EVS32 A world of E MOTION 2019 MAY 19 22
INTERNATIONAL ELECTRIC VEHICLE SYMPOSIUM & EXHIBITION
EVS 50th anniversary 1969-2019

Electrifying freight transport in Europe

An analyses of the current status and forecast of suppliers, technologies and developments with regards to the future of electric freight transport

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INTERREG Deutschland Nederland
Europäische Union Europese Unie
eGLM electric Green Last Mile
FIER Automotive & Mobility

Examples E-Truck projects - FIER

AH Online (NL):
25 Orten Crafters
+ 4 Fuso's E-Canters

DSV (DE):
1 EMOSS Truck

Technische Unie (NL):
1 EMOSS Truck

eGLM (NL+DE):
7 FRAMO trucks

Breytner/Vlot (NL):
2 EMOSS Trucks

Niinivirta (IT) :
2 EMOSS Trucks

Hoogwout (NL):
Full electric towing

Supported:

X 32

X 77

Realised:

X 55

Amsterdam elektrisch

City of Rotterdam

FRevue

Current suppliers of eTrucks in NW Europe

DAF Trucks (VDL)

EMOSS

GINAF

EFORCE

FRAMO

Orten

Examples of announcements by OEM's

VW / MB 4.250kg

Mitsubishi/Daimler FUSO eCanter (7,5t)

Volvo FL electric (16t) & FE electric (27t)

MAN eTGM (26t)

MB/Daimler eActros

Tesla Semi: Announced 2020 in Europe

eGLM, 44-ton transport, multiple use cases

CTV Multimodal Container Transport
Köppen
EULENBERG
Große Vehne Transporte + Speditions GmbH
Smurfit Kappa
BCTN
LIOF
FIER Automotive & Mobility
Nordrhein-Westfalen
provincie limburg
INTERREG Deutschland Nederland

eGLM project: What will be tested:

In different use cases, logistic processes, routings and distances

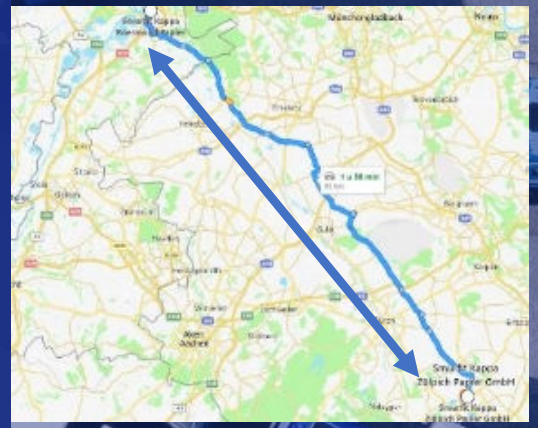
- Performance and behaviour of the vehicles and charging infrastructure
- Alignment of vehicle and charging infra-infrastructure
- Optimisation of the system: Routing, logistics planning and charging
- Performance and durability
- Analysing driver behaviour and satisfaction
- Testing multiple users per trucks and truck-sharing (increase utilisation)
- Models for the charging utilisation (public open, with reservation)
- Local & micro-grid impact

Test-environment for academics, manufacturers, transport, energy and others

Use cases examples

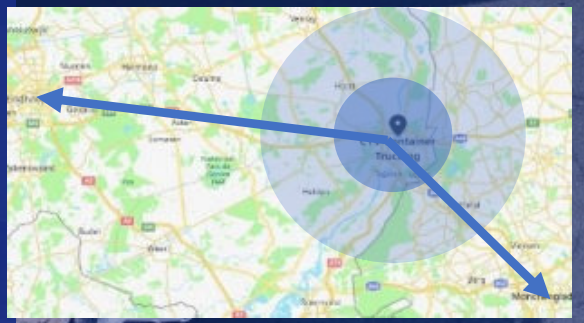
Case 1: Fixed routines, maximised distances

- 3 return trips a day between Cologne - Roermond (90 km one-way)
- 350kW chargers on both sides



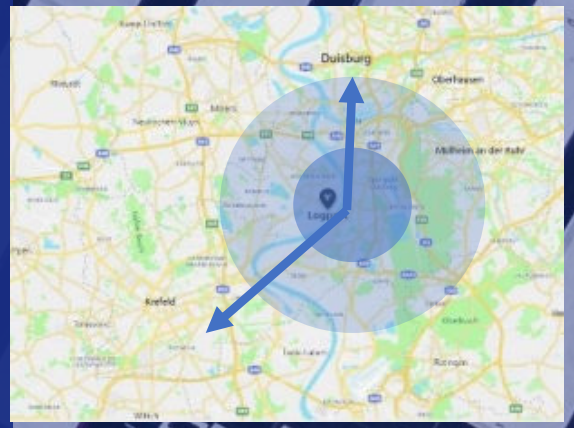
Case 2: Frequent and varying short distances: Venlo & Roermond

- Constant changing routes, (container) transport distribution
- 20 and 50 km
- 350KW charging at port terminals



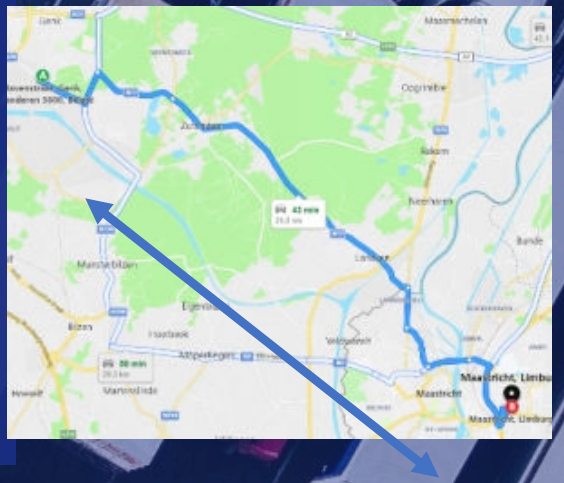
Case 3: Frequent and varying short distances (Duisburg port)

- Fixed & changing routes
- Tank container transport
- Short & occasional longer routes
- AC charging during container filling / Fast charging at port terminal



Case 4: Fixed routines, mid range

- Multiple short trips a day between Maastricht, Lanaken and Genk (max 26 km one-way)
- 44kW AC chargers during 2hours dock loading/unloading



eGLM vehicle

Market evaluation and tender :
Converters, niche and large OEM's

Specifications:

- FRAMO (Germany) / Based on MAN TGS
- 44 ton | 4 x 2
- 400 kW nominal, 495 kW peak power
- 9.161 Nm nominal, 11.885 Nm peak torque
- 90 km/h max speed
- 345 kWh net battery capacity, >150km range

First demo vehicle January; test-truck May; delivery 7 e-trucks July-November 2019

Result from market evaluation of vehicle supply

Based on 150KM range demand and 44ton GVW

Trucks:			
GVW	8.900 kg	⟷	9.700 kg
Range	135 km	⟷	175 km
Power	210 kW	⟷	600 kW
Torque	2.000 Nm	⟷	11.000 Nm
Battery capacity (net)	190kWh	⟷	350 kWh
Energy efficiency	1,3 kWh/km	⟷	2,4kWh/km
Service and Maintenance contracts (monthly)	€ 350	⟷	€ 600
Warranty (years)	1	⟷	8
Price level	€ 300.000	⟷	€ 345.000

eGLM charging infrastructure

Charging infra we will realise in the project:

Slow (night) charging:

- 5 x 50 kW CCS DC
- 3 x 44 kW AC (onboard converters, for flexibility)

Ultra-Fast charging:

- 5 x 350 kW CCS DC
- Near logistics operations: Reduce waiting
- Network in Ruhr-area (GER) and Limburg (NL)
- 4 chargers near inland port-terminals

Simultaneous developments in charging infrastructure

Charging	Connection	Location	When	For	< 2018	2019	2020	2021	2022	2023	> 2024
AC charging	**Plug: Type 2, industrial**	**Depot**	**Overnight, at the dock etc**	**All**	**22/44KW operational (overtaken by DC ?)**						**???**
Static DC fast charging	**Plug: CCS**	**Depot**	**Overnight, at the dock etc**	**All**	**20-50KW operational Smart charging**						
		Near operations/ destinations	**In logistic operations, breaks etc**	**All**		**150KW operational**		**150-350KW operational**			
		Rest area's	During breaks	Long haulage & mid-range			Battery electrification of long haulage and mid-range transport uncertain				**???**
	Panthograph	Near operations/ destinations	In logistic operations, breaks etc	?			Testing only for upcoming years, uncertain direction (Oppcharge standard?)				**???**
Dynamic charging	Panthograph / road conductive	On-the-road, near, logistic hotspots etc	While driving	?			Testing only for upcoming years, uncertain direction which dominant technology				**?**
Other fast/slow charging	Inductive / conductive underbody, swapping etc	Depot, on-the-road, near logistic hotspots etc	Overnight, in logistic operations, while driving	Depending on technology			Many different initiatives, different power ranges, and technologies only testing for upcoming years, uncertain direction.				**???**

Road to implementation

Past -2018:

- R&D projects: low TRL
- Quality& reliability problematic
- Low range
- Slow AC overnight charging
- Very expensive

- Individual test:
  - focus at vehicle

Now 2019-2021:

- Small series & OEM proto's
- Improved reliability
- Service, maintenance & warranty below expectations & expensive
- High purchase price limits uptake
- Higher battery capacities
- Ultra fast charging in operations

- Living labs:
  - Fleet integration
  - Logistics optimisation
  - Testing grid impact

Future 2022-:

- OEM's
- Increasing volumes
- Service, maintenance & warranty ➔ OEM standards
- Cost will go down (uncertainties)
- Grid limitations ➔ MegaWatts simultaneous charging

- Large scale implementation:
  - Electric fleets
  - Smart & planned charging integrated in routing
  - Logistics planning: competitive edge

Maturing of the market

Expected future of electric freight transport

- Forecasted price drop → not happened → not followed decreasing battery prices
- Large purchase price difference with diesel truck, now and upcoming years
  No signs yet (outside Tesla) that OEM prices will be substantially lower soon
- Despite low operational cost, no viable business cases yet: in standard segments and most countries (some countries like Norway positive business case)
- Towards TCO neutrality:
  - Stimulating uptake: Public incentives, privileges & restrictions (environmental zones)
  - Smart logistics planning and ultra-fast charging (limited driving range)

<u>Higher OEM volumes & purchasing power ← → Higher demand</u>

Invitation to **join forces**! We can build the demand **together**!

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