ZEFES survey results
Session I: Supply chain needs

ZEFES project

Aim ZEFES survey

Preliminary results

www.zefes.eu

Stefanie Van Damme (ALICE)
Stefanie.vd@etp-alice.eu

Maximo Martinez (ALICE)
Maximo.martinez@etp-alice.eu

Ted Zotos(IRU)
Ted.zotos@iru.org

Holger Loewendorf (IRU)
holger.loewendorf@iru.org

Funded by the European Union

Project funded by
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Partners

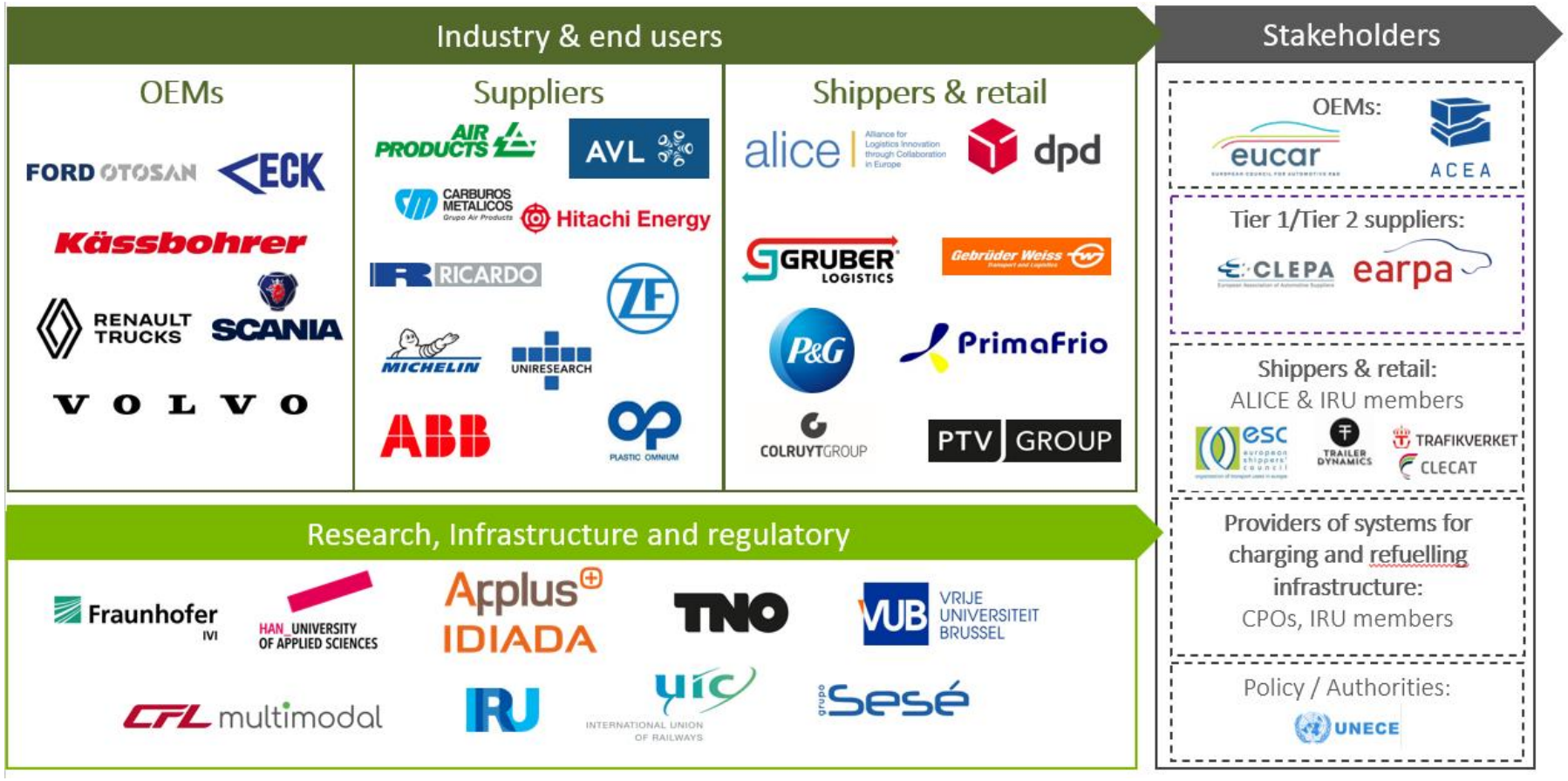
40 Partners
- 6 OEM's
- 14 Suppliers
- 11 Shippers & retail
- 9 Research

Start date 01 January 2023

Duration 42 Months

6 Battery electric trucks

3 Fuel cell electric trucks



Funded by the European Union

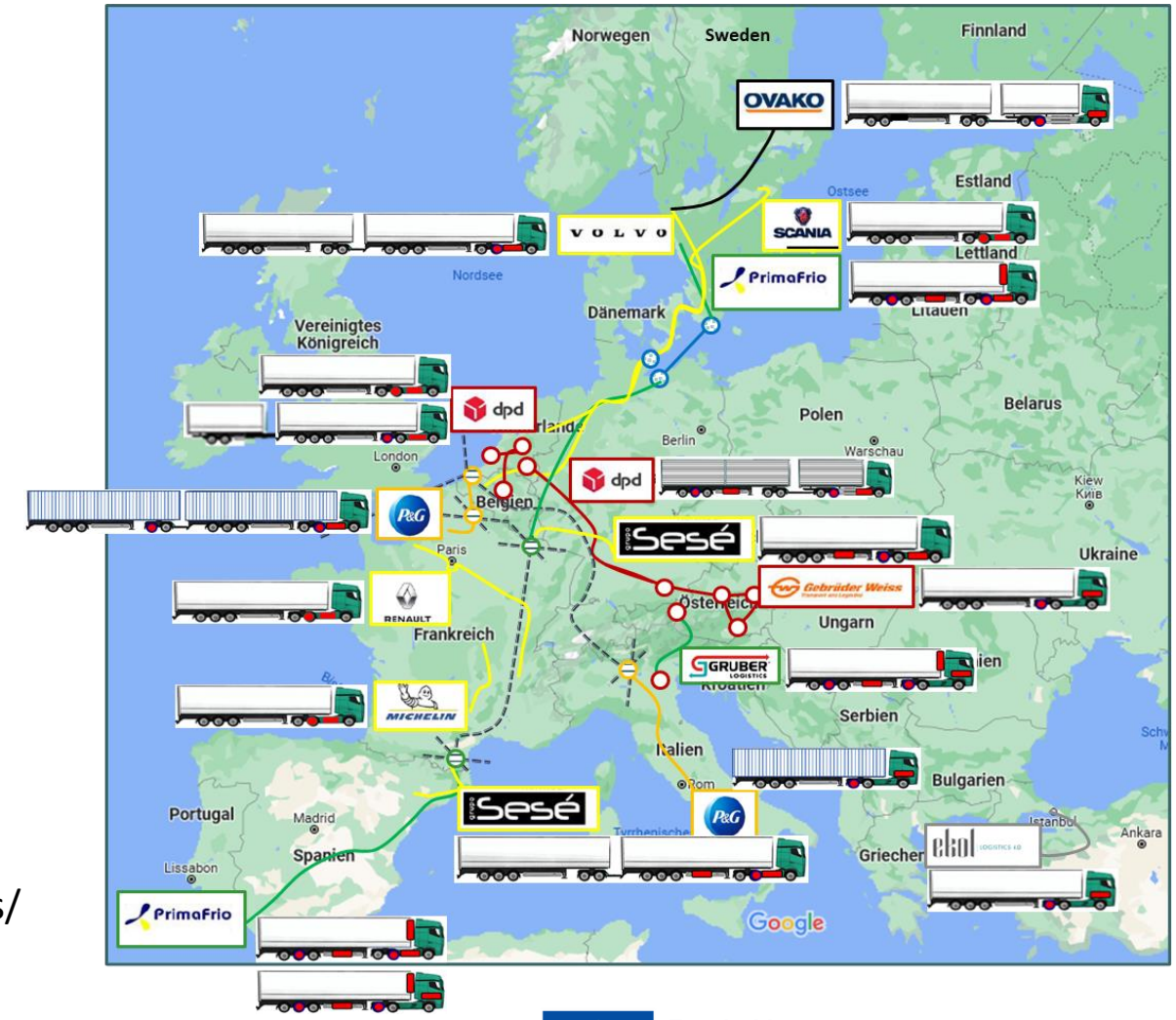
Ambition to take zero-emission long-haul goods transport in Europe to the next level

1. Execute **real-world demonstrations** of **long-haul BEVs** and **FCEVs** across Europe.
2. **Creating a pathway** for long-haul BEVs and FCEVs to become more affordable, reliable and more energy efficient
3. **Mapping** of flexible and abundant charging/refuelling points. Demonstrate n**ovel charging concepts**.
4. Develop technologies which can deliver **promised benefits** to operate in complex transport supply chains.
5. Create **Digital Twin with** novel tools for **fleet management** to support the long-haul BEVs and FCEVs vehicles in the logistics supply chains.

Funded by the European Union

15 use cases throughout Europe, each focussing a specific logistic operation

Challenging route components	Challenging factors and KPIs
Long-haul: up to 1300 km one-way 	Minimise extra waiting time for charging/refuelling 
Shorter hub-to-hub and factory-to-factory transport 	Availability of technology 
Cross mountains 	Having the right energy carrier and quantity on board 
Multi-modal (including train and ferry) 	Reducing extra costs 
Stretching across Europe using TEN-T corridors 	Remote optimisation and predictions 
	Permissions to drive (incl. tunnels) 



https://zefes.eu/defined-use-cases-target-metrics-and-needs/

Funded by the European Union

ZEFES stakeholder survey results

Link ZEFES survey

https://www.etp-logistics.eu/zefes-survey-final/

Derive a list with **needs and requirements** was the aim of the ZEFES stakeholder Survey

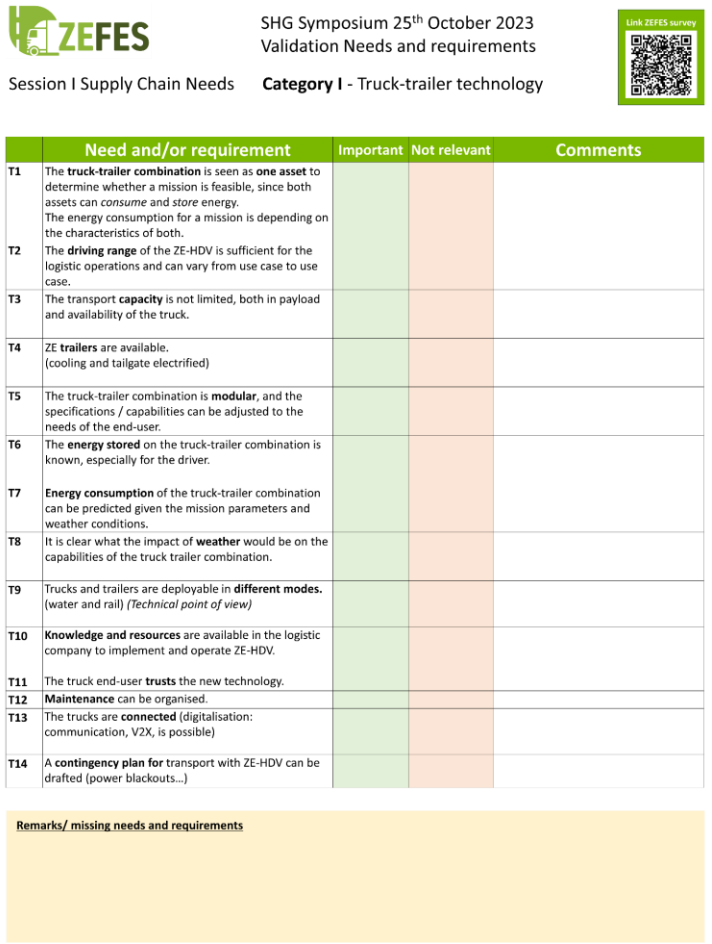
ZE-HDV: battery and fuel cell electric truck-trailer combinations (GCW +36 tons) for the whole **ZE-HDV ecosystem**.

59 Needs and requirements in total, over 6 categories

- 14 related to Truck-trailer technology (technical)
- 4 related to Fleet integration (digital twin)
- 6 related to Safety and acceptance
- 25 related to Infrastructure
- 9 related to Viable Business case
- 1 related to Legal barriers

Today a final validation during the interactive workshop

Results will be published in D1.3 (submitted)+D1.5 (december 2023) which are public (ZEFES website)



ZEFES

SHG Symposium 25th October 2023
Validation Needs and requirements

Session I Supply Chain Needs **Category I** - Truck-trailer technology

Link ZEFES survey

	Need and/or requirement	Important	Not relevant	Comments
T1	The **truck-trailer combination** is seen as **one asset** to determine whether a mission is feasible, since both assets can *consume* and *store* energy. The energy consumption for a mission is depending on the characteristics of both.			
T2	The **driving range** of the ZE-HDV is sufficient for the logistic operations and can vary from use case to use case.			
T3	The transport **capacity** is not limited, both in payload and availability of the truck.			
T4	ZE **trailers** are available. (cooling and tailgate electrified)			
T5	The truck-trailer combination is **modular**, and the specifications / capabilities can be adjusted to the needs of the end-user.			
T6	The **energy stored** on the truck-trailer combination is known, especially for the driver.			
T7	**Energy consumption** of the truck-trailer combination can be predicted given the mission parameters and weather conditions.			
T8	It is clear what the impact of **weather** would be on the capabilities of the truck trailer combination.			
T9	Trucks and trailers are deployable in **different modes.** (water and rail) *(Technical point of view)*			
T10	**Knowledge and resources** are available in the logistic company to implement and operate ZE-HDV.			
T11	The truck end-user **trusts** the new technology.			
T12	**Maintenance** can be organised.			
T13	The trucks are **connected** (digitalisation: communication, V2X, is possible)			
T14	A **contingency plan for** transport with ZE-HDV can be drafted (power blackouts…)			

Remarks/ missing needs and requirements

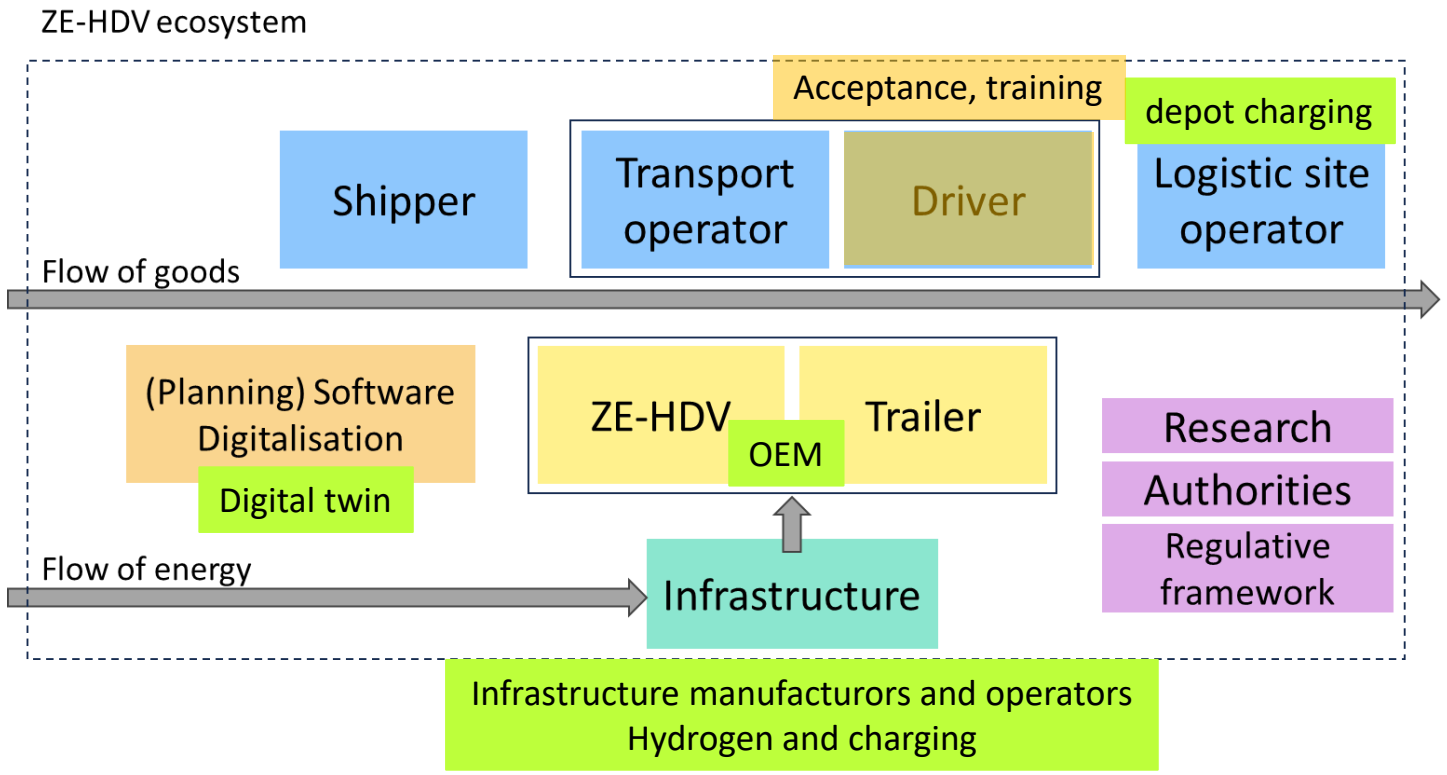
Funded by the European Union

10 identified stakeholder groups

Link ZEFES survey

- **Shipper**
- **Transport operator**
- Logistics hub operator
- Truck OEM
- Trailer OEM
- Infrastructure operator (charging / HRS)
- Infrastructure manufacturer (charging / HRS)
- Research
- Authorities
- Policy

Status 13/10: **37** respondents
4 shippers
12 transport operators



Funded by the European Union

Preliminary results

Truck end-user (n=12)

The respondents own in total 13 460 trucks, and 129 300 trailers.

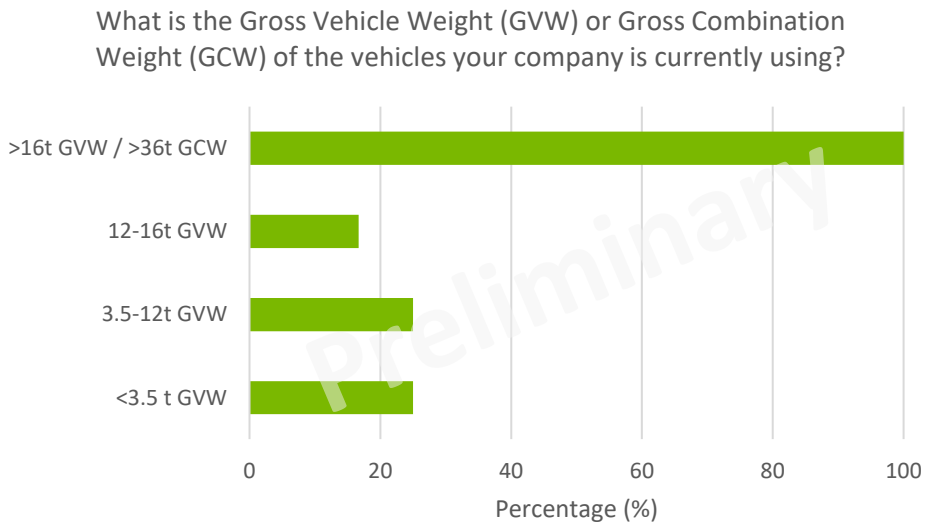
4 of the respondents did not have experience with ZE-HDV

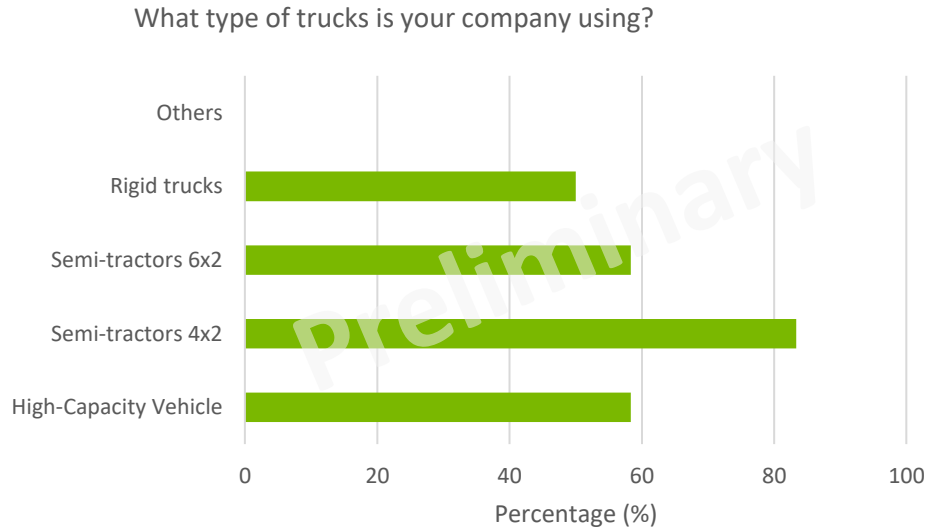
7 of the respondents have experience with BE-HDV

1 of the respondents have experience with FCE-HDV

226 BE-HDV purchased or implemented

All companies are using +36 ton GCW trucks





Funded by the European Union

Preliminary results

Truck end-user (n=12)

The respondents own in total 13 460 trucks, and 129 300 trailers.

4 of the respondents did not have experience with ZE-HDV

7 of the respondents have experience with BE-HDV

1 of the respondents have experience with FCE-HDV

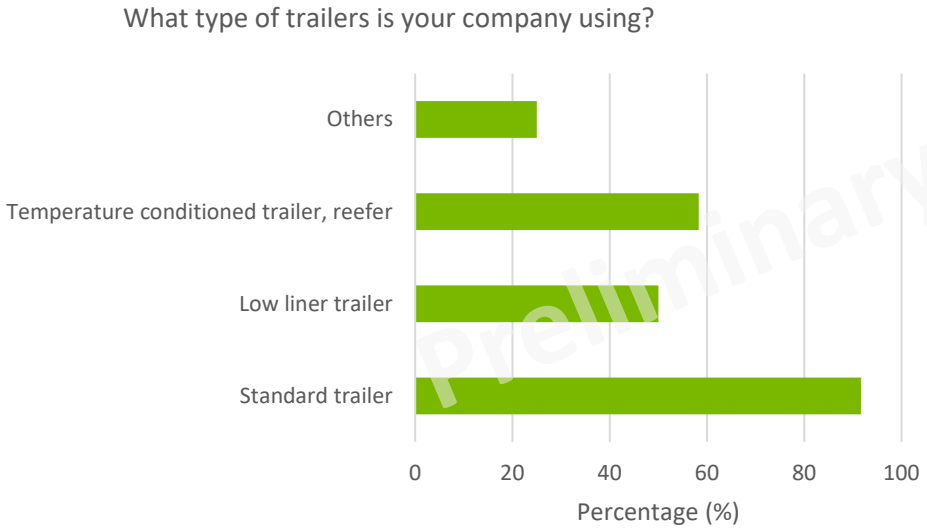
226 BE-HDV purchased or implemented

Knowledge and experience with FCE-HDV is limited

⇒ **We will not discuss FCE-HDV today**

All companies are using +36 ton GCW trucks

Different use cases and trailers



Funded by the European Union

Preliminary results

Truck end-user (n=12)

	The main reasons to **not** invest in BE-HDV (n=4)	The main reasons to invest in BE-HDV (n=7)
BE-HDV are commercially available	100% (n=4)	
Sufficient ZE-HDV are commercially available		43% (n=7)
Driving range is too low/unsufficient	50% (n=4)	86% (n=7)
Payload is restricted	25% (n=4)	
Transport capacity is restricted		83% (n=6)
ZE-HDV can be deployed in almost all missions		14% (n=7)
Conclusion Technical	**The current BE-HDV on the market do not suffice in payload or driving range. Not all mission can be done.**	

Funded by the European Union

Preliminary results

Truck end-user (n=12)

	The main reasons to **not** invest in BE-HDV (n=4)	The main reasons to invest in BE-HDV (n=7)
BE-HDV are safe (high voltage, fire hazard…)	100% (n=3)	100% (n=3)
BE-HDV are socially accepted (environmental impact)	100% (n=3)	100% (n=5)
BE-HDV will lead to an emission reduction (GHG and PM)	100% (n=3)	
We want to lower our emissions		83% (n=6)
Conclusion Safety and acceptence	**Safety of homologated vehicles is not a concern. Opinion and acceptence of the driver?**	

Conclusion

59 identified needs and requirement on 6 topics

14 related to Truck-trailer technology (technical)

	Technical
T1	The **truck-trailer combination** is seen as **one asset** to determine whether a mission is feasible, since both assets can *consume* and *store* energy. The energy consumption for a mission is depending on the characteristics of both.
T2	The **driving range** of the ZE-HDV is sufficient for the logistic operations and can vary from use case to use case.
T3	The transport **capacity** is not limited, both in payload and technical availability (reliability) of the truck.
T4	ZE **trailers** are available. (cooling and tailgate electrified)
T5	The truck-trailer combination is **modular**, and the specifications / capabilities can be adjusted to the needs of the end-user.
T6	The **energy stored** on the truck-trailer combination is known, especially for the driver.
T7	**Energy consumption** of the truck-trailer combination can be predicted given the mission parameters and weather conditions.
T8	It is clear what the impact of **weather** would be on the capabilities of the truck trailer combination.
T9	Trucks and trailers are deployable in **different modes.** (water and rail) *(Technical point of view)*
T10	**Knowledge and resources** are available in the logistic company to implement and operate ZE-HDV.
T11	The truck end-user **trusts** the new technology.
T12	**Maintenance** can be organised.
T13	The trucks are **connected** (digitalisation: communication, V2X, is possible)
T14	A **contingency plan for** transport with ZE-HDV can be drafted (power blackouts…)

4 related to Fleet integration (digital twin)

	Integration in logistic operation
F1	The ZE-HDV (fleet) can be implemented in an existing fleet by a **fleet management system** that takes into account the capabilities of ZE-HDV.
F2	It is clear **where to** charge/fuel and how it will fit in the logistic operation.
F3	It is clear what is **the impact** of charging/refuelling time will be on the logistics operation.
F4	It is clear what is **the impact** of less payload and availability (maintenance) will be on the logistics operation.

6 related to Safety and acceptance

	Safety and social acceptace
S1	A **methodology** to determine, if the ZE-HDV **run on renewable energy** (electricity and hydrogen) is available.
S2	**Emissions over the full life cycle** of a truck-trailer combination is known.
S3	Vehicle must be **safe**, both while driving and charging/fuelling.
S4	It is clear how **the job** of truck driver will change, and how the driver will be **trained** to use ZE-HDV it in a safely manner.
S5	It is clear what to do in **case of emergency,** especially for the driver.
S6	**Safety regulations** and **precautions** are known, especially for the driver, for first responders it is clear the vehicles are ZE-HDV.

1 related to Legal barriers

	Legal barriers
L1	Innovative technologies (trucks and infrastructure) can be implemented since a **regulative framework** exists.

Funded by the European Union

Conclusion

59 identified needs and requirement on 6 topics

9 related to Viable Business case

	Viable business case
B1	The **TCO** of ZE-HDV can be calculated.
B2	Assessment of **new business models for ZE-HDV** is needed
B3	Realistic scenarios to reach **economies of scale** are drafted and defined in time
B4	**Incentives** to invest in **ZE-HDV** are available.
B5	The **emission reduction** can be monetized.
B6	Renewable electricity and hydrogen should be **affordable** for logistic companies.
B7	**Incentives** for charging and fuelling **infrastructure** are available.
B8	The **TCO** can be calculated for the **infrastructure** (viable business case).
B9	**New business model to operate infrastructure** are assessed.

25 related to Infrastructure

	Infrastructure Truck end-user
I1	Charging or fuelling infrastructure is **available.**
I2	Charging or fuelling a ZE-HDV should be **easy and safe.**
I3	**Driver amenities** are available at charging stations and HRS.
I4	**Charging** can be combined with **overnight** parking.
I5	Charging / fuelling infrastructure available at the **right location.**
I6	Charging / fuelling infrastructure available at the **right power/pressure.**
I7	**Waiting time** at the charging station/HRS is minimal (not only waiting time during refuelling or charging, but also waiting time to get a charger/refuelling nozzle).
I8	**Availability and reliability** of the infrastructure is high.
I9	The charging station/HRS is **accessible** by truck-trailer combination.
I10	Charging infrastructure for **trailers** is available.
I11	The charger/refuelling infrastructure is capable of fuelling/charging the wanted **amount of energy.**
I12	Connected ZE-HDV, **V2X communication.**
I13	**Unambiguous pricing displayed** or communicated at the charging and refuelling stations (AFIR ↺).
I14	At charging and fuelling stations can be **paid with conventional means** (credit card, pay per use over digital platform) (AFIR ↺).
I15	**Quality of the hydrogen should be fuel cell grade.**
VIEW infrastructure operator	
I16	The **need** for charging/fuelling infrastructure is clear (location and demand is known). An expected daily consumption profile is available.
I17	It is **economically feasible** to operate the infrastructure
I18	It is **technically feasible** to operate the infrastructure
I19	**Suitable land slots** are available (commercial location with sufficient power connection)
I20	The infrastructure can be expanded in a **modular** way.
I21	**Optimisation** of charging/fuelling both technical and financial.
I22	**Quality of hydrogen** can be tested fast and in an easy way.
I23	**Reliable** GREEN hydrogen **supply** to the HRS Reliable renewable energy supply to the charging infrastructure.
VIEW logistic hub operator, that wants to install infrastructure on its own sites	
I24	The impact of the infrastructure **installation** on logistic operations is minimal.
I25	The impact of the infrastructure **operation** on logistic operations is minimal.

Disclaimer

Funded by
the European Union

Project funded by

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the granting authority can be held responsible for them.

This work has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI)