



HENRIK WENTZEL

Battery electric and plug-in hybrid vehicles



Zero-emission vehicles 2020

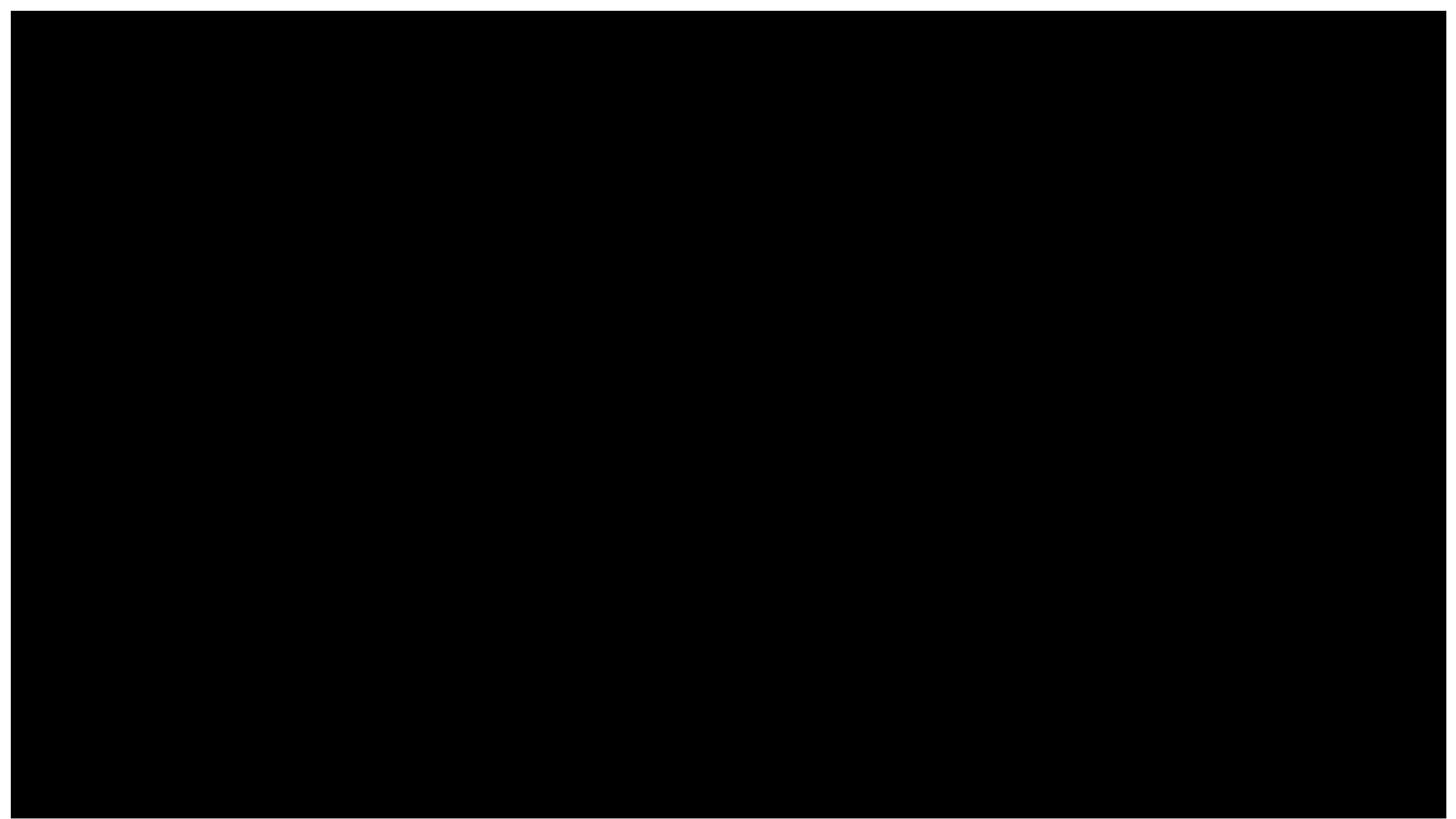


Main drivers in 2020

Public procurement
Zero-emission zones

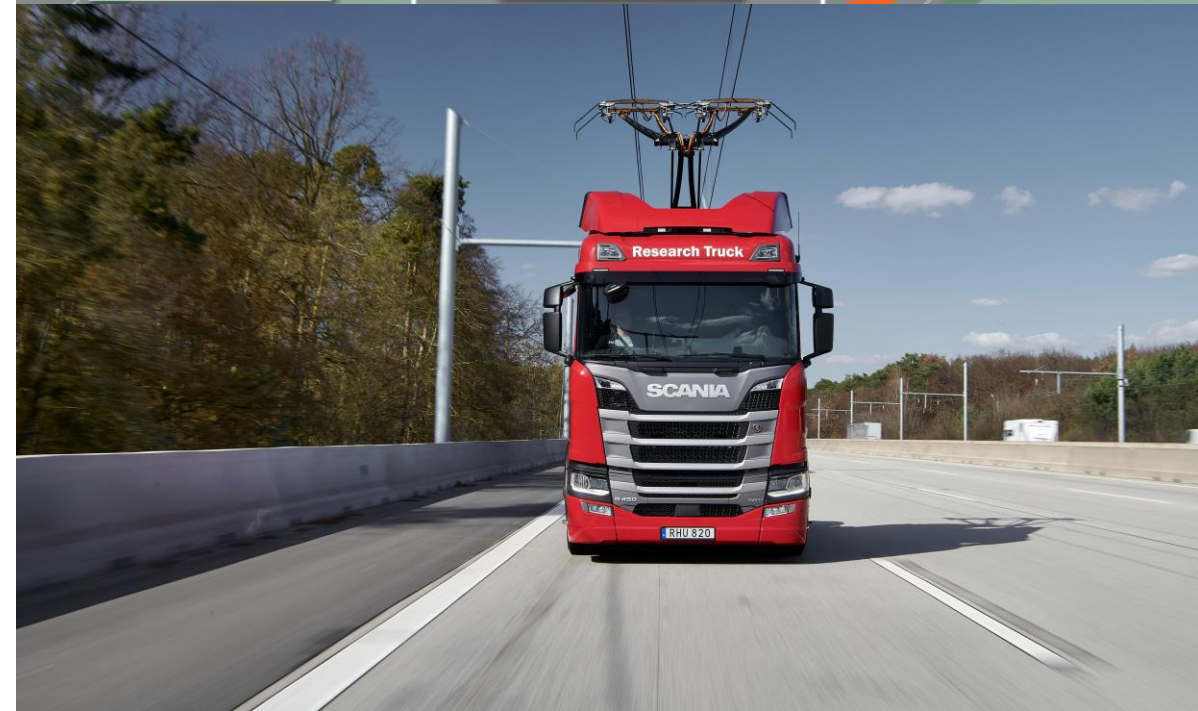
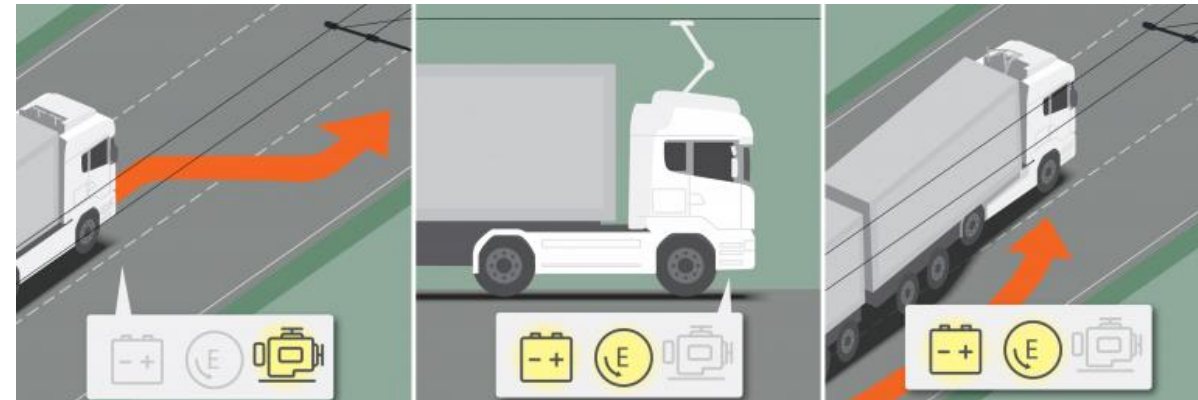
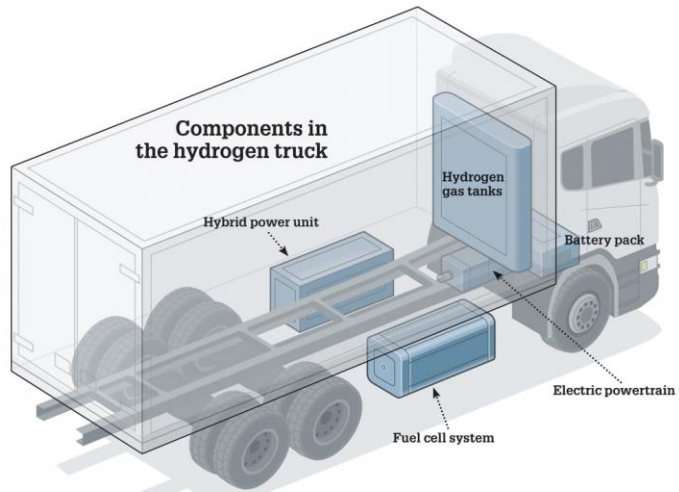
- BEV buses
- Hybrid trucks
- Prototypes E-highway, Fuel cell

Several certification discussions (safety, endurance brakes, emission certificates)



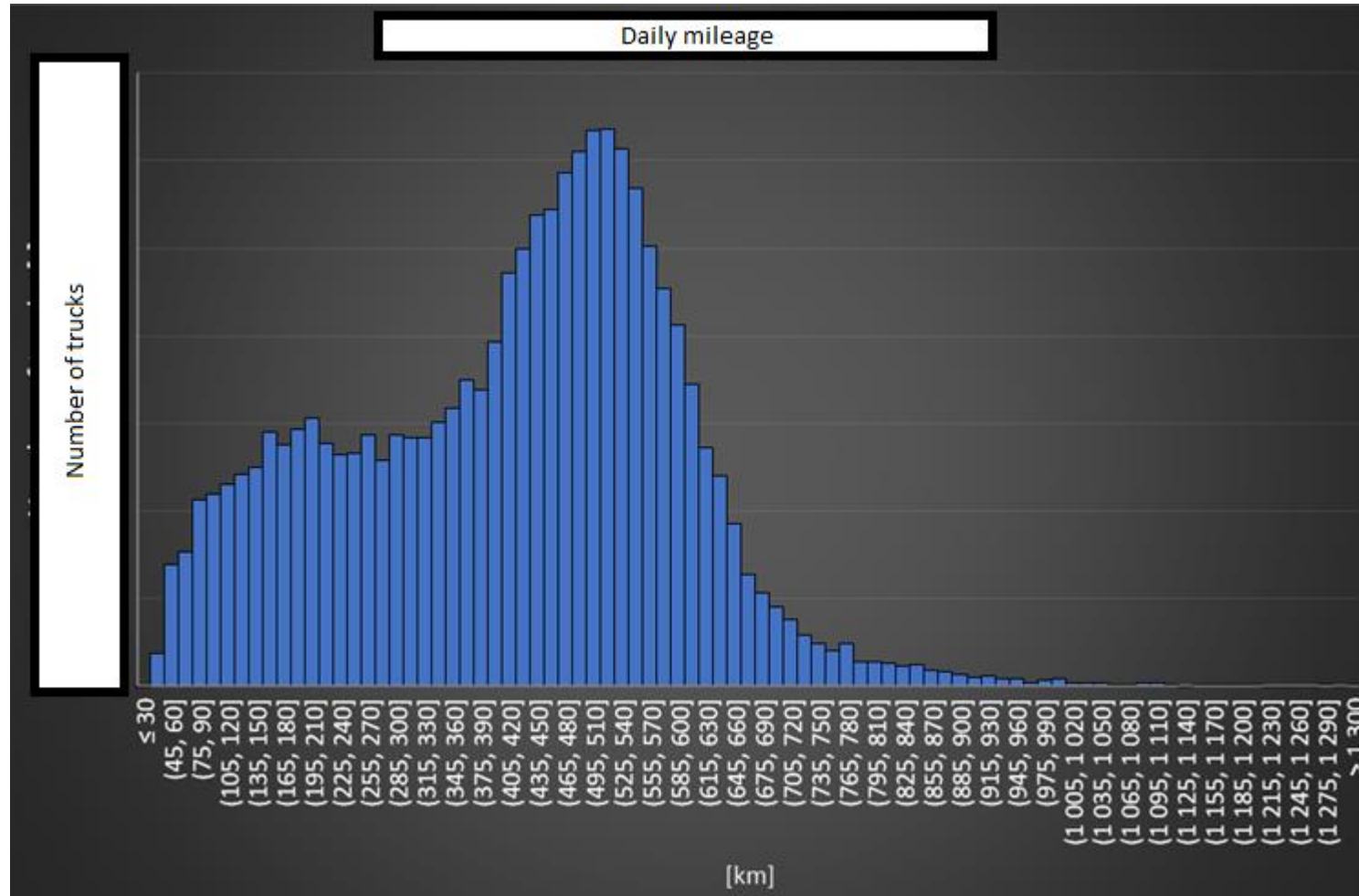


Fuel cell and e-highway prototypes

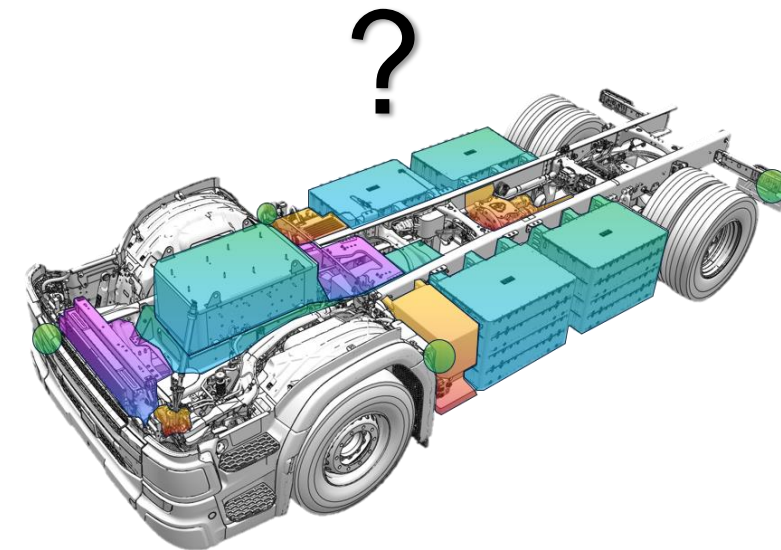




How much range is needed?



400 km range with 2 charges/24h.





Zero-emission vehicles 2025

- Bus-segment largely electrified, coaches not.
- Thousands of BEV long haul trucks (limited by infrastructure availability)
- Plug-in hybrids in same numbers as BEV
- Electric highways? Cheap hydrogen?

Main drivers 2025

Cost of operations

oil 60\$ / 159L vs. electricity (coal) 40\$ / ton

CO₂ emissions

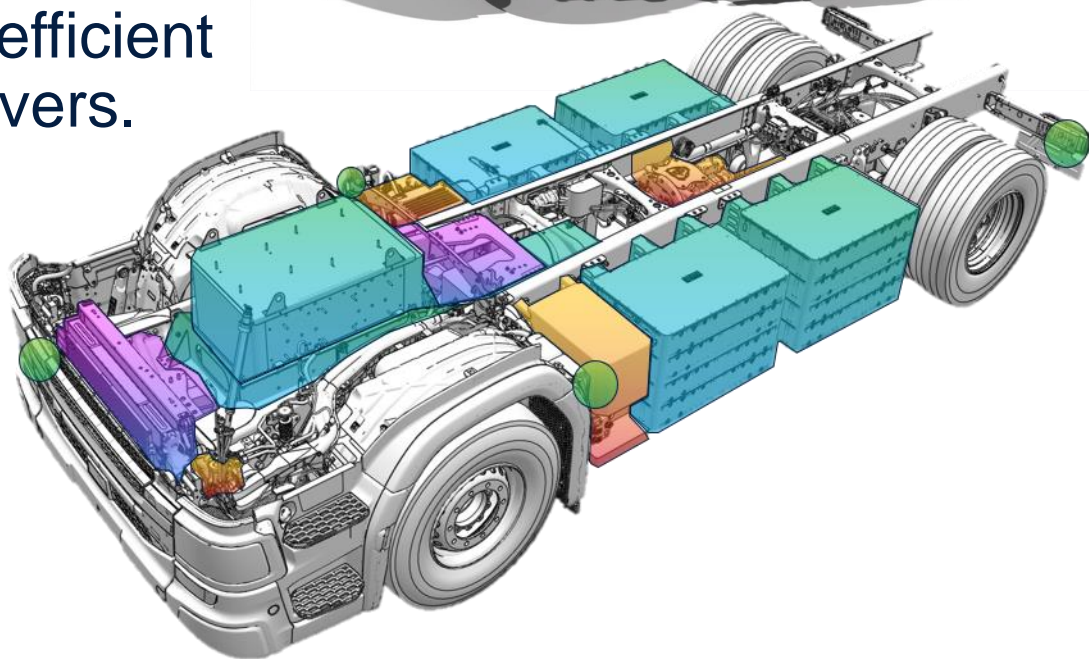
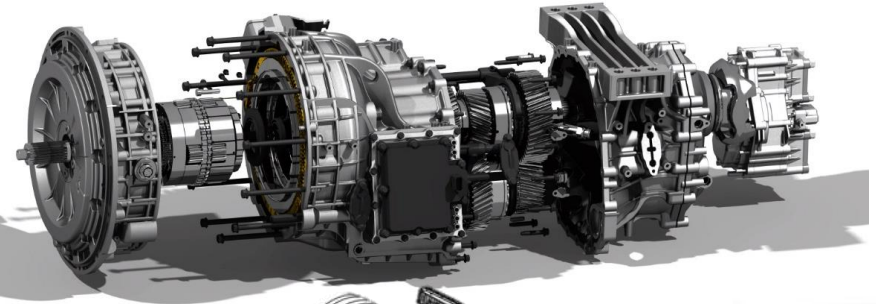
when electricity-mix is below 600 g CO₂ / kWh¹

¹required for life-cycle break-even in long haul operations.



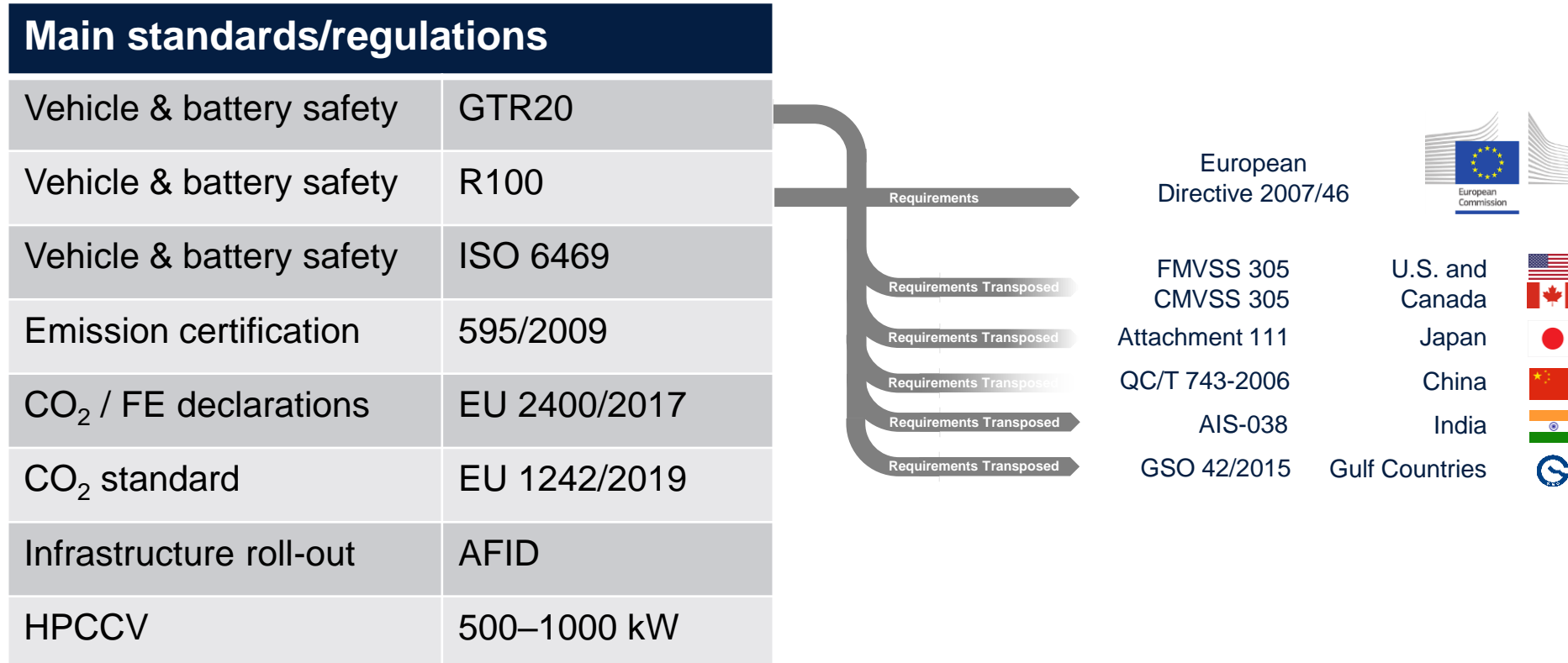
Product outlook

- Dedicated e-axles and hybrid powertrains creating torque-free shifting.
- Battery optimized chassis for long haul.
- Megawatt chargers to allow efficient operation of vehicles and drivers.





Main standards involved in the shift to electric





Updates in the working (1/2)

EU HDV CO2 certification 2400/2017

Work to estimate the CO₂ and energy use of Hybrid and Battery electric vehicles

Important to consider the utility of hybrids in a world with expanding charging infrastructure

EU HDV CO2 standard 1242/2019

Investigations on how to appropriately credit the utility of LZEV

Long haulage BEVs should be given larger incentives (super-credits) than distribution vehicles.

HPCCV - CharIN

Defining requirements for the connector in high power charging for commercial vehicles

>500 kW charging for CV is needed by 2023-2025.



Updates in the working (2/2)

UN GTR 20 – Phase 2

Risk to include a battery level thermal propagation test, but a more holistic approach is needed.

Current proposal is detrimental to energy density!

Vibration test profile under discussion
Elimination or strengthen?

Vibration test doesn't add safety, OEM tests are tougher & more relevant!

Overcurrent protection test for N3/M3 under discussion.

Meaningful for HPCCV – look forward!

UN Regulation No. 100 Revision 3

Definitive draft is already published

Scope discussions ongoing, how to handle mild hybrids.

Scope and definitions should be clarified!

Safety is improved in Whole vehicle and Battery terms. Documental justifications are admitted.

Meaningful and good improvements.

ISO 6469-1 Amd 1

Thermal propagation

A more holistic approach to fire hazard is needed! Repeatability is an issue with the Amd 1