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English version

User centric charging infrastructure for electric vehicles - Charging stations of the future - Stations models considering users' expectations

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword	4
Introduction	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions.....	7
4 User requirements and expectations	7
4.1 General.....	7
5 Business models.....	10
5.1 General.....	10
5.2 BM1 — Logistics Hubs	11
5.3 BM2 — Citizens e-mobility stations	12
5.4 BM3 — City Centre (park & charge)	12
5.5 BM4 — E-trucks	13
5.6 BM5 — E-taxi stops.....	14
6 BM6 — Special events.....	15
6.1 BM7 – Mobile Charging Stations	16
7 Intermodal station of the future.....	17
7.1 The sketch.....	17
7.2 The main features.....	18
7.3 The business model.....	19
7.3.1 Business.....	20
7.3.2 Market.....	20
7.3.3 Flow.....	20
7.3.4 Value	21
8 Urban station of the future	21
8.1 The Sketch	21
8.1.1 Business.....	24
8.1.2 Market.....	24
8.1.3 Flow	24
8.1.4 Value	25
9 Highway station.....	25
9.1 The sketch.....	25
9.2 The main features.....	26
9.3 The business model.....	27
9.3.1 Business.....	28
9.3.2 Market.....	28
9.3.3 Flow.....	28
9.3.4 Value	29
10 LEV chargers of the future	29
10.1 The sketch.....	29
10.2 The main features.....	30
10.3 The business model.....	31

10.3.1 Business	32
10.3.2 Market.....	32
10.3.3 Flow	32
10.3.4 Value.....	32
Bibliography	34

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European foreword

This CEN Workshop Agreement has been developed in accordance with the CEN-CENELEC Guide 29 “CEN/CENELEC Workshop Agreements – A rapid prototyping to standardization” and with the relevant provisions of CEN/CENELEC Internal Regulations - Part 2. It was approved by a Workshop of representatives of interested parties on 2023-11-29, the constitution of which was supported by CEN following the public call for participation made on 2023-07-07. However, this CEN Workshop Agreement does not necessarily include all relevant stakeholders.

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The following organizations and individuals developed and approved this CEN Workshop Agreement:

- Ángel Moya (ETRA I+D), Chair.
- Juan Gimenez Pla (Instituto de Biomecánica de Valencia), Vice-Chair.
- Alberto Zambrano (ETRA I+D).
- Amparo López-Vicente (Instituto de Biomecánica de Valencia).
- Carol Soriano (Instituto de Biomecánica de Valencia).
- Fábían Zoltán Attila (Municipality of Budapest).
- Jayson Dong (ChargePoint).
- José Bernardo López Martínez (Murcia City Council).
- Juan Manuel Mico Soler (Power Electronics).
- Lars Balzer (Qwello GmbH).
- Luca Grzeski (Gewobag).
- Luka De Bruyckere (Environmental Coalition on Standards (ECOS)).
- María de la Cruz González Tudela (Murcia City Council).
- Marion Pignel (Eurocities).
- Mika Zaurin (CHAdEMO Association).
- Mourad Tiguercha (VEDECOM).
- Natascia Andrenacci (ENEA).
- Nico Frankhuizen (Rocsys).
- Orosz László (Municipality of Budapest).

- Ruud Pennings (The Royal Netherlands Standardization Institute).
- Tomoko Blech (CHAdEMO Association).
- Javier López Rodríguez (UNE), Secretary.

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Introduction

This document presents results generated in the USER-CHI project, a research and innovation project funded under European Union's program Horizon 2020, 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.

This CWA presents the four different stations envisaged by the project team to fulfil the needs and expectations of EV (Electric Vehicle) users (including LEVs, Light Electric Vehicles), according to the results obtained in the user research.

When considering the key aspects related to the charging process of an EV, the number of chargers and the availability of a dense charging infrastructure emerge as a critical aspect. Consequently, the quantity is important, but also qualitative aspects related to end user satisfaction. The charging stations models presented in this document also aim to cover qualitative aspects, such as:

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

Besides software solutions offered by the OCPI protocol allowing for V2G and load balancing, alternative hardware-based solutions are also in development or already available. Alternative solutions comprise, amongst others, autonomous connection devices (ACD), AVP-guided parking systems, and inductive and conductive charging solutions. With connection options to all available sides of the vehicle.

1 Scope

This CWA provides guidelines for the stations of the future to fulfil the needs and expectations of Electric Vehicle (EV) users. This document includes design features for the charging stations that electromobility users demand, and recommendations for its successful deployment.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

4 User requirements and expectations

4.1 General

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, it is necessary to provide an appropriate charging infrastructure.

This document focuses on the definition of the charging stations that not only EVs and LEVs require, but also fulfil the needs and expectations of the end users. To achieve this, a qualitative and quantitative user research following the user experience principles has been performed, achieving a deep knowledge of EV drivers' charging preferences and patterns in order to increase their acceptance. As a result of this research, three categories of requirements have been identified:

A) 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.

B) 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.