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

HORIZON Innovation Actions ¦ Project Number: 101056740

D7.1
Demonstration plan and processes

Co-funded by the European Union

NextETRUCK has received funding from the European Union Horizon Innovation Actions programme under grant agreement No. 101056740.

Dissemination level	Public (PU) - fully open
Work package	WP7: Use cases and demonstrations
Deliverable number	D7.1. Demonstration plan and processes
Version	V1.1
Submission date	10/03/2026

Quality Control

	Name	Organisation	Date
Peer review 1	Steven Wilkins	TNO	11/07/2024
Peer review 2	Omar Hegazy	VUB	09/07/2024

Version history

Version	Date	Author	Summary of changes
0.1	02/11/2023	Jean-Charles Pandazis (ERTICO)	First draft: structure + chapter 1 introduction, writing responsibilities
0.2	30/01/2024	Jean-Charles Pandazis Writers & contributors (see page 3)	Writing of sections 2, 3 and 4
0.3	17/04/2024		Writing of section 5 and update of the other sections
0.4	05/07/2024	Jean-Charles Pandazis (ERTICO)	Final draft version ready for Peer review
1.0	12/07/2024	Emin Aliyev (ERTICO)	Final version to be submitted to the EC
1.1	06/03/2026	Jean-Charles Pandazis (ERTICO)	Updated version to include DAF use case and demo plan and other relevant updates

Legal disclaimer

Writers and contributors per Use Case site (section 2) & potential risks (section 5)

IST	**Lead: Ford Otosan** contributors: • AVL-D • AIT • TNO • JEMA • Panion-ABB	**Mustafa Başaran**, Barış Kırım • Daniel Braun (TMS) • Dragan Simic (Cabin HVAC) • Subhajeet Rath (Digital twin) • Ibon Cerro (Charging) • Kai Koenig, Rafal Rudol (Charging)
BAR	**Lead: IRIZAR** contributors: • AVL-D • TEC • CIDETEC • TNO • JEMA • Panion-ABB	**Josu Letona / Iñigo Larman** • Daniel Braun • Iban Vicente • Mikel Arrinda • Subhajeet Rath (Digital twin) • Ibon Cerro • Kai Koenig, Rafal Rudol
UK	**Lead: DAF** contributors: • AVL-D • AVL-AT • TNO • TEC • VUB • AIT • Panion-ABB	**Louis Jones** • Daniel Braun (thermal system modelling) • Hans-Michael Koegeler (digital twin) • Subhajeet Rath (Digital twin, battery model, ViL) • Iban Vicente (TBC) (auxiliary system modelling) • Duong Tran (Co-design framework; system modelling) • Dragan Simic (support) (HVAC system modelling) • Kai Koenig, Rafal Rudol

Main writers and contributors for section 3, 4 & 5

Dimitri Margaritis (CERTH), Victor Lejona (CENEX-UK), Jorden Vander Hoogt (CENEX-NL), Barış Kırım (Ford Otosan), Josu Letona / Sonia Vilchez IIRIZAR) , Louis Jones, (DAF).

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
2ZERO	Towards Zero Emission Road Transport (https://www.2zeroemission.eu)
BAR	Barcelona
BEV	Battery Electric Vehicle
CCS2	Combined Charging System 2
DoA	Description of Action (part of the NextETRUCK Grant Agreement)
DSO	Distribution System Operator
DT	Digital Twin
eTruck	electric Truck (battery truck in NextETRUCK)
HDV	Heavy Duty Vehicle
ICE	Internal combustion engine
IRU	International Road Transport Union
IST	Istanbul
KPI	Key Performance Indicator
LeMesurier	2Zero -Coordination & Support Action project. Full title: Measuring the value of the Key Performance Indicators of the 2ZERO Partnership
LEZ	Low Emission Zone
LL	Living Lab
LTZ	Limited Traffic Zone
KPI	Key Performance Indicators
NGO	Non-Governmental Organisation
OEM	Original Equipment Manufacturer
OTA update	over-the-air update
SULP	Sustainable Urban Logistics Plan
SUMP	Sustainable Urban Mobility Plan
TCO	Total Cost of Ownership
TSO	Transmission System Operator
UC	Use Case
UTR	Utrecht
WP	Work Package
ZEV	Zero Emission Vehicle
ZEZ	Zero Emission Zone

EXECUTIVE SUMMARY

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

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

NextETRUCK will conduct six Months demonstrations in Istanbul, Barcelona, and in the United Kingdom.

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

This deliverable is key for setting-up the demonstration phase and the successful collection of data to be used for assessing project objectives. The demonstration plan presents:

- the revision by IRIZAR, FORD & DAF, of their respective use case and the permission process for their demonstration vehicle to run on public roads. As a result, TEVVA will not be able to run on The Netherlands roads, so they are redefining their demonstration in the London area. TEVVA have subsequently been replaced by DAF, for a use case in the UK. These Use Cases are:
    - Use case 1: Distribution Logistics in Istanbul. Ford Otosan will operate their demo truck in Turkey transporting parts between two manufacturing plants
    - Use case 2: Voluminous waste collection in Barcelona. A refuse truck from IRIZAR in Barcelona will be operated by a waste collection & recycle company
    - Use case 3: Back-to-base logistics in the UK. "Back to base" logistics vehicle manufactured by DAF will be operated by a logistic company (Turners of Soham) in a single shift per day planning, from 2 different depots (Matthew Kibbles Transport and Jack Richards & Sons). This Use Case was still under development as TEVVA entered into Administration and were replaced by DAF.
- KPIs to be measured and the corresponding data requirements
- Demonstration planning elements, including the vehicle baseline definition, the process for data collection and management, and the time-plan for each test site
- Demonstration assessment questionnaire for drivers as well as for fleet managers

This deliverable will be used by all demonstration site responsible as well as innovation developer to make sure that all data to be collected can be collected and use by WP8 "Evaluation, Impact assessment and upscaling strategy,

1 INTRODUCTION

1.1 PROJECT INTRODUCTION

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

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

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

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

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

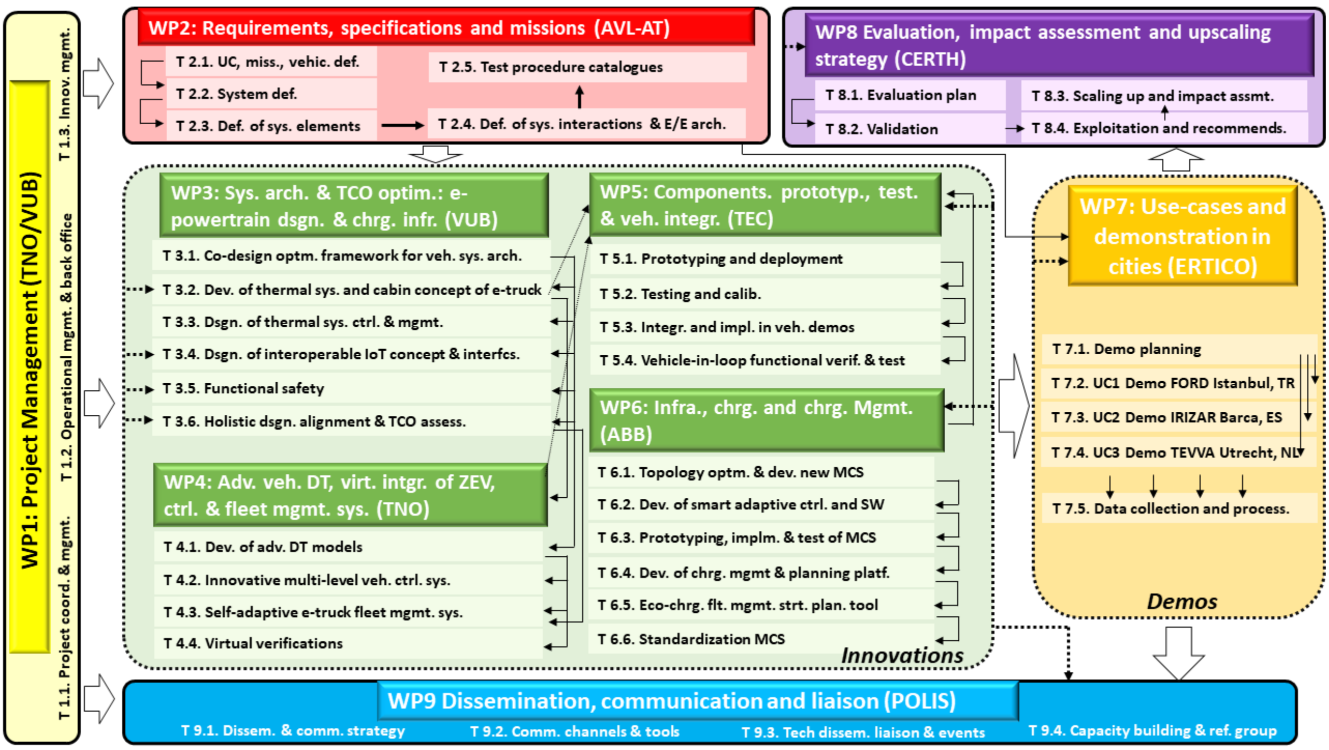


Figure 1: NextETRUCK WP structure and organisation.

1.2 PURPOSE OF THE DELIVERABLE

This deliverable is the first document of WP7 " Use cases and demonstrations " which objectives are to

- develop the demonstration plan for each Use Case and pilot city and region (T7.1).
- demonstrate the use cases defined in T2.1 to ascertain the functionality and performance of the e-trucks in real world conditions, with at least 200 km average daily operation over a period of at least 6 months (T7.2-7.4).
- set data requirements (related to KPIs), formats and undertake data collection and processing according to the Evaluation plan (T8.1). (T7.1 & T7.5)
- carry out the data analysis." (T7.5)

WP7 is the demonstration Work Package which must ensure that all KPIs defined to measure the objectives of the project can be computed with the data collected during the six Months demonstration of the vehicle prototypes developed by NextETRUCK.

Figure 2 presents the different steps from the objectives to the evaluation in which the demonstration phase takes place. NextETRUCK KPIs are defined with the objectives of the project and are also related to the impact section of the DoA. In Task 8.1, developing the evaluation plan, all KPIs were defined in detail with the corresponding mathematical equation and the necessary data to be collected leading to data requirements reported in D8.1. The evaluation plan will be the basis to perform the Evaluation in WP8 but is also used for its KPIs definition for the Demonstration plan, which will as a first step update the Use Case definition proposed in D2.1 earlier in the project. This plan will ensure that all demonstration sites will collect the data necessary for the computation of the KPIs. This will be tested during a two Months ramp-up phase before the six Months demonstration phase.

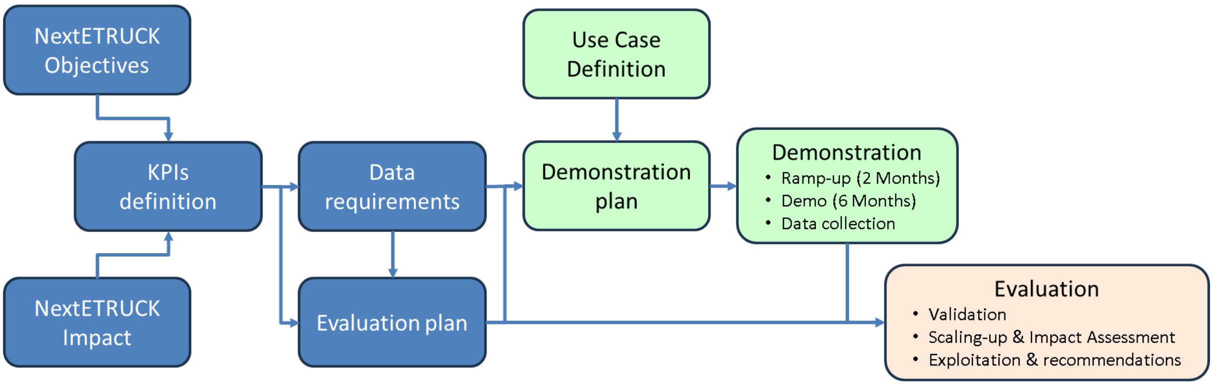


Figure 2: From objectives to evaluation.

Deliverable 7.1 reports on the preparation of the demonstration phase developed in Task 7.1: Demonstration planning, procedures, ramp-up and pilot (M12-M32).

The demonstration plan is agreed by all partners involved in the demonstration phase and will be used as basis for the demonstration phase as well as input for the Evaluation phase (WP8). Partners' contribution in Task 7.1 are summarised in Table 1 hereafter.

Table 1. Partner contribution in the task.

Who:	Role:	T7.1
ERTICO	As Task leader of T7.1 & T2.1 will ensure well defined Use cases and data definition with T8.1;	Lead
IRIZAR	Liaison with use case organisation and on-site technical support	✓
FORD	Liaison with use case organisation and on-site technical support	✓
DAF	Liaison with use case organisation and on-site technical support	✓
CERTH	Contribute to the demos requirements specification and set up as well as to the preparation of the means of data collection (e.g. questionnaires);	✓
NNG	Implementing the generic eco-routing concept;	✓
ABB	Provides and deploys charge management system developed in T6.4	✓
VUB	Work closely with OEMs in e-powertrain innovation deployments	✓
TEC	will support the planning of the IRIZAR UC	✓
TNO	Implementing the fleet management tool	✓

CENNEX-UK as T7.5 leader for Data collection and processing, was also involved in T7.1.

1.3 DELIVERABLE STRUCTURE AND RELATION WITH OTHER WORK PACKAGES/DELIVERABLES

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

- Section 2 revise the IRIZAR, FORD & DAF use cases defined in Task 2.1
- Section 3 present the KPIs to be measured and the corresponding data requirements
- Section 4 present the demonstration planning elements including the necessary permission requirements for each demo truck to be driven on the demo site.
- Section 5 list the potential risks associated to the demonstration and the possible mitigation
- a short conclusion finalises this document

Finally, a first Annex present the questionnaires' template to be filled by the drivers and the fleet managers during the demonstration, a second annex present a daily dairy (log book) to be filled by drivers.

This deliverable was built on inputs from T2.1 and T8.1. It will be used by all development WPs to ensure that all data required for KPIs computation will be implemented in each vehicle prototype.
This is also a living document that will be adapted, if necessary, during the development phase. In particular as DAF Truck just entered in administration when finalising this deliverable.

2 USE CASES UPDATE

This chapter is an update of the preliminary description of all Use cases reported in D2.1. NextETRUCK will implement the following three Use Cases (UCx):

Figure 3: OEMs eTrucks' illustration

- <u>**Use case 1**</u>: Distribution Logistics in Istanbul
  Ford Otosan will operate their demo truck in Turkey transporting parts between two manufacturing plants

- <u>**Use case 2**</u>: Voluminous waste collection in Barcelona
  A refuse truck from **IRIZAR** in Barcelona will be operated by a waste collection & recycle company

- <u>**Use case 3**</u>: Back-to-base logistics in UK
  "Back to base" logistics vehicle manufactured by **DAF** will be operated by a logistic company in a single shift per day planning. This Use Case was still under development as DAF had to move his demo site from Utrecht (NL) to the UK. .

2.1 USE CASE #1: ISTANBUL

The following objectives have been set for the Use case in Istanbul and is harmonised with the other Use cases objectives.

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

#	Specific Objective	Baseline	Target
#1	**10% improvement in overall efficiency**		
IST	10% improvement in overall efficiency	0,95 kWh/km energy consumption	0,86 kWh/km energy consumption
#2	**Demonstrate at least 200 km average daily operation in real conditions over a period of at least 6 months**		
IST	Demonstrate at least 200 km average daily operation in real conditions over a period of at least 6 months	Existing intercity and urban route of ICE truck.	Same 200 km daily testing with electric Truck in real world.

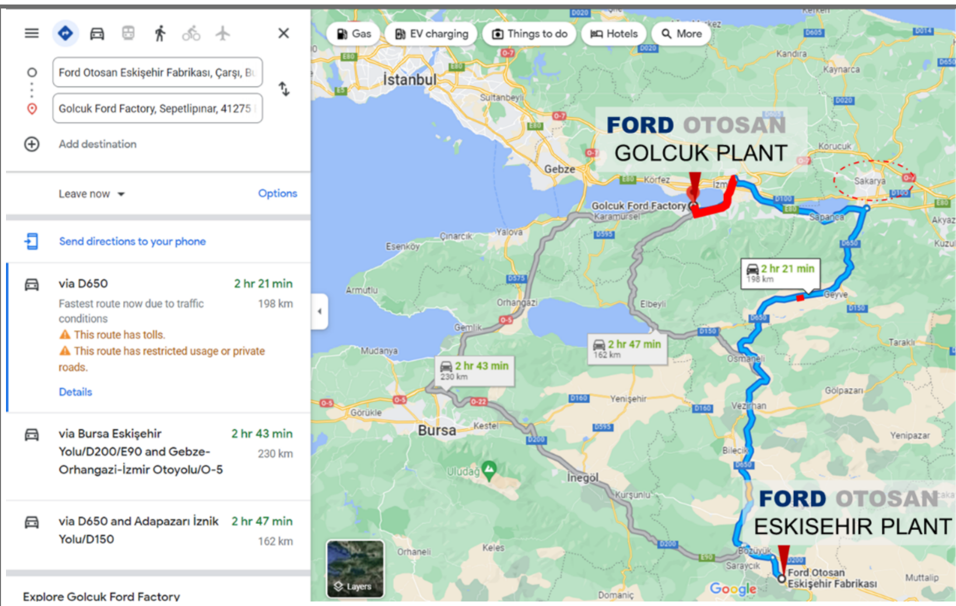
#	Specific Objective	Baseline	Target
#3	**90% Payload capacity**		
IST	90% Payload capacity:	16T BEV Trucks in the market.	Almost 9% reduction in Curb weight regarding FO BEV Truck keeping the 90% payload capacity of the ICE truck
#4	**Chassis development & integration of Next gen power electronic**		
IST	Development of lightweight chassis and integration of electric powertrain components	Chassis design based on ICE powertrain.	Lightweight and modular chassis based on electrical powertrain systems.
#5	**Digital twin**		
IST	Digital twin will be developed to assess vehicle performance at different cycles	Not Available	Vehicle system model
#6	**Fast charging, battery control & energy management**		
IST	DC fast charging	Existing BEV charging concept: AC and DC charging	DC only charging concept with 40% increased charging power.
ABB	Charge planning & management (for all test site, TBC)	Charging starts when plugged in, full power until fully charged	Scheduled charging for minimized energy/power cost, based on planned trips

The table hereafter presents the main characteristics and associated mission of the Use Case in Istanbul.

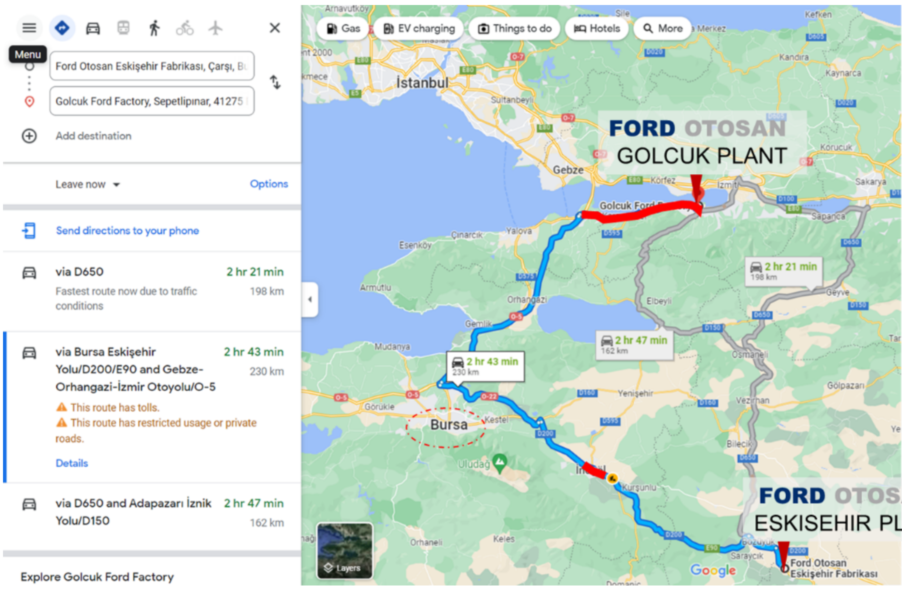
Table 3. Istanbul (IST) Use Case description.

Use case (UC) title	**Distribution Logistics**
Demo site location where the UC will be implemented	Turkey
Addressed challenge(s)	Development of lightweight and modular electrical born platform for N3 type trucks that is not in the current product portfolio of Ford trucks.
Mission description % among all mission	Demonstrate at least 200 km average daily operation between Eskisehir and Golcuk plants where we can demonstrate intercity and urban transport scenarios. This mission represents 100% of ICE truck usage.
Charging requirements	DC overnight charging is required for every cycle.

Charging infrastructure	JEMA CCS2 DC charging (180KW DC)
Charge management	Cloud-based software solution for charge planning and shifts scheduling. PANION solution collects data from the available telemetry providers and on-site chargers to calculate the charge opportunity windows and prepare most suitable charging plans with awareness of additional external constraints and insights like electricity prices, or available power capacity. Then the software supervises execution of the charge plan and aligns dynamically it in case of any changes. In this particular case, PANION will provide a solution that will optimize the charge times and introduce charge planning allowing the truck to perform more operations than with just an overnight charging approach. This will lead to reduced TCO for a comparable base case by reducing infrastructure cost (less trucks and chargers needed for same amount of trips) and energy cost (in case of time variable energy cost).
Innovations	• [INO-1 and INO-4] An improved thermal management model will be created and used in the UC1 truck. • [INO-2] Digital twins will be designed at different levels. • [INO-3] Efficiency increases of the truck using advantage of electric powertrain-based lightweight and modular platform that led to payload increase compared to current ICE trucks, and reduction of TCO (Total Cost of Ownership) as well. • [INO-4] DC overnight charging infrastructure and strategy will be designed. Daily charge option could be studied if use case includes multiple trips in one day.
Partners involved and roles OEM: Vehicle operator: Charging system supplier: Charge management SW supplier: Thermal system concept and control:	 FORD OTOSAN FORD OTOSAN JEMA ABB (PANION) AVL-D
Use Case Route Options	**Route #1** is between FORD Otosan Golcuk and Eskisehir plants. This route includes 10% urban roads and 90% is intercity road. Route length is 198 km. Map link: https://goo.gl/maps/xBAGfzoyJ5ZxWeyb9

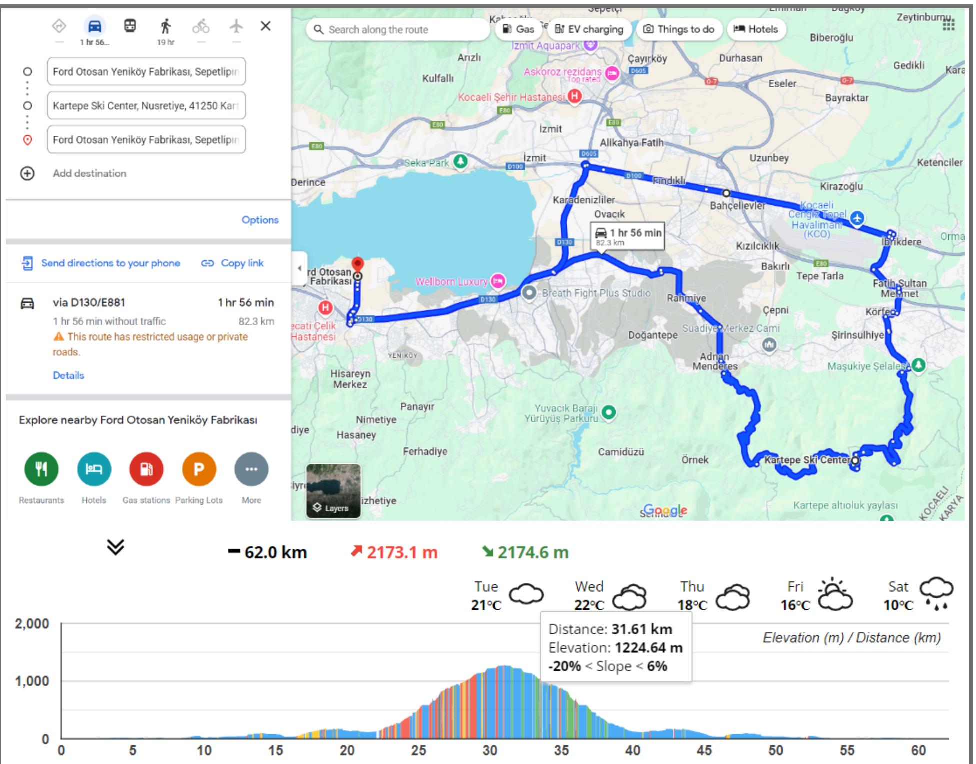


Route #2 is between FORD Otosan Golcuk and Eskisehir plants. This route includes 15% urban roads and 85% is intercity road. Route length is 230 km. Map link: https://goo.gl/maps/r7n5z8dskyvRNbDaA



Following the reviewer proposal at the first periodic meeting a third route is proposed.

Route #3 involves travelling from the Ford Otosan Gölcük Factory to the Kartepe Ski Resort and back. This route will be used 20% of the time during the entire demo. The purpose of this route is to collect data on vehicle performance in extreme cold weather conditions and high altitude. The route itself is 82 kilometres long. To achieve a total distance of 200 kilometres, the route will be completed multiple times throughout the day.



Map link: https://maps.app.goo.gl/Sw8DWXKPz1Zfqigi9

Route #4 will be used for internal homologation processes. One lap around the track is approximately 1.2 km. During internal testing, 200 km will be driven daily before the vehicle is taken onto public roads. Throughout this period, internal tests will be conducted to ensure the vehicle can safely operate on public roads. The track is mostly flat, with no significant inclines.

2.2 USE CASE #2: BARCELONA

The following objectives have been set for the Use case in Barcelona and is harmonised with the other Use cases objectives.

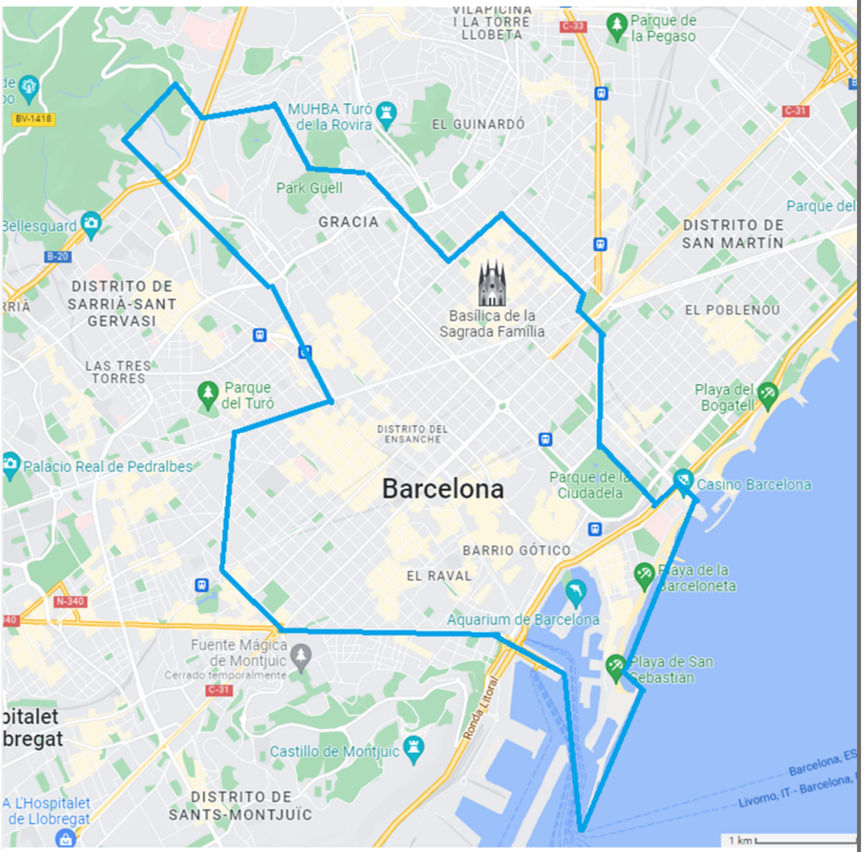
Table 4. Harmonisation of Use Case objectives, baseline & target for demo site Barcelona (BAR).

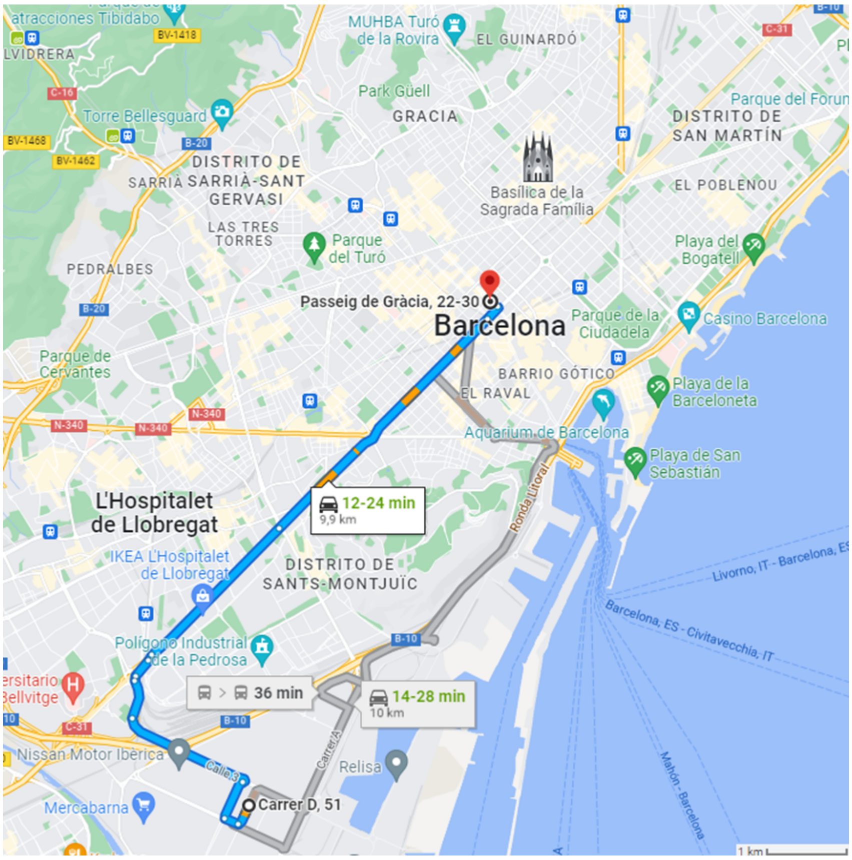
#	Specific Objective	Baseline	Target
#1	**10% improvement in overall efficiency**		
BAR	10% improvement in overall efficiency	Existing IRIZAR HD BEV truck	10% overall system efficiency improvement
#2	**Demonstrate at least 200 km average daily operation in real conditions over a period of at least 6 months**		
BAR	200km electric range scalability demonstration	Existing urban ICE truck route	Perform the requested route considering the typical urban ICE truck
#3	**90% Payload capacity**		
BAR	90% Payload capacity:	Existing HD BEV truck platform (20t)	Less than 10% reduction
#4	**Chassis development & integration of Next gen power electronic**		
BAR	Development and integration of next gen. WBG-based power electronics (traction, auxiliaries, charger)	Existing IRIZAR i.e. (IRIZAR Electric) truck	Electric powertrain and auxiliaries efficiency improvement
#5	**Digital twin**		
BAR	Develop and validate tools for zero tailpipe emission vehicles integration in fleets (and mixed fleets) for efficient assignment of tasks Scalability through digital twin demonstration and connectivity approach for fleet management (tracking, mission profiles, charge management, maintenance management based on internal diagnosis)	Not available	Vehicle system model
#6	**Fast charging, battery control & energy management**		
BAR	Fast Charging / opportunity charging	Overnight BEV charging CCS2	Overnight BEV charging – CCS2 fast charge
ABB	Charge planning & management	Charging starts when plugged in, full power until fully charged	Charging every day until fully charged

The table hereafter presents the main characteristics and associated mission of the Use Case in Barcelona.

Table 5. Barcelona (BAR) Use Case description.

Use case (UC) title	**Voluminous waste collection**
Demo site location where the UC will be implemented	Barcelona (Spain)
Addressed challenge(s)	90% ICE truck payload with a range >200km
Mission description % among all mission	Large dimension waste collection (furniture, electronic devices, etc.). It is not a repetitive route, as it is on demand service. It could be that the route does not reach 200km, depending on the demand.
Charging requirements	DC overnight charging
Charging infrastructure	JEMA CCS2 DC charging (180KW DC)
Charge management	Cloud-based software solution for charge planning and shifts scheduling. PANION solution collects data from the available telemetry providers and on-site chargers to calculate the charge opportunity windows and prepare most suitable charging plans with awareness of additional external constraints and insights like electricity prices, or available power capacity. Then the software supervises execution of the charge plan and aligns dynamically it in case of any changes. PANION software can support this use case by direct, live supervision of the operations during shift and calculation of appropriate charging plans in real time, to ensure vehicle operability during the next shift. The main benefit will be the intensification of the operations in difficult to predict conditions and thus lowering the cost of ownership for a particular electric vehicle.
Innovation	• [INO-1 and INO-4] An improved thermal management model will be created and used in the UC2 truck. • [INO-2] Digital twins will be designed at different levels. • [INO-3] Demonstration of ZEV truck with 90% payload compared to existing diesel vehicle at equivalent Total Cost of Ownership Efficiency increases of the truck using advantage of electric powertrain-based lightweight and modular platform that led to payload increase compared to current ICE trucks, and reduction of TCO (Total Cost of Ownership) as well. Improved thermal management of the vehicle cabin • [INO-4] DC overnight charging infrastructure and strategy will be designed i.e. Charging every day until full when the route is finished.

Partners involved and roles OEM: Vehicle operator: Charging system supplier: Charge management SW supplier:	 IRIZAR FCC (https://www.fcc.es/) JEMA ABB (PANION)
Use Case Route	The vehicle will operate in Barcelona in l'Example, Gracia and Ciutat Vella neighbourhood or areas. The route will depend on the daily demand. The vehicle will start the operation from the depot based in the south of the city every day. It will drive towards the mentioned areas with an approximated 10 km drive.  It will make a route of 10-20 voluminous goods pick up and will drive to the goods/waste treatment facilities. It can repeat this sequence for 4-5 times per journey.



2.3 USE CASE #3: UNITED KINGDOM

In D2.1, the foreseen demonstration site for the DAF demonstrator was in Utrecht, but as mentioned in section 4.1.3, TEVVA was not allowed to drive a demonstration ruck in the Netherlands. The Use case was therefore transferred to the UK by DAF , but still needs to be finalised. As mentioned above, DAF replaced TEVVA, due to TEVVA entering administration.

Nevertheless, the following objectives have been set for the Use case in the United Kingdom and is harmonised with the other Use cases objectives.

Table 6. Harmonisation of Use Case objectives, baseline & target for each demo site / OEM.

Use Case 3 Objectives

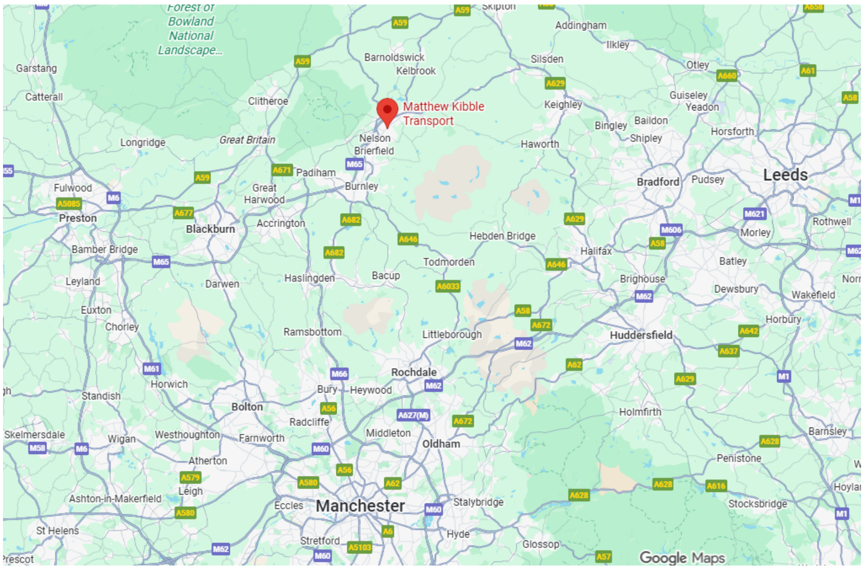
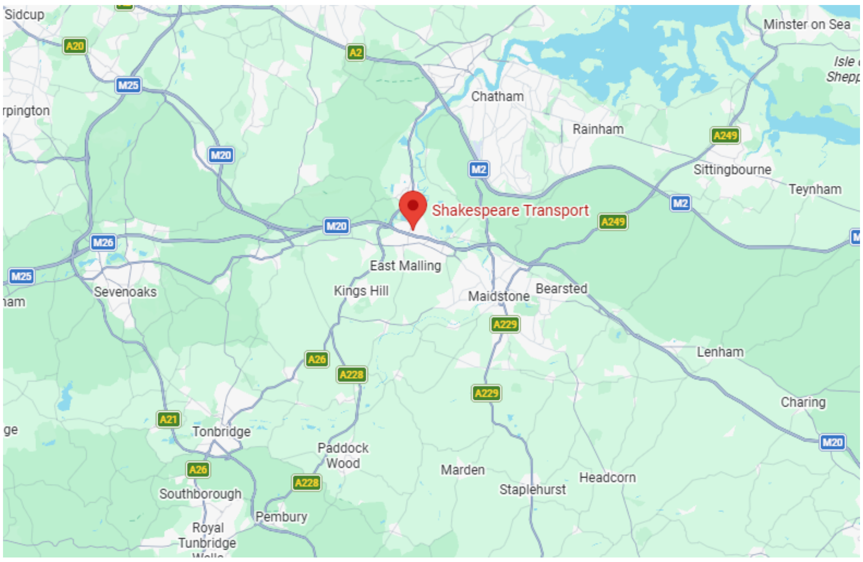
Table 6 United Kingdom use case objectives.

Specific objective	Baseline	Target
300km demonstrated range; driver variability	Baseline 19t vehicle	Improved range through driver variable
300km demonstrated range; weather variability	Baseline 19t vehicle	Improved range through improved weather conditions
300km demonstrated range; topography variability	Baseline 19t vehicle	Improved range through topography optimisation
300km demonstrated range; weight variability	Baseline 19t vehicle	Improved range through reduced weight

Digital twin; Route simulation	Route simulation estimated mileage of each operation	Real world range and efficiency metrics
Digital twin; Development of Charge Time est	Baseline vehicle	Improved charge time estimation
Proof-of-concept charge scheduling	Baseline vehicle	Improved charging schedule
TCO Monitoring	Baseline vehicle	Demonstrated Total Cost of Ownership improvement, and the biggest drivers of this
Demonstration of fast charging concepts; DC charging capability	AC charging	Demonstrated DC charging, showcasing impact on TCO and operating efficiency

Table 7. United Kingdom Use Case description.

Use case (UC) title	**Back-to-base logistics**
Demo site location where UC will be implemented	United Kingdom
Addressed challenge(s)	Zero emissions zone from 2025; displacement of current diesel truck fleet at affordable TCO
Mission description % among all mission	Transport logistics from a main depot to multi drop urban distribution, returning to main depot.; this is 100% representative of existing diesel use case
Charging requirements	DC charging required in first instance as truck returns to base each night
Charging infrastructure	PACMobile 40kW charger, PACCAR is the charger being used (mobile charger – Heliox OEM)
Charge management	• Not relevant
Innovation	• [INO-2] Digital twins will be designed at different levels. • [INO-3] Demonstration of ZEV truck with 90% payload compared to existing diesel vehicle at equivalent Total Cost of Ownership Efficiency increases of the truck using advantage of electric powertrain-based lightweight and modular platform that led to payload increase compared to current ICE trucks, and reduction of TCO (Total Cost of Ownership) as well. • [INO-4] DC overnight charging infrastructure and strategy will be designed. Daily charge option could be studied if use case includes multiple trips in one day. • **INO-5:** New business models for end-user increased acceptance and increased market uptake

Partners involved and roles OEM: Vehicle operator (fleet company: Charging system supplier: Charge management SW supplier	 DAF; vehicle supplier Agreement Pending Formalisation PACCAR is the charger being used (mobile charger – Heliox OEM) Not relevant
Vehicle Route	The vehicle will operate between from the 2 depots highlighted below, in the UK. The Proposed route will include a split of urban and rural driving. The total daily route length will vary based on demand but will average 200km. The area that the truck will operate in is highlighted below. Nelson depot  Maidstone depot 

3 KPIs AND DATA REQUIREMENTS

This chapter set the data requirements (related to KPIs) and formats (based on D8.1) to enable a harmonised data collection and processing in T7.5 for each of the UC:

3.1 KPIs TO BE MEASURED

The presented KPIs encompass both quantitative and qualitative measures, originating from predetermined assessments and expressed as percentages, indices, rates, or similar metrics. These indicators will undergo regular or irregular monitoring and are compared against specific criteria tailored to the field of study and intended objectives. To confirm initial assumptions in project development, it's crucial to employ appropriate evaluation criteria, which might include baselines, varied experimental conditions, absolute values, and more.

Within Table 8 lies a compilation of KPIs for appraising the performance of NextETRUCK systems across each UC. This compilation has undergone validation against the requisites detailed in D2.1, ensuring the comprehensive evaluation of all system-related impact requirements, utilizing indicators derived from WP2 and WP8.
The categorized KPIs, encompassing e-Truck (ET), Charging Infrastructure/Efficiency (CI), and User Acceptance (UA), have been arranged. The listed KPIs specifically relate to real-life demonstrations. Computation of these KPIs is provided in D8.1.

The new CSA, LeMesurier, will collect data from each 2Zero Horizon project to compute dedicated KPIs to assess the impact of the 2Zero partnership. To that end, the last seven KPIs (KPI-20 to KPI-26) included into the evaluation process are proposed from 2Zero partnership recommendations.

Table 8 List of KPIs and their link to the UC

KPI id	KPI title	UC id	Category classification
KPI-1a	Efficiency Increase & Payload Capacity Distance: *Driven per Absolut Energy Consumption*	All 3	ET
KPI-1b	Efficiency Increase & Payload Capacity Distance: *Load per mission*	1 & 3	ET
KPI-2	Thermal management system efficiency	All 3	ET
KPI-6a	TCO reduction of ZEV: *vs modern e-trucks*	All 3	UA
KPI-6b	TCO reduction of ZEV: *parity with ICE 2020 trucks*	All 3	UA
KPI-7	Charger efficiency	All 3	ET, CI
KPI-8	Vehicle thermal efficiency	All 3	ET
KPI-10	TCO reduction of charging	All 3	UA
KPI-12a	Charging experience: *user perspective*	All 3	UA
KPI-13a	Realisation of UC1: *200 km per day*	1	ET
KPI-13b	Realisation of UC1: *vehicles meet user needs*	1	UA
KPI-14a	Realisation of UC2: *200 km per day*	2	ET

KPI id	KPI title	UC id	Category classification
KPI-14b	Realisation of UC2: *vehicles meet user needs*	2	UA
KPI-15a	Realisation of UC3: *200 km per day*	3	ET
KPI-15b	Realisation of UC3: *vehicles meet user needs*	3	UA
KPI-18	The NextETRUCK overall system is compatible with the driving/mission tasks	All 3	UA
KPI-19	High usability of the NextETRUCK overall system	All 3	UA
KPI-20	Reduction in operational CO_2 emission	All 3	ET, 2ZERO
KPI-21	Operating hours	All 3	ET, 2ZERO
KPI-22	Charging rate	All 3	ET, CI, 2ZERO
KPI-23	Charging time	All 3	ET, CI, 2ZERO
KPI-24	Driving to charging time	All 3	ET, CI, 2ZERO
KPI-25	Average driving speed	1 & 3	ET, 2ZERO
KPI-26	Charging cost per km	All 3	ET, CI, 2ZERO

3.2 DATA REQUIREMENTS

The computation of the KPIs necessitates a comprehensive approach to ensure accurate and relevant data. During the baseline and demonstration phase, it is crucial to gather data that meets specific requirements, enabling a thorough analysis of the electric trucks' performance. This involves leveraging insights from D8.1, which confirms that OEMs can measure and collect the necessary data for computing each KPI, including those defined by the 2Zero initiative. Additionally, D2.5 outlines all required data signals that must be provided, ensuring that no critical data points are overlooked.

To facilitate the KPI computation, any missing data from D2.5 must be identified and incorporated. Ensuring completeness and precision in the data collected is vital for a robust evaluation of the vehicles' performance. Below is a detailed table summarizing the specific parameters, their sources, and their link with the KPIs in D8.1. This table contains the following columns:

- **Input signal or Data name**: This column lists various parameters that need to be measured. These parameters are essential for calculating the KPIs and could include metrics such as energy consumption, range, charging time, maintenance costs, and more.
- **Data Source**: This indicates the origin of the data for each parameter. It could be collected e.g. directly from the electric trucks' onboard systems, through external sensors, or provided by the OEMs, the driver, the fleet operator.

- **Unit**: Each parameter has a specific unit of measurement, such as kWh/km for energy consumption, km for range, and min for charging time.
- **KPI id**: There are as many columns as the number of KPIs to be computed. Each KPI is linked to the data needed for the computation. Note: in blue are the KPIs referring to the realisation of the Digital tools/ DT models.

Table 9 Data computation parameters: table linking defined data signal (D2.5) with KPIs (D8.1)

Data source	Input signal or Data name	unit	KPI 1	KPI 2	KPI 8	KPI 13	KPI 14	KPI 15	KPI 20	KPI 21	KPI 25	KPI 7	KPI 22	KPI 23	KPI 24	KPI 26	KPI 3	KPI 4	KPI 5	KPI 9	KPI 11	KPI 12	KPI 6	KPI 10	KPI 19
V	HV battery Current i(t)	A	x	x	x	x	x	x										x			x				x
V	HV battery Voltage u(t)	V	x	x	x	x	x	x										x			x				x
V	Power Vehicle	kW	x	x	x	x	x	x										x			x				x
V	E-Motor Power use	kW	x	x	x	x	x	x										x		x					x
V	Battery Power use	kW	x	x	x	x	x	x										x		x	x				x
V	Energy consumption / Absolute energy consumption E (t)	kWh	x	x	x	x	x	x										x			x				x
V	Distance	km	x	x	x	x	x	x								x		x							x
V	Energy consumption	kWh/km	x			x	x	x										x							x
V	Battery SoC	%				x	x	x					x		x										
V	Vehicle average speed	km/h									x							x			x				
V	Temperature (inside cabin) T(t)	°C		x	x																				
V	Temperature (set temp. inside cabin) T(t)	°C		x	x																				
V	Driving range with thermal eff.	km		x	x																				
V	Driving range without thermal eff.	km		x	x																				
V	Heating elements current i(t)	A		x	x																				
V	Heating elements voltage u(t)	V		x	x																				
V	Heating elements Electric power p(t)	W		x	x																				
V	Heating elements Electric energy E(t)	Wh		x	x																				
V	Truck charging time	min								x	x		x	x	x			x			x				
V	Driving time	min												x											
V	Truck ON(Ready to drive) time	min												x											
Ch/V	Charger Current, Current from the charge i(t)	A	x	x		x	x	x		x		x											x	x	x
Ch/V	Charger Voltage, Voltage from the charge u(t)	V	x	x		x	x	x		x		x											x	x	x
Ch/V	Charger Power, Power from the charge p(t)	kW	x	x		x	x	x		x		x	x		x								x	x	x
Ch/V	Charger Energy, Energy from the charge	kWh	x	x		x	x	x		x		x									x		x	x	x
Ch	Charger, Current to the charge i(t)	A										x											x	x	x
Ch	Charger, Voltage to the charge u(t)	V										x											x	x	x
Ch	Charger, Power to the charge p(t)	kW										x											x	x	x
Ch	Charger, Energy to the charger	kWh										x											x	x	x
Ch	Charge efficiency	%																					x	x	x
Ch	Energy cost at the charger	€/kWh																					x	x	x
V/F	Load /Payload	kg	x	x	x	x	x	x	x		x					x									
F	Annual charger maintenance cost per UC	€/year																					x	x	x
F	Annual operational energy demand per UC	kWh/year																					x	x	x
F	Vehicle maintenance breaks	hours																x			x				
F	Operational hours per day [OHpD]	h/day							x																
F	Total operating time/day	hours							x																
F	Charging stops	No.									x							x			x				
F	Number of stops	No.									x														
F	Managed recharge/refuel unit cost per UC	€/kWh																					x	x	
F	Managed charging	kWh																				x			
F	Unmanaged charging	kWh																				x			
F	Operational cost	€																x			x				

4 DEMONSTRATION PLANNING ELEMENTS

This section presents key components such as permission requirements, baseline definition, data collection processes, and the orchestration of the demonstration protocol. The baseline and demonstration phase have been scheduled through an analytic time plan for optimal data acquisition. Furthermore, the formulation of questionnaires tailored to drivers and fleet managers were necessary for ensuring a comprehensive understanding of their experiential insights.

4.1 PERMISSION REQUIREMENT AND IMPLEMENTATION

To ensure a successful demonstration phase, each OEM must guarantee that their prototype vehicle can operate on the demo site throughout the entire duration of the demonstration. The following subsections provide a status update on the permissions for each OEM demo vehicle.

4.1.1 Istanbul

Homologation or permission requirements to run the demo on public roads for eTrucks and charging station was addressed. Result of this investigation is:

- Vehicle can be run on the public roads dummy load but commercial load.

Steps for obtaining the permission for the trial:

- Contacted with authorities to run the vehicle with commercial loads.
- No approval got from the authorities yet. In case of not getting approval, dummy loads to be carried are defined according to the required payload.
- If the permission is got until the demo start date, rear axle assembly parts will be carried between Golcuk and Eskisehir plants.

Ford Otosan is currently checking the possibility to carry real part between their factory plants. If not granted, as an alternative solution ballast will be transported to fulfil project requirements.

4.1.2 Barcelona

Homologation or permission requirements to run the demo on public roads for eTrucks and charging station was addressed. Result of this investigation are:

- Homologation is required in Spain.
- An inspection and approval from a verified laboratory must be granted to get the homologation.

Steps for obtaining the permission for the trial:

- Prepare the vehicle with the changes and pass the test for homologation (EU type)
- The demo vehicle will need to comply with the following homologations:
  - Batteries (R10, R100)
  - Tractor system (R10, R85)
  - HVAC- BTMS (Clima) (R122)
  - Mass and dimensions: 97/27/CE
  - Braking: 71/320/CEE

Each homologation will be verified by an approved laboratory that certifies that the vehicle is suitable for circulation.

IRIZAR is applying for a European homologation of their vehicle.

4.1.3 United Kingdom

With the bankruptcy of TEVVA, the test site will take place in UK with DAF replacing TEVVA in the consortium.
The DAF vehicle is Whole Vehicle Type Approved, and fully eligible for roadworthiness in the United Kingdom.

4.2 BASELINE DEFINITION AND DATA COLLECTION

Baseline data refers to the initial set of measurements and observations collected as a reference point for evaluating and comparing the performance of project introduced technologies. This data serves as a benchmark against which subsequent measurements and evaluations are compared to assess each vehicle's performance improvements or deviations.

Accurate and reliable baseline data is crucial for ensuring the validity and effectiveness of subsequent validation processes, as it forms the foundation for the performance assessments. In NextETRUCK two sets of baseline data will be used: one concerning the performance of similar ICE trucks and the other of the most resent medium size e-trucks. For the ICE and e-truck baseline data, FORD and IRIZAR will provide reference values from their current models on the market.

Several of the KPIs are to demonstrate direct improvements in the performance and efficiency attained by the demonstration vehicles over the baseline, so the baseline data should contain comparable signals to the demonstration data.

The exact method of collecting this telemetry data is to be determined, however there is no plan to install dedicated loggers for the baseline data collection. If there are existing telematics systems which collect this data, CENEX will interface with these systems to collect the existing data.

The data will be collected and stored on CENEX's data processing workstation which is physically located in CENEX's UK office. This data will then be automatically processed to produce summary aggregate data which can be used to produce reports.

Further details of the data processing methodology are in section 4.3.2 Process for data collection and management.

The following sub-sections present for each OEM the specification of both baseline and NextETRUCK vehicles.

4.2.1 FORD truck

FORD has a BEV vehicle that will be used as baseline vehicle to run tests during Q2/2024.

FORD	Parameters	Baseline truck Value	NextETRUCK Value	Unit
Overall	Truck Type	BEV Rigid	BEV Rigid	n.a.
	Powertrain type	Central drive	E-Axle	n.a.
	Range	250	250	km
	Top speed	90	90	km/h
	Energy consumption	0.95	0.86	kWh/km
	Gross Trailer Weight	18	16	ton
	Wheel configuration	4x2	4x2	n.a.
Powertrain	Battery installed	295	295	kWh
	Electric motor (Continuous power)	210 (PMSM)	210	kW
	Induction motor/ or permanent magnets motor?			
	Gear ratio	3-Speed Gear Box	3-Speed Gear Box	n.a.
	Charging power/ time	20-AC-10h 125-DC-3h	180-DC-2h	kW/AC DC/hours

4.2.2 IRIZAR truck

IRIZAR has currently a 20t BEV truck which will be used as the baseline truck.

The NextETRUCK developed by IRIZAR will be an upgrade of the baseline Truck with their proposed innovations.

The baseline truck and NextETRUCK from IRIZAR, have the following specification:

IRIZAR	Parameters	Baseline truck Value	NextETRUCK Value	Unit
Overall	Truck Type	BEV Rigid	BEV Rigid	n.a.
	Powertrain type	Central drive	Central drive	n.a.
	Range	100-120	300	km
	Top speed	90	90	km/h
	Energy consumption	1.3	1.0	kWh/km
	Gross Trailer Weight	20	20	ton
	Wheel configuration	4x2	4x2	n.a.

Powertrain	Battery installed	170	307	kWh
	Electric motor (Continuous power)	Permanent magnets motor 230	Permanent magnets motor 230	kW
	Induction motor/ or permanent magnets motor?			
	Gear ratio of 2-speed gear box	NO GEAR BOX	NO GEAR BOX	n.a.
	Charging power/ time	50-DC-3h	180-DC-2h	kW/ AC DC/hours

The NextETRUCK of IRIZAR will implement the following changes:

Changes from baseline	
HVAC - BTMS	New solution that introduces an improvement unifying both systems
HV Batteries	Replace GEN2 batteries with GEN3 ones that make it possible to increase the energy densities and efficiency of the system (mechanical, thermal, and electrical improvements), thus lowering their weight and consumption
Digital twin integration	An IoT device and new HMI with cloud connectivity that interacts with the BTMS will be integrated to improve the thermal efficiency of the cooling system

Baseline truck will record data with a datalogger installed in the vehicle. This data will be uploaded to IRIZAR servers in order to study the different data necessary to compute the requested KPIs. After the baseline truck has been modified for the NextETRUCK project, this datalogger will be used to record the same information, and in addition, the system provided by Tecnalia will be installed on the truck to collect the data.

4.2.3 DAF truck

The Baseline vehicle is the DAF electric LF 19t BEV rigid truck with the following specifications: Demonstrator vehicle will be the DAF electric XB 19t BEV rigid truck.

DAF	Parameters	Baseline truck Value	Next ETRUCK Value	Unit
Overall	Truck Type	BEV Rigid	BEV Rigid	n.a.
	Powertrain type	Central drive	Central drive	n.a.
	Range	300	300	km
	Top speed	56	56	mph
	Energy Consumption	TBC	TBC	km/kWh
	Gross Vehicle Weight	19	19	ton
	Wheel configuration	4X2	4X2	n.a.

Powertrain	Battery	282	282	kWh
	Electric Motor (Maximum Power)	260	190	kW
	90% Charging power/time - AC Type 2	22kW AC / 10h	22kW AC / 10h	kW/ AC DC/hours

4.3 DEMONSTRATION PROTOCOL

4.3.1 Demonstration operation description

This section shortly describes how the demonstration phase will be operated in general on a daily basis. From section 4.1, we know that each of the prototype vehicle will be authorised to operate during 6 Months on the define demonstration site. Each of the vehicle will be driven by selected drivers under the responsibility of the respective eTruck OEM.

Drivers will be selected by each OEMs following their own selection process and will be educated on how to drive the vehicle.

Before the start of demonstration phase, it is planned to have a two Month ramp-up period starting January 2025 to check and test all aspects of the demonstration and the Use case, in order to make sure that the first day of the demonstration phase in March 2025 everything will be ready.

Daily operations will follow a general mission schedule as presented in the table below that may be adapted to the specificities of the related Use Case:

Mission preparation	• eTruck prepared and loaded, check charging state, etc., data collection check • Driver education if necessary (new driver)
Mission operation	• eTruck operated according to the Use Case and mission • Data collection
Mission finalisation	• Data upload to the data centre • Driver debriefing • Driver to report in the Daily dairy (see section 4.5)

At the end of the demonstration period, each driver and fleet manager will be asked to answer the following questionnaires (see the related sections):

- Questionnaire for the Vehicle driver (4.4.1)
- Questionnaire for the HMI (4.4.2)
- Questionnaire for the Fleet managers (4.4.3)

As soon as the demonstration starts, the data collection will take place and already after one or two weeks first exploitation of the data will be performed to compute the KPIs. This computation will then converge towards its final value as more and more data are collected.

The following table summarise per Demonstration site the global operations' parameters, it will be updated when we will approach the demonstration ramp-up period:

	IST	BAR	UK
#of drivers	1	1	1
Driver profile			
• # men / women	Men	x / x	x / x
• Age category: <30 / 31-50 / >51	31-50	x / x / x	x / x / x
Time of operation (**M**orning, **A**fternoon, **W**hole day)	Working hours	Working hours	Working hours
Charging time (when charging is usually done?)	At Night	At Night	At Night
Charging duration in hours	TBC	TBC	TBC

4.3.2 Process for data collection and management

The primary objective of data collection is to assess the KPIs, which require a combination of subjective and objective data. The data will be collected through logged data and personal surveys. Subjective data will encompass factors such as driving load, interface with the system, effectiveness of information and stress generation. This subjective data will be collected through written surveys administered to test drivers before, during, and after the driving tasks.

Objective telemetry data will include background data, in-vehicle data and sensor data covering signal including the battery voltage and current, battery state of charge, vehicle speed and location, acceleration and braking rates, and battery charging power. The exact method of collecting this telemetry data is to be determined. If there are existing telematics systems which collect this data, CENEX will interface with these systems to collect the existing data. If no such system exists, then for the demonstration vehicles only, CENEX will configure CAN bus data loggers to collect and remotely transmit the data.

In either case, the raw data will be collected and stored on CENEX’s data processing workstation which is physically located in CENEX’s UK office. This data will then be automatically processed to produce summary aggregate data which can be used to produce reports.

Reported information consists of participants' opinions regarding the functionality of the systems. This data is crucial for evaluating the subjective KPIs. Typically, these measurements are obtained through questionnaires, rating scales, interviews, focus groups, or other similar methods. In addition to subjective assessments, reported measurements can also include data related to costs and revenues. These financial aspects may be collected by the driver or an operator during the test period, providing valuable insights into the economic implications of the system.

As part of the data collection process, CENEX will set up systems to detect missing data, faulty loggers and invalid data. These checks will comprise both systems already in place as part of our existing suit of data collection and processing software, and custom checks specific to this project. We will receive alerts if there is a problem so we can investigate and organise a solution to the issue.

Check we will perform, and actions taken include:

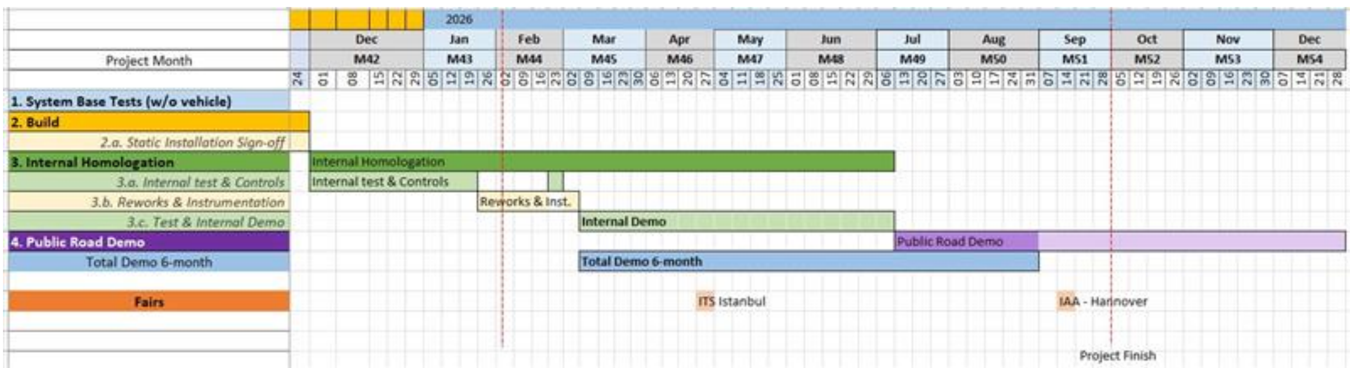
- Identifying patterns of usage and flagging if data has not been received for an unusually long time, which might indicate a non-functional logger. Action can be taken to verify a faulty logger (as opposed to the vehicle not being used, e.g. due to maintenance) and to repair or replace the logger as necessary.
- Ensuring that all signals are present and received at the expected rate. Any deviations may point to a faulty connection to a specific CAN bus, or a potential logger malfunction.
- Validating the values of data received to ensure they are within sensible limits. Telemetry systems often produce spurious data, e.g. a default very high or low value or an invalid identifier if a sensor or not working, that signal is not applicable at that time, or is simply producing junk data at the start or end of a session. Cenex's data processing pipeline identifies such invalid data and either automatically removes it or highlights it as suspicions so that such data does not find its way into the final analysis.

4.3.3 Time-plan challenge

This sub-section presents for each OEM his time-plan for both, the baseline truck and the NextETRUCK prototype vehicle.

Ford Otosan:

- Baseline vehicle: is ready for testing.
- Ramp-up for checking the Demo site: December 2025 – February 2026- (M42-M44).
- Demo vehicle will be run July-September 2026. (M49-M51). Internal tests are also planned March 2026 to June 2026 (M245-M48). Proper measurements can be taken during this time if it is necessary.



IRIZAR

- Baseline vehicle: the vehicle is already running as baseline. Data recording started December 2023.
- Start of changes: May 2024 - June 2025 (M23- M36), this period corresponds to the development phase with the modification of the Truck with the proposed innovations
- Ramp-up for checking the Demo site: July-September 2025 (M37-M39)
- Demo vehicle will be run: September 2025 - March 2026 (M39-M38)

DAF

- The demonstration vehicles were built in Q4 2025
- The demonstration will begin in February 2026 for 6 months

The overlap between WP7 demonstration phase and WP8 evaluation phase leads to a **timing challenge** as highlighted with a red circle in Figure 4

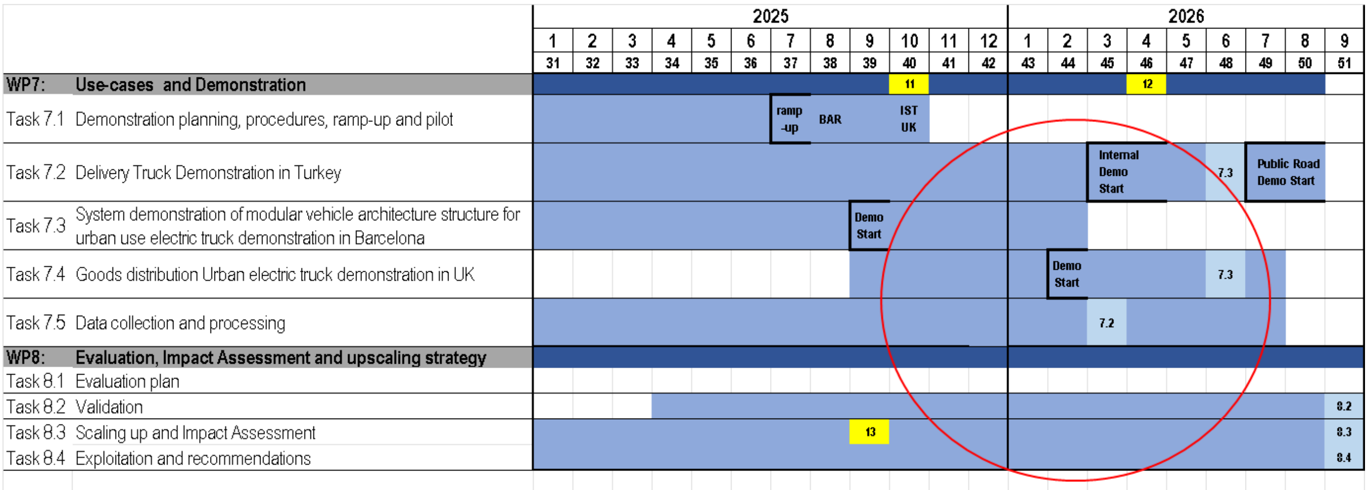


Figure 4: Demonstration time-plan challenge

This challenge will be addressed as follow:

- The two Months ramp-up phase will include data collection on each demonstration site which will already uploaded to the data server used for all NextETRUCK data. Computation of the KPIs will be tested in order to be ready at the beginning of the real demonstration phase.
- The demonstration phase will regularly upload data to the server and all KPIs will be computed on e.g. a weekly basis converging to the final value. At each of the iteration the evaluation process will take place and first results will be available also converging to the final results at the end of the project.

The set-up of such an iterative process will enable the NextETRUCK project to deliver its results ion time.

4.4 QUESTIONNAIRES TO THE DRIVERS AND THE FLEET MANAGERS

Self-reported assessments involve gathering subjective opinions and experiences from individuals using the provided systems (vehicles and chargers) or service. These measurements will be acquired through methods such as questionnaires, rating scales, interviews, or similar approaches. Typically, the reported data will be collected at various points, including before, during, and at the testing period's end. In studies related to vehicle performance, these assessments play a crucial role in evaluating aspects such as driver behaviour and user acceptance.

4.4.1 Questionnaire for the Vehicle driver

This feedback form is designed to collect comprehensive information from individuals who have tested the NextETRUCK vehicle. The form covers general information about the respondent, initial impressions, driving experience, technology and features, comfort and interior, and an overall impression of the vehicle. Respondents are prompted to rate various aspects on a scale of 1 to 10, such as the exterior and interior design, handling, acceleration and braking, drive comfort, technology features, and overall vehicle performance. The form also seeks opinions on the effectiveness of the vehicle's features, and suggestions for improvements or additional features. The overall goal is to gain insights into the driver's experience, preferences, and perceptions of the NextETRUCK truck, helping to assess its performance and identify areas for enhancement.

A draft version of the feedback form is presented in Annex A1.1.

4.4.2 Questionnaire for the HMI

The questionnaire consists of two parts: the System Usability Scale (SUS) and the DALI. Both questionnaires aim to gather insights into the usability and perceived constraints of the system being evaluated, providing feedback for improvements and enhancements.

System Usability Scale (SUS):
The System Usability Scale (SUS) is a questionnaire designed to assess the usability of a system. Respondents rate their agreement with a set of statements on a scale from 1 to 5, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree." The scale includes statements related to the system's complexity, ease of use, integration of functions, need for technical support, consistency, and overall confidence in using the system.

DALI Questionnaire:
The DALI questionnaire evaluates the constraints and difficulties experienced by participants during a driving task. Seven factors are considered, and respondents rate the level of constraint for each factor on a scale from 0 (low) to 5 (high) with respect to their usual driving task. These factors include global attention demand, visual demand, auditory demand, tactile demand, stress, temporal demand, and interference. Additionally, the questionnaire includes

specific questions about unnecessary notifications, the system's guidance during the driving task, and its perceived effectiveness in achieving energy reduction.

A draft version of the HMI evaluation questionnaire is presented in Annex A1.3.

4.4.3 Questionnaire for the Fleet managers

The survey aims to gather information and feedback about the NextETRUCK fleet management tool. It covers key areas such as general information about the company and its fleet, the current fleet management situation, user interface and experience, vehicle monitoring and maintenance, route optimization and planning, reporting and analytics, and overall satisfaction. Participants are asked to rate various aspects on a scale of 1 to 10 and provide additional comments or suggestions. The survey seeks to understand the user's experience with the tool and gather insights for improvement.

A draft version of the fleet manager questionnaire is presented in Annex A1.2.

4.5 DEMONSTRATION REPORTING: DAILY DIARY (LOGBOOK)

This record-keeping form captures detailed information about a specific mission or journey, focusing on various aspects related to the driver, vehicle, weather conditions, mission details, driver remarks, issues encountered, and additional comments. Key sections include driver information, vehicle details such as make, model, and VIN, weather conditions including temperature and road conditions, specifics about the mission's start and end locations, driver observations on performance and energy consumption, and a comprehensive section on issues related to the vehicle. The form provides a structured approach for recording critical and minor issues, any maintenance or repairs conducted, and additional comments from the driver. This systematic documentation aims to facilitate a thorough analysis of the mission and helps in addressing any concerns or improvements needed. The form will be used and validated by the test drivers during the ramp-up phase.

Please visit ANNEX 2 for a draft version of the diary form.

5 POTENTIAL RISKS AND MITIGATION

Beside the following risks identified in the DoA, this chapter list the issues identified by each OEM for the implementation of their use case.

Description of risk	*L	**S	WP(s) involved	Proposed risk-mitigation measures
Delay on the demo availability	H	M	**WP7**	Increase the effort and the alignment with WP5 to avoid unexpected delay.
Road tests to be enabled by permission from local authorities.	M	M	**WP7**	Demonstrator vehicles/components may not fully cover homologative requirements due to being test vehicles with TRL7-8 at testing time. T-Plate will be used for demonstrator with local authority permission on tests.

*__Level of Likelihood__ *to occur:* Low/Medium/High (L/M/H), **__Level of Severity__ (L/M/H)

5.1 USE CASE #1: ISTANBUL

Permission to carry automotive part with demo vehicle.

The original plan for UC1 included transporting commercial cargo, such as automotive parts, between production sites. However, a homologation process is required to carry any commercial loads, even for those transported by the OEMs themselves. Unfortunately, there is insufficient time to complete the homologation process. Additionally, some new technology components, currently unavailable in the market, will be used in the Ford Otosan vehicle. Homologation for a vehicle with unproven components seems unlikely.

We have submitted a request for permission to operate the vehicle with the automotive parts on board and are currently working to convince the authorities to grant this permission. A response is still pending.

Detailed data collection time plan is needed to not miss anything.

Early identification of any required sensors or measurement devices for the data collection process is crucial. These components must be determined before the design freeze phase of the vehicle design project. Once the design is finalized and the vehicle is built, adapting it to accommodate these sensors could be difficult or even impossible.

5.2 USE CASE #2: BARCELONA

The truck will operate during the day to collect large volume waste left in pick up points of the city. An optimized “eco-route” will be generated with the cloud connected HMI to streamline the collection process and reduce travel time and energy consumption.

As constraint for the success of the mission:

- It is necessary to obtain an eco-route that optimizes driving routes to be more efficient in terms of energy and time.
- It is necessary to have a control of the battery that shows the charge and temperature, especially during extreme weather conditions. The battery will power the propulsion system and auxiliaries (crane, etc.).

The truck will be fully charged every day when it finishes the working day. The following challenges will need to be addressed on a daily basis:

- Every day will be different, which implies different energy consumption. The route will be within the marked perimeter, and the average kilometers will be known thanks to the collected data.
- The payload will be different every day (which implies different energy consumption). Total weight estimation will be recorded by the datalogger.
- The truck will be fully charged every day.

5.3 USE CASE #3: UK

The risk to the project of TEVVA leaving the project was mitigated by DAF joining to complete the 3rd demonstration. The administration and time delay of completing this creates a risk from a timeline perspective, however the demonstration trucks are now built and the demonstration is being coordinated.

Another risk with the customer use of an EV vehicle compared to ICE vehicle is charge depletion. As the vehicle drive cycle will change with demand, charge and route planning will have to be conducted prior to operations to avoid disruption.

In the UK, an operator's license is required for goods vehicles with a weight over 3.5 Tonnes, therefore our customer will require a license for the trial. There are a number of requirements to obtain a license, and it will be the responsibility of the fleet operator to obtain and retain the license for the duration of the trial.

6 CONCLUSION

This deliverable presented the NextETRUCK project demonstration plan.

All Use cases described in the early NextETRUCK deliverable D2.1 (Use case, mission and overall vehicle definition) were revisited, and the OEMs had to confirm that the prototype will be able to perform the demonstration during six Months as proposed in the DoA. During this process, TEVVA entered in administration and had to resign from NextETRUCK. They are now replaced by DAF truck with their demonstration in the United Kingdom is presented in the document.

The Demonstration plan defines how the demonstration is organised at each of the demo site, what and how data will be collected, and based on the evaluation plan (D8.1) how data relates to the KPIs to be measured on each demonstration site.

Beside the data collected by the demonstration vehicles, questionnaire were also developed to get feedback from the drivers as well as from the fleet operators.

The demonstration plan is an important document to make sure that the demonstration phase will be set-up the best way to collect all data necessary for the computation of the KPIs enabling the assessment of the project as a whole.

ANNEX 1 QUESTIONNAIRES (TEMPLATE)

A1.1 NextETRUCK test driver questionnaire

Dear Test Driver,

Thank you for participating in the evaluation of our new NextETRUCK model. Your insights and feedback are invaluable in shaping the future of automotive innovation. Kindly take a few moments to complete the following questionnaire based on your experience driving the vehicle:

General Information

- Name:
- Age:
- Company you are working for:
- Occupation in the company:
- How frequently do you drive such vehicle types?
- Initial Impressions:

- Rate your initial impression of the vehicle's exterior design on a scale of 1 to 10.
- Rate your initial impression of the vehicle's interior design on a scale of 1 to 10.
- Any specific features or aspects that stood out positively or negatively upon first glance?

Driving Experience

- How would you rate the vehicle's handling and maneuverability? (Scale of 1 to 10)
- Describe your experience with the vehicle's acceleration and braking.
- How comfortable was the ride quality? (Scale of 1 to 10)
- Were there any noticeable noises, vibrations, or discomfort during the drive?
- Did the vehicle meet your expectations in terms of performance and responsiveness?

Technology and Features

- Evaluate the range of the battery for achieving the mission. (Scale of 1 to 10)
- Did the infotainment required any additional effort from what you have used to from similar vehicles?
- Any specific features (safety, entertainment, connectivity) that particularly impressed or disappointed you?
- Evaluate the effectiveness and usefulness of the vehicle's features. (Scale of 1 to 10)
- Any suggestions for additional features or improvements?

Comfort and Interior

- Rate the comfort level. (Scale of 1 to 10)
- How would you describe the overall interior?
- Were there any ergonomic issues or discomfort experienced during the drive?

Overall Impression

- Does the NextETRUCK truck preform better than the baseline? (Scale of 1 to 10)
- In what aspects do the vehicles differentiate from each other?
- How likely are you to recommend this vehicle to a professional based on your test drive experience? (Scale of 1 to 10)
- Any additional comments or suggestions to improve the vehicle?

Your candid feedback is instrumental in enhancing our vehicle's performance, design, and features. We greatly appreciate your time and contribution to this evaluation.

Thank you for your valuable input!

A1.2 NextETRUCK Fleet Management Tool questionnaire

Dear Fleet manager,

Thank you for participating in the evaluation of our NextETRUCK tool. Your insights and feedback are invaluable in shaping the future of automotive innovation. Kindly take a few moments to complete the following questionnaire based on your experience driving the vehicle:

General Information

- Company Name:
- Contact Person:
- Email:
- Phone Number:
- Fleet Size:

Current fleet management Information:

- Types of vehicles in your fleet (e.g., electric trucks, hybrid trucks):
- Average daily mileage per vehicle:
- Are you familiar with fleet management tools?
- Current challenges faced in managing your (electric) truck fleet:

User Interface and Experience

- How would you rate the overall user interface of the NextETRUCK fleet management tool? (Scale of 1 to 10)
- Is the dashboard user-friendly and intuitive for monitoring electric truck performance? (Scale of 1 to 10)
- Does the dashboard suit the fleet needs? (Scale of 1 to 10)

Vehicle Monitoring and Maintenance

- How effectively does the tool monitor the battery health and charging status of electric trucks? (Scale of 1 to 10)
- Does the tool provide alerts for maintenance issues or potential failures? (Scale of 1 to 10)
- Can you track the historical performance and maintenance records of each electric truck? (Scale of 1 to 10)

Route Optimization and Planning:

- How well does the tool assist in optimizing routes for electric trucks to maximize efficiency and reduce energy consumption? (Scale of 1 to 10)
- Is there a feature for traffic monitoring and re-routing to minimize delays?
- Can the tool factor in charging station locations in route planning?

Reporting and Analytics:

- What type of performance reports and analytics does the tool offer for the electric truck fleet?
- Can you customize and export reports based on specific metrics (e.g., energy consumption, charging times)?

Overall Satisfaction:

- How satisfied are you with the current fleet management tool for electric trucks? (Scale of 1 to 10)
- Would you recommend this tool to other organizations managing electric truck fleets?

Additional Comments:
Please provide any additional comments, suggestions, or feedback regarding the NextETRUCK fleet management tool.

Your candid feedback is instrumental in enhancing our vehicle's performance, design, and features. We greatly appreciate your time and contribution to this evaluation.

Thank you for your valuable input!

A1.3 NextETRUCK HMI questionnaire

Dear Test Driver,

Thank you for participating in the evaluation of our new NextETRUCK model. Your insights and feedback are invaluable in shaping the future of automotive innovation. Kindly take a few moments to complete the following questionnaire based on your experience using the HMI:

System Usability Scale

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	1	2	3	4	5
2. I found the system unnecessarily complex	1	2	3	4	5
3. I thought the system was easy to use	1	2	3	4	5
4. I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5. I found the various functions in this system were well integrated	1	2	3	4	5
6. I thought there was too much inconsistency in this system	1	2	3	4	5
7. I would imagine that most people would learn to use this system very quickly	1	2	3	4	5
8. I found the system very cumbersome to use	1	2	3	4	5
9. I felt very confident using the system	1	2	3	4	5
10. I needed to learn a lot of things before I could get going with this system	1	2	3	4	5

DALI questionnaire

During the experiment that you have just achieved, you may have felt some constraints and difficulties with regard to your usual driving task.

Also, we are proposing to evaluate these potential modifications through 7 factors; these factors are described on the board below. Don't hesitate to ask any questions if you need it.

Factor	Description
Global attention demand	Mental (to think about, to decide…) visual and auditory demand required during the test to achieve the whole activity.
Visual demand	Visual demand required during the test to achieve the whole activity.
Auditory demand	Auditory demand required during the test to achieve the whole activity.
Tactile demand	Specific constraints induced by vibrations during the test.
Stress	Level of stress during the whole activity such as fatigue, insecure feeling, irritation, discouragement…
Temporal demand	Pressure and specific constraint felt due to timing demand when running the whole activity.
Interference	Disturbance of the driver' state and consequences on the driving activity when conducting the driving activity simultaneously with any other supplementary task such as phoning, using systems or radio…

For each factor, you are going to rate the level of constraint felt during the session on a scale from **0 (low) to 5 (high)** with regard to your usual driving task.

Level of constraint of this factor

Global attention demand

Low → *High*

0 1 2 3 4 5

Visual Demand

Low → *High*

0 1 2 3 4 5

Auditory Demand

Low → *High*

0 1 2 3 4 5

Tactile Demand

Low → *High*

0 1 2 3 4 5

Stress

Low → *High*

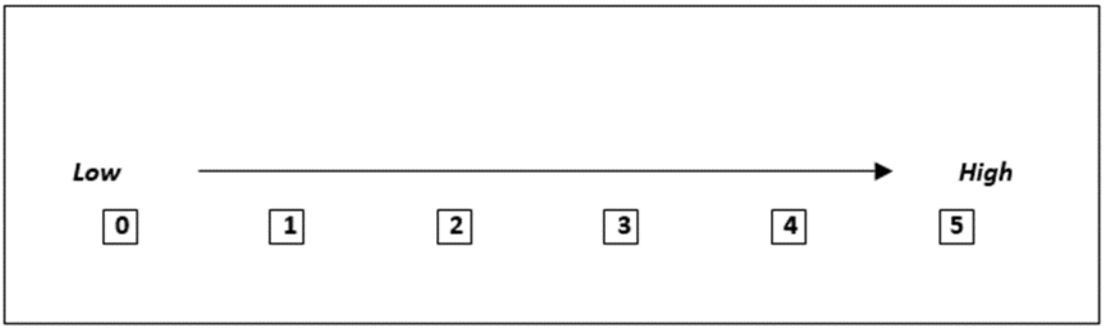
0 1 2 3 4 5

Temporal demand

Low → *High*

0 1 2 3 4 5

Interference



1. **Did you receive any unnecessary notification by the HMI while driving?**

2. **To which extent the system was helpful to guide you during the driving task?**

3. **To which extent did you perceive the system was able to achieve energy reduction during a trip?**

ANNEX 2 DAILY DIARY (LOG BOOK TEMPLATE)

NextETRUCK test driver mission dairy

Dear Test Driver,

Thank you for participating in the evaluation of our new NextETRUCK model. Your insights and feedback are invaluable in shaping the future of automotive innovation. Kindly take a few moments to complete the following form based on your experience driving the vehicle.

Adjustments can be made to cater to specific test parameters or company requirements.

1. Date:

2. Driver information

- Driver name:
- Company:

3. Vehicle Information

- Make:
- Model:
- VIN/Serial Number:
- Mileage at the beginning of the mission:
- Mileage at the beginning of the mission:
- Charging level of battery at the beginning of the mission:
- Charging level of battery at the end of the mission:

4. Weather Conditions

- Temperature:
- Precipitation:
- Wind Speed & Direction (descriptive):
- Road Conditions:

5. Mission information

- Start of mission Route/Location:
- End of mission Route/Location:

6. Driver remarks

- Performance observations (acceleration, braking, handling, etc.):
- Any unusual noises or vibrations:
- Behaviour in different road conditions:
- Energy consumption observations:
- Comfort and ergonomics feedback:
- Any system failures or malfunctions encountered:
- Issues/Concerns Raised:

7. Issues related to the vehicle

- Critical issues requiring immediate attention:
- Minor issues to monitor or investigate further:
- Maintenance/Repairs Conducted:
- Any maintenance or repairs performed on the vehicle during the day:

8. Additional driver Comments:

Thank you for your valuable input!