



MODE 3



MODE 2



MODE 4

Designed with Dall-E3

ECODESIGN PREPARATORY STUDY FOR ELECTRIC VEHICLES CHARGERS – STAKEHOLDER MEETING – DRAFT TASK 1

Grietus Mulder (VITO) -presenting

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25th June 2024

ecodesign-ev-charger.eu



AGENDA

Ecodesign Preparatory Study for Electric Vehicles Chargers

- 9:30 10:00 Session opened
- 10:00 10:10 Welcome + tour de table Tim Hettesheimer Fraunhofer ISI
- 10:10 10:15 Introductory statement Eleftheria Vounouki European Commission
- 10:15 10:30 Methodology and objectives Antoine Durand Fraunhofer ISI
- 10:30 11:15 Preliminary results Task 1: Scope Grietus Mulder VITO
- 11:15 12:00 Preliminary results Task 2: Markets Tim Hettesheimer Fraunhofer ISI
- 12:00 13:00 *Lunch*
- 13:00 13:45 Preliminary results Task 3: Users Daniel Speth Fraunhofer ISI
- 13:45 14:30 Outlook on task 4: technologies Paul Van Tichelen VITO
- 14:30 15:00 Further proceeding, issues, closing Tim Hettesheimer Fraunhofer ISI

STUDY SCOPE

Ecodesign Preparatory Study for Electric Vehicles Chargers

- Definition product scope
 - With help of relevant:
 - Prodcom categories
 - Considered not useful
 - Standards
 - initiatives according to the MEErP- Analysis of test standards
- Analysis of legislation



Sites: Europa.eu

STUDY SCOPE

Ecodesign Preparatory Study for Electric Vehicles Chargers

- Wide variety in infrastructure properties
- Different naming and approaches for same object

Place	Private place	Public place	Non-publicly accessible	Publicly accessible	Home charger	Workplace charging station	
Infrastructure	Connector	Recharging point	Recharging station	Recharging pool	Wall-mounted	Free standing	
Accessibility	Private use (e.g. home)	Selected users (e.g. work)	Time-restricted (e.g. shops)	Fully accessible (e.g. at roads)			
Current	Alternating Current (AC) 1 phase	Alternating Current (AC) 3 phase	Direct Current (DC)				
Connector	Domestic / IEC 60083	Industrial / IEC 60309	Type 2	CCS2 / FF	CHAdeMO / AA	NACS / Tesla	
Charging power	Low power ≤ 3.7 kW	Normal power $3.7 < P \leq 22$ kW	High power $22 < P \leq 50$ kW	High power $50 < P \leq 150$ kW	High power $150 < P \leq 350$ kW	High power > 350 kW	
Energy transmission	Cable	Wireless	Catenary / pantograph	Shore connection	Modular recharging station	Electric road system	
Applications	E-Bikes (L)	Light-duty (M1, N1)	Heavy-duty (M2, M3, N2, N3)	Trains	Vessels	Aircrafts	
Interoperability with grid	Smart charging	Bi-directional charging	Battery buffered	Photovoltaic	Other local generator		
Features	Display	RFID reader	Digitally connected (WiFi, LTE)	Payment card reader	QR-Code	MID meter	...

Own figure

DEFINITION PRODUCT SCOPE

Relevant product definitions in the Alternative Fuel Infrastructure Regulation ((EU) 2023/1804) ('AFIR')



→ Connector → Recharging point ↵ Recharging station ↵ Recharging pool

Figure 1-2: Components of a recharging pool with its components (own photo)

Category	Sub-category	Maximum power output	Definition pursuant to Article 2 of this Regulation
Category 1 (AC)	Slow AC recharging point, single-phase	$P < 7,4 \text{ kW}$	Normal-power recharging point
	Medium-speed AC recharging point, triple-phase	$7,4 \text{ kW} \leq P \leq 22 \text{ kW}$	
	Fast AC recharging point, triple-phase	$P > 22 \text{ kW}$	High-power recharging point
Category 2 (DC)	Slow DC recharging point	$P < 50 \text{ kW}$	
	Fast DC recharging point	$50 \text{ kW} \leq P < 150 \text{ kW}$	
	Level 1 - Ultra-fast DC recharging point	$150 \text{ kW} \leq P < 350 \text{ kW}$	
	Level 2 - Ultra-fast DC recharging point	$P \geq 350 \text{ kW}$	

Table 1-1: Reporting requirements on deployment of electric vehicles and publicly accessible recharging infrastructure

DEFINITION PRODUCT SCOPE

IEC 61851-1:2017 'Electric vehicle conductive charging system - Part 1: General requirements'

- 'EV supply equipment'
 - 'charger'
 - 'off-board charger'
 - 'on-board charger'
 - 'AC EV charging station'
 - 'DC EV charging station'
-
- Mode 1 - Standard socket outlet - domestic installation
 - Mode 2 - Standard socket outlet with an AC EV supply equipment– domestic
 - Mode 3 - AC EV equipment permanently connected to an AC supply network
 - Mode 4 - DC EV Supply equipment

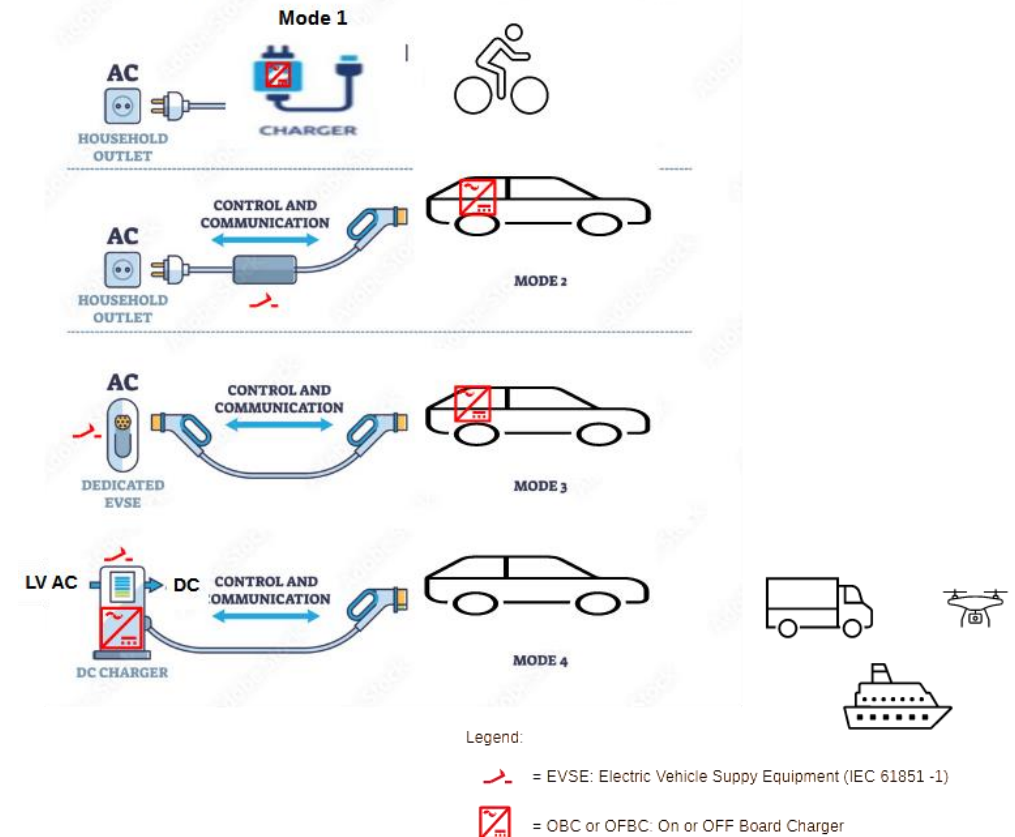


Figure 1 3: IEC 61851-1 about electric vehicle conductive charging systems, with charging modes 1-4 (own figure)

DEFINITION PRODUCT SCOPE

IEC 61851-1:2017 'Electric vehicle conductive charging system - Part 1: General requirements'

- Mode 2 and 3 are close to each other



Source: Amazon.com

Figure 1-4: Mode 2 charging cables with adapters for different sockets. Copyright Tesla, BMW, Mercedes-Benz

Source: Amazon.com Source: Voldt.nl

Source: Voldt.nl

DEFINITION PRODUCT SCOPE

PEP ecoPassport® product specific rules for charging infrastructure (PSR-0018)

- 5 Product families
 - [Reinforced] “Domestic socket”
 - “Private or semi-public station”
 - Note: despite the use of semi-public this term does not exist in EU legislation
 - Public station on a base
 - Charging system with industrial sockets for industrial environment
 - Combination of charging points.

- Functional unit
 - to put at disposition 1 kWh to an EV according to the reference case including the reference lifetime at a charging point.
 - Note: charging point is not explicitly defined but seems to be a single socket or cable.
 - Lifetime divided into:
 - Active (charging)
 - Idle (connected, not charging)
 - Off (no EV connected)

DEFINITION PRODUCT SCOPE

U.S. Energy Star® Program

- SAE consistent definitions
 - Electric Vehicle Supply Equipment (EVSE)
 - Level 1 (120 V, 16 A)
 - Level 2 (208-240 V, 80 A)
 - DC-output
 - Wireless / inductive
- EVSE Functions:
 1. Primary Function
 - Providing current to a connected load
 2. Secondary Function
 - enables, supplements, or enhances a primary function
 3. Tertiary Function
 - other than a primary or a secondary function
 4. In-use
 - Enabled feature to provide a service in standby mode
- EVSE Operational Modes and Power States
 1. Disconnected
 2. No Vehicle Mode
 3. On Mode
 - a) Operation Mode
 - b) Idle Mode
 4. Partial On Mode
- No functional unit: no LCA involved

Preliminary product scope

- **Electric vehicle supply equipment (EVSE) combined with the charging modes**
 - From IEC 61851-1
- Mode 2 and 3
 - **Limited to 22 kW** (32 A, 3 phase) to remain in consumers' area
 - Matching AFIR's category 1: normal-power recharging point
 - Mode 2: connected to domestic (IEC 60083) and industrial (IEC 60309) sockets
- Other modes excluded:
 - Mode 1 is commonly discouraged for EVs, being a kind of emergency solution
 - Mode 4 (?) should according to the study team be excluded since :
 - Business-to-business environment
 - EMC solutions interrelate to conversion losses
 - Losses remain at Charging Point Operator and are not for the consumer, as necessary in the AFIR
 - AFIR requires indirectly the measurement of EVSE mode 4 losses for most of EVSE above 50kW
 - Study team interpretation
 - Mixed mode (3&4) is implicitly excluded
 - Wireless & catenary charging excluded since not generally available on the market

Preliminary product scope

- Proposal of primary performance parameter (functional unit)
 - **to supply 1 kWh to an EV according to the reference case including the reference lifetime at a charging point.**
 - Note:
 - The reference scenario and lifetime for each EVSE type is defined in Task 3.
 - An EVSE can have 1 or 2 charging points (i.e. sockets or cables). The energy is attributed to a charging point.
- Secondary performance parameters and/or functions
 - Power output
 - Charge mode (2 or 3)
 - Compliance against Article 5 (5) and Article 6 (2) within the newly proposed ESPR regulation, such as
 - no significant negative impact on the functionality of the product, from the perspective of the user
 - no significant negative impact on consumers in terms of the affordability of relevant products
 - no proprietary technology imposed on manufacturers
 - All features for product functionality (next slide)

DEFINITION PRODUCT SCOPE

Preliminary product scope

- Secondary performance parameters and/or functions
 - Features for product functionality:
 - bi-directional recharging' function
 - connection: 'socket' or 'cable with plug'
 - 'connector type'
 - 'digitally-connected recharging point'
 - 'high-power recharging point' (>22 kW)
 - 'payment service'
 - 'publicly accessible alternative fuels infrastructure'
 - 'smart recharging'
 - DC/Single phase AC/Three Phase AC [DC/ 230 VAC/ 3x400 VAC]
 - number of charging points per EVSE
 - fixed cable attached to the EVSE
 - display included
 - signage lighting included
 - 'recharging point, station or pool dedicated to light-duty vehicles' or 'recharging point, station or pool dedicated to heavy-duty vehicles'

Subjects

- Energy consumption and power loss
- Function state
 - It is proposed to follow the 3 states according to the PEP ecopassport[®] :
 - Off state: no EV connected for each charging point
 - Idle state: connected but finished with charging
 - Active state: charging the EV at one or both charging points.
 - Each state needs a certain power leading to an intrinsic energy need. The charging itself leads to additional dissipative loss.
- EMC filter
- Reactive power
- Screen brightness
 - From Energy Star[®] program

Short overview

- Europe
 - Ecodesign for Sustainable Products Regulation (ESPR)
 - European regulation on deployment of alternative fuels infrastructure (EU) 2023/1804 (AFIR)
 - Energy Performance of Buildings Directive (EPBD) (EU/2024/1275)
 - Upcoming Right to Repair Directive (R2RD)
 - Waste of Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU
- Beyond Europe
 - USA
 - National Electric Vehicle Infrastructure Standards and Requirements
- Member state legislation
 - Local regulation for mode 2 recharging
 - Mode 2 EVSE with industrial sockets might be hampered

TASK 1

Thank you

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