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Zero Emission flexible vehicle platform with modular powertrains serving the long-haul Freight Eco System

ZEFES - Deliverable report

D1.6 Legal and administrative needs and requirements

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Publishable summary

The objective of the Green Deal for achieving the 30% CO2 reduction target for the road transport by 2030, different strategies and technologies are under study. In the HDV sector, vehicles are becoming greener thanks to new fuels and energy sources additionally to new technologies maturing and new vehicle combinations deployed in order to reduce tailpipe emissions. All these disruptions need to be reflected in the regulatory frameworks to allow use and ensure safety and environmental improvement. For this reason, regulations both at EU and national level need to be reviewed and studied in order to control if these improvements would be fitted, or the regulations should be modified for the trucks to be deployed on the roads under daily operational conditions.

The ZEFES project is going to demonstrate a total of 15 use-cases using 9 different Zero-Emission tractors and rigid trucks, both Battery electric and Fuel Cell electric. These vehicles will be used in different combinations as truck semitrailer or EMS, driving through 11 countries (10 of them EU countries). New technologies, concepts of vehicles, charging and refuelling will be tested during the project, as two e-trailers (trailers with propulsion) and e-dolly.

In the already published documents of the ZEFES project, the stakeholders and partners that will support the project, the vehicles and their characteristics, the use cases requirements and their missions were presented. This deliverable defines the legal needs and requirements for achieving the objective of developing and implementing the ZEFES use cases. The current status on relevant legislation and guidelines for the vehicle approvals and road permits to allow the execution of the different routes will be elaborated. With the current regulations, some technologies and vehicle characteristics could be out of scope or could have difficulties in getting type approved. As all vehicles will operate under real-time conditions, an approval is needed in such a way so that the demonstrations during the period specified can be executed, allowing cross border, use of ferry, and combined transport (rail / road). The type approval authorities and road authorities of the 11 different countries will be involved to achieve the granting for the demonstrations. The status of the current regulations related to the project scope will be explained and the use cases will be analysed in order to develop a roadmap, mitigate potential risks and document future recommendations.

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Abbreviations & Definitions

Abbreviation	Explanation
HDV	Heavy-Duty Vehicle
ZEV	Zero tailpipe Emission Vehicle
BEV	Battery Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
ICE	Internal Combustion Engine
OEM	Original Equipment Manufacturer
VECTO	Vehicle Energy Consumption Calculation Tool
GCW	Gross Combination Weight
ZE-HDV	Zero tailpipe Emission Heavy Duty Vehicles
WPL	Work Package Leader within ZEFES project
BE-HDV	Battery Electric Heavy-Duty Vehicle
FCE-HDV	Fuel Cell Electric Heavy-Duty Vehicle
HV	High Voltage
ISO	Interchangeable container as defined in the ISO-Norm 668
SWAP	Interchangeable container accommodating Euro-pallets for road and rail transport
Reefer	Loading unit to transport temperature-controlled cargo
USP	Unique Selling Proposition (uniqueness of ZEFES use cases)
EMS	European Modular System, HDV carrying standardised loading units for intermodal freight transport
T	Tractor unit
R	Rigid unit
ST	Semi-trailer
TR	Trailer
D	Dolly
e-ST	Electric semi-trailer
e-D	Electric dolly
CCS	Combined Charging System
MCS	Megawatt Charging System
HRS	Hydrogen Refuelling Station
vkm	Vehicle kilometers
tkm	Tonne kilometers
DTP	Digital Twin Platform
DT	Digital Twin
	Abbreviations of project partners, see chapter 8 acknowledgement

1 Introduction

WP1 and more specifically the task on the Legal and Administrative Needs & Requirements for the ZEFES project demonstrations is dealing with the preparation of the trucks in order to be able to deploy on public roads. This deliverable will influence especially WP2 (Design optimisation of HD ZEV powertrains), WP5 (Modular and Efficient Long Haulage Battery Electric Vehicles (BEVs)), WP6 (Modular and efficient long haulage FCHEVs) and WP7 (Demonstrations & Fleet integration/management in national & cross-border missions). This document is a status report with a latest update in February 2025. The process to obtain the final approval and permissions that will allow the vehicles to be driven along the countries and regions involved in the project are depicted in the present document. In future deliverables, the final status of the use cases will be reported (D1.5), use case menu card (D7.1) and the final recommendations of WP1 will be delivered (D1.7).

The different use cases and corridors are defined on the deliverable 1.2; in this document, the references to all the use cases are based on the deliverable 1.2 definitions.

Along the project, different types of long-haul vehicles will be demonstrated and tested. The trucks used will be battery electric or fuel-cell electric powered, used as tractor units or rigid trucks. The trucks will be used as combinations of truck semitrailer or rigid truck drawbar trailer. Also, combinations of European Modular Systems (EMS) will be used on the demonstrations, which are longer and heavier combinations of standard vehicles able to carry more goods while reducing traffic and emissions. Furthermore, new concepts of vehicles, as the e-trailer (with self-propulsion) and the e-dolly will be used in the demonstrations.

The current regulations allow the type-approval of Battery electric and Fuel-Cell Hydrogen electric trucks. Even, the new concepts of e-trailer and e-dolly implicate a challenge to the ZEFES project with regards to their approval. The different options to grant the approval for those cases are explained in chapter 3 of this deliverable. On this document, there is an explanation of the homologation and type-approval process and the different types of homologations available. Before that, there is a description of the different regulations to consider for trucks and trailers manufactured by the OEMs. This project's challenges due to type-approval process of trucks and trailers are also defined in the present deliverable.

It is important to note the fact that obtaining a type approval for a truck and/or a trailer, does not include the allowance to operate in a country with any combination. The national regulations indicating the maximum weights and dimensions should be respected by the total combination in the country of origin, destination or of transit. If any of the requirements is not fulfilled, a possible alternative process could be found in the national or regional regulations, or a road permit could be granted by the authorities.

Some challenges are identified in the ZEFES project as vehicles and combinations used for the demonstrations are not fulfilling some aspects of the current regulations. The reason why they are not in line with the current regulations are the needs for additional battery weight and extra length

for the Zero Emission powertrain systems (BEVs and FCEVs). A new proposal for the revision of the Weights and dimensions Directive (EU) 96/53, which is pending to be finalised, takes into account new requirements for these new concepts of vehicles with those new technologies with the main changes including the addition of extra length and extra weight for Zero Emissions combinations. The fact of not being approved yet is making the process for granting the allowance of the demonstrations more challenging. On this document, the permissions necessary to drive the vehicles for each country involved in the project are presented, defining the conditions related to weights and dimensions in each country.

Finally, there is an analysis of each use case, defining the challenges on the different routes (related to type approval and weights and dimensions), the restrictions and requirements for the combinations of vehicles in each use case and the permissions enabling the vehicles to drive on the roads in the different countries.

2 Vehicles homologation

2.1 Introduction of homologation

The Homologation of vehicles and/or components is the administrative procedure that is used by an Approval Authority to verify if a prototype of a vehicle or a component meets the regulatory requirements prior to deployment.

2.2 Regulatory framework and authorities

Before defining the regulations applicable to the project, this section explains the different types of regulations depending on where they apply, as well as the conditions of the vehicles.

2.2.1 UNECE regulations

The United Nations Economic Commission of Europe (UNECE) is an organisation created to promote the economic integration and cooperation among the member states.

One of the working areas of UNECE is Transport promoting sustainable transport, through the development of freight and passenger mobility by inland transport modes, by improving traffic safety, environmental performance, energy efficiency, inland transport security and efficient services in the transport sector.

The UNECE regulations are accepted by all countries that signed the 1958 Agreement, which have adopted a particular regulation within their respective regulatory systems. Often, UN regulations are mandatory under EU law. The agreement establishes the procedures for unifying prescriptions for new vehicles and equipment and the mutual recognition of the homologations granted in compliance with the UN regulations.

The UNECE Sustainable Transport Division serves as the secretariat services to WP.29, which provides a regulatory framework for the technological innovations to improve vehicle safety and protect the environment.

2.2.1.1 UNECE working groups

UNECE is organised in different working parties related formed by expert groups. The WP29 titled "*World forum for the Harmonisation of Vehicle Regulations*" concerns vehicle regulations addressing the safety and environmental performance of wheeled vehicles, their subsystems and components. The WP29 is divided into 6 permanent groups:

- Noise and Tyres (GRBP)
- Lighting and Light-Signalling (GRE)
- Pollution and Energy (GRPE)

- Automated and Connected Vehicles (GRVA)
- General Safety Provisions (GRSG)
- Passive Safety (GRSP).

In addition to permanent groups, there are Informal Working Groups (IWGs) dealing with some technical issues during a time-limited mandate:

- IWVTA: International Vehicle Type Approval System
- ITS/AD: Intelligent Transport Systems and Automated Driving – Discontinued (From 06/18 on – incorporated into GRVA)
- DETA: Database for the Exchange of Type Approval
- EWG: Enforcement Working Group
- PTI: Periodical Technical Inspections

Within those working groups, there are different subgroups to perform some detailed tasks. Regarding the scope of this project, there are two important subgroups:

- MVC: The Modular Vehicle Combination is a working group of the GRVA, with the objective to harmonise technical level allowing EMS vehicles in the international traffic. Currently, the EMS framework is not standardised internationally and is subject to national regulations.
- MVWG: The Motor Vehicle Working Group is a subgroup on the Weights and Dimensions, which has the objective to reduce the CO2 emissions of the Heavy-Duty Vehicles, taking into account aspects related to aerodynamics, safety and comfortability.

2.2.2 EU regulations

The European Commission is the executive institution of the European Union. It is responsible for proposing legislation, implementing decisions, overseeing application of the EU treaties and day-to-day running of the EU.

There are two different types of legislations:

- EU regulations: When are approved, they enter into force being considered as a national regulation.
- EU/EC directives: National authorities are responsible for transposition of the directive into the national law.

2.2.3 National legislations

Apart from the UNECE and European legislations, each country has its own regulations created at the national level. Moreover, national administrations are in charge of regulating the traffic rules, driving licenses and the general interaction between vehicles.

2.3 Types of homologations

Approvals can be obtained in different typologies - in the scope of this project EU type approval and national homologation are the most relevant

2.3.1 EU Type Approval

The European Whole Vehicle Type Approval is defined on Regulation (EU) 2018/858.

This approval allows the manufacturers to register an unlimited number of vehicles in any EU member state, if the vehicles fulfil all the stipulated requirements.

This Regulation (EU) 2018/858 includes in its article 39, the possibility of granting an EU-Type approval in respect of a type of vehicle, system, component or separate technical unit that incorporates new technologies or new concepts that are incompatible with one or more regulatory acts.

In case article 39 of the regulation EU 2018/858 applies to a vehicle, the vehicle should be referred to the national approval authority. That authority will then present its decision to the *Technical Committee on Motor Vehicles* (TCMV) which will decide if the approval can be granted. Obtaining the approval can be a very long process.

2.3.2 National homologation

In case national homologation applies, the vehicle type may not fulfil 100% of the technical or administrative requirements or concerning the level of safety.

Depending on the number of manufactured vehicles, there could be find two different types:

- Small series (NKS): The approval is limited to a small number of vehicles per year and one country (the one where the vehicle is expected to be deployed).
- Individual: It is granted only for a single vehicle. There are two types of the individual homologation:
    - An approval that could be valid for the vehicle registration in the State granting the approval; or
    - An approval valid for all the EU countries. However, this EU individual approval is only applicable to M1 and N1 vehicles and special purpose vehicles.

2.3.2.1 Prototype approvals

This Regulation (EU) 2018/858, in the article 2 (scope of the regulation), point 4, explains the possibility of the approval for prototypes:

> 4. For the following vehicles, the manufacturer may apply for individual vehicle approval under this Regulation:
>
> (a) vehicles intended exclusively for racing on roads;
>
> (b) prototypes of vehicles used on the road under the responsibility of a manufacturer to perform a specific test programme provided they have been specifically designed and constructed for that purpose.

Figure 1. Article 2, point 4, of the Regulation (EU) 2018/858 related to prototypes approval.

Requirements for this type of approval are covered under the national legislation. For example, in Spain, the *RD 750/2010*, which establishes the procedure for the homologation of vehicles, in the point 2 of the article 5 (*Aplicaciones particulares*), explains the requirements for the approval of prototypes.

> 2. Para los prototipos o preseries que pertenezcan a los proyectos en fase de desarrollo por parte de los fabricantes:
>
> a) El solicitante será el fabricante del vehículo.
> b) El fabricante del o de los vehículos presentará la solicitud de inspección técnica unitaria al organismo competente en inspección técnica de vehículos, acompañada de:
>
> 1.º Ficha reducida, firmada por persona legalmente autorizada por el fabricante, con indicación de los números de identificación de los vehículos afectados.
> 2.º Copia de la resolución de la autorización emitida por la autoridad de homologación.
>
> c) En caso de inspección favorable, el organismo que realice la inspección técnica unitaria emitirá la correspondiente tarjeta de ITV.
> d) Estos vehículos sólo podrán ser matriculados, de forma ordinaria o temporal, a nombre del fabricante que ha desarrollado el prototipo, anotándose esta condición en la tarjeta de ITV.

Figure 2. Point 2 of the article 5 of the Spanish RD 750/2010 related to prototypes approval.

3 Type Approval challenges and current regulations

Two different types of ZEVs are used within the scope of this project: BEVs (R or T) and FCEVs (R or T).

Furthermore, 6 types of trailers have been considered to be used during the project: Standard trailers, Swap-body trailers, container trailers, B-trailers, E-trailers and e-Cooled trailers. Finally, due to technology and manufacturing difficulties, the B-trailer concept will not be used in the demonstrations, even though this concept was analysed.

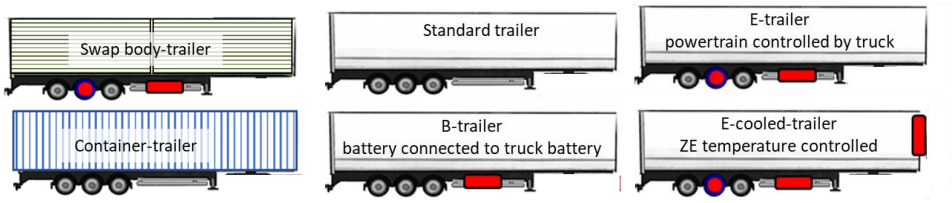


Figure 3. Concept of trailers considered to be used in ZEFES.

Considering the exposed trailers, there are some challenges to obtain the homologation for some of the vehicles. These trailers include different elements which are out of the scope of current regulations; those elements are:

- E-Axles
- HV Batteries and systems on trailers.

Apart from the standard trailers, container-trailers and swap body trailers, which have dedicated regulations in force, there are other types of trailers used in ZEFES which are a challenge for Type Approval: B-Trailers, E-Trailers and E-Cooled trailers.

3.1 Trucks

This section covers the regulations and requirements to homologate trucks, considering the different engine types. In the Appendix II of this document, there is a list of the regulatory acts to consider for the EU Type approval of the trucks, if needed.

3.1.1 Battery Electric Heavy-Duty Vehicles (BE-HDV)

Regulations and Directives for Heavy Duty Vehicles and applicable to BEVs are a part of the Regulation (EU) 2018/858. Section G of the *Appendix II* (*Environmental performance and emissions*)

and the Regulation UN R100 from section A are particularly important for trucks used in ZEFES (*Restraint systems, crash testing, fuel system integrity and high voltage electrical safety*).

A - Restraint systems, crash testing, fuel system integrity and high voltage electrical safety			
Item	Subject	Regulatory act	
A19	In-use electric safety	UN Regulation No 100	

Table 1. Battery regulation applicable to BE-HDV.

The legislation does not create additional challenges for ZEFES - electric trucks can be approved to drive in Europe. However, if the OEM is not fulfilling all the requirements, it must be determined if the vehicle can be approved as a prototype according to the national requirements.

There are also standards (see table 2) affecting vehicles used in the project. They are not mandatory, if not required by the regulations, but they can be applicable to the harmonisation of the vehicle, the use of the trucks or to the infrastructure where the trucks will be used.

Regulatory act	Vehicle	Use	Infrastructure
Standards			
ISO 26262: Road vehicles - functional safety	X		
ISO 11992: CAN Communication between truck and trailer	X		
SAE J1939: Communication and diagnosis among vehicle components	X		
EN 283: Swap bodies - Testing	X		X
EN 16973: Road vehicles for combined transport - Vertical transhipment	X	X	X
EN 596-5: Railway specifications - Semi-trailer			X

Table 2. Standards applicable to BE-HDVs, their use and linked infrastructure.

3.1.2 Fuel Cell Electric Heavy-Duty Vehicles (FCE-HDV)

For the Fuel-Cell trucks, the same regulations and directives as in the section 3.1.1 must be taken into account. In particular, section G of the Appendix II (*Environmental performance and emissions*) and section A have to be considered for FCE-HDVs (*Restraint systems, crash testing, fuel system integrity and high voltage electrical safety*):

A - Restraint systems, crash testing, fuel system integrity and high voltage electrical safety			
Item	Subject	Regulatory act	
A17	Hydrogen safety	UN Regulation No 134	

A18	Hydrogen system material qualification	Regulation (EU) 2021/535, Annex XIV	
A19	In-use electric safety	UN Regulation No 100	

Table 3. Some regulations related to Hydrogen powertrain systems applicable to FCE-HDV.

There are no additional challenges for FCE-HDVs homologation; hydrogen powered trucks can be approved to drive in Europe. As for the BE-HDVs, if the OEM is not fulfilling any requirement, it must be determined if the vehicle can be approved as a prototype according to the national requirements.

3.2 Trailers

In order to obtain the European homologation and register the vehicle in any EU country, the homologation process must be in accordance with Regulation EU 2018/858 and EU 2019/2144 GSR2.

If the requirements stipulated in any of the regulatory acts cannot be met, the article 39 of the Regulation EU 2018/858 can be applied; this article regulates the exemptions of new technologies or new concepts on vehicles. Even, if an EU Type approval is not required, it could be demanded for a prototype to meet the national requirements, taking into account the restrictions they implicate.

All the trailers used in this project can be classified as category O4, with a maximum weight of 10T per axis, according to the article 4 of Regulation (EU) 2018/858. Also, those are the classifications for the O4 category, described in Regulation (EU) 2018/858 Annex I part C:

- DA: Semi-trailer
- DB: Drawbar trailer
- DC: Centre-axle trailer
- DE: Rigid Drawbar trailer
- DF: Link semi-trailer
- DG: Link drawbar trailer

The classification per use is also defined in the Regulation (EU) 2018/858 Annex I Appendix 2.

Similarly to the previous section concerning trucks regulations required to get the trailers homologation are analysed below.

3.2.1 Trailers regulations

The regulatory acts applicable to trailers are defined in the Regulation EU 2018/858 Annex II part 1; all their requirements must be met in order to obtain the European Type Approval.

Appendix III contains a list of Regulations applicable to trailers.

3.2.2 B-Trailers and E-Trailers

The B-Trailers and the E-Trailers are vehicles used to extend the autonomy range of the combination. They are equipped with a high voltage battery and, in case of E-Trailers, an e-Axle which is used to recharge the high voltage battery and to boost the vehicle; this boost reduces the energy usage and increases the autonomy of the vehicle.

Figure 4. Examples of a B-Trailer and an E-Trailer.

3.2.2.1 B-Trailers

The B-Trailers are defined as a trailer connected to the towing truck by cable in order to increase the total autonomy.

The B-trailers have difficulties to obtain the European Type Approval according to Regulation (EU) 2018/858 and R(EU) 2019/2144 GSR2.

Not all conditions in R100 have to be fulfilled. This regulation shows "*Uniform provisions concerning the approval of vehicles with regard to specific requirements for the electric power train*".

Concretely, this would suppose some of the challenges of this project:

- Firstly, the UN R100 does not include O category vehicles in its scope.
- Secondly, it is important to specify the function of the battery; the UN R100 has to be considered only if the battery is used to powertrain energy supply; in case of the B-trailers, it is important because the battery is used as an autonomy range extender.

It needs to be mentioned that an amendment has been proposed - the Supplement 4 to the 03 series of amendments and the Supplement 1 of the 04 series of amendments to the UN R100. This amendment was voted on during the 194th session of the WP29, in Geneva, in November 2024. This amendment includes the O vehicles and the conditions for the Type Approval of these systems in this category of vehicles.

The B-Trailers also face a special difficulty; the need of HV communication wires between truck and trailer creating a challenge in electrical safety that is not easy to mitigate by the OEMs. There are no currently known provisions for this topic.

3.2.2.2 E-Trailers

The e-Trailers are vehicles that are not connected to the towing vehicle by HV cables. The e-Axle is used to recharge the battery of the trailer and this energy is used by the e-Axle to give a boost when necessary.

The fact of having a boost, did not meet the definition of a trailer formulated in Regulation (EU) 2018/858 until June 2024, which indicated that the trailer must be a towed vehicle. On 26th June 2024, this regulation has been amended by the Regulation (EU) 2024/1610, applying since 1st July 2024, in which the definition of semi-trailer is modified, and the definition of an e-trailer is added.

Regarding the UN R100, there are obstacles for the e-trailers to obtain the European Type Approval according to Regulation (EU) 2018/858 and Regulation (EU) 2019/2144 GSR2. Similarly to the B-Trailers, the E-Trailers have a high battery voltage used to powertrain energy supply and that is why they face the same challenges as B-Trailers.

Apart from that, the E-Trailers include an e-Axle, which is used to recharge the battery. Considering this, the regulation UN R13 (Braking) might be considered in the homologation of this type of vehicles. The current braking regulation does not include the regenerative axle on O category vehicles. Currently, an amendment to include e-Axles in O vehicles is being worked on in the document GRVA-20-14; GRVA requested the secretariat to distribute GRVA-20-14 with an official symbol at the January 2025 session of GRVA.

If any of those regulations (UN R13 and UN R100) do not enter into force before the trailers are manufactured, article 39 of the Regulation EU 2018/858 related to new technologies applies to the process of homologation. In this case, it is also important to remark that it is not possible to apply for an EU individual homologation because the category O4 is not in the scope of this type of homologation.

In the course of the project the possibility of doing an individual homologation in accordance with the national regulations has been evaluated. Different authorities and countries have been considered for the approval of an e-trailer. Considering the Spanish regulations and the communications established with the authorities in Spain, it could be possible to grant an approval according to the article 5 of the Spanish regulation *RD 750/2010,* but with some exceptions to the regulatory acts which are not fulfilled. Concretely, in case of e-trailers, considering that the definition of e-trailer is now added to the Regulation (EU) 2010/858, some exceptions could be done to regulations UN R13 and UN R100 which are under discussion and the new proposals are pending. This could allow the e-trailers to be registered with a regular Spanish licence plate and drive through all EU countries.

3.2.3 E-Cooled trailers

Figure 5. Example of an e-Cooled Trailer.

For the e-Cooled trailer, the situation is not the same as it is for the E-Trailers. According to the UN R100, there is a significant difference. In case of the E-Cooled trailers, the high voltage battery is not used to powertrain energy supply, it is only used for auxiliary services, such as the cooling system. For this reason, the UN R100 is not applicable to this case. Also, this type of trailer does not include the option of boosting the vehicle.

From the point of view of the UN R13, the e-Cooled trailer is in the same situation as the e-Trailer. The fact of having a system of energy regeneration which could affect the braking system of the vehicle is not explicitly defined for category O vehicles; electric regenerative braking system is defined in point 2.21 of the definitions of the UN R.013 Supplement 2 to 12 series. According to that document, the vehicle should be approved using the same method as the e-trailer, taking into account article 39 of the Regulation EU 2018/858 or a prototype approval and there is need for special permits in the countries it will pass through.

Alternatively, if the energy generation system for the cooling equipment is not a part of the braking system, it can be approved by the current regulations.

Depending on the system of the OEM, the system should be approved in one way or another.

During the last meeting held by the project partners, there was the intention of not using e-cooled trailers. Instead, cooled trailers based on liquid Nitrogen system will be used, which are not equipped with any e-axle. It is confirmed by the project partners that the trailers will have a Type Approval granted to drive through the whole EU countries.

3.2.4 Dolly and e-Dolly

Another interesting element, which has to be considered is the e-Dolly. The dolly converter is considered as a special purpose vehicle in the *Annex I* of the Regulation(EU) 2018/858 with the codification SJ, but this regulation does not allow the EU Type Approval; it is considered as an O category trailer which is normally approved by a national homologation, even though it could be done as an individual or an NKS.

The e-Dolly is a system which includes an HV battery that will be used to move the vehicle with an e-Axle. If the propulsion is used to boost the vehicle, it does not meet the definition of a dolly, similarly

to the e-Trailer. Even, if the propulsion is used only as a remote parking system out of the public road, the approval could be adjusted to the current regulations.

Also, dolly and e-Dolly systems experience the same difficulties as the e-Trailers. Firstly, the use of HV batteries, which must be included in the UN R100 requirements for e-Dollies. Secondly, the use of regenerative braking systems- the UN R13 does not include provisions for this kind of vehicles.

Furthermore, the use of the article 39 of the Regulation (EU) 2018/858 is not possible because the EU Type Approval is not allowed for this category. The solution to receive the approval is to apply for a prototype approval and obtain the permit or exemption in the countries where it is going to be used.

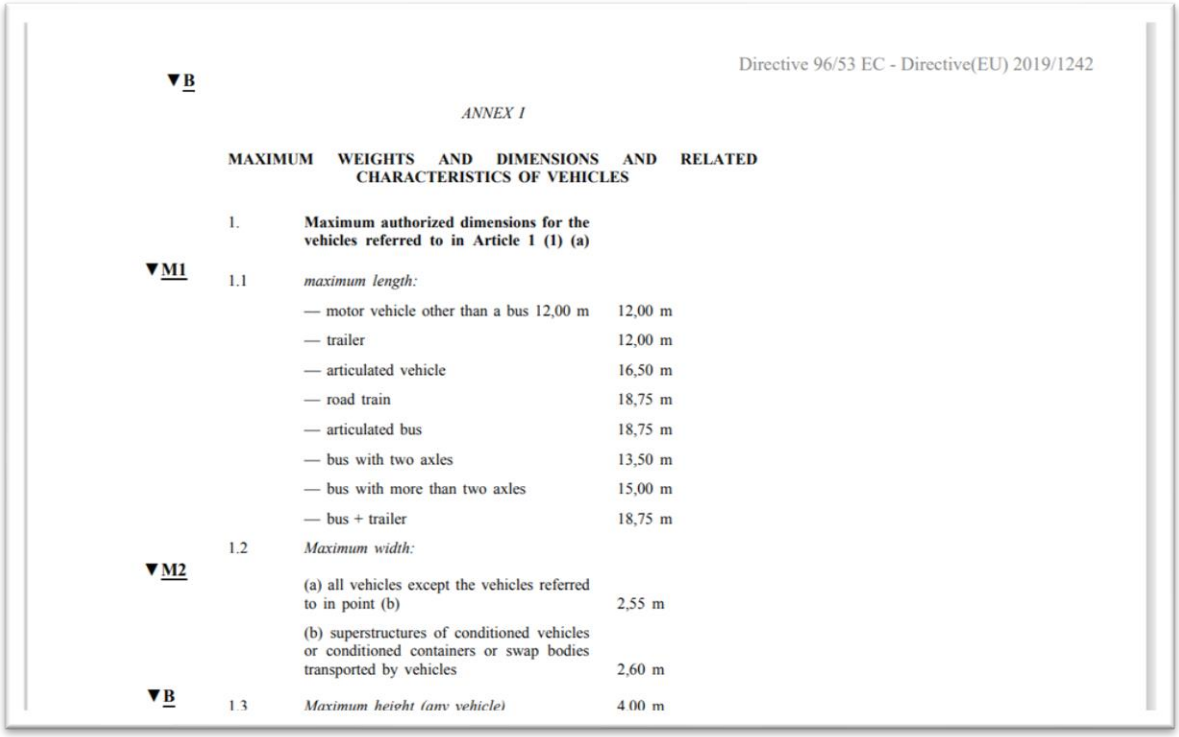
There is also a possibility of obtaining an individual approval, without being a prototype. If the e-Dolly works as a normal dolly, without regenerative braking, and the e-axle is only used to boost the semitrailer as a remote parking system outside of the public road, it could obtain the individual approval.

4 Road permissions. Weights and dimensions.

4.1 Weights and dimensions regulation

The EU basis the weights and dimensions basis for the vehicles is the Directive (EU) 96/53, which establishes some limits of lengths and weights of M2, M3, N2, N3, O2 and O3 vehicles. The section 2.2 of Annex I explains the lengths and weights limits of vehicle combinations, which are shown on the next image.

To begin with, the length limit of the vehicle types used in the scope of the project is defined under the provisions for articulated vehicles (combination of T+ST) and is set at 16,50m.



Directive 96/53 EC - Directive(EU) 2019/1242

▼B

ANNEX I

MAXIMUM WEIGHTS AND DIMENSIONS AND RELATED CHARACTERISTICS OF VEHICLES

	1.	**Maximum authorized dimensions for the vehicles referred to in Article 1 (1) (a)**	
▼M1	1.1	*maximum length:*	
		— motor vehicle other than a bus	12,00 m
		— trailer	12,00 m
		— articulated vehicle	16,50 m
		— road train	18,75 m
		— articulated bus	18,75 m
		— bus with two axles	13,50 m
		— bus with more than two axles	15,00 m
		— bus + trailer	18,75 m
	1.2	*Maximum width:*	
▼M2		(a) all vehicles except the vehicles referred to in point (b)	2,55 m
		(b) superstructures of conditioned vehicles or conditioned containers or swap bodies transported by vehicles	2,60 m
▼B	1.3	*Maximum height (any vehicle)*	4,00 m

Figure 6. Extract of length limits from the Directive 96/53/EU.

There are no provisions for European Modular Systems (EMS) combinations, which will be used in some use cases of this project.

2.2	*Vehicle combinations*	
2.2.1	Road trains with five or six axles	
	(a) two-axle motor vehicle with three-axle trailer	40 tonnes
	(b) three-axle motor vehicle with two or three-axle trailer	40 tonnes
2.2.2	Articulated vehicles with five or six axles	
	(a) two-axle motor vehicle with three-axle semi-trailer	40 tonnes
	(b) three-axle motor vehicle with two or three-axle semi-trailer	40 tonnes
	(c) three-axle motor vehicle with two or three-axle semi-trailer carrying a 40-foot ISO container as a combined transport operation	44 tonnes
2.2.3	Road trains with four axles consisting of a two-axle motor vehicle and a two-axle trailer	36 tonnes
2.2.4	Articulated vehicles with four axles consisting of a two-axle motor vehicle and a two-axle semi-trailer, if the distance between the axles of the semi-trailer:	
2.2.4.1	is 1,3 m or greater but not more than 1,8 m	36 tonnes
2.2.4.2	is greater than 1,8 m	36 tonnes + 2 tonnes margin when the maximum authorized weight (MAW) of the motor vehicle (18 tonnes) and the MAW of the tandem axle of the semi-trailer (20 tonnes) are respected and the driving axle is fitted with twin tyres and air suspension or suspension recognized as being equivalent within the Community as defined in Annex II

Figure 7 Extract of weights limits from the Directive 96/53/EU.

In general terms, the combination of T+ST of 5 or more axles is allowed until 40T of weight. Apart from this regulation, there are two approved amendments applicable to the vehicles used in the ZEFES project:

- Directive (EU) 2015/719
- Directive (EU) 2019/1242

The amendment 2015/719 explains that “To further promote intermodal transport operations and to take account of the unladen weight of containers or swap bodies of a length of up to 45 feet, the circulation of three-axle motor vehicles with two- or three-axle semi-trailers should be allowed up to a total authorised weight of 44 tonnes. Two-axle motor vehicles with three-axle semi-trailers transporting containers or swap bodies of a length of up to 45 feet should be allowed in intermodal transport operations up to a total authorised weight of 42 tonnes.”

(c) point 2.2.2(c) is replaced by the following:

'(c) two-axle motor vehicle with three-axle semi-trailer carrying, in intermodal transport operations, one or more containers or swap bodies, up to a total maximum length of 45 feet: 42 tonnes';

(d) in point 2.2.2, the following point is added:

'(d) three-axle motor vehicle with two- or three-axle semi-trailer carrying, in intermodal transport operations, one or more containers or swap bodies, up to a total maximum length of 45 feet: 44 tonnes';

Figure 8. Extract from 2015/719 amendment related to HDV weights.

The amendment 2019/1242 is related to weights of alternative fuel vehicles and ZEVs- their total weight can be increased in case of alternative fuel vehicle up to 1T and 2T in case of ZEVs.

(3) Annex I is amended as follows:

(a) the following subparagraph is added to the second column of points 2.2.1, 2.2.2, 2.2.3 and 2.2.4:

'In the case of vehicle combinations including alternatively fuelled or zero-emission vehicles, the maximum authorised weights provided for in this section shall be increased by the additional weight of the alternative fuel or zero-emission technology with a maximum of 1 tonne and 2 tonnes respectively.';

Figure 9. Extract from 2019/1242 amendment related to ZEVs.

Even though, the Directive 96/53/EC is not a mandatory regulation; the EU countries can impose their own limits. This is the reason why each country involved in ZEFES have been consulted in order to assure the correct road permissions in each of them; in the next sections, there is a description of the situation in each country.

4.1.1 Proposal for amendments to Weights and Dimensions regulation

There is a proposal COM (2023)445, published on the 11th of July 2023, for amendments to the Directive (EU) 96/53. This proposal, explained in the D1.3, includes some provisions which could affect the development of the demonstrations:

- The increase of the GCW for combinations of T+ST until 44T.
- The allowance of some extra-length to Zero Emission combinations of T+ST. The initial text proposes the increase of 90cm.
- Provisions to facilitate the intermodal and cross-border operations.

Also, the proposal includes the option of expanding the operational domain of the European Modular Systems (EMS), which is a solution that allows combinations of existing loading units – also called modules –longer and sometimes heavier vehicle combinations to be used in some parts of the road network.

Before the text is approved and adopted by the EU states, the combinations which are out of the scope of the current regulation should be examined to determine the rules in each of the countries.

4.2 Introduction and challenges on corridors

Each use case will run along one or more different countries. The table 4 below, lists the countries each of the use cases passes through.

	SE	DK	BE	NL	LU	GE	IT	AUS	FR	SP	TUR
7.2.1	X										
7.2.2	X	X	X	X		X					
7.2.3 (EMS)			X						X		
7.2.3 (T+ST)	X	X			X	X					
7.2.4				X		X					
7.3.1	X	X		X		X					
7.3.2						(X)	X	X			
7.3.3									X	X	
7.3.4 (EMS)									X	X	
7.3.4 (T+ST)					X	X					
7.4.1									X		
7.4.2			X	X							
7.6.1											X
7.6.2								X			
7.6.3							X				

Table 4. Matrix of use cases and countries.

Section 4 defines the weights and dimensions limits as well as the permission needed in each country.

During the process of making this deliverable, the different authorities of each country involved have been contacted in order to obtain their confirmation of the weights and dimensions allowed to in their countries. Apart from that, they were informed about the different combinations of the use cases and were requested to share information about the processes to obtain any special permission if required.

Apart from authorities and EU directives (specially 96/53/EC), the International Transport Forum (ITF), where all the countries involved in the project are associated, was consulted.

4.3 Sweden

Transportstyrelsen, the Swedish Transport Agency (STA), is the Swedish government agency which is responsible for the regulation and permissions of rail, air, sea and road transport. They have been contacted to analyse use cases 7.2.1, 7.2.2, 7.2.3.B and 7.3.1.

Following the STA instruction, if the combination of vehicles is according to 96/53/CE, the national approval can be granted and the trailer can be approved based on 2016:22. Also, the information found in the International Transport Foundation indicates that road trains can be up to 25,25m length and articulated vehicles can be up to 24m.

Since 1993, in Sweden it is allowed to drive a combination of 24m of maximum length and 60T of maximum GCW. Since 1997, the maximum length increased to 25,25m, maintaining the 60T of maximum GCW.

Nowadays, the combination is considered an EMS only if it is longer than 24m. If the combination is shorter than 25,25m, no permission is necessary. In case of longer combinations, the maximum allowed length is 34,5m. No permission is required for EMS combinations as long as they fulfil the technical requirements of the *TSFS 2023:42*. In some cases, the local authorities could restrict the access to this long -haul vehicles in some areas.

Regarding the GCW, 64 tonnes are currently allowed on almost all roads and up to 74T are allowed in a limited network.

4.4 Denmark

Færdselsstyrelsen is the Danish Road Traffic Authority. The institution was contacted to confirm the rules concerning use cases 7.2.2, 7.2.3.B and 7.3.1.

The Danish authority assured that the vehicles can travel along Danish roads if they are registered in the country where they come from, and they fulfil the rules in Directive 96/53/EC on weights and dimensions.

Also, heavier combinations are allowed without asking for a permission. A 6-Axle combination can have a total gross weight of 50T (up till 28T on a zero-emission truck and up till 24T axle load on the semitrailer – but in total max 50T).

If the vehicles are not above these limits, no special permission is necessary.

Since January 2024, a trial is running in Denmark, allowing heavier and longer combinations, EMS2, until 32m of length (34m in case of ZEVs) and 72T of tonnage. The permitted weights and dimensions

of the vehicles allowed to drive in Denmark are explained in the *Communication No 1980 - Revised rules on weights and dimensions,* of the 20th of December of 2013.

4.5 Belgium

From the point of view of mobility and infrastructure, Belgium is divided into three different regions:

- Brussels region: the mobility entity there is the Bruxelles Mobilité, from the Service public régional de Bruxelles.
- Wallonia region: the mobility entity is the DG Routes et Bâtiments, form the Service Public de Wallonie (SPW).
- Flanders region: the mobility entity is the Agentschap Wegen en Verkeer, from the Flemish Government.

Regarding all the use cases, the routes that cross through Belgium are the use cases 7.2.2, 7.2.3.A and the 7.4.2. Analysing the three use cases, all of them pass through the region of Flanders, but not for Bruxelles or Wallonia region.

Basically, the authority of the Flanders region, the *Agentschap Wegen & Verkeer*, considers that those dimensions are the maximum allowed without needing a permission:

- Length:
  - Single vehicle: 12m;
  - Tractor + trailer: 16,50m;
  - Truck + trailer: 18,75m
- Width: 2,55m
- Height: 4,00m
- Mass: 44T for 5-axis assemblies
- Rear overhang: 3,00m

Also, it is considered that Long-Haul Vehicles (LHV) can be driven through Belgian roads if they have up to 25,25m length and 60T of weight, equivalent to an EMS1, but require a special permission. The conditions to the LHV are explained in the Appendix IV, section 9.4.1.

Due to Flemish road infrastructure, LHV are not allowed to use the Flemish roads. The local government is managing some projects to investigate the security implications of driving those vehicles on its roads.

Also, some steps are being taken currently, in order to allow some trails in longer combinations of ZEVs in Belgium, but no final resolution is achieved at this moment.

Related to EMS2 combinations, the road authority indicates that there is no legal basis in Belgium for combinations of more than 25,25m of length, which means that currently the EMS2 combinations are not allowed.

Finally, the road permit could be requested by the Flemish *WebTEUV* app or by post, the route must be planned, not all the roads are allowed to LHV, and a permit must be obtained to drive on this route.

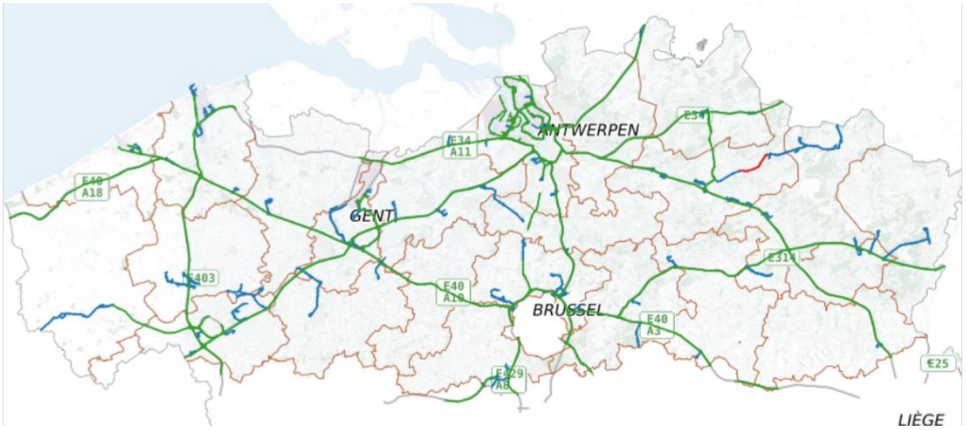


Figure 10. Map of roads through Belgium allowed LHV.

4.6 Netherlands

The Netherlands Vehicle Authority is the *RDW*; it is responsible for the Type Approval and the road permissions and registrations of vehicles.

The information found and the information provided by the road authority show that the Netherlands allows articulated vehicles of 16,5m of length and 50T of maximum GCW. The road trains are allowed to be of 18,75m of length.

Under specific conditions, the EMS are allowed to drive through the Netherlands as a combination of 25,25m of length and 60T of maximum GCW, but they always require a permission. The conditions to allow this kind of transport are explained in the *Beleidsregel keuring en ontheffingverlening LZV,* which can be consulted on the website *wetten.overheid.nl.* The exemption can be requested on the website: *https://www.rdw.nl/en/exceptional-transport/requesting-an-exemption-for-lzv-ecocombi.*

There have been trials of longer combinations, but the result was not successful due to the length of the combinations.

4.7 Luxembourg

"*Département de la mobilité et des transports*" from the *Ministère de la Mobilité et des Travaux publics* from Luxembourg has been contacted; it is the authority responsible for road permissions.

This institution assures that the combinations of T+ST are allowed as a maximum length of 16,5m and 44T of GCW; it is possible to increase the GCW of the combination until 1T additionally if the

vehicle is equipped with a decarbonization technology, but this fact implicates a special permission to drive.

4.8 Germany

The *Kraftfahrt-Bundesamt* (*KBA*) is the federal authority within the scope of the Federal ministry for Digital and Transport.

The limits of weights and dimensions in Germany are the same as the directive 96/53. If the combination is out of the limits of this directive, it is possible to request a permit according to the next national regulations: the one specific to the vehicle combination *(§ 70 Straßenverkehrs-Zulassungs-Ordnung*) and the one specific to the road usage (if applicable on specified routes) *(§ 29 Absatz 3, § 46 Absatz 1 Nummer 2 und Nummer 5 Straßenverkehrs-Ordnung*). The permit must be applied for in the State where the vehicle enters the country or where the vehicle starts the route; the administration where the permit is applied for, will share information about the permit with the rest of the statal administrations of the route.
Combinations of T+ST are allowed to be longer than 16,5m, following the combinations and conditions of the *§ 3 der LKWÜberlStVAusnV vom 19. Dezember 2011,* but the maximum weight allowed is up to 40T or 44T in case of intermodal transport.
For vehicles intended to test new technologies on the road, Germany requires a special road permission called “Testing permits”. For new technologies regarding functionalities of autonomous driving, the KBA is the responsible authority; for other functionalities, the responsibility is with the German federal states. The “Testing permit” must be requested in each state the vehicle will pass through.
Regarding to the final GCW, the regulations *53. Ausnahmeverordnung zur StVZO* and *§34 StVZO Absatz 6 Nummer 6* show some exemptions are to be considered to allow the increase of the tonnage up to 44T in case of combined or intermodal transport. It is recommended to check with the regional authority if the possibility of increasing weight up to 44T is feasible for each case.

The following table lists the states each of the use cases passes through.

	7.2.2	7.2.3.B	7.2.4	7.3.1	7.3.4.B
Baden-Württemberg			X		X
Bayern			X		
Bremen	X			X	
Hamburg	X	X		X	
Hessen					
Niedersachsen	X	X		X	
Nordrhein-Westfalen	X	X	X		
Rheinland-Pfalz		X	X		X
Saarland					X
Schleswig-Holstein	X	X		X	

Table 5. Matrix of German states and use cases.

4.9 Italy

In the Italian "*Codice della strada*", the "*Decreto legislativo 30 aprile 1992 n.285*", the general information on combinations of trucks and trailers which are relevant for the project can be found. Regarding article 61 of chapter III of this regulation, in general terms, the combinations of T+ST are allowed to have up to 18,75m of length and 44T of weight in case of 5 or more axles. No evidence of longer or heavier combinations has been found in this piece of legislation; if any of the limits are not met, the authority decides (*Direzione generale per la motorizzazione e per i servizi ai cittadini e alle imprese in materia di trasporti e navigazione*) if a permit can be granted.

4.10 Austria

The *Bundesministerium für Klimaschutz* (BMK; Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology) is the authority responsible for mobility aspects in Austria.

The documentation shared by the BMK defines that the maximum GCW for articulated vehicles is 40T, except for the next cases that it allows a GCW of 44T:

- Transport of wood, from the hood.
- Transport of fresh milk to the transformation plant.

Also, the maximum length allowed for articulated vehicles is 16,5m and 18,75m for road trains.

In Austria, it is allowed to increase the maximum GCW up to 1T for alternative fuel vehicles or 2T for ZEVs. What is more, in case of vehicles equipped with auxiliary electric engines, the total GCW could be increased up to 1T due to the electric system components.

If the vehicle is not beyond the limits of the national regulation, it requires a certificate of exemption. The certificate must be issued by the governor of the area of the border crossing or the beginning of the journey.

Related to Type Approval, in Austria it is allowed to road with a vehicle when it is registered in a Member State of the EU. When it comes to Type Approval in Austria, it is allowed to drive a vehicle registered in a different Member State of the EU.

4.11 France

In the French "*Code de la route*", the combinations of T+ST are allowed to have 40T of weight and 16,5m of length, as in the Directive (EU) 96/53. From the 1st January of 2023, it is allowed to increase the weight of this combination up to 44T if the vehicles follow the decreet *2012-1359 du 4 décembre 2012 relatif au poids total roulant autorisé des véhicules terrestres à moteur,* but only in national transport, not allowed to go cross-border.

Apart from that, there is no evidence of longer or heavier combinations. The authority has not confirmed if a permission could be granted to drive through France with longer or heavier combinations.

4.12 Spain

In Spain, the regulation on weights and dimensions is similar to Directive (EU) 96/53. For articulated vehicles, the maximum length is 16,5m and 40T of maximum GCW. Also, for road trains, the maximum GCW allowed is 40T.

Provisions concerning road permits differ depending on the area; there are 3 different institutions: *The Security department* for the Basque Country, the *Servei Català de Trànsit* for Catalonia and the *Dirección General de Tráfico* (*DGT*) for the rest of Spain. The three institutions have common instructions for road permits related to testing, exceptions and EMS combinations.

Until January 2024, the EMS combinations are allowed if the maximum length is 25,25m and the maximum GCW is 60T, but require the following permits:

- *Autorizaciones para conjuntos euromodulares (megacamiones)*.
- *Autorizaciones complementarias de circulación*.

Longer and heavier EMS combinations, such as the EMS2 combinations of 32m of length, could be allowed, , but an additional permission is required for “Extraordinary research testing” (*Pruebas o ensayos de investigación extraordinarios*).

All the permits can be requested on the authorities’ websites. Also, all the conditions for the EMS combinations and all those authorisations are explained in the following regulations:

- *Real Decreto 2822/1998* of the 23rd of December, in which the *Reglamento General de Vehículos* is approved, which are the Spanish regulations for vehicles.
- *Real Decreto 1428/2003* of the 21st of November, in which the *Reglamento General de Circulación* is approved, which are the Spanish road regulations.
- *Código de Tráfico y Seguridad Vial*, which is the Spanish traffic code.

All the requirements which must be fulfilled by the EMS configurations to drive through Spain are defined in the instruction *16/V-117*.

Since January 2024, the instruction *MOV 2023/28* allows the EMS1 and EMS2 to drive through Spain without the need for any exemption. The requirements are explained in the same instruction *MOV 2023/28*. Even though, it is important that this instruction is only applicable on the territory of *DGT*, which excludes Catalonia and the Basque Country; in those territories, the exemptions are needed according to the instructions explained previously in this section.

4.13 Turkey

Ministry of Transport and Infrastructure DG for Regulation of Transport Services has been contacted. The regulation in Turkey is similar to 96/53, but there are a few differences. There is a summary of the points relevant for ZEFES:

- Articulated vehicles: 16,5m length
- Road trains: 18,75m length
- Road trains (with 2 trailers): 20m length

The maximum GCW allowed is 40T, except for ISO containers of 40ft for which maximum GCW is 44T.

Evidence of heavier or longer combinations has not been found.

4.14 CEDR (Conference of European Directors of Roads)

The CEDR is an organisation of European national road administrators. In the course of the project, there have been meetings organised to set up a collaboration between ZEFES and the road authorities. The CEDR has supported the ZEFES project in establishing contact with the authorities.

The support from CEDR was important to make easier the cooperation with responsible authorities in each use case, arriving to executive bodies if needed. The fact of not being approved the new amendment for the directive 96/53/EC, causes difficulties on achieving the allowance for the combination. For each demonstration in which the regulation is not fulfilled, a road permit is needed by the responsible authority. The process for granting a road permit is different in each country, sometimes is an administrative procedure and sometimes more communications with higher level authorities are needed.

In December 2024, CEDR decided to set up a working group on W&D linked to the ZEFES project to support the process of getting road permits for the ZEFES demonstrators along the specified corridors and countries. A template describing the details of each demonstration is developed and will be the input for the discussions at national and regional level.

5 Use cases: Analysis and solutions

The next step consists of analysis of the different use cases and identification of the problems that can be found in each case according to regulatory affairs. In each use case different working conditions of each trailer and configuration are explained, specifically focusing on their aspects related to weights and dimensions, fuel and energy systems. This chapter examines the challenges and regulatory gaps and recommends solutions to the identified problems.

The next section describes each use case, using a brief table describing its characteristics and another table showing the weights and dimensions provisions in each country, following the below legend:

Allowed	Not Allowed	Permission required
✓	✖	?

Table 6. Legend of weights and dimensions.

5.1 T7.2 VOLVO

Figure 11 Overview VOLVO demonstrators and logistics missions.

Volvo provides the project with 4 vehicles, 1 FCEV and 3 BEVs. 1 of the BEVs is expected to be a series vehicle and the rest would be prototypes. The series vehicle is expected to fulfil the Type Approval requirements; it must be ensured that the prototypes could be granted approval in the country where they will be registered, as well as transit permit in all countries it passes through.

5.1.1 ST7.2.1 Demonstration of Volvo FCEV innovations

The first use case of Volvo has recently changed. The OEM has just confirmed that it will use a Fuel Cell tractor unit in a combination of T+ST. The maximum length of the combination and the GCW are not confirmed, but some extra-length is expected due to the Fuel-Cell system.

OEM: VOLVO	
Truck: FCEV	T+ST
Distance: 4,800km/week (2 x 340km x 5days/week)	March 2025 – February 2026
Shipper: OVAKO	Steel scrap
Cross border: No	Gothenburg to Hofors

Table 7. Summary of use case 7.2.1.

Figure 12. Example of a vehicle used in use case 7.2.1.

As mentioned in section 4.3, Sweden allow longer combinations of T+ST of up to 24m of length. In case a combination is longer, it should be verified if any road permit is needed.

Related to the tonnage, the GCW should be adjusted to the limits specified in section 4.3 of this deliverable.

The FCEV truck will be a prototype, registered in Sweden. This fact will not suppose a problem, while the approval authority of Sweden allows it.

5.1.2 ST7.2.2 Demonstration of Volvo BEV-1 innovations

5.1.2.1 Plan A

OEM: VOLVO	
Truck: BEV	EMS2
Distance: 1,250km/trip	October 2025 – September 2026
Shipper: Volvo	Automotive parts
Cross border: Yes	Gothenburg to Gent (Intermodal)

Table 8. Summary of use case 7.2.2.

The use case 7.2.2 is using an EMS2 combination with a Battery Electric tractor unit. The vehicle will pass through Sweden, Denmark, Deutschland, Netherlands and Belgium.

Figure 13. Example of vehicles used in use case 7.2.2-Plan A.

The OEM has confirmed that the truck will be a prototype of electric vehicle with a regular plate, which will allow the truck to drive through the EU countries without restrictions.

If we focus on the road permits, with the information that has been obtained from the authorities, the summary of the conditions can be found in the following table.

Country	Long: 32m	Weight: 64T
Sweden	✓	✓
Denmark	?	?
Deutschland	✗	✗
Netherlands	✗	✗
Belgium	✗	✗

Table 9. Weights and dimensions in use case 7.2.2-Plan A.

As presented in table 10, the EMS2 combination is not currently allowed along this route; Belgium rejects the possibility of this length and weight. The road authority of Belgium assures there is no legal basis for this length and tonnage. Also, from CEDR was informed that the trials on the Netherlands of EMS2 vehicles were not successful and nowadays it is so difficult to obtain a permit to road through the Netherlands with this combination. Moreover, CEDR has shared the information that trials of EMS2 vehicles in the Netherlands were unsuccessful and as a result, it is difficult to obtain permits for this combination.

In Germany, the route passes through 5 different states: Bremen, Hamburg, Niedersachsen, Nordrhein-Westfalen and Schleswig-Holstein. Along these states there is a corridor which has been used by LHV's. The authority of Schleswig-Holstein has assured that a permit could be requested for vehicles longer than 25,25m, but under the condition that the load must be indivisible. Taking this into account, the combination of EMS2 would not be allowed in Germany.

Sweden allows the EMS2 combinations, and no permit is necessary if the vehicle is within the scope of its national regulation *TSFS 2023:42*.

As indicated in point 4.4 of this document, Denmark is conducting a trial for EMS2 combinations, but the route of this use case is not included in the trial. The Danish authority agreed to allow a road permit for ZEFES route if the vehicle meets the requirements indicated in the point 4.4 to EMS2. Currently, it is not confirmed whether the permit will be granted, until the characteristics of the truck are not specified by the OEM.

In the course of the project, different discussions with the Benelux countries and the *Secrétariat général de l'Union Benelux* have been held. The aim of those meetings was to show the project and come to an agreement regarding the demonstrations in those countries, especially on the EMS use cases. Non-definitive solutions were given but there is a possibility of alignment between the Netherlands and ZEFES; in Germany, it was stated that road authorities and energy authorities must be involved. More meetings will be set to find solutions for a road permit to organise trails for the demonstration.

5.1.2.2 Plan B

Deployment of the EMS2 on this route seems to be difficult during the planned time of the demonstration. There is a plan B for this route, which consists of separating the semitrailers and using 2 simple combinations of T+ST.

Figure 14. Example of vehicles use case 7.2.2-Plan B.

Country	Long: 16,5m	Weight: 44T
Sweden	✓	✓
Denmark	✓	✓
Deutschland	✓	✗
Netherlands	✓	✓
Belgium	✓	✓

Table 10. Weights and dimensions in use case 7.2.2-Plan B.

In the above table, it is easy to see that the configuration T+ST is possible to be used in all countries except in Germany, in which the maximum GCW allowed is 40T, except for intermodal situations as described in regulations *53. Ausnahmeverordnung zur StVZO* and *§34 StVZO Absatz 6 Nummer 6*, which could be increased up to 42T or 44T (for 2 axle motor vehicle or 3 axle motor vehicle, respectively). In case it is not intermodal, the increase of the final tonnage until 42T is allowed if the vehicle is a Zero Emission truck.

As a result, we can conclude that, if the EMS2 is not possible, the route could be supplied by 2 vehicles as a combination of T+ST of 42T GCW and 16,5m of length.

5.1.3 ST7.2.3 Demonstration of Volvo BEV-2 innovations

The second BEV vehicle of VOLVO will operate in two different modalities. As in the previous use case, the OEM has confirmed that the truck will be approved as a prototype of electric vehicle with a regular plate, which will allow the truck to drive through the EU countries without restrictions.

5.1.3.1 VOL BEV-2 innovations part 1

OEM: VOLVO	
Truck: BEV	EMS2 (with e-Dolly)
Distance: 550km/day	June 2025 – May 2026
Shipper: Procter&Gamble	Semi-finished products
Cross border: Yes	Amiens to Zeebrugge

Table 11. Summary of use case 7.2.3, part 1.

The first part of the use case will be developed by an EMS2 with two semitrailers and an e-Dolly. Its total Length will be 32m of length and 64T of weight. The vehicle is expected to use the EMS2 combination between Amiens and Dourges (only French territory), and between Dourges and Zeebrugge, the truck will run on a combination of T+ST.

Figure 15. Example of vehicles used in use case 7.2.3, part 1.

The next table shows the weights and dimensions of both combinations of this part of the use case, considering the two countries involved.

Country	Long: 16,5m / 32m	Weight: 44T / 64T
France	✓ / ✗	✓ / ✗
Belgium	✓ / ✗	✓ / ✗

Table 12. Weights and dimensions in use case 7.2.3, part 1.

As in the previous use case, the road authority of Belgium assures that there is no legal basis to this length and tonnage of an EMS2.

Also in France, there are no provisions for the EMS combinations on the highways. The *Direction Générale des Infrastructures, des Transports et des Mobilités* has not confirmed the permissions for the EMS2 combination.

In case of T+ST combination, it is allowed in both countries. First, in Belgium it is allowed until up to 44T of weight, but in France it is only allowed in case of intermodal combinations or national transport. If the use case uses intermodal operations with container trailers, the 44T of weight is allowed.

From the initial plan for this route, a remarkable change is that it has been confirmed that the use case will not involve the transport of dangerous goods (ADR).

Also, it has to be considered that electric vehicles have to enter the intermodal station of Dourges (FR) and Zeebrugge (BE). Currently, on those stations it is allowed for the electric vehicles to enter and also transport this kind of vehicles. The contacts established in the intermodal stations do not foresee any regulatory issue in use of the electric truck in the intermodal stations.

Related to the Dolly used in this demonstration, the project partners have confirmed the use of an e-Dolly during the operations on the shipper's yard. In case the e-Dolly is going to be used in the public

road, outside from shipper's yard, it must be type approved and registered, according to section 3.2.4 of this deliverable.

In case the e-Dolly is only used in in the shipper's yard, out of the public road, there is a plan of using another usual dolly on the EMS2 demonstration. The dolly used in the demonstration must be approved to drive on public road. If it is going to be used only on the French territory, no issues are foreseen if the vehicle is registered with a French plate. If the vehicle is registered in another EU country, it will be checked by the authority in France if any road permit is needed.

Finally, the discussions with the French authorities (regional and national) have not been finished by the project stakeholders' and partners' who are trying to find an agreement to set up the demonstration.

5.1.3.2 VOL BEV-2 innovations part 1 – Plan B

In case the EMS2 combination is not allowed, there is a plan B of running the whole use case with a T+ST combination. As indicated in the previous section 5.1.3.1, no potential issues are foreseen if the combinations used in this part are of 16,5m of length and 44T of GCW as maximum.

5.1.3.3 VOL BEV-2 innovations part 2

OEM: VOLVO	
Truck: BEV	T+ST (Cooled)
Distance: 1,200km/trip	July 2025 – November 2025
Shipper: Primafrio	Temperature controlled goods
Cross border: Yes	Dudelange to Lidl Halmstad

Table 13. Summary of use case 7.2.3, part 2.

The second part will be developed by a semitrailer of total length of 16,5m and 44T of weight.

Figure 16. Example of vehicles use case 7.2.3, part 2.

Country	Long: 16,5m	Weight: 44T
Luxemburg	✓	✓
Deutschland	✓	✗
Denmark	✓	✓
Sweden	✓	✓

Table 14. Weights and dimensions in use case 7.2.3, part 2.

As in the previous use case 7.2.2, the combination T+ST with the specified characteristics is allowed, except for Germany because of its weight limit (maximum 40T allowed). As indicated, in the use case 7.2.2, the use of a Zero Emission truck could allow for the increase of the final tonnage up to 42T. Specifically for this use case, taking into consideration conversations with the authorities, we can conclude that reaching 42T is possible.

This demonstration is planned to be used as combined transport. The conversations held between the *BMDV* and the project partners have only confirmed the allowance of 42T of GCW. The possibility of reaching 44T is not confirmed. More research will need to be done in order to confirm if there is the possibility of increasing the tonnage until 44T.

Finally, another important challenge for this use case is the type-approval of the Cooled trailer. In the course of the project, two possibilities have been identified: an e-Cooled trailer equipped with an e-axle and battery to supply the refrigerating system, or a cooled trailer equipped with a system of cryogenic Nitrogen. In both possibilities, the shipper has assured that the trailer will be supplied by them and it will have an EU Type Approval, as it is assured by the OEM of the trailer. According to this, the cooled trailer is should not have any issue related to the permissions in any EU country.

5.1.4 ST7.2.4 Demonstration of Volvo BEV-3 innovations

The last BEV vehicle of Volvo, which will be a series one expected to fulfil the EU Type Approval, will be used on an EMS1 of 25,235m length and 48T GCW, with an e-Trailer, based on 3 three swap bodies.

OEM: VOLVO	
Truck: BEV	EMS1 (with e-trailer)
Distance: 675km/trip	November 2025-October 2026
Shipper: DPD	Packaging
Cross border: Yes	Münich to Eindhoven

Table 15. Summary of use case 7.2.4.

Figure 17. Example of vehicles used in use case 7.2.4.

Country	Long: 25,24m	Weight: 48T
Germany	?	✖
Netherlands	?	?

Table 16. Weights and dimensions use case 7.2.4.

For this case, it is known that some trials of EMS combinations have been organised along the Netherlands roads; also, it is also the case for some German states.

The Netherlands allows EMS combinations of maximum 25,25m and 60T; even it is always necessary the, but a permit from the road authority, the *RDW* is necessary.

In Germany, the permit from the road authority is necessary. As in the other cases, it must be asked for in the state of entrance into the country and it will share with other states along the route. The 25,25m of length is allowed, but an exemption must be applied according to the *§ 70 Straßenverkehrs-Zulassungs-Ordnung*, the *§ 29 Absatz 3* and the *§ 46 Absatz 1 Nummer 2 und Nummer 5 Straßenverkehrs-Ordnung.* The Road conditions of these combination of vehicles are included in the *§ 3 der LKWÜberlStVAusnV vom 19. Dezember 2011.*

The 48T of GCW are not allowed in Germany, the maximum allowed is 40T.The possibility of increasing 2T due to a Zero Emission truck could be allowed in this case. Some conversations have been held with BMDV, but the permission for 48T of GCW cannot be granted. However, the possibility of reaching 42T is confirmed. As in the previous use case, it is not confirmed if 44T is possible to be reached, taking into account the use of containers. The recommendation is to do more research in order to confirm if there is the possibility of increasing the tonnage to 44T.

Furthermore, this use case has the challenge of obtaining the approval for the e-Trailer, following the requirements of the section 3.2.2.2. The semi-trailer, including the container, must fulfil the requirements on weights and dimensions. The type-approval of the e-trailer will assure the fulfilment of the dimensions of the semitrailer, not including the container. The entity responsible for container dimensions adhering to the limits of weights and dimensions regulation is the shipper. In case any of these points is not fulfilled, the authority/authorities are the institution deciding whether a road permit can be issued.

5.2 T7.3 SCANIA

Figure 18. Overview of Scania demonstrators and logistics missions.

Scania will contribute to the project with three vehicles: 2 BEV trucks (1 of them a low liner) and 1 FCEV truck.

The OEM has confirmed that the non-low liner BEV truck will be a vehicle with a European Type Approval homologation, following the regulations; this fact implies that no problem has been identified for the vehicle approval and it can follow the usual homologation procedure.

For the low-liner BEV truck, it is confirmed by Scania that it will be a series vehicle which will fulfil all the EU type approval regulations.

Finally, Scania confirmed that the FCEV will be a retrofitted BEV. The vehicle is expected to be fitted with the Type Approval regulations, except for the Regulation (EU)155 and Regulation (EU)156 of Cybersecurity and Software update. Because of that, obtaining of an EU type approval is impossible, but the fact that the vehicle will be only a single prototype opens the door to explore the possibility

of obtaining an individual approval. Project partners have informed the OEM that in Spain, there is the possibility of granting an individual approval without fulfilling the GSR2 regulations (including Regulation (EU)155 and Regulation (EU)156) while the *RD2028/1986* allows for it to happen. The point 5.2.1.1 explains the requirements and legal framework.

Also, regarding to the FCEV, even though the vehicle meets the requirements of the Weight and Dimensions Directive (EU)96/53, the fact of being under the scope of the Regulation(EU)134 will require the truck to have the fuel cell tanks behind the cabin, which implicates the position of the fifth wheel is modified and the combination is longer than 16,5m (the maximum allowed by the same directive). This fact could implicate the need for a road permit to drive through European countries under the current regulation.

5.2.1.1 Individual approval under Spanish regulation

The *RD750/2010* of the 4th of June is the national Spanish regulation which establishes the administrative procedure for the type-approval of vehicles, parts and components included within the framework of the EU Directives and granting the mutually recognised permission between the CEE States.

The *RD2028/1986* of the 6th of June is the regulation that sets rules for the implementation of certain EEC Directives relating to the type-approval of motor vehicles, trailers and semi-trailers, as well as parts and components of such vehicles. This regulation does not currently include the GSR2 requirements. This fact could allow the individual permission to be granted without accomplishing the GSR2 regulations. Furthermore, the document *RD2028/1986* GSR2 requirements is expected to be updated in the near future, but the official date of entering into force is not confirmed yet.

Since the GSR2 requirements are included in the *RD2028/1986* of the 6th of June, and the regulation has entered into force, the individual permit will not be granted if any provision of this regulation is not fulfilled. In this case, there is a possibility of granting an approval under the *RD750/2010* of the 4th of June, which is the prototype approval. In this last case, the approval authority decides on granting the individual approval with an exemption for the requirements that have not been met for the OEM that produced the truck.

With all these approvals under the scope of the *RD750/2010*, the vehicles could be granted with a regular Spanish plate, which is allowed to drive through all the EU countries.

5.2.2 ST7.3.1 Demonstration of Scania BEV and SLI innovations

OEM: SCANIA	
Truck: BEV	T+ST (with e-trailer)
Distance: 1,325km/trip	November 2025 – April 2026
Shipper: Scania	Automotive parts
Cross border: Yes	Södertälje to Zwolle

Table 17. Summary of use case 7.3.1.

Figure 19. Example of vehicles used in use case 7.3.1.

Country	Long: 16,5m	Weight: 44T
Sweden	✓	✓
Denmark	✓	✓
Deutschland	✓	✗
Netherlands	✓	✓

Table 18. Weights and dimensions in use case 7.3.1.

The first BEV of Scania will be used in a simple configuration of T+ST. This type of truck can be deployed on the roads of all the countries involved, but with a maximum GCW of 40T to 44T, depending on the country.

In this case, Germany is again the unique country which does not allow the 44T vehicles. The allowance for reaching 42T GCW is granted by the *BMDV* due to the Zero Emission powertrain. The initial conversations held with *BMDV* and the regional authorities involved in the use case, did not result in the permission for increased tonnage being granted.

The challenge for the type-approval in this case is also the use a of an e-Trailer. If the trailer will be registered in Spain with a regular Spanish plate, following the recommendations of the project

partners in section 3.2.2.2, no road permit is expected to be needed to use the e-Trailer on the UE use cases.

5.2.3 ST7.3.2 Demonstration of Scania FCEV innovations

OEM: SCANIA	
Truck: FCEV	T+ST (cooled)
Distance: 680km/trip	October 2025 – March 2026
Shipper: Grueber	Temperature controlled goods
Cross border: Yes	Calcio to Brixen

Table 19. Summary of use case 7.3.2.

Figure 20. Example of vehicles used in use case 7.3.2.

Country	Long: 17,4m	Weight: 44T
Italy	?	✓
Austria	✗	✗

Table 20. Weights and dimensions in use case 7.3.2.

The FCEV truck provided by SCANIA will operate during 6 months through Italy and Austria as a T+ST configuration of 17,4m and 44T of GCW, with a cooled trailer.

Analysing per countries, Italy is allowing the combinations of 44T of GCW, but no longer than 16,5m. Research done by the ZEFES' partners arrived at the conclusion that it is possible to obtain a road permit with a logistic operator in Italy for this combination, reaching the length and GCW defined for this demonstration.

If we analyse the use case in Austria, currently there is no permission for a combination of this use case, due to the extra-length and the extra-weight. The contacts with the regions in Austria have not confirmed granting of a road permit due to the characteristics of this use case combination. Also, the

maximum GCW could not be allowed to exceed the 42T. The possibilities for this demonstration's permit are still a discussion subject between ZEFES partners and the regional authorities in Austria.

As in use case 7.2.3 part 2, another important challenge for this use case is the type-approval of the Cooled trailer. The project partners involved in the use case have ensured that the trailer will be supplied by them and it will have an EU type approval. According to this, the cooled trailer is not supposed to have any issue related to the road permits in any EU country.

The last challenge of this route is the permit for the FCEV going through Italian tunnels. The road operator of the A22 highway has been contacted and assured that this they do not foresee any restrictions.

5.2.4 ST7.3.3 Demonstration of SCA BEV & FCEV

OEM: SCANIA	
Truck: FCEV	T+ST (cooled)
Distance: 680km/trip	October 2025 – March 2026
Shipper: Grueber	Temperature controlled goods
Cross border: Yes	Calcio to Brixen

Table 21. Summary of use case 7.3.3.

The FCEV and the BEV vehicles of SCANIA used in 7.3.1 and 7.3.2 will be used for this use case along the same route to compare the difference between a BEV and a FCEV vehicle in the same conditions. The shipper PRI will use both vehicles depending on its needs. The configuration will be the same in both cases, T+ST.

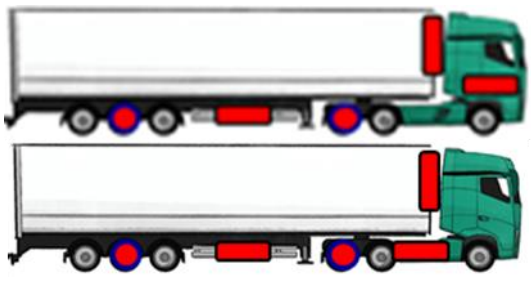


Figure 21. Example of vehicles used in use case 7.3.3.

For the BEV, the total dimensions will be 16,5m of length and 44T of weight. For the FCEV, the dimensions are the same as in the use case 7.3.3.

Country	Long: 16,5m (BEV) / 17,4m (FCEV)	Weight: 44T/44T (BEV / FCEV)
Spain	✓ / ?	? / ?
France	✓ / ✗	✓ / ✓

Table 22. Weights and dimensions in use case 7.3.3.

In Spain, according to the Spanish road authority, it is possible to request a *Circulation Complementary Authorisation* (*ACC*) to obtain permission for this combination of 44T of weight and 17,4m of length. The conditions for this authorisation are indicated in the *Real Decreto 2822/1998, de 23 de diciembre* and the *Real Decreto 1428/2003, de 21 de noviembre.* With the current legislation in force in Spain, both trucks will need a road permit due to the extra-length and the extra-weight. In France, the maximum weight granted is 40T, but it is allowed to exceed until 44T in case of intermodal operations and 1T more in case of a zero emissions vehicle. There is no confirmation of the French authority, but it is possible to request a permit as an exceptional transport. The conditions for obtaining a permission for exceptional transport are explained in the "*Arrêté du 4 mai 2006 relatif aux transports exceptionnels de marchandises, d'engins ou de véhicules et ensembles de véhicules comportant plus d'une remorque*". Furthermore, as it is explained in section 4.11, it is allowed to drive through France with a combination of T+ST and 44T of weight if the route is not cross-border. The recommendation is to ask both authorities if an exemption could be granted in both countries.

The French authorities have been approached by the project partners with the use case information. Even though vehicles are expected to fulfil the requirements of the new proposal for weights and dimensions regulation (currently pending for the approval), from the *Direction Générale des Infrastructures, des Transports et des Mobilités*. They refused to inspect the use case until the new proposal is approved or until the legislative procedure is completed.

As in use case 7.2.3 part 2 and use case 7.3.2, another important challenge for this use case is the type approval of the cooled trailer. The project partners have ensured that the trailer will be supplied by them and it will have an EU type approval. The cooled trailer is not supposed to have any issue related to the road permits in any EU country.

To sum up, any issue can be foreseen for the BEV if the permits in Spain are allowed for 44T. The FCEV is at risk because the new amendment to the Directive 96/53/EC is not approved and the approval of a road permit in Spain is also pending.

5.2.5 ST 7.3.4 Demonstration of Scania BEV-Low Liner innovations

The low liner BEV of SCANIA will operate for 6 months for GSS. During those six months, it will operate in two configurations: the truck will run as a T+ST of 16,5m of length and 44T of maximum weight and as an EMS2 of 32m of length and 64T of weight.

5.2.5.1 Part 1 – Semitrailer

OEM: SCANIA	
Truck: BEV – Low Liner	T+ST
Distance: 600km/trip	July 2025 – November 2025
Shipper: GSS	Automotive goods
Cross border: Yes	KCC-Heilbronn to Dudelange

Table 23. Summary of use case 7.3.4 (T+ST).

Figure 22. Example of vehicles used in use case 7.3.4 (S+ST).

Country	Long: 16,5m	Weight: 44T
Germany	✓	✗
Luxembourg	✓	✓

Table 24. Weights and dimensions in use case 7.3.4 (T+ST).

This part of the use case, will be running through Germany and Luxembourg. As it is shown, the combination studied is allowed in Luxembourg, but the maximum GCW is not allowed in Germany. The situation is the same as in the previous use cases: it is possible to reach 42T of GCW, but it seems difficult to reach an exemption to a maximum GCW of 44T. In case the shipper wants to apply for an exemption, it must follow the instructions which can be found in section 4.8 of this document. Finally, it was confirmed that the trailer used in this use case will not be an e-trailer, as it was defined at the beginning of the project.

5.2.5.2 Part 2 – EMS2

In the case of the EMS2 configuration, the same BEV will operate as a combination of 32m length and 64T weight.

OEM: SCANIA	
Truck: BEV – Low Liner	EMS2
Distance: 550km/trip	July 2026 – November 2026
Shipper: GSS	Automotive goods
Cross border: Yes	Le Boulou to Martorell

Table 25. Summary of use case 7.3.4 (EMS).

Figure 23. Example of vehicles used in use case 7.3.4 (EMS).

Country	Long: 32m	Weight: 64T
France	✖	✖
Spain	?	?

Table 26. Weights and dimensions in use case 7.3.4 (EMS).

In Spain it is possible to operate with an EMS2 (*Duotrailer*), according to the conditions described in point 4.12. As the vehicle is passing through Catalonia, an exemption will be needed by the *Servei Català de Trànsit*, granting a road permit. The requirements are the same as defined by DGT in the rest of the Spanish territory.

Similarly, to use case 7.2.3, there is no evidence found in the highway code of France concerning the authorisation of EMS combinations. The authority has not confirmed if there is a possibility to grant an exemption or road permit from the Spanish border to Le Boulou. The communications established between the project partners and the *Direction Générale des Infrastructures, des Transports et des Mobilités*, involving the CEDR, did not result in an exemption. The possibility of obtaining a road permit is still under discussion between ZEFES partners, who are trying to involve local authorities.

In case any exemption is obtained from French authorities, the plan B could be used to decouple both semitrailers and use two combinations of T+ST of 16,5m and 44T of weight, taking into account that in Spain a road permit is required in case of 44T of GCW.

5.3 T7.4 RENAULT

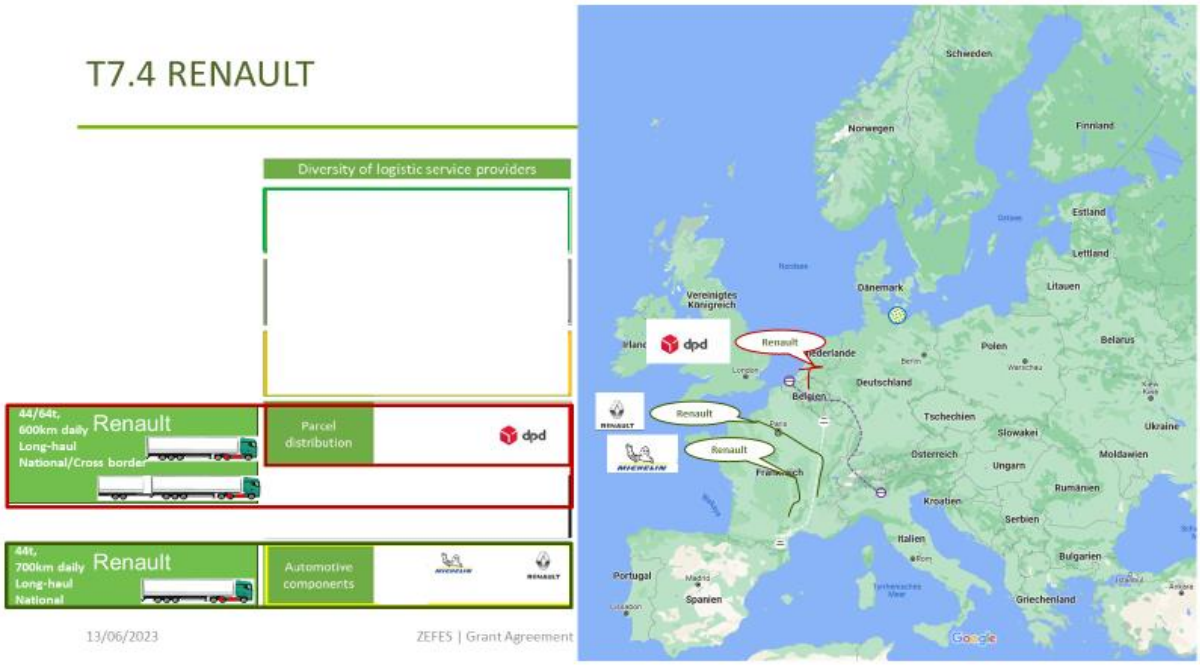


Figure 24. Overview of Renault demonstrator and logistics missions

Renault is bringing 2 tractor units into the project as BE-HDV, operating in 3 demonstrations. Renault has confirmed that the vehicle used will be approved as a prototype, it will be a pre-series demonstrator vehicle but fulfilling all the EU type approval requirements. The OEM has also confirmed that the vehicle will be longer than usual because of a third axle of the truck and other issues related to construction; this will implicate the modification of the fifth wheel and probably a longer combination.

The vehicle is expected to have an elongated cab; it is important to remark that the Directive 96/53/CE, in amendment 2019/1242 allows to the exceed the maximum lengths laid down in point 1.1 of Annex I of 96/53/EC if it fulfils the requirements indicated in Article 9a of the same amendment 2019/1242.

The OEM has confirmed that the truck will be registered in France. If the truck is going to be registered with a regular French plate, no issue is foreseen regarding permits in EU; even, if the truck is registered with a special plate, it must be considered that an exemption or permission could be required by the road authorities of the countries it will pass through.

5.3.1 ST7.4.1 Demonstration of Renault BEV and Michelin Tyre innovations

The first demonstration of Renault will be used in two different routes, but with the same combination of T+ST.

OEM: RENAULT	
Truck: BEV	T+ST
Distance: 500km/trip	July 2026 – October 2026
Shipper: Michelin	Semi-finished products
Cross border: No	Bloivazy to Blanzy

Table 27. Summary of use case 7.4.1 (T+ST). 1st route.

OEM: RENAULT	
Truck: BEV	T+ST
Distance: 700km/trip	January 2026 – June 2026
Shipper: Renault	Cabs to assembly plant house
Cross border: No	Blainville to Bourg-en-Bresse

Table 28. Summary of use case 7.4.1 (T+ST). 2nd route.

Figure 25. Example of vehicles used in use case 7.4.1.

Country	Long: 17,65m	Weight: 44T
France	✖	✓

Table 29. Weights and dimensions in use case 7.4.1.

Michelin will operate the BEV of Renault with a single T+ST configuration of 17,65m of length and 44T of GCW. As explained in the use case 7.3.3, this combination with 44T is not allowed if it does not operate in intermodal or national transport. In this case, the condition of national transport is fulfilled and the use case is under the scope of the regulation. Even though, the extra length of the combination is not allowed by the current regulation.

The project partners have contacted the *Direction Générale des Infrastructures, des Transports et des Mobilités* in order to confirm the possibility of obtaining a road permit for those demonstrations. Despite the fact that the vehicles and combinations are expected to fulfil the requirements of the new proposal for weights and dimensions regulation, from the *Direction Générale des Infrastructures, des Transports et des Mobilités* they refused to inspect the use case until the new proposal is approved or until the legislative procedure is completed. In case there is a final text or a conclusion on amendment is reached, there could be a possibility to receive permit due to the Zero Emission powertrain and the elongated cab.

Similarly to the use case 7.3.3, the conditions to obtain a permission for exceptional transport are explained in the "*Arrêté du 4 mai 2006 relatif aux transports exceptionnels de marchandises, d'engins ou de véhicules et ensembles de véhicules comportant plus d'une remorque*".

5.3.2 ST7.4.2 Demonstration of Renault BEV innovations

For 6 months, DPD will use the BEV of Renault in two different configurations:

- T+ST configuration, of 17,65m of length and 44T of GCW through the Netherlands and Belgium.
- EMS1 configuration T+ST+TR, of 25,39m of length and 60T of GCW through the Netherlands.

OEM: RENAULT	
Truck: BEV	T+ST & T+ST+RT (EMS1)
Distance: 625km/trip	January 2026 – October 2026
Shipper: DPD	Parcel hub to hub distribution
Cross border: Yes (Only T+ST; T+ST+RT only in Netherlands)	Leiden to Veenendaal and Puurs

Table 30. Summary of use case 7.4.2.

Figure 26. Example of vehicles used in use case 7.4.2 – Part 1.

5.3.2.1 Part 1 – T+ST

Country	Long: 17,65m	Weight: 44T
Netherlands	✖	✓
Belgium	✖	✓

Table 31. Weights and dimensions table summary for use case 7.4.2 (T+ST).

The combination of T+ST of this use case is not allowed to drive through the Netherlands and Belgium, as it is shown in the table above, due to the extra length. During the meetings held with the CEDR in the course of the project, the representatives of this institution have indicated that elongated cabs are currently allowed in Benelux countries, but there is also an additional extra-length due to the Zero Emission powertrain.

The authorities contacted in Belgium, concretely the *Departement mobiliteit and openbare werken*, have assured that some steps have been taken to start trials in Belgium to test the combination of extra-length truck with Zero Emission powertrain systems. Nonetheless, there is no evidence of the approval for these initiatives.

As in the use case 7.4.1, considering the truck specifications and the current regulations, there is a risk of non-running the use case if the new proposal of weights and dimensions Directive is not approved.

5.3.2.2 Part 2 – EMS1

Figure 27. Example of vehicles used in use case 7.4.2 – Part 2.

Country	Long: 25,39m	Weight: 60T
Netherlands	?	?

Table 32. Weights and dimensions in use case 7.4.2 (EMS1).

As in the use case 7.2.4, the Netherlands allows EMS1 combinations of maximum 25,25m and 60T under specific conditions - only a permit from the road authority (*RDW*) is necessary. The conditions to obtain a permit for the EMS1 in the Netherlands are explained in section 4.6 of this deliverable.

This use case also includes the elongated cab, which increases the maximum length allowed by 14cm. As in part 1 of this use case, the CEDR has indicated that elongated cabs are currently allowed in the

Netherlands. That would mean that the truck could be allowed to be used in the use case if the *RDW* grants the road permit, which should be requested by the shipper. Also, as an EMS combination, each of the modular parts (the truck, the semitrailer and draw-bar trailer) should fulfil the requirements of the Directive 96/53/CE considering the payload and the containers (if applicable).

There is a possibility of using a T+ST combination in this use case for the purpose of a demonstration between the Netherlands and Belgium. The specifications (length and GCW) are the same as part 1 of this use case. Considering the latter, the conclusions are the same as in part 1.

5.4 T7.6 FORD

Figure 28 Overview of Ford demonstrator and logistics missions

The FCEV of FORD will operate in the three use cases as a T+ST configuration of 17,9m of length and 44T of weight. As it was the case in Volvo and Scania use cases, the length of the truck is longer than standard due to the hydrogen tanks. It creates another challenge related to the weights and dimensions permits and regulations.

Concerning the truck approval, the OEM confirmed that the vehicle will not fulfil some of the ADAS regulations, which makes it impossible to obtain the EU Type Approval. The truck is planned to receive an individual approval in Spain, as explained in section 2.3.2.1. The same procedure as used for the Scania FCEV could be applied as explained in section 5.2.1.1 of this deliverable.

Also, the three use cases of Ford have the particularity of not crossing a border. This is important if the truck is registered in a different country than the one it operates in. This is the case for the Ford uses cases - the truck is expected to be registered in Spain, obtain a regular Spanish plate, but drive in Turkey, Austria and Italy. This fact constitutes cabotage and there is a need to better understand the implications or develop potential mitigation strategies to avoid fees.

5.4.1 ST7.6.1 Demonstration of FRD FCEV innovations

OEM: FORD	
Truck: FCEV	T+ST
Distance: 500km/day	November 2026 – December 2026
Shipper: EKOL	General cargo
Cross border: No	Ford Kocaeli Plant to Istanbul Pendik Ports

Table 33. Summary of use case 7.6.1.

Figure 29. Example of vehicles used in use case 7.6.1.

Country	Long: 17.9m	Weight: 44T
Turkey	?	?

Table 34. Weights and dimensions table summary for use case 7.6.1.

This use case will be a two-month demonstration running in a non-EU country (Turkey). This combination does not fulfil the requirements to drive through Turkey, as indicated in section 4.13.

The Turkish authority has confirmed that, as stated in paragraph (c) of the first paragraph of Article 128 of the Road Traffic Regulation, the maximum length is determined as 16,50 meters for semi-trailer vehicles. Regarding the maximum load, the Turkish authority stated that the maximum total weight of the semi-trailer vehicles in question must not exceed 40 tonnes.

The General Directorate of Highways in Turkey has been contacted by the partners of the project. It has confirmed that, considering the specifications of this combination, a Special Cargo Transport Permit must be obtained each time for this type of transportation.

In fact, two special permits will be required for this use case. If the maximum length of the semi-trailer vehicles in question exceeds 16.50 meters, a Special Permit Certificate is required for unloaded vehicles and a Special Load Transport Permit Certificate is required for loaded vehicles each time they enter traffic, both unloaded and loaded.

It is important to remark that a solution to avoid cabotage or a mitigation strategy could be necessary for this use case, in case it involves cabotage.

5.4.2 ST7.6.2 Demonstration of FRD FCEV innovations

OEM: FORD	
Truck: FCEV	T+ST
Distance: 600km/day	March 2026 – June 2026
Shipper: DPD	Parcel hub to hub distribution
Cross border: No	Graz to Graz (DPD depots)

Table 35. Summary of use case 7.6.2.

Figure 30. Example of vehicles used in use case 7.6.2.

Country	Long: 17.9m	Weight: 44T
Austria	✖	✖

Table 36. Weights and dimensions in use case 7.6.2.

This use case will be a two-month demonstration running in Austria. As in the previous use case, this combination does not fulfil the requirements to drive through Austria. The partners have contacted the Austrian authorities to demonstrate the use case. Those authorities have indicated that current legislation does not allow to drive the combination defined for this demonstration. The conversations held with the Austrian authorities did not lead to a solution for the road permit to be obtained for this use case, but they have confirmed that 44T of GCW is not possible for this use case, but it is possible to reach 42T due to the Zero Emission powertrain.

The possibilities to grant a road permit are still under discussion involving road authorities, road operators and ZEFES' partners and stakeholders.

As in the previous use case, it is important to remark that a solution to avoid cabotage or a mitigation strategy could be necessary for this use case, in case it involves cabotage.

5.4.3 ST7.6.3 Demonstration of FRD FCEV innovations

OEM: FORD	
Truck: FCEV	T+ST
Distance: 660km/trip	July 2026 – October 2026
Shipper: Procter&Gamble	Semi-finished products
Cross border: No	Milano to Pomezia (Through Apennines or coast)

Table 37. Summary of use case 7.6.3.

In this route, operating in Italy for two months, a long-haul VECTO mission profile of a FCEV will drive through a route with tunnels.

Figure 31. Example of vehicles used in use case 7.6.3.

Country	Long: 17.9m	Weight: 44T
Italy	?	✓

Table 38. Weights and dimensions table summary Use case 7.6.3.

In Italy, 44T of GCW is allowed for articulated vehicles, but the authority has not confirmed if a permission could be granted to allow the extra length of the combination. The ZEFES' partners have contacted the road operators in Italy, to verify if a permit could be allowed for this demonstration.

ZEFES' partners have confirmed with the road operators that, if the truck is rented by an Italian company with a driver under the Italian working contract, there will not be a problem of cabotage.

The partners involved in this use case have confirmed that the goods to be transported in this use case are not considered as ADR.

5.5 Challenges on railways and ferries

5.5.1 Ferries

Use cases 7.2.2, 7.2.3 and 7.3.1 have something in common: a part of all those routes involves a ferry from Rodby to Puttgarden, managed by SLI.

SLI allows vehicles to be embark their ferries if they are approved by EU regulations, including electrical safety which is important especially for electric vehicles.

As indicated by the ZEFES stakeholders', the current weights and dimensions regulations indicates that the limits of weight per axle is depending on the number of axles of the vehicle: for 2 axle vehicles, the maximum weight allowed is 16T/axle and for 3 axle vehicles the limit is set at 13T/axle. There is no maximum length restriction for trucks on ferries.

Finally, the option of charging vehicles on the ferries is not possible due to safety reasons. Charging mode increases the risk of a fire and even the option of charging the vehicle in the terminal is impossible.

Figure 32. Scandinavian Lines ferry.

5.5.2 Railways

The use cases 7.3.3 and 7.3.4 are planned to use intermodal transport involving railways.

Trains can be used to transport goods on long distances. It is possible to combine road transport with railways and reduce time of loading and unloading goods from the vehicles using intermodal stations.

In those intermodal terminals, the containers are loaded on the rail wagons or the trailers and semitrailers are loaded on the train directly, without using cranes, only towing vehicles. This fact reduces the time of loading the vehicles on the train.

Figure 33. Working mechanism of intermodal train station in Le Boulou.

The types of trailers and semitrailers used must be taken into consideration. E-trailers, e-cooled trailers and the usual trailers can be loaded onto the rail wagons.

Currently, the usual semitrailers are used in intermodal terminals and train wagons are prepared to accommodate those trailers, considering their weights and dimensions. Using heavier trailers with batteries and e-axles could implicate the necessity of changing the maximum permissible load on the rail wagon.

For the development of the intermodal use cases, the following components are going to be used as presented in Figure 34, Figure 35, Figure 36 and Figure 37:

- T3000e pocket wagon
- Loading platform r2L Vega
- Loading platform Nikrasa
- Modalohr wagon.

The vehicles used on these use cases should be adapted to be fitted on these systems.

Figure 34. Pocket wagon T3000e.

Figure 35. R2L Vega platform.

Figure 36. Nikrasa platform.

Figure 37. Modalohr Wagon.

There is no special regulation banning the battery trailers, but it is suggested by the intermodal partner, to identify or mark the trailers with HV batteries due to safety reasons. For example, a codification as an ADR vehicle could be used for this type of trailers equipped with batteries.

Finally, some use cases face a challenge of installing a system to recharge the battery of the trailer or truck on the rail wagon. SWS will provide a Power Box to charge the batteries during the railway operation, in order to ensure the service of the e-Cooled trailers and charging the trucks, if needed. The charger is a pneumatic system which uses the force of the wheels to generate electricity.

5.6 Challenges on cross-borders

Most of the use cases have been designed to cross different countries, which implicates risks and difficulties due to the cross-border transport for vehicles with special licence plates. Almost all of the use cases are foreseen to drive in EU countries, but the different regulations between all the countries and the national permissions, could potentially cause some problems at the borders.

Those problems could be solved using a uniform regulation throughout the EU, but in the current state of play, different national laws are in force.

To avoid problems with cross-border traffic of special vehicles, prototypes or combinations with higher than usual weight or length, permissions from both countries situated at a given crossing should be obtained. Should the permission be obtained in all countries involved, the problems are not expected to occur.

The application process can be long and requires appropriate planning and respect of the administrative deadlines.

6 Conclusions and recommendations

6.1 Conclusions

One of the biggest challenges in the ZEFES project is obtaining the type- or exemptions for the vehicles to operate in the different countries and regions. Most of the legal requirements, this task dealt with are related to type approval and weights and dimensions-related limitations for the different combinations.

Related to the challenges in obtaining type approval for the vehicles used in ZEFES, there are some regulatory challenges that need to be addressed as elaborated below:

Regarding the approval of e-Trailers, some affected amendments of regulations are pending to enter into force or pending to be approved (as is the case of UN R100), additionally some regulations are under drafting process and have no set date to enter into force (as the UN R13). There is more risk in granting the approval if the homologation process has to be started and these draft regulations have not been approved or the current regulations have not changed. Even though, different possibilities of approval have been explored during the project, such as granting the use of e-trailers through the whole EU countries during the ZEFES' demonstrations.

From the point of view of the trucks type-approval, no challenge is identified. The whole fleet of vehicles involved in the ZEFES project is expected to be approved and allowed to run in all demonstrations. The issues shown by the OEMs have been solved, finding solutions to receive approvals for all trucks, especially for the FCEVs involved in the use cases operating Ford and Scania vehicles.

From the point of view of truck-trailer combinations and the respective maximum allowed weights and dimensions, some challenges still need to be figured out in order to achieve the allowance to run the demonstrations.

Firstly, the regulations of the EU Member States are different in regard to the maximum allowed weights and dimensions for heavy-duty vehicles. The GCW in each country could be different, affecting the trans-border (international) demonstrations.

Secondly, the regulations (at EU and national level) are still not adapted to specific technical requirements for ZEVs. The great part of the demonstrations shows issues related to the extra-length or extra-weight requirements for ZEVs. These issues could be solved with the entry into force of the new amendment of weights and dimensions directive (revision of Directive (EU) 96/53), but the different EU countries need also to transpose the final text adopted to its national regulation. Regarding to this, two main issues need to be clarified:

- The extra-length needed due to Zero Emission technologies, which is not homogeneous on the different demonstrations, and sometimes more than 90cm, which is the limit of the new

weight and dimensions regulation proposal. The final text adopted could affect the allowance of the demonstrations.
- The majority of EU countries is aware about the need to increase GCW to 44T in general cases of Zero Emission trucks, but the not acceptance by some countries are limiting the load conditions of some demonstrations and the international transport of goods with ZEVs.

Finally, the combinations of EMS are not standardised in all EU countries. In most of the north European countries, EMS1 combinations are allowed, even with a permission, up to 25,25m of length and 60T of weight; but not all countries are prepared for these combinations on their roads. Moreover, only a few countries have included the EMS2 combinations in the regulation; the rest of the countries, does not consider it or consider it as an exemption of the EMS combinations, which implicates the need for a road permit. For that reason, the trials of EMS2 have no final resolution, depending on the authorities' decisions.

It is important to highlight the support from CEDR, which has been important during the whole project development. As seen, a great part of the use cases shows incompatibilities with current weights and dimensions directive, which need to be resolved in cooperation with authorities until the new regulation is entering into force. The set up of a working group between CEDR and ZEFES has been important for the resolution of road permits conflicts in the project due to its closed collaboration with executive bodies.

To sum up, the current situation affecting the ZEFES project has been explained and elaborated in this report. Some details regarding the permits must be followed-up and confirmed by some authorities in order to assure the success of the use cases, the project will keep monitoring advancements in the EU and the MS.

Additionally, solutions or plan B's have been identified to solve potential issues in all demonstrations, even considering weight and length reductions that in some cases will be needed. Mitigation actions have been put in place that could potentially affect the final payload. It is important to mention the pending situation on the demonstrations passing through Austria.

6.2 Recommendations

Considering all the above-mentioned conclusions, some next steps in order to ensure the success of the trials can be found below:

- Ensure with relevant authorities of each route that all vehicles are able to road through their countries and under what conditions. Specially, it is referring to e-Trailers and other vehicles implicated which are not allowed to get the EU Type Approval.
- Consider the time needed for the process to apply for the road permissions. Some of the permits could take some months to confirm the allowance. Also, depending on the types of homologations that the OEMs will decide to their vehicles, the timing could widen.
- Be aware of latest updates from the working groups. If some of the draft regulations enter into force during the project, the homologation process could be simplified and unified. Also, the

national regulations should be monitored in order to follow the weights and dimensions updates.

Maintaining an open communication with the authorities during the project life is a way to ensure the successful deployment, as the EMS combinations and the road permissions of the vehicles, also to avoid mistakes and future delays and cross-border problems. One of the main recommendations is to engage the authorities which are not replying to the project too; working together could help solve the problems related to legal aspects in the ZEFES use cases.

As a technical remarks, the use of combinations adjusting to turning circle radius conditions laid down on current directive 96/53/EC or on the new proposal for its amendment, could help in the allowance of longer combinations. Additionally, the use of intermodal combinations for the demonstrations could allow the increase of the GCW to 44T.

7 Risks and interconnections

7.1 Risks/problems encountered

The most important problems that has been encountered during the project is obtaining the information and the support from the authorities. Sometimes they are difficult to get in contact with and this could provoke delays and also topics that could be not confirmed.

The main risks found related to the combinations of vehicles are the approval of the new concept of trailers and the e-Dolly, which must be approved with regulations that are pending from new updates or amendments or involving several authorities. Also, the national regulations of weights and dimensions on some countries could lead to the not success on the EMS routes.

Finally, the differences on the weights and dimensions regulations between the different countries, could also provoke some risks on the cross-border situations.

7.2 Interconnections with other deliverables

The use case definitions are specified on D1.2, which has been taken into account to the general data of the use cases.

It is expected that the D1.6 has a great influence on the D1.7 about recommendations and also the D7.1 about the use cases. Even, it could have influences too on deliverables about WP5 and WP6, related to vehicles tasks.

It is important to add that this document is a status report by February 2025, updating the data from D1.2. The final status of the demonstrations, which will be described on D1.5, will influence the final recommendations from D1.7.

8 Acknowledgement

Project partners:

#	Partner short name	Partner Full Name
1	VUB	VRIJE UNIVERSITEIT BRUSSEL
2	FRD	FORD OTOMOTIV SANAYI ANONIM SIRKETI
4	KAE	KASSBOHRER FAHRZEUGWERKE GMBH
5	REN	RENAULT TRUCKS SAS
6	SCA	SCANIA CV AB
7	VET	VAN ECK TRAILERS BV
8	VOL	VOLVO TECHNOLOGY AB
9	ABB	ABB E-MOBILITY BV
9.1	ABP	ABB E-MOBILITY SPOLKA Z OGRANICZONAODPOWIEDZIALNOSCIA
10	AVL	AVL LIST GMBH
11	CM	SOCIEDAD ESPANOLA DE CARBUROS METALICOS SA
11.1	APG	AIR PRODUCTS GMBH
12	HEPL	HITACHI ENERGY POLAND SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA
13	MIC	MANUFACTURE FRANCAISE DES PNEUMATIQUES MICHELIN
14	POW	PLASTIC OMNIUM NEW ENERGIES WELS GMBH
15	RIC-CZ	RICARDO PRAGUE S.R.O.
15.1	RIC-DE	RICARDO GMBH
16	UNR	UNIRESEARCH BV
17	ZF	ZF CV SYSTEMS HANNOVER GMBH
18	ALI	ALLIANCE FOR LOGISTICS INNOVATION THROUGH COLLABORATION IN EUROPE
19	DPD	DPD (NEDERLAND) B.V.
20	COL	ETABLISSEMENTEN FRANZ COLRUYT NV
21	GRU	GRUBER LOGISTICS S.P.A.
22	GBW	GEBRUEDER WEISS GESELLSCHAFT M.B.H.
23	PG	PROCTER & GAMBLE SERVICES COMPANY NV
23.1	PGP	PROCTER AND GAMBLE POLSKA SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA
23.2	PGA	PROCTER & GAMBLE AMIENS
24	PRI	PRIMAFRIO CORPORACION, S.A.
25	PTV	PTV PLANUNG TRANSPORT VERKEHR GmbH
26	Fraunhofer	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
27	HAN	STICHTING HOGESCHOOL VAN ARNHEM ENNIJMEGEN HAN
28	IDI	IDIADA AUTOMOTIVE TECHNOLOGY SA

29	TNO	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO
30	UIC	UNION INTERNATIONALE DES CHEMINS DE FER
31	CFL	CFL MULTIMODAL S.A.
32	GSS	Grupo Logistico Sese
33	HIT	Hitachi ABB Power Grids Ltd.
34	IRU	UNION INTERNATIONALE DES TRANSPORTS ROUTIERS (IRU)
35	RIC-UK	RICARDO CONSULTING ENGINEERS LIMITED

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9 Appendix A

9.1 Appendix I

CHAPTER VII

NEW TECHNOLOGIES OR NEW CONCEPTS

Article 39

Exemptions for new technologies or new concepts

1. The manufacturer may apply for an EU type-approval in respect of a type of vehicle, system, component or separate technical unit that incorporates new technologies or new concepts that are incompatible with one or more regulatory acts listed in Annex II.

2. The approval authority shall grant the EU type-approval referred to in paragraph 1 where all of the following conditions are met:

(a) the application for the EU type-approval states the reasons why the new technologies or new concepts make the vehicles, systems, components or separate technical units incompatible with one or more regulatory acts listed in Annex II;

(b) the application for the EU type-approval describes the safety and environmental implications of the new technology or new concept and the measures taken in order to ensure at least an equivalent level of safety and environmental protection to that provided by the requirements in respect of which an exemption is sought;

(c) test descriptions and results are presented proving that the condition in point (b) is met.

3. The granting of EU type-approvals exempting new technologies or new concepts shall be subject to the authorisation by the Commission.

Figure 38. Extract 1 from Article 39 of the Regulation EU 2018/858.

▼B

The Commission shall adopt implementing acts to decide whether to grant the authorisation referred to in the first subparagraph of this paragraph. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 83(2).

4. Pending adoption of implementing acts referred to in paragraph 3, the approval authority may grant a provisional EU type-approval, valid only in the territory of the Member State of that approval authority, in respect of a type of vehicle covered by the exemption sought. The approval authority shall inform the Commission and the other Member States thereof without delay by means of a file containing the information referred to in paragraph 2.

The provisional nature and the limited territorial validity of the EU type-approval shall be apparent from the heading of the EU type-approval certificate and the heading of the certificate of conformity.

5. Approval authorities of other Member States may accept the provisional EU type-approval referred to in paragraph 4 within their territory, provided they inform the approval authority that granted the provisional EU type-approval of their acceptance in writing.

6. Where appropriate, the implementing acts referred to in paragraph 3 shall specify whether authorisations are subject to any restrictions, in particular with regard to the maximum number of vehicles covered. In all cases, the EU type-approval shall be valid for at least 36 months.

7. Where the Commission adopts implementing acts referred to in paragraph 3 to refuse to grant the authorisations, the approval authority shall immediately inform the holder of the provisional EU type-approval referred to in paragraph 4 that the provisional EU type-approval approval shall be revoked six months after the date of the implementing act.

However, vehicles that have been manufactured in conformity with the provisional EU type-approval before it ceased to be valid may be placed on the market, be registered or enter into service in any Member State that has accepted the provisional EU type-approval in accordance with paragraph 5.

Figure 39. Extract 2 from Article 39 of the Regulation EU 2018/858.

9.2 Appendix II

A - Restraint systems, crash testing, fuel system integrity and high voltage electrical safety			
Item	Subject	Regulatory act	
A2	Seats and head restraints	UN Regulation No 17	
A4	Safety-belt anchorages	UN Regulation No 14	
A5	Safety-belts and restraint systems	UN Regulation No 16	
A6	Safety-belt reminders	UN Regulation No 16	
A8	Child restraint anchorages (*)	UN Regulation No 145 ([1])	
A9	Child restraint systems (*)	UN Regulation No 44	
A10	Enhanced child restraint systems (*)	UN Regulation No 129	
A11	Front underrun protection	UN Regulation No 93	
A12	Rear underrun protection	UN Regulation No 58	
A13	Lateral protection	UN Regulation No 73	
A14	Fuel tank safety (*)	UN Regulation No 34	
A15	Liquified petroleum gas safety (*)	UN Regulation No 67	
A16	Compressed and liquified natural gas safety (*)	UN Regulation No 110	
A17	Hydrogen safety (*)	UN Regulation No 134	
A18	Hydrogen system material qualification (*)	Regulation (EU) 2021/535, Annex XIV	
A19	In-use electric safety (*)	UN Regulation No 100	
A24	Cab impact	UN Regulation No 29	

Table 39. Restraint systems, crash testing, fuel system integrity and high voltage electrical safety regulations of the Regulation(EU) 2018/858.

B - Vulnerable road users, vision and visibility			
Item	Subject	Regulatory act	
B5	Pedestrian and cyclist collision warning	UN Regulation No 159	
B6	Blind spot information system	UN Regulation No 151	
B7	Reversing detection	UN Regulation No 158	
B9	Heavy-duty vehicles direct vision	Regulation (EU) 2019/2144	
B10	Safety glazing	UN Regulation No 43	
B11	Defrost/demist	Regulation (EU) 2021/535, Annex VI	
B12	Wash/wipe	Regulation (EU) 2021/535, Annex IV	

B13	Indirect vision devices	UN Regulation No 46	
B14	Acoustic Vehicle Alerting Systems	Regulation (EU) No 540/2014	

Table 40. Vulnerable road users, vision and visibility regulations of the Regulation (EU) 2018/858.

C - Vehicle chassis, braking, tyres and steering			
Item	**Subject**	**Regulatory act**	
C1	Steering equipment	UN Regulation No 79	
C2	Lane departure warning	UN Regulation No 130	
C4	Braking	UN Regulation No 13	
C5	Replacement braking parts	UN Regulation No 90	
C7	Stability control	UN Regulation No 13 UN Regulation No 140 ([2])	
C8	Advanced emergency braking on heavy-duty vehicles	UN Regulation No 131	
C10	Tyre safety and environmental performance (**)	UN Regulation No 30 UN Regulation No 54 UN Regulation No 117	
C12	Retreaded tyres (**)	UN Regulation No 108 UN Regulation No 109	
C14	Tyre pressure monitoring for heavy-duty vehicles	UN Regulation No 141	
C15	Tyre installation	UN Regulation No 142	

Table 41. Vehicle chassis, braking, tyres and steering regulations of the Regulation (EU) 2018/858.

D - On-board instruments, electrical system, vehicle lighting and protection against unauthorised use, including cyberattacks			
Item	**Subject**	**Regulatory act**	
D1	Audible warning	UN Regulation No 28	
D2	Radio interference (electromagnetic compatibility)	UN Regulation No 10	
D3	Protection against unauthorised use, immobiliser and alarm systems (*)	UN Regulation No 18 UN Regulation No 97 UN Regulation No116 UN Regulation No161 UN Regulation No 162 UN Regulation No 163	
D4	Protection of vehicle against cyberattacks	UN Regulation No 155	

D5	Speedometer	UN Regulation No 39	
D6	Odometer	UN Regulation No 39	
D7	Speed limitation devices	UN Regulation No 89	
D8	Intelligent speed assistance	Commission Delegated Regulation (EU) 2021/1958 ([3])	
D9	Identification of controls, tell-tales and indicators	UN Regulation No 121	
D10	Heating systems	UN Regulation No 122	
D11	Light signalling devices (**)	UN Regulation No 4 UN Regulation No 6 UN Regulation No 7 UN Regulation No 19 UN Regulation No 23 UN Regulation No 38 UN Regulation No 77 UN Regulation No 87 UN Regulation No 91 UN Regulation No 148	
D12	Road illumination devices (**)	UN Regulation No 31 UN Regulation No 98 UN Regulation No 112 UN Regulation No 119 UN Regulation No 123 UN Regulation No 149	
D13	Retro-reflective devices (**)	UN Regulation No 3 UN Regulation No 104 UN Regulation No 150	
D14	Light sources (**)	UN Regulation No 37 UN Regulation No 99 UN Regulation No 128	
D15	Installation of light signalling, road illumination and retro-reflective devices	UN Regulation No 48	
D16	Emergency stop signal	UN Regulation No 48	
D17	Headlamp cleaners (*)	UN Regulation No 45	

Table 42. On-board instruments, electrical system, vehicle lighting and protection against unauthorised use, including cyberattacks regulations of the Regulation (EU) 2018/858.

E - Driver and system behaviour		
Item	**Subject**	**Regulatory act**
E1	Alcohol interlock installation facilitation	Commission Delegated Regulation (EU) 2021/1243 ([4])
E2	Driver drowsiness and attention warning	Commission Delegated Regulation (EU) 2021/1341 ([5])
E3	Advanced driver distraction warning	Commission Delegated Regulation (EU) 2023/2590 ([3])
E4	Driver availability monitoring system (in case of automated vehicles)	UN Regulation No 157
E5	Event data recorder	Commission Delegated Regulation (EU) 2022/2220 ([6]) UN Regulation No 169
E6	Systems to replace driver's control (in case of automated vehicles)	UN Regulation No 157
E7	Systems to provide the vehicle with information on state of vehicle and surrounding area (in case of automated vehicles)	UN Regulation No 157
E8	Platooning (*)	Regulation (EU) 2019/2144
E9	Systems to provide safety information to other road users (in case of automated vehicles)	Regulation (EU) 2019/2144

Table 43. Driver and system behaviour regulations of the Regulation (EU) 2018/858.

F - General vehicle construction and features		
Item	**Subject**	**Regulatory act**
F1	Registration plate space	Regulation (EU) 2021/535, Annex III
F2	Reversing motion	Regulation (EU) 2021/535, Annex XI
F4	Door entry steps, handholds and running boards	Regulation (EU) 2021/535, Annex X
F6	External projections of commercial vehicle cabs	UN Regulation No 61
F7	Statutory plate and vehicle identification number	Regulation (EU) 2021/535, Annex II
F8	Towing devices	Regulation (EU) 2021/535, Annex VII
F10	Spray suppression systems	Regulation (EU) 2021/535, Annex VII
F11	Masses and dimensions	Regulation (EU) 2021/535, Annex XIII
F12	Mechanical couplings (*)	UN Regulation No 55 UN Regulation No 102
F13	Vehicles intended for the transportation of dangerous goods (*)	UN Regulation No 105

Table 44. General vehicle construction and features regulations of the Regulation (EU) 2018/858.

G - Environmental performance and emissions			
Item	Subject	Regulatory act	
G1	Sound level	Regulation (EU) No 540/2014	
G3	Tailpipe emissions of engine in lab	Regulation (EC) No 595/2009	
G3a	Determination of specific CO_2 emissions and fuel consumption of vehicle	Regulation (EC) No 595/2009	
G4	Tailpipe emissions on the road	Regulation (EC) No 715/2007 Regulation (EC) No 595/2009	
G5	Durability of tailpipe emissions	Regulation (EC) No 715/2007 Regulation (EC) No 595/2009	
G6	Crankcase emissions	Regulation (EC) No 715/2007 Regulation (EC) No 595/2009	
G9	On-board diagnostics	Regulation (EC) No 715/2007 Regulation (EC) No 595/2009	
G10	Absence of defeat device	Regulation (EC) No 715/2007 Regulation (EC) No 595/2009	
G11	Auxiliary emissions strategies	Regulation (EC) No 715/2007 Regulation (EC) No 595/2009	
G12	Anti-tampering	Regulation (EC) No 715/2007 Regulation (EC) No 595/2009	
G15	Permanent management circularity requirements	Regulation (EU) 2024/1252 ([7])	

Table 45. Environmental performance and emissions regulations of the Regulation (EU) 2018/858.

H - Access to vehicle information and software update			
Item	Subject	Regulatory act	
H1	Access to vehicle OBD information and vehicle repair and maintenance information	Regulation (EU) 2018/858, Articles 61 to 66 and Annex X.	
H2	Software update	Regulation (EU) 2018/858, Annex IV UN Regulation No 156	

Table 46. Access to vehicle information and software update regulations of the Regulation (EU) 2018/858.

(*) This regulatory act could not be applicable to the vehicle, depending on their characteristics.
(**) This regulation is not applicable to the vehicle, but it is applicable to the component or separate technical unit in question for N3 category vehicles.

(1) Type-approvals granted in accordance with the 07 series of amendments to UN Regulation No 14, and their extensions, shall be considered equivalent to a type-approval granted under UN Regulation No 145 (original version).
(2) Type-approvals granted in accordance with UN Regulation No 13-H (original version), and their extensions, shall be considered equivalent to a type-approval granted under UN Regulation No 140 (original version).
(3) Commission Delegated Regulation (EU) 2023/2590 of 13 July 2023 supplementing Regulation (EU) 2019/2144 of the European Parliament and of the Council by laying down detailed rules concerning the specific test procedures and technical requirements for the type-approval of certain motor vehicles with regard to their advanced driver distraction warning systems and amending that Regulation (OJ L, 2023/2590, 22.11.2023, ELI: http://data.europa.eu/eli/reg_del/2023/2590/oj).
(4) Type-approvals granted in accordance with the 07 series of amendments to UN Regulation No 14, and their extensions, shall be considered equivalent to a type-approval granted under UN Regulation No 145 (original version).
(5) Child restraint systems, not built in a motor vehicle, approved in accordance with the requirements of UN Regulation No 44 and placed on the Union market before 1 September 2023, may continue to be made available on the market and entered into service until 1 September 2024.
(6) Commission Delegated Regulation (EU) 2024/2220 of 26 July 2024 supplementing Regulation (EU) 2019/2144 of the European Parliament and of the Council by laying down detailed rules concerning the specific test procedures and technical requirements for the type-approval of heavy-duty motor vehicles with regard to their event data recorder and for the type-approval of those systems as separate technical units and amending Annex II to that Regulation (OJ L, 2024/2220, 2.10.2024, ELI: http://data.europa.eu/eli/reg_del/2024/2220/oj).'
(7) Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020 (OJ L, 2024/1252, 3.5.2024, ELI: http://data.europa.eu/eli/reg/2024/1252/oj).'.

9.3 Appendix III

Subject		Regulatory acts
A	RESTRAINT SYSTEMS, CRASH TESTING, FUEL SYSTEM INTEGRITY AND HIGH VOLTAGE ELECTRICAL SAFETY	
A12	Rear underrun protection	UN Regulation No 58.03
A13	Lateral protection	UN Regulation No 73.01
A14	Fuel tank safety (*)	UN Regulation No 34.03
B	VULNERABLE ROAD USERS, VISION AND VISIBILITY	
B10	Safety glazing	UN Regulation No 43.01
C	VEHICLE CHASSIS, BRAKING, TYRES AND STEERING	
C1	Steering equipment	UN Regulation No 79.03
C4	Braking	UN Regulation No 13.11 UN Regulation No 13-H.00
C5	Replacement braking parts (***)	UN Regulation No 90.02
C7	Stability control	UN Regulation No 13.11 UN Regulation No 140.00(**)
C10	Tyre safety and environmental performance (***)	UN Regulation No 30.02 UN Regulation No 54.00 UN Regulation No 117.02
C12	Retreaded tyres (***)	UN Regulation No 108.00 UN Regulation No 109.00
C14	Tyre pressure monitoring for heavy-duty vehicles	UN Regulation No 141.01
C15	Tyre installation	UN Regulation No 142.01
D	ON-BOARD INSTRUMENTS, ELECTRICAL SYSTEM, VEHICLE LIGHTING AND PROTECTION AGAINST UNAUTHORISED USE, INCLUDING CYBERATTACKS	
D2	Radio interference (electromagnetic compatibility)	UN Regulation No 10.05
D10	Heating systems	UN Regulation No 122.00
D11	Light signalling devices (***)	UN Regulation No 4.00 UN Regulation No 6.01

		UN Regulation No 7.02 UN Regulation No 19.04 UN Regulation No 23.00 UN Regulation No 38.00 UN Regulation No 77.00 UN Regulation No 87.00 UN Regulation No 91.00 UN Regulation No 148.00
D13	Retro-reflective devices (***)	UN Regulation No 3.02 UN Regulation No 104.00 UN Regulation No 150.00
D14	Light sources (***)	UN Regulation No 37.03 UN Regulation No 99.00 UN Regulation No 128.00
D15	Installation of light signalling, road illumination and retro-reflective devices	UN Regulation No 48.07
F	**GENERAL VEHICLE CONSTRUCTION AND FEATURES**	
F1	Registration plate space	Regulation (EU) 2021/535, Annex III
F7	Statutory plate and vehicle identification number	Regulation (EU) 2021/535, Annex II
F10	Spray suppression systems	Regulation (EU) 2021/535, Annex VIII
F11	Masses and dimensions	Regulation (EU) 2021/535, Annex XIII
F12	Mechanical couplings	UN Regulation No 55.01 UN Regulation No 102.00
F13	Vehicles intended for the transportation of dangerous goods (*)	UN Regulation No 105.05
G	**ENVIRONMENTAL PERFORMANCE AND EMISSION-RELATED TESTS**	
G3b	Determination of specific energy efficiency performance of trailer	Regulation (EC) No 595/2009
H	**ACCESS TO INFORMATION AND IN-VEHICLE SOFTWARE UPDATE**	
H1	Access to vehicle OBD information and vehicle repair and maintenance information	Regulation (EU) 2018/858, Articles 61 to 66 and Annex X.
H2	Software update	Regulation (EU) 2018/858, Annex IV UN Regulation No 156

Table 47. Regulations applicable to trailers.

(*) This regulatory act could not be applicable to the vehicle, depending on their characteristics.
(**) Type-approvals granted in accordance with UN Regulation No 13-H (original version), and their extensions, shall be considered equivalent to a type-approval granted under UN Regulation No 140 (original version).
(***) This regulation is not applicable to the vehicle, but it is applicable to the component or separate technical unit in question for O4 category vehicles.

9.4 Appendix IV

9.4.1 Belgium

Conditions to tractors, trucks, semi-trailers and trailers to road through Flemish roads:

- be up to 25.25 metres long
- have a turning radius between 6.50 and 14.50 metres
- be equipped with a working EBS and ESC or RSS braking system
- have a brake circuit with brake discs or drums
- be equipped on each axle with an air-suspended suspension or a non-air-suspended suspension that meets all the requirements of the technical regulations for vehicles.
- An authorised technical service centre tests whether the calculator and modulator of the EBS brake system react immediately and whether the axle groups react quickly enough when the brake pedal is pressed.

The LHV must also meet the conditions set out in the Ministerial Decree of 22 June 2018:

- The total mass of your LHV should not exceed 5.5 times the mass on the driven axles. The mass per 3-axle axle group is limited to the mechanical suspension value specified in the technical regulation, regardless of the suspension. The formulas in the technical regulation shall be applied from each individual axis or first axis of an axle group to each underlying individual axis or the centre of an axle group. The sum of the masses under the axles of the centre-axle trailer towed by another centre-axle
- er shall not exceed the sum of the masses under the axles of that towing centre-axle trailer.
- The additional coupling point on the intermediate vehicle is installed in accordance with the UNECE Regulation. You can prove this with a test report issued by an approved technical service or manufacturer.
- The steering of the towing vehicle is located on the left side of the cab.
- The towing vehicle complies with the latest emission level imposed by the Euro standard. Once a new Euro standard is introduced, you can use vehicles with a lower Euro standard for a maximum of 3 years.
- The towing vehicle is able to pull and brake the predetermined loads.
- The engine power in kilowatts of the towing vehicle is at least 5 times greater than the mass of the tow.
- All vehicles can rotate horizontally and vertically in relation to each other.
- Each axle is equipped with an axle load gauge that accurately displays the measurement up to 100 kg. The meter must be readable inside the cab and on the outside of your LHV.
- At the back of the vehicle is a warning sign 'CAUTION EXTRA LONG' in black letters 12 cm high.

9.5 Appendix V

List of contacts	
Sweden	• Swedish Transport Administration - *Trafikverket*
Denmark	• Danish Road Directorate - *Vejdirektoratet* • The Swedish Transport Agency - *Færdselsstyrelsen*
Germany	• Department StV 22 - Automotive engineering (vehicle safety and innovative technologies), Federal Ministry for Digital and Transport - *Referat StV 22 - Kraftfahrzeugtechnik (Fahrzeugsicherheit und innovative Technologien), Bundesministerium für Digitales und Verkehr (BMDV)* • List of contact per regions. See attached.
Belgium	• Department of Mobility & Public Works Policy - *Department Mobiliteit & Openbare Werken Beleid*
The Netherlands	• Ministry of Infrastructure and Water Management - *Ministerie van Infrastructuur en Waterstaat, Rijkswaterstaat* • Directorate-General for Mobility and Transport - *Directie Mobiliteit* • RDW
Luxembourg	• Department of Mobility and Transport, Ministry of Mobility and Public Works
Austria	• ASFINAG – Austrian road operator of highways and motorways • Office of the Tyrolean State Government, Department of Transport and Cable Car Law - *Amt der Tiroler Landesregierung, Abteilung Verkehrs und Seilbahnrecht*
France	• Road Mobility Directorate. General Directorate of Infrastructure, Transport and Mobility - *Direction des Mobilités Routières. Direction Générale des Infrastructures, des Transports et des Mobilités*
Italy	• General directorate for Motor Vehicles and Drivers, Department for Sustainable Mobility, Ministry of Infrastructure and Transport
Turkey	• General Directorate of Transport Services Regulation, Ministry of Transport and Infrastructure - *Ulaştırma Hizmetleri Düzenleme Genel Müdürlüğü, Ulaştırma ve Altyapı Bakanlığı*
Spain	• Traffic General Directorate - *DGT* • *TRAZA* application - cau.traza@dgt.es • Catalan Traffic Service - *Servei Català de Trànsit* (for Catalan region)
Benelux	• General Secretariat of the Benelux Union - *Secretariaat-Generaal van de Benelux Unie*