Frugal Zero-Emission Vehicles for the Urban Passenger challenge

Project deliverable D4.1

Demonstration and simulation plans including homologation and certification

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EXECUTIVE SUMMARY

This document defines the vehicle demonstration framework of the ZEV-UP project, detailing how the developed passenger and commercial vehicle variants will be tested in real-world conditions to generate robust technical, behavioural and operational evidence. The demonstration activities are structured around seven representative use cases covering urban and peri-urban passenger mobility, shared travel, last-mile logistics, regional delivery operations and company service fleets. Together, these use cases reflect the most relevant real-life mobility and transport missions targeted by frugal electric vehicle concepts.

The document describes the operational setup of the demonstrations, including recruitment and rotation of participants, vehicle familiarisation and training, flexible route execution, charging and energy replenishment strategies, data logging and quality assurance procedures. Emphasis is placed on ensuring realistic, unconstrained vehicle use while maintaining consistency and comparability across locations and use cases. The demonstration protocol is complemented by a digital-twin-based simulation framework that enables fleet-level upscaling, scenario analysis and assessment of environmental and economic impacts beyond the scope of the physical pilots.

By combining real-world demonstrations with harmonised data management and simulation activities, this framework provides the basis for the comprehensive evaluation tasks in WP5 (Tasks 5.1–5.5), supporting assessments of vehicle performance, energy efficiency, user acceptance, environmental benefits, total cost of ownership and market uptake potential. The document therefore serves as both an operational guide for partners executing the demos and a reference for subsequent analysis and exploitation activities within the project.

LIST OF ABBREVIATIONS AND ACRONYMS

Acronym	Meaning
BEV	Battery-Electric Vehicles
BMS	Battery Management System
CAN	Controller Area Network
CO_2	Carbon dioxide
EV	Electric Vehicles
EVSE	Electric Vehicle Supply Equipment
GDRP	General Data Protection Regulation
GPS	Global Positioning System
HVAC	Heating, Ventilation and Air Conditioning
KPI	Key Performance Indicator
NVH	Noise, Vibration and Harshness
PVL	Powered Light Vehicle
RBAC	Role-Based Access Control
SoC	State of Charge
SoH	State of Health
TAM	Technology Acceptance Model
TCO	Total Cost of Ownership
UC	Use Case
UTAUT	Unified Theory of Acceptance and Use of Technology
VRU	Vulnerable Road User
WTP	Willingness-to-Pay
WP	Work Package
ZEV	Zero-Emission Vehicle

1 PROJECT AND DELIVERABLE

1.1 Project introduction and link with the deliverable

The ZEV-UP project develops a new concept of lightweight Battery Electric Vehicle (BEV) based on frugal design principles, advanced manufacturing approaches, and a swappable battery architecture. This concept aims to address key barriers to electromobility adoption, particularly high acquisition and operating costs as well as range limitations, thereby supporting the wider transition toward sustainable urban mobility. The project focuses on light BEV solutions within the L6 and L7 vehicle categories, commonly referred to as Powered Light Vehicles (PLVs), designed for efficient passenger and commercial use in urban and peri-urban environments.

The technical concepts and operational performance of the ZEV-UP vehicles are assessed through real-world demonstrations conducted at two pilot sites, Thessaloniki (Greece) and Istanbul (Turkey). These demonstrations cover a set of representative passenger and commercial use cases reflecting typical mobility and logistics missions, including urban commuting, peri-urban travel, last-mile delivery, regional logistics, and company service operations. The structured demonstration framework enables systematic collection of technical, operational, and user-experience data under realistic driving and charging conditions.

This deliverable defines the overall demonstration and simulation planning, including methodological principles, recruitment and training procedures, data-collection protocols, and the linkage between real-world testing and digital-twin-based fleet simulation. As such, it provides the operational foundation for subsequent evaluation activities within the project, supporting the assessment of vehicle performance, energy efficiency, environmental impact, total cost of ownership, and user acceptance.

1.2 Attainment of the objectives and explanation of deviations

The objectives of the deliverable were fully achieved. This document main objective is to define the methodological, operational, and analytical framework guiding the ZEV-UP vehicle demonstrations and the associated simulation activities.

Although preparatory work for the demonstration plan had started in advance of the official timeline, the finalisation of the deliverable experienced a three-month delay. This deviation was primarily due to the withdrawal of OTOK from the consortium, which had held the role of demonstration coordinator under Task 4.2 and was responsible for activities initially foreseen in Budapest, Hungary. Consequently, the demonstration setup required partial reorganisation, including the rescheduling of pilot activities, redistribution of coordination responsibilities, and clarification of operational arrangements among the remaining partners.

However, this delay did not affect the overall progress of the project, as the demonstration vehicles were not yet available for deployment during the affected period.

1.3 Intended audience

This document is primarily intended for project partners responsible for planning, implementing, and analysing the ZEV-UP vehicle demonstrations and associated simulation activities. It provides methodological guidance, operational procedures, and data-collection principles necessary for the consistent execution of demonstration tasks and for ensuring comparability of results across pilot sites and use cases.

Deliverable D4.1 has a transversal role within the project, as it establishes the common framework supporting subsequent evaluation and impact-assessment activities. In this context, it is closely linked to WP1, which defines user-centric strategies and acceptance considerations; WP2, which provides the baseline vehicle design, architecture, and digital-twin foundations; WP3, which delivers the vehicle prototypes; WP4, which carries out the real-world demonstrations and data collection; and WP5, which performs the integrated evaluation of performance, environmental impacts, economic indicators, and market uptake potential.

As such, the document also serves as a reference for consortium members involved in analysis, validation, and dissemination activities related to the ZEV-UP demonstration outcomes.

2 REVIEW OF DEMO ACTIVITIES FROM PREVIOUS RELEVANT PROJECTS AND STUDIES

2.1 Project/studies review

The following review presents a structured overview of selected European research projects and scientific studies that are relevant to the design, execution and evaluation of the ZEV-UP demonstration activities. These initiatives include large-scale vehicle pilots, urban living labs, charging-infrastructure demonstrations and data-driven analyses of real-world electric vehicle usage, providing a comprehensive state of the art for both experimental and simulation-based approaches. Together, they illustrate how user-centric vehicle concepts, harmonised data collection, charging behaviour analysis and fleet-level upscaling methodologies have been successfully applied in previous projects. The review is used to extract transferable lessons on demo planning, logging strategies, user recruitment, charging integration and performance evaluation, which directly inform the definition of ZEV-UP's demonstration framework and its digital-twin-based simulation activities.

2.1.1 L3Pilot

The L3Pilot ("Piloting Automated Driving on European Roads") aimed to test the viability of automated driving (AD) as a safe and efficient means of transportation in real-world traffic across Europe. It deployed around 100 vehicles with SAE Level 3 (and some Level 4) automation functions, across up to 11 European countries, with about 1,000 test drivers. Its objectives included creating a Europe-wide standardised piloting environment, coordinating large-scale data acquisition, piloting and evaluating AD functions, and promoting innovation and market.

L3Pilot's demo plan involved equipping many cars from multiple OEMs with AD functions and deploying them in mixed traffic environments—motorways, urban intersections and parking. Drivers used the vehicles over real trips; data logging captured vehicle signals, user interactions, and scenario context. Analyses included technical performance, user acceptance, travel behaviour and traffic/impact metrics. The activities included pre-pilot baseline drives, full pilot operations, user surveys and acceptance studies, and compiling lessons into a common data format (CDF) to harmonise across OEMs and sites.

2.1.2 CIVITAS ECCENTRIC

CIVITAS ECCENTRIC focused on sustainable mobility in peripheral urban areas (less-served by typical mobility policies) and on urban freight logistics. The project operated in five European cities: Munich (Germany), Madrid (Spain), Ruse (Bulgaria), Stockholm (Sweden), and Turku (Finland). A total of around 50 measures were implemented across six thematic demonstration work-packages, mixing technology, policy and soft measures.

ECCENTRIC's demo plan was built around living-lab neighbourhoods in each participating city. Each city selected test zones, deployed fleets of electric vehicles, light electric vehicles and other sustainable mobility offerings (e-bikes, shared mobility, logistic hubs) and installed associated charging/fuelling infrastructure. The demo activities also emphasised user-involvement (especially under-served groups, women, older people), stakeholder co-creation, and monitoring of usage and acceptance. A thorough evaluation framework captured user logs, vehicle/fleet data, policy and operational impacts, and replication guidelines for other cities.

2.1.3 USER-CHI

USER-CHI (Innovative solutions for user-centric charging infrastructure) aimed to promote large-scale electromobility market uptake by integrating innovative charging technologies, favouring user-centric design, novel business models and regulatory frameworks. The project focused on five urban areas in Europe: Barcelona metropolitan area (Spain), Rome (Italy), Berlin (Germany), Budapest (Hungary) and Turku (Finland), plus replication nodes in Murcia (Spain) and Florence (Italy). Its focus was the charging infrastructure ecosystem—stations, services, grid integration, user experience and business models.

USER-CHI's demo plan involved co-creation of charging station solutions with users and cities, deployment of smart, modular charging stations (including induction, V2G, mobile charging) and development of supporting tools (e.g., the "CLICK" planning tool). For each urban site, activities included installation of charging infrastructure, user research (surveys, interviews), operational trials of services, evaluation of user satisfaction, grid impact and business model viability, and replication support for other cities. The user-centric approach emphasised acceptability, ease of use, interoperability and future-proofing.

2.1.4 eCharge4Drivers

eCharge4Drivers targeted the improvement of EV charging user-experience by developing user-friendly stations, smart services (mobile charging, battery swapping), and demonstrating in 10 areas across cities and TEN-T corridors. The project delivered guidelines for charging location planning, regulatory recommendations and sustainability of infrastructure investments.

The demo plan of eCharge4Drivers involved surveying user perceptions and habits about charging, then deploying new charging station types (modular scalable, low-power DC, LEV charging, mobile solutions, battery swap), along major corridors and urban contexts. The deployed stations included advanced features (Plug & Charge via ISO 15118, direct payment methods, smart services) across multiple demonstration sites. The activities included user surveys, deployment and operation of infrastructure, monitoring charging sessions (power, energy, usage), analysis of grid/service/operational impacts, and producing a charging-location planning tool plus investor/authority recommendations.

2.1.5 INCIT-EV

INCIT-EV (Large demonstratIoN of user CentrIc urban and long-range charging solutions to boosT an engaging deployment of Electric Vehicles in Europe) was a European large-scale demonstration project that aimed to accelerate electric vehicle uptake by improving the overall charging experience through innovative technologies, infrastructures and business models. The project implemented real-life demonstrations across five different environments, covering urban, peri-urban and extra-urban contexts, and addresses seven complementary use cases, including smart and bidirectional charging, dynamic wireless charging for both urban roads and long-distance corridors, park-and-ride charging hubs, superfast corridor charging stations, low-power DC vehicle-to-grid solutions, and opportunity wireless charging for taxi services. A distinctive feature of INCIT-EV was its strong user-centric approach: in addition to technical and operational evaluation, the project applies neuroscience and biosignal measurements to capture users' unconscious preferences and reactions to charging solutions.

INCIT-EV's demo plan was structured around five real-life demo environments (Amsterdam/Utrecht, Paris/Versailles, Turin, Tallinn, Zaragoza), each hosting one or more-use cases covering slow/fast, static/dynamic, and bi-directional charging. The demonstrations were staged: first, analysis of user needs and technology integration; then, deployment of seven full-scale use cases, such as dynamic inductive lanes in urban and highway scenarios, a charging hub at a park&ride facility, and superfast DC chargers on EU corridors. Pilot activities combined technical operation (charging performance, V2G, grid services, interoperability) with user-centric evaluation. This included monitoring hundreds of charging events, evaluating smart/bidirectional algorithms at >100 locations, instrumenting inductive sites for real-world taxi and passenger use, and using neurometrics and surveys to understand perceived ease-of-use and preference. Site-specific deliverables (e.g. Tallinn UC-5 solution description) documented the full chain: local context, technical solution, deployment steps, KPIs and lessons learned.

2.1.6 E-Mobility NSR (North Sea Region Electric Mobility Network)

E-Mobility NSR was an Interreg IVB North Sea Region project that aimed to create favourable conditions for the coordinated development of electric mobility across the North Sea Region. The project brought together a network of eleven partners from Germany, the Netherlands, Denmark, Sweden, Norway, Belgium and the United Kingdom, addressing e-mobility from a systemic perspective that combined policy, infrastructure, logistics and user information. Its activities focused on identifying barriers and opportunities for EV uptake, analysing infrastructure and charging standards, and testing electric vehicles and charging solutions through laboratory and real-world field trials. Key outputs included state-of-the-art assessments, policy and strategy reports, studies on charging infrastructure deployment, and detailed technical reports from lab and field tests. These results were consolidated into practical, case-study-based guidance to support municipalities and regions in planning and implementing electric mobility solutions aligned with both environmental and economic objectives.

E-Mobility NSR combined laboratory tests with field tests of EVs and charging to understand energy consumption, charging behaviour and infrastructure impacts under real conditions. Lab tests measured storage capacities, charging needs and energy consumption of different EVs; field tests then monitored EVs and electric buses in actual daily transport operations, recording charging events and energy profiles. On top of that, several living pilots explored specific deployment contexts, such as EV sharing in cohousing communities and municipal or regional fleet applications. These pilots logged vehicle and charging data while collecting qualitative feedback on user behaviour, acceptance and organisational arrangements. Results fed into policy and planning recommendations, highlighting best practices for EV fleets, fast-charging deployment, and stakeholder strategies for rolling out EV recharging infrastructure across a transnational region.

2.1.7 EV use patterns from large-scale monitoring

The study “*Identification of EV use patterns, based on large-scale EV monitoring data*” by De Cauwer et al., published in 2013 in the World Electric Vehicle Journal (and also presented at EVS27), develops a systematic methodology for analysing extensive real-world electric vehicle monitoring datasets. The research is based on data collected within the Flemish Living Labs Electric Vehicles, where fleets of battery electric vehicles and plug-in hybrid electric vehicles were monitored over long periods during everyday use. The main objective of the study was to extract meaningful and representative EV use patterns that are closely linked to driving behaviour, range utilisation and charging practices. To achieve this, the authors defined and computed a set of key indicators from trip and charging logs, such as reset points corresponding to full charging events, daily driven distance, average and maximum distances between charging events, and the potential for unused or “extra” range. The resulting methodology demonstrates how continuous vehicle logging can be transformed into behavioural clusters, providing valuable insights for vehicle design, charging infrastructure planning and the assessment of real-world EV suitability for different user profiles.

While not a “demo project” in the H2020 sense, the study describes a field-trial style monitoring setup: EVs and PHEVs in everyday use are continuously logged (distance, time, energy, state of charge), with data centralised for analysis. The experimental design focuses on longitudinal monitoring – i.e. capturing many weeks/months of use to derive robust behavioural indicators rather than one-off tests. The analysis pipeline—signal pre-processing, identification of “reset points” (full charges), calculation of range-related indicators, and clustering of vehicles by use pattern—might serve as a blueprint for post-processing ZEV-UP demo data.

2.1.8 Electric Vehicles Demonstration Projects – An Overview Across Europe

The review paper "*Electric Vehicles Demonstration Projects – An Overview Across Europe*" (UPEC 2020) synthesises experiences and results from a range of European EV demonstration and integration studies, with particular attention to charging behaviour and grid interactions. It highlights how uncontrolled EV charging can strain distribution networks, and how smart charging and user behaviour modulation are key enablers of grid flexibility and renewable energy utilisation. The paper analyses multiple research initiatives that explore ancillary services, the controllability of charging processes, and the role of electric vehicles as flexible grid resources, underlining that the technical control of charging must be coupled with an understanding of user acceptance to unlock its potential. Across projects, a recurring finding is that the charging process serves not only as an energy transfer event but also as a strategic tool for grid support, requiring coordinated control strategies, appropriate infrastructure placement, and supportive market arrangements to ensure EVs contribute optimally to both transport decarbonisation and electrical system stability.

2.1.9 Electric L-category Vehicles for Smart Urban Mobility

The study *"Electric L-category Vehicles for Smart Urban Mobility"* examines the role of electrically powered light vehicles (L-category, including e-scooters, e-motorcycles, and small electric quadricycles) as a complementary solution to conventional passenger cars in dense urban environments. It analyses how L-category electric vehicles can contribute to reduced energy consumption, lower CO_2 emissions, and decreased congestion, particularly for short-distance urban trips where cars are often oversized and inefficient. The study highlights that these vehicles are well suited to smart urban mobility strategies because of their lower mass, reduced space requirements, and significantly lower energy demand per kilometre. It also discusses enabling factors such as dedicated infrastructure, regulatory frameworks, safety considerations, and integration with shared mobility and multimodal transport systems. From a technological and operational perspective, the paper underlines the importance of appropriate charging solutions, user acceptance, and policy support to unlock the full potential of electric L-category vehicles as scalable, affordable, and efficient components of future sustainable urban mobility systems.

2.2 What ZEV-UP can borrow from previous projects and studies

The table below synthesises the main transferable lessons from the reviewed European projects and scientific studies, highlighting elements that can be directly adopted or adapted within ZEV-UP. Rather than providing a general comparison, it focuses on practical aspects relevant to demonstration design, data collection, user involvement, charging integration and fleet upscaling.

Table 1: Lessons learnt from previous relevant projects and studies

Source	Elements ZEV-UP can borrow from
L3Pilot	Harmonised demo protocols across sites (common scenarios, KPIs); definition of a common data format for vehicle logging; integration of technical performance, user acceptance and impact assessment in a single evaluation framework; structured link between on-road demos and data-driven analysis.
CIVITAS ECCENTRIC	Living-lab approach for urban demonstrations; clear segmentation of user groups and neighbourhood-based use cases; combination of vehicle deployment with supporting measures (access rules, incentives, charging availability); strong focus on replication and upscaling guidance for other cities.

Source	Elements ZEV-UP can borrow from
USER-CHI	Treatment of demos as complete e-mobility ecosystems (vehicles, charging, services, users); user-centric co-creation and iterative feedback loops; KPIs related to usability, interoperability and acceptance; structured description of demo sites and local context.
eCharge4Drivers	Systematic monitoring of charging behaviour alongside vehicle use; definition of charging-related KPIs (power, duration, energy, failed sessions); use of before/after user surveys linked to real charging data; translation of demo results into planning and deployment guidelines.
INCIT-EV	Use-case-driven demo design covering urban, peri-urban and corridor contexts; integration of advanced charging concepts (fast charging, V2G, opportunity charging); explicit link between demo results and decision-support tools for planners and operators; strong user-centric evaluation approach.
E-Mobility NSR	Combination of laboratory testing and long-term field trials to validate energy consumption and charging needs; focus on fleet applications (municipal, shared, logistics); production of policy-oriented outputs translating technical results into actionable guidance for cities and regions.
EV monitoring study	Methodology for turning raw logs into behavioural indicators (daily distance, reset points, range utilisation); clustering of users and vehicles based on real usage; emphasis on long-term monitoring rather than short test drives; strong basis for post-processing ZEV-UP demo data.
Review of EV Demonstration Projects	Holistic view of charging infrastructure as a system component; importance of smart and controlled charging strategies; inclusion of grid interaction and flexibility metrics in demos and simulations; recognition that user acceptance is critical for charging control strategies.
Electric L-category Vehicles for Smart Urban Mobility	Justification for light, frugal EV concepts in dense urban contexts; focus on energy per km, trip length suitability and space efficiency; consideration of regulatory and infrastructure enablers; framing ZEV-UP vehicles as part of smart urban mobility ecosystems rather than niche solutions.

3 METHODOLOGY DEFINITION

This chapter presents the methodological framework guiding the ZEV-UP vehicle demonstrations. The approach builds on best practices from previous European projects and combines real-world testing, harmonised data collection, and user-centric evaluation to ensure robust and comparable evidence across use cases and locations. The methodology links operational vehicle performance, energy consumption, charging behaviour, environmental impact, and user acceptance with the project's key performance indicators. Real-world telemetry logging and pre- and post-use surveys provide the empirical foundation for both technical assessment and socio-economic evaluation. In addition, structured data management, participant recruitment, training, and validation procedures ensure reliability, safety, and ethical compliance throughout the demonstrations.

3.1 Use cases

The table below presents the seven demonstration use cases, as also defined in the Description of Work (DoW), which together cover a representative spectrum of passenger and goods transport missions targeted by the ZEV-UP project. The use cases are structured to reflect both urban and peri-urban mobility patterns and to test the developed vehicle concepts under diverse operational, environmental and user conditions. By encompassing private mobility, shared use and professional logistics applications, the set of use cases ensures that the demonstrations capture the most relevant real-world contexts for evaluating vehicle performance, energy efficiency, user acceptance and scalability, in line with the objectives of the project

Table 2: Demonstration use cases

UC id	Use Case description	Vehicle	Location	Duration	Particularities
P1	***Urban use***: Commuting with home charging	Passenger variant	*Phase 1*: Thessaloniki, Greece (Lead: CERTH) *Phase 2*: Istanbul, Turkey (Lead: FORD)	2 weeks per UC for the **2-seater** variant and 2 week per UC for the **4-seater** variant	Dense traffic while peak hours
P2	***Urban use***: Shopping activities, e.g. visiting a supermarket				Additional weight, variation in traffic and parking conditions
P3	***Peri-urban use***: Traveling longer distances (> 70km)				Charging the vehicle before the return trip (battery charging points availability). Diversity of road types (urban, rural, highway)
P4	***Peri-urban use***, *ride-sharing*: Traveling longer distances (>				Charging the vehicle before the return trip (battery charging points availability) and carrying extra weight with the additional occupant(s). Variation of

UC id	Use Case description	Vehicle	Location	Duration	Particularities
	70km), picking up another passenger				traffic, road type and parking conditions
C1	***Last mile mission***: small - light- parcel delivery	Commercial variant	*Phase 1*: Istanbul, Turkey (Lead: FORD) *Phase 2*: Thessaloniki, Greece (Lead: CERTH)	1,5 week per UC for the **4-seater** variant (vehicle modifications/ adaptation will take place the 1st week of the demo period)	More deliveries per charge and thus more mileage driven
C2	***Peri-urban deliveries****:* heavier cargo delivery with opportunity charging				Long distances travel with variation in road morphology and type and charging strategy
C3	***Company service vehicle****:* will be used in FORD facilities, as a support vehicle, mainly in the warehouses				Different users with variation in the purpose of the use (cargo and people move from one to another place)

In addition to conventional charging strategies (home, depot, public and opportunity charging), battery swapping is considered within the ZEV-UP methodological framework as a complementary energy replenishment concept. While the real-world demonstrations focus primarily on charging-based scenarios due to infrastructure availability, battery swapping is integrated at the simulation level to assess its potential impact on vehicle availability, downtime reduction, and fleet productivity. This allows a comparative evaluation between charging-only strategies and hybrid charging–swapping models, particularly for high-utilisation commercial use cases.

While the demonstration plan foresees a balanced allocation of participants across sites and use cases, it is acknowledged that differences in local availability of commercial drivers may occur. In particular, one demonstration site may have a higher number of professional drivers willing to participate in commercial use cases compared to the other. In such cases, any imbalance will be managed operationally by adjusting the recruitment strategy, for example by engaging additional private participants for passenger vehicle demonstrations at the corresponding site. This approach ensures continuity of testing activities, maintains sufficient data density for each vehicle variant, and preserves comparability of the collected datasets across locations.

3.1.1 Use Case description

P1 – Urban commuting: home-to-work trips with home charging

This use case addresses everyday urban commuting, representing one of the most frequent and repetitive mobility patterns in large metropolitan areas. The passenger variant of the ZEV-UP vehicle will be used by private users traveling between their residence and workplace during peak hours, in dense urban traffic conditions. In Phase 1 the use case will be executed in Thessaloniki, followed by Phase 2 in Istanbul, allowing comparison between two cities with different traffic intensity, driving behaviour and urban morphology.

Participants will rely primarily on home or semi-private charging, enabling the evaluation of overnight charging strategies and daily energy sufficiency without mid-day recharging. The focus of this use case is on energy consumption under stop-and-go traffic, regenerative braking efficiency, range adequacy for daily commuting, and user perception of comfort and usability in congested conditions. The two-seater variant will be tested for a longer duration (two weeks) to capture repeated commuting cycles, while the four-seater variant will be tested for one week to assess capacity and comfort trade-offs. Data collected in this use case will form a baseline for urban energy demand, charging regularity and user acceptance in the most typical passenger scenario.

P2 – Urban shopping trips and short routes

This use case extends urban driving beyond commuting to include discretionary trips such as grocery shopping or visits to retail areas. The passenger variant will be used for short, irregular trips that involve additional payload due to shopping goods, frequent parking manoeuvres, and variable traffic conditions depending on time of day. This scenario reflects real-life urban mobility patterns where trips are shorter but more fragmented and include parking in constrained spaces.

The focus of P2 is on vehicle performance and usability under varying load conditions, ease of access and manoeuvrability in parking areas, and the impact of stop-and-start driving on energy consumption. Charging behaviour will typically follow home charging patterns, but irregular trip timing may lead to different charging decisions compared to P1. This use case complements the commuting scenario by how the ZEV-UP vehicle performs in everyday non-routine urban activities.

P3 – Peri-urban long-distance trips (>70 km)

P3 addresses peri-urban mobility, where users travel longer distances exceeding 70 km and encounter a mix of urban, rural and highway driving conditions. The passenger variant will be tested on routes that require careful energy planning and the use of public charging infrastructure before the return trip. This use case directly evaluates the suitability of the ZEV-UP vehicle for extended trips beyond the typical urban range.

Key aspects include energy consumption at higher speeds, range predictability, charging availability and reliability, and user confidence in planning longer journeys. The diversity of road types allows assessment of vehicle efficiency under steady-state highway driving versus variable rural and urban segments. This use case can be used for validating digital-twin simulations related to range, charging time and infrastructure dependency, and for understanding how frugal BEV concepts scale beyond short urban trips.

P4 – Peri-urban car-pooling/sharing trips with additional passengers

This use case builds on P3 by introducing shared mobility elements. The passenger variant will be used for long-distance peri-urban trips with additional occupants, reflecting ride-sharing scenarios. In addition to the distance and route diversity of P3, this use case introduces extra payload and variations in passenger comfort expectations.

The focus is on the impact of additional weight on energy consumption, range and charging needs, as well as on usability aspects such as cabin comfort and flexibility. Charging before the return trip remains a key component, and the variability in traffic, road type and parking conditions further stresses the operation of the vehicle. P4 provides critical insights into how shared usage and higher occupancy affect both technical performance and user acceptance, supporting future upscaling scenarios.

C1 – Last-mile delivery of small and light parcels

C1 focuses on urban last-mile logistics using the commercial variant of the ZEV-UP vehicle. The use case will be executed in Phase 1 in Istanbul and in Phase 2 in Thessaloniki. The vehicle will perform multiple short delivery trips (mock-ups) within dense urban areas, characterised by frequent stops, repeated acceleration, and high daily mileage relative to battery capacity.

This scenario is designed to assess how many deliveries can be performed per charge, how energy consumption evolves under intensive stop-and-go driving, and how vehicle ergonomics support repetitive loading and unloading. The demo duration is one week for the four-seater commercial variant, with vehicle modifications or adaptations carried out during the first week of the demo period. The results will be particularly relevant for fleet operators seeking efficient, low-cost solutions for urban deliveries.

C2 – Peri-urban deliveries with heavier cargo and opportunity charging

C2 extends the logistics focus to peri-urban deliveries involving heavier payloads and longer distances. The commercial variant will be used on routes that combine urban access with rural and highway segments, requiring careful energy management and the use of opportunity charging along the route.

This use case evaluates the interaction between payload, road morphology and charging strategy, including the feasibility of partial or intermediate charging to complete delivery missions. It provides inputs for fleet-level simulations, particularly regarding charging power requirements, charging time, and total cost of ownership under different operational strategies. C2 is contributing to assessing the scalability of ZEV-UP concepts for regional delivery services.

C3 – Company service vehicle within industrial facilities

C3 examines the use of the commercial variant as a company service vehicle operating within FORD Otosan facilities, primarily in warehouse and industrial environments. The vehicle will be used for a variety of tasks, including the transport of goods, tools and personnel over short distances.

This use case reflects shared fleet operation rather than dedicated vehicle assignment, introducing variability in driving style, trip purpose and vehicle utilisation. The focus is on robustness, ease of handover between users, and suitability for mixed cargo-and-passenger missions. Data from this use case will support analysis of multi-user fleet dynamics.

Table 3: Contribution of Use Cases to ZEV-UP objectives

UC ID	What the use case serves in ZEV-UP
P1 – Urban commuting	Establishes the baseline passenger use case for energy consumption, charging regularity and user acceptance in dense urban environments; enables comparison between cities and between vehicle variants; supports evaluation of everyday private mobility and market uptake potential.
P2 – Urban shopping & routes	Complements the commuting scenario by capturing discretionary urban mobility patterns; supports assessment of vehicle usability, manoeuvrability and energy efficiency under variable load and parking conditions.
P3 – Peri-urban long-distance travel	Evaluates range adequacy, charging reliability and trip planning confidence beyond urban use; supports validation of digital-twin simulations and assessment of infrastructure dependency for extended passenger travel.
P4 – Peri-urban shared travel	Provides insights into the effects of shared use and higher occupancy on energy consumption, comfort and acceptance; informs upscaling scenarios for ride-sharing applications.

UC ID	What the use case serves in ZEV-UP
C1 – Urban last-mile delivery	Demonstrates feasibility, productivity and cost-effectiveness of frugal EVs for urban logistics; supports energy efficiency, operational performance and total cost of ownership analysis for delivery fleets.
C2 – Peri-urban logistics with opportunity charging	Assesses scalability of ZEV-UP vehicle concepts for regional delivery services; supports evaluation of charging strategies, payload impact, energy demand and economic performance at fleet level.
C3 – Company service vehicle	Supports analysis of shared fleet operation in controlled environments; evaluates robustness, usability and suitability for mixed cargo-and-passenger missions and early adoption in corporate fleets.

3.2 Equipment

3.2.1 Demo vehicles

For the test, homologation, and subsequent demonstration activities within the project, **3 different prototype vehicles** and **1 safety buck** will be manufactured. The technical details of the prototype vehicles are as follows.

Figure 1 – Prototype variants

Thanks to the interchangeable common battery architecture, all battery types can be installed on all prototype vehicles. To evaluate range, performance, and cell characteristics across different battery capacities, one prototype battery will be produced for each of three variants with capacities of 7, 11, and 20 kWh.

On the other hand, the production of the safety buck will include only the lower and upper body, meaning the body frame mounted on the rolling chassis. The purpose of this buck is to perform pull tests on body-mounted seats and seat belts. If any permanent damage occurs during testing for any reason, the affected parts will be repaired.

Before the demonstrations, vehicle type approval activities will be completed, and the vehicles will carry out the demo activities with license plates. The procurement and registration of the relevant license plates will be completed on a country-by-country basis at the demonstration locations (see Chapter 4).

In addition, 5G remote control test and demonstration activities will also be conducted on one of the vehicles.

3.2.2 Telemetry devices

When selecting the onboard telemetry devices, the following criteria were prioritized to ensure an end-to-end connectivity system for the ZEV-UP test models, including

- Remote control functionalities such as door lock-unlock, climate control and lighting, triggered via CAN messages and accessible through the mobile application with visual representation of ZEV-UP vehicles.
- Telemetry features covering real-time tracking of GPS location and speed, along with monitoring of designated 20 CAN messages.
- Integration with an existing vehicle tracking interface on cloud, allowing us to utilize the current monitoring tools without disruption.
- Minimum 4G cellular connectivity for the device, to ensure reliable and high-speed data transmission.

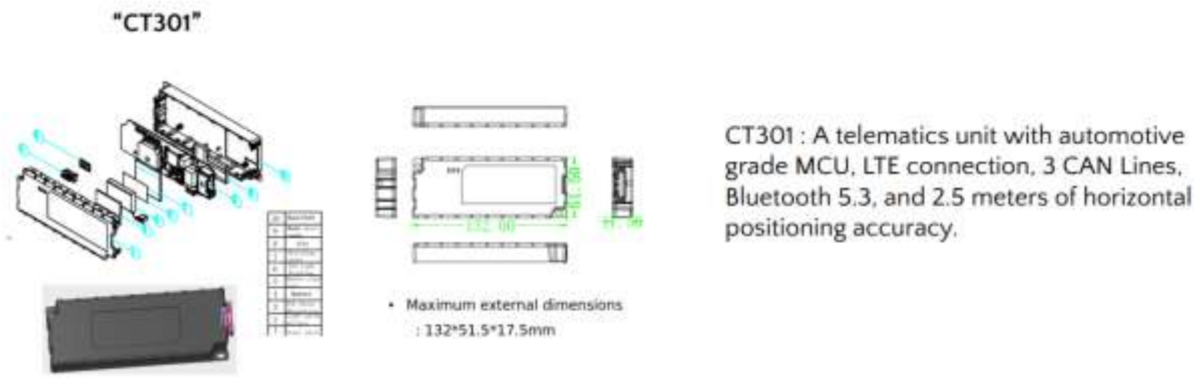

Figure 2 Technical specifications of the nominated telematics device

In the scope of the project, the connected vehicle telemetry and interface solution integrated into the vehicle will not only record 20 different data points in real time, but will also enable remote control of certain vehicle functions. This infrastructure will create significant added value in addressing the expectations of a key target market—the shared mobility model—as well as the demand of next-generation users for a more interactive vehicle experience.

During testing, these devices will allow real-time monitoring of all vehicles, and the Beemobs team will be alerted to enable rapid action in the event of any malfunction or accident. The collected data will be especially valuable for faster analysis and resolution of software issues, which are frequently encountered in early-stage prototypes.

Additionally, for vehicles provided to customers for testing purposes, usage patterns will be monitored, enabling early preventive measures if usage goes beyond the defined demonstration scope.

3.3 Other tools

3.3.1 Overview of the Survey Approach

To assess user acceptance, perceived usability, and market potential of the ZEV-UP light battery electric vehicle, a structured survey-based evaluation was conducted in conjunction with real-world vehicle demonstrations. The evaluation followed a two-stage longitudinal design, combining a pre-usage survey administered immediately before the test-driving phase and a post-usage survey administered after one week of using the vehicle. This approach enables comparison between a priori and a posteriori acceptance, thereby capturing changes in attitudes and perceptions before and after direct exposure and use of the vehicle.

The survey framework is structured around seven representative use cases, presented in section 3.1 covering both private and professional mobility contexts. Three versions of questionnaires were built and adapted to the characteristics of the target users and operational environments while maintaining a harmonized core structure to ensure comparability across use cases (Table 4).

Table 4 The questionnaire versions and their corresponding use cases

Questionnaire version	UC id	Use Case description
Version 1	P1	***Urban use***: Commuting with home charging
	P2	***Urban use***: Shopping activities, e.g. visiting a supermarket
	P3	***Peri-urban use***: Traveling longer distances (> 70km)
	P4	***Peri-urban use****, ride-sharing*: Traveling longer distances (> 70km), picking up another passenger
Version 2	C1	***Last mile mission***: small -light- parcel delivery
	C2	***Peri-urban deliveries****:* heavier cargo delivery with opportunity charging
Version 3	C3	***Company service vehicle****:* will be used in FORD Otosan facilities, as a support vehicle, mainly in the warehouses

To ensure clarity, inclusiveness, and accurate understanding by all participants, the questionnaires will be translated into the respective local languages of the demonstration sites (Greek and Turkish). The translation process will follow a consistency-checking procedure to preserve the meaning of the original English version and to minimise risks of misinterpretation or response bias. This approach supports the reliability and comparability of the collected data across locations while reducing potential errors arising from language barriers.

3.3.2 Survey Structure and Measurement Dimensions

Across all use cases, the questionnaires were developed using a common methodological framework. This approach ensures consistency across the main topics measured, while allowing for the structure to be adapted between surveys conducted before and after use (see Annex 2 for the full surveys[1]). The questionnaire design was informed by (i) an extensive review of the scientific literature on electric vehicle acceptability (e.g., Bektaş & Akyıldız Alçura, 2024, Mpoi et al., 2023, Sugihara & Hardman, 2022) and (ii)

[1] The final versions of the surveys administered during the vehicle demonstrations may differ slightly from those presented here, should minor last-minute adaptations be required.

evidence from demonstration studies conducted within previous European research projects (see section 2.1). The questionnaires were adapted to the specific context of the project, particularly regarding the type of vehicle tested, the battery swapping service, the target user profiles, the use cases studied (private and commercial), and project KPIs.

The questionnaires will be administered at two key moments in the demonstration protocol: prior to the vehicle testing/demo phase (pre-test/demo), to assess participants' initial characteristics, expectations, and perceptions of the service; and after the testing/demo phase (post-test/demo), to capture users' actual experience with the service and any changes in its acceptability.

Pre-test questionnaire

The pre-test questionnaire begins with sociodemographic questions to characterise the profile of vehicle testers. These are followed by questions related to mobility habits or operational characteristics, depending on the type of user surveyed (i.e., private or commercial users). Acceptability is then assessed across several dimensions, namely perceived usefulness, perceived ease of use, behavioural intention, enjoyment, trust, and range anxiety, derived from established theoretical models of technology acceptance, including the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT).

Participants are subsequently introduced to the battery swapping concept. Their level of familiarity with this solution is assessed, along with their perceptions of its usefulness, safety, and anticipated practical value within their mobility or operational context.

Post-test questionnaire

The post-test questionnaire is administered after the vehicle demonstration and real-world use (up to one week). Its objective is to evaluate the actual user experience and to identify potential changes in acceptability and behavioural intention to use the tested vehicle. Participants are asked to provide subjective feedback on vehicle characteristics (e.g., handling and maneuverability, acceleration, braking, ride comfort, and overall interior quality) and on technological features (e.g., battery range, safety, entertainment, and connectivity).

In addition, the same acceptability dimensions measured in the pre-test questionnaire are reassessed in the post-test survey to ensure comparability and to enable the analysis of changes over time.

Willingness-to-Pay (WTP)

Both pre- and post-test surveys include questions related to willingness to pay, price sensitivity, acceptable price thresholds, and interest in subscribing to a battery swapping service. For commercial users that are involved in the purchase decision of vehicles in their company, these questions are framed at the business or fleet level, while for private users they reflect personal purchasing intentions. To improve the robustness and reliability of WTP estimates, the results obtained from the vehicle demonstrations will be complemented by a larger-scale dedicated WTP study conducted within WP5.

3.4 Data collection and management

3.4.1 Variables logging

A common and harmonised set of variables will be collected across all use cases to ensure consistency and comparability between locations and between passenger and commercial applications. The recorded dataset will cover trip-related information, such as timestamps, vehicle speed, distance travelled and GPS position, as well as energy and battery parameters, including state of charge, energy consumption per trip, and charging duration. In addition, operational status information, such as vehicle operating mode and available warning or fault signals, will be captured where supported by the vehicle systems. All logged variables will be defined with standard units (e.g. km, km/h, kWh, kW, minutes, % state of charge) and accompanied by metadata identifying the vehicle, the associated use case and an anonymised participant identifier. Sampling rates will be tailored to the characteristics of each variable, combining low-frequency continuous logging for general driving and energy data with event-based recording for charging activities, trip start and end points, and system status changes, thereby balancing data resolution with efficient data storage.

Table 5 Variables' description and units

Variable	Description	Unit
Battery Charge Level	State of Charge (SoC)	%
Battery Health Level	State of Health (SoH)	%
Battery Current	Instantaneous current draw	A
Battery Cell Resistance	Each cell resistance value	Ohm
Battery Cell Temperature	Each cell temperature	°C
Battery Pack Temperature	Average cell temperature	°C
Battery Cell Voltage	Each cell voltage	V
Battery Pack Voltage	Total pack voltage	V
Motor Current	Electric motor current	A
Motor Temperature	Electric motor temperature	°C
Inverter Temperature	Inverter temperature	°C
Motor Speed	Rotational speed	rpm
Vehicle Speed	Ground speed	km/h
Brake Pedal Position	Driver input	%
Accelerator Pedal Position	Driver input	%
Steering Angle	Front wheel direction	°
Accelerations (X, Y, Z)	Vehicle dynamics	m/s^2
Door Status	Open/closed	Boolean
Road Slope	Inclination angle	°

Variable	Description	Unit
GPS Location	Position data	lat/lon
HVAC Setting	User climate input	°C / mode
HVAC Consumption	Power use over time	W

The demo leader will administer both the pre- and post-demonstration surveys directly with the participants, which is considered the most practical approach to minimise incomplete or blank questionnaires. All surveys will be conducted in hard-copy format during the vehicle demonstration activities in the different pilot countries. Contextual variables, including date, weather conditions, traffic congestion level, vehicle variant and any notable incidents, will be systematically recorded to support the interpretation of survey results. Following completion, the questionnaires will be digitised by the local demonstration administrator and made available for analysis. Although the questionnaires are linguistically and monetarily adapted to national contexts, the underlying constructs, scales and question logic are harmonised to ensure comparability across countries and use cases.

3.4.2 KPI coverage

The demonstration activities enabled the systematic collection of operational, technical, and user-related data to support the evaluation of key performance indicators (KPIs). These logged variables provide quantitative evidence on vehicle performance, energy use, charging behaviour, environmental impact, and user perception. While some KPIs are only partially addressed due to the scope of the demo measurements, the collected dataset still allows meaningful assessment of cost efficiency, air quality contribution, operational performance, and social acceptance of the ZEV-UP vehicles. In particular, the integration of energy consumption, range, charging parameters, and questionnaire-based feedback ensures a comprehensive link between real-world vehicle operation and user experience. This combination supports both technical performance monitoring and socio-economic evaluation aligned with the project's assessment framework and the additional KPIs proposed by the 2ZERO initiative.

Table 6 Logged variables and their contribution to the evaluation of project KPIs.

KPI N°	KPI name	Demo data contribution
3	**Reduction of Total Cost of Ownership (TCO)**	Partly, by providing info about the energy consumption and range.
6	**Interest from Other Users/Stakeholders**	Contributing to the number of users responding to the questionnaires.
18	**Improvement of Air Quality**	Through the energy consumption and range values.
21	**Range Enhancement**	Through the energy consumption and range values.
23	**Solar Panel Charging Efficiency**	Logging charging data in different weather condition through the demo period.
33	**Charging and Driving Experience**	Specific questioners in the post-questionnaires.

KPI N°	KPI name	Demo data contribution
35	**User satisfaction on demonstration**	Specific questioners in the post-questionnaires.
36	**Active User Involvement in Vehicle Demonstration**	Active users involved.
37	**Gender-Diverse Active User Involvement in Vehicle Demonstration**	Gender representation of users in numbers in the demonstration.
38	**User's access to electric charging infrastructure**	Specific questioners in the pre- and post-questionnaires.
39	**Non-BEV drivers willing to shift from conventionally fuelled vehicles to BEVs in the future**	Specific questioners in the post-questionnaires.
40	**Inclusion of vulnerable users in the test sessions**	VRU (*see page 38*) representation in numbers in the demonstration.
41	**Reduction in operational CO2 emission**	Through the energy consumption and range values. (2ZERO proposed KPI)
42	**Operating hours**	Time logs. (2ZERO proposed KPI)
43	**Charging rate**	Incoming energy vs energy stored in the battery. (2ZERO proposed KPI)
44	**Charging time**	Charging time logs. (2ZERO proposed KPI)
45	**Driving to charging time**	Total time of vehicle used vs charging time. (2ZERO proposed KPI)
46	**Average driving speed**	Average speed per trip or day of demo driving. (2ZERO proposed KPI)
47	**Charging cost per km**	Cost per private or public charging vs km driven per charge. (2ZERO proposed KPI)

3.4.3 Data management

Data management in the ZEV-UP demonstrations is designed to ensure reliable, traceable and interoperable data collection across all use cases, vehicles and sites, while supporting subsequent analysis and digital-twin-based simulations. The overall approach follows established practices from previous European vehicle demonstration projects, combining on-board data logging with structured quality control, secure storage and controlled data sharing among partners.

Data integrity and malfunction checks will be carried out throughout the demo period to ensure continuity and quality of the collected data. Automatic plausibility checks will be implemented where possible, such as verifying that state-of-charge values remain within physical limits, that charging events correspond to increases in battery energy, and that timestamps and GPS data are consistent. In addition, periodic manual checks will be conducted by the site teams to detect missing data, logging interruptions or sensor malfunctions. Any identified issues will be documented, and corrective actions (e.g. logger reset, device replacement, or data flagging) will be applied promptly to minimise data loss, following practices established in previous large-scale demonstrations.

Data extraction from the vehicles will be performed either automatically or semi-automatically, depending on the local setup. Where connectivity allows, data will be transmitted securely to a central server at regular intervals. In cases where continuous connectivity is not available, data will be extracted manually at predefined checkpoints (e.g. end of a use-case period) and uploaded to the central data repository. All extraction procedures will include verification steps to confirm completeness and successful transfer before local data are cleared or overwritten.

Storage and back-up procedures will ensure data security and long-term availability. All demo data will be stored in a central project repository with controlled access rights. Regular back-ups will be performed to prevent data loss due to hardware failure or accidental deletion, and versioning will be applied to processed datasets to preserve traceability between raw and cleaned data. Personal data will be pseudonymised at the earliest possible stage, in line with GDPR requirements and the project's Data Management Plan.

Data sharing with partners will follow a clear governance framework defined at project level. Access to demo data will be granted to partners involved in data analysis, simulation and evaluation activities, in particular those contributing to WP5, under agreed conditions. Data sharing will respect intellectual property rights, confidentiality obligations and any restrictions defined in the Consortium Agreement. Where required, datasets will be shared in aggregated or anonymised form to support cross-work-package analysis while protecting sensitive information. This structured data management approach ensures that ZEV-UP demo data are robust, reusable and suitable for both internal exploitation and future replication or upscaling activities.

3.4.4 Data Monitoring

To ensure effective tracking of the ZEV-UP demonstrations, a web-based dashboard has been conceptualized and prototyped. This tool is designed to consolidate high-level Key Performance Indicators (KPIs) from the 5 Impact Areas (Economic, Operational, Environmental, Technological, and Social) into a single interactive view.

Prototype Access: A live version of the concept prototype is available for review here: https://brilliant-croissant-587bd4.netlify.app/

3.4.4.1 Dashboard Architecture

The dashboard utilises a modular web architecture allowing for data visualisation. The current prototype, developed in alignment with the KPIs defined in D1.3, includes the following key modules:

- **Executive Overview:** A high-level summary of both pilot sites (Thessaloniki, Istanbul).
    - **Illustrative charts:** (1) Global KPI Counters: Aggregated metrics for Total Distance Driven (km), Active Users, Number of Battery Swaps, etc.; (2) Impact Area Slicer: Interactive filtering to toggle between Economic, Operational, Environmental, and Social impact views.
- **Vehicle Telemetry:** Visualizes real-time technical data including Battery State of Health (SoH), State of Charge (SoC), acceleration rate etc.
    - **Illustrative charts:** (1) Trip Timeline (Multi-Line Chart): Synchronises Speed, SoC, and Elevation to identify energy-intensive route segments; (2) NVH Monitoring (Dual-Axis Line Chart): Tracks cabin noise (dB) and vibration to ensure the lightweight chassis meets comfort standards; (3) Digital Twin Validation (Comparative Line Chart): Overlays real-time battery temperature readings against theoretical predictions.

- **Survey Feedback (Private Use, Commercial Use, Fleet Operators):** Aggregates qualitative data from user surveys, visualising Likert-scale responses regarding Comfort, Safety etc.
  - **Illustrative charts:** (1) Acceptance Stacked Bars: A divergence chart visualising Likert-scale responses (Strongly Disagree / Strongly Agree) for key acceptance criteria: Perceived Safety, Driving Comfort, and Ease of Charging; (2) Willingness-to-Pay (WTP) Histogram: A frequency distribution showing the maximum price threshold respondents are willing to pay; (3) Demographic Slicers: Interactive pie charts filtering the results by Age Group, Gender, and Prior EV Experience etc.
- **Correlation Analysis:** An advanced analytical tool allowing partners to visualise relationships between telemetry and survey data (e.g., “Energy Consumption vs. User Satisfaction").
  - Illustrative chart: Regression Scatter Plot (Interactive): A dynamic X-Y plotting tool where users can select independent variables (e.g., Outside Temperature) against dependent variables (e.g., Driver Comfort) to visually detect trends.
- **About:** Provides essential project context, including consortium partner details, funding acknowledgments, etc.

3.4.4.2 Dashboard Tools

The specific visualisation platform is to be confirmed, though **Microsoft Power BI** is currently the primary candidate due to its ease of use for non-technical partners. The final decision will be made following an assessment of potential licensing charges to ensure alignment with the project budget.

3.4.4.3 Access Regulation

To comply with GDPR requirements and project confidentiality protocols, the dashboard implements a Role-Based Access Control (RBAC) system with two distinct tiers:

- **Tier 1: Consortium (Restricted)**
- **Tier 2: Public (Dissemination)**

Data Privacy Note: All survey data displayed in the dashboard is strictly aggregated. Individual socio-demographic details (such as user income, age, or specific fleet addresses) are anonymised during the data ingestion process to ensure no individual respondent can be identified.

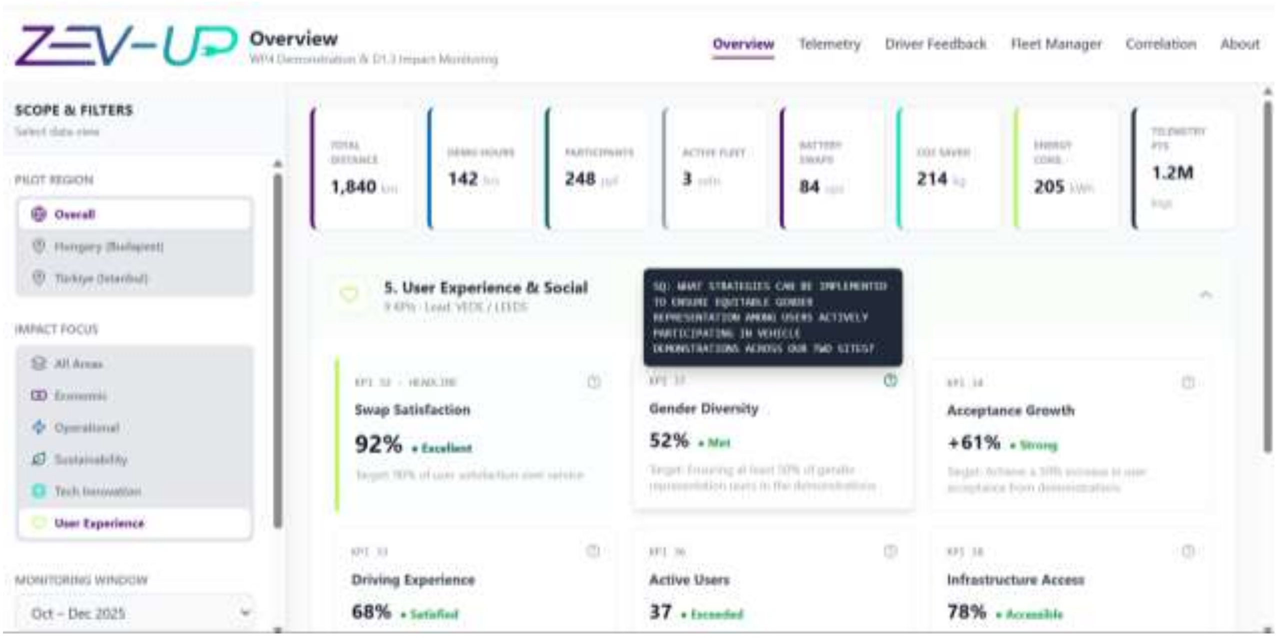

Figure 3 Dashboard Executive Overview - The main interface showing high-level KPIs and pilot site filtering

Figure 4 Correlation Analysis Tool - Analytical view for cross-referencing technical telemetry with user feedback

3.5 Recruitment

3.5.1 Recruitment strategy

The recruitment strategy for ZEV-UP is designed to ensure that the demonstration activities generate representative, qualitative data aligned with the defined passenger and commercial use cases, while remaining feasible within the short duration of each use case. Drawing on best practices from previous European demonstration projects, the recruitment approach combines targeted user profiling, short-term but intensive vehicle exposure, and controlled onboarding procedures to balance realism with experimental control. The recruitment strategy is designed to ensure continuous vehicle operation throughout the demonstration period while maintaining flexibility to manage drop-outs or scheduling constraints.

For passenger use cases (P1–P4), participants will be recruited among private drivers who regularly perform urban and peri-urban trips similar to the defined scenarios. For P1 and P2, priority will be given to commuters living in dense urban areas of Thessaloniki and Istanbul who typically travel during peak hours and have access to private or semi-private home charging. This mirrors approaches used in L3Pilot and CIVITAS ECCENTRIC, where users with stable, repetitive travel patterns were preferred to ensure comparability across short demo periods. For P3 and P4, recruitment will focus on users who regularly undertake longer peri-urban trips exceeding 70 km, including mixed road types (urban, rural, highway), and who are familiar with public charging infrastructure. For the ride-sharing-oriented P4 use case, participants must also be comfortable with carrying additional passengers and adapting driving behaviour accordingly.

Participants for passenger use cases will be recruited through local partner networks, employer channels, communication platforms and targeted calls, following a short screening interview. Selection criteria will include possession of a valid driving licence, minimum annual mileage, basic familiarity with EVs[2] or willingness to follow charging instructions, access to private or semi-private home charging and availability during the specific demo windows. To maximise data richness within the limited test duration (1–2 weeks per use case), users will be required to commit to a minimum number of trips and to complete short baseline and post-use questionnaires, as commonly applied in USER-CHI and eCharge4Drivers. Each participant will typically be assigned to a single use case to avoid learning bias between scenarios.

For commercial and service-oriented use cases (C1–C3), recruitment will follow an organisational rather than individual-user model, consistent with approaches observed in E-Mobility NSR and INCIT-EV. For C1 and C2, participants, when possible, will be commercial drivers or delivery staff operating within partner companies or logistics units, already accustomed to structured routes, delivery schedules and performance targets. This ensures that increased mileage per charge, payload variation and opportunity charging strategies are tested under realistic operational constraints. In C3, the vehicle will be shared among multiple users within FORD Otosan facilities, reflecting real fleet usage patterns and enabling the analysis of multi-user variability, handover effects and mixed cargo/passenger missions.

Commercial participants will be recruited through partner organisations (FORD, Beemobs, CERTH and associated logistics operators), with participation embedded in normal work activities rather than incentivised individually. Drivers will receive a brief onboarding session covering vehicle operation, charging procedures, safety and incident reporting, but no behavioural coaching beyond standard instructions, in order to preserve natural usage patterns. This approach aligns with findings from De Cauwer et al., which emphasise the importance of observing unconstrained real-world behaviour for deriving meaningful usage patterns.

Across all use cases and locations, recruitment will aim for diversity rather than statistical representativeness, given the exploratory and demonstrative nature of ZEV-UP. Variation in age, gender, trip purpose, traffic exposure and driving style will be sought where possible, while ensuring that each use case is tested by users whose real mobility needs match the intended scenario. More specifically, about Vulnerable Road Users (VRUs), the term refers to individuals or user groups who may experience disproportionate barriers, risks, or exclusion in transport systems due to physical, social, economic, or demographic characteristics. This concept extends beyond traditional safety-related definitions —such as pedestrians and cyclists— to encompass broader aspects of accessibility and inclusion in mobility services[3]. Furthermore, all participants will provide informed consent, and personal data will be anonymised in line with GDPR requirements, following established protocols from previous EU demonstrations.

3.5.2 Participants list and back-up strategy

For the passenger demonstrations, a total duration of eight weeks is foreseen, with two drivers participating per week, resulting in a planned pool of sixteen primary participants per site. For the commercial demonstrations, which will run for approximately six and a half weeks, two drivers per week are similarly foreseen, resulting in a planned pool of thirteen primary participants. This weekly rotation approach allows exposure of the vehicles to a diversity of users and driving styles while ensuring sufficient data density for each use case.

For each demonstration week and use case, a participants list will be established in advance, identifying the primary drivers assigned to the vehicle. In addition, a back-up list of pre-screened participants will be

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[2] If a participant has prior EV experience and/or demonstrates the ability to operate the vehicle safely after the structured familiarisation session, they may be considered eligible.

[3] DIGNITY EC project, https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5f48dcf33&appId=PPGMS,

maintained to mitigate risks related to participant unavailability, withdrawal or non-compliance. Back-up participants will meet the same eligibility criteria as primary participants and will have completed all administrative steps, including informed consent and basic training, prior to the start of the demo. This ensures that replacements can be activated with minimal disruption to the demonstration schedule and data continuity.

The recruitment and back-up strategy will be coordinated by the local demonstration teams, who will monitor participation on a weekly basis and activate replacements if needed. All participants and back-ups will be assigned anonymised identifiers before the start of their participation to ensure seamless integration with data logging, evaluation and analysis activities.

3.5.3 Training and acquaintance with the vehicle and systems

All participants will undergo a structured but lightweight training and acquaintance process prior to the start of their assigned use case. The objective of this process is to ensure safe and correct operation of the vehicle and its systems, without influencing natural driving or charging behaviour. Training will be delivered by the local site leader or vehicle provider and will be adapted to the participant profile (private user or commercial l driver).

The training will cover vehicle access and basic operation, dashboard and HMI functions, driving modes, charging procedures (home charging, public charging and opportunity charging where applicable), safety features, and incident or malfunction reporting. Participants will also be informed about the data logging taking place during the demo, including what data are collected and how privacy is protected. For commercial use cases, training will additionally address vehicle loading limits, cargo securing, and operational constraints relevant to delivery or service missions.

Acquaintance with the vehicle will include a short familiarisation drive before formal data collection begins, allowing participants to adjust to the vehicle dimensions, handling and controls. This familiarisation phase is particularly important for short demo durations and is consistent with best practices observed in previous projects such as L3Pilot and CIVITAS ECCENTRIC. Quick-reference user guides will be provided in the vehicle, and a local technical contact will be available throughout the demo period to address questions or issues. This approach ensures safe operation, reduces user uncertainty, and improves data quality without biasing the real-life usage patterns targeted by the ZEV-UP demonstrations.

4 PROTOTYPES PERMISSION FOR ROAD USE

4.1 Type approval procedure

As part of the ZEV-UP project, it was planned to obtain type approval in accordance with Regulation (EU) No 168/2013 for the prototype vehicles to be developed. Specifically, L7e-CP type approval was sought for the CM1 and CM2 vehicle models, while L7e-CU type approval was pursued for the CM3 model.

In addition to vehicle-level type approvals, manufacturer-level type approval, also known as Conformity of Production (COP), is a prerequisite for proceeding with the certification process. This requirement was met through the use of the existing L-category manufacturer approval held by Beemobs. This was a strategic decision, as obtaining new manufacturer approval from scratch typically requires between six to nine months, thus leveraging Beemobs's existing certification significantly reduced time and administrative burden.

For the vehicle testing and homologation process, three accredited approval bodies operating in Turkey have been identified: RDW, IDIADA, and VINCOTTE. A competitive tender process launched among these three organisations (see Annex 1), with the aim of selecting the most cost-effective and technically capable partner. The tender is scheduled to be finalised in February 2026, based on the evaluation of the offers received.

Following the selection of the approval body, the development of vehicle information documents commenced in collaboration with the chosen authority. This phase included detailed design reviews and preliminary evaluations, running until May 2026, to ensure alignment with approval criteria prior to full testing.

The prototype vehicles will be finalised in April 2026, at which point the formal inspection and testing process can begin. This testing phase includes a predefined set of 18 test items, which are completed within one month. Upon completion of testing, an additional two-month period allocated for report preparation and review by the technical authority. Overall, the certification process is projected to span three months, targeting completion before the vehicle demonstration events scheduled for June-July 2026.

To optimise costs and simplify testing logistics, certain systems underwent component-level testing, rather than being evaluated solely within the full vehicle context.

In general, the subcontracting procedure complies with Article 6.2.B of the Grant Agreement, ensuring that all costs are necessary for the action, incurred within the project duration, reasonable and fully identifiable, and that the subcontractor is selected in line with the principles of best value for money or lowest price, sound financial management and absence of conflict of interest. In addition, the subcontract follows applicable public procurement rules where relevant, and the eligible cost corresponds strictly to the amounts invoiced by the subcontractor.

4.2 Vehicle registration and license plate issuance

Upon successful type approval, the process of vehicle registration and license plate issuance is initiated to enable legal operation of the vehicles on public roads during the demonstration events in both Istanbul (Turkey) and Thessaloniki (Greece).

In Turkey, license plate issuance is coordinated through the national registration system, which requires that the registering entity be a locally registered company with a valid tax ID. The type approval documentation serves as the foundation for the registration process.

In Greece, the process is similar in terms of requirements. The vehicle must be registered by a Greek entity with a tax identification number, using the approved EU type approval documents. The Greek authorities verified that the vehicle meets all local and EU-level requirements before issuing a registration certificate and license plate.

In both countries, possession of the proper type approval documentation significantly streamlines the license plate issuance process, ensuring that the vehicles can be legally driven on public roads during the demonstration period.

4.3 Insurance coverage for demo vehicles — Participant and third-party liability

During the ZEV-UP prototype demonstrations, all vehicles are covered by mandatory motor third-party liability insurance (MTPL/KGFB) to protect against injuries or damage caused to others. In Greece, compulsory third-party motor liability insurance (as required under national law implementing the EU Motor Insurance Directive) provides coverage of at least approximately €1.3 million for property damage per incident and €6.45 million for personal injury per incident (regardless of the number of injured parties), and similarly allows direct claims by injured third parties against the insurer. In Turkey, MTPL is also compulsory under national traffic law (Law No. 2918), covering both bodily and material damage within statutory limits, and utilises a national-pool system to address high-risk or large-claim situations. To ensure full protection during the demo phases, we will also apply an optional comprehensive (Casco) insurance, which safeguards the vehicles themselves against collision, theft, vandalism, or related incidents.

4.4 Risk mitigation measures

To proactively address potential delays in the homologation process, preliminary data validation checks will be conducted in coordination with the chosen type of approval authority. These checks took place before the physical production of the prototype vehicles, enabling early identification and resolution of any issues related to compliance. This approach significantly minimised the risk of delays in the overall certification timeline.

5 RAMP-UP PHASE

The ramp-up phase in Istanbul represents a critical piloting stage whose purpose is to verify that all technical, operational and organisational requirements are in place before the start of the large-scale demonstration activities. Led by FORD Otosan with the support of Beemobs, this phase serves as a controlled transition from vehicle and system readiness to full demo execution, ensuring that the experimental procedures defined in the Demonstration Plan are applicable under Istanbul's specific operating conditions. Given the city's dense traffic, complex road morphology and high variability in driving and charging behaviour, the Istanbul ramp-up is essential for de-risking the subsequent use cases.

During the ramp-up, a small-scale pilot test will be conducted using a demo vehicle to validate the full demonstration workflow. This includes hosting and daily operation of the vehicles, confirmation of vehicle availability and condition, and verification that the deployed configurations (vehicle software, logging devices, charging interfaces). Particular attention will be paid to ensuring that charging procedures required by the Istanbul use cases, such as pre-return charging for peri-urban trips and opportunity charging for commercial missions, are feasible in practice, both technically and operationally.

A central element of the ramp-up phase is the selection, training and familiarisation of drivers. FORD Otosan and Beemobs will recruit 6-8 drivers (or internal staff acting as proxy users) to execute pilot runs that reflect the planned passenger and commercial use cases. Training will focus on safe vehicle operation, correct charging procedures, understanding of the demo rules, and reporting of incidents or anomalies, without influencing natural driving behaviour. This stage will also validate the effectiveness of participant management procedures, including informed consent, data protection measures, and mitigation strategies for participant drop-out or non-compliance.

The ramp-up will also be used to verify management and operational procedures, including scheduling of trials, availability of alternative routes and time slots. Given the short duration of individual use cases, this planning is essential to ensure that disruptions (e.g. traffic incidents, vehicle unavailability, charging access issues) can be handled without compromising data completeness.

A key objective of the Istanbul ramp-up is the collection and processing of preliminary data to validate the data logging and management chain. Pilot runs will be analysed to confirm that all required variables are logged correctly, that timestamps and GPS data are consistent, and that charging events and energy consumption are captured without gaps or anomalies. Any bugs, data loss or inconsistencies identified during this phase will be documented and rectified before the start of the large-scale demos. This ensures that the subsequent use-case data are robust and suitable for evaluation and simulation activities.

At the end of the ramp-up phase, FORD Otosan and Beemobs will implement a rectification and stabilisation step, addressing all issues identified during the pilot tests. Only once the experimental procedure, data logging, participant management and operational planning have been validated and stabilised will the Istanbul and Thessaloniki site proceed to the full demonstration phase. In this way, the ramp-up acts as a formal "go/no-go" gate, significantly reducing technical and organisational risks and ensuring a smooth and successful execution of the ZEV-UP demonstrations in Istanbul and Thessaloniki.

6 VEHICLE DEMONSTRATION INSTRUCTIONS

This section defines the practical instructions for executing the ZEV-UP vehicle demonstrations across all use cases and pilot sites. It translates the framework described in this deliverable into a clear, step-by-step operational protocol, ensuring consistency, data quality, and comparability.

6.1 General demonstration principles

The demonstrations are designed to capture real-world vehicle use under natural driving conditions. Drivers are therefore not required to follow rigid or pre-defined routes. Instead, they are asked to perform trips that correspond to the assigned use case, reflecting their actual mobility or operational needs. This approach aligns with best practices from previous European demonstration projects and ensures ecological validity of the collected data.

Route maps will be collected retrospectively through GPS logging and may be illustrated afterwards for reporting purposes. Drivers must remain within the geographical boundaries of the demonstration area and respect the operational constraints defined for each use case (e.g. urban vs. peri-urban context, payload limits).

6.2 Participant familiarisation and start of demo

Before the start of each use case, all participants must complete a short familiarisation phase, which includes:

- Presentation of the study context
- Confirmation of informed consent and data logging awareness
- Pre-vehicle usage evaluation/questionnaire
- Introduction to the vehicle variant and its basic controls
- Explanation of charging procedures (home, public, opportunity charging where applicable)
- Safety briefing and incident-reporting instructions
- A short familiarisation drive is conducted before formal data collection begins. Data from this phase are excluded from the analysis to avoid bias related to initial adaptation.

6.3 Use-case execution rules

For each assigned use case, participants are instructed to:

- Use the vehicle as their **primary means of transport** for the defined period
- Perform trips consistent with the assigned use case (passenger or commercial)
- Avoid deliberate eco-driving or performance testing behaviours
- Respect vehicle loading limits and safety rules

For commercial use cases, missions may consist of **simulated or shadow operations**, reproducing the timing, distance and payload characteristics of comparable L-category vehicles currently in operation, to avoid administrative or contractual constraints.

6.4 Routes and driving behaviour

Drivers are free to choose their routes based on convenience, traffic conditions and habitual practices. However:

- Urban use cases must remain predominantly within dense urban environments
- Peri-urban use cases must include mixed road types (urban, rural, highway)
- Commercial routes should reflect realistic delivery or service patterns

Any exceptional events (e.g. road closures, detours, or extreme congestion) should be reported to the local demo leader for contextual annotation. To support accurate recall and avoid omissions, participants will be asked to maintain a short daily diary (Annex 3) in which such events, along with any other notable incidents encountered during vehicle use, are recorded immediately after each driving period. This diary-based reporting complements the logged telemetry data and contributes to a more reliable interpretation of the demonstration results.

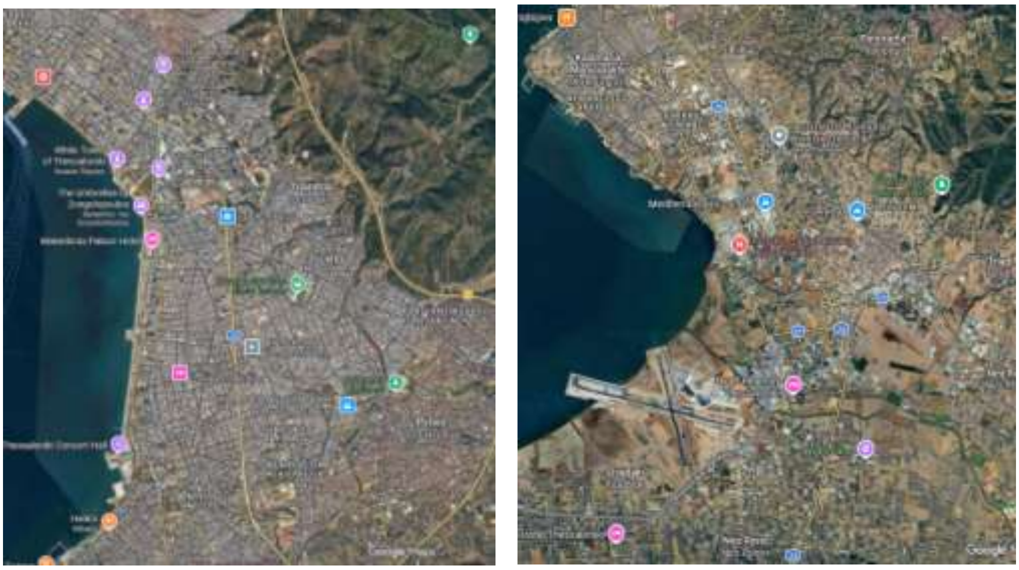

Figure 5 Geographical areas of the urban (left picture) and the peri urban (right picture) routes in the city of Thessaloniki

6.5 Charging and energy strategy

Participants are instructed to follow the charging strategy associated with their use case:

- Home or depot charging for urban passenger and logistics use
- Public or opportunity charging for peri-urban missions
- Charging decisions should reflect practical needs, not optimisation

Battery swapping is not physically available during the demo; however, charging behaviour and downtime are logged to support later simulation of swapping scenarios.

6.6 Cargo configuration (commercial variants)

For commercial use cases:

- Cargo loads are defined using ballast or representative goods
- Payload mass and configuration are documented at the start of each demo period
- Drivers are instructed to load and unload as they would in normal operations

Vehicle reconfiguration (e.g. seat removal or cargo partition installation) is performed by the technical team before the demo week begins.

6.7 Data logging and incident handling

All vehicles are equipped with onboard telemetry systems that operate automatically. Drivers are not required to interact with logging equipment. In case of: i. technical malfunction, ii. accident or safety issue, and iii. unexpected charging or vehicle behaviour, drivers must **immediately inform** the local demo leader, who will document the event and coordinate corrective actions.

6.8 End of use case and feedback collection

At the end of each use case period:

- Vehicles are returned and inspected
- Logged data are verified for completeness
- Participants complete the post-use questionnaire with the support of the demo lead

The digitisation of the pre- and post-use questionnaires, as well as the daily diary entries, will be carried out by the local demonstration administrator, who will ensure completeness, consistency, and secure integration of the collected information into the central project dataset.

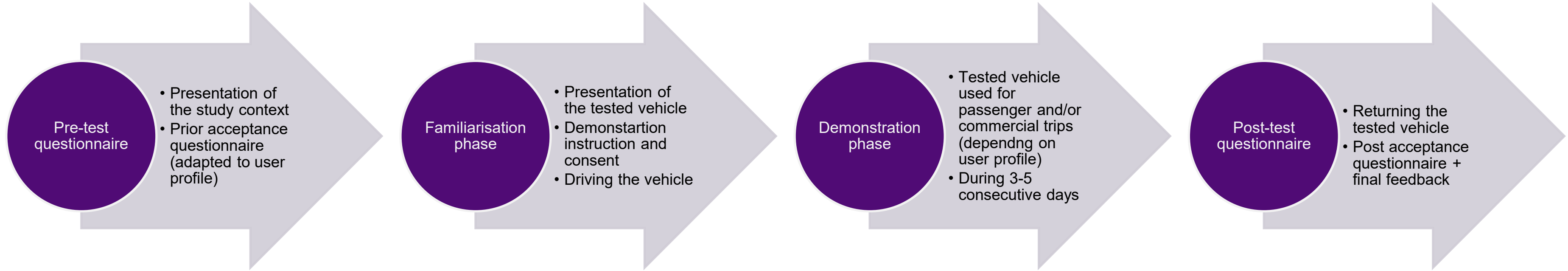

Figure 6 Demonstration process flowchart

7 SIMULATION PLAN

In Sub-task 4.2.2 “Digital Twin Simulation,” the simulation plan is structured around thematic areas to ensure that scaling from single-vehicle digital twins to a full fleet is coherent, traceable, and useful for decision-making. The first thematic area is the definition of representative use cases for fleet upscaling. These use cases will mirror the real-life operation patterns of the ZEV-UP demonstrators, namely:

- urban commuting
- last-mile logistics
- shared-mobility services, or municipal fleet operations

and they will define the operational boundaries, driving cycles, and charging behaviours to be simulated. Each use case will specify fleet size, duty cycles, route typologies, and charging strategies (e.g. depot charging, opportunity charging, public fast charging), so that the simulations reproduce realistic aggregate energy demands and infrastructure loads.

The second thematic area concerns input data specification and parameterisation of the digital twins. After calibration and validation of the single-vehicle models in WP3, the fleet-level simulation requires harmonised inputs: vehicle characteristics (mass, powertrain efficiency, usable battery capacity), driving profiles, environmental conditions (temperature, gradients, traffic levels), and charging-station models. The digital twins will use these inputs to replicate operational energy flows and assess fleet energy demand and recharging interactions across time and geography.

A third thematic area is data logging and simulation outputs, which will be consistent with the demo data and with the KPIs defined for fleet upscaling. The simulation should log time-series of vehicle position, velocity, power, energy consumption, battery state of charge, and charging events (start, end, power level, duration). Aggregated indicators such as yearly energy needs (kWh/year), total fleet energy consumption (kWh), equivalent CO_2 emissions savings, and charging-infrastructure load profiles will be generated automatically. The total cost of ownership (€/km) will be computed using simulated energy consumption, maintenance assumptions, and depreciation models; this enables cost comparisons between operational strategies.

The fourth thematic area involves scenario analysis and sensitivity studies. Once the digital twins operate at fleet level, different what-if scenarios must be simulated—varying fleet size, route assignment, charging-power availability, grid constraints, and electricity price profiles—to understand how these parameters affect the KPIs. This provides insights into how the ZEV-UP concept scales under different policy or market conditions and supports extrapolation to regional or national deployment scales.

A fifth thematic area focuses on integration with environmental and energy models. The simulation should calculate the indirect effects of charging schedules on local and upstream energy systems, including CO_2-equivalent emissions based on dynamic electricity-mix factors. By linking each simulated charging event to time-dependent grid carbon intensity, the study can quantify the environmental benefits of optimal charging strategies.

Finally, the simulation plan describes the data management and validation strategy, ensuring consistency between simulated and real-world demo data. Logged data from the demonstrations (energy consumption, charging patterns, driving distances) will be used to cross-check and adjust the digital twin behaviour before upscaling. This closed feedback loop between real data and simulation output guarantees that fleet-level projections remain grounded in measured performance.

Table 7: Scope, KPIs, and expected outputs of the ZEV-UP fleet simulation use cases.

Simulation UC	Linked real-world demo UCs	Scope of simulation	Main KPIs	Key simulation outputs
S-UC1: Urban commuting fleet	*P1 (urban commuting)* *P2 (urban routes)*	Scale up single-vehicle urban passenger use to a fleet level, reproducing dense traffic, peak hours, short trips and home-based charging patterns. Assess daily and yearly energy demand and charging regularity in urban conditions.	Energy consumption per vehicle and per fleet (kWh/year); charging energy per day; charging power demand (kW); TCO (€/km); equivalent CO_2 emissions savings vs ICE.	Fleet-level urban energy demand profiles; charging load curves for residential areas; CO_2 savings under different fleet penetration levels; cost comparison between charging strategies.
S-UC2: Peri-urban long-distance passenger travel	*P3 (peri-urban long trips), P4 (shared peri-urban trips)*	Simulate fleets performing longer trips (>70 km) with mixed road types (urban, rural, highway) and reliance on public or destination charging before return trips. Include increased payload and shared-use effects.	Energy consumption per trip and per fleet (kWh); charging time and power (kW); range utilisation; TCO (€/km); CO_2 emissions per km.	Sensitivity of range and charging needs to trip length and payload; charging infrastructure stress at peri-urban nodes; performance comparison across driving profiles and charging availability.
S-UC3: Urban last-mile logistics fleet	*C1 (last-mile delivery)*	Upscale intensive urban delivery operations with frequent stops, high mileage per day and depot-based charging. Focus on productivity and energy efficiency under stop-and-go conditions.	Energy consumption per delivery and per fleet (kWh); number of missions per charge; charging duration; TCO (€/km and €/delivery); CO_2 savings vs diesel vans.	Fleet energy demand and depot charging profiles; operational limits on number of deliveries per vehicle; cost-effectiveness of frugal EVs for last-mile logistics.
S-UC4: Peri-urban logistics with opportunity charging	*C2 (peri-urban deliveries)*	Simulate longer logistics routes with heavier payloads, mixed road morphology and opportunity charging along routes. Assess interaction between	Energy consumption (kWh); charging frequency, power and time; TCO (€/km); CO_2 emissions savings.	Optimal charging strategies for regional logistics; impact of charging-power availability on mission feasibility; scalability of frugal EV logistics beyond urban areas.

Simulation UC	Linked real-world demo UCs	Scope of simulation	Main KPIs	Key simulation outputs
		payload, charging strategy and energy demand.		
S-UC5: Fleet service and shared-use vehicles	*C3 (company service vehicle)*	Model shared-use fleets operating in controlled environments (industrial sites, campuses), with multiple users and mixed cargo/passenger missions.	Utilisation rate; energy consumption per vehicle; charging frequency; operational availability; TCO (€/km).	Fleet sizing recommendations; impact of multi-user variability on energy demand; suitability of ZEV-UP vehicles for early fleet adoption scenarios.

Within Sub-task 4.2.2, battery swapping will be modelled as a distinct energy replenishment mechanism alongside charging. The digital twin framework will represent swapping events as discrete operations characterised by swap duration, battery state-of-charge thresholds, battery inventory constraints and associated energy and cost flows. Simulation outputs will quantify impacts on fleet energy demand, infrastructure load, operational availability, total cost of ownership and CO_2-equivalent emissions.

In the simulation framework, battery swapping is most suitable for S-UC2 (Peri-urban long-distance passenger travel), S-UC3 (urban last-mile logistics fleet) and S-UC4 (peri-urban logistics with opportunity charging), as these scenarios involve high vehicle utilisation, operational time constraints and fleet-managed energy strategies where minimising downtime is critical. In these cases, simulations can meaningfully compare charging and swapping in terms of fleet availability, productivity, total cost of ownership and energy system impacts.

8 CONCLUSIONS AND RECOMMENDATIONS

The vehicle demonstration framework defined in this document provides a structured yet realistic basis for assessing the performance, usability and scalability of the ZEV-UP vehicle concepts. By grounding the demonstrations in seven defined passenger and commercial use cases, the framework ensures coverage of the most relevant mobility and logistics missions targeted by frugal electric vehicles, ranging from everyday urban commuting to peri-urban deliveries and shared fleet operations. This diversity is essential for understanding how the vehicles perform under varying traffic conditions, payload configurations, charging strategies and user profiles.

A central outcome of the proposed approach is the generation of high-quality, comparable and reusable datasets. The harmonised data logging and management procedures enable consistent capture of energy consumption, driving behaviour and charging events across locations and vehicle variants. At the same time, the decision to allow flexible route selection and natural driving behaviour ensures that the collected data reflect real-world conditions rather than artificial test scenarios. This combination strengthens the validity of subsequent analyses related to energy efficiency, user acceptance and operational feasibility.

The framework also establishes a traceable link between real-world demonstrations and digital-twin-based simulations. Preliminary calibration and validation using demo data allow the digital twins to accurately reproduce vehicle behaviour, while fleet-level simulations enable systematic exploration of scaling effects, alternative charging and energy replenishment strategies, and infrastructure constraints. This is particularly relevant for assessing long-term impacts, economies of scale and deployment pathways that cannot be fully addressed through short-duration pilots alone.

From an evaluation perspective, the demonstration design directly supports the objectives of WP5 by enabling integrated assessment across technical, environmental, economic and behavioural dimensions. Passenger-oriented use cases provide essential input for analysing user acceptance, comfort and willingness to adopt frugal EVs, while commercial and fleet-oriented use cases generate evidence on total cost of ownership and operational suitability. Together, these insights feed into environmental impact assessments and economic evaluations strengthening the project’s capacity to inform policy makers, cities and market actors.

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ANNEX

Annex 1. Request For Quotation (RFQ)

L-Category Electric Vehicle – EU Whole Vehicle Type Approval under Regulation (EU) No 168/2013

1. Purpose of This RFQ

This Request for Quotation (RFQ) is issued to obtain **binding technical and commercial proposals** from qualified European organisations capable of delivering the **complete EU Whole Vehicle Type Approval (WVTA)** for an **L6/L7 category electric vehicle platform** in accordance with **Regulation (EU) No 168/2013**.

The selected supplier is expected to act as a **single-point, end-to-end homologation partner**, covering approval strategy, testing, documentation, authority interaction, and final certification. The supplier should have a physical office or representative in Türkiye.

2. Vehicle Scope and Assumptions

The L-category electric vehicle platform consists of a total of four vehicle variants — L6e-BP, L6e-BU, L7e-CP, and L7e-CU — derived from a single modular vehicle package by differentiating the number of seats, number of doors, motor power, and battery capacity.

- High-level assumptions:
- Powertrain: Fully electric (BEV), rear wheel drive
- Energy storage: LFP battery system
- Charging: External CCS & 220V wall socket type AC charging
- Safety Devices: with ABS, without airbag, ECS and ADAS devices
- Intended use: Urban mobility (private and commercial)
- Production volume: 5.000 vehicle / year
- Manufacturing location: Türkiye

Detailed technical data will be provided to the awarded supplier under NDA.

3. Scope of Supply – Mandatory

The quotation shall cover **all activities required to obtain EU WVTA**, including but not limited to the items listed below. Partial scope offers are not acceptable.

3.1 Homologation and Regulatory Strategy

- Vehicle sub-category determination
- Identification of all applicable EU and UNECE regulations
- Definition of approval roadmap, milestones, and critical path
- Management of exemptions, transitional provisions, and alternatives where applicable

Deliverable: Written homologation strategy document

3.2 Testing Services

The supplier shall be responsible for planning, execution, coordination, and reporting of all required tests.

Expected test scope includes:

- Braking performance
- EMC / EMF
- Electrical safety
- Battery and energy storage system testing
- Noise (L-category applicable requirements)
- Structural and mechanical safety
- Lighting and signalling
- Masses and dimensions

For each test, the quotation shall clearly specify:

- Applicable regulation or standard
- Test location (in-house or subcontracted)
- Number of required samples
- Test duration
- Cost per test
- Re-test cost and assumptions

3.3 Technical Documentation and Approval File

The quotation shall include full support for preparation and submission of the complete approval documentation, including:

- Information Package (IP)
- Test reports and technical assessments
- Technical drawings and schematics
- Battery system, BMS, and software documentation
- Conformity of Production (CoP) documentation

The supplier shall clearly state which documents are prepared by the supplier and which are expected from the customer.

3.4 Authority Interface and Certification

- Selection and coordination with the Approval Authority
- Submission of the official type approval application
- Management of authority questions and non-conformities
- Issuance of the EU Type Approval Certificate

The quotation shall identify the Approval Authority proposed and confirm authorization to act as Technical Service where applicable.

4. Project Management Requirements

The quotation shall include:

- Dedicated project manager and technical contact

- Project execution plan and communication structure
- Progress reporting frequency and format
- Interface model with the customer's engineering team

5. Schedule and Milestones

The supplier shall provide a **binding project schedule** including:

- Project kick-off
- Completion of testing
- Submission to Approval Authority
- Expected approval decision
- Final certificate issuance

Assumptions, dependencies, and risks impacting schedule shall be clearly stated.

6. Commercial Proposal Requirements

The quotation shall be fully itemized and include:

- Fixed price per activity (testing, documentation, project management, authority interaction)
- Authority and third-party fees
- Optional services clearly separated
- Assumptions and exclusions
- Validity period of the quotation

Lump-sum pricing is preferred. Time-and-material elements must be explicitly justified.

7. Experience and Compliance Declarations

The supplier shall include:

- Relevant L-category type approval references (last 5 years)
- Accreditation and authorization details
- Confirmation of compliance with Regulation (EU) No 168/2013

8. Commercial and Legal Conditions

- Expected project start: January 2026
- Target approval timing: June 2026
- Governing law: EU member state law
- Confidentiality: All information exchanged is confidential

9. RFQ Submission Instructions

- Language: English
- Format: PDF
- Submission deadline: TBD
- Contact person: Alican Yılmaz, Director, Beemobs Mobility Solutions Otomotiv San. Ve Tic. A.Ş.,

This RFQ constitutes a formal request for quotation. The contracting entity reserves the right to accept or reject any quotation in whole or in part without obligation.

Annex 2. Draft questionnaires

Questionnaire 1: Private urban (P1 & P2)/ peri-urban (P3 & P4) use

Introduction

[to be read by the interviewer, the description of the vehicle could be adapted and must correspond to the vehicle tested on the demonstration day]

Hello,

Thank you for participating in this study on a new light battery electric vehicle called ZEV-UP (for Frugal Zero-Emission Vehicles for the Urban Passenger challenge), developed within the framework of a European research project.

The purpose of this survey is to collect your general opinion on this type of vehicle, as well as your feedback after test-driving it.

The ZEV-UP vehicles are light and exist in 2 variants. The 1st variant is a two-seater vehicle, and the 2nd variant is a four-seater.

[interviewer shows the vehicle for the demo and/or the images below]

Two-seater variant

Four-seater variant

There are no right or wrong answers in this questionnaire. Please respond to the questions to the best of your knowledge and personal experience—only your honest opinion matters."

Pre-usage evaluation

Contextual information

[to be completed by the interviewer]

User ID: ☐ UC-P1…... ☐ UC-P2…... ☐ UC-P3…... ☐ UC-P4…...

Date: / /2026

Hour: :

Weather: ☐ Rainy ☐ Sunny ☐ Cloudy

Congestion level: ☐ Peak-hour ☐ Off-peak hour

Type of vehicle: ☐ 2-seater (Passenger) ☐ 4-seater (Passenger) ☐ 2-seater (Cargo)

Demonstration country: …………

Interviewer's comments (general or if any incidents): …………"

Socio-demographic questions

Q1V1. How old are you?

………… years old

Q2V1. You are a ….?

☐ Man

☐ Woman

☐ Other

☐ Do not want to answer

Q3V1. What is the highest level of education you have completed?

☐ No formal education

☐ Primary education

☐ Lower secondary education (middle school / junior high)

☐ Upper secondary education (high school)

☐ Post-secondary non-tertiary education (short vocational qualifications after high school)

☐ Bachelor's degree or equivalent

☐ Postgraduate degree (master's degree, doctoral degree)

☐ Other

Q4V1. What best describes your current main occupation or socio-professional group?

☐ Farmer / Agricultural operator

☐ Artisan, Tradesperson, Business owner

☐ Manager / Professional (senior and intellectual professions)

☐ Technician / Associate Professional / Intermediate profession

☐ Employee / Office worker

☐ Worker / Manual worker

☐ Retired

☐ Not in employment

☐ Student

Q5V1. What is your total monthly household net income (after taxes and deductions)?

[Turkish version]	**[Greek version]**
☐ 0 – 17,000 TRY	☐ 0 – 1,000 €
☐ 17,001 – 25,000 TRY	☐ 1,001 – 1,500 €
☐ 25,001 – 35,000 TRY	☐ 1,501 – 2,000 €
☐ 35,001 – 50,000 TRY	☐ 2,001 – 2,500 €
☐ 50,001 – 75,000 TRY	☐ 2,501 – 3,500 €
☐ 75,001 TRY or more	☐ 3,501 € or more
☐ Do not want to answer	☐ Do not want to answer

Q6V1. Please enter the number of children under 18 years old living in your household:

0 is allowed

………… kid(s)

Q7V1. Do you identify as a person with a disability (physical or mental)?

☐ Yes, physical

☐ Yes, mental

☐ Yes, physical and mental

☐ No

☐ Do not want to answer

Mobility habits questions

Q8V1. Do you have a driving license (Category B)?

☐ Yes

☐ No

Q9V1. Do you have a private car in your household?

If you own more than one car, multiple answers are possible.

☐ Yes, a gasoline/diesel car

☐ Yes, a hybrid vehicle

☐ Yes, an electric vehicle

☐ No

☐ Do not want to answer

Q9V1_1. What was the purchase price range of your current car (at the time of purchase)?

[Ask if Q9V1 = yes]

[Turkish version]	**[Greek version]**
☐ Under 150,000 TRY	☐ Under 5,000 €
☐ 150,000 – 299,999 TRY	☐ 5,000 – 9,999 €

☐ 300,000 – 599,999 TRY	☐ 10,000 – 19,999 €
☐ 600,000 – 899,999 TRY	☐ 20,000 – 29,999 €
☐ 900,000 – 1,199,999TRY	☐ 30,000 – 39,999 €
☐ 1,200,000 TRY or more	☐ 40,000 or more
☐ Do not know	☐ Do not know
☐ Do not want to answer	☐ Do not want to answer

Q10V1. Do you currently have access to a place where you could regularly charge an electric vehicle?

Multiple choices possible

☐ Yes, at home

☐ Yes, at work

☐ Yes — Public charging near home (≤ 10 minutes)

☐ Yes — Public charging near work

☐ Other regular access to charging

☐ No, currently no access

First impressions

FI1V1. Please describe your initial impressions of the vehicle :

……
……
………………………………………………………………………………………

FI2V1. How would you rate your initial impression of the vehicle's exterior design?

1	2	3	4	5	6
Very unattractive					**Very attractive**

FI3V1. How would you rate your initial impression of the vehicle's interior design?

1	2	3	4	5	6
Very unattractive					**Very attractive**

Q11V1. If you would adopt the ZEV-UP vehicle, what would be the main purpose of your trips using it?

Please select the one option that best describes the primary reason for using the ZEV-UP vehicle

☐ Commuting to/from work

☐ Education (school, university, training)

☐ Shopping and errands

☐ Leisure, recreation, or entertainment

☐ Visiting family or friends

☐ Personal business (appointments, administrative tasks, services)

☐ Escorting others (e.g., children, elderly, carpool passengers)

☐ Other (please specify): …..................

Acceptability questions

Tell us whether you agree with the statements below, using a scale from 1 for “Strongly disagree” to 6 for “Strongly agree”.

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
PU1_Pre. I believe that ZEV-UP electric vehicles can reduce carbon emissions and energy consumption						
PEU1_Pre. I think it is easy to learn how to use ZEV-UP electric vehicles.						
UI1_Pre. I am willing to adopt a ZEV-UP vehicle when choosing a vehicle in the near future.						

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
ENJ1_Pre. I think driving a ZEV-UP electric vehicle would be enjoyable.						
TRU1_Pre. I feel confident that a ZEV-UP vehicle would allow me to circulate without unexpected problems.						
PU2_Pre. I believe that the use of a ZEV-UP vehicle can improve my travel efficiency						
RA2_pre. I feel anxious when planning longer trips in an EV due to charging limitations.						
PEU2_Pre. I think it is easy to learn how to charge ZEV-UP electric vehicles.						
UI2_Pre. If I have the possibility, I would choose a ZEV-UP vehicle rather than a conventional vehicle.						
RA1_pre. I feel confident that I can complete most daily trips without worrying about recharging.						
SI1_Pre. People who are important to me influence my decision to adopt a fully electric vehicle.						

Battery swapping feature

[Explicative text (read by interviewer) + show image]

The ZEV-UP project offers a battery swapping solution for recharging the vehicles' batteries. In this system, the empty battery is automatically removed from beneath the vehicle at a Swapping Station and replaced with a fully charged, ready-to-use battery. Imagine that Swapping Stations are conveniently located throughout the city, and the entire process takes approximately 10 minutes, significantly reducing recharging time compared to conventional charging.

Please note that the battery swapping functionality is not yet available in the test vehicle. Therefore, we ask you to answer the following questions based on your best understanding and judgment.

Tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
BSS1. I am familiar with Battery Swapping as a recharging solution of electric vehicles						
BSS2. Due to the fast and automated battery swap at a Swapping Station, the range of the ZEV-UP vehicle would not be as important to me.						
BSS3. If I could swap my battery at any gas station today, that would be enough charging options for me.						
BSS4. If the battery were checked at every swap at the Swapping Station, I would have no concerns about the safety of the ZEV-UP vehicle.						

Willingness to pay

WTP1V1_pre. Which of the following vehicles would you be willing to buy the next time you consider purchasing a private car?

Please choose one answer

☐ Gasoline/diesel

☐ Hybrid Electric

☐ Battery Electric (Regular size)

☐ Light Battery Electric (like the ZEV-UP vehicle)

☐ Other

WTP2V1_pre. Under current market conditions, how likely are you to consider an electric vehicle as your next car?

1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremly

WTP1.1V1_ pre. Which of the following factors would most discourage you from purchasing an EV? *Select up to three*

☐ High upfront purchase price

☐ Insufficient public charging infrastructure

☐ Difficulty installing or accessing home charging

☐ Long charging time compared to refueling

☐ Uncertainty about battery lifespan and replacement cost

☐ Limited driving range, range anxiety

☐ Safety concerns

☐ Lack of clear information about EV technology and costs

☐ Uncertainty about resale value

☐ Complexity or uncertainty of subsidies and tax benefits

☐ Limited availability of suitable EV models

☐ Lack of confidence in dealership expertise

☐ No significant concerns

WTP3V1_ pre. Assuming you would consider purchasing an electric vehicle, which of the following time horizons best describes when you expect to make that purchase?

☐ At my next vehicle purchase / lease (within 12 months)

☐ In 1–2 years

☐ In 3–5 years

☐ In more than 5 years

☐ I do not plan to switch to an electric vehicle

WTP4V1_ pre. Disregarding any existing government subsidies for electric vehicle purchase, at what price would a light electric vehicle (like ZEV-UP vehicle) be too expensive for you?

[Turkish version]	[Greek version]
☐ Under 150,000 TRY	☐ Under 5,000 €
☐ 150,000 – 299,999 TRY	☐ 5,000 – 9,999 €
☐ 300,000 – 599,999 TRY	☐ 10,000 – 19,999 €
☐ 600,000 – 899,999 TRY	☐ 20,000 – 29,999 €
☐ 900,000 – 1,199,999TRY	☐ 30,000 – 39,999 €
☐ 1,200,000 TRY or more	☐ 40,000€ or more
☐ Do not know	☐ Do not know
☐ Do not want to answer	☐ Do not want to answer

WTP5V1_ pre. What is the maximum price you would pay for a light electric vehicle (like ZEV-UP vehicle)?

[Turkish version]	[Greek version]
………. TRY	………. €

WTP6V1_ pre. Answer on a scale from 1 to 6

	1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremly
How important are registration taxes, VAT, and annual circulation fees in your final purchase decision?						
How important are maintenance and repair costs in your purchasing decisions?						
To what extent would subsidies or tax incentives increase your willingness to buy an EV?						

WTP7V1_ pre. How much extra would you pay for an additional 100 km of range?

For reference, ZEV-UP vehicle range is 150-200 km.

[Turkish version]

☐ 25,000 TRY

☐ 50,000 TRY

☐ 75,000 TRY

☐ 100,000 TRY

☐ 125,000 TRY

☐ 75,001 TRY or more

☐ Do not want to answer

[Greek version]

☐ 500 €

☐ 1,000 €

☐ 1,500 €

☐ 2,000 €

☐ 2,500 €

☐ 3,000 €

☐ Do not want to answer

WTP8V1_ pre. How much would you be willing to pay per month for a battery swapping service?

[Turkish version]

☐ 0 TRY I would use the service if it was free

☐ 150 – 300 TRY

☐ 301 - 600 TRY

☐ 601 – 900 TRY

[Greek version]

☐ 0 € I would use the service if it was free

☐ 5 - 10 €

☐ 11 - 20 €

☐ 21 – 30€

☐ 901 TRY or more	☐ 31€ or more
☐ Do not want to use this service	☐ Do not want to use this service
☐ Do not want to answer	☐ Do not want to answer

Ending

This concludes the survey. Thank you very much for your time and for sharing your answers with us. Your participation is greatly appreciated. We will contact you again in one week to collect the test vehicle and to ask a few additional questions to gather your final feedback.

Bye bye!

Post-usage evaluation

[To be asked after 1 week of vehicle testing]

Driving Experience

DE1V1. On a typical day during this week, how far did you usually drive with the vehicle?

☐ Less than 5 km

☐ 5–10 km

☐ 11–20 km

☐ 21–40 km

☐ 41– 70km

☐ More than 70 km

DE2V1. During the one-week test period, what was the main purpose for which you used the ZEV-UP vehicle?

Please select the one option that best represents the majority of your vehicle use during the test

☐ Commuting to/from work

☐ Education (school, university, training)

☐ Shopping and errands

☐ Leisure, recreation, or entertainment

☐ Visiting family or friends

☐ Personal business (appointments, administrative tasks, services)

☐ Escorting others (e.g., children, elderly, carpool passengers)

☐ Other (please specify): …..................

DE3V1. Which other purposes did you use the vehicle for during the test period?

Select all that apply

☐ Commuting to/from work

☐ Education (school, university, training)

☐ Shopping and errands

☐ Leisure, recreation, or entertainment

☐ Visiting family or friends

☐ Personal business (appointments, administrative tasks, services)

☐ Escorting others (e.g., children, elderly, carpool passengers)

DE4V1. During the one-week test period, how did you typically use the vehicle in terms of passengers?

☐ I drove alone (no passengers)

☐ I drove with passengers

☐ I drove alone and with passengers

According to your own driving experience, please rate the following aspects using a 1 to 5 scale:

	1 Very poor	2 Poor	3 Somewhat poor	4 Somewhat good	5 Good	6 Excellent
DE5V1. Handling and maneuverability						
DE6V1. Vehicle's acceleration						
DE7V1. Vehicle's braking						
DE8V1. Suspension comfort and bump absorption						
DE9V1. Vibrations from rough or uneven roads						
DE10V1. Overall comfort of the ride						
DE11V1. Overall interior						

DE12V1. How would you rate the ease of driving the vehicle in the following environments?

One answer per row

Environment	Very difficult	Difficult	Somewhat difficult	Somewhat easy	Easy	Very Easy	Not concerned/ Not used
Urban / city streets							
Rural / country roads							
Highway / fast roads							

DE13V1. In which situations did you find parking easier with the test vehicle?
Multiple answers possible

☐ On-street parking

☐ Parking lots / supermarkets

☐ Residential areas

☐ City centers

☐ I did not find parking easier

☐ Not applicable / did not park

DE14V1. How would you rate the trunk/storage space for your daily needs?

1	2	3	4	5	6
Completely Inadequate	Inadequate	Somewhat Inadequate	Adequate	Good	Excellent

DE15V1. What types of items did you transport in the trunk of the vehicle?
Multiple answers possible

☐ Grocery shopping

☐ Backpack / handbag

☐ Small luggage

☐ Large luggage

☐ Sports equipment

☐ None

DE16V1. For what purposes did you typically use the rear seats in your car? [ask if demo vehicle is 4-seaters]

Select all that apply

☐ Transporting passengers
☐ Child seating
☐ Cargo or luggage
☐ Pets
☐ I did not use the rear seats

DE17V1. Were there any noticeable noises, vibrations, or discomfort during the drive?

☐ Yes (please specify): ……………………………………………..

☐ No

DE18V1. Did the vehicle meet your expectations in terms of performance and responsiveness?

☐ Below expectations

☐ Met expectations

☐ Exceeded expectations

Technology and Features

TF1V1. Evaluate the range of the battery for completing your trip:

1	2	3	4	5	6
Completely Inadequate	Inadequate	Somewhat Inadequate	Adequate	Good	Excellent

TF2V1. Did you change your travel behaviour due to battery range limitations?

Select all that apply

☐ No change

☐ Planned trips more carefully

☐ Reduced trip length or frequency

☐ Used another vehicle or transport mode

☐ Avoided certain trips

☐ Other (please specify): ……………..

TF3V1. What were the specific features (example, safety, entertainment, connectivity) that impressed you during your driving experience?

………
………
……………………………………………………………………………………

TF4V1. What were the specific features (example, safety, entertainment, connectivity) that disappointed you during your driving experience?

………
………
…………………………………………………………………………………..

Acceptability questions (Post-test)

Considering your own experience during the demonstration of the vehicle, tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
PU1_post. I believe that ZEV-UP electric vehicles can reduce carbon emissions and energy consumption						
PEU1_ post. I think it is easy to learn how to use ZEV-UP electric vehicles.						
UI1_ post. I am willing to adopt a ZEV-UP vehicle when choosing a vehicle in the near future.						
ENJ1_ post. I think driving a ZEV-UP electric vehicle would be enjoyable.						
TRU1_ post. I feel confident that a ZEV-UP vehicle would allow me to circulate without unexpected problems.						
PU2_ post. I believe that the use of a ZEV-UP vehicle can improve my travel efficiency						

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
RA2_ post. I feel anxious when planning longer trips in an EV due to charging limitations.						
PEU2_ post. I think it is easy to learn how to charge ZEV-UP electric vehicles.						
UI2_ post. If I have the possibility, I would choose a ZEV-UP vehicle rather than a conventional vehicle.						
RA1_ post. I feel confident that I can complete most daily trips without worrying about recharging.						
SI1_Post. People who are important to me influence my decision to adopt a fully electric vehicle.						

Willingness to pay

WTP1V1_post. Which of the following vehicles would you be willing to buy the next time you consider purchasing a private car?

Please choose one answer

☐ Gasoline/diesel

☐ Hybrid Electric

☐ Battery Electric (Regular size)

☐ Light Battery Electric (like the ZEV-UP vehicle)

☐ Other

WTP2_ post. Under current market conditions, how likely are you to consider an electric vehicle as your next car?

1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremely

WTP1.1V1_ post. Which of the following factors would most discourage you from purchasing an EV? *Select up to three*

☐ High upfront purchase price

☐ Insufficient public charging infrastructure

☐ Difficulty installing or accessing home charging

☐ Long charging time compared to refueling

☐ Uncertainty about battery lifespan and replacement cost

☐ Limited driving range, range anxiety

☐ Safety concerns

☐ Lack of clear information about EV technology and costs

☐ Uncertainty about resale value

☐ Complexity or uncertainty of subsidies and tax benefits

☐ Limited availability of suitable EV models

☐ Lack of confidence in dealership expertise

☐ No significant concerns

WTP3V1_ post. Assuming you would consider purchasing an electric vehicle, which of the following time horizons best describes when you expect to make that purchase?

☐ At my next vehicle purchase / lease (within 12 months)

☐ In 1–2 years

☐ In 3–5 years

☐ In more than 5 years

☐ I do not plan to switch to an electric vehicle

WTP4V1_post. Disregarding any existing government subsidies for electric vehicle purchase, at what price would a light electric vehicle (like ZEV-UP vehicle) be too expensive for you?

[Turkish version]	[Greek version]
☐ Under 150,000 TRY	☐ Under 5,000 €

☐ 150,000 – 299,999 TRY	☐ 5,000 – 9,999 €
☐ 300,000 – 599,999 TRY	☐ 10,000 – 19,999 €
☐ 600,000 – 899,999 TRY	☐ 20,000 – 29,999 €
☐ 900,000 – 1,199,999TRY	☐ 30,000 – 39,999 €
☐ 1,200,000 TRY or more	☐ 40,000€ or more
☐ Do not know	☐ Do not know
☐ Do not want to answer	☐ Do not want to answer

WTP5V1_post. What is the maximum price you would pay for a light electric vehicle (like ZEV-UP vehicle)?

[Turkish version]	**[Greek version]**
………. TRY	………. €

WTP6V1_post. At a purchase price of €8,000–€10,000 [Turkish version: 400,000-500,000 TRY], would you consider purchasing the demonstrated ZEV-UP vehicle?

☐ Yes

☐ No

DI1V1. How likely are you to recommend using this vehicle based on your test drive experience?

1	2	3	4	5	6
Very unlikely	Unlikely	Somewhat unlikely	Somewhat likely	Likely	Very likely

DI2V1 . Do you have any additional comments or suggestions to improve the vehicle?
……

Ending

The survey is over. Thank you so much for your participation and answers.

Bye bye!

Questionnaire 2: Last mile mission (C1) & Peri-urban deliveries (C2)

Introduction

[to be read by the interviewer, the description of the vehicle could be adapted and must correspond to the vehicle tested on the demonstration day]

Hello,

Thank you for participating in this study on a new light battery electric vehicle called ZEV-UP (for Frugal Zero-Emission Vehicles for the Urban Passenger challenge), developed within the framework of a European research project.

The purpose of this survey is to collect your general opinion on this type of vehicle, as well as your feedback after test-driving it.

The ZEV-UP vehicle is a two-seater commercial vehicle featuring two seats for passengers and a separate loading area to transport goods.

There are no right or wrong answers in this questionnaire. Please respond to the questions to the best of your knowledge and personal experience—only your honest opinion matters."

Pre-usage evaluation

Contextual information

[to be completed by the interviewer]

User ID: ☐ UC-C1…... ☐ UC-C2…...

Date: / /2026

Hour: :

Weather: ☐ Rainy ☐ Sunny ☐ Cloudy

Congestion level: ☐ Peak-hour ☐ Off-peak hour

Type of vehicle: ☐ 2-seater (Passenger) ☐ 4-seater (Passenger) ☐ 2-seater (Cargo)

Demonstration country: ………….

Interviewer's comments (general or if any incidents): ………….

Socio-demographic questions

Q1V2. How old are you?

…………. years old

Q2V2. You are a ….?

☐ Man

☐ Woman

☐ Other

☐ Do not want to answer

Q3V2. What is the highest level of education you have completed?

☐ No formal education

☐ Primary education

☐ Lower secondary education (middle school / junior high)

☐ Upper secondary education (high school)

☐ Post-secondary non-tertiary education (short vocational qualifications after high school)

☐ Bachelor's degree or equivalent

☐ Postgraduate degree (master's degree, doctoral degree)

☐ Other

Respondent activity

Q4V2. What type of freight activity do you mainly perform?

☐ Urban delivery / last-mile distribution

☐ Regional freight (within one region)

☐ National long-haul freight

☐ International freight

☐ Specialized transport (e.g. refrigerated, hazardous goods, construction materials)

☐ Courier / express delivery

☐ Other (please specify): …………………………………………..

Q5V2. What is the size of your company's fleet?

☐ 1–5 vehicles

☐ 6–20 vehicles

☐ 21–50 vehicles

☐ 51–100 vehicles

☐ More than 100 vehicles

☐ Do not know

Q6V2. Does your company's fleet include electric vehicles?

☐ Yes

☐ No

☐ Do not know

if yes, how many (approximately)? .....

Q7V2. What is your main role within the company?

☐ Driver

☐ Owner-driver / self-employed

☐ Other (please specify): ……………………….

Q8V2. Are you directly involved in decisions related to vehicle acquisition?

☐ Yes, directly

☐ Yes, as a contributor

☐ No

Q9V2. What type of vehicle(s) do you typically drive to carry out your work tasks?

☐ Passenger cars

☐ Light commercial vehicles

☐ Heavy-duty vehicles

☐ Mixed fleet

Activity characteristics

Q10V2. Across your operations, how many kilometers does a vehicle typically cover per day?

☐ Less than 100 km

☐ 100–200 km

☐ 201–300 km

☐ 301–400 km

☐ More than 400 km

Q11V2. What type of driving environment best describes your activity?

☐ Predominantly urban

☐ Predominantly rural

☐ Long-distance / intercity

☐ Mixed use

Q12V2. Do you currently have access to charging infrastructure suitable for electric freight vehicles?

☐ Yes, at company depot

☐ Yes, at home

☐ Yes, via public charging stations along routes

☐ Yes, multiple options available

☐ No, currently no access

☐ Do not know

Q13V2. How would you rate the adequacy of current charging infrastructure for your operations?

1	2	3	4	5	6
Very inadequate					**Very adequate**

First impressions

FI1V2. Please describe your initial impressions of the vehicle:

……
……
……………………………………………………………………

FI2V2. How would you rate your initial impression of the vehicle's exterior design?

1	2	3	4	5	6
Very unattractive					**Very attractive**

FI3V2. How would you rate your initial impression of the vehicle's interior design?

1	2	3	4	5	6
Very unattractive					**Very attractive**

Acceptability questions (Pre-test)

Tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
PU1_Pre. I believe that ZEV-UP electric vehicles can reduce carbon emissions and energy consumption.						
PEU1_Pre. I think it is easy to learn how to use ZEV-UP electric vehicles.						

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
ENJ1_Pre. I think driving a ZEV-UP electric vehicle would be enjoyable.						
TRU1_Pre. I feel confident that a ZEV-UP vehicle can help me to complete my work without unexpected problems.						
UI1_Pre. I am willing to use a ZEV-UP vehicle to do my work in the near future.						
RA1_pre. I feel confident that I can complete most daily missions without worrying about recharging.						
PU2_Pre. I believe that using a ZEV-UP vehicle can improve my efficiency at work.						
PEU2_Pre. I think it is easy to learn how to charge ZEV-UP electric vehicles.						
UI2_Pre. If I have the possibility, I would choose a ZEV-UP vehicle rather than a conventional vehicle to do my job						
RA2_pre. I feel anxious when planning higher number of deliveries in an EV due to charging limitations.						

Battery swapping feature

[Explicative text (read by interviewer) + show image]

The ZEV-UP project offers a battery swapping solution for recharging the vehicles' batteries. In this system, the empty battery is automatically removed from beneath the vehicle at a Swapping Station and replaced with a fully charged, ready-to-use battery. Imagine that Swapping Stations are conveniently located throughout the city, and the entire process takes approximately 10 minutes, significantly reducing recharging time compared to conventional charging.

Please note that the battery swapping functionality is not yet available in the test vehicle. Therefore, we ask you to answer the following questions based on your best understanding and judgment.

Tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
BSS1. I am familiar with Battery Swapping as a recharging solution of electric vehicles						
BSS2. Due to the fast and automated battery swap at a Swapping Station, the range of the ZEV-UP vehicle would not be as important to me.						
BSS3. If I could swap my battery at any gas station today, that would be enough charging options for me.						
BSS4. If the battery were checked at every swap at the Swapping Station, I would have no concerns about the safety of the ZEV-UP vehicle.						

Willingness to pay

[Show WTP questions only if **Q8V2** = "Yes, directly" OR "yes, as a contributor"]

[to be read by interviewer: You mentioned that you are directly or indirectly involved in purchase decisions for vehicles used for professional purposes. Please answer the following questions to the best of your knowledge.]

WTP1V2_pre. Which type of vehicle would you consider for your next freight vehicle purchase or fleet expansion?

Multiple choice, select all that apply

☐ Gasoline/diesel

☐ Hybrid Electric

☐ Battery Electric (Regular size)

☐ Light Battery Electric (like the ZEV-UP vehicle)

☐ Other

WTP2V2_pre. Under current market conditions, how likely are you to consider purchasing electric freight vehicles?

1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremely

WTP1.1V2_ pre. Which of the following factors would most discourage you from purchasing electric freight vehicles?

Select up to three

☐ High upfront purchase price

☐ Insufficient public charging infrastructure

☐ Difficulty installing or accessing home charging

☐ Long charging time compared to refueling

☐ Uncertainty about battery lifespan and replacement cost

☐ Limited driving range, range anxiety

☐ Safety concerns

☐ Lack of clear information about EV technology and costs

☐ Uncertainty about resale value

☐ Complexity or uncertainty of subsidies and tax benefits

☐ Limited availability of suitable EV models

☐ Lack of confidence in dealership expertise

☐ No significant concerns

WTP3V2_ pre. Assuming you would consider purchasing an electric vehicle, which of the following time horizons best describes when you expect to make that purchase?

☐ At my next vehicle purchase / lease (within 12 months)

☐ In 1–2 years

☐ In 3–5 years

☐ In more than 5 years

☐ I do not plan to switch to an electric vehicle

WTP4V2_pre. Ignoring any government subsidies, at what purchase price would a light-duty electric freight (cargo) vehicle (the ZEV-UP vehicle for example) be too expensive for your business?

[Turkish version]	**[Greek version]**
☐ Under 150,000 TRY	☐ Under 5,000 €
☐ 150,000 – 299,999 TRY	☐ 5,000 – 9,999 €
☐ 300,000 – 599,999 TRY	☐ 10,000 – 19,999 €
☐ 600,000 – 899,999 TRY	☐ 20,000 – 29,999 €
☐ 900,000 – 1,199,999TRY	☐ 30,000 – 39,999 €
☐ 1,200,000 TRY or more	☐ 40,000 – or more
☐ Do not know	☐ Do not know
☐ Do not want to answer	☐ Do not want to answer

WTP5V2_pre. What is the maximum price your company would pay for a light-duty electric freight vehicle like the ZEV-UP vehicle?

[Turkish version]	**[Greek version]**
………. TRY	………. €

WTP6V2_pre. Answer on a scale from 1 to 6

	1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremely
How important are registration taxes, VAT, and annual circulation fees in your final purchase decision?						
How important are maintenance and repair costs in your purchasing decisions?						
To what extent would subsidies or tax incentives increase your willingness to buy an EV?						

WTP7V2_pre. How much extra would your business pay for an additional 100 km of range per full charge?

For reference, ZEV-UP vehicle range is 150-200 km.

[Turkish version]	**[Greek version]**
☐ 25,000 TRY	☐ 500 €
☐ 50,000 TRY	☐ 1,000 €
☐ 75,000 TRY	☐ 1,500 €
☐ 100,000 TRY	☐ 2,000 €
☐ 125,000 TRY	☐ 2,500 €
☐ 75,001 TRY or more	☐ 3,000 €
☐ Do not want to answer	☐ Do not want to answer

WTP8V2_pre. Access to charging infrastructure at your depot / operational routes:

☐ Sufficient / convenient

☐ Limited / inconvenient

☐ Not available

WTP9V2_pre. How much would you be willing to pay per month for a battery swapping service (one subscription per car)?

[Turkish version]	**[Greek version]**
☐ 0 TRY I would use the service if it was free	☐ 0 € I would use the service if it was free
☐ 150 – 300 TRY	☐ 5 - 10 €
☐ 301 - 600 TRY	☐ 11 - 20 €
☐ 601 – 900 TRY	☐ 21 – 30€
☐ 901 TRY or more	☐ 31€ or more
☐ Do not want to use this service	☐ Do not want to use this service
☐ Do not want to answer	☐ Do not want to answer

Ending

This concludes the survey. Thank you very much for your time and for sharing your answers with us. Your participation is greatly appreciated. We will contact you again in one week to collect the test vehicle and to ask a few additional questions to gather your final feedback.

Bye bye!

Post-usage evaluation

[To be asked after 1 week of vehicle testing]

Driving Experience

According to your own driving experience, please rate the following aspects using a 1 to 6 scale:

	1 Very poor	2 Poor	3 Somewhat poor	4 Somewhat good	5 Good	6 Excellent
DE1V2. Handling and maneuverability						
DE2V2. Vehicle's acceleration						
DE3V2. Vehicle's braking						
DE4V2. Suspension comfort and bump absorption						
DE5V2. Vibrations from rough or uneven roads						
DE6V2. Overall confort of the ride						
DE7V2. Overall interior						

DE8V2. Were there any noticeable noises, vibrations, or discomfort during the drive?

☐ Yes (please specify): …………………………………………..

☐ No

DE9V2. Did the vehicle meet your expectations in terms of performance and responsiveness?

☐ Below expectations

☐ Met expectations

☐ Exceeded expectations

Technology and Features

	1	2	3	4	5	6
	Completely Inadequate	Inadequate	Somewhat Inadequate	Adequate	Good	Excellent
TF1V2. Evaluate the range of the battery for achieving the mission						
TF2V2. How adequate was the compatibility between the vehicle's charging needs and your daily delivery schedule?						
TF3V2. How would you rate the overall ergonomic adequacy of the vehicle for loading and unloading operations (e.g., cargo access height, door opening, interior layout, required physical effort)?						

TF4V2. What were the specific features (example, safety, entertainment, connectivity) that impressed you during your driving experience?

……
……
………………………………………………………………………………

TF5V2. What were the specific features (example, safety, entertainment, connectivity) that disappointed you during your driving experience?

……
……
………………………………………………………………………………

Acceptability questions (Post-test)

Considering your own experience during the demonstration of the vehicle, tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
PU1_post. I believe that ZEV-UP electric vehicles can reduce carbon emissions and energy consumption.						
PEU1_ post. I think it is easy to learn how to use ZEV-UP electric vehicles.						
ENJ1_ post. I think driving a ZEV-UP electric vehicle would be enjoyable.						
TRU1_ post. I feel confident that a ZEV-UP vehicle can help me to complete my work without unexpected problems.						
UI1_ post. I am willing to use a ZEV-UP vehicle to do my work in the near future.						
RA1_ post. I feel confident that I can complete most daily missions without worrying about recharging.						
PU2_ post. I believe that using a ZEV-UP vehicle can improve my efficiency at work.						
PEU2_ post. I think it is easy to learn how to charge ZEV-UP electric vehicles.						
UI2_ post. If I have the possibility, I would choose a ZEV-UP vehicle rather than a conventional vehicle to do my job						
RA2_ post. I feel anxious when planning higher number of deliveries in an EV due to charging limitations.						

Willingness to pay

[Show WTP questions only if **Q8V2** = "Yes, directly" OR "yes, as a contributor"]

[to be read by interviewer: You mentioned that you are directly or indirectly involved in purchase decisions for vehicles used for professional purposes. Please answer the following questions to the best of your knowledge.]

WTP1V2_post. Which type of vehicle would you consider for your next freight vehicle purchase or fleet expansion?

Multiple choice, select all that apply

☐ Gasoline/diesel

☐ Hybrid Electric

☐ Battery Electric (Regular size)

☐ Light Battery Electric (like the ZEV-UP vehicle)

☐ Other

WTP2V2_ post. Under current market conditions, how likely are you to consider purchasing electric freight vehicles?

1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremely

WTP1.1V2_ post. Which of the following factors would most discourage you from purchasing electric freight vehicles?

Select up to three

☐ High upfront purchase price

☐ Insufficient public charging infrastructure

☐ Difficulty installing or accessing home charging

☐ Long charging time compared to refueling

☐ Uncertainty about battery lifespan and replacement cost

☐ Limited driving range, range anxiety

☐ Safety concerns

☐ Lack of clear information about EV technology and costs

☐ Uncertainty about resale value

☐ Complexity or uncertainty of subsidies and tax benefits

☐ Limited availability of suitable EV models

☐ Lack of confidence in dealership expertise

☐ No significant concerns

WTP3V2_ post. Assuming you would consider purchasing an electric vehicle, which of the following time horizons best describes when you expect to make that purchase ?

☐ At my next vehicle purchase / lease (within 12 months)

☐ In 1–2 years

☐ In 3–5 years

☐ In more than 5 years

☐ I do not plan to switch to an electric vehicle

WTP4V2_ post. Ignoring any government subsidies, at what purchase price would a light-duty electric freight (cargo) vehicle (the ZEV-UP vehicle for example) be too expensive for your business?

[Turkish version]	[Greek version]
☐ Under 150,000 TRY	☐ Under 5,000 €
☐ 150,000 – 299,999 TRY	☐ 5,000 – 9,999 €
☐ 300,000 – 599,999 TRY	☐ 10,000 – 19,999 €
☐ 600,000 – 899,999 TRY	☐ 20,000 – 29,999 €
☐ 900,000 – 1,199,999TRY	☐ 30,000 – 39,999 €
☐ 1,200,000 TRY or more	☐ 40,000 – or more
☐ Do not know	☐ Do not know
☐ Do not want to answer	☐ Do not want to answer

WTP5V2_ post. What is the maximum price your company would pay for a light-duty electric freight vehicle like the ZEV-UP vehicle?

[Turkish version]	**[Greek version]**
………. TRY	………. €

WTP6V2_ post. At a purchase price of €8,000–€10,000 [Turkish version: 400,000-500,000 TRY], would you consider purchasing the demonstrated ZEV-UP vehicle?

☐ Yes

☐ No

[show to all participants]

DI1V2. How likely are you to recommend using this vehicle based on your test drive experience?

1	2	3	4	5	6
Very unlikely	Unlikely	Somewhat unlikely	Somewhat likely	Likely	Very likely

DI2V2. Do you have any additional comments or suggestions to improve the vehicle?

………

Ending

The survey is over. Thank you so much for your participation and answers.

Bye bye!

Questionnaire 3: Company service vehicle (C3)

Introduction

[to be read by the interviewer, the description of the vehicle could be adapted and must correspond to the vehicle tested on the demonstration day]

Hello,

Thank you for participating in this study on a new light battery electric vehicle called ZEV-UP (for Frugal Zero-Emission Vehicles for the Urban Passenger challenge), developed within the framework of a European research project.

The purpose of this survey is to collect your general opinion on this type of vehicle, as well as your feedback after test-driving it.

The ZEV-UP vehicles are light and exist in 2 variants. The 1st variant is a two-seater commercial vehicle featuring two seats for passengers and a separate loading area to transport goods, and the 2nd variant is a four-seater designed primarily for carrying passengers.

Two-seater variant	Four-seater variant
	

There are no right or wrong answers in this questionnaire. Please respond to the questions to the best of your knowledge and personal experience—only your honest opinion matters.

Pre-usage evaluation

Contextual information

[to be completed by the interviewer]

User ID: UC-C3…...

Date: / /2026

Hour: :

Weather: ☐ Rainy ☐ Sunny ☐ Cloudy

Congestion level: ☐ Peak-hour ☐ Off-peak hour

Type of vehicle: ☐ 2-seater (Passenger) ☐ 4-seater (Passenger) ☐ 2-seater (Cargo)

Demonstration country: …………

Interviewer's comments (general or if any incidents): …………

Socio-demographic questions

Q1V3. How old are you?

………… years old

Q2V3. You are a ….?

☐ Man

☐ Woman

☐ Other

☐ Do not want to answer

Q3V3. What is the highest level of education you have completed?

☐ No formal education

☐ Primary education

☐ Lower secondary education (middle school / junior high)

☐ Upper secondary education (high school)

☐ Post-secondary non-tertiary education (short vocational qualifications after high school)

☐ Bachelor's degree or equivalent

☐ Postgraduate degree (master's degree, doctoral degree)

☐ Other

Respondent activity

Q4V3. What is your primary role in the company?

☐ Technician / Operator

☐ Engineer

☐ Supervisor / Manager

☐ Logistics / Support staff

☐ Other (please specify): …………………………………

Q5V3. Are you directly involved in decisions related to vehicle acquisition?

☐ Yes, directly

☐ Yes, as a contributor

☐ No

Fleet/activity characteristics

Q6V3. How frequently do you use company service vehicles?

☐ Daily

☐ Several times per week

☐ Several times per month

☐ Rarely

Q7V3. For which purposes do you typically use these vehicles?

Multiple choice

☐ Transporting people

☐ Transporting tools or equipment

☐ Transporting materials or parts

☐ Mixed use (people and cargo)

☐ Other (please specify): …………………………………

Q8V3. What is the size of your company's fleet?

☐ 1–5 vehicles

☐ 6–20 vehicles

☐ 21–50 vehicles

☐ 51–100 vehicles

☐ More than 100 vehicles

☐ Do not know

Q9V3. What type of vehicle(s) do you typically drive to carry out your work tasks?

☐ Passenger cars

☐ Light commercial vehicles

☐ Heavy-duty vehicles

☐ Mixed fleet

Q10V3. What type of driving environment best describes your activity?

☐ Inside of the company facilities

☐ Predominantly urban

☐ Predominantly rural

☐ Long-distance / intercity

☐ Mixed use

Q11V3. Does your fleet currently include electric vehicles?

☐ Yes ☐ No (**if yes, how many (approximately**))? .....

Q12V3. Is fleet electrification part of your strategic objectives?

☐ Yes, already implemented

☐ Yes, planned

☐ Under discussion

☐ No

☐ Do not know

Q13V3. Across your operations, how many kilometers does a vehicle typically cover per day?

☐ Less than 100 km

☐ 100–200 km

☐ 201–300 km

☐ 301–400 km

☐ More than 400 km

Q14V3. Do you currently have access to charging infrastructure suitable for electric vehicles?

☐ Yes, at company depot

☐ Yes, via public charging stations along routes

☐ Yes, multiple options available

☐ No, currently no access

☐ Do not know

Q15V3. How would you rate the adequacy of current charging infrastructure for your operations?

1	2	3	4	5	6
Very inadequate					**Very adequate**

First impressions

FI1V3. Please describe your initial impressions of the vehicle:

………
………
…………………………………………………………………………

FI2V3. How would you rate your initial impression of the vehicle's exterior design?

1	2	3	4	5	6
Very unattractive					**Very attractive**

FI3V3. How would you rate your initial impression of the vehicle's interior design?

1	2	3	4	5	6
Very unattractive					**Very attractive**

Acceptability questions (Pre-test)

Tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
PU1_Pre. I believe that adopting ZEV-UP electric vehicles in our fleet can reduce the company's CO_2 emissions and energy consumption.						
PEU1_Pre. I believe it would be easy for our drivers to learn how to use ZEV-UP electric vehicles.						
UI1_Pre. I am willing to integrate ZEV-UP electric vehicles into our fleet in the near future.						
ENJ1_Pre. I think driving a ZEV-UP electric vehicle would be enjoyable for users.						
TRU1_Pre. I feel confident that a ZEV-UP vehicle can be operated in our fleet without causing major operational problems.						
PU2_Pre. I believe that using a ZEV-UP vehicle could improve the efficiency of our fleet operations (logistics/transport).						
PEU2_Pre. I think it would be easy to train staff to charge ZEV-UP vehicles (simple procedures).						
UI2_Pre. If I have the possibility, I would choose a ZEV-UP vehicle rather than a conventional for our fleet in the future.						

Battery swapping feature

[Explicative text (read by interviewer) + show image]

The ZEV-UP project offers a battery swapping solution for recharging the vehicles' batteries. In this system, the empty battery is automatically removed from beneath the vehicle at a Swapping Station and replaced with a fully charged, ready-to-use battery. Imagine that Swapping Stations are conveniently located throughout the city, and the entire process takes approximately 10 minutes, significantly reducing recharging time compared to conventional charging.

Please note that the battery swapping functionality is not yet available in the test vehicle. Therefore, we ask you to answer the following questions based on your best understanding and judgment.

Tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
BSS1. I am familiar with Battery Swapping as a recharging solution of electric vehicles						
BSS2. Due to the fast and automated battery swap at a Swapping Station, the range of the ZEV-UP vehicle would not be as important to me.						
BSS3. If I could swap my battery at any gas station today, that would be enough charging options for me.						
BSS4. If the battery were checked at every swap at the Swapping Station, I would have						

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
no concerns about the safety of the ZEV-UP vehicle.						

Willingness to pay

[Show WTP questions only if **Q5V3** = "Yes, directly" OR "yes, as a contributor"]

[to be read by interviewer: You mentioned that you are directly or indirectly involved in purchase decisions for vehicles used for professional purposes. Please answer the following questions to the best of your knowledge.]

WTP1V3_pre. Which type of vehicle would you consider for your next freight vehicle purchase or fleet expansion?

Multiple choice, select all that apply

☐ Gasoline/diesel

☐ Hybrid Electric

☐ Battery Electric (Regular size)

☐ Light Battery Electric (like the ZEV-UP vehicle)

☐ Other

WTP2V3_pre. Under current market conditions, how likely are you to consider purchasing electric freight vehicles?

1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremely

WTP1.1V3_ pre. Which of the following factors would most discourage you from purchasing electric freight vehicles?

Select up to three

☐ High upfront purchase price

☐ Insufficient public charging infrastructure

☐ Difficulty installing or accessing home charging

☐ Long charging time compared to refueling

☐ Uncertainty about battery lifespan and replacement cost

☐ Limited driving range, range anxiety

☐ Safety concerns

☐ Lack of clear information about EV technology and costs

☐ Uncertainty about resale value

☐ Complexity or uncertainty of subsidies and tax benefits

☐ Limited availability of suitable EV models

☐ Lack of confidence in dealership expertise

☐ No significant concerns

WTP3V3_ pre. Assuming you would consider purchasing an electric vehicle, which of the following time horizons best describes when you expect to make that purchase?

☐ At my next vehicle purchase / lease (within 12 months)

☐ In 1–2 years

☐ In 3–5 years

☐ In more than 5 years

☐ I do not plan to switch to an electric vehicle

WTP4V3_pre. Ignoring any government subsidies, at what purchase price would a light electric vehicle (the ZEV-UP vehicle for example) be too expensive for your business?

[Turkish version]	**[Greek version]**
☐ Under 150,000 TRY	☐ Under 5,000 €
☐ 150,000 – 299,999 TRY	☐ 5,000 – 9,999 €
☐ 300,000 – 599,999 TRY	☐ 10,000 – 19,999 €
☐ 600,000 – 899,999 TRY	☐ 20,000 – 29,999 €

☐ 900,000 – 1,199,999TRY ☐ 30,000 – 39,999 €

☐ 1,200,000 TRY or more ☐ 40,000 € or more

☐ Do not know ☐ Do not know

☐ Do not want to answer ☐ Do not want to answer

WTP5V3_pre. What is the maximum price your company would pay for a light-duty electric freight vehicle like the ZEV-UP vehicle?

[Turkish version] **[Greek version]**

………. TRY ………. €

WTP6V3_pre. Answer on a scale from 1 to 6

	1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremely
How important are registration taxes, VAT, and annual circulation fees in your final purchase decision?						
How important are maintenance and repair costs in your purchasing decisions?						
To what extent would subsidies or tax incentives increase your willingness to buy an EV?						

WTP7V3_pre. How much extra would your business pay for an additional 100 km of range per full charge?

For reference, ZEV-UP vehicle range is 150-200 km.

[Turkish version] **[Greek version]**

☐ 25,000 TRY ☐ 500 €

☐ 50,000 TRY ☐ 1,000 €

☐ 75,000 TRY ☐ 1,500 €

☐ 100,000 TRY	☐ 2,000 €
☐ 125,000 TRY	☐ 2,500 €
☐ 75,001 TRY or more	☐ 3,000 €
☐ Do not want to answer	☐ Do not want to answer

WTP8V3_pre. How much would you be willing to pay per month for a battery swapping service (one subscription per car)?

[Turkish version]	**[Greek version]**
☐ 0 TRY I would use the service if it was free	☐ 0 € I would use the service if it was free
☐ 150 – 300 TRY	☐ 5 - 10 €
☐ 301 - 600 TRY	☐ 11 - 20 €
☐ 601 – 900 TRY	☐ 21 – 30€
☐ 901 TRY or more	☐ 31€ or more
☐ Do not want to use this service	☐ Do not want to use this service
☐ Do not want to answer	☐ Do not want to answer

Ending

This concludes the survey. Thank you very much for your time and for sharing your answers with us. Your participation is greatly appreciated. We will contact you again in one week to collect the test vehicle and to ask a few additional questions to gather your final feedback.

Bye bye!

Post-usage evaluation

[To be asked after 1 week of vehicle testing]

Driving Experience

According to your own driving experience, please rate the following aspects using a 1 to 6 scale:

	1 Very poor	2 Poor	3 Somewhat poor	4 Somewhat good	5 Good	6 Excellent
DE1V3. Handling and maneuverability						
DE2V3. Vehicle's acceleration						
DE3V3. Vehicle's braking						
DE4V3. Suspension comfort and bump absorption						
DE5V3. Vibrations from rough or uneven roads						
DE6V3. Overall confort of the ride						
DE7V3. Overall interior						

DE8V3. Were there any noticeable noises, vibrations, or discomfort during the drive?

☐ Yes (please specify): …………………………………………..

☐ No

DE9V3. Did the vehicle meet your expectations in terms of performance and responsiveness?

☐ Below expectations

☐ Met expectations

☐ Exceeded expectations

Other aspects

According to your own driving experience, please rate the following aspects using a 1 to 6 scale:

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
EHO1. The process of taking over a vehicle from another user is straightforward.						
RD1. The vehicle feels robust enough for daily use in an industrial environment.						
DT1. The vehicle is well suited for transporting both people and cargo.						
EHO2. When shared, the vehicle is usually left in a ready-to-use condition by the previous user.						
RD2. The vehicle withstands frequent use by multiple users without noticeable degradation.						
DT2. Switching between different task types (e.g., people vs. cargo transport) is easy.						
EHO3. Adjusting the vehicle (seat, mirrors, settings, cargo configuration) is quick and easy.						
RD3. Interior and cargo areas are resistant to wear, dirt, and minor impacts.						
DT3. Overall, the vehicle supports the range of tasks required at the company facility.						

Technology and Features

TF1V3. Evaluate the range of the battery for achieving the mission:

1	2	3	4	5	6
Completely Inadequate	Inadequate	Somewhat Inadequate	Adequate	Good	Excellent

TF2V3. What were the specific features (example, safety, entertainment, connectivity) that impressed you during your driving experience?

………
………
…………………………………………………………………………

TF3V3. What were the specific features (example, safety, entertainment, connectivity) that disappointed you during your driving experience?

………
………
…………………………………………………………………………

Acceptability questions (Post-test)

Considering your own experience during the demonstration of the vehicle, tell us whether you agree with the statements below, using a scale from 1 for "Strongly disagree" to 6 for "Strongly agree".

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
PU1_post. I believe that adopting ZEV-UP electric vehicles in our fleet can reduce the company's CO_2 emissions and energy consumption.						
PEU1_ post. I believe it would be easy for our drivers to learn how to use ZEV-UP electric vehicles.						
UI1_ post. I am willing to integrate ZEV-UP electric vehicles into our fleet in the near future.						
ENJ1_post. I think driving a ZEV-UP electric vehicle would be enjoyable for users.						
TRU1_ post. I feel confident that a ZEV-UP vehicle can be operated in our fleet without causing major operational problems.						
PU2_ post. I believe that using a ZEV-UP vehicle could improve the efficiency of our fleet operations (logistics/transport).						

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Somewhat agree	5 Agree	6 Strongly agree
PEU2_ post. I think it would be easy to train staff to charge ZEV-UP vehicles (simple procedures).						
UI2_ post. If I have the possibility, I would choose a ZEV-UP vehicle rather than a conventional for our fleet in the future.						

Willingness to pay

[Show WTP questions only if **Q5V3** = "Yes, directly" OR "yes, as a contributor"]

[to be read by interviewer: You mentioned that you are directly or indirectly involved in purchase decisions for vehicles used for professional purposes. Please answer the following questions to the best of your knowledge.]

WTP1V3_post. Which type of vehicle would you consider for your next freight vehicle purchase or fleet expansion?

Multiple choice, select all that apply

☐ Gasoline/diesel

☐ Hybrid Electric

☐ Battery Electric (Regular size)

☐ Light Battery Electric (like the ZEV-UP vehicle)

☐ Other

WTP2V3_ post. Under current market conditions, how likely are you to consider purchasing electric freight vehicles?

1 Not at all	2 Very slightly	3 Slightly	4. Quite	5 Very	6 Extremely

WTP1.1V3_ post. Which of the following factors would most discourage you from purchasing electric freight vehicles?

Select up to three

☐ High upfront purchase price

☐ Insufficient public charging infrastructure

☐ Difficulty installing or accessing home charging

☐ Long charging time compared to refueling

☐ Uncertainty about battery lifespan and replacement cost

☐ Limited driving range, range anxiety

☐ Safety concerns

☐ Lack of clear information about EV technology and costs

☐ Uncertainty about resale value

☐ Complexity or uncertainty of subsidies and tax benefits

☐ Limited availability of suitable EV models

☐ Lack of confidence in dealership expertise

☐ No significant concerns

WTP3V3_ post. Assuming you would consider purchasing an electric vehicle, which of the following time horizons best describes when you expect to make that purchase?

☐ At my next vehicle purchase / lease (within 12 months)

☐ In 1–2 years

☐ In 3–5 years

☐ In more than 5 years

☐ I do not plan to switch to an electric vehicle

WTP4V3_post. Ignoring any government subsidies, at what purchase price would a light electric vehicle (the ZEV-UP vehicle for example) be too expensive for your business?

[Turkish version] **[Greek version]**

☐ Under 150,000 TRY	☐ Under 5,000 €
☐ 150,000 – 299,999 TRY	☐ 5,000 – 9,999 €
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☐ 900,000 – 1,199,999TRY	☐ 30,000 – 39,999 €
☐ 1,200,000 TRY or more	☐ 40,000 € or more
☐ Do not know	☐ Do not know
☐ Do not want to answer	☐ Do not want to answer

WTP5V3_pre. What is the maximum price your company would pay for a light-duty electric freight vehicle like the ZEV-UP vehicle?

[Turkish version]	**[Greek version]**
………. TRY	………. €

WTP6V3_pre. At a purchase price of €8,000–€10,000 [Turkish version: 400,000-500,000 TRY], would you consider purchasing the demonstrated ZEV-UP vehicle?

☐ Yes

☐ No

[show to all participants]

DI1V3. How likely are you to recommend using this vehicle based on your test drive experience?

1	2	3	4	5	6
Very unlikely	Unlikely	Somewhat unlikely	Somewhat likely	Likely	Very likely

DI2V3. Do you have any additional comments or suggestions to improve the vehicle?

Ending

The survey is over. Thank you so much for your participation and answers.

Bye bye!

Annex 3. Daily driving diary

1. General Information

Participant ID:

Date:

Demonstration site: ☐ Thessaloniki ☐ Istanbul

Use case ID: ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ C1 ☐ C2 ☐ C3

Vehicle variant: ☐ Passenger ☐ Commercial

Start time of vehicle use:

End time of vehicle use:

Approximate distance driven (km):

2. Charging Activity

Was the vehicle charged today? ☐ Yes ☐ No

If yes: **Charging type:** ☐ Home ☐ Depot ☐ Public ☐ Opportunity

Start time of charging:

End time of charging:

Estimated battery level before charging (%):

Estimated battery level after charging (%):

Any charging difficulties or delays?

Free text
………
………
……………………………………………………………………………

3. Driving Conditions and Context

Traffic conditions:

☐ Light ☐ Moderate ☐ Heavy ☐ Extreme congestion

Weather conditions:

Clear ☐ Rain ☐ Wind ☐ High temperature ☐ Low temperature ☐ Other: ____

Road types used:

☐ Urban ☐ Rural ☐ Highway ☐ Mixed

4. Exceptional Events or Incidents

(road closures, detours, unexpected congestion, technical warnings, safety issues, charging problems, etc.)

What happened?

Approximate time and location

Impact on trip or charging behaviour

Free text description:
……
……
…………………………………………………………………

5. Vehicle Experience (Short Daily Feedback)

Rate today's experience (1 = very poor, 5 = very good):

Driving comfort: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Vehicle handling & manoeuvrability: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Perceived range adequacy: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Ease of charging (if applicable): 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Additional comments:

Free text
……
……
…………………………………………………………………

6. Confirmation

Diary completed by participant: ☐ Yes

Date & time of completion:

Annex 4. Participant information sheet

Study context

The ZEV-UP project develops frugal, lightweight battery electric vehicles designed to provide affordable, energy-efficient, and user-centred zero-emission mobility for urban and peri-urban environments. By combining innovative vehicle design with real-world demonstrations in representative metropolitan settings, the project evaluates technical performance, charging behaviour, environmental impact, and user acceptance under realistic operating conditions. The results contribute to the advancement of inclusive and sustainable mobility solutions in Europe.

Aim of the demonstration

The demonstrations aim to generate reliable evidence on how the ZEV-UP vehicles perform in everyday passenger and commercial mobility scenarios, including urban commuting, short urban trips, peri-urban travel, shared mobility, last-mile logistics, and company fleet use. Vehicle telemetry data, contextual observations, and pre- and post-use questionnaires are combined to assess energy efficiency, operational usability, cost implications, environmental benefits, and user experience. Your participation supports both real-world validation and future large-scale deployment analysis.

Your role as a participant

During the assigned demonstration period, you are asked to:

- Use the vehicle according to the specified use case and normal mobility needs.
- Follow standard safety and charging instructions provided during training.
- Report any exceptional events (e.g., detours, congestion, warnings, or incidents).
- Complete the short **daily diary** and the **pre- and post-use questionnaires**.

All collected information will be handled confidentially, anonymised, and used solely for research and evaluation purposes in accordance with GDPR and project data-management procedures.

Acknowledgement

We sincerely thank you for your valuable participation and contribution. Your involvement is essential for improving zero-emission mobility solutions and supporting the transition toward sustainable and accessible transport systems.

Emergency and support contact

For any **emergency, safety concern, technical malfunction, or urgent issue**, please immediately contact:

Local demo leader: ____________________________
Telephone (24/7): ____________________________
Email: ____________________________

Your safety and well-being are our highest priority. Please do not hesitate to seek assistance at any time.

Annex 5. Participant selection criteria form

Administrative information

Candidate ID:

Date of screening:

Screening conducted by (local partner):

Demonstration site: ☐ Thessaloniki ☐ Istanbul

Target use case: ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ C1 ☐ C2 ☐ C3

Eligibility criteria (all participants)

Criterion	Yes	No	Notes
Valid driving licence	☐	☐	
Meets minimum legal driving age	☐	☐	
Available during the assigned demo period	☐	☐	
Willing to follow charging and safety instructions	☐	☐	
Agrees to complete pre- and post-questionnaires and daily diary	☐	☐	
Provides informed consent and GDPR agreement	☐	☐	

Eligibility decision

☐ Eligible ☐ Not eligible

These baseline requirements reflect the need for licensed, available, and cooperative participants able to follow operational procedures and complete evaluation instruments.

Additional criteria – Passenger Use Cases (P1–P4)

Criterion	Yes	No	Notes
Regularly performs urban or peri-urban trips similar to the assigned use case	☐	☐	

Criterion	Yes	No	Notes
Minimum annual driving mileage sufficient for meaningful data collection	☐	☐	
Access to home or semi-private charging (for P1–P2)	☐	☐	
Familiar with public charging or willing to learn (for P3–P4)	☐	☐	
Comfortable carrying additional passengers (P4 only)	☐	☐	

Passenger recruitment prioritises drivers whose real mobility behaviour matches the defined scenarios and who can ensure sufficient trip frequency within the short demo duration.

Additional criteria – Commercial / Service Use Cases (C1–C3)

Criterion	Yes	No	Notes
Professional or organisational driver (delivery, service, fleet)	☐	☐	
Familiar with structured routes, schedules, or logistics tasks	☐	☐	
Able to operate within payload and operational constraints	☐	☐	
Participation embedded in normal work activities	☐	☐	

Commercial recruitment follows an organisational model ensuring realistic operational conditions, including mileage, payload variation, and opportunity charging behaviour.

Diversity and representation check (non-exclusionary)

Aspect	Recorded value
Age group	
Gender	
Prior EV experience	
Typical trip purpose	

Recruitment seeks diversity rather than strict statistical representativeness to capture varied driving styles, user needs, and mobility contexts.

Final selection decision

Selected as primary participant: ☐ Yes ☐ No

Selected as backup participant: ☐ Yes ☐ No

Backup participants must meet the same eligibility requirements and be ready to replace primary drivers without disrupting the demonstration schedule.

Local coordinator signature: ____________________

Date: ____________________