



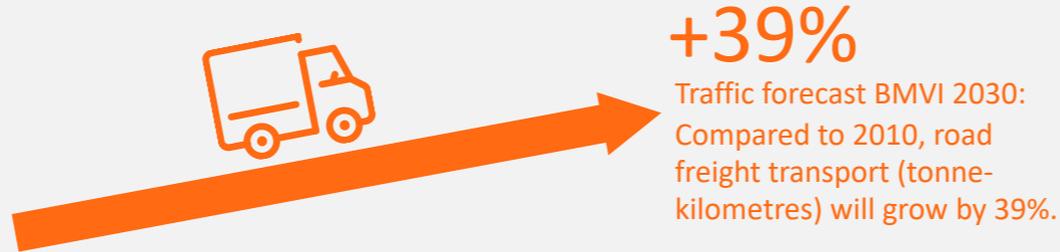
# The eHighway Future oriented technology

## Development of CO<sub>2</sub> emissions in Germany



### Emission CO<sub>2</sub> equivalent 2020

Road transport		146.000.000 t
Agriculture		66.000.000 t
Construction		120.000.000 t
Industry		178.000.000 t
Energy industry		221.000.000 t



**2030 -42%** (compared to 2020)

The Federal Government's interim target for 2030 is to save around 85,000,000 t CO<sub>2</sub> in the transport sector.

The Federal Government's goal is to reduce greenhouse gas emissions in the transport sector by

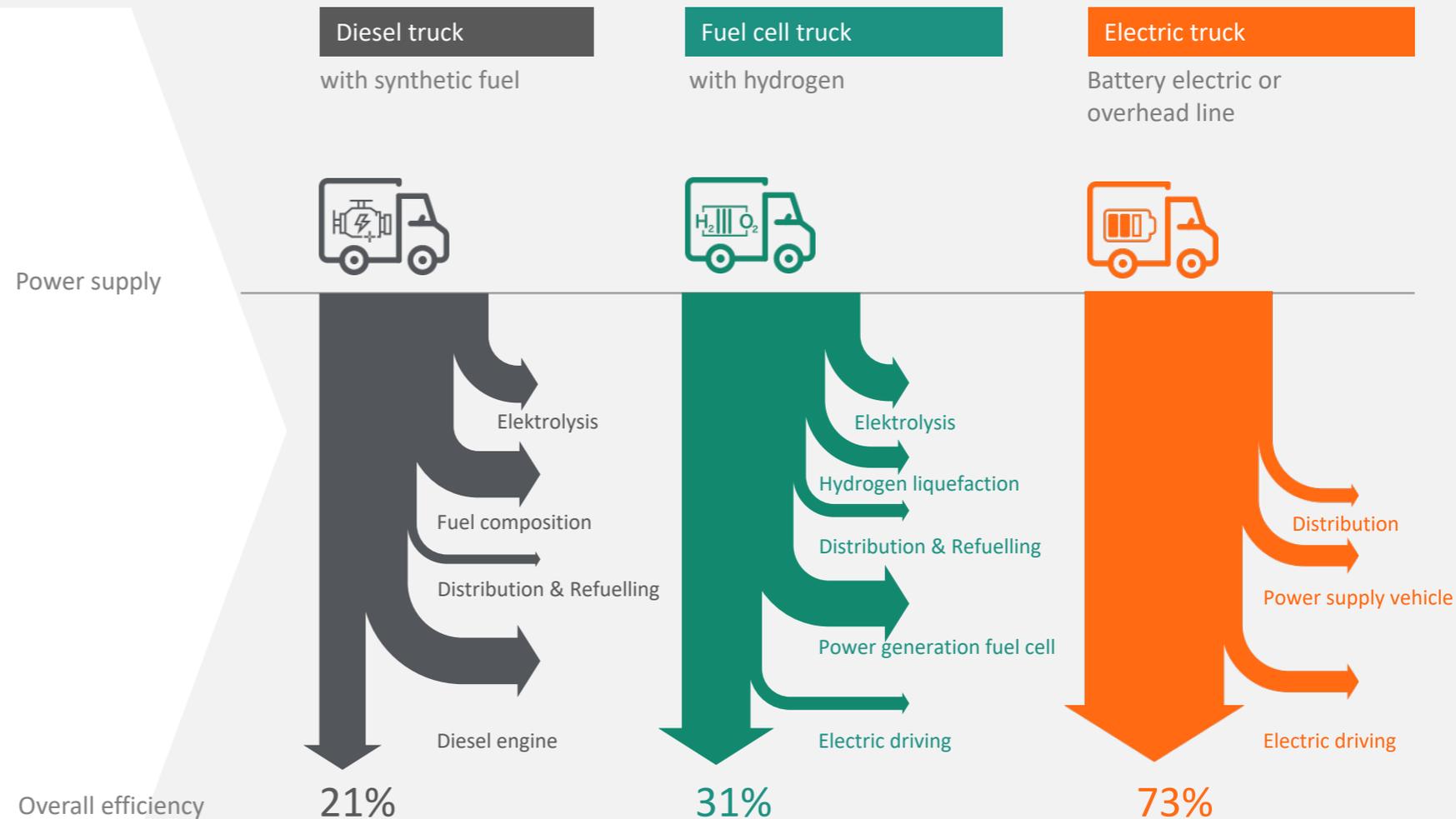
**2045 -78%** (compared to 2020)

## Motivation

Electric mobility is a central building block of an energy transition in transport.



- There is considerable potential for climate protection and pollutant reduction through alternative drive technologies for heavy commercial vehicles.
- Overhead-line-hybrid (OH) trucks have a particularly high potential to decarbonise the 40 t truck in long-distance transport.
- Heavy Goods Vehicle (HGV) traffic on the roads is growing and, without intervention, so are the corresponding CO2 emissions. This growth cannot be compensated by an expansion of rail freight transport alone.



Based on Kühnel et al. 2018 and Hacker et al. 2020

## Objective

The ELISA field trial is intended to provide a valid scientific scheme as a basis for decisions on a future application and expansion of the e-Highway technology.



- Within the field trial, electric driving of heavy commercial vehicles and their energy supply via overhead lines is tested.
- All relevant traffic and energy-related, ecological and economic aspects that are relevant for a later expansion of the system are examined.
- The functionality and reliability of the new vehicle and infrastructure systems can be tested in real-life operation.



## ELISA Pilot Line on the motorway "A5" Frankfurt – Darmstadt



### Framework conditions:

- Real-life operational environment
- High public visibility
- Practical testing of the capability to integrate the technology into real transport chains
- Integration into the *Test Field Germany* for cooperative and automated driving
- Eight lanes (four per direction), approx. 134.000 motor vehicles per day
- Approx. 10 % Heavy Goods Vehicle (HGV) traffic
- Total length: 10 km electrification of the right carriageway lane

If 30% of the German motorway network were equipped with overhead lines, around 80% of the heavy trucks registered in Germany would be able to drive electrified.

Source: Wietschel et al. 2016

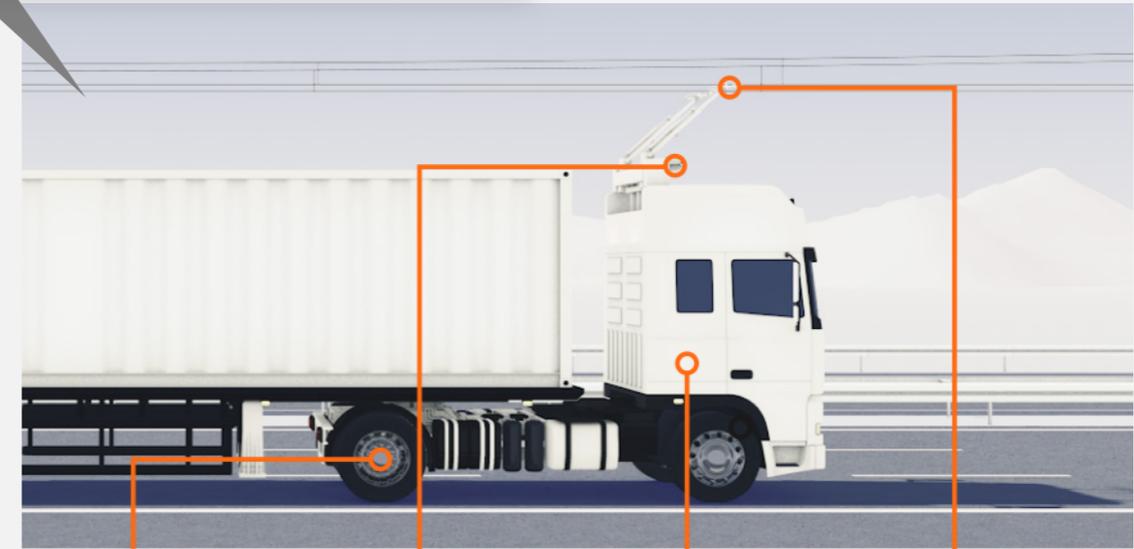


## Operating principle

eLISA

- When an OH-truck equipped with an electric motor and battery approaches the overhead line, the built-in pantograph is extended and contact is made with the overhead line.
- The electric motor is supplied with power and the battery is charged at the same time.
- As soon as the overhead line ends or the OH truck starts to overtake, the battery takes over the power supply of the electric motor.
- The power connection can be disconnected in moving traffic without reducing the speed.

75 % less fuel consumption



Braking energy is  
fed back



Sensors detect  
the overhead line



Hybrid driving



Innovative  
current collector

Source: Siemens Mobility GmbH 2018

With ELISA, 100% green electricity feeds the electric driving of the OH-truck directly via the current collector.

## Strategic framework



### German government

- Climate protection action program 2020
- National energy efficiency action plan

### Funding program of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

- "Renewable Mobile" program - Marketable solutions for climate-friendly electric mobility

#### ELISA I

Planning and construction of the infrastructure

01/2017 – 12/2018

#### ELISA II

Operation and Evaluation

11/2018 – 12/2022

#### ELISA III

Extension of the facility

07/2020 – 12/2022

### Affiliated partners:

- Die Autobahn GmbH des Bundes
- Technical University Darmstadt
- ENTEGA AG
- Siemens Mobility GmbH



### Associated partners:

- Spedition Hans Adam Schanz GmbH & Co. KG
- Ludwig Meyer GmbH & Co. KG
- Contargo GmbH & Co. KG
- Knauf Gips KG
- Merck KGaA







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