Electrification of Heavy-Duty Vehicles

IEA HEV-TCP Task41 “Electric Freight Vehicles”
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IEA AMF ANNEX57 WEB SEMINAR
“Heavy Duty Vehicles — Recent and Future Options with Regard to Energy Consumption and Pollutant Emissions”
October 21st 2021, Online
Background

First steps are taken in electrification of freight vehicles:
✓ first products on the market
✓ first series of demonstration projects done
✓ problems are identified: costs, range, infrastructure etc.

Environmental targets tightened
– Paris 1.5 °C-target & air quality in EU
– EU targets for average CO₂ emissions from new lorries

Zero-Emission Freight Vehicles needed!

How to proceed?
– How is the system of OEM, logistic companies, leasing companies, city policies evolving?
– Which powertrain technologies are suitable for which application/transport task?
– Which policy framework is needed?
– What could/should be the contribution of EFV to CO₂-reduction?
**Task41 „Electric Freight Vehicles“**

**Programme of Work:**
Monitor of technological progress and analyse the potential contribution of electric freight vehicles to emission reduction targets

**Working Method:**
- Hosting stakeholder workshops for the exchange of information to a wider audience
- Desk research to provide information for dedicated discussion topics and summarize it in fact sheets/policy briefs
- Networking/cooperation with further (international) initiatives on (Electric) Freight Vehicles

**Running time:**
01/04/2019 - 01/04/2022

The State of the Art of Electric Freight Vehicles

- Task41 Electric Freight vehicles database consist currently of 330 entries (FHEV, PHEV, BEV, FCEV)

- A benchmark analyse of EFV was carried out using technical specification on the vehicle models and concept listed in the Task41 EFV database

Task41 Fact sheet on technical parameter of EFV [1]

How is the electric freight vehicle market developing?

<table>
<thead>
<tr>
<th><strong>Pick-up Trucks</strong> (N1 category)</th>
<th><strong>Vans</strong> (N1 category)</th>
<th><strong>Light Articulated Trucks</strong> (N2 category)</th>
<th><strong>Heavy Articulated Trucks</strong> (N3 category)</th>
<th><strong>Semi-trailer Trucks</strong> (N3 category)</th>
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How is the light electric freight vehicle market evolving?

**Pick-up trucks**
*(N1 category)*
- **BEV**
  - Alke ATX 330E [2]
  - Clean Motion Re:volt [3]

**Vans**
*(N1 category)*
- **HEV**
  - Ford Transit (PHEV) [4]
- **FCEV**

**Light Articulated Trucks**
*(N2 category)*
- **HEV**
  - Not available
- **FCEV**
  - Converted FCEVs on the market
- **BEV**
  - Mercedes-Benz eSprinter [6]
  - Fuso eCanter [9]

**Electric Light Duty Vehicles for urban Applications**

- In the pick-up segment, only BEVs are available (in small series).
- PHEV and BEV are already in series production in the vans segment; SOP of the first FCEV models announced for 2022.
- Light articulated trucks: First hybrid vehicles were sold in 2009 (e.g. by Mercedes Benz), but only a few BEVs are available in series production today; converted FCEVs are also on the market.
Experiences with Light Electric Freight Vehicles in urban applications

Challenges of EFV in city logistics
- Operationalization: range vs. payload; “secured payload for greater planning reliability”
- Invest risk: investment vs. operating costs; “too high investment costs result in return of investment above total cost of ownership”
- Perspective more loading zones necessary

Potentials of EFV in city logistics
- Attractiveness of the professional driver
- “Green” company image
- New financing concepts – leasing and rental in combination with BEV
How is the heavy electric freight vehicle market evolving?

**Electric Heavy duty vehicle for regional distribution and long-haul transport**

- First electric heavy articulated trucks for regional distribution in series production
- No series production ready alternatives but successful prototypes via pilot projects known for long-haul transport; from overhead catenary trucks in Germany, FC trucks in Switzerland to battery-electric trucks from Volvo

see also *Task41 Fact sheet about OEM Strategies and announcement on alternative powertrains see [1]*

**Semi-trailer Trucks**  
(N3 category)

- Scania R450 Hybrid [12]
- Hyundai Xient Fuel Cell [13]
- Daimler eActros [11]
- Volvo FE Electric [14]
Different powertrain options for long-distance transport depending on individual transport tasks

2nd Task41 online workshop on “Electrification of Heavy-Duty Vehicles in Long Haul Transport”, September 29th, 2020 with 40 attendances

MAN eTGM tests in Austria since 2018
- Nine 26-ton E-trucks operated in distribution transport
- Range of 200km is sufficient for the transport tasks
- Need for standardization of the charging process and communication

eHighways from Siemens on German Highways
- Development of the eHighways today in the 3rd generation = field trials (1st generation: Proof-of-concept, 2nd Swedish and US demonstration projects)
- three field trials in Germany with each around five km track length and five trucks in operation
Evaluation of powertrain and fuel options for heavy-duty vehicles to meet the EU CO2 emission fleet targets

Tailpipe CO₂ emissions in g per ton-kilometer for different powertrain and fuel options

Total CO₂ emissions in g per ton-kilometer for different powertrain and fuel options

Source: Task41 fact sheet „Evaluation of powertrain and fuel options for heavy-duty vehicles to meet the EU CO2 emission fleet targets“ [18]
First findings and outlook

- Conventional powertrain with fossil fuels are not compatible with EU CO2 fleet target in 2030
- Market-ready solutions with traction batteries for urban and distribution transport exist
- Combination of powertrain options is needed for long-haul transportation
- TCO parity, infrastructure availability and suitable regulatory framework are essential for scaling the EFV market
- Electrification of the freight vehicle market requires a holistic approach (incl. infrastructure roll-out plan, regulatory etc.)
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