



INSTITUTE FOR ENERGY AND
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Climate-friendly road transportation – putting Electric Road Systems into context

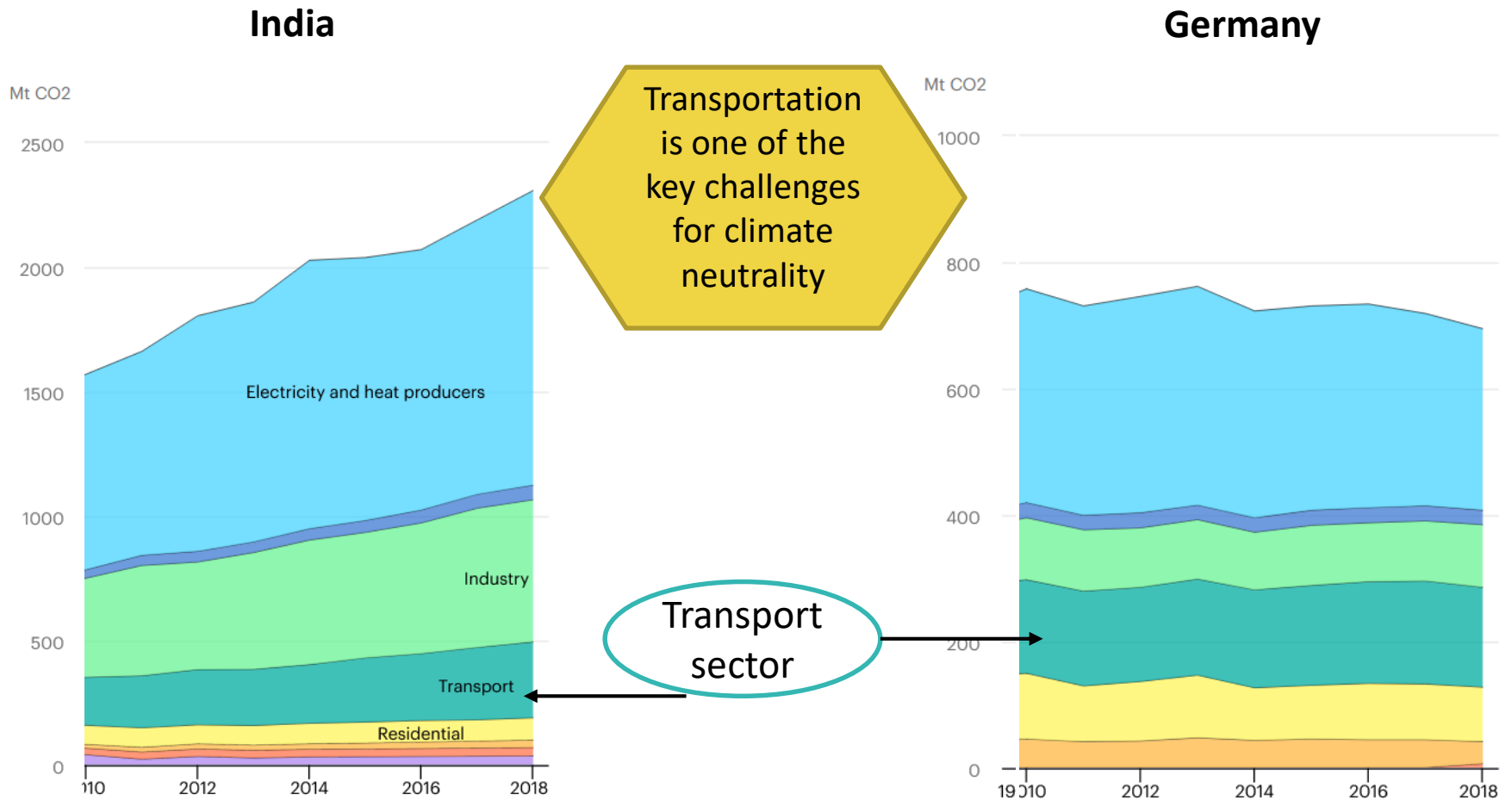
Julius Jöhrens | ifeu – Institute

Indo-German virtual workshop on innovative charging technologies
for heavy duty Vehicles (IChargeHDV) – February 18th, 2021



Wilckensstraße 3 69120 Heidelberg Telefon +49 (0)6 221. 47 67 - 0 Telefax +49 (0)6 221. 47 67 - 19 www.ifeu.de

National CO₂ emissions and the role of transport





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Challenge:

Decarbonize the transport sector!

...but which technologies to choose?

Requirements for technologies to rapidly decarbonize road transport

- **Effectiveness:** compatible with decarbonization (GHG reduction > 80 %)
- **Sustainable volume potential** for large market share
- **Commercial readiness** within sight (TRL >= 6)



Fossil fuels and natural Gas



1st and 2nd generation biofuels



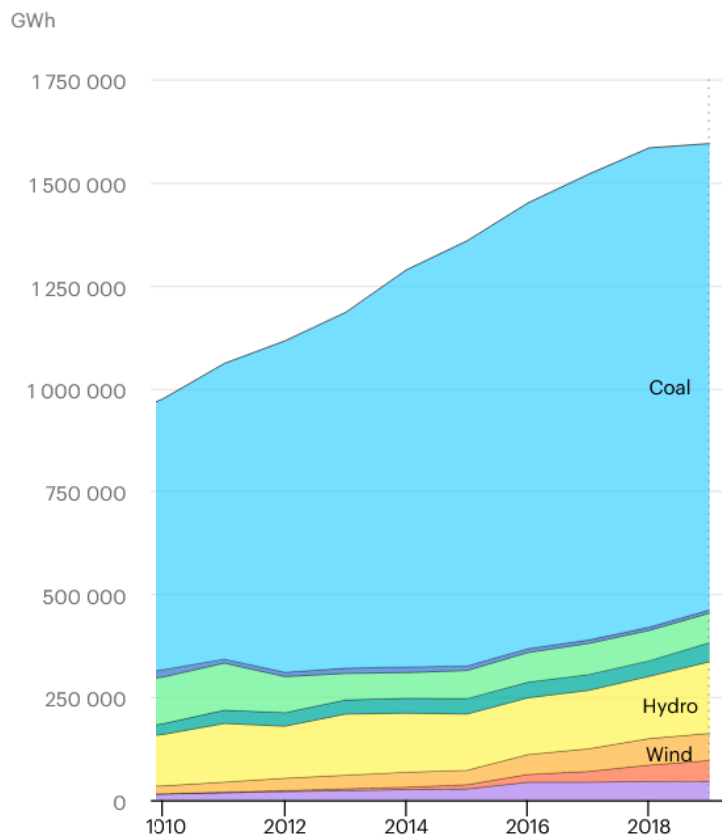
3rd generation biofuels



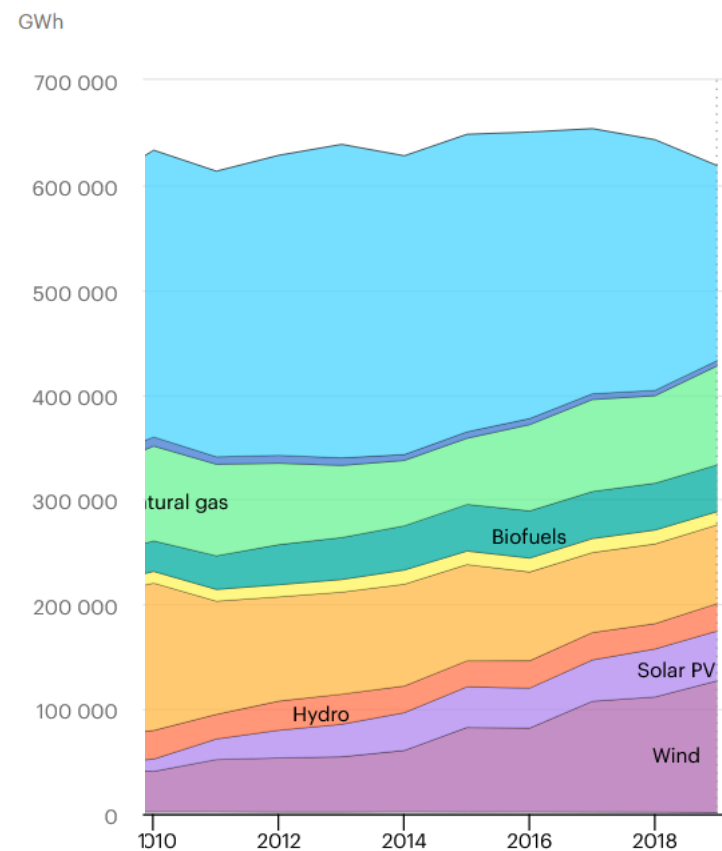
→ Real decarbonization in road transport will be (mainly) based on **electricity!**

National electricity supply by power sources

India

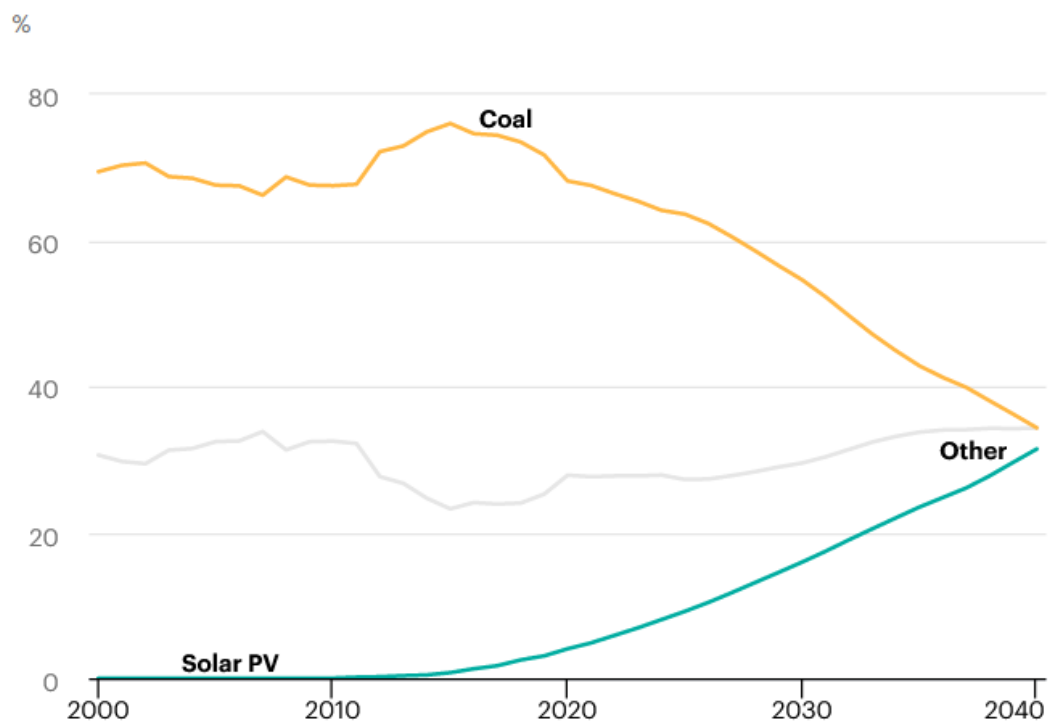


Germany



But the picture might change in India...

Changes in share of power generation in India in the Stated Policies Scenario, 2010-2040



→ To bring down CO₂-intensive coal as fast as possible, we need to use renewable power **most efficiently!**

Electricity-based drive technologies for HDV



Direct usage of electricity (Battery, catenary vehicles or a combination of both)



Hydrogen / fuel cell

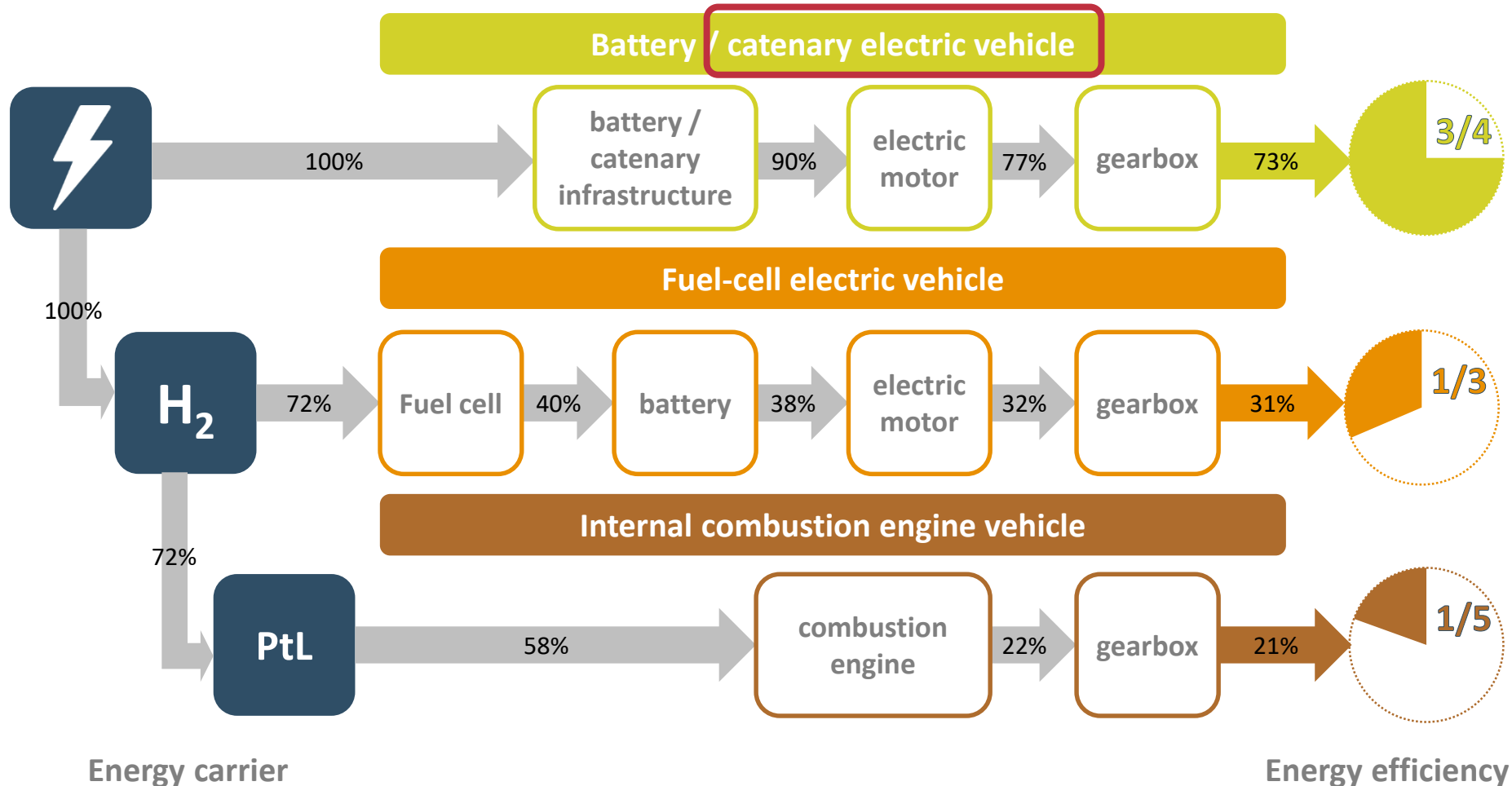


Synthetic eFuels / combustion engine

- All of these options rely on renewable electricity as primary energy
- Multiple hybridisation options exist

Comparing technology options

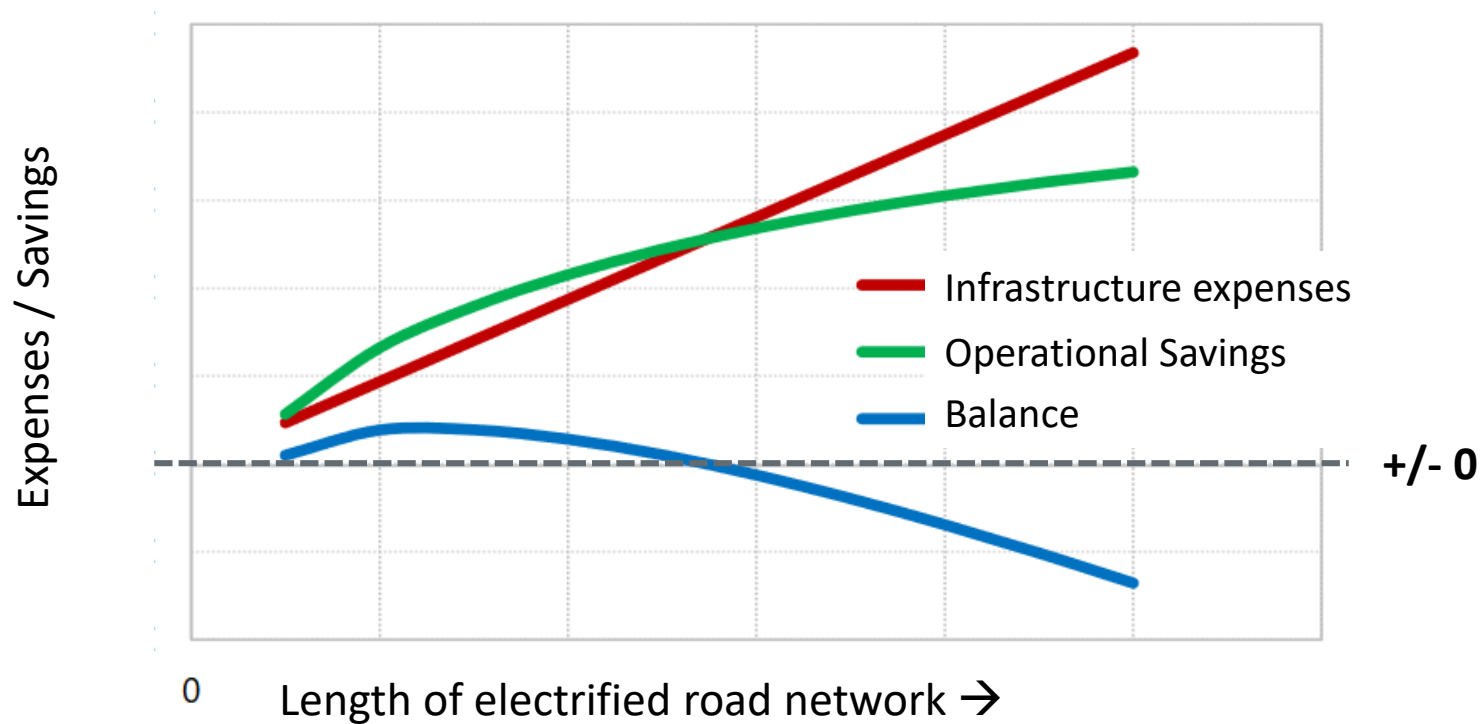
Energy efficiency



Cost characteristics of a catenary truck system

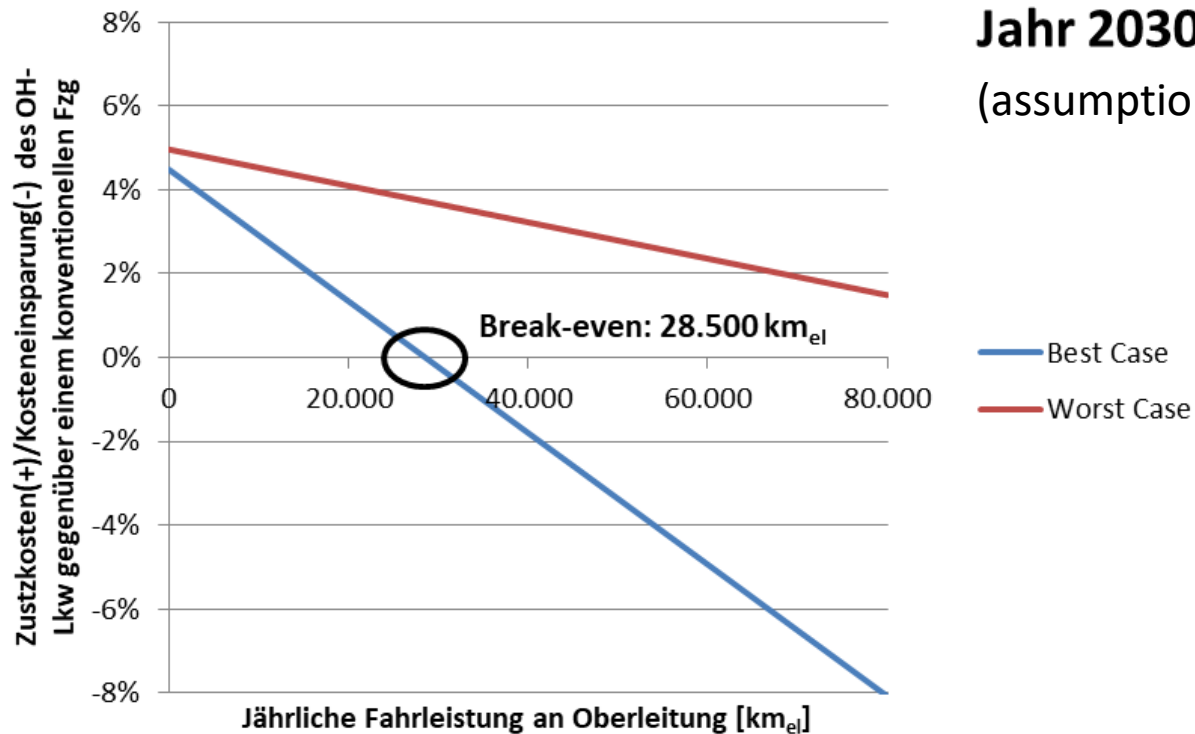
System perspective

Schematic, first-order approximation



→ Makes sense as a backbone for highly trafficked roads.

Cost characteristics of a catenary truck system Operator's perspective



For the German case, higher up-front costs are mostly offset by lower operating costs, provided that a sufficient overhead line network is available.

Operators' costs are highly sensitive to taxation / fiscal framework

How to tap CO₂ mitigation potential of catenary trucks



Pilot phase

Define a possible **role for catenary truck technology** in a sustainable transport system

Create a **major pilot** as a nucleus for future network expansion

Initiate a **business ecosystem** for catenary trucks (supply and operation of vehicles / infrastructure)

Aim at international standardization

Network phase

Push on **network expansion in a predictable way**

Align **fiscal framing conditions** with network expansion to ensure a high network utilization

Three recommendations...

- Think of an Electric Road System (ERS) just as an additional charging possibility for HDV while in motion. It will eventually make BEV trucks more efficient.
- Consider ERS-readiness when planning new infrastructure
- Align a potential ERS roll-out strategy with developments in the energy sector.



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Thanks for your attention!

Julius Jöhrens

(julius.joehrens@ifeu.de | +49-6221-4767-45)



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