



SUB-GROUP TO FOSTER THE CREATION OF AN ELECTROMOBILITY MARKET OF SERVICES (SGEMS)

D.2.2. Memorandum of Understanding (MoU) fostering seamless and valuable EV customer experience in Europe

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This MoU was elaborated by a group of expert of the SGEMS under the mandate of the European Commission to progress in the implementation of the Directive 2014/94/EU with the help of recommendations aiming at facilitating the deployment of electro-mobility services at EU level.

The aim of this MoU is to bring together all Electro Mobility stakeholders to agree on key principles and technical guidelines to follow in order to foster seamless and valuable EV customer experience in Europe.

Document history

v	Date	Main author	Summary of change
01	21/06/2016	Jean-Charles Pandazis	Structure and very first draft, include comments from Giovanni Coppola (ENEL) and Christian Hahn (Hsubject)
02	21/09/2016	Jean-Charles Pandazis Bruno Lebrun Giovanni Coppola,	Reshaping and update to version v02 including Christian Hann and Philippe Dupuy contributions
03	03/10/2016	Jean-Charles Pandazis	Update with received input:
04	06/10/2016	Giovanni Coppola with D2.2 core team	update of the Annex MoU during D2.2 core team meeting on 6/10/2016
05	18/11/2016	Giovanni Coppola, Jean-Charles Pandazis	Update taking into account Dorothée Coucharrière (DG-MOVE) comments, input of Philippe Dupuy and comment of Bruno Lebrun.
06	30/11/2016	Giovanni Coppola, Jean-Charles Pandazis	Update taking into account comments of Alain van Gaever (DG-MOVE and eMI ³)
06b	05/12/2016	Giovanni Coppola, Jean-Charles Pandazis	Updates in preparation to the SGEMS meeting on 06/12
07	07/12/2016	Giovanni Coppola with D2.2 core team	update of the Annex MoU during D2.2 core team meeting on 7/12/2016
08	08/12/2016	Jean-Charles Pandazis	Reorganisation of the document keeping the MoU as the main part of the document. Update with D2.2 core team contributions.
09	25/01/2017	Jean-Charles Pandazis Giovanni Coppola with D2.2 core team	Update of the document answering the comment from last SGEMS meeting
10	21/03/2017	Jean-Charles Pandazis	Final draft including proposal for a letter of support, all sections finalised, considering also short summary of other STF-SGEMS deliverables.
11	11/04/2017	Jean-Charles Pandazis with D2.2 core team	Final version including comments from SGEMS meeting on 30/03/2017 and D2.2 core team telco on 11/04/2017.
12	12/06/2017	Jean-Charles Pandazis	Final version with updated statement at the end of the technical guidelines (p.9) on RFID readers in-line with SGEMS last meeting recommendations.

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Memorandum of Understanding fostering seamless and valuable EV customer experience in Europe

The signatories

Signatories are representing different roles in the ElectroMobility market framework such as the following:

Electric Vehicle Manufacturers

Companies manufacturing and selling Electric Vehicles on the market.

Benefit: MoU implementation will ensure interoperability of EV charging and services

Electric Utilities (Energy Retailers and Distribution System Operators)

Companies with business operations in production, distribution and sales of electricity

Benefit: MoU implementation will lead to interoperable energy distribution schemes and operations

Charging Point Operators (CPO)

Companies with business operations in charging stations management

Benefit: MoU implementation will lead to interoperable charging services

Technology Suppliers (e.g. charging stations, hardware, software)

Companies providing enabling technology for ElectroMobility market

Benefit: MoU implementation will ensure interoperable systems for EV charging and services

ElectroMobility Service Providers (EMSP)

Companies providing end-customer services within ElectroMobility market

Benefit: MoU implementation will ensure interoperability of EV services and a wider market for eMobility

Roaming Service Providers (RSP)

Companies providing services to ensure data exchange between B2B companies within ElectroMobility market

Benefit: MoU implementation will ensure interoperability of Roaming services

Industrial Representative Associations

Business association representing industries

Benefit: MoU implementation will strengthen the EV industry by enabling a global market for EV thanks to interoperability

User associations

National and international customer associations

Benefit: MoU implementation will provide to the user/customer a seamless eMobility experience thanks to interoperability of charging and services.

Rationale

ElectroMobility is seen by the Signatories as a key enabler in the transition to sustainable energy and transport industries as well as in meeting climate change objectives.

In order to foster ElectroMobility mass market, EV (Electric Vehicle) customers must be capable of **seamlessly and valuably** accessing charging infrastructure for EVs, including receiving transparent information for services payment. To this aim, **ElectroMobility interoperability**, as the ability to enable various systems to work together, is seen as the critical feature.

Interoperability is a characteristic of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, in either implementation or access, without any restrictions.

From customer experience perspective interoperability allows an EV customer to seamlessly use the Electric Vehicle Charging Infrastructure (EVCI) wherever it is located, whichever EV the customer uses, whoever operates the Charging Point, whoever supplies the charging service and electricity¹.

Interoperability therefore implies the development of an open market of digital services and makes it available through-out a defined territory without limitation and with a coherent service quality level for the EV customers.

Charging service to the EV customers could be provided by means of two different access relationships:

- **Ad-hoc access**

As requested in EU 94/2014 Directive, ad-hoc access ensures charging of electric vehicles even without entering into a contract with electricity supplier or operator.

- **Contract-based access**

It consists in providing charging of electric vehicles based on customer contract.

Despite the value of ad-hoc access, its provisioning by the Charging Point Operator does not imply seamless EV customer experience due to diversity of possible implementations.

Contract-based charging requires cost-effective, open, business and technical framework to be established between stakeholders to allow seamless and affordable EV customer experience.

In any case, regardless the access relationship, industry must cooperate on shared business and technical requirements for interoperability which will be beneficial for the EV customer experience. Both ad-hoc access and contract-based access needs interoperability which is leading to comfortable customer experience.

It is widely shared that the EV customer experience is enhanced by contract-based access which enrich customer proposition with value added services beyond charging: e.g. searching, finding and booking a charging station, charging notifications update, smart charging such as optimizing EV charging according to pricing, grid stability,

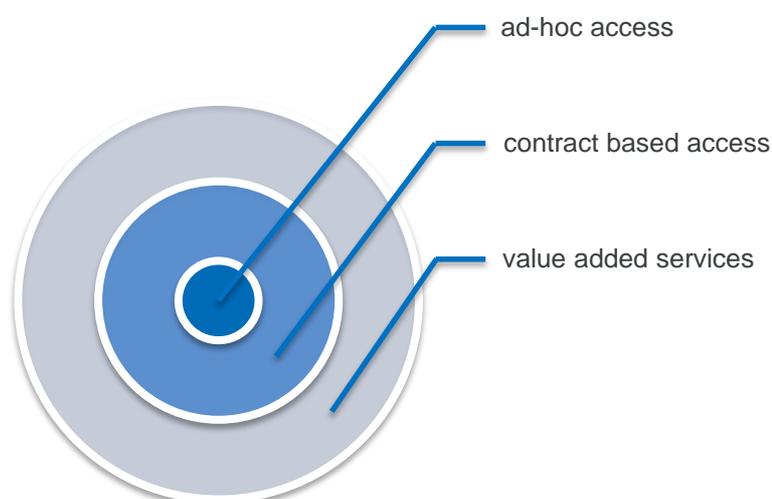
¹ taken from <http://interoperability-definition.info/> dedicated website for a Definition of Interoperability

availability of distributed renewables energy resources nearby, as referenced in the winter package of the European Commission².

In addition, value added services also offer the option to charge with 100 % green energy to address the EV customer's concern of eco-friendly mobility. Using a remote application, an EV customer can choose different charging options, which is - using a physical CC reader - very limited.

Based on interoperability, all EV customers shall be able to use their mobility services (ad-hoc and contract base) and value added services as well as POI data exchange (including static and dynamic data) and paying the charging session at all publicly available charging stations.

The following graphic shows the connection of ad-hoc access, contract based access and the use of value added services:



For these reasons, the signatories of this MoU cooperate on ensuring interoperability and therefore endorse the following key principles and technical guidelines on which the signatories will focus in order to foster the development of an ElectroMobility mass market.

² More info on:

<http://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>

Key principles

The signatories agree on the following general principles for seamless and valuable EV customer experience that must be implemented to enable interoperability in the ElectroMobility market:

- **Connectivity of assets is required**
All assets involved in ElectroMobility ecosystem for publicly accessible infrastructure must ensure reasonable real-time connectivity to enable provisioning of services. Assets include EVs, Charging Stations, IT platforms, etc.
- **Usage of interoperable contract-based charging boost the ElectroMobility market of services**
Contract-based charging provides a seamless and valuable EV customer experience, enriching customer proposition with value added services on a large scale. Interoperability establishing cooperation between Service Providers and Charging Point Operators is ensured by means of agreements handled on centralized or de-centralized manner.
- **Publicly available charging infrastructure must be opened**
Charging infrastructure is open for all customers, in a non-discriminatory way, regardless the EMSP providing them with a contract. Where this is not true, closed silos of charging infrastructure prevent seamless EV customer experience. On this base, CPOs and EMSPs are free to close B2B agreement for making this happen. To further avoid closed networks, fair and reasonable usages tariffs shall be used.
- **Customer experience must be improved**
Customer experience provided by EMSPs should be continuously improved, particularly through digital means of accessing the EV charging infrastructure, especially before, during and after charging; ensuring availability of robust, reliable and ergonomic charging stations and driving a competitive market of charging services.
- **Continuous adoption of business and technical solutions ensures interoperability**
These solutions leverage harmonization including business objects, charging standards, car compatibility with charging stations, real-time information exchange in line with the technical guideline given below.

Technical guidelines

Even if commercial and implementation issues may exist, technology must not be a barrier to interoperability. In order to lower the technical constraints for implementation of interoperability, the SGEMS – Sub-Group ElectroMobility Market of Services – within Sustainable Transport Forum of the European Commission, defined guidelines for standardized formats and protocols that the signatories also support, and that should be followed by ElectroMobility stakeholders and any future international standard should take them into account.

The key technical guidelines to be implemented are as follow:

- **Talking a common language by adopting shared data model**
Shared data model for business objects definition and interaction allow e-mobility stakeholders to talk a common language, enabling their business transactions. The eMI³ data model is fully relevant and recommended, as it is simple to implement and very robust regarding future possible enhancement and changes
- **Setting common rules for identifying business objects**
Based on ISO 15118 relevant Actors and Business Objects should be identified to achieve interoperability:
 - *Global Service Provider ID: Identifier of unique ElectroMobility Service Provider*
 - *eMA ID: Identifier of unique Customer Contract*
 - *Global Spot Operator ID: Identifier of a unique Charging Point Operator*
 - *EVSE ID: Identifier of a unique charging point*

With regards to the ID issuing process it is recommended to:

- *publish a **single ID registration process** for unique identification of EVSP (Global Service Provider IDs) and EVSE Operator (Global Spot Operator IDs) to ensure backward compatibility with existing practices*
- *set up a **public-private working initiative** to facilitate a list of reserved “Global Service Provider IDs” and all “Global Spot Operator IDs” and to facilitate the interim ID registration processes for unmanaged country codes.*
- **Adopt common rules for authorization and billing information**
Charging process information should be exchanged between e-mobility stakeholders adopting the same definition of Authorization and Charging Detail Record, including for example the EVCOID, EVSEID, the amount of consumed energy, timestamp, etc. This will fully support fair prices policy and price transparency for the benefit of the customer.
- **Target real-time information exchange**
Deploying real time data exchange between the transport and the energy industries is seen as enabler of value added services:
 - *e.g. Point Of Interest (POI) data, EV data, Distribution System Operator (DSO) relevant data, Customer preferences are important enabler of value added services that can be delivered such as smart charging, promotion and access to clean energy, searching, finding and booking of charging stations, and many other services that might be developed and deployed in the next decades.*

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- *eRoaming solutions should rely on real-time exchange of information. If new central solutions are created, there is the clear recommendation to establish them as real-time solutions, no whitelisting anymore.*
 - **Promote the definition of common interface to Energy Network**
Common interfaces, such as those deployed in the communication between EVSE operator and utilities, making use of smart meters and calibrated systems, are needed to enable value-added services related to the Vehicle Grid Integration (VGI) domain. These services will trigger energy transition experienced in the electricity market by allowing the EV battery monetisation and improving the EV total cost of ownership.(e.g. smart charging, V2G, demand response).
 - **Adopt international standards and support their future definition**
International standards and particularly at EU level are essential to avoid technological barriers. Beyond the data model and business objects, the following topics are seen as critical enablers:
 - *Communication protocol between charging station and charging station back-end systems (ongoing initiative within IEC TC 69)*
 - *Compatibility between the EV and the charging station (e.g. ISO 15118, IEC 61851-1, IEC 61851-23)*
 - *Communication protocol between back-end systems (ongoing initiative within IEC TC 69)*
 - *Common understanding of interoperability and eRoaming is crucial to promote new project in the European market.*
 - *Installation of readers that are able to support both MiFare Classic & Mifare Desfire is recommended for RFID access to charging infrastructure.*

Implementation of the MoU

The Signatories agree and commit on implementing the objectives of this MoU through:

- Participation to cross industries working groups on interoperability
- Close cooperation with international standardization bodies
- Compliance with regulations in force

Signature process

This MoU brings together all stakeholders of the eMobility market.

Under the patronage of the European Commission, the MoU and signature process will be officially announced in due time.

The signature process will start as an open process bringing over the time more and more signatories. Each new signature will be added as an attachment of this document in an alphabetical order.

The MoU will be supported by the European Commission as a way to enable interoperability across the EU with the aim to achieve a wide adoption of its terms by increasing the number of its signatories.

Public Authorities support

Beside the engagement of the eMobility industry it is very important to get the full support from Public Authorities, NGO's, non-profit and governments related to ElectroMobility in using / applying the MoU recommendation.

We can distinguish the following different level of organisations:

- **Public authorities in charge of implementing the Alternative Fuel Infrastructure directive**
- **Regional and local authorities interested in rolling out charging infrastructure (e.g. Länders in Germany, Departments in France, Regions in Italy, etc.)**

Benefits for these organisations to support this MoU are to:

- widen and strengthen the implementation of the AFI directive
- ensure the deployment of an interoperable charging infrastructure in order to maximise customer usage, fitting best value for money principle in public funding, in particular when launching tenders and/or supporting deployment with funding schemes
- provide quality ElectroMobility services to the citizens

It is proposed to these organisations to sign a Letter supporting the MoU as proposed in **Annex 2: Letter of Support of the MoU**.

Administration of the MoU

This MoU does not constitute any legal obligation to either party, nor does it amend or abrogate any organisational requirements for either party

The signatories may consult with each other and the European Commission at any time with regard to any application, suggestion or procedure capable of enhancing their cooperation under this MoU.

Any dispute or differences arising out of the interpretation or implementation or application of the provisions of this MoU shall be settled amicably through consultation or negotiation between the Parties.

The follow-up of the implementation and where-needed modifications of this MoU will be administered by the European Commission through the Expert Group under the Sustainable Transport Forum. This will allow promotion of the MoU, informing interested organisations, etc.

MoU signatures

The following pages present:

- first the statistics per signee category
- then all the one page signature following the alphabetical order

Signatory role in the ElectroMobility market framework	Number signatures
Electric Vehicle Manufacturers	
Electric Utilities (Energy Retailers and Distribution System Operators)	
Charging Point Operators (CPO)	
Technology Suppliers (e.g. charging stations, hardware, software)	
ElectroMobility Service Providers (EMSP)	
Roaming Service Providers (RSP)	
Industrial Representative Associations	
User associations	

Total signatures:

Signatures

LOGO	Company legal name Address Signature _____ XX YY Head of XX YY
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Comments

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Annex 1: Additional information supporting the MoU

Content for the MoU

Over the last 2 years a number of legislative changes, regulatory drivers and standardization efforts can be observed. These legislative developments frame the market for ElectroMobility (eMobility) in Europe, and subject to integrated implementation could serve to drive the uptake of electric vehicles in EU Member States. The development of eMobility must also be in line with EU Commission policy goals in term of climate action contributing to the reduction of CO₂ emissions.

What is Interoperability?

Interoperability is the ability to enable various systems to work together. For the eMobility market, interoperability leads to non-discriminatory eMobility services, such as charging and navigation, and makes it available through-out a defined territory (in this case Europe) without limitation and with a coherent service quality level at an optimized price. From a customer point of view, interoperability is the ability to use the Electric Vehicle Charging Infrastructure (EVCi) wherever it is located, whichever EV the customer uses, whoever operates the charging Point, etc.

Rationale

There is no technological barrier to interoperability: While different technical protocols are used between market players, those often rely on relatively similar structures avoiding technology lock-in situations.

However, in some cases, commercial barriers may arise: even with technical compatibility, strategic considerations sometimes lead market players to purposely limit interoperability. Such behaviour is particularly questionable for publicly funded charging infrastructure. So, when technical compatibility and commercial feasibility is ensured, publicly funded charging point operators should not have to possibility to purposely limit interoperability of their infrastructure.

But this should not only be limited to public funded projects – also when private financed projects are established, the access to this charging infrastructure – if it usable publicly – shall be opened for every end customer of mobility services providers, who have a contract with the respective charge point operator.

Main challenges

Interoperability is a key challenge for the global eMobility industry and, if left unresolved, will continue holding back the uptake of electric driving.

eMobility challenges can be described in 3 main areas:

- Set up a fair business case for all actors respecting investments and running costs
- Define clear interoperability rules and pieces of evidence
- Ensure pan-European coherent and equivalent service level

Directive 2014/94/EU has solved the problem of EV plug standardisation at EU level (i.e. physical plug). However, interoperability of protocols and formats is still lacking. Existing standards are unevenly applied. A Memorandum of understanding between industries, with the support of public authorities, would help giving a step further to the deployment of ElectroMobility.

Market framework for interoperability

Regarding the European eMobility market, there is the common understanding, that accessing publicly available charging infrastructure has to be available for everyone on a transparent, seamless and interoperable manner.

To reach this goal, in the last years especially the so-called subscription based charging is widely used, in that case subscription registration is needed and the end customer is using a contract ID with an RFID card or a smart phone application. So, about 50% of all publicly accessible charge points offering are contract based charging.

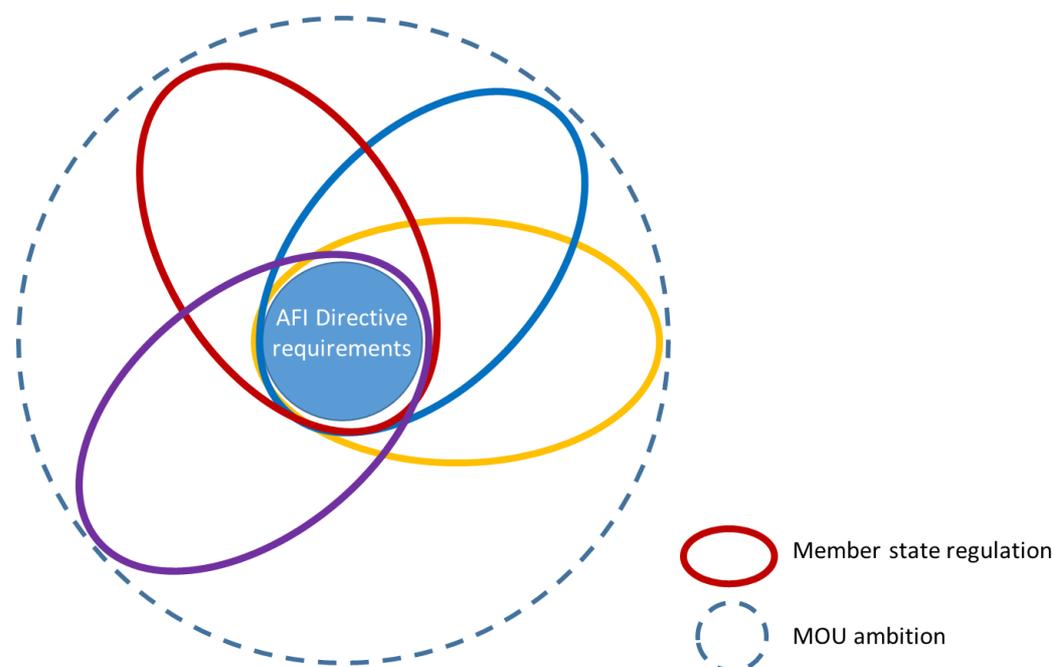
In the future, subscription based charging may easily enable enhanced services (e.g. real-time POI data) and facilitate EV integration in the electricity value chain (e.g. smart charging solutions). To reach a further level of interoperability, the use of roaming or interoperability platforms has evolved. This interoperability platforms offer B2B services, so that no more bilateral connections are needed, but connections between n-CPOs to one or more platforms enables the access by end customers of 1:n mobility services providers.

In addition to contract based access, also ad-hoc charging is available, but in numbers, this is used by less than 5% of publicly accessible charge points. When it is available, it is mostly available via Apps/mobile websites and prepaid RFID cards as these ad-hoc solutions relies on the similar technologies than contract based charging methods.

A systemic structure based on Charging Point Operators (CPOs), E-Mobility Service Providers (E-MSPs) and mixed CPOs/MSP roles is emerging in countries with higher EV penetration. While technical and contractual relationships between these market players were initially solved using simplified solutions (e.g. whitelisting), wider aggregating solutions (e.g. eRoaming platforms) are now materializing to facilitate cross-operator's subscription based charging.

Market driven requirement for interoperability

Signatories of this MOU acknowledge the progress made thanks to the AFI directive voted 2 years ago. The ambition they're setting through this document takes into account lessons learnt from those 2 past years, including the state of the art of the AFI directive implementation in each of the MS. In such a way, this ambition can go beyond the specificities of each countries and leads to an interoperability framework envisioned as a target for eMobility market development in Europe.



Overall requirements for interoperability

As preamble, a **reminder of the normative references and following technical compliance standards** can be found hereafter regarding compatibility and robustness of the charging system:

- EN 60364 for Electrical Safety
- EN 61851, EN 62196-2, in particular :
 - Socket outlet Type 2 and Type 2S for normal charging and E type (domestic) to facilitate access to the terminals for smaller vehicles and older vehicles.
 - Connectors Type 2 AC, Combo and Chademo to equip multi-tethered cable fast charge stations

Overall requirement are listed hereafter:

- unique identifiers over Europe for CPOs to be able to find the Charging station
- consistent organisation to issue a unique ID world wide
- publish the unique ID and related information of any publicly accessible EVSE
- public EVSE must be operated through a charging management system (back-end system)
- Comply to the data model elaborated by eMI3 (pool, station, EVSE, connectors/plugs)

Ad hoc charging

- Provide ad-hoc access to the charging infrastructure without customer enrolment
- Pricing information for ad hoc charging should be included within the charging station related information (according to national law)
- receipt of payment including information on energy delivered and time of charging should be provided to the customer (B2C) (according to national law)

Contract based charging

- need to be open to any EMSP on a non-discriminatory basis
- a B2B agreement also called Roaming agreement needs to be established between CPOs and EMSPs
- by convention it is considered that a CPO is fully compliant to the first requirement as soon as he is connected to one roaming platform itself connected to a network of roaming platforms
- CPOs and EMSPs under B2B roaming agreement exchange authorisation requests as well as charge detail records which includes at least contract EMA ID and EVSE ID. Some additional fields such as energy required, time of departure, pricing level among others is foreseen to enable added value services
- Charge Detail Record (CDR) data should include information on energy delivered and duration of charging
- All charging station related information including real time information such as plug/connector availability, maximum power must be provided by CPOs.
- In order to unlock the development of value added services such as smart charging, car related information like state of charge need to be provided by Vehicle makers.
- For the sake of neutrality a roaming platform cannot perform EMSP or CPOs activities.

Annex 2: Letter of Support template

Organisation / Public Authority letter heading

Letter in support the Memorandum of Understanding (MoU) fostering seamless and valuable EV customer experience in Europe

Over the last 2 years a number of legislative changes, regulatory drivers and standardization efforts can be observed. These legislative developments frame the market for ElectroMobility (eMobility) in Europe, and subject to integrated implementation could serve to drive the uptake of electric vehicles in EU Member States. The development of eMobility must also be in line with EU Commission policy goals in term of climate action contributing to the reduction of CO2 emissions.

ElectroMobility is seen as a key enabler in the transition to sustainable energy and transport industries as well as in meeting climate change objectives.

In order to foster ElectroMobility mass market, EV (Electric Vehicle) customers must be capable of seamlessly and valuably accessing charging infrastructure for EVs, including receiving transparent information for services payment.

To this aim, **ElectroMobility interoperability**, as the ability to enable various systems to work together, **is seen as the critical feature**.

The Commission has sponsored³ a Memorandum of Understanding to help tackle this problem. It was signed on xxx 2017 by key Stakeholders of the ElectroMobility market. Beside the engagement of the ElectroMobility industry it is very important to get the full support from Public Authorities, NGO's, non-profit and governments related to ElectroMobility in using / applying the MoU recommendations.

The MoU has the potential to:

- widen and strengthen the implementation of the AFI directive
- ensure the deployment of an interoperable charging infrastructure in order to maximise customer usage, fitting best value for money principle in public funding, in particular when launching tenders and/or supporting deployment with funding schemes
- provide quality ElectroMobility services to the citizens

By signing this letter, the [Organisation Public Authority legal name] acknowledges this MoU and supports ElectroMobility Interoperability as presented in the MoU.

Signed by

Location

Date

³ The MoU was developed by the EC Sustainable Transport Forum - Sub Group to foster the creation of an Electro-Mobility Market of Services

Letter of Support signatures

The following pages present:

- first the statistics per category of Public Authorities
- then all the one page letter of support signed following the alphabetical order

Public Authority, NGO category	Number signatures
National Authorities in charge of implementing the AFI directive	
Regional Authorities	
Local Authorities	
NGO	

Total signatures: