Highly Efficient Drivetrains for the Mobility of the Future

Hannes Prenn, COO ePowertrain
I want to take you back 200 years, to a time before the invention of the motorcar, to old London Town, and the horse and cart, where the average travelling speed was just 13km/h.
Skip forward to today to modern megacity London, with cars not horses.

where the average travelling speed is still just 13km/h!
The CO₂ problem

While it might be a reduced rate, world population is increasing.

By year 2030 megacities will increase from 33 to 43.

Urbanization still progressing at constant rate.

World governments aim for drastic CO₂ reductions over the next 10 years.

It’s clear - We need to transform our cities, transform the cars of today and of the future.
We are changing the future now

We started way back in 2002 when we launched the first GKN eAxle

And later brought the first Active Connect AWD system to market

Continued developments in sideshaft lightweighting and CVJ efficiency

Let me show you what’s next
We have the solutions

- Modular, scalable solutions
- To fit every vehicle drivetrain architecture
- From zero drivetrain-electrification to 100%
- For Torque Classes between 2000 Nm and 6000 Nm axle torque and Power Classes between 50 kW and 300 kW
- Either fully integrated or modular
- Either single speed or multiple speed torque shift
- Twinster® as option

*) based on WLTP
We have the solutions

- For efficiency optimized AWD systems

*) based on WLTP
Active Connect Technology

- Traditional AWD amounts to a 6% CO2 penalty compared to FWD/RWD
- AWD Drivetrain efficiency improvement activities have a potential to reduce CO2 by around 1,5% compared to traditional AWD
- GKN’s Active Connect Technology has a potential to reduce CO2 by more than 5% compared to traditional AWD
GKN electrification roadmap

*) based on WLTP

Efficiency optimized AWD system

CO₂ Reduction %*

Level of electrification %
GKN electrification roadmap

We have the solutions

> For 48 V P4 systems

*) based on WLTP
48 V P4 Transmission Technology

14%
CO₂ reduction potential compared to ICE

> 48 V P4 transmissions for mild hybridization architectures
GKN electrification roadmap

*) based on WLTP

CO₂ Reduction %*

Efficiency optimized AWD system

Level of electrification %
Proprietary and confidential restrictions on title slide apply throughout this presentation

GKN electrification roadmap

We have the solutions

For Dedicated Hybrid Transmissions

*) based on WLTP
Dedicated Hybrid Transmission: Next Gen GKN Multimode Transmission

> Next Generation GKN Multi Mode Transmission
> Reduced system cost and improved traction
> 2 speed transmission
> GKN developed eMotor
> CVT input stage
> Only one eMachine

15% efficiency improvement on previous generation
GKN electrification roadmap

*) based on WLTP

CO₂ Reduction %*

Level of electrification %

Dedicated Hybrid transmission

Efficiency optimized AWD system
We have the solutions

> For P4 eAxles

*) based on WLTP
HV P4 Drive Units – Multiple concepts

45% CO₂ reduction

- Multiple P4 concepts to accommodate all packaging requirements
- GKN Coaxial eDrive Semi-Integrated System with Planetary Gear Set
GKN electrification roadmap

*) based on WLTP
We have the solutions

For fully integrated 3-in-1 EDUs for BEVs

*) based on WLTP
Full BEV

100% CO₂ reduction potential

- Fully integrated 3-in-1 eDrive unit for BEV
- GKN building blocks
- Fully integrated electric motor
- Integrated inverter with software to control park lock and cooling
- GKN Twinster® and/or multiple speeds can be implemented
Two further solutions

Multiple speeds?
eTwinster® 2-Speed

8% system efficiency improvement

- Coaxial integrated P4 architecture
- 2-speed torque shift provides significant system efficiency improvement and allows downsizing of eMotor
- **GKN Twinster®** technology

<table>
<thead>
<tr>
<th>Cycle</th>
<th>1 Speed</th>
<th>2 Speed</th>
<th>Improvement %</th>
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<tbody>
<tr>
<td>NEDC</td>
<td>1.36 kWh</td>
<td>1.24 kWh</td>
<td>9.4</td>
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<tr>
<td>WLTP</td>
<td>1.54 kWh</td>
<td>1.42 kWh</td>
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</table>
Two further solutions

Torque Vectoring by Twinster®?
Twinster – True Sailing

Amongst other benefits the Twinster technology provides True Sailing capabilities.

Coasting test in NEUTRAL from 130 km/h to 0

9% sailing efficiency improvement
GTD18 hybrid demonstrator

- Torque Vectoring on all four wheels
- True Torque Vectoring on rear drivetrain providing traction, stability, longitudinal and lateral dynamics
- True Sailing Capability
- Maximised all wheel drive capabilities

- GKN Twinster® in front axle
- GKN Twinster® in rear axle
- GKN 2-speed Gearbox
- GKN eDrive (eMotor and Inverter)
- GKN Controls
The vision of future mobility?
Transforming the future now

Highly efficient modular drivetrain solutions to fit every architecture

All levels of integration expertise

GKN Automotive. We make the drive