



Statement on quality of e-mobility service using publicly accessible charging infrastructures.

Version number: Final Version

Date: 30/06/2020

Table of contents

1. Motivation and target.	4
2. Principles of the proposal.....	5
3. Possible scenarios for the use of the proposed lists.....	5

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

eMI3 standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While eMI3 administers the process and establishes rules to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

eMI3 disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. eMI3 disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfil any of your particular purposes or needs. eMI3 does not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, eMI3 is not undertaking to render professional or other services for or on behalf of any person or entity, nor is eMI3 undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

eMI3 has no power, nor does it undertake to police or enforce compliance with the contents of this document. eMI3 does not certify, test, or inspect products, designs, or installations for safety or health purposes, this might change in the future. Any certification or other statement of compliance with any health or safety-related information in this document shall not be attributable to eMI3 and is solely the responsibility of the certifier or maker of the statement.

Executive summary

e-mobility market increasing sharply, quality of service for EV charging on publicly accessible infrastructure has to be addressed in a coordinated process European wide in view of common market efficiency and fluid users' travels, within their country and when crossing borders. Based on recent return of experience and analysis of causes of anomalies, eMI3 proposes in this paper to set up a process which can be scaled up with time and with degree of insurance requested. Initiatives to follow up can be undertaken locally, at member state level and European wide.

The process is based on three lists of quality commitments addressing the four roles at play for EV charging service on publicly accessible charging infrastructures: infrastructure owner and operator of the charging infrastructure, e-mobility service provider and roaming service platform.

This document aims to raise awareness among all stakeholders and is a kick-start for them to design practical ways forward on the proposed path. eMI3 intends to accompany the initiatives in a continuous follow-up through consultation and improvement of the document.

Definitions: In this document, the following terms used are defined as:

A charging point (EVSE) is an interface capable of recharging a single electric vehicle at a time, associated with a parking space. It includes at least one socket for plug (may be several, but only one usable at a time), and/or one cable attached with connector for EV (case for fast charging).

A charging pool is one or several charging points connected to the same electricity supply grid connection and operated by a single operator, able to incorporate communication and control.

A charging infrastructure owner is the main contractor for a **charging infrastructure** (i.e. a set of charging pools) up until it comes into service, and the owner of the infrastructure as soon as it is in service.

A charging point operator (CPO) operates charging stations on behalf of a charging station owner or on its own account.

An e-mobility service provider (EMSP) is a service provider for electric vehicle users, including services for access to charge.

A roaming service platform (RSP) is a service provider for CPO and EMSP to organize their IT connections in order to set up roaming of charging service and establish roaming contracts (roaming agreements) on this purpose.

Ad-hoc payment is the ability for a user to pay the total price of a charging session directly at the charging station, using a monetary means provided, with no contract registration needed. The alternative for a user is to subscribe a contract at an EMSP and use the contract ID at the charging station to be authorized to charge (**charging on contract basis**).

1. Motivation and target

All EV drivers, present and prospective, have to be ensured of the availability and reliability of publicly accessible charging services wherever they go and be ensured to be charged in a fair manner. Moreover, finding a charging point and be authorized to connect his EV must be easy, with no mental burden neither heavy manipulations, and with clear pricing transparency. This is especially important in order to convince many fossil fuel car users that they can switch to EV. All of these expectations can be satisfied with the proper design and organization of the businesses and adequate levels of quality of services. As a matter of fact, present return of experience shows anomalies which, although marginal, deter confidence in EV. Moreover, it reveals discrepancies in the design and operation of infrastructures from different owners, which disrupts the fluency of the drivers' journey. This concern has to be addressed at European level for the sake of cross-border journeys.

Therefore, a process for quality with Key Performance Indicators (KPI) has to be set up with the two objectives: ensure full confidence in charging services, and harmonize the relevant quality levels between the different actors producing them: e-mobility service providers (EMSP) supplying all useful services to customers including charging, charging infrastructure operators (CPO), exchanging requested data with EMSP, possibly through a roaming service platform (RSP).

As a CPO may be subcontractor of a charging infrastructure owner, who specifies the equipment and its installation, and decides the requirements of the contract with the CPO, quality commitment involves both initiatives: the charging infrastructure owner and the CPO. Therefore, quality commitments address both.

EU commission DG MOVE underlines this concern within its Sustainable Transport Forum draft report mid-2019 and considers that "Guidelines on minimum quality requirements for infrastructure and best practices for public tendering" should be delivered in the course of 2020. Quality is also of concern in the European Program Support Action IDACS under course which deal with identifiers and data and define the roles of IDRO and NAP (National Access Point).

With this document, eMI³ wishes to contribute to the establishment of such a process for harmonized quality of roamed charging services on publicly accessible charging infrastructures.

2. Principles of the proposal

Based on return of experience, we have drawn up lists of topics for attention and commitment (see annex) addressing the four types of actors: charging infrastructure owner and CPO, EMSP and RSP. Navigation service providers are not specifically addressed because either they are EMSP or they have similar needs as these for data quality and data transfer. Data quality and transmission of data between actors is a major concern, and also how the drivers can understand and use properly the equipment and data provided, and get price transparency.

Thus, the lists of topics are divided into 4 chapters:

- 1) Design and operation,
- 2) Services and data,
- 3) Price of services and invoicing,
- 4) User assistance.

As they are, they constitute a check list of the points of attention with which the actor concerned should undertake to comply. Several points include numerical parameters for which a value is recommended.

3. Possible scenarios for the use of the proposed lists

eMI³ intends by this document to launch a long-term plan of action with involvement of the concerned actors and organizations at Member State and European levels. Starting with a first step limited to simple recommendations, it could gradually include increasing degrees of commitment such as:

- 1) Propose to the relevant actors to sign the lists, with a possible choice of compliance commitments and value of performance objectives. Signatories lists could be published.
- 2) Qualify the level of commitment of signatories, with more quantified results indicators added and measured (KPIs).
- 3) Set up a label for the actors with possible several grades.
- 4) Create a certification process of actors, possibly in relation with quality insurance standards such as ISO 9000 series and comparable.

Three possibilities may thus be considered: without quality result measurement, with quality result measurement, and complete certification of operators.

eMI³ considers anyway that this process should very soon include a monitoring of quality level achieved and continuous return of experience, at least globally if not for each actor, in order to update the process in relation with actual situation. Moreover, KPIs have to be defined more precisely altogether with their measuring method, and more KPIs might be considered further on.

eMI³ will consequently propose further concertation and take initiatives to follow up this proposal.

Appendices: lists of quality commitments for:

- 1) charging infrastructure owners & CPO,
- 2) EMSP,
- 3) RSP.

1) Design and operation of charging infrastructures.

Statement	Target value for parameter
1) 1. The owner or operator is registered at an identifier registering office (IDRO) to be assigned an identifier prefix.	
1) 2. All charging pools and charging points (EVSE) are uniquely identified (ID) in accordance with the standards published by IDRO. These IDs are shared with EMSP and any other interested partner and/or roaming Interoperability Platform (they are part of static data in the National Access Point) ¹ .	
1) 3. The infrastructure is designed with a backend system which can be connected to partners, allowing users (EV drivers) to access either through an EMSP subscription, or through ad-hoc payment at the charging station.	
1) 4. Authentication for authorization to charge using an EMSP contract can be done locally (e. g. RFID card reader) or remotely (the user request is transmitted by the EMSP to the CPO).	
1) 5. The uptime (i.e. equipment and control system good for service) of at least X1 % of the charging points is available X2 % in average on a defined time (not more than 1 year), excluding external causes (accident, vandalism...).	X1 = 80 X2 = 99
1) 6. Fixed and variable displays (e.g. LEDs) on the charging points are accurate, readable (e.g. with sun) and clearly understandable (e.g. an information on the meaning of LEDs color and status is available).	
1) 7. X3 % at least of the charging sessions for authorized vehicles are not untimely interrupted before charging expectation is fulfilled because of charging infrastructure malfunction.	X3 = 99
1) 8. Solutions allow the CPO to detect anomalies that prevent normal use of the charging points through monitoring by backend system (e.g. disconnection of the power supply circuit breaker), user alert, periodic physical inspection etc.	
1) 9. Solution is provided to allow users to charge even in case of temporary interruption of communication between the EVSE and its back end.	
1) 10. Teleoperation and maintenance organization is able to correct major anomalies: - within X4 minutes for any anomaly concerning unlocking the plug of a user in a charging point, - within X5 business days for other material anomalies.	X4 = 15 X5 = 5

¹ European Program Support Action IDACS is setting these standards.

2) Services and data.

Data transmission means either to the interoperability platform or to the EMSP in the case of a direct connection.

Statement	Target value for parameter
2) 1. All static data as defined in standards and regulation are publicly accessible and, in case of change, updated within X6 days. At minimum, static data include: <ul style="list-style-type: none"> - Localization - Connector Type - Ad-hoc payment method - Authorization mean accepted (RFID, NFC, Remote through EMSP, Plug & Charging...) - Access (free access, in a parking garage...) - Nominal Power of the charging point and standardized name and label for sockets and connectors (EN 17186). - Station Sign/Brand helping for visual identification on site. 	X6 = 5
2) 2. Any change in the dynamic status of a charging point (in/out of service, free/occupied, tariff, maximum power available etc. according to communication protocols) is updated in the data publication towards the roaming partners in less than X7 seconds.	X7 = 60
2) 3. EMSP and/or the interoperability platform are informed of any impacting anomaly detected in the CPO service, equipment or data exchange within X8 minutes.	X8 = 5
2) 4. Response time to webservice requests such as authorization to charge from an EMSP or RSP, including communication with the charging station, is normally less than X9 second.	X9 = 30
2) 5. Any untimely charging interruption during a session, preventing charging as expected by the user, is notified to him, directly or through his EMSP or the interoperability platform.	
2) 6. Any confirmed static data error identified by a customer or an EMSP or an interoperability platform is corrected within X10 business days after the moment it has been reported to the CPO.	X10 = 5
2) 7. The CPO is open to requests from EMSP for a roaming agreement and answers to the request (yes/no/conditions) within X11 working days, offering charging services on fair conditions.	X11 = 15
2) 8. After signature of a roaming contract with an EMSP, charging service is available to the EMSP within the agreed time in this contract, so that the EMSP can give his customers access to the charging points of the CPO.	
2) 9. Quality of IT service of the backend system is adequate in terms of: MTBF (Mean Time Between Failures), MTTR (Mean Time To Repair), response time to requests (with limitation of longest response times), prevention of stuttering (uncontrolled repetition of the same message), throttling control and also cyber security. ISO 27001 (IT Security) is an ultimate reference.	
2) 10. Private data are processed in accordance with GDPR and declining regulation.	

3) Price of services and invoicing.

Definitions: - “Tariff scheme” is the formula with parameters to calculate the total price of a future charging session.

- “Unit price” is the value applied to each parameter of the tariff scheme; it can be dependent on contextual factors such as time of the day, or nominal power of the station.
- “Total price” is the sum that is to be paid by a customer for a realized charging session based on the application of the tariff scheme.

Example: Total price = x€ + y€ x time in minutes + z € x number of kWh; tariff scheme is the formula and complete set of unit prices x, y and z, which may depend on time of the day or other options.

Statement	Target value for parameter
3) 1. In any situation (ad-hoc payment or roaming service) an EV driver knows the tariff scheme and unit price(s) before the session, and after the session the total price. On this purpose, the relevant data is sent to EMSP in a timely manner.	
3) 2. The tariff scheme and unit price(s) for Ad Hoc payment are displayed so that the EV driver is informed before charging (e.g. display or sticker at the station, app or website). In this situation the CPO is responsible for the correct transaction information towards the EV driver. Tariff scheme has no hidden costs. Any option fee (e.g. mean of payment option) is clearly stated.	
3) 3. The information on charging tariff with ad-hoc payment specifies that it does not concern the price of a roaming session and refers the user to his EMSP.	
3) 4. Tariff scheme and unit price(s), and their updates, applicable to an EMSP are communicated to him in a timely manner in accordance with the roaming agreement.	
3) 5. The charging detail record (CDR) of a session is sent to the EMSP within X12 seconds after the session. The CDR contains all the information agreed by contract; in any case: date, total duration of the session, number of kWh delivered and any additional information necessary to calculate the total price of the session according to the tariff scheme.	X12 = 30
3) 6. A charging session is invoiced under the following conditions: <ul style="list-style-type: none"> - The vehicle has been detected and remained connected for at least X13 minutes or has been powered with more than X14 kWh. - No defects in identification and connection were detected by the charging station or reported by the customer. - Registered energy volume of the charging session is minimal X15 and maximal X16 kWh, duration of the session is less than 24 hours (these extreme situations not including the case of heavy vehicles). If these conditions are not fulfilled, a billable CDR is sent anyway with a null cost.	X13 = 2 X14 = 0.2 X15 = 0 X16 = 350

4) User assistance.

Statement	Target value for parameter
4) 1. Information on how to use a charging point is displayed at the charging point or in the pool (e.g. order of sequence of operations: authorization, plug-in on EV side, plug-in on charging point, etc.)	
4) 2. A call center phone number is displayed on every charging station or pool.	
4) 3. This call center is able to solve user emergency situations due to the infrastructure (e.g. locked cable) during opening hours within X4 minutes - see statement 1) 10.	
4) 4. Referring the user to his EMSP only occurs for causes that duly concern the latter.	
4) 5. This call center or a specific number is made accessible to EMSP on the purpose to help solving customer problems, stated in the roaming agreement.	

1) Design and operation of customer service.

Statement	Target value for parameter
1) 1. The EMSP is registered at an identifier registering office (IDRO) to be assigned an identifier prefix.	
1) 2. All EMSP customers contracts are uniquely identified (ID) in accordance with the standards as published by IDRO ² . These IDs are shared with CPO and any other interested partner and/or roaming service platform in relation with charging sessions.	
1) 3. The services are designed with a backend system which can be connected to partners, CPO and/or roaming Interoperability platforms.	
1) 4. When charging using the contract with the EMSP, the customer can identify his EMSP contract at a CPO charging station either locally (e. g. card reader) or remotely (user request through an App, transmitted by the EMSP to the CPO) according to EMSP's offer.	
1) 5. Quality of IT service of the backend system is adequate in terms of: MTBF (Mean Time Between Failures), MTTR (Mean Time To Repair), response time to requests (with limitation of longest response times), prevention of stuttering (uncontrolled repetition of the same message), throttling control and also cyber security. ISO 27001 (IT Security) is an ultimate reference.	

2) Services and data.

Statement	Target value for parameter
2) 1. The user has all the static data on the infrastructure to which he can access; in case of data change, the updates received from the CPO or RSP are reflected within Y1 seconds.	Y1 = 60
2) 2. The customer is advised of information on charging infrastructures such as how to make use of CPO facilities, what to do in case of difficulty or emergency etc.	
2) 3. Any change in dynamic data on charging points received (in/out of service, free/occupied, tariff, maximum power available etc. according to communication protocols), is updated in the data publication to the customers in less than Y2 seconds after reception.	Y2 = 60
2) 4. Response time to requests for authorization to charge received, either from the customer (case of remote authorization request), or a CPO or RSP (e.g. use of a RFID card) is within Y3 seconds in more than Y4 % of the cases.	Y3 = 1 Y4 = 99
2) 5. Customers are informed of any impacting anomaly in a CPO service (equipment or data) within Y5 minutes after the EMSP has been notified.	Y5 = 5
2) 6. Any untimely charging interruption during a session that has an impact on the service expected by the customer, of which the EMSP is informed, is notified to the customer in less than Y6 seconds.	Y6 = 60

² European Program Support Action IDACS is setting these standards

Statement	Target value for parameter
2) 7. The EMSP warns the CPO or the RSP of anomalies or data errors that he has detected, or been notified by customers, within Y7 day.	Y7 = 1
2) 8. After signature of a roaming contract with a CPO, the customers are informed of the date when they will be effectively authorized to charge at these CPO's charging stations.	
2) 9. The backend system to exchange messages with roaming partners and the frontend system to provide services to customers are available at least Y8 % of the operating time.	Y8 = 99
2) 10. A solution allows customers to record their appraisal of the service and report anomalies.	
2) 11. Private data are processed in accordance with GDPR and declining regulation.	

3) Prices of services and invoicing.

Definitions: - "Tariff scheme" is the formula with parameters to calculate the total price of a future charging session.

- "Unit price" is the value applied to each parameter of the tariff scheme; it can be dependent on contextual factors such as time of the day, or nominal power of the station.
- "Total price" is the sum that is to be paid by a customer for a realized charging session based on the application of the tariff scheme.

Example: Total price = x€ + y€ x time in minutes + z € x number of kWh; tariff scheme is the formula and complete set of unit prices x, y and z, which may depend on time of the day or other options.

Statement	Target value for parameter
3) 1. The information, pricing scheme and prices proposed by the EMSP are in accordance with consumer law.	
3) 2. In the event that the price of the CPO service is directly passed on the customer, the additional remuneration specific to the EMSP and the possible cost of roaming are also communicated to the customer.	
3) 3. The total price of a charging session, or the tariff scheme and unit price(s) allowing it to be calculated, is communicated to the customer before he decides to charge at a charging station.	
3) 4. A charging detail record (CDR) of a session is sent to the customer within Y9 seconds after its end and in any case in accordance with the commercial contract. The CDR contains all the information agreed by contract, including the session total price and at least the date, total duration of the session and the number of kWh delivered if available.	Y9 = 60

<p>3) 5. A charging session is invoiced under the following conditions:</p> <ul style="list-style-type: none"> - The vehicle has been detected and remained connected for at least Y10 minutes or has been powered with more than Y11 kWh. - No defects in identification and connection were detected by the charging station or reported by the customer. - Registered volume of the charging session is minimal Y12 and maximal Y13 kWh, duration of the session is less than 24 hours (these extreme situations not including the case of heavy vehicles). <p>If these conditions are not fulfilled, a billable CDR is sent anyway with a null cost.</p>	<p>Y10 = 2 Y11 = 0.2 Y12 = 0 Y13 = 350</p>
<p>3) 6. CPO's invoices are paid in accordance with the roaming contract and the contents of the charging detail records (CDR).</p>	

4) User assistance.

Statement	Target value for parameter
<p>4) 1. A call center is accessible Y14 hours a day, Y15 days a week. Relevant information on the accessibility and how to joint it is supplied to the customers.</p>	<p>Y14 = 24 Y15 = 7</p>
<p>4) 2. Referral of the customer to the CPO call center occurs only in case of blocking situation due to the CPO infrastructure such as:</p> <ul style="list-style-type: none"> - Impossibility to start a session while the user is duly authorized, - Impossibility to stop a charging session by the user willing to do it, - Plug remaining locked although the charging session is stopped. 	
<p>4) 3. This EMSP call center, or a specific phone number, is made accessible to CPO having a contract agreement with him on the purpose to help solving customer problems, as stated in the roaming agreement.</p>	