Retrofit Concept for Dynamic Charging of Battery-electric Trucks

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RWTH Aachen University

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Motivation

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The BEE Project

Project idea

Retrofitting BEV trucks with pantograph system and testing in field trials

- ***1 university***
- ***2 prototypes***
- ***4 test tracks***

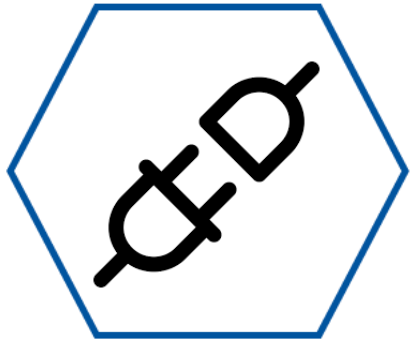
Erneuerbar mobil

Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

Associated partners:

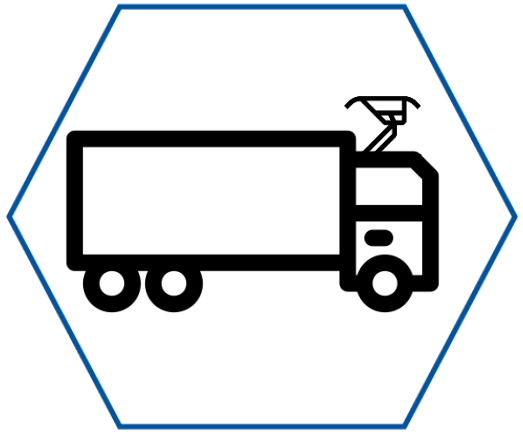
CONTARGO® trimodal network
DAF
DSLV Bundesverband Spedition und Logistik
MERCK
RHENUS LOGISTICS
SIEMENS

Project Goals



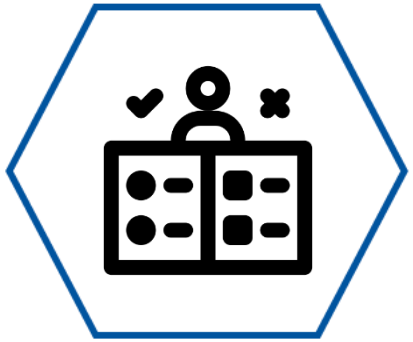
Interface development

Development of a system interface for the standardized integration of overhead line technology together with vehicle and component manufacturers



Road testing

Test drives on public roads with vehicles of different powertrain technologies for direct technology comparison



Technology assessment

User studies with drivers from the logistics industry, evaluation of stakeholder input and validation with gathered data from prototypes

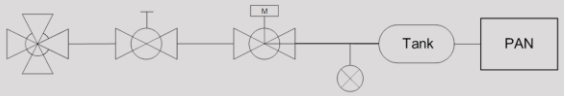
Interface Development

Mechanical

- Mounting according to body builder guidelines of OEM
- Frame adapter is modular adaptable to different frame geometries

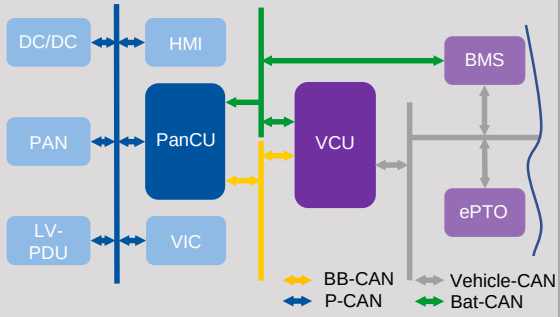
Pneumatic

- Connected to auxiliary circuit of compressed air system
- Disconnection of compressed air system via LV-connection as a safety function



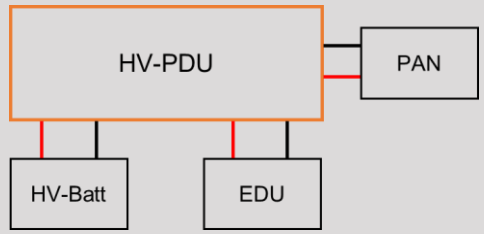
Communication

- Reading of relevant vehicle communication
- Active communication with vehicle via body builder CAN
- PAN tower has own ECU

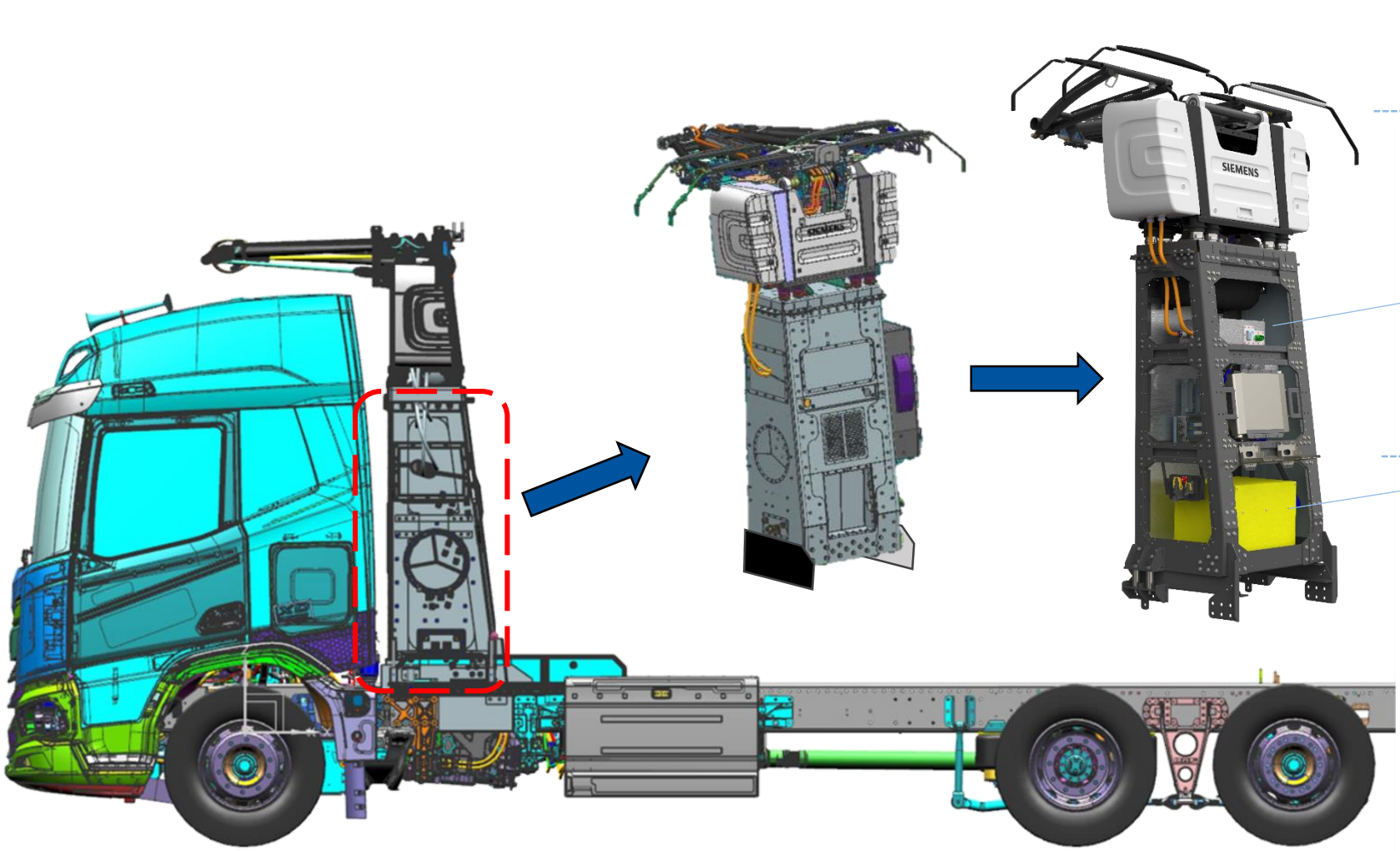


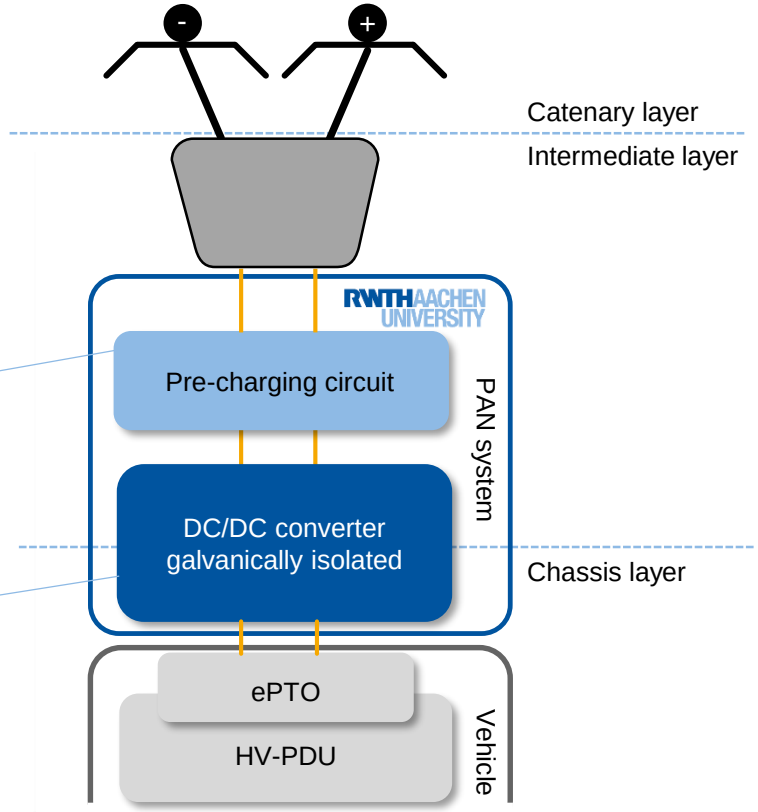
Electric

- Connection to HV system via ePTO
- Interface must function bi-directional
- Limiting factor for power
- LV supply for PAN components



Integration Concept





Road Approval

Vehicle with type approval

RDW

E4 THE NETHERLANDS

COMMUNICATION

Concerning [1]:
~~approval granted~~
approval extended
approval refused
approval withdrawn
production definitely discontinued

of a type of vehicle/~~component separate technical unit~~ [1] with regard to Regulation number 10.

Approval number: E4*10R06/01*0154*01

1.	Make (trade name of manufacturer)	: DAF	
2.	Type	: EMC_BEV_00	
3.	Means of identification of type, if marked on the vehicle/~~component separate technical unit~~ [1]	: N/A	
3.1.	Location of that marking	: N/A	
4.	Category of vehicle	: N3/ N3S / N3G/ N3GS	
5.	Name and address of manufacturer	: DAF Trucks NV Hugo van der Goeslaan 1 5643 TW Eindhoven The Netherlands P.O. Box 90065 5600 PT Eindhoven The Netherlands	
6.	In the case of components and separate technical units, location and method of affixing of the approval mark	: N/A	
7.	Address(es) of assembly plant(s)	: DAF Trucks NV Hugo van der Goeslaan 1 5643 TW Eindhoven The Netherlands or Leyland Trucks Ltd Croston Road Leyland, Preston Lancashire PR26 6LZ United Kingdom	
8.	Additional information (where applicable)	: see Appendix below	

Type-approval Department

Road Approval

Vehicle with type approval


RDW

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THE NETHERLANDS

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Concerning (1)

- approval granted
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- approval refused
- approval withdrawn
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of a type of vehicle/component/separate technical unit (1) with regard to Regulation number 10.

Approval number: E4*10R06/01*0164*01

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2.	Type	: EMC_BEV_00
3.	Means of identification of type, if marked on the vehicle/component/separate technical unit (1)	: N/A
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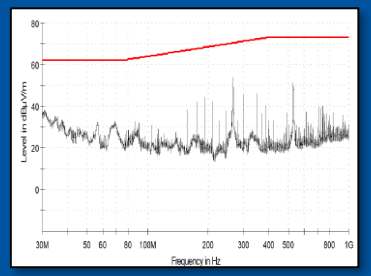
Type-approval Department

Page 1 of 3

EMC Testing

- Testing according to ECE R10
- Interference resistance & emission



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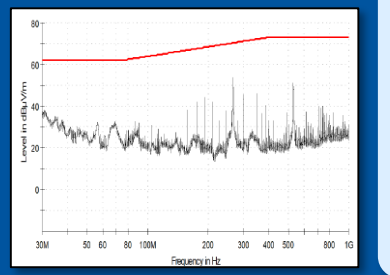
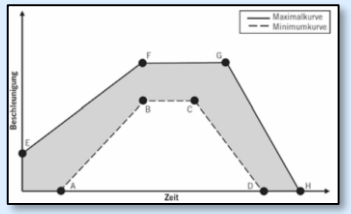
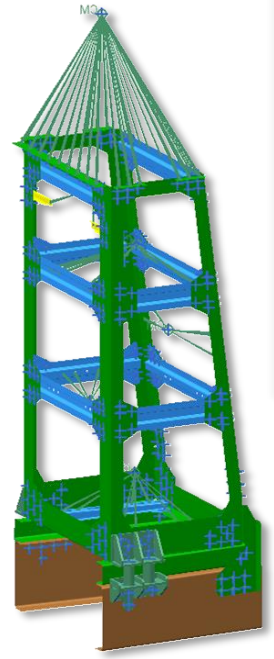
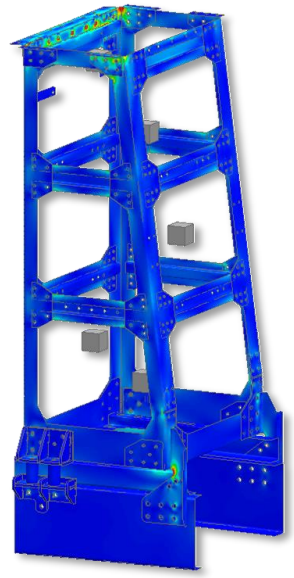


Mechanical testing

- Proof of mechanical strength through simulation
- ECE R100 load cases







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Vehicle with type approval


RDW

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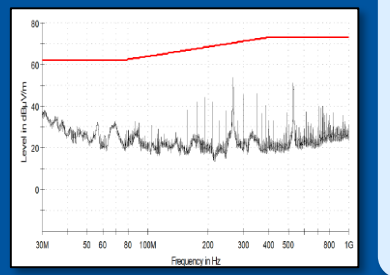

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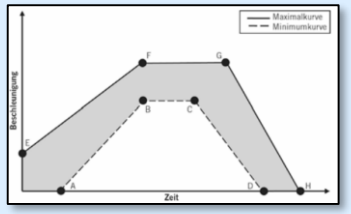

Electrical testing

- Testing according to ECE R100
- Measuring equipotential compensation
- R100 conformity

Road Approval

Vehicle with type approval


RDW

E4

THE NETHERLANDS

COMMUNICATION

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Approval number: E4*10R06/01*0184*01

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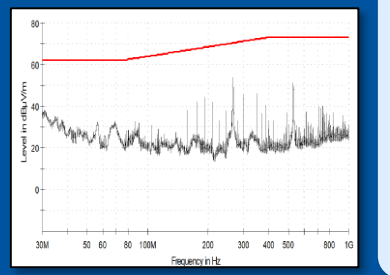

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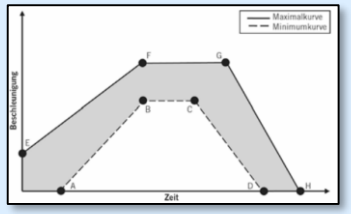

Electrical testing

- Testing according to ECE R100
- Measuring equipotential compensation
- R100 conformity

Road approval through alteration acceptance

BEE
BEV Goes eHighway

Road Approval

ika | PEM | RWTH AACHEN UNIVERSITY

- ***Approval of base vehicles***
- ***Registration of PAN tower via alteration acceptance***
- ***Registration of PAN system according to R 10 and R 100 via alteration acceptance***

GUTACHTEN zur Erlangung der Betriebserlaubnis gemäß §21 StVZO (§19(2) StVZO)

1 Fahrzeugbeschreibung

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J	N3	4	BA08				18	11910			19	2550				
E	XLRASF5E0[redacted]	3	0				20	3995			G	12145				
D.1	DAF						12	-	13	-	Q	-				
D.2	F53N3						V.7	-	F.1	28000	F.2	26000				
	-						7.1	8000	7.2	13000	7.3	8000				
	-						8.1	8000	8.2	11500	8.3	7500				
	-						U.1	-	U.2	-	U.3	73				
D.3	XD FAN Electric						O.1	-	O.2	-	S.1	2	S.2	-		
2	DAF TRUCKS (NL)						15.1	315/70R22,5 156/-L								
5	Fz.z.Gü.bef. >12 t						15.2	315/70R22,5 -/150L								
	BA ATL/Containeraufbau						15.3	315/70R22,5 156/-L								
V.9	-						R	-	11	-						
14	-						K	-								
P.3	Elektro						6	-	17	E	16	HF912926				
10	0004	14.1	-	P.1	-		21	-								
22	Fz.entspr.96/53/EG Art.9a*zu(5):m.BDF-Aufbau Typ SDG Segment*zu(8.2):Achsabst.1400mm,Achs lastverteil.11,5:7,5*20,G: m. Pantographen / Oberleitungsstromabnehmer; Ausfahren des Pantographen nur erlaubt auf zugelassener Teststrecke***															

- **Retrofitting BEVs for dynamic charging works!**

Road testing

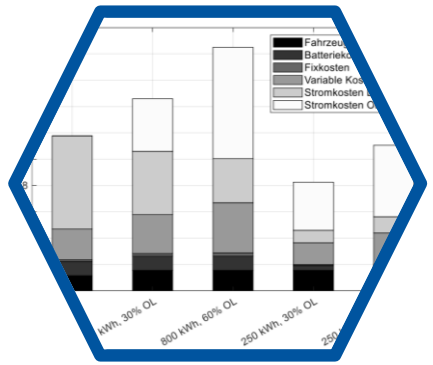
Testing at FESH on A1 (Hamburg – Lübeck)

Testing at ELISA on A5 (Frankfurt – Darmstadt)

Project Outlook

Interface development Completed

Road testing 2024-2025



Technology assessment 2025

BEE
BEV Goes eHighway

Thank you for your attention

Find out more:
www.bee-ehighway.de

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Internet www.ika.rwth-aachen.de

Supported by:

Federal Ministry
for Economic Affairs
and Climate Action

on the basis of a decision
by the German Bundestag