



MACBETH

MULTIPOINT MEGAWATT CHARGING FOR BATTERY ELECTRIC TRUCK HUBS



Co-funded by
the European Union



MACBETH

About

What is MACBETH?

Multipoint megAwatt Charging for Battery Electric Truck Hubs

The MACBETH project will pilot the mass deployment of megawatt charging systems (MCS) at two demonstration sites in Europe. Aiming to electrify long-haul trucks, MACBETH will address technical, social, and economic challenges by developing MCS hubs along critical logistics corridors. This initiative will help reduce emissions in the logistics sector and provide valuable insights for scaling up MCS technology across Europe.

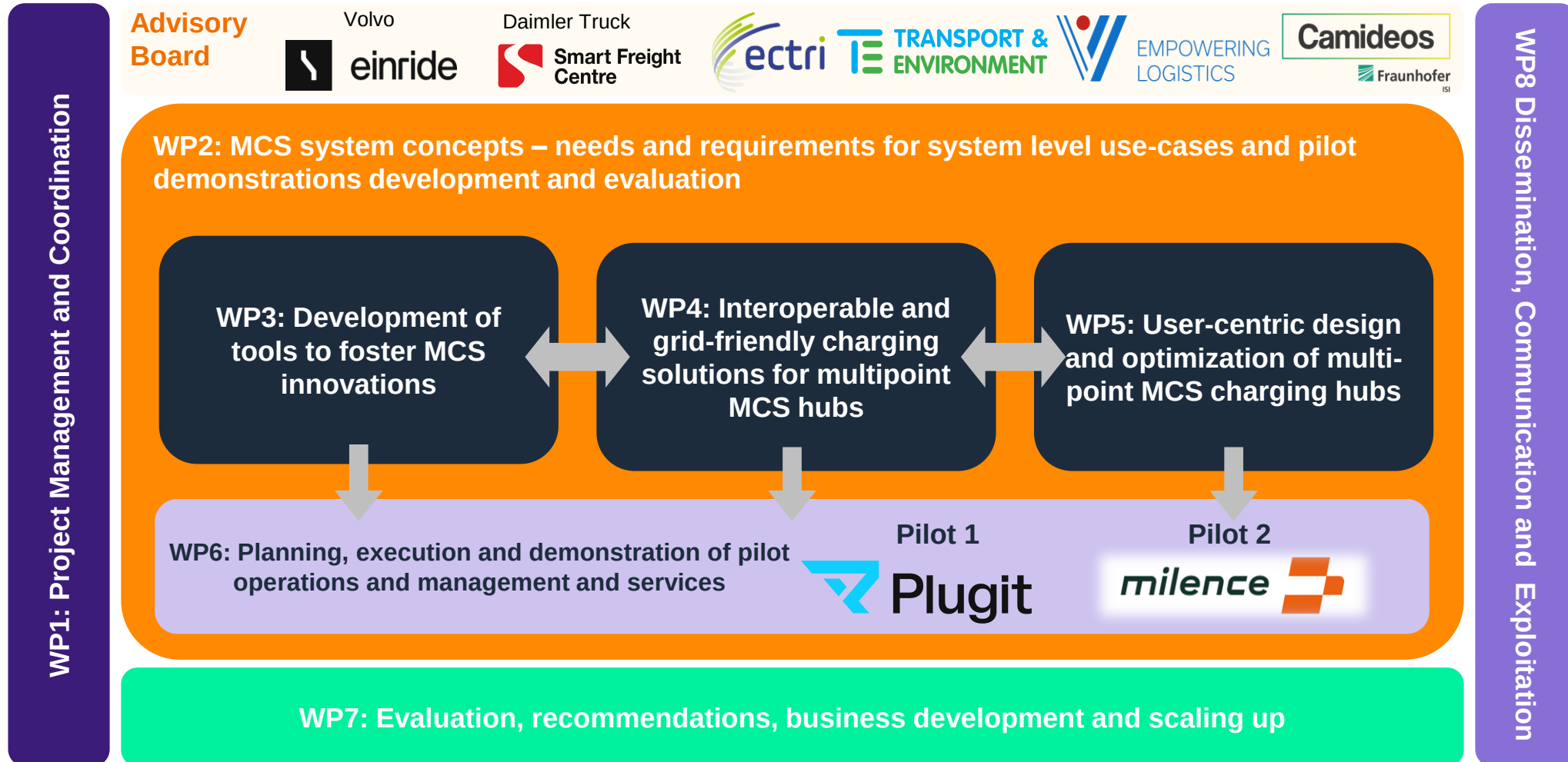


Facts & Figures

Topic: HORIZON-CL5-2024-D5-01-04: Integrated flexible multipoint megawatt charging systems for electric truck mass deployment (2ZERO Partnership)

- Type of action: IA
- Coordinator: VTT Technical Research Center of Finland
- Start date: 01.02.2025
- Duration: 48 months
- Total budget: 10 238 095,25€
- EU Funding: 8 390 483,76€
- Website: www.macbethproject.eu
- Topic is open to international collaboration, in particular regarding interface specifications (e.g. with the USA).

Work Package Structure



MACBETH Partners



No.	Participant Organisation Name	Short Name	Country
1	Teknologian Tutkimuskeskus VTT Oy (Coordinator)	VTT	FI
2	Fraunhofer Gesellschaft Zur Förderung Der Angewandten Forschung e.V.	Fraunhofer	DE
3	Chalmers Tekniska Hogskola Ab	CTH	SWE
4	European Road Transport Telematics Implementation Coordination Organisation - & ITS Services Europe	ERTICO	BE
5	Lindholmen Science Park Aktiebolag	LSP	SWE
6	Alliance for Logistics Innovation through Collaboration in Europe	ALICE	BE
7	Stichting Cenex Nederlands	CENEX NL	NL
8	Cenex - Centre Of Excellence For Low Carbon And Fuel Cell Technologies (Affiliated entity CENEX NL)	CENEX UK	UK
9	FIER Bv	FIER	NL
10	Kempower Oy	KEMPOWER	FI
11	Rocsys Bv	ROCSYS	NL
12	Commercial Vehicle Charging Europe BV	MILENCE	NL
13	Power Electronics España, S.L.	PE	ES
14	CharIN Academy GmbH	CharIN	DE
15	PostNord Denmark	PostNord	DK
16	Sender Technologies	Sennder	DE
17	MAN Truck & Bus SE (Associated partner)	MAN	DE
18	Emobility Solutions	EMS	HU

02

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Vision, Objectives & Impact

Vision

With a strong focus on the industrial cluster, MACBETH contributes to the real-world **demonstration** of charging infrastructure and service offerings for regional and long-haul battery electric trucks (BET) along TEN-T (Trans-European Transport Network) corridors, logistic terminals, and depots covering multiple countries.

To facilitate a **scale-up**, it will also develop necessary **tools, guidelines, and recommendations**. By demonstrating **real-world use cases** of multipoint MCS hubs and tools for scaling up, MACBETH is set to deliver system-level multipoint megawatt charging hub concepts at **Technology Readiness Level (TRL) of 8** by the end of the project.



Objectives



1. Establish a **scalable framework** for interoperable multipoint MCS, facilitating the integration of high-power charging solutions (charger towards vehicle).
2. Formulate advanced **grid management strategies** to minimise the impact of MCS deployment on the electrical grid while enhancing the user experience (charger towards grid).
3. Effectively **integrate large-scale, multipoint MCS hubs along significant TEN-T corridors** to serve a spectrum of vehicle types, from light-duty (passenger) vehicles (LDVs) to HDV trucks.
4. Develop **operational tools and management strategies** for MCS multipoint hubs, focusing on the full spectrum of user and stakeholder needs along the value chain.
5. **Optimise infrastructure placement** and sizing based on the specific needs of diverse use cases, including private versus public charging considerations.

Impact

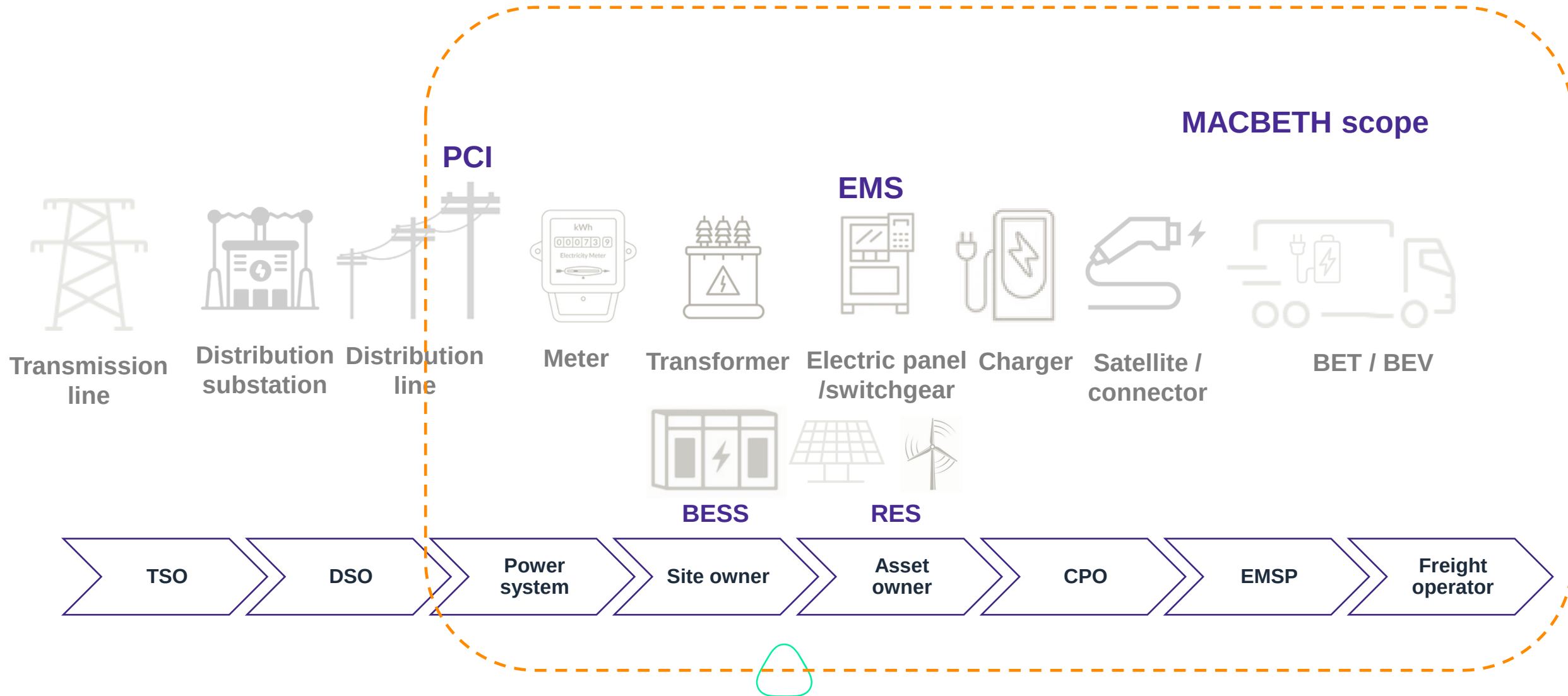
- ✓ Maximum EV energy efficiency and affordability through keeping battery size to the practical minimum
- ✓ Megawatt charging required to meet the demand for long operational range with even shorter charging times.
- ✓ Evolution of MW charging towards multi-charger hubs that cater for a widespread deployment of HD-EV on the 2030 horizon.
- ✓ Each charger in these charging hubs will be usable for multiple lighter vehicles with lower power (150-350 kW) during peak times, when demand from HDV may be lower
- ✓ Concepts for topologies capable for accommodating one heavy vehicle or 4-6 light vehicles in each charging spot

03

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Technical Framework and Pilots

Technical Framework



PILOT 1 - NORDICS

Pilot MCS transport corridor location: Nordics

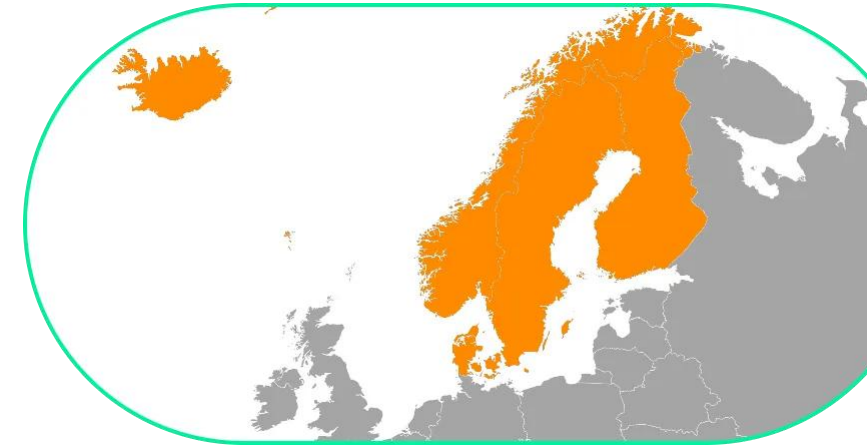
Pilot key partners: Plugit, Kempower, PostNord

Innovative features:

- Piloting in adverse weather conditions and low traffic demand
- Sharing of DC charging capacity and prioritization between the MCS and CCS charging hubs, which are physically separated for safety
- Combined charging hub for trucks and passenger cars, fulfilling the AFIR regulation with additional cost efficiency
- Prioritization, reservation and power management system, based on inputs from users and DSO

Pilot high level requirements and specifications:

- 3500 kW total charging output power
- Grid impact mitigation with local energy storage (minimum 1MW/1MWh), optimized for the use case (to be simulated in the project, based on demand predictions to 2030)
- 4 x MCS charging points
- 16 x 350kW 800V CCS shared charging points



PILOT 2 - BENELUX

High demand TEN-T transport corridor location: (North Sea-Baltic)

Pilot main partners: Milence, Power Electronics, sennder Technologies

Pilot innovative features (to be finalised with Milence)

- Focus on high-demand trucks only location – solution and business development
- Scale up MCS deployment with focus to design user-centric solutions
- Scalability from a few MW to multi-MW hubs
- Multiple MCS charging points (fast charging of trucks)
- Multiple CCS charging points (slower charging of trucks)
- Solutions to work around electricity grid congestions

Combination of MCS and CCS for different truck types & operations

High level requirements (minimum):

- 4 * MCS charging points
- 14 * CCS charging points



THANK YOU!

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