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Siemens eHighway

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Solution to reduce truck emissions

Transport Week Gdańsk, Poland, March 2015

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Freight will replace passenger traffic as main source of CO_2 emissions from surface transport

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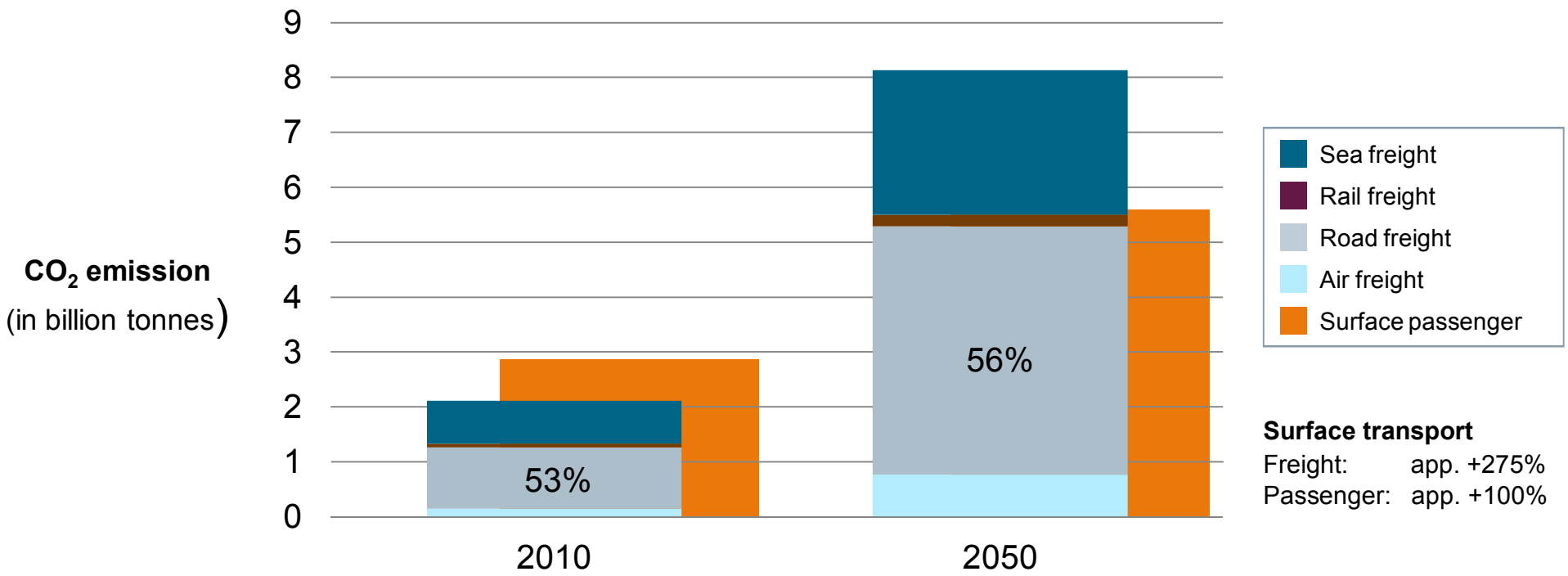
Global transport emissions, by mode



Surface transport
Freight: app. +275%
Passenger: app. +100%

Road freight will remain the majority emitter in the goods transport sector

Source: The ITF Transport Outlook 2015

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Possible development of CO_2-emissions from road freight in Germany

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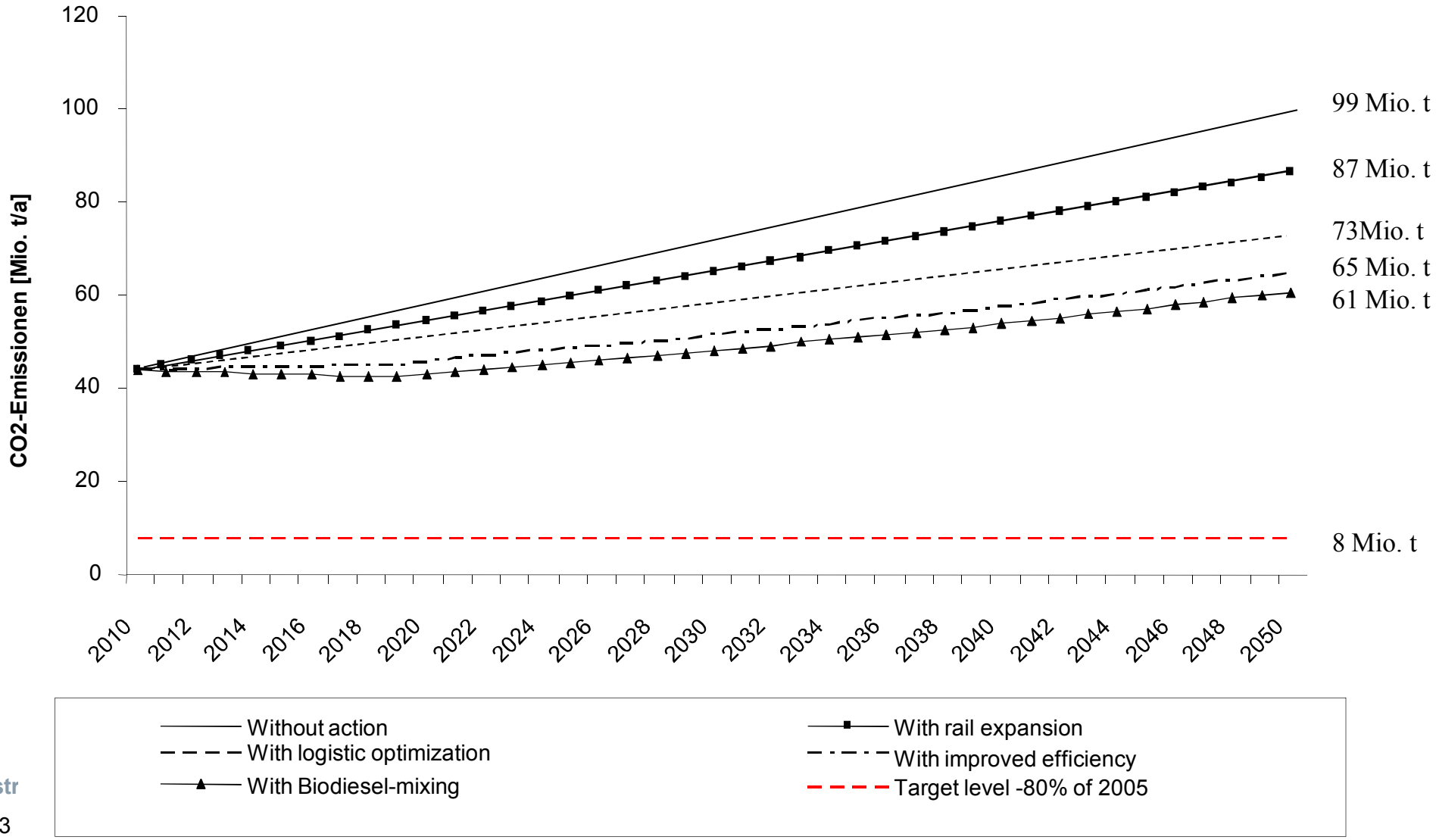
Source: German Ministry of Environment (BMU)



Overview alternative concepts

Investigated concepts comprise external power supply and on-board storage systems

External power supply

- **Contactless**
  - Linear s. motor concepts
  - Inductive power supply
- **Conductive**
  - Ground based contact line
  - Overhead contact line

On-board storage

- **Electricity**
  - Fuel cell
  - Capacitors
  - Battery
- **Alternative fuel**

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Overview alternative concepts – On-board storage

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On-board storage of renewable energy

	Description	Concerns
Biofuels	• Converting feedstock into fuels • Using internal combustion engines	• Incremental Land-Use Change(ILUC) • Supply & capacity constraints
Natural gas	• Compressed natural gas(CNG) • Liquefied natural gas (LNG) • Dual-fuel engines • Gas transmission & distribution	• Best case: small net CO_2 reduction • Methane leakage risks eliminating all CO_2 benefits, or even increase GHG effect • Power-to-Gas efficiency
Hydrogen	• Fuel Cell on board • Storage tanks on vehicle • Fuelling station • H_2-Production	• Maturity to technology and weight of tanks • Station CapEx and OpEx • Production Cost vs Saving of CO_2 • Energy efficiency and capacity constraints
Battery	• Static, stationary or dynamically charged	• Cost • Weight • Life-time • Availability of raw materials

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Overview alternative concepts – External power supply, with focus on Electric Road Systems (ERS)

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Investigated electric road systems supply power dynamically to vehicles while moving

External power supply

- **Contactless**
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ERS

On-board storage

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Inductive and conductive ground-based solutions for dynamic power supply

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Any system in the roadway will cause **interference** with normal operations

- During installation of electric road system (ERS)
- During maintenance & repairs of ERS
- During normal road surface maintenance

→High **complexity** of total road system, with increased life-cycle cost

Ground-based systems consist of **short (ca. 20m) segments**.

- For safety reasons a section can only be electrified when one vehicle is on it, and nothing else (people or vehicles)
- This requires both detection equipment and switches between the segments to turn them on and off at the right time

→**Complex** (and costly) electrical infrastructure

Inductive

- Dynamic power transfer efficiency low, especially at high speed
- Costs high and very uncertain
- Risks lane grooves and high wear

Conductive

- Objects and fluids can interfere with electrified section
- No long-term Pick-up experience
- Unsafe change in surface grip

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eHighway – electrification of hybrid trucks via an overhead catenary system

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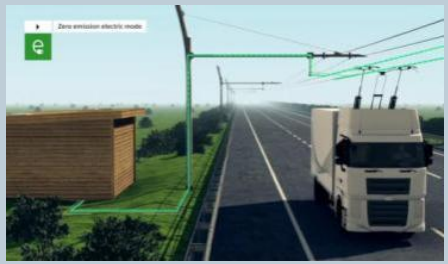
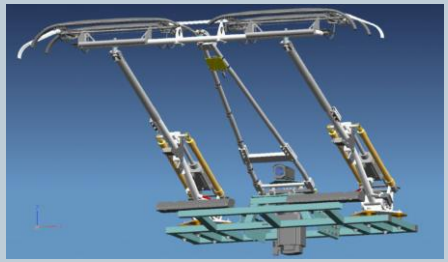
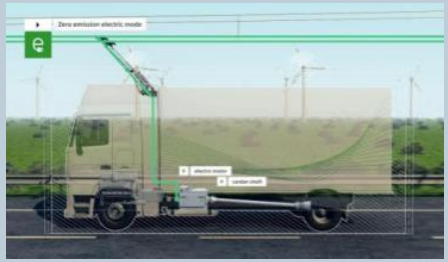
Electrification infrastructure



Active current collector



Hybrid-electric drive train



Advantages of eHighway

- **Open** and **proven** system with **scalability**
- Addition to existing road infrastructure **without direct interference**
- Improved **efficiency** by e.g. direct transfer of energy
- **Financing** of the infrastructure possible through **operative savings**

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Siemens eHighway Technology

Film clip

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eHighway improves truck performance and is readily implementable on a large scale

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No concessions on truck availability and performance

- No decrease on axle weight rating and load capacity
- Full electric operation up to maximum highway speed

Operability in all traffic situations

- Passing
- Cutting in / out of lanes
- Full electric idling

Adaptable to all situations

- Overhead line solutions for bridges, interchanges, tunnels and low clearances
- No system change in established point-to-point connections

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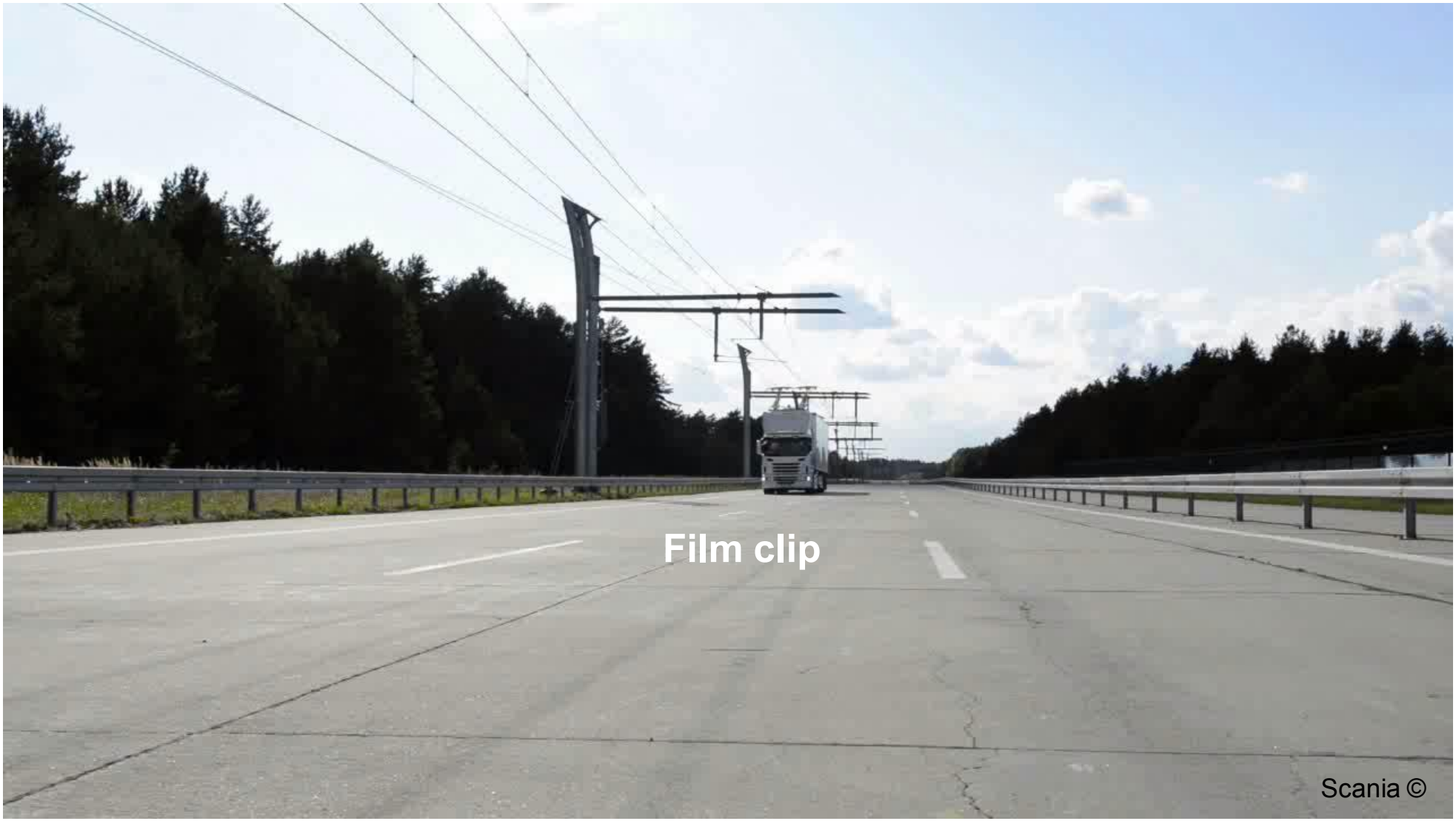
Siemens eHighway test track today



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Electrification is especially attractive on highly frequented routes

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eHighway application fields

Shuttle transport

- Solution for high frequency shuttle transport over short and medium distances (<50km)
- Lower fuel consumption and longer lifetime
- Reduction of air and noise pollution

Electrified long-haul traffic

- Economical and sustainable alternative for road freight transport
- Significant reduction of CO_2 emissions
- Substantial cost savings for freight carriers

Electrified mine transport

- Connection of pits and mines to storage or transit locations
- Minimization of harmful emissions
- Sustainable, clean and economical mine operation

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eHighway in the U.S. Demonstration project

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General project information

- Very high volume of road freight traffic due to the ports. **AQMD** (Air Quality Management District) is pursuing environmental relief for the LA metropolitan area
- Siemens eHighway concept as chosen solution
- **Goal:** To promote the implementation of zero emission goods movement technologies, and to demonstrate the most viable technology to be adopted for a future, regional zero-emissions corridor

Project scope

- One mile of infrastructure on Alameda St as connection to near-dock rail terminals.
- Different hybrid and zero-emission trucks supplied by Volvo Trucks and local truck manufacturers

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eHighway in Sweden
Pre-Commercial Procurement of demonstration

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Process Specifics

- **Trafikverket** (the Swedish Transport Administration) initiated an **Pre-Commercial Procurement Process** (PCP) for demonstration projects with **electric road systems (ERS)** for heavy transport (>16 tons) with a budget of app. **11,5 M€**
- Aim of the call: Realization of demonstration projects to evaluate **different ERS-technologies** prior to a potential introduction on the Swedish road network

Project scope

- 2 km of infrastructure on a highway
- Hybrid trucks supplied in cooperation with SCANIA

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eHighway is developing quickly and is ready for commercial use in near future

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Your port could be the first to benefit

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