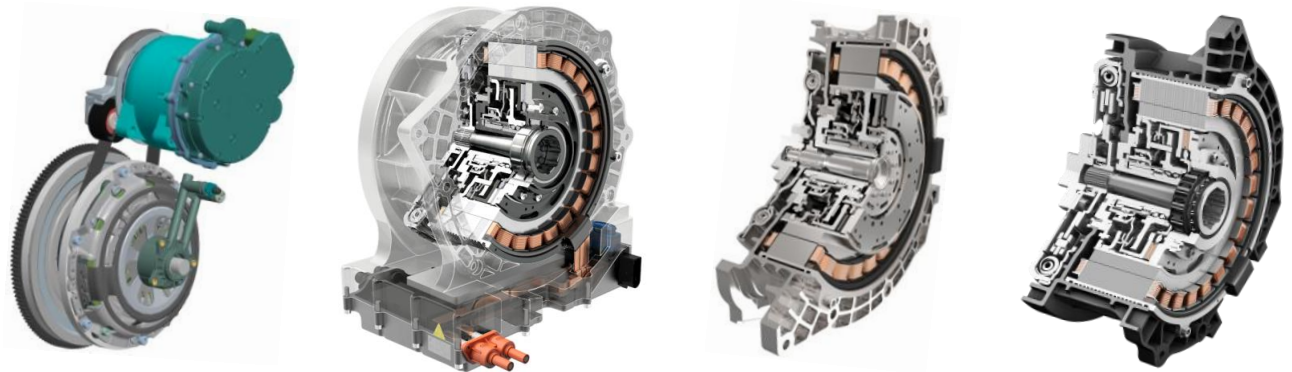
- ➔ Reduced axial space by 17 mm
- ➔ Electrical sailing up to 100 miles/hr
- ➔ Applicable to all types of transmissions







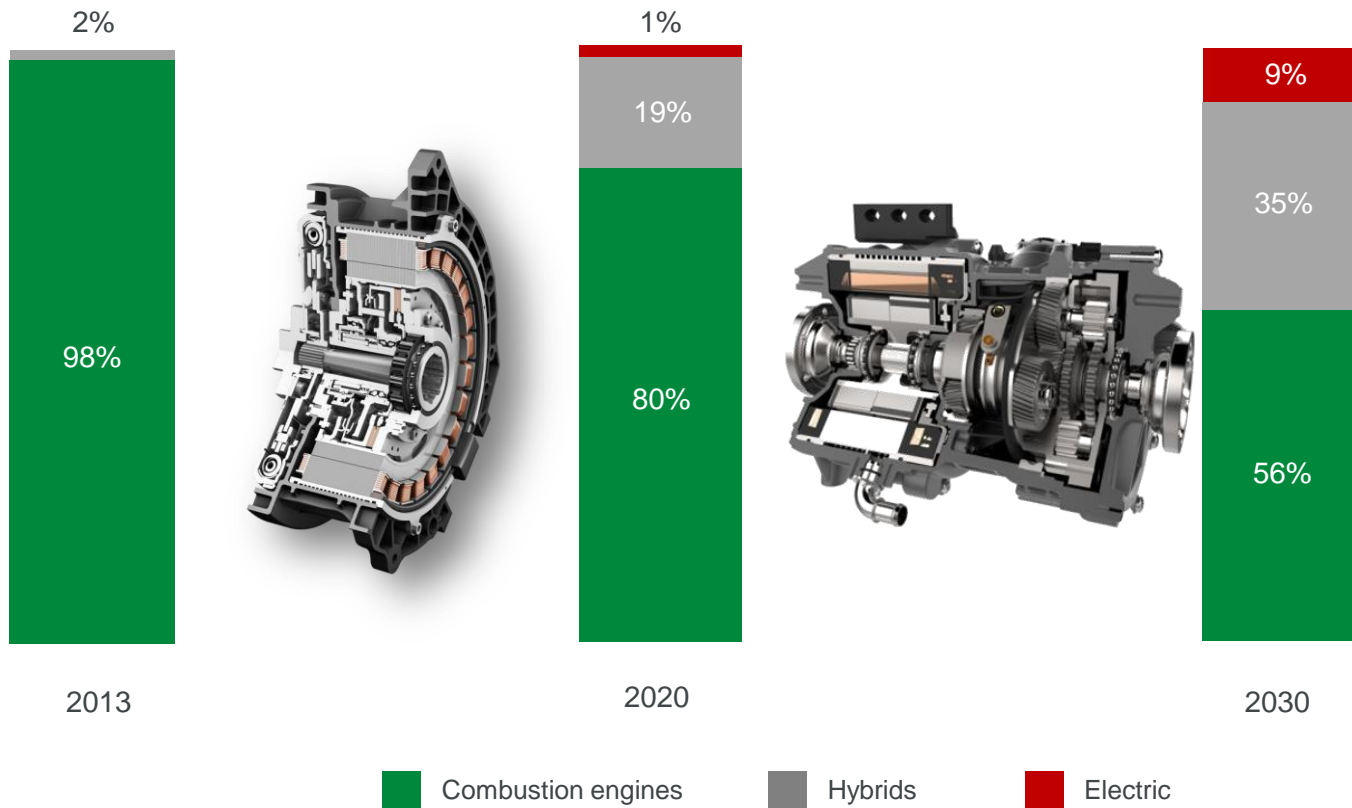
Hybrid – modules

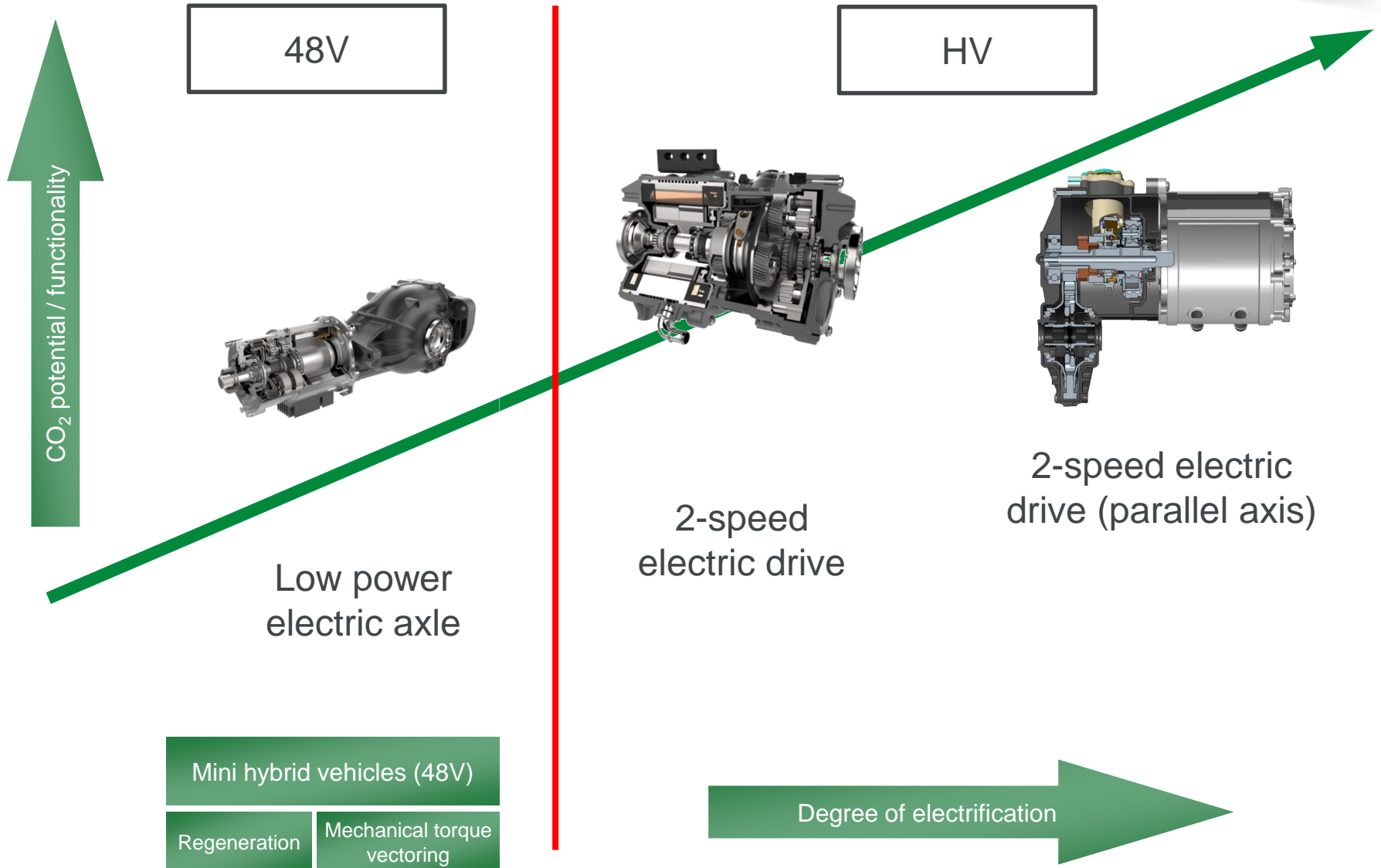


**Modular solutions for all levels of hybridization!**

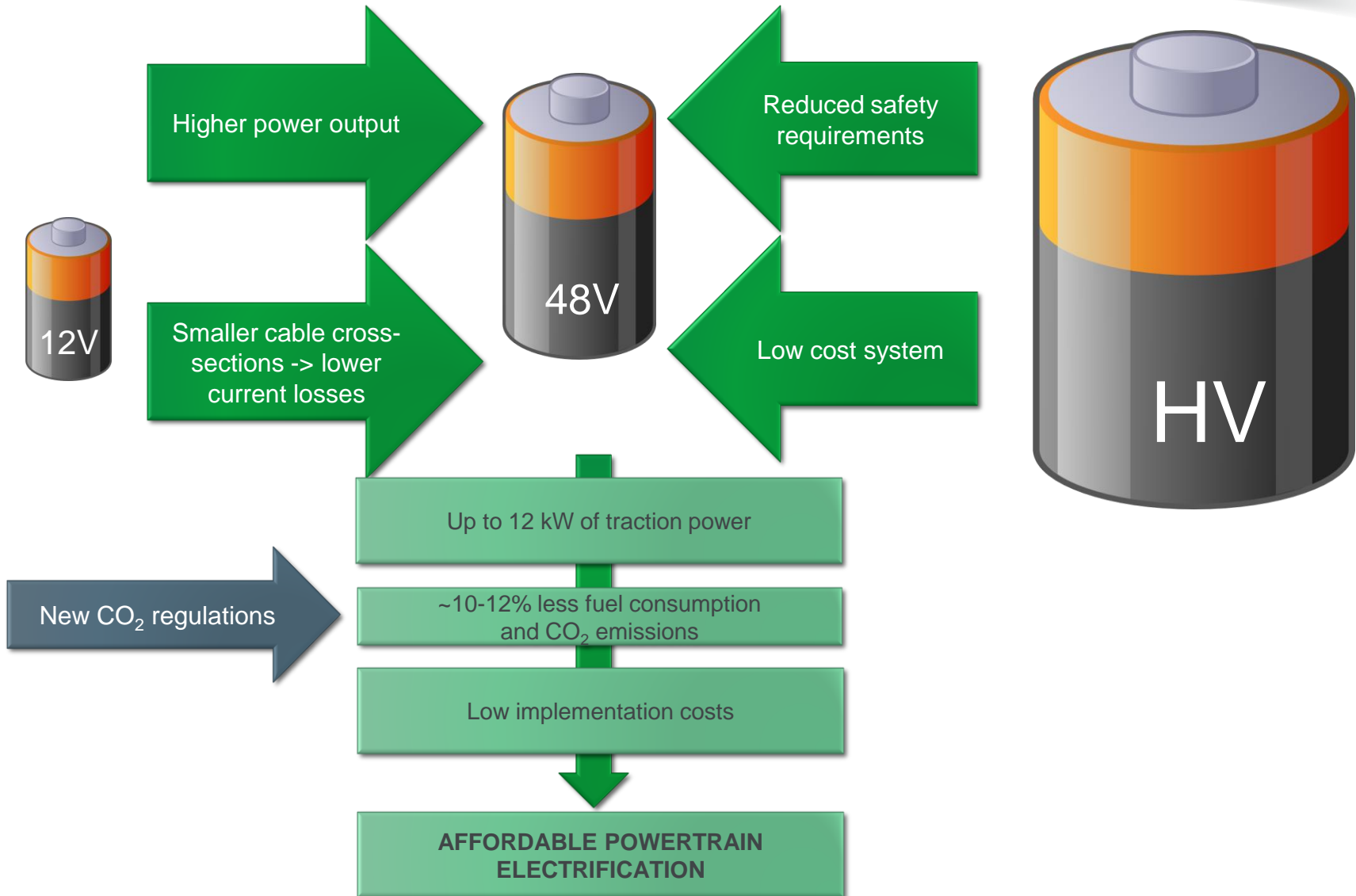
# Powertrain electrification – Schaeffler's roadmap

SCHAEFFLER





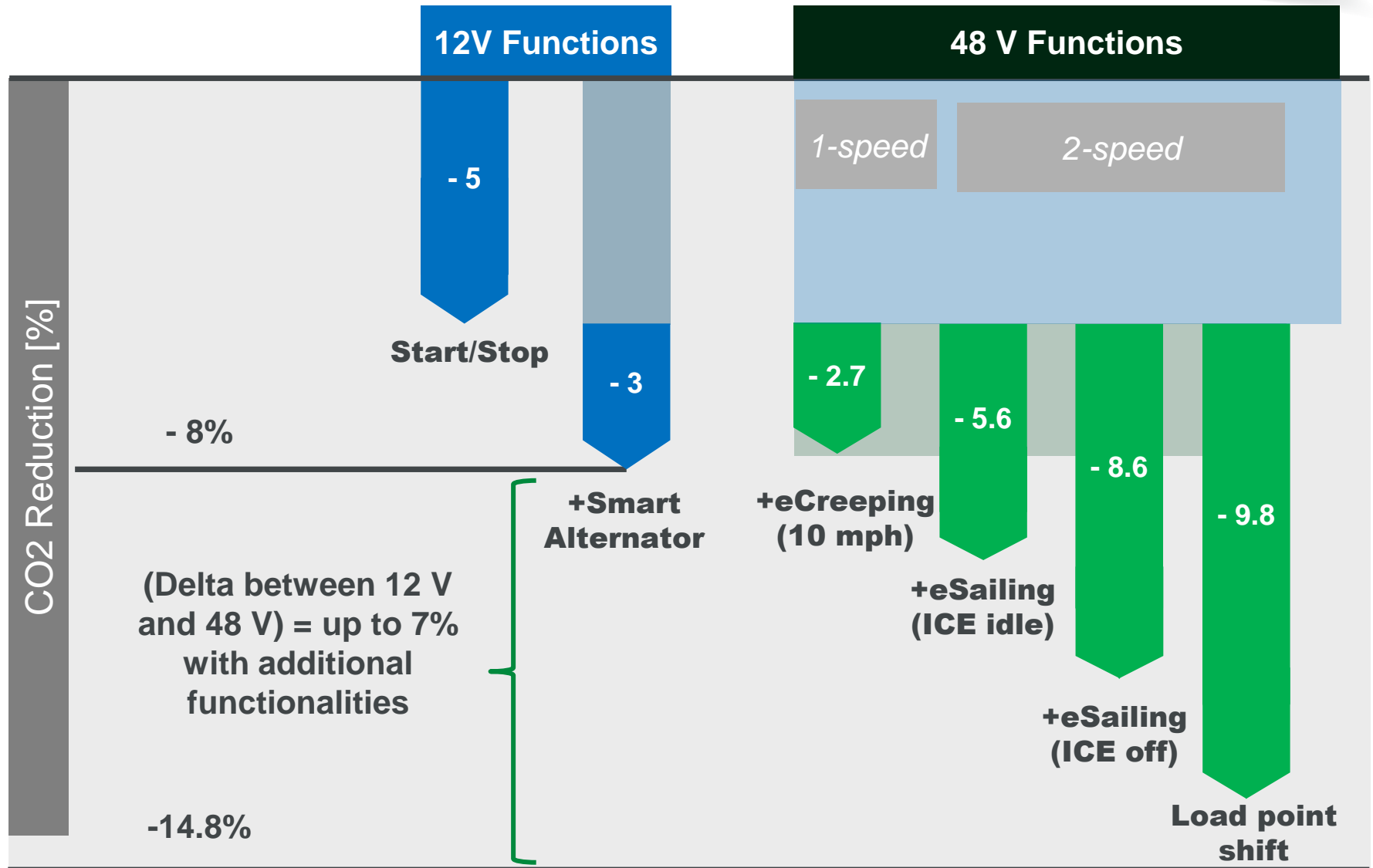
# 48V axles – why 48volts?





# 48V axles – CO2 reduction potentials (e-segment car)

SCHAEFFLER

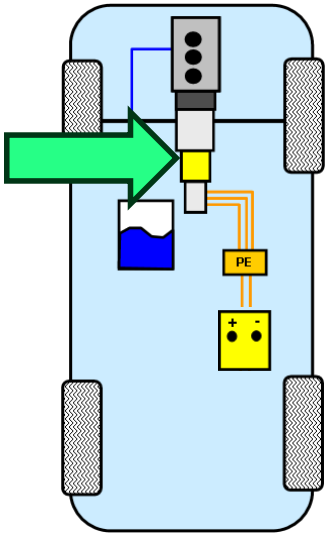


## Front wheel drive

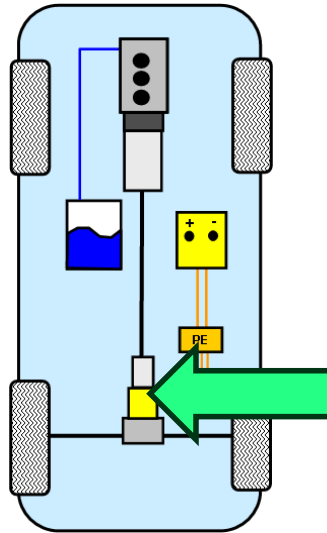
## Rear wheel drive

## eAWD

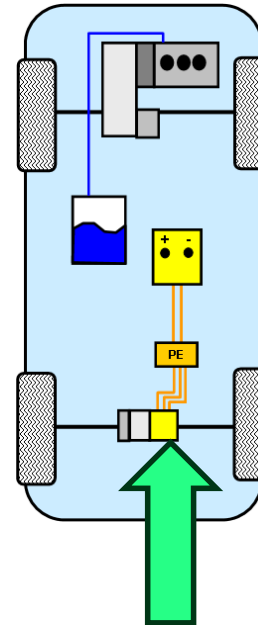
## All wheel drive



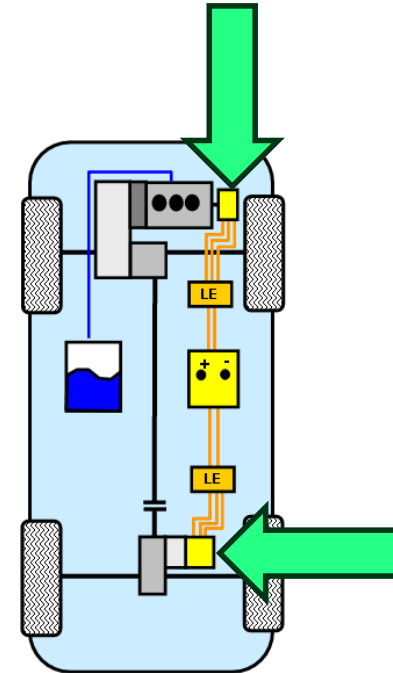
P2



P3



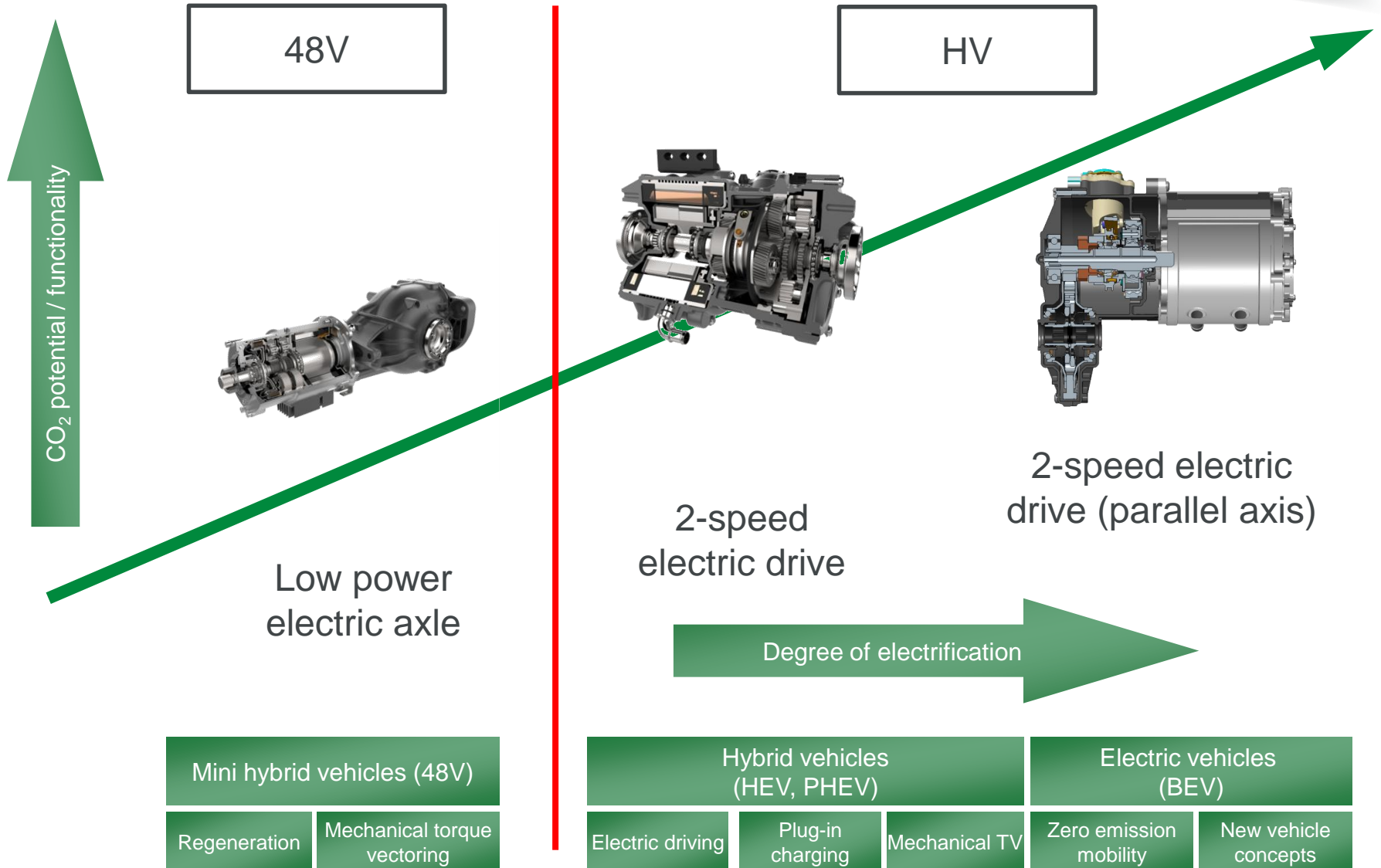
P4 elect.

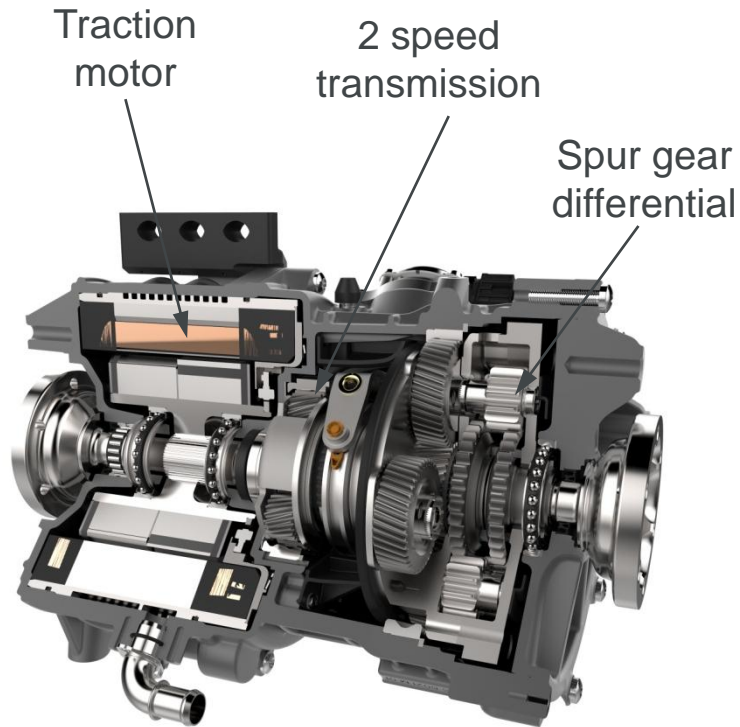


P0 – P3

# Product portfolio electric axle systems

SCHAEFFLER



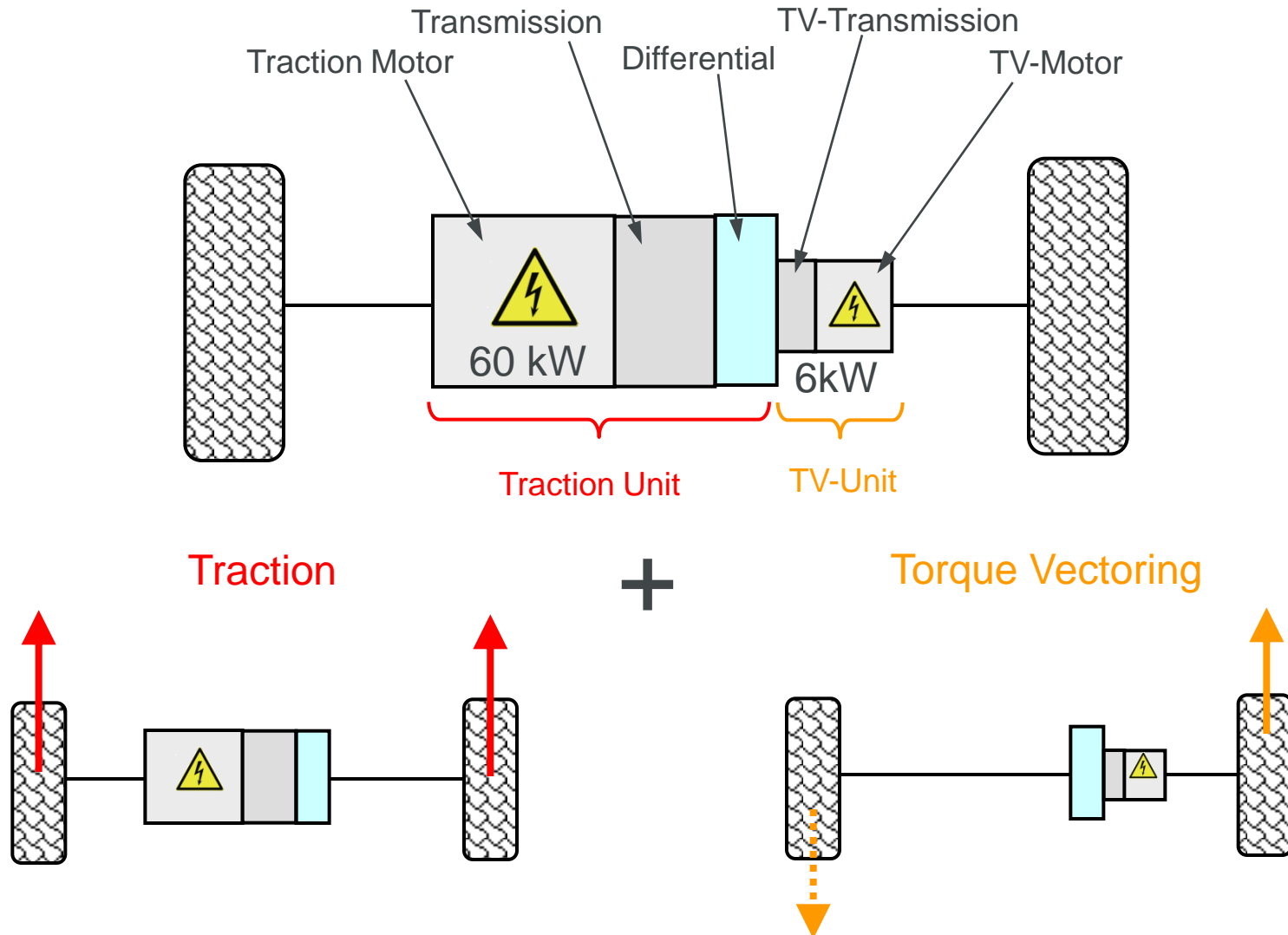


## Technical Data

Weight	ca. 60 kg
Power output	65 kW
Dimensions	∅ 230 x 423
Maximum torque	2000 Nm
Maximum speed of vehicle	> 260 km/h

## Customer benefits

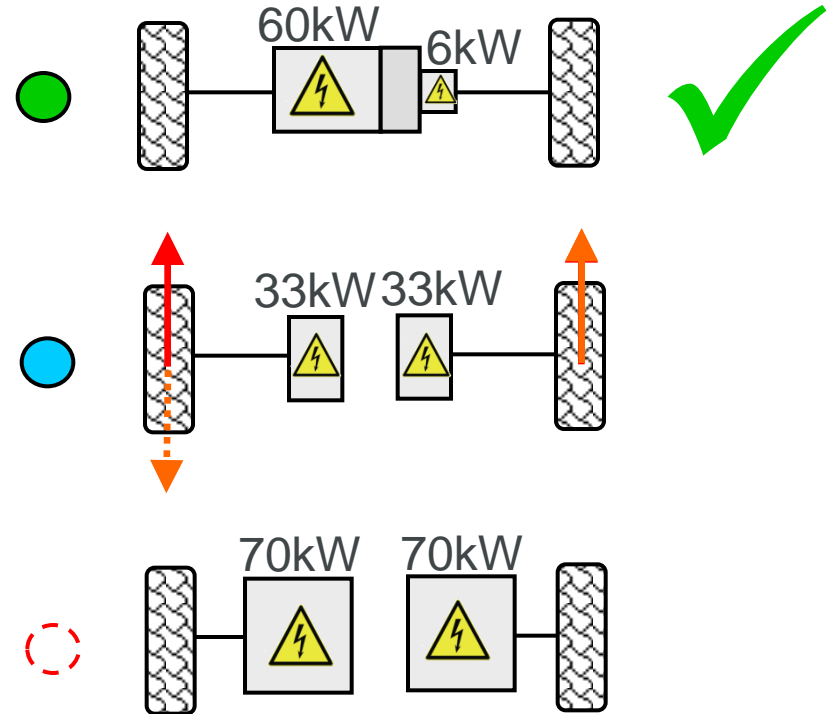
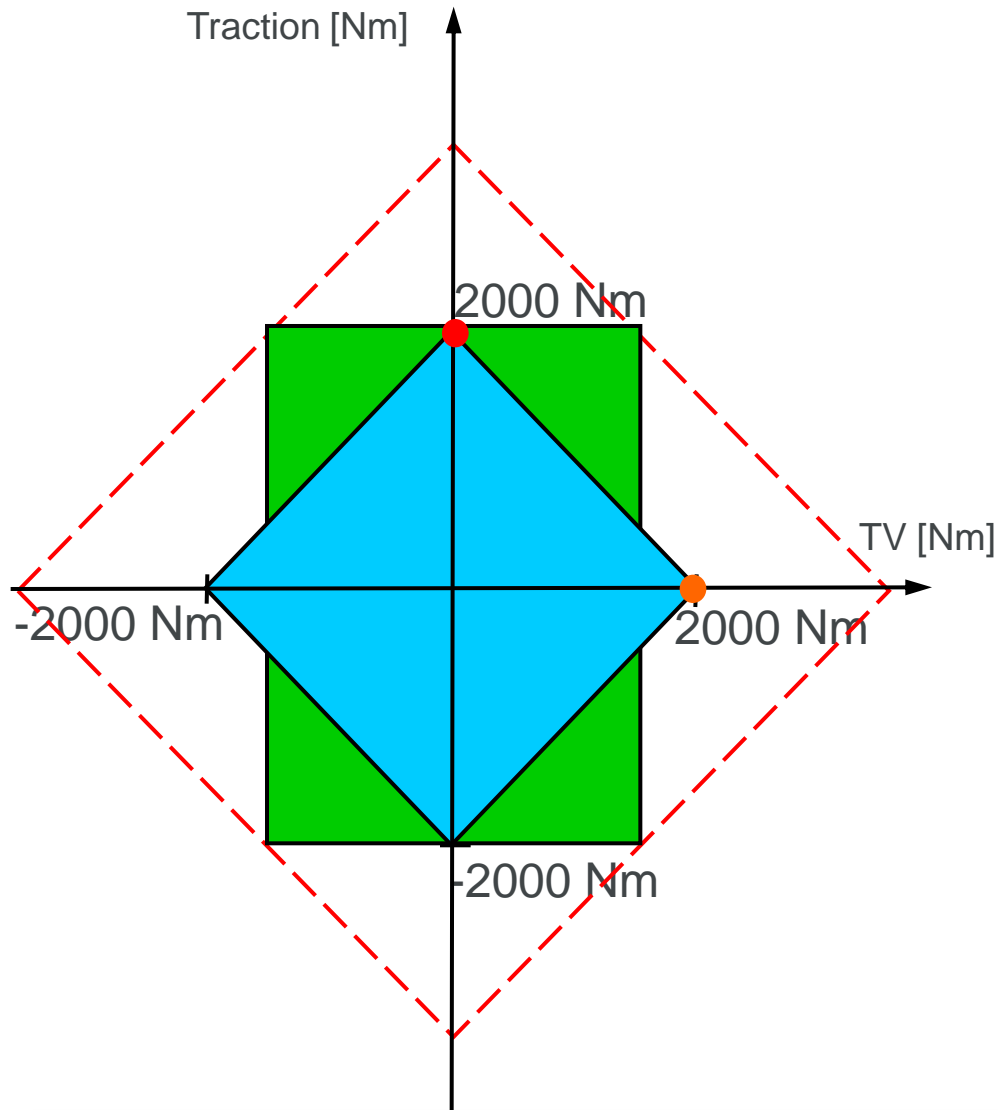
- Compact coaxial electric transaxle
- Modular system 1- or 2-speed
- Suitable for HEVs and BEVs as well
- Good scalability of power level
- Customer tailored scope of delivery



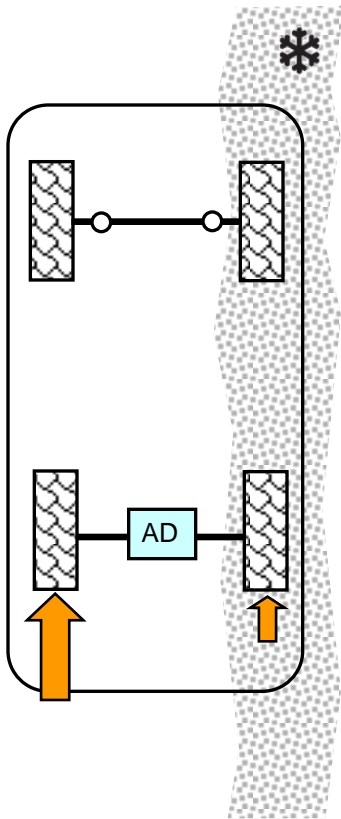


# Torque vectoring system

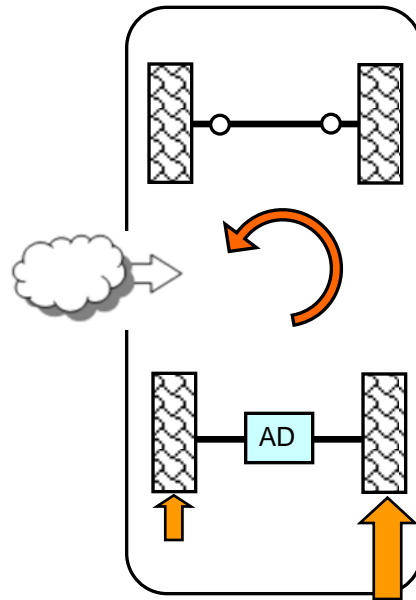
SCHAEFFLER



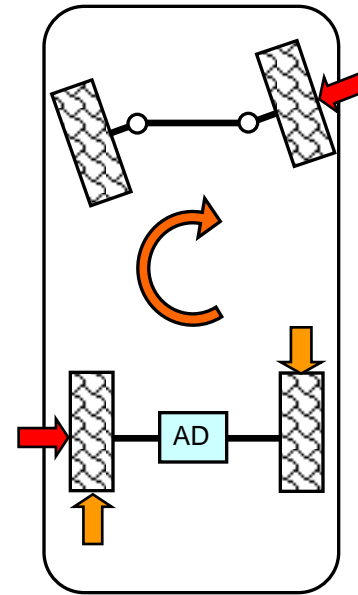
Improved traction



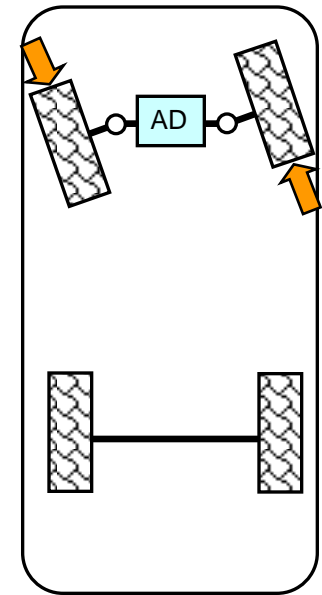
High comfort



Dynamics & safety

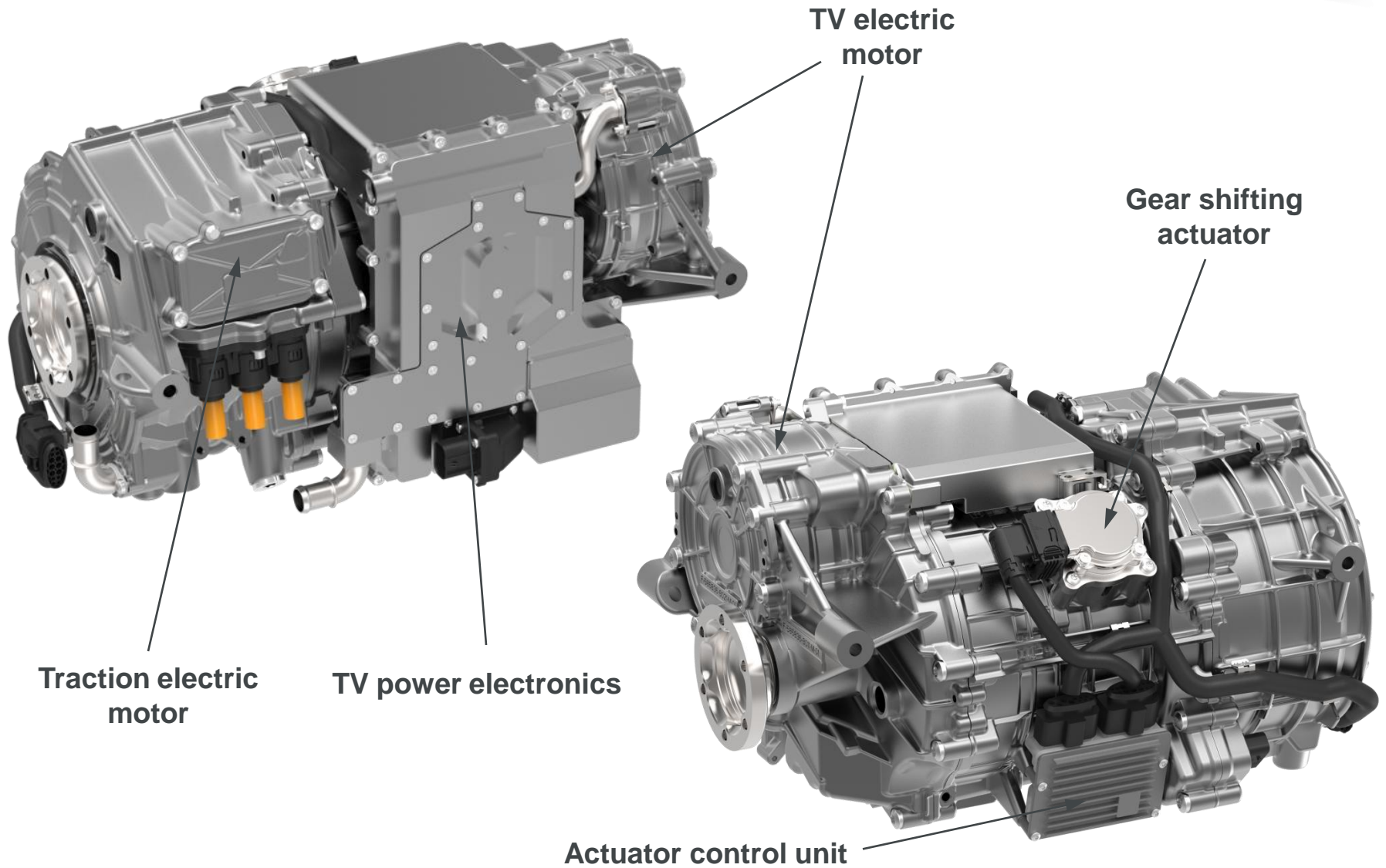


Steering support



# Electric axle drive gen III with torque vectoring

SCHAEFFLER



65 kW

2 speed, TV



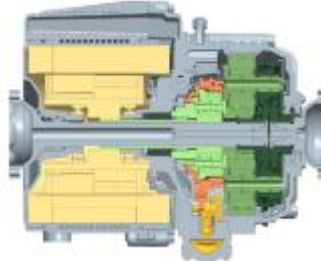
- Electric motor (scalable)
- 1 Planetary gear set
- 2 Planetary gear set
- Spur gear differential
- Transmission actuator with ECU
- Torque vectoring unit
- Other components

65 kW

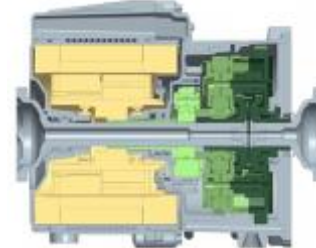
2 speed, N



1 speed, N



1 speed

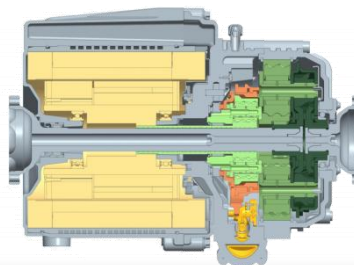


85 kW

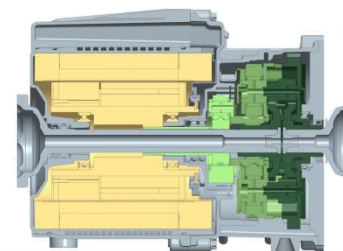
2 speed, N



1 speed, N

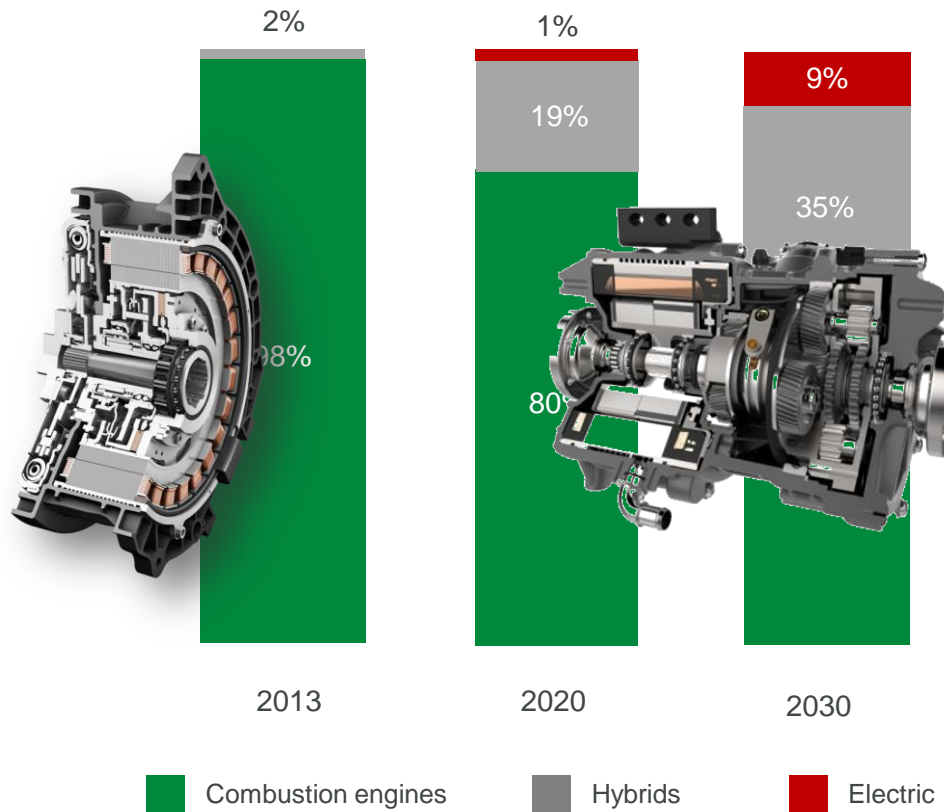


1 speed



## Powertrain concepts

Light vehicle production

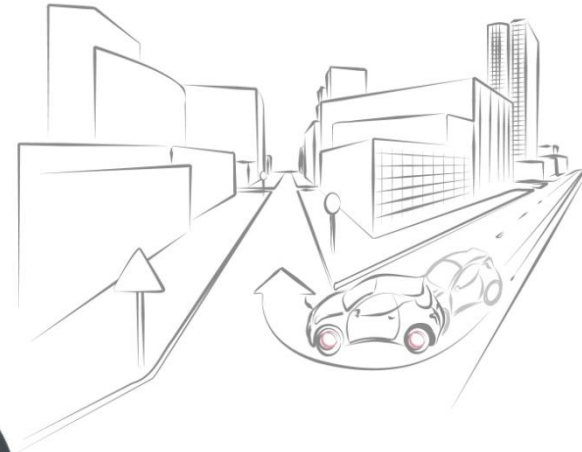


Source: : IHS 2013; University of Duisburg-Essen 2012





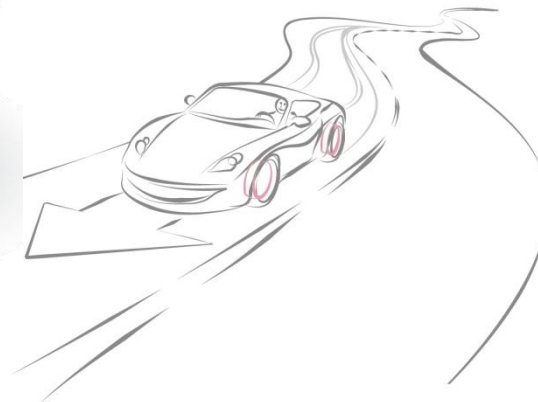
**Usable space**  
In-wheel drive train

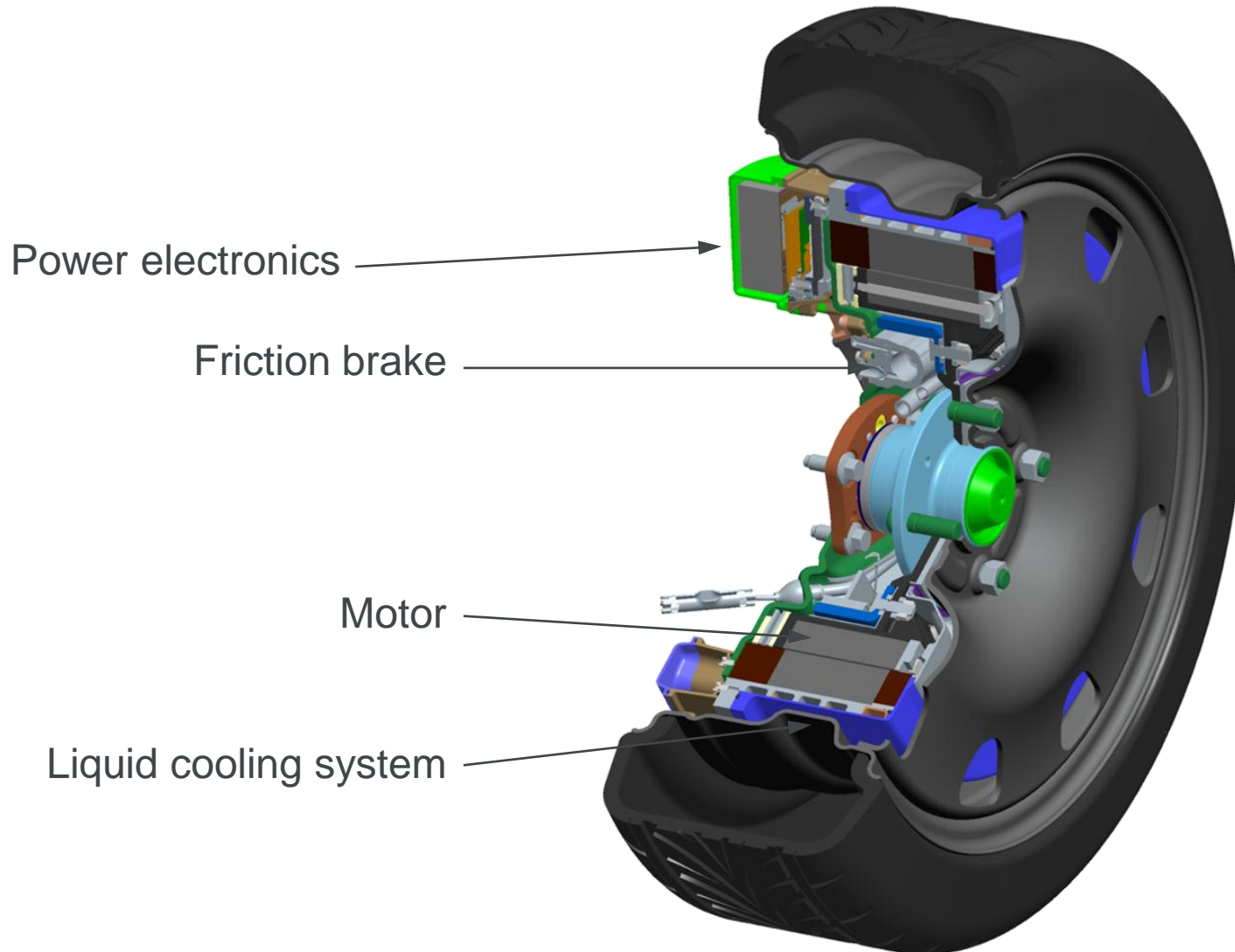


**Maneuverability**  
Extended steering angle

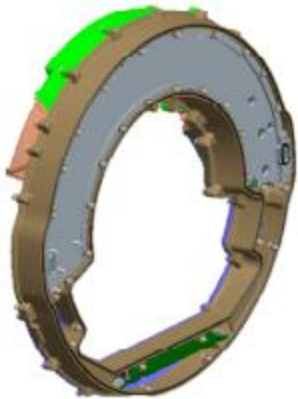


**Safety**  
High control quality





Power electronics  
and controller



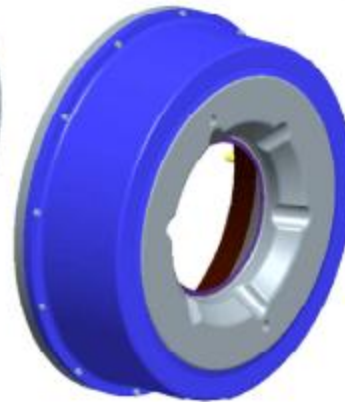
Stator plate  
(friction brake,  
wheel bearing)



Rotor



Stator  
with  
cooling



Tire with  
wheel rim

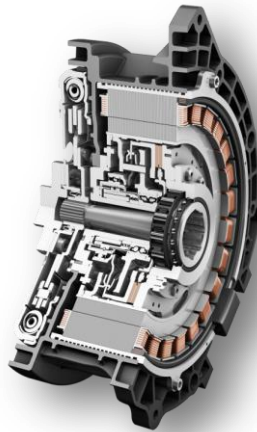
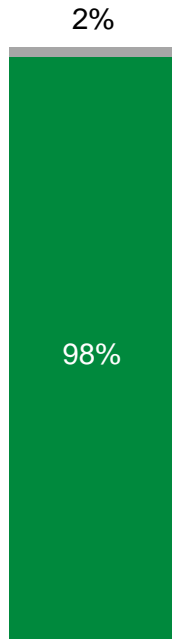


## Schaeffler's solutions

■ Combustion engines

■ Hybrids

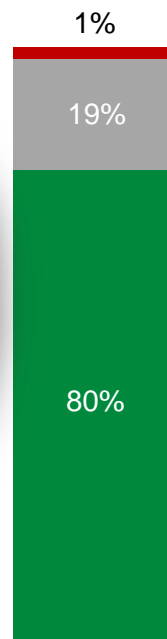
■ Electric



2013

### HYBRID MODULE:

- Modular Concept
- 15-30% FE
- P2 configuration



2020

### eAXLE:

- 48V or HV variants w or w/o TV
- Coaxial / in-parallel design
- 1-speed / 2-speed configuration



2030

### eWHEEL:

- Innovative product
- Integral compact design
- New vehicle configurations

“

**It is not the strongest or the most intelligent who will survive but those who can best manage change.**

”

**Charles Darwin**  
1809 - 1882