

EnerMOB



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Interregional Electromobility Networks for intERurban low carbon MOBility

ELECTROMOBILITY DESIGN GUIDELINES

OCTOBER 2018

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Project Partner 3	Regional Development Agency of Northern Primorska Ltd (Slovenia)
Project Partner 4	County of Primorje and Gorski Kotar (Croatia)
Project Partner 5	Regional Economic Development Agency of Sumadija and Pomoravlje (Serbia)

Responsible Partner for the Deliverable



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1. Purpose of document within the project

1.1 Overview of the project

EnerMOB is an *European Territorial Cooperation project* aiming to approach and upgrade regional and local low carbon transport policies by integrating electromobility systems at interregional and interurban level.

EnerMOB plans, tests and promotes common standards for transnational and interregional electric transport networks tackling **2 main challenges**:

1. to plan and test parallel “*Interregional Electromobility Networks*”, in order to connect cities and regions with electric transport systems using same standards at transnational level.
2. to improve low carbon transport policies and electromobility strategies in interurban displacements between cities, rural areas and intermodal terminals.

About 1st challenge, despite the *Directive 2014/94/EU on Deployment of Alternative Fuels Infrastructure*, to date EU territory has still not integrated “*Small-Scale Infrastructure Networks*” to allow large displacements with Battery Electric Vehicles (BEVs). Differently to vehicles with combustion engines, a BEV cannot cross over to different EU States because of a lack of charging infrastructures and common charging standards.

About 2nd challenge, current low carbon transport policies were developed mainly in big cities that often implemented SUMP. But many smaller towns need to develop different sustainable mobility policies, due to more frequently interurban displacements with longer distances.

Often, national/regional low carbon mobility policies affect only urban scale (pedestrianism, bicycles, etc.) without considering interurban displacements with longer distances. So traditional public transport services are designed for urban and metropolitan areas, and are not remunerative for weak demand areas as small towns and rural areas. Consequently, use of private cars increases in such areas increasing GHG emissions.

Within pilot actions, EnerMOB will promote and test electromobility solutions to be adopted by regional and local mobility policies for medium-small cities connections.

1.2 Project objectives, expected results and main outputs of the project

EnerMOB project aims to study and support common solutions for electric transport systems at interurban and interregional level, by:

- implementing pilot networks of charging infrastructures;
- using common BATs to manage charging points and monitor energy demand.

In particular, as **main overall objective** of ENERMOB project is **to implement Adriatic-Ionian “Interregional Electromobility Networks”** connecting regions at transnational level with same standards.

Such overall ENERMOB objective is structured through **3 specific objectives**:

- *To define **common design guidelines for electromobility systems** according to same technical standards and communication protocols.*

- To implement **joint strategies** for mobility and urban planning of electromobility systems in the framework of existing regional transport networks;
- To implement **regional “Small-Scale Infrastructure Network”** allowing interurban electric transport displacement between cities, rural areas and intermodal terminals.

Main expected project result of ENERMOB is the creation of a pilot Adriatic-Ionian “Interregional Electromobility Network”, constituted by 5 pilot regional “Small-Scale Infrastructure Networks” connecting cities, rural areas and intermodal terminals at transnational as well as at interurban level.

Thus, ENERMOB partners will test **5 pilot actions** aimed to reach following electromobility **challenges**:

- to overcome interregional and transnational restrictions by using common and integrated communication protocols of charging operations, so that same *Battery Electric Vehicle* (BEV) can cross over to different EU States using common charging standards and *Electric Vehicles’ Supply Equipment* (EVSE).
- to overcome intermodal restrictions by integrating electromobility infrastructures in existing intermodal terminals (as airports, ports, railway stations, etc.).
- to overcome interurban and spatial restriction by installing charging infrastructures within a medium-range distance, so that a BEV can cover longer distances by using several electric fuel stations along its trip.

To test such pilot actions, ENERMOB will develop some **small-scale investments** in all participating regions and affecting following **main deliverables**:

- n. 8 “Battery Electric Vehicles” (BEV) to be used by all the partners for the testing phase of pilot actions;
- n. 16 “Charging points” to be installed in all participating regions in order to provide electric energy to BEVs;
- n. 4 predisposition to connect photovoltaic plant to the charging points to be installed in Ragusa province;
- ICT tools for remote control of charging services using common communication protocols in all participating regions.

To reach such purposes, the project develops the following *Implementing Work Packages*:

- **WP T1** *Start-Up Planning*
- **WP T2** *Electromobility Pilot Actions*
- **WP T3** *Transferring*

1.3 Purpose and structure of the document

As reported in the Application Form, the **Deliverable T1.1.2 – Electromobility operational planning guidelines** is drafted by LP with contribution of partnership and has to be used by all partners to plan and design electric transport infrastructures/services with same technical standards, best available technologies (BATs) and minimum requirements.

Common guidelines aim to plan parallel “*Small-Scale Infrastructure Networks*” as integrated parts of an “*Interregional Electromobility Network*”, in order to allow each partner:

1. to plan and design parallel regional “*Small-Scale Infrastructure Network*” within a common framework of “*Interregional Electromobility Network*” using same communication protocols and same EV equipment supply (WP T1 activities);
2. to install/build parallel regional “*Small-Scale Infrastructure Network*” according to the above mentioned plans and designs (WP T2 pilot activities).

After the testing phase of WP T2, the “*Electromobility operational planning guideline*” will be upgraded and finalized with the Deliverable T3.3.1 (“*Electromobility Implementation Guidelines*”) to be developed within WP T3 – Transferring.

This Guidelines were drafted on the basis of the *Directive 2014/94/EU of the European Parliament and of the Council on the Deployment of Alternative Fuels Infrastructures* (DAFI), that establishes a common framework of measures for the deployment of alternative fuels infrastructure in the European Union in order to minimise dependence on oil and to mitigate the environmental impact of transport.

According to such Directive, the Guidelines set out minimum requirements for the building-up of alternative fuels infrastructure, with special regards to recharging points for electric vehicles to be implemented by project partners, as well as common technical specifications for such recharging points and user information requirements.

With this purpose, the current version of document has been structured in the following chapters:

1. Purpose of document within the project;
2. Definitions;
3. Legal references and Technical Standards;
4. Minimum requirements.

2. Definitions

Following pages show the description of the technical terms to be shared and used by partners for the implementation of the project, following the EU Directives and technical standards for electric transport.

For the purpose of these Guidelines, the following table reports the main common Electromobility definitions to be applied according to the Directive 2014/94/UE and other EU Directives listed in the subsequent chapter.

Main common Electromobility definitions	
Definition	Description
Guidelines	Deliverable T1.1.2 – Electromobility operational planning guidelines (this document)
DAFI Directive	Directive 2014/94/EU of the European Parliament and of the Council on the Deployment of Alternative Fuels Infrastructures
Electricity (or Electric Energy)	“Alternative fuels” or “power sources” serving, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector.
Electric Vehicle (EV)	Motor vehicle equipped with a powertrain containing at least one non-peripheral electric machine as energy converter with an electric rechargeable energy storage system, which can be recharged externally.
Recharging point	Interface that is capable of charging an Electric Vehicle at a time or exchanging a battery of one electric vehicle at a time.
Slow power recharging point	Recharging point that allows for a transfer of electricity to an electric vehicle with a power less than or equal to 3,7 kW, which are installed in private households or the primary purpose of which is not recharging electric vehicles, and which are not accessible to the public.
Normal power recharging point	Recharging point that allows for a transfer of electricity to an electric vehicle with a power less than or equal to 22 kW, excluding devices with a power less than or equal to 3,7 kW, which are installed in private households or the primary purpose of which is not recharging electric vehicles, and which are not accessible to the public.
High power recharging point	Recharging point that allows for a transfer of electricity to an electric vehicle with a power of more than 22 kW.
Public recharging point	Recharging point accessible to the public for electric energy supply, which provides Union-wide non-discriminatory access to users. Non-discriminatory access may include different terms of authentication, use and payment.

Main common Electromobility definitions	
Definition	Description
Category M1 vehicle	Vehicle designed and constructed according to Directive 2007/46/CE for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat.
Category L7-e vehicle	<p>Heavy quadricycle designed and constructed according to Regulation (EU) No 168/2013, with following classification criteria:</p> <ol style="list-style-type: none"> 1. length \leq 4 000 mm 2. width \leq 2 000 mm 3. height \leq 2 500 mm 4. four wheels and powered by a propulsion as listed under Regulation (EU) No 168/2013 5. mass in running order: <ol style="list-style-type: none"> a. \leq 450 kg for transport of passengers; b. \leq 600 kg for transport of goods.
Smart metering system or Intelligent metering system	Electronic system that can measure energy consumption, providing more information than a conventional meter, and can transmit and receive data using a form of electronic communication.
Energy from renewable sources	Energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.

3. Legal references and technical standards

The project partners have to consider the following EU legal references and international technical standards for the technical reports, the thematic equipment and the small-scale investments to be developed, purchased and/or implemented within the project.

3.1 Main legal references

For the WP T1 and WP T2 implementation, each project partner has to develop the activities and deliverables according to the following European legal framework:

- Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (Framework Directive);
- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC;
- Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC;
- Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC;
- Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the Deployment of Alternative Fuels Infrastructures;
- Regulation (EU) N. 168/2013 of the European Parliament and of the Council of 15 January 2013 on the approval and market surveillance of two- or three-wheel vehicles and quadricycles.

3.2 Main technical standards

For the WP T1 and WP T2 implementation, each project partner has to develop the activities and deliverables according to (at least) the following technical standards:

- IEC 62196-1:2014 applied to “Plugs, socket-outlets and vehicle couplers - Conductive charging of electric vehicles” - Part 1: General requirements;
- IEC 62196-2:2016 applied to “Plugs, socket-outlets and vehicle couplers - Conductive charging of electric vehicles” - Part 2: Dimensional interchangeability requirements for a.c. pin and contact-tube accessories;
- IEC 62196-3:2014 applied to “Plugs, socket-outlets and vehicle couplers - Conductive charging of

electric vehicles” - Part 3: Dimensional compatibility and interchangeability requirements for d.c. and a.c./d.c. pin and contact-tube vehicle couplers;

- IEC 61851-1:2017 applied to “Electric vehicle conductive charging system” - Part 1: General requirements.
- IEC 62752:2016 applied to “In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD)”.

4. Minimum requirements

Such chapter defines the minimum requirement to develop/implement the project deliverables planned for WP T1 and WP T2 according to the legal references and technical standards reported in the previous pages.

Therefore the following section of the document defines:

- Minimum requirements for WP T1 technical reports;
- Minimum requirements for executive design of small-scale investments and thematic equipment.

4.1 Minimum requirements for WP T1 technical reports

This section provides some minimum contents to develop the technical reports and related annexes for the following WP T1 deliverables:

- Deliverable T1.2.1 - Local Electromobility Analysis
- Deliverable T1.3.1 - "Small-Scale Infrastructure Network" Action Plan
- Deliverable T1.4.1 - "EV Supply Equipment" Executive Design

Each partner has to develop some minimum contents for every deliverable according to the index reported in the table below.

Minimum requirements for <i>Small-Scale Investments and Thematic Equipment</i>		
Deliverable	Typology of document	Index of suggested minimum contents
Local Electromobility Analysis	Feasibility study with: <ul style="list-style-type: none"> - Technical report - Statistics - Project drawings (Plans, etc.) 	Feasibility study needs minimum contents requested by local legal references on public procurements and on urban planning, in order to reach all the technical and administrative authorizations by competent Authorities operating in the local context. Below it is reported a suggested index of possible content requested by Authorities for the feasibility study: <ul style="list-style-type: none"> - Technical report including: <ul style="list-style-type: none"> o Territorial and socio-economic framework o Transport demand and supply analysis o Comparison of alternative planning proposals and technical solutions o Environmental and urban planning pre-assessment o Time plan o Preliminary economic calculation of investments - Planning drawings (from 1:50.000 to 1:2.000 scales, indicatively) - Economic report (preliminary cost-benefit analysis and business model hypothesis)

Minimum requirements for <i>Small-Scale Investments</i> and <i>Thematic Equipment</i>		
Deliverable	Typology of document	Index of suggested minimum contents
"Small-Scale Infrastructure Network" Action Plan	Preliminary Plan with: <ul style="list-style-type: none"> - Technical reports - Project drawings (Plans, etc.) 	<p>Preliminary plan needs minimum contents requested by local legal references on public procurements and on urban planning, in order to reach all the technical and administrative authorizations by competent Authorities operating in the local context.</p> <p>Below it is reported a suggested index of possible content requested by Authorities for the preliminary plan:</p> <ul style="list-style-type: none"> - General report - Technical reports - Topographic surveys - Urban planning evaluations - Environmental pre-feasibility study - Landscape assessment - Project drawings (from 1:5.000 to 1:100 scales, indicatively) - Energy and Structural calculations - Cost-Benefit analysis - Calculations of technical installations (recharging points, connection to the grid etc.) - Price Analysis, estimative metric computation and economic framework - Descriptive and performance specifications
"EV Supply Equipment" Executive Design	Executive design with: <ul style="list-style-type: none"> - Technical reports - Data processing - Project drawings (Plans, etc.) 	<p>Executive design needs minimum contents requested by local legal references on public procurements and on urban planning, in order to reach all the technical and administrative authorizations by competent Authorities operating in the local context.</p> <p>Below it is reported a suggested index of possible content requested by Authorities for the executive design:</p> <ul style="list-style-type: none"> - General report - Technical reports - Project drawings (from 1:1.000 to 1:100 scales, indicatively) - Executive drawings, construction details (from 1:100 to 1:1 scales, indicatively) - Structural and executive calculations - Estimative metric computation and economic framework - Safety plan - Maintenance plan - Special tender specifications

4.2 Minimum requirements for executive design of small-scale investments and thematic equipment

This section provides some parameters to develop the *Deliverable T1.4.1 - "EV Supply Equipment" Executive Design*.

In particular, with the *Executive Design* for next WP T2 deliverables, each partner has to define the minimum requirements for *small-scale investments* and *thematic equipment* to be purchased and/or installed before the pilot actions.

The following table reports the suggested minimum requirements to be respected and to be requested in the calls for tenders that each partner will publish for the public procurements of following *small-scale investments* and *thematic equipment*:

- Category M1 Electric Vehicle
- Category L7-e Electric Vehicle
- Public recharging point (for all the partners with exception of REDASP)
- Private charging point (**only for REDASP partner**, because of the lower allocated budget in AF)

Such minimum requirements use the parameters reported in the legal references and technical standards which were explained in the previous pages. Anyway, during the executive design phase each partner has to integrate the minimum requirements with its National/Local regulations.

Minimum requirements for <i>Small-Scale Investments</i> and <i>Thematic Equipment</i>	
<i>Small-Scale Investments</i> or <i>Thematic Equipment</i>	Description and minimum requirements
Category M1 Electric Vehicle	<p>Passenger car having following minimum requirements:</p> <ul style="list-style-type: none"> - Vehicle type: M1 category homologated according to the Directive 2007/46/EC - Seats: suitable 4 or more (anyway no less than 2 seats) - Engine: full electric (not hybrid) - Minimum range: 100km - Maximum Power: no less than 40 kW - Maximum speed: no less than 80 km/h - AC Charging time with "Mode 1" as described in IEC 61851-1 standard: not more than 8 hours for 100 Km of range. - CO2 Emissions: 0gm/km - Charging Cable with charging connection plug conforming to connector of "Type 2" (single and three phase vehicle coupler, reflecting the VDE-AR-E 2623-2-2 plug specifications), as described in IEC 62196 standard, for charging with at least 16A in single phase. The minimum length of the cable shall be at least 2 metres - Battery type: Long life Lithium Ion and/or Lithium Ceramic and/or Lithium Polymer

Minimum requirements for <i>Small-Scale Investments</i> and <i>Thematic Equipment</i>	
<i>Small-Scale Investments</i> or <i>Thematic Equipment</i>	Description and minimum requirements
Category L7-e Electric Vehicle	<p>Quadricycle having following minimum requirements:</p> <ul style="list-style-type: none"> - Vehicle type: L7e category homologated according to the Regulation (EU) N. 168/2013 - Seats: suitable 2 (anyway no less than 1 seats) - Engine: full electric (not hybrid) - Minimum range: 40 km - Maximum Power: no less than 15 kW - Maximum speed: no less than 40 km/h - AC Charging time with "Mode 1" as described in IEC 61851-1 standard: not more than 8 hours for 100 Km of range. - CO₂ Emissions: 0gm/km - (if available as Best Available Technology in current national market) Charging Cable with charging connection plug conforming to connector of "Type 2" (single and three phase vehicle coupler, reflecting the VDE-AR-E 2623-2-2 plug specifications), or "Type 3A" (Single-phase vehicle coupler) as described in IEC 62196 standard, for charging with at least 16A in single phase. The minimum length of the cable shall be at least 2 metres. - An eventual adaptor from IEC 62196 Type 2 "Mennekes" plug to local domestic plug must be supplied, for charging at a maximum 16A (domestic charging purposes) - Battery type: Long life Lithium Ion and/or Lithium Ceramic and/or Lithium Polymer
Public recharging point	<p>Recharging point accessible to the public for electric energy supply to motor vehicles with following minimum features:</p> <ul style="list-style-type: none"> - Charging mode: "Mode 3" as described in IEC 61851-1 standard; - Alternating current (AC) High Power (more than 22 kW) recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with connectors of "Type 2" (single and three phase vehicle coupler, reflecting the VDE-AR-E 2623-2-2 plug specifications), as described in EN 62196-2 standard. <i>or, if not possible,</i> - Alternating current (AC) Normal Power (from 3,7 kW to 22 kW) recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with socket outlets or vehicle connectors of "Type 2" (single and three phase vehicle coupler, reflecting the VDE-AR-E 2623-2-2 plug specifications), as described in EN 62196-2 standard. While maintaining the Type 2 compatibility, those socket outlets may be equipped with features such as mechanical shutters.

Minimum requirements for <i>Small-Scale Investments</i> and <i>Thematic Equipment</i>	
<i>Small-Scale Investments</i> or <i>Thematic Equipment</i>	Description and minimum requirements
Private recharging point (only for REDASP partner)	Recharging point for electric energy supply to motor vehicles with following minimum features: <ul style="list-style-type: none"> - Charging mode: “Mode 2”, with In-Cable Control and Protection Device) as described in IEC 61851-1 and IEC 62752 standards; - Alternating current (AC) Slow Power (less than or equal 3,7 kW) recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with connectors of “Type 2” (single and three phase vehicle coupler, reflecting the VDE-AR-E 2623-2-2 plug specifications), as described in EN 62196-2 standard. <i>or, if not possible,</i> - Alternating current (AC) Normal Power (from 3,7 kW to 22 kW) recharging points for electric vehicles shall be equipped, for interoperability purposes, at least with socket outlets or vehicle connectors of “Type 2” (single and three phase vehicle coupler, reflecting the VDE-AR-E 2623-2-2 plug specifications), as described in EN 62196-2 standard. While maintaining the Type 2 compatibility, those socket outlets may be equipped with features such as mechanical shutters.



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