# **STATIONS OF THE FUTURE** USER-CHI Charging your e-mobility future





# Introduction

USER-CHI is a research an innovation project, aimed at unlocking the massive potential of electromobility in Europe, from a user-centric perspective. Following a user driven innovation approach, the project performed a deep qualitative and quantitative research of charging needs, demands and requirements of citizens and users in six different European countries: Norway, Finland, Hungary, Germany, Italy and Spain. As a result of this research work, subjective perception of charging options, decision influences and acceptance barriers have been analysed to define the innovative features and value-added services needed and expected in the next generation of future charging stations.

STATIONS OF THE FUTURE This document, Stations of the Future, presents the four different stations envisaged by the project team to fulfil the needs and expectations of Electric Vehicle users (including Light Electric Vehicles - LEVs), according to the results obtained in our user research.

# Highlights



# THE UPCOMING SCENARIO IN MOBILITY IS ELECTROMOBILITY

Plug-in hybrid electric vehicles became the most popular type of passenger electric vehicles in the European Union in November 2020. This technological transition is supporting today the development of electromobility, but to foster a widespread use of electromobility, we need to provide appropriate charging infrastructure.

# HOW MANY CHARGERS DO WE NEED? AND

Although amount of chargers is quite different between Norway and Germany-Spain, Norwegians consider that the charging infrastructure is still an unsolved issue. This suggests that even in Norway the charging infrastructure has not overcome the required critical threshold, or perhaps there is something else...

### NUMBER OF EV CHARGE INFRASTRUCTURE PER POPULATION

	GERMANY	NORWAY	SPAIN
Tesla Supercharger	1/1.000.000	1/70.000	1/700.000
Tesla Dest Charger	1/100.000	1/37.000	1/100.000
<b>Charging Point</b>	1/10.000	1/2.000	1/9.000
Connector	1/4.500	1/900	1/3.400

# ELECTROMOBILITY IS ONLY A QUANTITATIVE PROBLEM, OR QUALITATIVE ASPECTS ALSO MATTER?

#### TRENDS IN EVs

- $\rightarrow$  Better availability of charging facilities
- $\rightarrow$  Energy saving and greener environment
- $\rightarrow$  Standardization of core components
- $\rightarrow$  Ubiquitous and environmentally friendly
- $\rightarrow$  Diversified charging modes
- $\rightarrow$  Digital and intelligent charging
- → Tighter control for safety and privacy protection
- $\rightarrow$  Charging infrastructure is a node for multi-network convergence

#### OUR AIM

In order to achieve the project aims, USER-CHI is focused in defining the charging infrastructures for EVs and LEVs that create value for customers, the industry and the society.

# ACORDING TO OUR RESEARCH, CAR ELECTROMOBILITY HAS REQUIREMENTS:

#### MUST-BE REQUIREMENTS

• Availability of a dense charging point network in cities and in highways, including promoting the installation of charging points at drivers' home and in public parking lots. For professional drivers the city charging network is critical, while for private drivers the most critical point is charging when they arrive home, in private chargers or public chargers.

• A procedure for booking a charging point that ensures its availability when the driver arrives.

#### INCREMENTAL GAIN REQUIREMENTS

- Charging point status: occupied-unoccupied-in maintenance, blocked, charging, or reserved.
- Standardization of technical components and signalization.
- Paying with credit cards; contactless payment.
- Employing app utilities without subscription.

- Increase the amount of fast charging points; fast charge in highways.
- Automatic user detection in the charging point.
- Interoperability among charging points, at European level.
- A unique application for routing, booking and paying; pre-booking.



#### DESIRABLE REQUIREMENTS

• Additional services to perform activities when charging the battery. We could differentiate between:

- Services at urban charging points, like shopping malls or mobility hubs.
- Services at the charging points on route, in long range trips.

• Monitoring utilities like remaining charging time, percentage of charge in real time, power limitation to obtain a lower price, different criteria for fixing fees, or service interruption alarm, are interesting features for managing the waiting time when charging.

• Sustainability: users perceive electromobility as sustainable, and this value must be present in all the charging process.

# AND WHAT ABOUT LEVS IN ELECTROMOBILITY?

#### INCREMENTAL GAIN REQUIREMENTS (FOR LEVs)

- Specific free charging points for LEVs in urban areas.
- Lighter e-Bikes (they are currently heavier than conventional bikes).
- Safer e-Scooters.





# AND WHAT ABOUT THE GENDER ISSUES?

### What differences do they make in electromobility?

Based on our research, women tend to park in private parking. On the other hand, women would like to have more charging points at home. Both results could be related to security reasons as the risk of sexual harassment is higher for women in public spaces. From the gender perspective, there are two different dominant patterns and needs associated. This should be adressed when planning charging stations in the future.

# That's why we are proposing Stations of the Future

It is USER-CHI's contribution to design the charging stations that electromobility users demand, and the requirements for its successful deployment.

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**USER-CHI** — Stations of the Future

#### **CONCEPT SOLUTIONS TO**

# Intermodal station of the future

Electric cars — eBikes — eScooters — Public transport

#### Services

①Chargers & ②inductive charging for EVs + vehicle maintenance + parking lot

③Chargers for LEVs④Intermodal ticketing point⑤Cafeteria

ToiletsLockers & courier serviceCoworking & resting area



#### **SPECIFICATIONS FOR**

# Intermodal station of the future

Electric cars — eBikes — eScooters — Public transport

### SERVICES

①Standard and fast chargers
②Inductive charging for EVs +
vehicle maintenance + parking lot
③Chargers for LEVs
④Intermodal ticketing point
⑤Cafeteria
⑥Toilets
⑦Lockers & courier service
⑧Coworking & resting area

# TECHNOLOGY

ØChargers for LEVs
ØShared electric scooters (e-scooters), electric-assist bicycles (e-bikes) and electric mopeds
ØSlow chargers. Low power chargers (AC, inductive charging)
ØFast chargers (DC)
ØPay for charging (not parking), payment method interchangeable (credit cards; contactless payment; subscriptions, cash...)
ØRental and shared vehicle area

# LOCATION

ØNature-integrated
ØAnti-theft/safe zone
ØRailway station, city accesses, university campuses
ØBig space is required

# Intermodal station of the future

Electric cars — eBikes — eScooters — Public transport

### THE BUSINESS

#### PARTNERS

**ACTIVITIES & RESOURCES** 

Electromobility Service Providers CPOs Grid Infrastructure Managers Energy supplier companies Power grid characteristics Deals with most important energy suppliers Roaming deals with different CPOs Strategic locations To stop and charge in strategic intermodal locations Standard, fast, and ultra fast chargers Vehicles maintenance Rental and shared mobility services Intermodal ticketing Lockers, courier and logistics services Sharing of logistics areas Coworking & resting areas Grid balancing solutions Energy storage solutions

THE VALUE

## THE MARKET

#### **RELATIONSHIP & CHANNELS**

SEGMENTS

Harmonized charging standards Providers roaming solutions Apps Private drivers PT companies Electromobility providers Logistics operators

## THE FLOW

Electricity grid upgrade Charging point installation Land setting and adaptation Maintenance

OUT

Private vehicles recharging Business vehicles charging Maintenance services Ancillary general services Ancillary logistics services EV drivers' data

#### **CONCEPT SOLUTIONS TO**

# Highway station of the future

Electric cars — Electric vans

#### Services

①Fast chargers + parking lot②Vehicle maintenance

③Shops④Fitness/Playground zone⑤Cafeteria

ToiletsPlaygroundCoworking & rest area



#### **SPECIFICATIONS FOR**

# Highway station of the future

Electric cars — Electric vans

# SERVICES

1) Fast chargers
2) Vehicle maintenance + parking lot
3) Shops
4) Physical activity zone
5) Cafeteria
6) Toilets
7) Playground
8) Coworking & resting area

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## TECHNOLOGY

ØFast chargers (DC)ØBooking of chargers

# LOCATION

ØNature-integratedØHighwayØBig space is required

# Highway station of the future

Electric cars — Electric vans

# THE BUSINESS

#### PARTNERS

**ACTIVITIES & RESOURCES** 

Highway operators and concessionaries CPOs Grid Infrastructure Managers

Analysis of relevant pools of attraction Power grid characteristics Roaming deals with different CPOs National electrical assets

#### To stop and charge in strategic highway locations Fast and ultra fast chargers Multiple ancillary services for different e-transport modalities Grid balancing solutions Energy storage solutions Emergency and ad-hoc support for EVs

THE VALUE

Provision of mobile charging stations

# THE MARKET

#### **RELATIONSHIP & CHANNELS**

**SEGMENTS** 

Booking of chargers Providers roaming solutions Parking & charging points for trucks Highway administrations and operators visibility

Private drivers Professional EV drivers Logistics operators

### THE FLOW

OUT

Electricity grid upgrade Charging point hardware (specific for heavy vehicles) Maintenance Staff, security

Logistics vehicles recharging Private vehicles recharging Business vehicles charging Ancillary general services EV drivers' data

# LEV chargers of the future

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eBikes — eScooters

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#### Services

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①Shelter+charger modules in underground stations

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②Solar powered chargers in streetlamps in university campuses, parks... <sup>(3)</sup>Solar powered chargers integrated in bus canopies, with vertical parking of LEVs

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#### **SPECIFICATIONS FOR**

# LEV chargers of the future

eBikes — eScooters

### SERVICES

 Secure parking
 Vertical parking
 Chargers for LEVs
 Interchangeable payment method (credit cards; contactless payment; subscription; cash...)

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# TECHNOLOGY

ØPhotovoltaic panels connected to grid
ØModularity
ØBattery storage cabinets / Battery
swaping
ØAC chargers
ØCharging booking

# LOCATION

 ØChargers in urban furniture, streetlamps and benches
 ØIntegrated in bus canopies or by underground stations
 ØNear university campuses

# LEV chargers of the future

eBikes — eScooters

### THE BUSINESS

#### PARTNERS

**ACTIVITIES & RESOURCES** 

Electromobility Service Providers CPOs Sharing mobility operators Location owners Engagement with users and citizens Analysis of relevant pools of attraction Analysis and design of public space Municipal electrical assets To stop and charge LEVs at strategic locations in the city Charging infrastructure and services tailored to cities specific features and to different vehicle models Secure parking eBikes sharing services Cargo-bikes for couriers and logistics services loading/unloading areas Battery storage cabinets/Battery swapping Solar powered chargers

THE VALUE

### THE MARKET

**RELATIONSHIP & CHANNELS** 

SEGMENTS

Different payment solutions Harmonized charging standards Providers roaming solutions Strategic urban location visibility Apps

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Private LEV drivers Cargo-bike logistics operators

## THE FLOW

OUT	IN
ectricity grid	Private LEVs
ograde	recharging
narging point	Business LEVs
stallation	charging
aintenance	Fees for parking
	LEV drivers' data

# Urban station of the future

Electric cars — eBikes — eScooters — Electric vans

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Services

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①Parking & charging (ultrafast) for LEVs②Parking & charging for EVs

③Lockers & courier service
④Logistics
⑤Loading/Unloading area

(3)

©Restricted access: retractable bollards (pre-registered users)

# Urban station of the future

Electric cars — eBikes — eScooters — Electric vans

### SERVICES

<sup>①</sup>Parking & charging (ultrafast)
for LEVs
<sup>②</sup>Parking & charging (AC & DC)
for EVs
<sup>③</sup>Lockers and courier service
<sup>④</sup>Logistics
<sup>⑤</sup>Loading/Unloading area
<sup>⑥</sup>Short stays

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# TECHNOLOGY

ØSlow chargers (AC)
ØFast chargers (DC)
ØParking & charging booking
ØRestricted access
ØPay for charging (not parking), payment method interchangeable (credit cards; contactless payment; subscriptions, cash...)

# LOCATION

ଡିCity centre ଡିNeighbourhood ଡିShopping area

# Urban station of the future

Electric cars — eBikes — eScooters — Electric vans

### THE BUSINESS

#### PARTNERS

**ACTIVITIES & RESOURCES** 

Electromobility Service Providers CPOs Grid Infrastructure Managers Local authorities/ Mobility agencies Identification of local conditions as neighbourhoods traffic type Analysis of relevant pools of attraction Power grid characteristics Municipal electrical assets

# THE VALUE

To stop and charge in strategic locations in the city Charging infrastructure and services tailored to cities' features and to different vehicle models

Shared mobility services Lockers, courier and logistics services Loading/unloading areas

### THE MARKET

#### **RELATIONSHIP & CHANNELS**

SEGMENTS

Different payment solutions Harmonized charging standards Providers roaming solutions Parking&Charging booking Apps Private drivers Charging at home Charging at office Charging during shopping Taxi corporations

### THE FLOW

Electricity grid upgrade (especially for DC fast charging points) Charging point hardware Charging point installation Land procurement

OUT

Logistics vehicles recharging Private vehicles recharging Business vehicles charging EV drivers' data



