Efficient and affordable Zero Emission logistics through **NEXT** generation **E**lectric **TRUCK**s

HORIZON Innovation Actions ¦ Project Number: 101056740

D2.1
Use case, mission and overall vehicle definition

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	Name	Organisation	Date
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0.3	03/03/2023	Michael Glensvig (AVL-AT)	Writing of Section 4 and Annex 2
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Fulfilment of deliverable / related task objective

This deliverable reports and covers all the work undertaken in Task T2.1. It has fulfilled the objectives and description in the DoA by describing the NextETRUCK Uses Cases, mission profiles and overall vehicle definitions.

Deviations: none

Time: planned date: 31.03.2023,
submission to EC date: 31.03.2023 , submission of the deliverable is on time
Technical: There are no relevant technical deviations to report.

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ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
BAR	Barcelona
BEV	Battery Electric Vehicle
CCS2	Combined Charging System 2
DSO	Distribution System Operator
DT	Digital Twin
eTruck	electric Truck (battery truck in NextETRUCK)
IRU	International Road Transport Union
IST	Istanbul
LEZ	Low Emission Zone
LL	Living Lab
LTZ	Limited Traffic Zone
NGO	Non-Governmental Organisation
OTA update	over-the-air update
SULP	Sustainable Urban Logistics Plan
SUMP	Sustainable Urban Mobility Plan
TCO	Total Cost of Ownership
TSO	Transmission System Operator
UC	Use Case
UTR	Utrecht
ZEV	Zero Emission Vehicle
ZEZ	Zero Emission Zone

EXECUTIVE SUMMARY

NextETRUCK is a 3-year Horizon Europe project that develops ZEV concepts tailored for regional medium freight haulage, running from 1 July 2022 until 31 December 2025.
The project aims at playing a pioneering role in the decarbonisation of vehicle fleets, demonstrating next-generation e-mobility concepts. It also contributes to the development of zero-emission vehicles and ecosystems that are holistic, innovative, affordable, competitive, and synergetic.

NextETRUCK will build concepts tailored for regional medium freight haulage with at least a 10% increase in energy efficiency compared to existing highest-end benchmark electric vehicles. In addition, it will prepare concept and infrastructure demonstrators for fast charging and offer new business models to increase end-user acceptance and foster the market uptake of the project solutions.

NextETRUCK will conduct six Months demonstrations in Istanbul, Barcelona, and Utrecht.

The project's consortium consists of 19 partners from 8 countries: The Netherlands, Belgium, Germany, Spain, Greece, Australia, Turkey, United Kingdom. The project's coordinator is TNO (Netherlands Organization for Applied Scientific Research).

This deliverable is part of the definition phase starting at the beginning of the project, it reports on the definition of the Use cases and related missions on one hand and on the overall vehicle definition on the other hand. In summary this report presents:

- the result of a four weeks' survey conducted by POLIS with the support of ERTICO mapping the needs, mostly from local and regional governments, as well as public, private, and non-governmental organisations. It shows for example that in more than half of the cases, respondents identify the current uptake in their location of ZEVs for commercial freight deployment and commercial freight infrastructure as starting up. more than half of the respondents replied that it part of an energy transition plan.
  Regarding the commercial freight charging infrastructure, a significant part of them (1/3 of the respondents in both cases) identified it as part of their Sustainable Urban Mobility Plans (SUMPs) and/or Climate Change Mitigation Plans (e.g., Covenant of Mayors).
- the harmonisation across the three demonstration sites of six specific objectives, in particular: 10% improvement in overall efficiency, demonstration during six months of daily mission ranging at least 200 km, development of digital twins, fast charging, battery control and energy management.
- the definition of the NextETRUCK use cases that will be implemented in Istanbul by FORD-Otosan, in Barcelona by IRIZAR and in Utrecht by TEVVA-Motors involving other partners for the charging infrastructure, the logistics, etc.
- and finally, an overall vehicle specification for both the baseline and target vehicles were defined. The baseline representing the current available OEM prototype vehicle with the 2022 technology level, and the target vehicle specifying the planned target of the NextETRUCK project.

This deliverable will be used as a starting point for the development work packages as well as for the set-up of the demonstration phase.

1 INTRODUCTION

1.1 Project introduction

NextETRUCK is a three years Horizon Europe project that develops ZEV concepts tailored for regional medium freight haulage, running from 1 July 2022 until 31 December 2025.
The project aims at playing a pioneering role in the decarbonisation of vehicle fleets, demonstrating next-generation e-mobility concepts. It also contributes to the development of zero-emission vehicles and ecosystems that are holistic, innovative, affordable, competitive, and synergetic.

NextETRUCK is expected to build concepts tailored for regional medium freight haulage with at least a 10% increase in energy efficiency compared to existing highest-end benchmark electric vehicles. In addition, it shall prepare concept and infrastructure demonstrators for fast charging and offer new business models to increase end-user acceptance and foster the market uptake of the project solutions.

The project's consortium consists of 19 partners from 8 countries: The Netherlands, Belgium, Germany, Spain, Greece, Australia, Turkey, United Kingdom. The project's coordinator is TNO (Netherlands Organization for Applied Scientific Research).

NextETRUCK shall conduct six Months demonstrations in Istanbul, Barcelona, and Utrecht.

The project is organised in nine Work-Packages (WPs) as presented in the figure below:

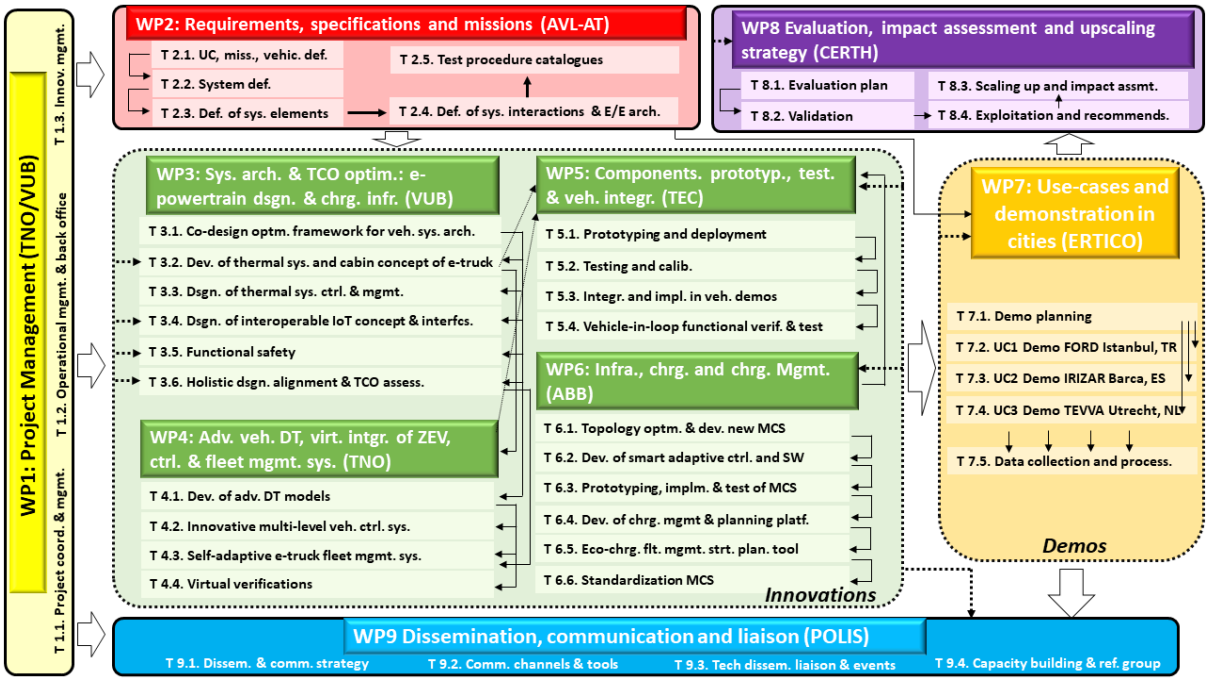


Figure 1: NextETRUCK WP structure and organisation.

1.2 Purpose of the deliverable

This deliverable is part of WP2 "Requirements, specifications and missions" which main objective is the definition of requirements, specifications and missions. This is a cascade of interaction and dependency of requirements, specifications and the test catalogue. This work package provides definitions from top level to element subsystems to ensure the successful integration of the elements (communication, electrical, mechanical, …) and also for virtual integration via the digital twin developments.

D2.1 reports on the result of the first task (T2.1) "Use case, mission and overall vehicle definition". This task started at the beginning of the project and is part of the definition phase on which the development phase will rely. The purpose of this deliverable is to provide:

- a definition of the NextETRUCK use cases that will be implemented by each OEM on their respective demonstration site, including the mission profiles (Task T2.1.1)
- and a top-level definition of the vehicles (Task T2.1.2).

It represents the highest level of specifications towards overall goals and will be used as input for the other WP2 tasks as well as the development WPs and WP7 "Use-cases and Demonstrations".

Table 1. Partner contribution in the task.

Who:	Role:	T2.1.1	T2.1.2
ERTICO	T2.1 and T2.1.1 leader, will organize the work, contribute to the definition of the Uses cases and mission profile	Lead	
CERTH	Mission Profiles definition	X	
FORD	Use case definition and preliminary vehicle level specification will be defined	X	X
IRIZAR	Use case definition in cooperation with fleet operators overall vehicle specification and sizing based on mission profile recordings and driving conditions comparable to VECTO regional and urban delivery mission profiles	X	X
TEVVA	Use case definition in cooperation with fleet operators overall vehicle specification and sizing based on mission profile recordings and driving conditions comparable to VECTO regional and urban delivery mission profiles	X	X
TEC	VECTO profiles adaptation (regional and urban delivery, waste collection, etc.)	X	X
AVL-AT	T2.1.2 leader: streamline overall vehicle information related to use cases		Lead
AVL-D	contribution to vehicle thermal management and control integration		X
NNG	contribute to vehicle consumption specification and interface		X
POLIS	Providing the wider context for the use-case definition and set-up, as well as mapping the key stakeholders	X	

1.3 Deliverable structure and relation with other Work Packages/deliverables

The structure of this deliverable reflects the work undertaken in the two sub-task. After this introduction section the document is organised as follow:

- Section 2 presents a survey realised by POLIS with the support of ERTICO to map the different stakeholders needs,
- Section 3 presents T2.1.1: Use case definitions and mission profiles,
- Section 4 presents T2.1.2: Overall vehicle definition,
- Section 5 will be the conclusion and link to the upcoming development work in NextETRUCK.

Finally, two Annexes present firstly the survey template and secondly the detail vehicle definition to the level that can be shared publicly.

This deliverable relates to the following WPs:

- WP1: each Use Case is linked to Innovations and KPIs,
- WP2: as basis for the other tasks of WP2,
- WP3, WP4, WP5 and WP6 will refer to the Use Cases and the vehicle definition data,
- WP7 will define more in detail the Use Cases early presented in this deliverable,
- WP8 will refer to the KPIs related to the Use Cases for the evaluation plan,
- WP9 will use the survey results, the Use Case description as basic information for early project dissemination.

2 STAKEHOLDERS MAPPING

POLIS Network, with the support of ERTICO, drafted, disseminated, conducted, and analysed a brief survey aimed (mostly) at local and regional governments, as well as public, private, and non-governmental organisations.

The survey was made public in the beginning of March 2023 and was open until the end of the same month. The survey was disseminated through POLIS's public and members-only respective newsletters, general informative e-mails to the members of the POLIS Working Groups (WGs) "Clean Vehicles and Air Quality" and "Urban Freight", as well as targeted e-mails to specialists working in the domains of mobility, logistics, distribution system operators (DSOs), or transmission system operators (TSOs). Furthermore, the partner cities/regions comprising the Living Labs (LLs) and Followers of the URBANE Horizon Europe project were also contacted, as it is a project specialising in green last-mile logistics.

The goal of this survey was to understand the state, needs, barriers, and challenges in the regulation of commercial freight vehicle circulation and/or parking, the uptake of Zero Emission Vehicles (ZEVs) for commercial freight deployment, commercial freight charging tendering processes, and (electric) grid challenges. By identifying the current state and trends in various locations across the EU, as well as outside of it, the Use-Case definition and set-up in the three locations (Barcelona, Utrecht, and Istanbul) can be "grounded" to the reality of the current situation. The survey template can be found in Annex 1.

2.1 Survey methodology

The survey is structured in three main parts:

1. General part providing an overview of the background and location of the participants.
2. Main part, comprising of questions relating to:
    - Current strategies/measures in place to regulate and/or limit commercial freight vehicle circulation and/or parking.
    - Current uptake of zero-emission vehicles (ZEVs) for commercial freight deployment and commercial freight charging infrastructure.
    - Commercial freight charging infrastructure and tendering.
    - Electricity grid congestion (grid overload)
    - Information and/or knowledge gaps in the subject.
3. Next steps following the survey.

In the general part, participants are invited to indicate their respective information with specific answers.

In the main part, participants may choose freely between one or more predefined answers within the same question, while there is always the possibility to provide alternative answers through an open field that follows each Q&A.

Concerning the third part of the survey, nine out of eleven respondents replied that they are willing to be approached for a short interview (maximum 30 minutes, via video call or by phone) to dive deeper into their needs and challenges relating to the topic of the survey.

Moreover, seven out of eleven respondents replied that they are interested in participating in the future NextETRUCK Reference Group.

Finally, 2/3 of them have already subscribed to the project's newsletter and half of them replied that they are following NextETRUCK on social media.

2.2 Analysis and survey results

In 4 weeks, eleven respondents completed the survey. All of them completed the survey in its entirety by replying to all the questions asked and filling all the fields.

OVERVIEW OF THE RESPONDENTS' PROFILES

Most of the respondents identify as male, with a ratio of male-to-female being two-to-one (the breakdown is seven males (63.6%) and four females (36.4%)). This gender imbalance in the survey's respondents reflects -unfortunately- realistically the gender imbalance currently present in the domains of mobility, logistics, distribution system operators (DSOs), or transmission system operators (TSOs).

Four of the eleven respondents (36.4%) are city officials (Municipality of Madrid, Municipality of Rotterdam, Valladolid City Council) or officials from a regional authority (Brussels-Capital Region). Two of the eleven (28.2%) work for research and/or academic institutions (Luxembourg Institute of Science and Technology (LIST), Sivas Cumhuriyet University (SCU)). Two of the eleven (28.2%) work for a Non-Governmental Organisation (NGO) (International Road Transport Union (IRU), Regulatory Assistance Project (RAP)). Two of the eleven (28.2%) work for a private company (MHL, EVBox). Finally, one of the eleven (9.1%) works for a specialised non-profit in the global mobility space (Open Mobility Foundation). There were no responses from public companies.

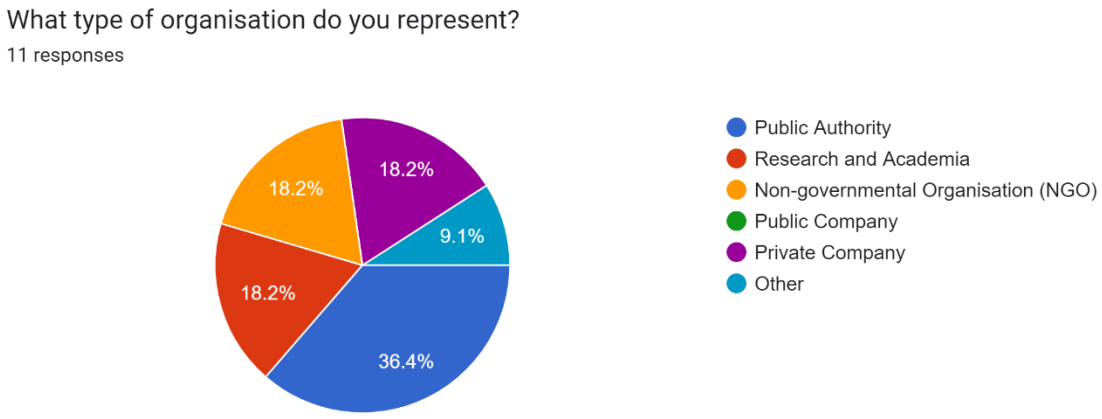


Figure 2: Type of organisation answering the survey.

The locations represented are the Brussels-Capital Region (two respondents), Madrid, Rotterdam, Sivas, Luxembourg (the whole country), Mühlhausen, Valladolid, and Amsterdam Metropolitan Area. These eight locations account for 81.8% of all responses in total. The remaining 18.2% of respondents represent global organisations with decentralised headquarters.
Furthermore, 1/3 of the participants report working in geographical districts with more than one million inhabitants (Brussels-Capital Region, Madrid, Amsterdam Metropolitan Area). In second place come areas with 500,000-1 million inhabitants (Rotterdam, Luxembourg) and with 250.000-500.000 inhabitants (Sivas, Valladolid). Finally, in third place come areas with less than 250,000 inhabitants (Mühlhausen).

Using the United Nations' geoscheme subregions system (a system devised by the United Nations Statistics Division (UNSD) which divides the countries of the world into regional and subregional groups, based on the M49 coding classification), the geographical distribution of the respondents is as follows:

- Western Europe (Belgium, the Netherlands, Luxembourg, Germany) – 54.5%
- Southern Europe (Spain) – 18.2%,
- Partially within Europe, but outside of the EU (Turkey) – 9.1%,
- Globally – 18.2%.

Even though there were no replies from one of the three Use-Case locations (Barcelona, Utrecht, Istanbul), there were replies from other locations in the same countries (Madrid and Valladolid in Spain, Amsterdam and Rotterdam in the Netherlands, and Sivas in Turkey).

OVERVIEW OF THE EXISTING STRATEGIES/MEASURES

Respondents were given the possibility to identify more than one of the following strategies/measures pertinent to commercial freight vehicle circulation and/or parking existing in their locations.

The overwhelming majority of the locations represented imposes some kind of emissions-related restrictions to regulate and/or limit commercial freight vehicle circulation and/or parking, by enforcing either Low Emission Zones (LEZs) and/or Zero Emission Zones (ZEZs) within their territory. This is of particular interest to the NextETRUCK project, as these strategies/measures do not affect neither the circulation nor the parking of Zero Emission Vehicles (ZEVs) for commercial freight.

Of somewhat less importance to the locations represented is the regulation of commercial freight vehicles by establishing urban logistics/consolidation hubs/centres, with 45.5% of the respondents reporting their existence.

Although less frequent, in some locations there exist strategies/measures regulating/limiting commercial freight vehicles either by their vehicle type, by imposing Limited Traffic Zones (LTZs), or by their vehicle characteristics (tonnage-related measures (access based on vehicle weight) and vehicle size-related measures (access based on vehicle dimensions)). This is also of particular interest to the NextETRUCK project, as these strategies/measures affect both the circulation and the parking of commercial freight vehicles, irrespective of whether they are responsible for emissions or not.

Most locations choose to combine more than one (with some of them several ones) strategies/measures. This leads to a result of restrictions/regulations that at times target both vehicles responsible for emissions, but also vehicles based on their type and/or characteristics. The only locations not enforcing any kind of measure currently are Sivas in Turkey and Mühlhausen in Germany.

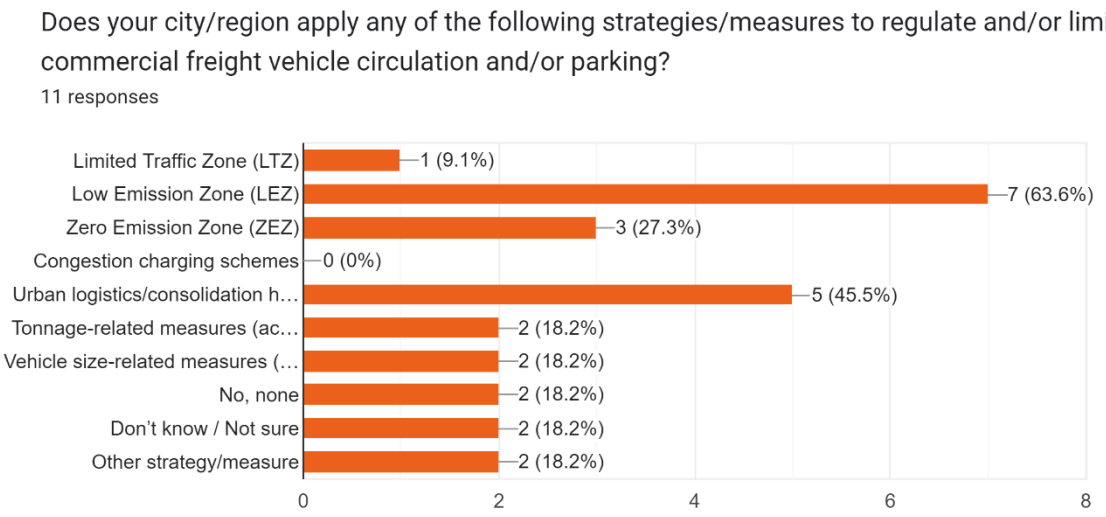


Figure 3: City / region applied strategies / measures related to freight vehicles.

OVERVIEW OF THE CURRENT UPTAKE

In almost half of the cases, respondents identify the current uptake in their location of zero-emission vehicles (ZEVs) for commercial freight deployment and commercial freight infrastructure as starting up.

The only respondents identifying the current uptake in their location as scale-up are both from the Netherlands, from the city of Rotterdam and the Amsterdam Metropolitan Area. Conversely, the respondents from Sivas, Luxembourg, Mühlhausen, and Valladolid identify the current uptake in their locations as non-existent, yet.

No respondents identify the current uptake in their respective locations as average or pioneer/advanced.

The responses to this question clearly highlight that there are some initiatives undergoing but there is still lots of ground to cover to reach a point of massive uptake. Therefore, the upscaling of NextETRUCK' s results will be instrumental in this respect.

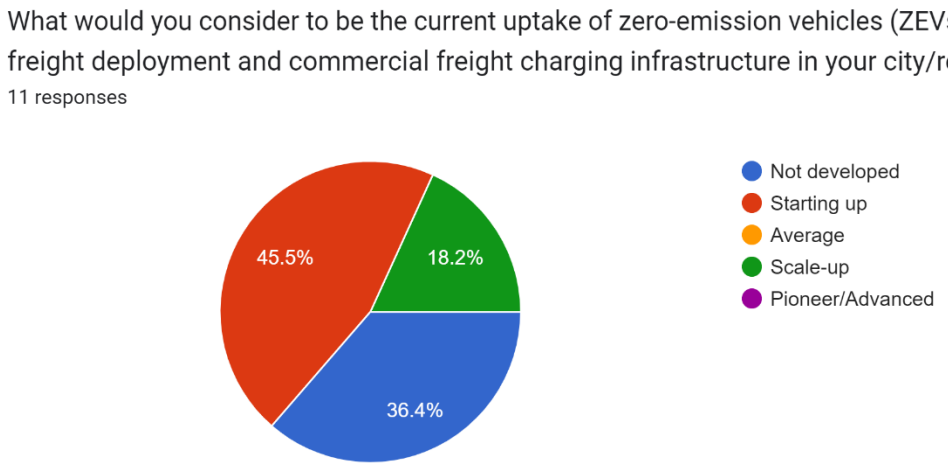


Figure 4: Current uptake of ZEVs for commercial freight deployment and charging infrastructure.

COMMERCIAL FREIGHT CHARGING INFRASTRUCTURE & TENDERING

When asked if commercial freight charging infrastructure is part of wider strategic plans in their locations, more than half of the respondents reply that it is part of an energy transition plan. A significant part of them (27.3% of the respondents in both cases) identify commercial freight charging infrastructure as part of Sustainable Urban Mobility Plans (SUMPs) and/or Climate Change Mitigation Plans (e.g., Covenant of Mayors).

Most locations choose to include commercial freight charging infrastructure as part of more than one wider strategic plan. Only Rotterdam has included commercial freight charging infrastructure as part of its Sustainable Urban Logistics Plan (SULP), while Sivas, Mühlhausen, and Valladolid do not include it currently in any kind of plan. Other plans including commercial freight charging infrastructure that are mentioned are congestion mitigation plans, double-parking safety plans, and the provision of subsidies to electric delivery vans, buses, and trucks.

Finally, it is significant to note that at 27.3% of the respondents reply that they are not sure as to whether commercial freight charging infrastructure is part of a current strategic plan in their location.

Some of the respondents also provided links to specific plans, through the open field section following the Q&A:
Luxembourg's National Integrated Plan concerning Energy and Climate
Low Emission Mobility (LEZ) Strategy of the Brussels-Capital Region
Madrid 360 – Environmental Sustainability Strategy
Amsterdam city subsidies for electric commercial vehicles

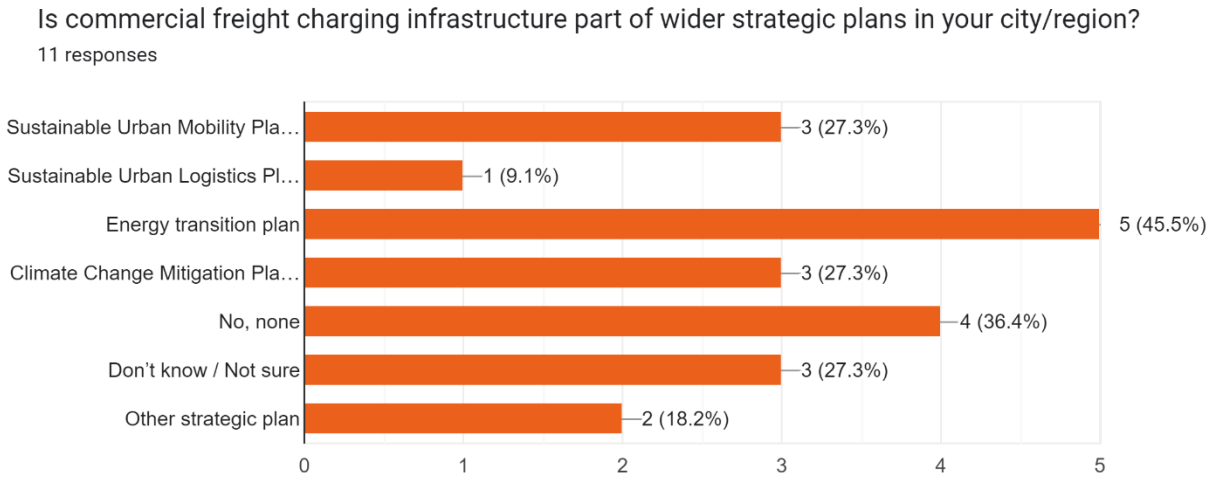


Figure 5: City / region strategy plan for commercial freight charging infrastructure.

When asked if there are specific requirements regarding the commercial freight charging infrastructure that their locations include as requirements in tenders, 27.3% of the respondents indicate the following requirements:

- Smart charging,
- Use of renewable energy sources.

28.2% of the respondents indicate, also, the following requirements:

- Charging network to network interoperability,
- Vehicle to Grid charging (V2G),
- Security measures,
- Privacy measures,
- Smooth integration with the electric grid,
- Accessibility and inclusivity.

Only one respondent identifies charging hubs and use of Curb Data Specification to manage and monitor curb zones as additional specific requirements regarding the commercial freight charging infrastructure.

Most locations choose to include in their tenders a combination of several of the above-mentioned requirements regarding the commercial freight charging infrastructure.

However, the Brussels-Capital Region, Sivas, Mühlhausen, and Valladolid do not currently have any specific requirements in tenders relating to commercial freight charging infrastructure.

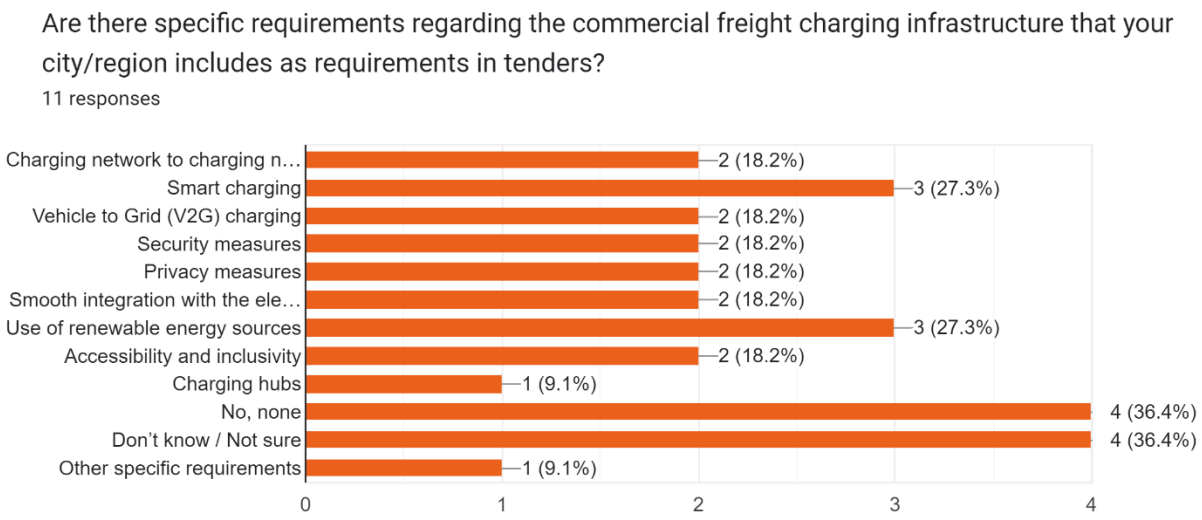


Figure 6: City / region specific requirements regarding commercial freight charging infrastructure.

Almost all respondents identify the existence of an interest in joint procurement for commercial freight charging infrastructure in their locations, except for Valladolid in Spain. A little less than half of them identify it on a regional level, while the other almost half of them are equally divided between interest on a municipal and a national level.

However, at least 1/3 of the respondents expresses uncertainty concerning the level of interest in joint procurement, which can be attributed to a currently unclear image of the interest in some locations.

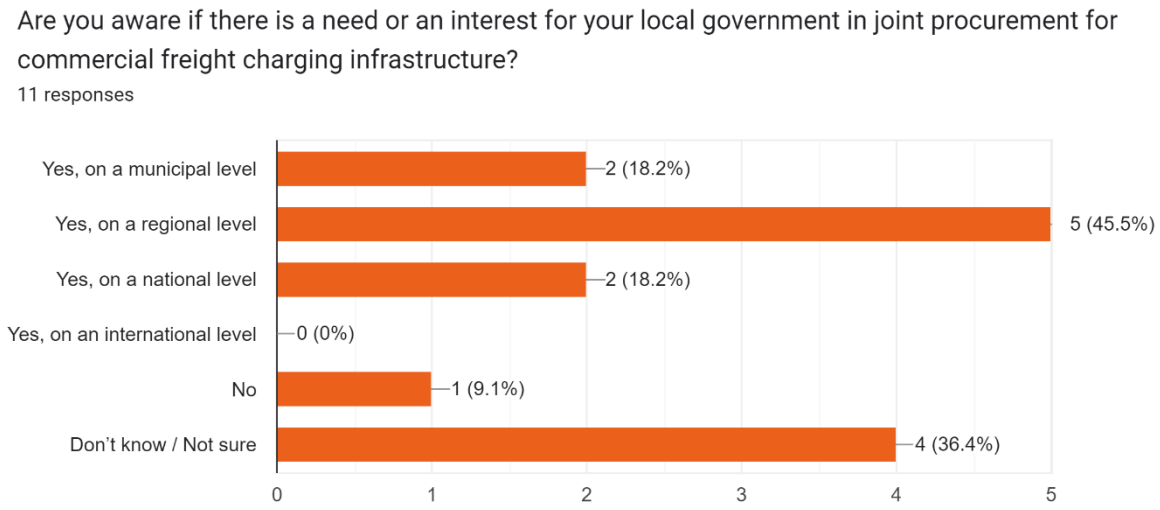


Figure 7: Interest of local government for joint procurement.

ELECTRICITY GRID CONGESTION (GRID OVERLOAD)

When asked how big of an issue is electricity grid congestion (grid overload) in their respective locations, the overwhelming majority (72.7%) identify it as somewhat of an issue.

In the case of Rotterdam, electricity grid congestion is a major issue, in the case of Valladolid it does not seem to be an issue, while in the case of the Brussels-Capital Region, the current situation is unclear.

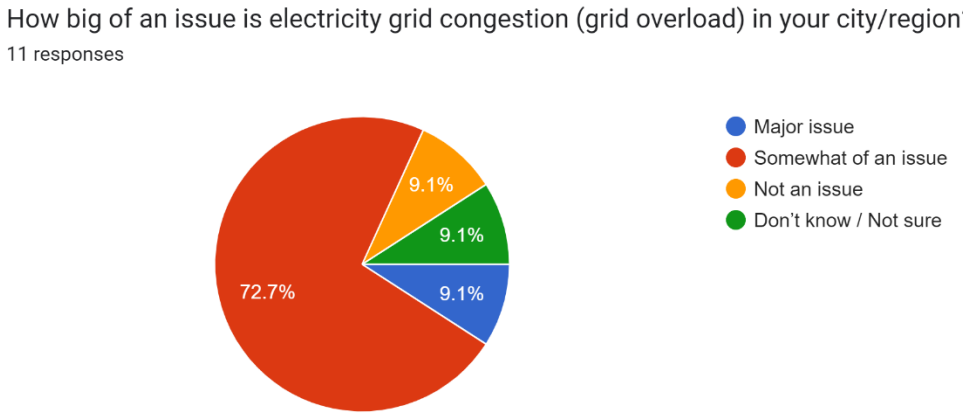


Figure 8: Electricity grid overload issue in surveyed city / region.

Most locations choose to combine several prediction tools, forward plans, or impact assessments studies. Almost half of the locations dispose of a rollout plan for AC EV charge points (destination charging), while a considerable number of them disposes of a rollout plan for DC EV charge points (fast charging). For a bit more than 1/4 of the locations, there are up-to-date predictions for the growth of electric vehicles (EVs) and/or zero-emission vehicles (ZEVs) for freight.

Rotterdam and the Brussels-Capital Region are the only locations with an impact analysis for the electricity grid, while Sivas and Valladolid do not currently dispose of any prediction, forward plan, or impact assessment. Finally, the current state is unclear in the case of Madrid.

The respondent from Amsterdam also provided a link to the Clean Air Action Plan, through the open field section following the Q&A.

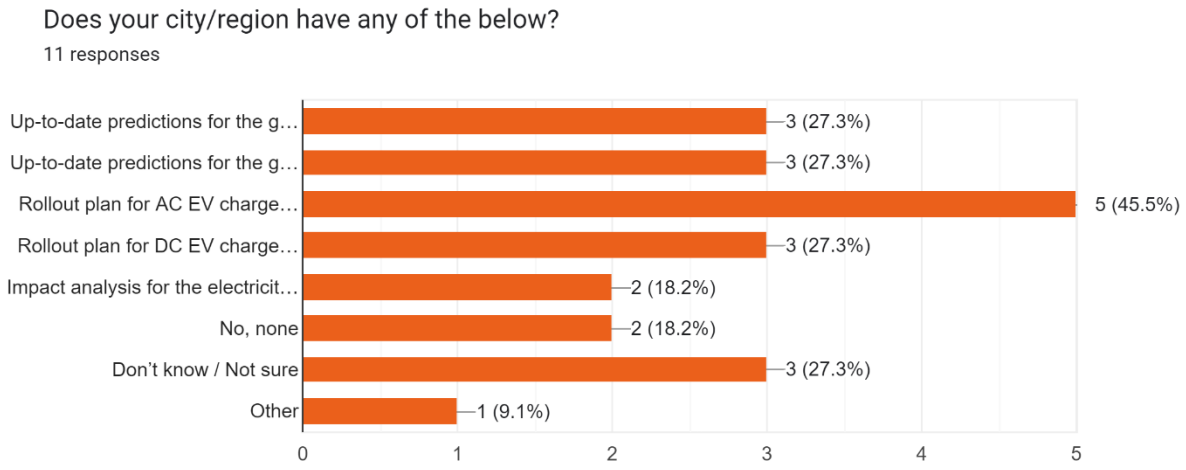


Figure 9: Surveyed city / region grid prediction and /or plan, etc.

NEXT STEPS TO FURTHER THE KNOWLEDGE ON THE SUBJECT

When asked on what subject they are lacking information or knowledge, more than half of the respondents reply as follows:

- Location planning for commercial freight charging stations,
- Predictions for commercial freight charging demand,
- Predictions for (electric) grid constraints,
- Digital tools on these issues (location planning, demand prediction, grid constraints, etc.).

A bit more than 1/3 of them indicate a lack of knowledge in the following:

- Streamlined permitting and grid connection procedures,
- Validated tender procedures charging infrastructure,
- Information on different market models to consider in tendering procedures.

A bit less than 1/3 of them indicate a lack of information on hardware and software requirements for charging infrastructure, while two of them could not identify the specific subject in which they are lacking information and/or knowledge.

These questions and their replies are of specific interest to the NextETRUCK project consortium, as they highlight the importance of properly disseminating the project's results, tools, and outcomes, aiming at bridging this gap of knowledge.

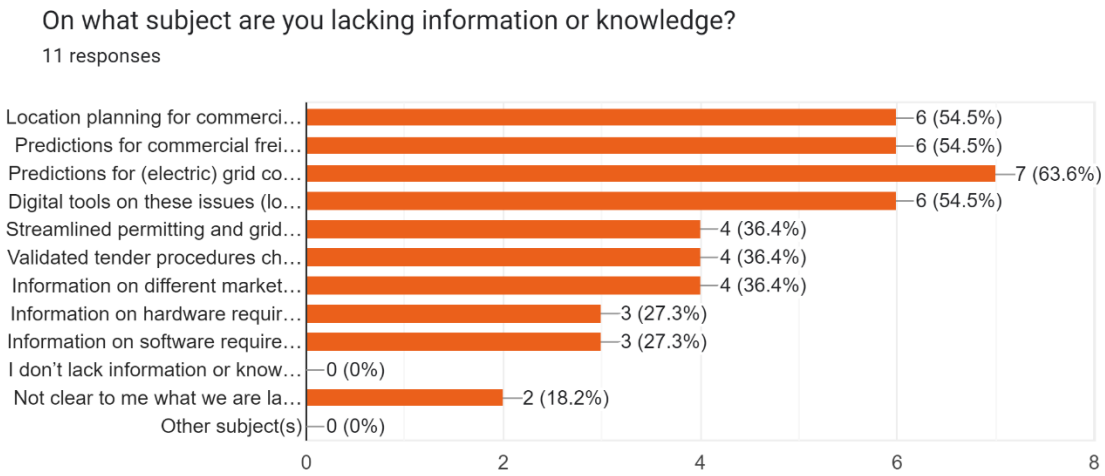


Figure 10: Surveyed city / region lack of information or knowledge.

3 USE CASES DEFINITION & MISSION PROFILES

This chapter reports task T2.1 activity. NextETRUCK will implement the following three Use Cases (UCx):

- UC1 (Istanbul) – Distribution Logistics, with FORD eTruck,
- UC2 (Barcelona) – Refuse eTruck from IRIZAR with modular vehicle architecture (adaptable to delivery truck),
- UC3 (Utrecht) – Distribution Logistics with TEVVA eTruck.

3.1 Use Case objectives harmonisation

The Use Cases presented in the Description of Action was first revisited and inconsistencies were identified between the UC, in particular regarding the objectives, baseline and target of each UC. The following table present the harmonisation proposed that will be the reference for the project future work. There is one main UC per demonstration site by the respective OEM, i.e. FORD in Istanbul (IST), IRIZAR in Barcelona (BAR) and TEVVA in Utrecht (UTR).

Table 2. Harmonisation of Use Case objectives, baseline & target for each demo site / OEM.

#	Specific Objective	Baseline	Target
#1	**10% improvement in overall efficiency**		
IST	10% improvement in overall efficiency	0,95 kWh/km energy consumption	0,86 kWh/km energy consumption
BAR	10% improvement in overall efficiency	Existing IRIZAR HD BEV truck	10% overall system efficiency improvement
UTR	10% efficiency improvement in overall efficiency	Existing TEVVA full BEV medium duty truck	10% overall system efficiency improvement
#2	**Demonstrate at least 200 km average daily operation in real conditions over a period of at least 6 months**		
IST	Demonstrate at least 200 km average daily operation in real conditions over a period of at least 6 months	Existing intercity and urban route of ICE truck.	Same 200 km daily testing with electric Truck in real world.
BAR	200km electric range scalability demonstration	Existing urban ICE truck route	Perform the requested route considering the typical urban ICE truck
UTR	Demonstrate at least 200 km average daily operation in real conditions over a period of at least 6 months	Existing logistics route operated by diesel truck	Replacement of existing diesel truck with 16t ZEV

#	Specific Objective	Baseline	Target
#3	**90% Payload capacity**		
IST	90% Payload capacity:	16T ICE Trucks in the market.	Almost 9% reduction in Curb weight regarding FO BEV Truck
BAR	90% Payload capacity:	Existing HD truck platform	Less than 10% reduction
UTR	90% payload capacity	Existing diesel truck	No more than 10% reduction in total payload – overall system mass differential
#4	**Chassis development & integration of Next gen power electronic**		
IST	Development of lightweight chassis and integration of electric powertrain components	Chassis design based on ICE powertrain.	Lightweight and modular chassis based on electrical powertrain systems.
BAR	Development and integration of next gen. WBG-based power electronics (traction, auxiliaries, charger)	Existing IRIZAR i.e. (IRIZAR Electric) truck	Electric powertrain and auxiliaries efficiency improvement
UTR	Improved thermal efficiency of power electronics	Existing TEVVA ZEV truck	10% thermal efficiency improvement
#5	**Digital twin**		
IST	Digital twin will be developed to assess vehicle performance at different cycles	Not Available	Vehicle system model
BAR	Develop and validate tools for zero tailpipe emission vehicles integration in fleets (and mixed fleets) for efficient assignment of tasks Scalability through digital twin demonstration and connectivity approach for fleet management (tracking, mission profiles, charge management, maintenance management based on internal diagnosis)	Not available	Vehicle system model
UTR	Full vehicle multi-fidelity digital twin, validated through demonstration phase	N/A - does not exist today for TEVVA	Validated vehicle system level model

#	Specific Objective	Baseline	Target
#6	**Fast charging, battery control & energy management**		
IST	DC fast charging	Existing BEV charging concept	Overnight and daily DC fast-charging feature (in case of multi-trip, TCO reduction)
BAR	Fast Charging / opportunity charging	Overnight BEV charging CCS2	Overnight BEV charging – CCS2 fast charge
UTR	Adaptive powertrain ECU with multi-level predictive eco-driving control strategy	Current / typical existing systems developed for diesel trucks	Adaptive system with predictive capability
UTR	Adaptive battery management with OTA updates	N/A - does not exist for ZEV trucks	Demonstrated range improvement through battery SoX optimisation
ABB	Charge planning & management (for all test site, TBC)	Charging starts when plugged in, full power until fully charged	Scheduled charging for minimized energy/power cost, based on planned trips

3.2 Use case description related to a mission

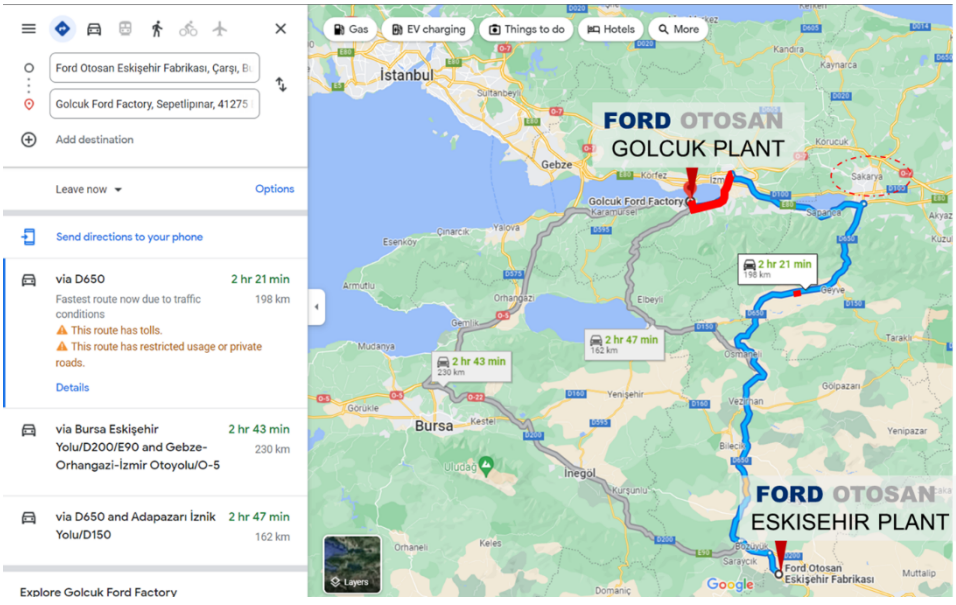
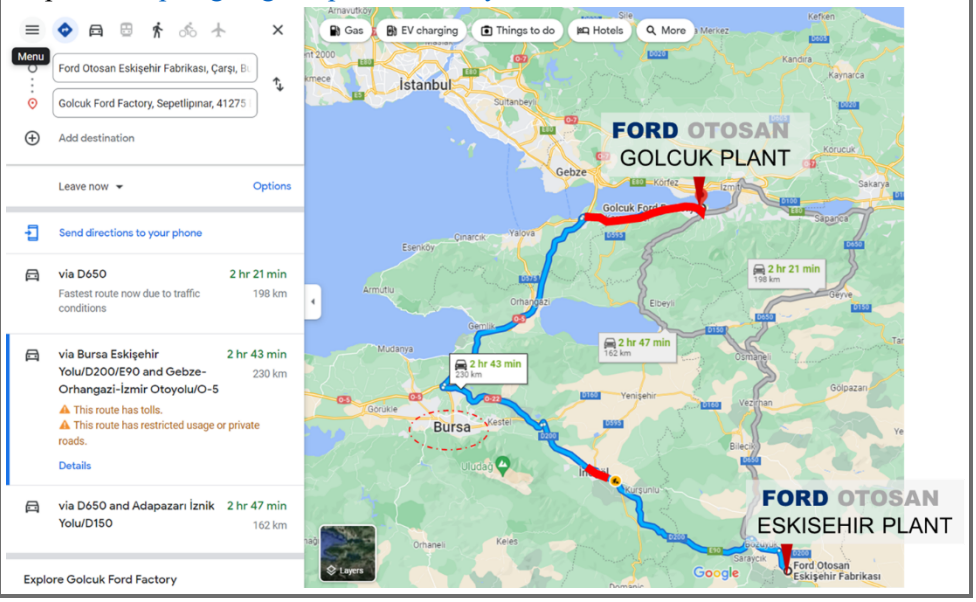
This sub-section presents for each demonstration site the Use Case main characteristics and the associated mission. This information is provided in a table for each demonstration site to ease their comparison. Each Use Cases will be further developed in WP7 later in the project and will also be used for the evaluation plan.

UC1 - ISTANBUL (IST)

Table 3. Istanbul (IST) Use Case description.

Use case (UC) title	Distribution Logistics
Demo site location where the UC will be implemented	Turkey
Addressed challenge(s)	Development of lightweight and modular electrical born platform for N3 type trucks that is not in the current product portfolio of ford trucks.
Mission description % among all mission	Demonstrate at least 200 km average daily operation between Eskisehir and Golcuk plants where we can demonstrate intercity and urban transport scenarios. This mission represents 100% of ICE truck usage.
Charging requirements	DC overnight charging is required for every cycle.
Charging infrastructure	JEMA Sigma 180
Charge management	Cloud-based software solution for charge planning and shifts scheduling. PANION solution collects data from the available telemetry providers and on-site chargers to calculate the charge opportunity windows and prepare most

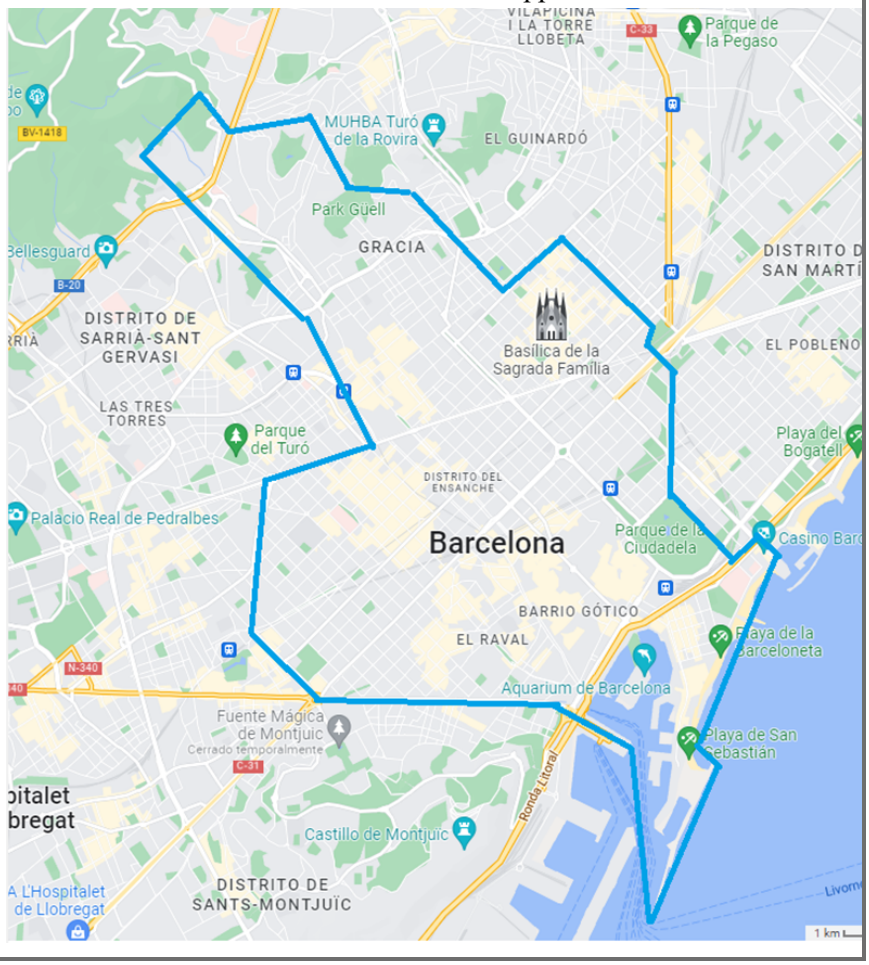
	suitable charging plans with awareness of additional external constraints and insights like electricity prices, or available power capacity. Then the software supervises execution of the charge plan and aligns dynamically it in case of any changes. In this particular case, PANION will provide a solution that will optimize the charge times and introduce charge planning allowing the truck to perform more operations than with just an overnight charging approach. This will lead to reduced TCO for a comparable base case by reducing infrastructure cost (less trucks and chargers needed for same amount of trips) and energy cost (in case of time variable energy cost).
Innovations	• [INO-1 and INO-4] An improved thermal management model will be created and used in the UC1 truck. • [INO-2] Digital twins will be designed at different levels. • [INO-3] Efficiency increases of the truck using advantage of electric powertrain-based lightweight and modular platform that led to payload increase compared to current ICE trucks, and reduction of TCO (Total Cost of Ownership) as well. • [INO-4] DC overnight charging infrastructure and strategy will be designed. Daily charge option could be studied if use case includes multiple trips in one day.
KPIs to be measured	• [KPI-1] Payload capacity and Efficiency increase. • [KPI-2] Thermal management system efficiency • [KPI-4] Realization of fleet management system • [KPI-6] TCO reduction of ZEV. • [KPI-8] Vehicle thermal efficiency • [KPI-10] TCO reduction of charging • [KPI-12] Charging experience • [KPI-13] Realisation of UC1
Partners involved and roles OEM: Vehicle operator: Charging system supplier: Charge management SW supplier: Thermal system concept and control:	 FORD OTOSAN FORD OTOSAN JEMA ABB (PANION) AVL-D

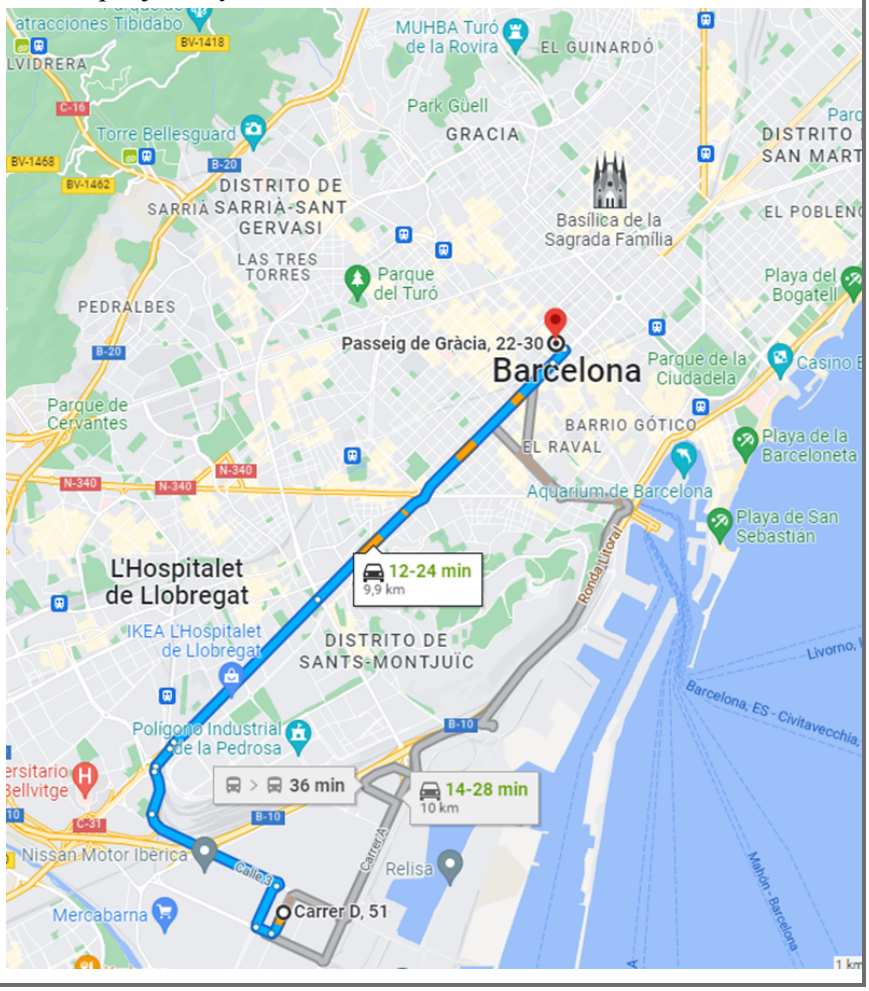
UC Route Options	Route #1 is between FORD Otosan Golcuk and Eskisehir plants. This route includes 10% urban roads and 90% is intercity road. Route length is 198 km. Map link: https://goo.gl/maps/xBAGfzoyJ5ZxWeyb9  Route #2 is between FORD Otosan Golcuk and Eskisehir plants. This route includes 15% urban roads and 85% is intercity road. Route length is 230 km. Map link: https://goo.gl/maps/r7n5z8dskyvRNbDaA 

UC2 - BARCELONA (BAR)

Table 4. Barcelona (BAR) Use Case description.

Use case (UC) title	**Voluminous waste collection**
Demo site location where the UC will be implemented	Barcelona (Spain)
Addressed challenge(s)	90% ICE truck payload with a range >200km
Mission description % among all mission	Large dimension waste collection (furniture, electronic devices, etc.). It is not a repetitive route, and is based on demand. It could be that the route does not reach 200km, this will have to be discussed with the vehicle operator.
Charging requirements	DC overnight charging
Charging infrastructure	MCS Megawatt Charging System (JEMA CCS2 DC charging)
Charge management	Cloud-based software solution for charge planning and shifts scheduling. PANION solution collects data from the available telemetry providers and on-site chargers to calculate the charge opportunity windows and prepare most suitable charging plans with awareness of additional external constraints and insights like electricity prices, or available power capacity. Then the software supervises execution of the charge plan and aligns dynamically it in case of any changes. PANION software can support this use case by direct, live supervision of the operations during shift and calculation of appropriate charging plans in real time, to ensure vehicle operability during the next shift. The main benefit will be the intensification of the operations in difficult to predict conditions and thus lowering the cost of ownership for a particular electric vehicle.
Innovation	• [INO-1 and INO-4] An improved thermal management model will be created and used in the UC2 truck. • [INO-2] Digital twins will be designed at different levels. • [INO-3] Demonstration of ZEV truck with 90% payload compared to existing diesel vehicle at equivalent Total Cost of Ownership Efficiency increases of the truck using advantage of electric powertrain-based lightweight and modular platform that led to payload increase compared to current ICE trucks, and reduction of TCO (Total Cost of Ownership) as well. Improved thermal management of the vehicle cabin • [INO-4] DC overnight charging infrastructure and strategy will be designed. Daily charge option could be studied if use case includes multiple trips in one day.

KPIs to be measured	• [KPI-1] Payload capacity and Efficiency increase. • [KPI-2] Thermal management system efficiency • [KPI-4] Realization of fleet management system • [KPI-6] TCO reduction of ZEV. • [KPI-8] Vehicle thermal efficiency • [KPI-10] TCO reduction of charging • [KPI-12] Charging experience • [KPI-14] Realization of UC2
Partners involved and roles OEM: Vehicle operator: Charging system supplier: Charge management SW supplier:	 IRIZAR FCC MA JEMA ABB (PANION)
Vehicle Route	The vehicle will operate in Barcelona in l'Example, Gracia and Ciutat Vella neighbourhood or areas. The route will depend on the daily demand. The vehicle will start the operation from the depot based in the south of the city every day. It will drive towards the mentioned areas with an approximated 10 km drive. 

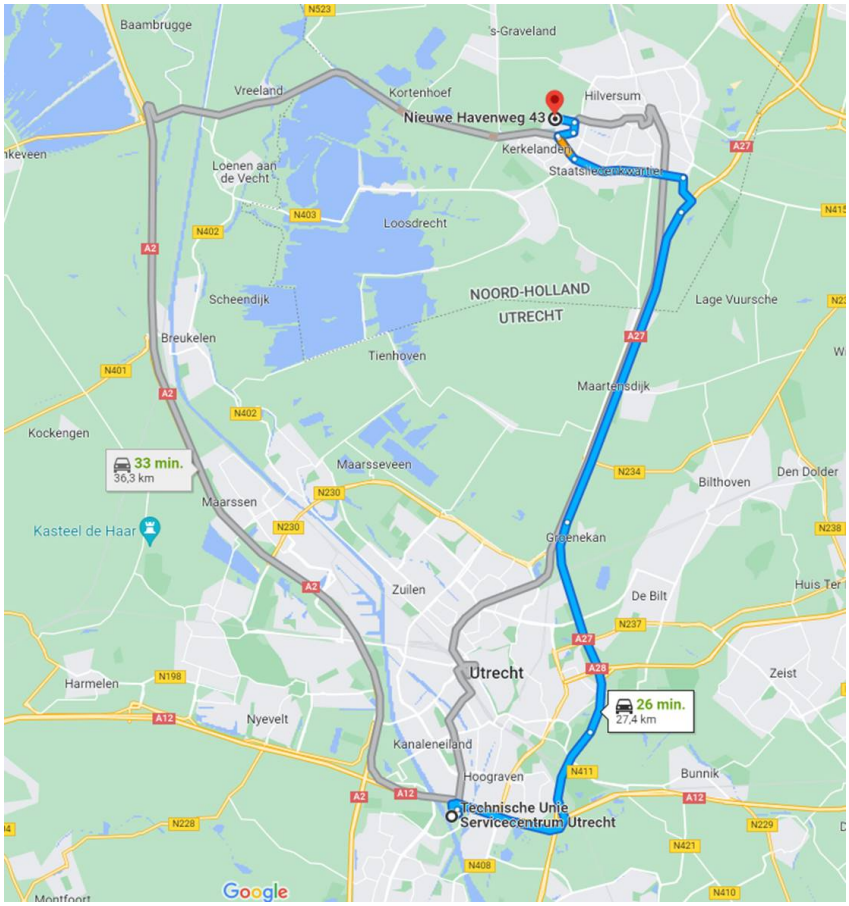
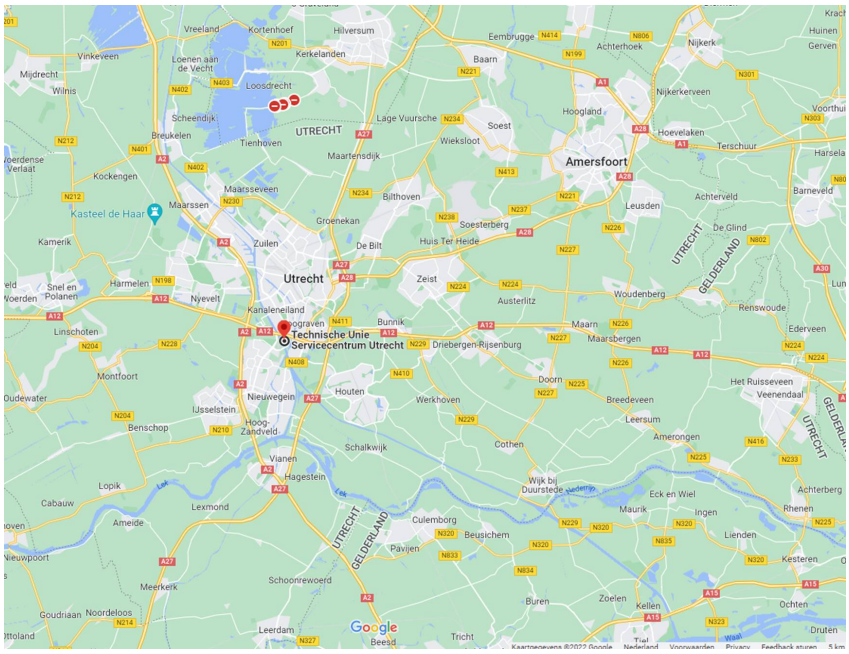
	It will make a route of 10-20 voluminous goods pick up and will drive to the goods/waste treatment facilities. It can repeat this sequence for 4-5 times per journey. 

UC3 - UTRECHT (UTR)

Table 5. Utrecht (UTR) Use Case description.

Use case (UC) title	**Back-to-base logistics**
Demo site location where UC will be implemented	Utrecht, Netherlands
Addressed challenge(s)	Zero emissions zone from 2025; displacement of current diesel truck fleet at affordable TCO
Mission description % among all mission	Transport logistics from main depot to satellite depot in Hilversum in the a.m. followed by last-mile deliveries in the Utrecht region in the p.m.; 100% representative of existing diesel use case
Charging requirements	A/C charging required in first instance as truck returns to base each night
Charging infrastructure	16A or 32A sockets

Charge management	Cloud-based software solution for charge planning and shifts scheduling. • PANION solution collects data from the available telemetry providers and on-site chargers to calculate the charge opportunity windows and prepare most suitable charging plans with awareness of additional external constraints and insights like electricity prices, or available power capacity. Then the software supervises execution of the charge plan and aligns dynamically it in case of any changes, according to the truck end user's needs and priorities (still to be gathered). • This use case will be supported by PANION solution by providing detailed and dynamically adjusted charging plans for the depot to ensure each of the vehicles will be charged in the most optimal way for his next operation window. With this approach, the cost optimization coming from less chargers needed than with an unmanaged approach in the depot will be available.
Innovation	• [INO-1 and INO-4] An improved thermal management model will be created and used in the UC3 truck. • [INO-2] Digital twins will be designed at different levels. • [INO-3] Demonstration of ZEV truck with 90% payload compared to existing diesel vehicle at equivalent Total Cost of Ownership Efficiency increases of the truck using advantage of electric powertrain-based lightweight and modular platform that led to payload increase compared to current ICE trucks, and reduction of TCO (Total Cost of Ownership) as well. • [INO-4] DC overnight charging infrastructure and strategy will be designed. Daily charge option could be studied if use case includes multiple trips in one day.
KPIs to be measured	• [KPI-1] Payload capacity and Efficiency increase. • [KPI-2] Thermal management system efficiency • [KPI-4] Realization of fleet management system • [KPI-6] TCO reduction of ZEV. • [KPI-8] Vehicle thermal efficiency • [KPI-10] TCO reduction of charging • [KPI-12] Charging experience • [KPI-15] Realisation of UC3 In addition, also CO2 displaced per day / week / month
Partners involved and roles OEM: Vehicle operator: Charging system supplier: Charge management SW supplier Fleet company:	 TEVVA; vehicle supplier Technische Unie; logistics provider ABB? (AC charging EVSE required for demo phase) ABB (PANION) Technische Unie - https://www.technischeunie.nl/ Current fleet size – 200 trucks

Vehicle Route	The following two routes are foreseen to cover the 200km daily journey: **Route #1**: Bulk stock and order deliveries from Utrecht depot to Hilversum branch office  **Route #2**: Return to Utrecht and delivery of volume customer orders in the Utrecht vicinity 

4 OVERALL VEHICLES' DEFINITION

Based on the Use Cases objectives (Table 2) and the Use case description related to a mission (Section 3.2), an overall vehicle specification for both the baseline and target vehicles are defined and presented in the section below. The baseline represents the current available OEM prototype vehicle with the 2022 technology level. The target vehicle specifies the planned outcome of the NextETRUCK project. The focus is to ensure standardization effects across the work streams and comparability of outcomes during the testing and evaluation of results. The overall vehicle specification presented represents the status at the end of February 2023 and it is expected that missing data and possible changes will be added at a later stage.

4.1 Table with overall vehicle definition

The overall vehicle specifications including the base and target vehicles for Ford Otosan, IRIZAR and TEEVA are presented in Annex 2. The overall vehicle specification has been streamlined to the use cases and mission profiles presented in section 3. It should here be noted that due to the development and delays in the project, some data is missing which is expected to be added at a later stage. This is especially true for the target vehicles where developments and calculations with the digital twins are still to be done.

The overall vehicle definition table is split into 13 categories covering all major vehicle definitions relevant for upcoming development steps and target fulfillment. For many of the categories, sensible data is available but not included in the table due to confidentiality reasons. in particular:

- for the **categories 1 to 4** covering vehicle overview, Standards & Regulations, Performance, electrical Range and Charging, a considerable amount of data for all three OEM's is available. This data is valuable for the upcoming calculations with the digitals twins to evaluate energy consumption and performance target fulfillments,
- for **category 5** covering Vehicle Operation and Features / Operation Modes, data is missing and will have to be filled in at a later stage,
- Passenger Comfort &Thermal Requirements are described in detail in **category 7** giving valuable information for the upcoming thermal/energy management, cooling circuits and comfort topics in WP3 and WP4,
- the Driving Attributes, Safety and Security, Production and Vehicle Usage & Environment in **category 8 to 11** are specified in detail and to be used mainly in the upcoming WP5, WP6 and WP7,
- finally, the **categories 12 and 13** covering Internet of Things and Cloud Services are not filled in and data will have to be delivered at a later stage.

5 CONCLUSION

This deliverable presented the results of Task T2.1 "Use case, mission and overall vehicle definition" activity during the first nine Months of the project. Three topics were addressed:

- a short survey realised by POLIS with the support of ERTICO to map the different stakeholders' needs leading to a better knowledge as a starting point for the proposed Use Cases.
- a definition of the NextETRUCK use cases that will be implemented by each OEM on their respective demonstration site, including the mission profiles
- and a top-level definition of the vehicles.

From the survey we learned more about the way the cities and region perceive and plan for the upcoming introduction of Electric Truck for regional medium freight haulage as well as the need for the adequate charging infrastructure.
NextETRUCK with its six-months demonstration in three different countries and region will surely use these results when discussing with the regional public authorities and help them in better preparing the change of freight transport paradigm.

We successfully harmonised the specific objectives across the three demonstrations ensuring similar level of engagement in the demonstration as well as the possibility to compare their results.

The preliminary description of the Use Cases at each of the Demonstration site has brought together all the relevant stakeholder sharing the same understanding of what will have to be implemented. This will be taken as a starting point for WP7 setting-up and running the demonstration phase as well as the evaluation WP (WP8).

Finally, the overall vehicle specification for both the baseline and target vehicles were defined. The baseline representing the current available OEM prototype vehicle with the 2022 technology level, and the target vehicle specifying the planned target of the NextETRUCK project, this will also serve as basis for more detailed specification in the other WP2 tasks as well as for the development Work Packages.

ANNEX 1: SURVEY TEMPLATE

Reply to the **NextETRUCK Survey** on e-freight!

NextETRUCK is a three-year Horizon Europe project that plays a pioneering role in the decarbonisation of vehicle fleets, by demonstrating next-generation e-mobility concepts consisting of holistic, innovative, affordable, competitive, and synergetic zero-emission vehicles and ecosystems for tomorrow's medium freight haulage.

It aims at a significant leap of knowledge at component, vehicle, fleet, infrastructure, and ecosystem levels, through innovations in e-powertrain components and architectures, smart charging infrastructure and management, improved thermal design of the cabin, fleet management systems with IoT, and digital tools.

The principal goal of this survey is to understand the state, needs, barriers, and challenges in the regulation of commercial freight vehicle circulation and/or parking, the uptake of zero-emission vehicles (ZEVs) for commercial freight deployment, commercial freight charging tendering processes, grid challenges, and more. A secondary goal is to raise awareness about the NextETRUCK project and to create strong synergies and collaborations with other organisations and projects.

*Required

1. **By ticking this box, you give your consent for the NextETRUCK project to use your data for research purposes:**

   All answers will be confidential and not shared with or sold to third parties, the data will be stocked securely by POLIS Network solely for and during the duration of the NextETRUCK project (2022-2025).

   This survey is conducted in compliance with the European General Data Protection Regulation (GDPR). For further information, please contact Antonios Tsiligiannis (atsiligiannis@polisnetwork.eu)

   Tick all that apply.

   ☐ I consent for the NextETRUCK project to use my data for research purposes

A couple of general questions...

2. **What is your name?** *

3. **What is your gender?** *

Mark only one oval.

- ◯ Male
- ◯ Female
- ◯ Non-binary/third gender
- ◯ Prefer not to say

4. **What type of organisation do you represent?** *

Mark only one oval.

- ◯ Public Authority
- ◯ Research and Academia
- ◯ Non-governmental Organisation (NGO)
- ◯ Public Company
- ◯ Private Company
- ◯ Other

5. **If you replied 'Other', please elaborate:**

_____

_____

_____

_____

_____

6. **What is the name of the organisation you work for?** *

_____

7. **Where is your organisation located?** *

_____

Freight and electromobility

The following questions will help us understand the state, needs, barriers, and challenges in the regulation of commercial freight vehicle circulation and/or parking, the uptake of zero-emission vehicles (ZEVs) for commercial freight deployment, commercial freight charging tendering processes, grid challenges, and more.

8. **Does your city/region apply any of the following strategies/measures to regulate and/or limit commercial freight vehicle circulation and/or parking?** *

Tick all that apply.

- ☐ Limited Traffic Zone (LTZ)
- ☐ Low Emission Zone (LEZ)
- ☐ Zero Emission Zone (ZEZ)
- ☐ Congestion charging schemes
- ☐ Urban logistics/consolidation hubs/centres
- ☐ Tonnage-related measures (access based on vehicle weight)
- ☐ Vehicle size-related measures (access based on vehicle dimensions)
- ☐ No, none
- ☐ Don't know / Not sure
- ☐ Other strategy/measure

9. **If you replied 'Other strategy/measure', please elaborate:**

10. **What would you consider to be the current uptake of zero-emission vehicles (ZEVs) for commercial freight deployment and commercial freight charging infrastructure in your city/region?** *

Mark only one oval.

- ◯ Not developed
- ◯ Starting up
- ◯ Average
- ◯ Scale-up
- ◯ Pioneer/Advanced

11. **Is commercial freight charging infrastructure part of wider strategic plans in your city/region?** *

Tick all that apply.

- ☐ Sustainable Urban Mobility Plan (SUMP)
- ☐ Sustainable Urban Logistics Plan (SULP)
- ☐ Energy transition plan
- ☐ Climate Change Mitigation Plan (e.g., Covenant of Mayors)
- ☐ No, none
- ☐ Don't know / Not sure
- ☐ Other strategic plan

12. **If you replied 'Other strategic plan', please elaborate:**

13. **Please provide a link to the strategy, if any and if publicly available:**

14. **Are there specific requirements regarding the commercial freight charging infrastructure that your city/region includes as requirements in tenders?** *

Tick all that apply.

- [ ] Charging network to charging network interoperability
- [ ] Smart charging
- [ ] Vehicle to Grid (V2G) charging
- [ ] Security measures
- [ ] Privacy measures
- [ ] Smooth integration with the electric grid
- [ ] Use of renewable energy sources
- [ ] Accessibility and inclusivity
- [ ] Charging hubs
- [ ] No, none
- [ ] Don't know / Not sure
- [ ] Other specific requirements

15. **If you replied 'Other specific requirements', please elaborate:**

16. **Are you aware if there is a need or an interest for your local government in joint procurement for commercial freight charging infrastructure?** *

Tick all that apply.

- [ ] Yes, on a municipal level
- [ ] Yes, on a regional level
- [ ] Yes, on a national level
- [ ] Yes, on an international level
- [ ] No
- [ ] Don't know / Not sure

17. **How big of an issue is electricity grid congestion (grid overload) in your city/region?** *

Mark only one oval.

- ◯ Major issue
- ◯ Somewhat of an issue
- ◯ Not an issue
- ◯ Don't know / Not sure

18. **Does your city/region have any of the below?** *

Tick all that apply.

- [ ] Up-to-date predictions for the growth of electric vehicles (EVs) in your area
- [ ] Up-to-date predictions for the growth of zero-emission vehicles (ZEVs) for freight
- [ ] Rollout plan for AC EV charge points (destination charging)
- [ ] Rollout plan for DC EV charge points (fast charging)
- [ ] Impact analysis for the electricity grid
- [ ] No, none
- [ ] Don't know / Not sure
- [ ] Other

19. **If you replied 'Other', please elaborate:**

20. **On what subject are you lacking information or knowledge?** *

Tick all that apply.

- [ ] Location planning for commercial freight charging stations
- [ ] Predictions for commercial freight charging demand
- [ ] Predictions for (electric) grid constraints
- [ ] Digital tools on these issues (location planning, demand prediction, grid constraints, etc.)
- [ ] Streamlined permitting and grid connection procedures
- [ ] Validated tender procedures charging infrastructure
- [ ] Information on different market models to consider in tendering procedures
- [ ] Information on hardware requirements for charging infrastructure
- [ ] Information on software requirements for charging infrastructure
- [ ] I don't lack information or knowledge on these subjects
- [ ] Not clear to me what we are lacking
- [ ] Other subject(s)

21. **If you replied 'Other subject(s)', please elaborate:**

Thank you for your time and for actively partaking in our survey!

We have only a couple more things to ask you!

22. **Can we approach you for a short interview (maximum 30 minutes, via video call or by phone) to dive deeper into your needs and challenges?** *

Mark only one oval.

- ◯ Yes
- ◯ No

23. **Are you interested in getting involved or staying updated on the project?**

If yes, then you can:

> Join the movement by expressing your interest to be part of NextETRUCK's Reference Group and get an insider's perspective on NextETRUCK's innovative work, direct access to our findings, and connect with experts.

> Join the NextETRUCK LinkedIn page and follow NextETRUCK's Twitter account to not miss any of the exciting developments happening in the project, share your thoughts, and take the conversation ahead!

> Subscribe to the NextETRUCK newsletter to get semestral updates straight in your inbox.

Tick all that apply.

- ☐ I am interested in the Reference Group
- ☐ I intend following NextETRUCK on social media
- ☐ I want to subscribe to the NextETRUCK newsletter

ANNEX 2: VEHICLE DEFINITION TABLE

The overall vehicle specification including the base and target vehicles for Ford Otosan, IRIZAR and TEEVA are presented in Annex 2.

Table 6. Detailed vehicle definition table.

AVL NextETRUCK					**Status:**	*Review*			
		rall Vehicle Definition			**Version:**	*0.1*			
		unctional description			**Last Change:**	*07/03/2023*			
Requirement of Vehicle, charging and connectivity					**UC1-Baseline**	**UC1-target**	**UC2-Baseline**	**UC2-target**	**UC3-Baseline**	**UC3-target**
1	**Vehicle Overview**			**Units**	**Ford Otosan**	**Ford Otosan**	**IRIZAR**	**IRIZAR**	**TEVVA**	**TEVVA**
	1.1	*General*								
		1.1.1	Vehicle segment	-	Urban Delivery Truck	Urban Delivery Truck	Heavy Duty Truck		Heavy-duty (Class 8)	Heavy-duty (Class 8)
		1.1.2	Vehicle type	-	N3-Type	N3-Type	N3 type		Rigid Chassis	Rigid Chassis
		1.1.3	Vehicle powertrain technology	-	4 speed gearbox	4 speed gearbox	BEV		Battery Electric Vehicle (BEV)	ttery Electric Vehicle (BEV)
		1.1.4	Technival readiness (Prototype, Series,...)	-	Series	Prototype	Series production		Prototype	Prototype
		1.1.5	Vehicle Lifetime	-	10 years	10 years	10 years		15 years	15 years
		1.1.6	Wheel configuration	-	4x2	4x2	4x2		4x2	4x2
		1.1.7	Vehicle body construction	-	Ladder Frame	Ladder Frame	Ladder frame		Steel Monocoque / Ladder Frame	lonocoque / Ladder Frame
	1.2	*Main dimensions*								
		1.2.1	Overall vehicle length L001	mm	sensible data available	sensible data available	8000		9337	9337
		1.2.2	Maximum overall height of vehicle, unloaded H003	mm	sensible data available	sensible data available	3600		2697+660 (high roof)	2697+660 (high roof)
		1.2.3	Overall width of chassis with cab W001	mm	sensible data available	sensible data available	2550		2295	2295
		1.2.4	Ground clearance rear and front part H013, H014	mm	sensible data available	sensible data available	250		rear 158 / front 235	rear 158 / front 235
		1.2.5	Turning circle radius R011	mm	sensible data available	sensible data available	18500		18680	18680
		1.2.6	Tyre specifications	inch	sensible data available	sensible data available	R22,5		285/70R 19.5 or 305/70R 19.5	35/70R 19.5 or 305/70R 19.5
	1.3	*Mass*								
		1.3.1	Gross combination weight (GCW)	kg	sensible data available	sensible data available	20000		16000	16000
		1.3.2	Payload	kg	sensible data available	sensible data available	7000		9285	9285
		1.3.3	Curb weight	kg	sensible data available	sensible data available	13000		6715	6715
		1.3.4.1	Permissible axle loads (front)	kg	sensible data available	sensible data available	9000		5800	5800
		1.3.4.2	Permissible axle loads (rear)	kg	sensible data available	sensible data available	13400		10900	10900
	1.4	*Driving resistance values*								
		1.4.1	Drag coefficient	-	sensible data available	sensible data available	0,65		Min.: 0.6, Typ.: 0.65, Max.: 0.7	
		1.4.2	Front surface	m²	sensible data available	sensible data available	9,5			
		1.4.3	Tyre rolling coefficient	-	sensible data available	sensible data available	0,008		0.009	
2	**Standards & Regulations**									
	2.1	*List of all relevant standards and regulations and derived requirements*				*TBD in detail in Task 2.5*	*UNECE*		*Various UNECE Regulations GSR + GRS2 Compliant London's DVS*	

Requirement of Vehicle, charging and connectivity				UC1-Baseline	UC1-target	UC2-Baseline	UC2-target	UC3-Baseline	UC3-target
3 Performance (Hybrid & Pure Electric Operation)									
3.1	*Acceleration Performance*								
	3.1.1	Acceleration	m/s²	sensible data available	sensible data available	10s from 0 km/h to 40 km/h fully loaded	sensible data available	≤25	
3.2	*Gradeability Performance*								
	3.2.1	Start up gradeability	%	sensible data available	sensible data available	>20	sensible data available		
	3.2.2	Gradeability at given slope, speed (time specification)	-						
	3.2.3	35-55 kph Time- Freeway Merge	-						
3.3	*Additional Performance Requirements*								
	3.3.1	Ancillary performance	-	sensible data available	sensible data available		sensible data available		
3.4	Maximum Velocity								
	3.4.1	Speed limit setpoint	km/h	sensible data available	sensible data available	90	sensible data available	(60 mph) 96.6	
	3.4.2	Technical maximum speed	km/h			110		(60 mph) 96.6	
	3.4.3	Maximum overspeed	km/h			110		(60 mph) 96.6	
3.5	*Transmission specifications*								
	3.5.1	Transmission type	-			Direct drive. Motor to axle differential		Automatic	
	3.5.2	Number of gears	-			1 - 6,58		Single Speed	
4 Electric Range and Charging									
4.1	All Electric Range / Vehicle Energy Consumption			sensible data available	sensible data available		sensible data available	sensible data available	sensible data available
	4.1.1	Range on defined cycle	km			> 200			
4.2	Real Life Range / Energy Consumption								
	4.2.1	Range in defined real-life driving	km			> 150			
4.3	General Charging Requirements		-			ISO15118			
4.4	AC Charging Requirements								
	4.4.1	AC charging standards (plug, communication)	-			sensible data available			
	4.4.2	AC charging power	kW						
4.5	DC Charging Requirements								
	4.5.1	DC charging standards (plug, communication)				CCS2			
	4.5.2	DC charging voltage level	V			800			
	4.5.3	DC charging power	kW			150			
4.8	Grid Charging and Discharging								
	4.8.1	V2G vehicle to grid	-			N/A			
	4.8.2	V2H vehicle to home	-			N/A			
	4.8.3	V2L vehicle to load	-			N/A			
	4.8.4	V2V vehicle to vehicle	-			N/A			

AVL NextETRUCK	**Overall Vehicle Definition** **Functional description**			**Status:**	*Review*					
				Version:	*0.1*					
				Last Change:	*07/03/2023*					
Requirement of Vehicle, charging and connectivity					**UC1-Baseline**	**UC1-target**	**UC2-Baseline**	**UC2-target**	**UC3-Baseline**	**UC3-target**
5	**Vehicle Operation and Features / Operation Modes**									
	5.1	*ECO-Driving-System Mode*				*Available (Task 4.2)*		*Available (Task 4.2)*		*Available (Task 4.2)*
6	**Electric & Electronic**									
	6.1	*Communication Requirements (Standards, interface, signals, messages, ...)*			sensible data available	sensible data available	CANJ1939	sensible data available	sensible data available	sensible data available
	6.2	*Telemetry - telematics provider & interfaces (Daten logging)*					N/A			
7	**Passenger Comfort & Thermal Requirements**									
	7.1	*Cabin Thermal Management Load Case 1 E.G. Steep Hill Climbing*								
		7.1.1	Velocity	km/h						
		7.1.2	Gradeability at given slope, speed (time specification)	%						
		7.1.3	Ambient temperature	°C						
		7.1.4	AC	On/Off						
		7.1.5	Initial cabin temperature	°C						
		7.1.6	Solar load	W/m²	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*
		7.1.7	Ambient humidity	%						
		7.1.8	Initial battery temperature	°C						
		7.1.9	Duration	min						
		7.1.10	Charging Power	kW						
		7.1.11	Vehicle weight	kg						
	7.2	*Cabin Thermal Management Load Case 2 E.G. Top Speed*								
		7.2.1	Velocity	km/h						
		7.2.2	Gradeability at given slope, speed (time specification)	%						
		7.2.3	Ambient temperature	°C						
		7.2.4	AC	On/Off						
		7.2.5	Initial cabin temperature	°C						
		7.2.6	Solar load	W/m²	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*
		7.2.7	Ambient humidity	%						
		7.2.8	Initial battery temperature	°C						
		7.2.9	Duration	min						
		7.2.10	Charging Power	kW						
		7.2.11	Vehicle weight	kg						
		7.2.12	Cabin Cool Down	°C						
	7.2	*Derating & Limitation of Elements/ Components*			*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*
	7.3	*Noise & Damping*			*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*
8	**Driving Attributes**									
	8.1	*Driveability*			*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*
	8.2	*Handling*			*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*
	8.3	*Steering*			*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*
	8.5	*Brake and Motor Brake*			*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*	*sensible data available*

AVL NextETRUCK						**Status:**	*Review*			
rall Vehicle Definition						**Version:**	*0.1*			
unctional description						**Last Change:**	*07/03/2023*			
Requirement of Vehicle, charging and connectivity						**UC1-Baseline**	**UC1-target**	**UC2-Baseline**	**UC2-target**	**UC3-Baseline**	**UC3-target**
9	**Safety and Security**										
	9.1	*Functional Safety*									
		9.1.1	Description of item under consideration	-		sensible data available	sensible data available	sensible data available	sensible data available	sensible data available	sensible data available
		9.1.2	Maturity of the target vehicle	-							
		9.1.3	New developments/modifications	-							
		9.1.4	Technical-related, organizational-related and legislative documents to be considered	-							
		9.1.5	Intended operational scenarios	-							
		9.1.6	Potential hazards not covered by already safe items/syst	-							
		9.1.7	Mitigation measures	-							
		9.1.8	Prototype vehicle implementations (vehicle adapations,	-							
		9.1.9	Test cases	-							
		9.1.10	Instructions and evidences	-							
	9.2	*Cyber Security*									
		9.2.1	Secure OnBoard Communication	-		sensible data available	sensible data available	N/A	sensible data available	sensible data available	sensible data available
		9.2.2	Firmeware Integrity (Secure Boot)	-				N/A			
		9.2.3	Secure storage of keys (HSM)	-				N/A			
		9.2.4	UDS Service Authentication 0x29	-				N/A			
		9.2.5	Over the air communication TLS 1.3	-				N/A			
		9.2.6	CSMS UNECE R155	-				N/A			
		9.2.7	SUMS UNECE R156	-				N/A			
		9.2.8	TARA analysis according to ISO 21434	-				N/A			
		9.2.9	Cyber Security Case according to ISO 21434	-				N/A			
	9.3	*Crash*	*HV safety, crash safety,... is not part of the project*	-							
10	**Vehicle Usage & Environment**										
	10.1	*Ambient Conditions*									
		10.1.1	Temperatures	°C		sensible data available	sensible data available	-20 to 50	sensible data available	sensible data available	sensible data available
		10.1.2	Operating altitude	m				2500			
		10.1.4	Special environments (ramp angles? ground clearance?)					Urban application. Mainly On-road with little Off-road (Landfill, etc.)			
	10.2	*Vehicle Operation*						UC2 described			

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Requirement of Vehicle, charging and connectivity				**UC1-Baseline**	**UC1-target**	**UC2-Baseline**	**UC2-target**	**UC3-Baseline**	**UC3-target**
11	**Production**								
	11.1	End of Life	-	sensible data available	sensible data available	sensible data available	sensible data available	sensible data available	sensible data available
	11.2	Workshop	-	sensible data available	sensible data available	sensible data available	sensible data available	sensible data available	sensible data available
	11.3	Warranty and Maintenance	-	sensible data available	sensible data available	sensible data available	sensible data available	3 years warranty, 8 years battery	sensible data available
	11.4	Recycling	-	sensible data available	sensible data available	sensible data available	sensible data available	sensible data available	sensible data available
12	**Internet of Things**								
	12.1	Vehicle to cloud interphase		Not available	Available (Task 3.4)	Not Available	Available (Task 3.4)	Not Available	Available (Task 3.4)
13	**Cloud Services**								
	13.1	store vehicle specific data		Not available	Available (Task 3.4)	Not available	Available (Task 3.4)	Not available	Available (Task 3.4)
	13.2	Set vehicle specific parameter		Not available	Available (Task 3.4)	Not available	Available (Task 3.4)	Not available	Available (Task 3.4)
	13.3	Charging management		Not available	Available (Task 3.4)	Not available	Available (Task 3.4)	Not available	Available (Task 3.4)
	13.4	Fleet mangement		Not available	Available (Task 3.4)	Not available	Available (Task 3.4)	Not available	Available (Task 3.4)
	13.5	Energy optimized mangement		Not available	Available (Task 3.4)	Not available	Available (Task 3.4)	Not available	Available (Task 3.4)