HORIZON EUROPE PROGRAMME
TOPIC HORIZON-CL5-2022-D5-01-08
Clean and competitive solutions for all transport modes
GA No. 101084046

Zero Emission flexible vehicle platform with modular powertrains serving the long-haul Freight Eco System

ZEFES - Deliverable report

D3.1 – Performance of the IMCS concept (VC11) - Charging functionality and control strategies performances

Funded by
the European Union

Deliverable No.	ZEFES D3.1	
Related WP	3	
Deliverable Title	Performance of the IMCS concept - Charging functionality and control strategies performances	
Deliverable Date	2025-05-14	
Deliverable Type	REPORT	
Dissemination Level	Sensitive – member only (SEN)	
Author(s)	Miguel Rodríguez Escudé (ABB) Kai Koenig (ABB)	
Checked by	Javier Iglesias (HIT), Joan Carles Artigau (IDI)	2025-04-20
Approved by	Omar Hegazy (VUB) – Project coordinator	2025-04-30
Status	Final	2025-05-16

Document History

Version	Date	Editing done by	Remarks
V01	24/12/2024	Miguel Rodríguez Escudé	Initial draft
V02	12/03/2025	Kai Koenig	ABB-Internal review
V03	27/03/2025	Miguel Rodríguez Escudé	Complete draft for HIT and IDI review
V04	21/04/2025	Miguel Rodríguez Escudé	Included feedback from HIT and IDI
V1.1	07/05/2025	Miguel Rodríguez Escudé	Included improvements in the IMCS by ABB and clarification of the scope
V2.0	14/05/2025	Nicolas Ruitenbeek (UNR)	Final version

Publishable summary

This deliverable focuses on the development of an interoperable Megawatt Charging System (MCS). The development for MCS is in continuous improvement alongside international standardization bodies, such as the International Electromechanical Commission (IEC) and the International Organization for Standardization (ISO). These actions follow objectives O3.1, O3.2 and O3.3 of WP3 of the ZEFES project.

The concept of MCS was introduced as a new system in IEC 61851-23-3, part of the IEC 61851 series for electric vehicle conductive charging system product specifications. IEC 61851-23-3 is currently under development, in the Committee Draft for Voting (CDV) phase. The existing scope covers energy transfer voltages up to 1 250 V DC.

The current for system MCS is dictated by the vehicle connector and vehicle inlet standard, IEC TS 63379. This document is currently under development in the Draft Technical Specification (DTS) phase. The first edition of IEC TS 63379 defines the requirements for the vehicle connector and vehicle inlet to perform energy transfer at up to 3 000 A. The physical design allows voltages up to 1 500 V DC.

The combination of requirements in IEC 61851-23-3 and IEC TS 63379 cover energy transfer power up to 3.75 MW. Initial commercial implementations of system MCS are expected to reach up to 1.2 MW during energy transfer.

System MCS, as presented in the latest IEC 61851-23-3 CDV document, was developed to improve on all the issues discovered over more than a decade of testing and troubleshooting the existing Combined Charging System (CCS) for DC charging. This includes a more robust physical interface for digital communication between the Electric Vehicle (EV) and the EV Supply Equipment (EVSE), based on 10BASE-T1S for automotive Ethernet networks. System MCS also considers all the conditions in case of a loss of continuity of the control pilot conductors and the protective conductor.

Digital communication is covered by the specifications ISO 15118-10 and ISO 15118-20 AMD1. ISO 15118-10 covers the physical (Layer 1) and data link (Layer 2) layers for 10BASE-T1S. This document had to be developed to support ISO 15118-20 as an application layer. Additionally, a new annex was created and included in the Amendment 1 of ISO 15118-20, to specify the requirements between IEC 61851-23-3, ISO 15118-10 and ISO 15118-20.

All of the previously mentioned documents were developed between ZEFES partners and other international experts to support the international standardization of MCS.

ABB E-mobility designed a transportable demonstrator of the MCS system to verify all the implementation of all the previously mentioned international standards regarding hardware and software, and additional product requirements to satisfy the ZEFES use cases.

9 Acknowledgement

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners:

#	Partner short name	Partner Full Name
1	VUB	VRIJE UNIVERSITEIT BRUSSEL
2	FRD	FORD OTOMOTIV SANAYI ANONIM SIRKETI
4	KAE	KASSBOHRER FAHRZEUGWERKE GMBH
5	REN	RENAULT TRUCKS SAS
6	SCA	SCANIA CV AB
7	VET	VAN ECK TRAILERS BV
8	VOL	VOLVO TECHNOLOGY AB
8.1	CPA	CPAC SYSTEMS AB
9	ABB	ABB E-MOBILITY BV
9.1	ABP	ABB E-MOBILITY SPOLKA Z OGRANICZONAODPOWIEDZIALNOSCIA
9.2	ABG	ABB E-MOBILITY GMBH
10	AVL	AVL LIST GMBH
11	CM	SOCIEDAD ESPANOLA DE CARBUROS METALICOS SA
11.1	APG	AIR PRODUCTS GMBH
12	HEPL	HITACHI ENERGY POLAND SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA
13	MIC	MANUFACTURE FRANCAISE DES PNEUMATIQUES MICHELIN
14	POW	OPmobility
15	RIC-CZ	RICARDO PRAGUE S.R.O.
15.1	RIC-DE	RICARDO GMBH
16	UNR	UNIRESEARCH BV
17	ZF	ZF CV SYSTEMS HANNOVER GMBH
18	ALI	ALLIANCE FOR LOGISTICS INNOVATION THROUGH COLLABORATION IN EUROPE
19	DPD	DPD (NEDERLAND) B.V.
20	COL	ETABLISSEMENTEN FRANZ COLRUYT NV
21	GRU	GRUBER LOGISTICS S.P.A.
22	GBW	GEBRUEDER WEISS GESELLSCHAFT M.B.H.
23	PG	PROCTER & GAMBLE SERVICES COMPANY NV
23.1	PGP	PROCTER AND GAMBLE POLSKA SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA
23.2	PGA	PROCTER & GAMBLE AMIENS
23.3	PGG	PROCTER & GAMBLE SERVICE GMBH
24	PRI	PRIMAFRIO CORPORACION, S.A.

25	PTV	PTV PLANUNG TRANSPORT VERKEHR GmbH
26	Fraunhofer	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
27	HAN	STICHTING HOGESCHOOL VAN ARNHEM ENNIJMEGEN HAN
28	IDI	IDIADA AUTOMOTIVE TECHNOLOGY SA
29	TNO	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO
30	UIC	UNION INTERNATIONALE DES CHEMINS DE FER
31	CFL	CFL MULTIMODAL S.A.
32	GSS	Grupo Logistico Sese
33	HIT	Hitachi ABB Power Grids Ltd.
34	IRU	UNION INTERNATIONALE DES TRANSPORTS ROUTIERS (IRU)
35	RIC-UK	RICARDO CONSULTING ENGINEERS LIMITED

Disclaimer/ Acknowledgment

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the granting authority can be held responsible for them.