



Deliverable D4.1

Specification, analysis and assessment of situation of interoperability related to EV deployment in EU cities and Member States

TECNALIA
26/08/2014
Version 1.4

**Project Full Title: COncepts, Capacities and Methods for Testing EV systems and their
interOperability within the Smart grid**

**FP7-SMARTCITIES-2013, ENERGY 2013.7.3.2
Grant agreement no. 608934
Collaborative Project**





Document information

| Author(s) | Company |
|--|--|
| Raúl Rodríguez | TECNALIA |
| <i>Other authors:</i> Christian Niklas Felix Lehfuss Peter Bach Andersen Thomas Meier Sørensen Sergejus Martinenas Rok Kralj Jure Ratej Till Zirkelbach Filippo Colzi Federico Belloni Marjan Gjelaj Eduardo Zabala Carlos Madina Robert Koffrie Joost Laarakers Pawel Kelm Peter Ševce | AIT AIT DTU DTU DTU ETREL ETREL IWES RSE RSE RSE TECNALIA TECNALIA TNO TNO TUL ZSDis |

| | |
|---------------------------|--|
| WP no. and title | WP4 Development of tests and procedures |
| WP leader | DTU |
| Task no. and title | T4.1. Interoperability assessment related to cities with eMobility Initiatives |
| Task leader | TECNALIA |

| Dissemination level | |
|---|----------|
| PU: Public | X |
| PP: Restricted to other program participants (including the Commission Services) | |
| RE: Restricted to other a group specified by the consortium (including the Commission Services) | |
| CO: Confidential, only for members of the consortium (including the Commission Services) | |

| Status | |
|-----------------|----------|
| For information | |
| Draft | |
| Final Version | X |
| Approved | |

| Revisions | | | |
|-----------|------------|------------------------------------|--|
| Version | Date | Author | Comments |
| 1 | 02/06/2014 | R. Rodríguez, C. Madina, E. Zabala | Inputs from all task partners included in the deliverable annexes. |
| 1.1 | 23/06/2013 | R. Rodríguez | Comments by partners included. |
| 1.2 | 23/07/2014 | AIT | Full review according to QAP |
| 1.3 | 21/08/2014 | R. Rodríguez | Comments by ETREL included |
| 1.4 | 22/08/2013 | E. Zabala | Full review |



Executive Summary

A methodology was set up for the identification of demonstration initiatives and pilots dealing with e-mobility interoperability. A first description of projects led to the selection of the most interesting ones, in the search for interoperability solutions. The analysis permitted to depict the current status of interoperability deployment and to catch sight of future trends, which were mainly pointed out by the work performed in research projects.

The results of the analysis were presented with the SGAM model layers in mind, covering issues related to business and regulation, services, systems, and communication and information protocols. In addition, data dealing with testing and aspects for improvement was also extracted from project descriptions.

Regulation represents the highest level framework for service implementation. Even if the regulatory analysis was not an objective of this work, this background surfaced from the analysis of the demo projects. For example, in Spain the roles of EMSP (e-mobility service provider) and EVSEO (infrastructure operator) are assumed by the same actor, which is entitled to resell electricity. Italy and Portugal have temporary regulations addressed to the first phases of EV market development. While in Italy it is considered that the DSO may play the roles of EMSP and EVSEO, in Portugal the EMSP and EVSEO roles are assumed by a regulated party which manages a national infrastructure for the charge of electric vehicles (EV), however private EVSEOs are also permitted.

Business market roles and models were first divided into four domains:

- Public and semi-public charging.
- Private charging.
- Mobile metering.
- Fleet management.

Public and semi-public charging present the highest range of solutions and of complexity, due to the fact that a higher amount of roles might be involved, including e-mobility service provider (EMSP), charging infrastructure operator (EVSEO), ICT interoperability (IOP) platform manager, etc. This has a direct impact on end-to-end communication complexity. The use of ICT interoperability platforms (marketplace, roaming...) is mostly under demonstration phase but some commercial applications already exist in the market. The next figure represents a general scheme showing possible business (**orange**) and communication (**black**) relationships between actors/roles.

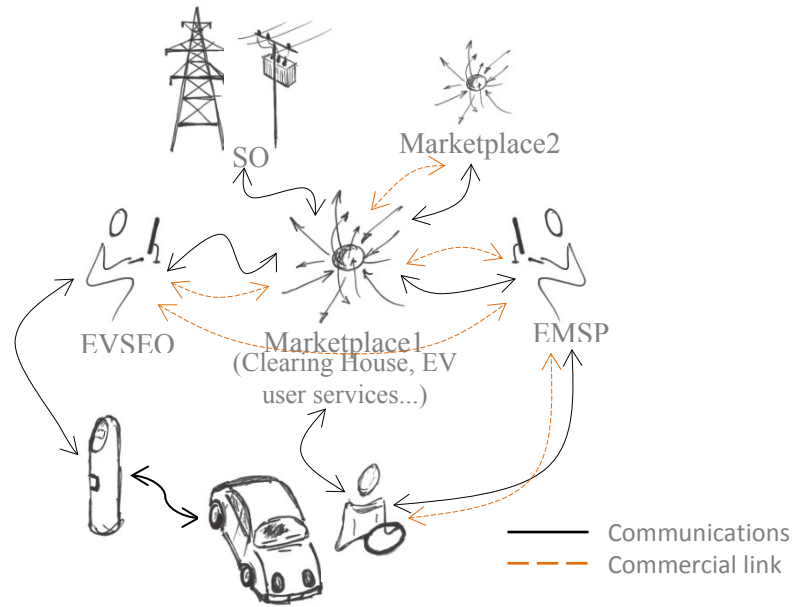


Figure 1. General market and business model (GeM project)

Within this scheme, several are the suitable business models and they will depend on applicable regulations in each region and on market approaches of stakeholders. The number of actors and their roles might also differ; normally, it will be lower than in the figure above, at least in the first steps of market development, where complexity might be a cause for high investment.

The EV charge in the **private domain** is similar to that in public and semi-public areas when e-mobility service providers and/or EVSE operators are involved. However, many EV users might charge their cars under conventional residential energy contracts and infrastructure. In this case, the final user would assume the role of EVSEOs and electricity retailers EMSP tasks. DSOs might perform load management in the frame of residential demand response strategies, using the infrastructure and protocols deployed for that purpose, including Home Energy Management Systems (HEMS), Advanced Metering Infrastructure (AMI), etc.

Mobile metering is a special case related to both the public and the private domain. This business approach proposes to use smart domestic or industrial sockets for EV charging, instead of the more expensive dedicated EVSEs.

Fleet management requires normally some specific services, such as EV monitoring, that other activities may not need. It is suitable for public transport and new businesses, such as the e-car sharing or flexibility aggregation.

Many **services** were identified in demo projects but their feasibility needs to be validated both in real markets and regulatory frameworks since, in many cases, they were developed under research and pilot project environments.

The **systems** related to the different roles (more than actors) are of great importance when going down in the layer stack. These systems will communicate with each other but they might be similar for different actors. For example, front-ends of EMSP, EVSEO, retailer, flexibility manager, etc. for ICT platform connections might share similar communication and information protocols.

Communication and information standards used in the pilot projects were also identified and summarized in two figures. The one referred to information standards is presented in the next page. It gives a good general overview, which should be completed with additional inputs on standards development.



Table of contents

| | |
|--|----|
| Document information | 2 |
| Executive Summary | 3 |
| Table of contents | 6 |
| List of figures | 7 |
| List of tables | 8 |
| Abbreviations and Acronyms | 9 |
| 1. Introduction | 11 |
| 2. e-Mobility initiatives dealing with interoperability | 12 |
| 3. e-Mobility interoperability solutions in Europe | 16 |
| 3.1. Regulation and business | 17 |
| 3.1.1. Public and semi-public charging | 17 |
| 3.1.2. Private charging | 23 |
| 3.1.3. Mobile metering | 24 |
| 3.1.4. Fleet management | 25 |
| 3.2. Services and stakeholders | 26 |
| 3.3. Systems | 28 |
| 3.4. Communication and information | 31 |
| 3.5. Testing | 34 |
| 3.6. Aspects for improvement | 35 |
| 4. Conclusions | 37 |
| 5. References | 39 |
| Annex A. General description of IOP initiatives | 41 |
| Annex B. Interoperability solutions dealt in the different initiatives | 89 |



List of figures

| | |
|---|----|
| FIGURE 1. GENERAL MARKET AND BUSINESS MODEL (GEM PROJECT) | 4 |
| FIGURE 2. INFORMATION PROTOCOLS SUMMARY | 5 |
| FIGURE 3. GEM MARKET AND BUSINESS MODEL EXAMPLE | 17 |
| FIGURE 4. MARKET AND BUSINESS MODEL EXAMPLE ACCORDING TO SLOVENIAN DEMOS | 18 |
| FIGURE 5. SPANISH MARKET MODEL EXAMPLE | 19 |
| FIGURE 6. PORTUGUESE MARKET MODEL EXAMPLE | 20 |
| FIGURE 7. NAGASAKI EV&ITS INITIATIVE MODEL | 20 |
| FIGURE 8. MARKET MODEL EXAMPLE WITHOUT ROAMING SERVICE. GENERAL (LEFT) AND PARTICULAR CASE (RIGHT)..... | 21 |
| FIGURE 9. ITALIAN MARKET MODELS EXAMPLE | 21 |
| FIGURE 10. ESB MARKET MODEL EXAMPLE..... | 22 |
| FIGURE 11. NO SUBSCRIPTION CONTRACT FOR EV USERS. CHARGE POINT | 22 |
| FIGURE 12. NO SUBSCRIPTION CONTRACT FOR EV USERS. OPEN ACCESS WITH PAYMENT PLATFORM | 23 |
| FIGURE 13. PRIVATE CHARGING | 24 |
| FIGURE 14. POWERUP PROJECT PROPOSALS FOR ISO/IEC 15118 IMPLEMENTATION..... | 24 |
| FIGURE 15. MOBILE METERING. ELVIIS (LEFT) AND GÖRLITZ (RIGHT) | 25 |
| FIGURE 16. FLEET MANAGEMENT. E-BUS OEM INITIATIVE..... | 26 |
| FIGURE 17. FLEET MANAGER AS FLEXIBILITY AGGREGATOR. EDISON PROJECT..... | 26 |
| FIGURE 18. INFORMATION PROTOCOLS SUMMARY | 33 |
| FIGURE 19. COMMUNICATION PROTOCOLS SUMMARY | 34 |



List of tables

| | |
|---|----|
| TABLE 1 ACRONYMS | 9 |
| TABLE 2. SELECTED E-MOBILITY INITIATIVES..... | 14 |
| TABLE 3. IOP SOLUTIONS AND RELATED EU INITIATIVES | 16 |
| TABLE 4. SERVICES AND STAKEHOLDERS..... | 27 |
| TABLE 5. SYSTEMS..... | 29 |
| TABLE 6. COMMUNICATION AND INFORMATION..... | 31 |



Abbreviations and Acronyms

Table 1 Acronyms

| | |
|-------|--|
| AC | Alternating Current |
| AMI | Advanced Metering Infrastructure |
| B2B | Business to Business |
| CCS | Combined Charging System (Combo plug/socket) |
| CEMS | Customer Energy Management System or Community EMS |
| CH | Clearing House |
| CIS | Customer Information System |
| CP | Charging Point |
| DC | Direct Current |
| DER | Distributed Energy Resource |
| DMS | Distribution (network) Management System |
| DR | Demand Response |
| DSM | Demand Side Management |
| DSO | Distribution System Operator |
| EDMS | Energy Data Management System |
| EMCH | E-mobility Clearing House (=CH) |
| EMS | Energy Management System |
| EMSP | E-mobility Service Provider |
| EV | Electric Vehicle |
| EVSE | Electric Vehicle Supply Equipment |
| EVSEO | Electric Vehicle Supply Equipment Operator |
| GeM | Green eMotion EU FP7 project |
| GIS | Geographic Information System |
| HEMS | Home Energy Management System |
| HMI | Human Machine Interface |
| ICT | Information and Communications Technology |
| ID | Identification |
| IOP | InterOPerability |
| IT | Information Technology |
| ITS | Intelligent Transport Systems |
| OEM | Original Equipment Manufacturer |
| OMS | Outage Management System |
| PLC | Power Line Communications |
| POD | Point of Delivery |
| QR | Quick Response (Code) |



| | |
|------|--------------------------------|
| RFID | Radio Frequency IDentification |
| SA | Secondary Actor |
| SGAM | Smart Grid Architecture Model |
| SO | System Operator (DSO, TSO) |
| SOC | State of Charge (batteries) |
| TSO | Transmission System Operator |
| V2B | Vehicle to Building supply |
| V2G | Vehicle to Grid supply |
| V2H | Vehicle to Home supply |
| WAN | Wide Area Network |



1. Introduction

The present report gathers COTEVOS task 4.1 work on interoperability assessment related to cities with e- mobility initiatives.

Even if the focus was set on European demonstration projects, other countries were analysed looking for different approaches. On the other hand, the fact that, in many cases, the demonstration activities were related to research projects permitted to obtain not only the current status, but also the future trends regarding this subject.

After a first search, more than sixty initiatives dealing with e-mobility interoperability, considering this in a broad sense, were selected. Then, a more in-depth analysis was carried out in some of the projects according to general criteria introduced in chapter 2. The first set of the initiatives are described in Annex A, while the solutions stemming from these are synthesised in Annex B.

The most relevant aspects that came out of the analysis of the initiatives were arranged in chapter 3 with the SGAM methodology in mind. The body of the report ends with a short conclusion and the reference list, which is extended in the project and solution descriptions in the annexes.



2. e-Mobility initiatives dealing with interoperability

A search of e-mobility initiatives resulted in a list of international, EU, national, regional and municipal EV related demonstration projects. Only initiatives addressing some kind of interoperability were the focus of the research.

The following are some of the references that were used as sources for demo project identification:

- **EU projects:** Green eMotion [1], ICT4FEV [2], ICT4EVEU [3], Power Up [4], Mobincity [5], smartCEM [6], Molecules [7], etc.
- **Literature on existing or past initiatives:** from CEN-CENELEC [8], the JRC [9], the IEA [10], the METI from Japan [11], etc.

The revision of the first list of initiatives concluded with the proposal of a set of interoperability aspects that were identified in the analysis. It was observed that each EV related initiative tried to achieve interoperability through one or more different means. Interoperability was considered here in a broad sense, not only related to pure EV aspects but including other approaches such as smart grid integration (load control through Energy Management Systems, V2X, etc.). Interoperability was grouped and classified according to the following concepts:

- **IOP platform:** use or development of any ICT platform designed to provide interoperability, including roaming (interaction between EVSEOs and EMSPs, either through a Clearing House or bilaterally), marketplace for service exchange, etc.
- **User services:** deployment of services for the EV user such as EVSE search, reservation..., information on mobility, traffic, weather, etc.
- **EVSE access:** addressing interoperability related to EV user access or payment at the EVSE.
- **Load management:** load management (smart charging) strategies used for network service (e.g. peak shaving) or energy cost optimization.
- **EVSE management:** EVSE remote monitoring, control and/or maintenance.
- **EV management:** demos including EV remote monitoring, control (bi-directional) and/or maintenance.
- **Smart grid:** integration of EV charge management in smart grid operation procedures (e.g. management performed by the DMS through a CEMS).
- **V2X supply:** vehicle supply of electricity to the network, including V2H, V2B, V2G... (V2X)
- **Gateway:** use of ad-hoc developed devices to interconnect systems using different communication protocols in order to achieve an end-to-end communication or/and a service provision improvement.
- **Multi standard:** deployment of EVSEs permitting different standardized connectors through the provision of more than one type of socket or plug.
- **Mobile meter:** use of mobile metering (meter inside the EV or in the charging cable).
- **Regulation:** use of regulation to achieve interoperability in a region, like in Portugal where all EVSEs should be part of the national network.

Analysed initiatives had to suit at least one of these aspects to be considered eligible for the next phase of the study. Those projects focused on the installation of new infrastructure or the study of EV user habits, for example, were left outside.

This gave as outcome a list of 63 initiatives, mainly located in Europe but also in Japan, China and USA, which are gathered in Table 2. **Annex A** of the present document includes the description and references of these initiatives, while the Table 2 shows the interoperability aspects they address according to the available information.



The next phase consisted in a more detailed analysis of a reduced set of projects. These stemmed from the previous list based on the following criteria:

- The focus was set on EU projects.
- All the above mentioned interoperability aspects had to be covered by the group of selected projects.
- The relevance of the initiatives was considered.
- The availability of the information was a pre-requisite.

A final set of 29 demonstration projects resulted from this selection (in green colour in Table 2) and they were the basis for the characterisation of the state of the art of e-mobility interoperability implementation in Europe that will be presented in the next chapter.



Table 2. Selected e-mobility initiatives

| | Name of Initiative | Type | Region | Interoperability aspects considered | | | | | | | | | | | | |
|----|--|----------------|--------------------------|-------------------------------------|---------------|-------------|-----------|-----------|---------|------------|------------|---------|------------|-----------|------------|---|
| | | | | IOP platform | User Services | EVSE access | Load Mngm | EVSE Mngm | EV Mngm | Smart grid | V2X supply | Gateway | Multi std. | Mobile m. | Regulation | |
| 1 | Green eMotion | EU | EU (various countries) | X | X | X | X | X | | | | | | | | |
| 2 | Charge of EVs in Spanish RECI cities | Private | Spain | | | X | | | | | | | | | | |
| 3 | Spanish data hub | Private | Spain | X | X | | | | | | | | | | | |
| 4 | ICT4EVEU (Spain) | EU | Spain (Vitoria-Pamplona) | X | X | X | | | | | | | | | | |
| 5 | VERDE CENIT project | National | Spain | | X | | X | X | | | | X | | | | |
| 6 | Movele Madrid | National | Spain (Madrid) | X | | X | | | | | | | | | | |
| 7 | Mugielec | Regional | Spain (Basque Country) | | X | | | X | | | | X | | | | |
| 8 | Endesa's pilots on IOP | Private/Public | Spain/Italy | X | X | | X | X | | X | | | | | | |
| 9 | Live Barcelona | Municipal | Spain (Barcelona) | X | | X | | | | | | | | | | |
| 10 | Tecmusa project | National&EU | Spain | | X | | | | | | | | | | | |
| 11 | Mobi.e | National | Portugal | X | | X | | X | | | | | | | | X |
| 12 | E-mobility Italy | Private | Italy | | | X | X | X | X | | | | | | | X |
| 13 | Mi Nuovo Elettrico | Regional | Italy (Emilia Romagna) | | | X | | | | | | | X | | | X |
| 14 | E-moving | Municipal | Italy (Milano&Brescia) | | | X | | | | | | | | | | X |
| 15 | L'Hera de la mobilit  elettrica | Private | Italy | | X | | | X | | | | | | | | X |
| 16 | Edison project | National | Denmark (Bornholm...) | X | | X | X | X | X | X | X | | | | | |
| 17 | Nikola project | National | Denmark (Roskilde...) | X | X | X | X | | X | X | X | | | | | |
| 18 | E-iaad | National | The Netherlands | | X | X | X | X | | | | | | | | X |
| 19 | Power up | EU | EU | | X | | X | | X | X | | X | | | | |
| 20 | E-Gap | National | Germany (Garmisch-Part.) | | X | | X | X | X | | | | | | | |
| 21 | 4S | National | Germany | | X | | X | X | X | | | | | | | |
| 22 | eNterop | National | Germany | | | | X | | X | | | | | | | |
| 23 | ICT4EVEU (Slovenia) | EU | Slovenia | X | X | X | X | X | | | | | | | | |
| 24 | Mobincity | EU | Slovenia (Ljubljana) | | X | X | X | X | X | | | | | | | |
| 25 | Etrel electromobility roaming system | National | Slovenia | X | X | X | X | X | | | | | | | | |
| 26 | ICT4EVEU (UK) | EU | UK (Bristol) | X | X | X | X | X | | | | | | | | |
| 27 | smartCEM | EU | UK, Spain, Italy | | X | | X | X | | | | | | | | |
| 28 | PI-P (Plugged-In Places) | National | UK | | X | X | | | | | | | | | | |
| 29 | BEVIP | Private | UK | | | | X | X | | X | | | | | | |
| 30 | Molecules | EU | Germany, France, Spain | X | X | | | | | | | | | | | |
| 31 | ESB's pilots on IOP | Private | Ireland | X | X | X | X | | | X | | | | | | |
| 32 | CROME | National | Germany-France | X | X | X | | | | | | | | | | |
| 33 | ELVIIS | Regional | Sweden (V stra G taland) | X | X | | X | | | | | | | | X | |
| 34 | Finseny | EU | Ireland | X | X | | X | | | X | | | | | | |
| 35 | G rlitz e-mobility smart charging solution | Private | Germany (Koblenz) | X | | | | | | | | | | | X | |
| 36 | Intellicharge | Private(?) | France | | | | X | X | | X | | | | | | |
| 37 | The basis for energy security | EU | Poland | | | | | X | X | | | | | | | |
| 38 | GIREVE | National&Priv | France | X | X | X | | | | | | | | | | |



| | | | | | | | | | | | | | | | |
|----|--|---------------|--------------------------|---|---|---|---|---|---|---|---|--|---|--|--|
| 39 | VIBRATE | International | Slovakia-Austria | X | | X | | | X | | | | | | |
| 40 | Crossing Borders | EU | Germany-Slovakia-Austria | X | X | X | | | | | | | | | |
| 41 | Eisenstadt e-mobilisiert | National | Austria | | X | X | | | | | | | | | |
| 42 | ElectroDrive Salzburg | National | Austria | X | X | X | | | | | | | | | |
| 43 | e-mobility on demand Wien | National | Austria (Vienna...) | | X | X | | | | | | | | | |
| 44 | e-pendler in Niederösterreich | National | Austria | | X | | | | | | | | | | |
| 45 | Großraum Graz | National | Austria (Graz...) | | X | X | | | | | | | | | |
| 46 | VLOTTE | National | Austria (Rheintal...) | | X | X | | | | | | | | | |
| 47 | Rapid Charge Network Project | EU (TEN-T) | UK, Ireland | | X | X | | | | | | | X | | |
| 48 | iZeus | National | Germany | X | | X | X | | X | | | | | | |
| 49 | RWE's pilots on IOP | Private | various | X | X | X | X | X | X | | | | | | |
| 50 | Keihanna Eco City | National | Japan (Kyoto) | | | | X | X | | X | X | | | | |
| 51 | Smart Melit | National | Japan (Toyota city) | | X | | X | X | X | X | | | | | |
| 52 | JUMPSmartMaui | Japan-USA | USA (Hawaii) | | | | X | X | | X | | | | | |
| 53 | Nagasaki EV&ITS project | National | Japan (Nagasaki) | | X | | | X | X | X | | | X | | |
| 54 | Osaka EV Action Plan | Municipal | Japan (Osaka) | X | X | X | | X | X | | | | | | |
| 55 | Smart Grid project in Rokkasho village | Private | Japan (Aomori) | | | | X | X | | X | | | | | |
| 56 | E-Kizuna | Private | Japan (Saitama) | | | | X | X | | X | | | | | |
| 57 | Nissan Leaf V2H & V2B | Private | Japan (Atsugi) | | | | X | X | | | | | X | | |
| 58 | The Yokohama Smart City Project | National | Japan (Yokohama) | | | | X | X | X | X | X | | | | |
| 59 | Smart Community Demonstration in China | Japan-China | China (Gongqingchen) | | X | | X | X | X | X | | | | | |
| 60 | E-Bus OMS | National | Japan (Hitachi city) | | X | | X | X | X | | | | X | | |
| 61 | Ten cities, Thousand vehicles | National | China | | X | | | | | | | | | | |
| 62 | Energy Conservation | Statal | USA (California) | | | | X | X | | X | | | X | | |
| 63 | Flemish Living Lab EVs programme | National | Belgium (Flemish region) | X | X | X | | X | X | | | | | | |



3. e-Mobility interoperability solutions in Europe

Both the general description of the list of initiatives in Table 2 and the more in-depth analysis of selected pilots were considered as input to determine the e-mobility interoperability solutions that are currently being deployed at European level.

The information was synthesised taking into account common approaches within the initiatives defining both company or country strategies, and specific solutions. The following table shows the relationship between the solutions, which are described in Annex B, and the initiatives, introduced in Annex A.

Table 3. IOP solutions and related EU initiatives

| IOP Solution | Related initiatives |
|----------------------------------|---|
| A2A | E-moving |
| Bristol City Council | ICT4EVEU (pilot UK) |
| CROME platform | CROME, Green eMotion (pilot Germany2) |
| Danish Initiatives | EDISON, NIKOLA |
| e-Gap project | e-Gap |
| e-laad | e-laad |
| ELVIIS approach | ELVIIS |
| EnBW | CROME, iZeus |
| Endesa/Enel | Endesa's pilots on IOP (ZEM2ALL, Smartcity Málaga), Green eMotion (pilots Italy and Spain1), E-mobility Italy, Mi nuovo Elettrico |
| ESB | ESB's pilots on IOP (Mobi Europe, Winter Trials), Green eMotion (pilot Ireland) |
| Green eMotion marketplace and CH | Green eMotion |
| Hubject interchange | iZeus, Electrodrive Salzburg |
| Iberdrola | Green eMotion (pilot Spain 2), ICT4EVEU (pilot Spain) |
| IBIL | ICT4EVEU (pilot Spain), Movele Madrid |
| ICT4EVEU roaming platform | ICT4EVEU |
| Mugielec IOP concept | Mugielec |
| Portuguese approach | Mobi.e |
| PowerUp project | PowerUp |
| RWE | RWE's pilots on IOP (metropol-e), Green eMotion (pilot Germany1) |
| Siemens | 4-S, eNterop, Green eMotion (pilot Italy and Spain1) |
| ETREL | ETREL electromobility roaming system, Mobincity, ICT4EVEU (pilot Slovenia) |
| SmartCEM project | SmartCEM |
| ZSE-Verbund | Vibrate, Crossing borders |

In this chapter, solutions are presented with the layers concept proposed by the SGAM in mind, which means addressing regulation and business, new services or functionalities, systems, and communication and information aspects. In addition, other inputs that were identified related to testing and experience based improvement proposals are also included in the following subchapters.

3.1. Regulation and business

3.1.1. Public and semi-public charging

The most general market model, affecting public and semi-public infrastructure for EV charge, might be the one considered in **Green eMotion** EU project (GeM), in which all EV business related stakeholders interact within a marketplace framework both technically and economically. Services are offered and contracted through an ICT platform, however, some of them, including roaming services might require economical agreements between involved parties (contracts might be aggregated by the market place but bilateral contracts should be possible as well). One of the demonstrations in the framework of this project even tested the interoperability between different ICT platforms, by means of the interconnection of the GeM and CROME project marketplaces. The next figure depicts communication (**black**) and commercial (**orange**) relationships that could be expected in the market model presented by GeM.

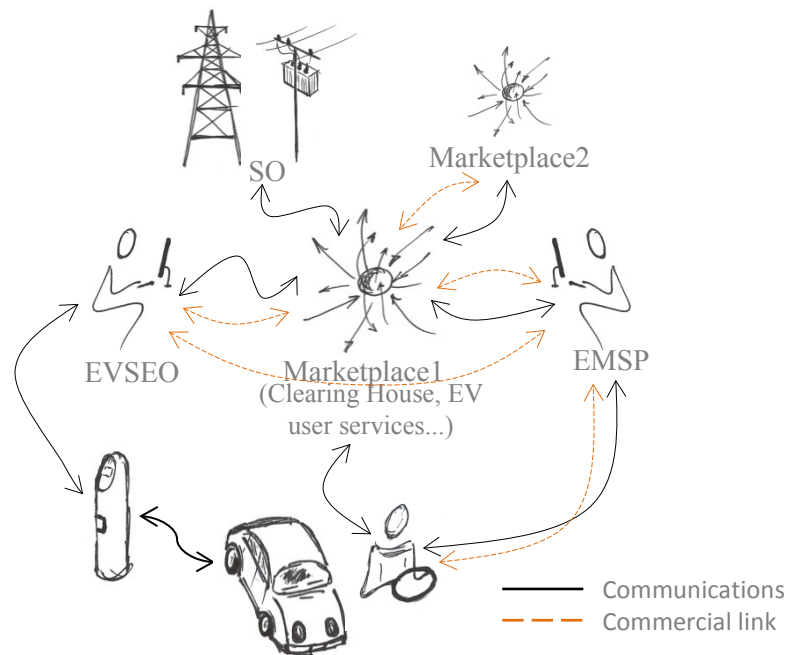


Figure 3. GeM market and business model example

Since GeM marketplace is not a commercial platform, the market model is not totally defined yet but it could be the one shown in the previous figure. An EV user, with a contract with an EMSP may hire additional services at the marketplace, such as a roaming. Communications required to achieve this might be established through the EVSE HMI or through a smart phone application directly with the marketplace, or even, through his/her EMSP. Service providers will have normally a contract with the marketplace to benefit from its services. Other actors, such as system operators, may request network services also through the marketplace even if other energy markets may also exist. Some network services will require shorter response times and then the marketplace will not be the most suitable choice to request them.

The existence of a marketplace is not compulsory and probably different ICT platforms will coexist throughout Europe. Some of these might be interconnected but others might not. In Slovenia different

projects have led to the development of a roaming platform (**ICT4EVEU Slovenian demo**) and an EV user information and support platform (**Mobincity**), which could end up with a scheme similar to the one shown in the next figure.

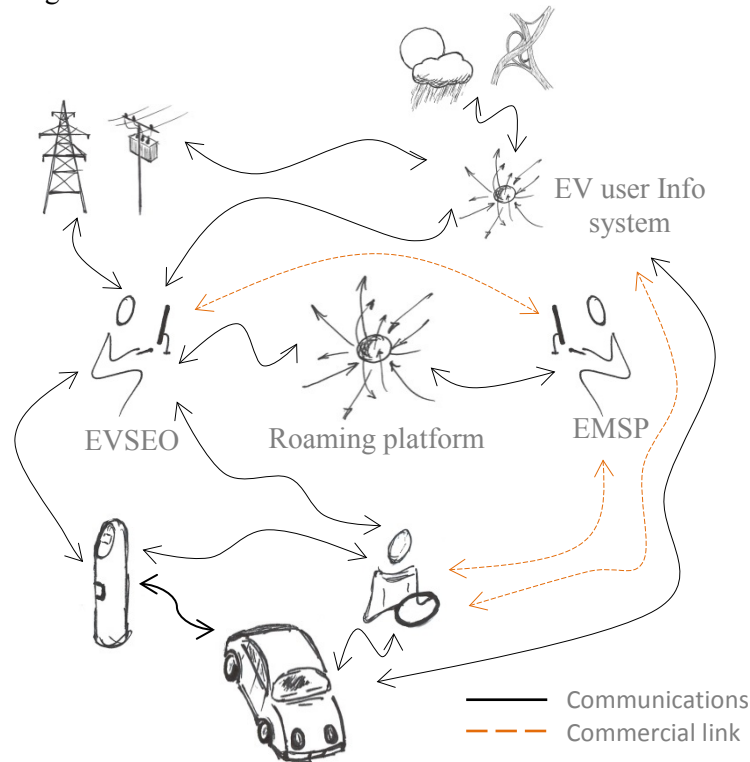


Figure 4. Market and business model example according to Slovenian demos

Several examples of EV service platforms can be found in the analysed initiatives and some of them are already at commercial stage or ready for it. They normally offer few services to EV users such as roaming and EVSE information (location, availability, etc.).

Different EMSPs and EVSEOs from Germany, Benelux and Austria are already connected to **Hubject Intercharge** platform, which is building an interoperable CP network by means of compatible EVSEs and EVSE back-end systems. When an EMSP is connected to Hubject (they have to face some fees to participate), its customers are allowed to charge their vehicles in the CPs belonging to the Intercharge network.

CROME is a similar platform that stemmed from a research project allowing cross-border roaming between the customers of EDF, EnBW and others as Bosch/Porsche. It was a platform conceived for a smaller number of stakeholders but it was connected to GeM marketplace, demonstrating that several platforms can coexist, at least technically. In this particular case, EVSE to EV communication was not considered.

Other interoperability platforms have been developed in demo projects. For example, in Slovenia (see above), UK and Spain under the ICT4EVEU project, in Portugal (Mobi.e) and Ireland (ESB). The approach is similar to the previous, but slight modifications may exist depending on the country regulations or business models.

In the case of Bristol city council (**ICT4EVEU, UK demo**), the interoperability platform (called *General Management System*) was set up by the municipality, at least during the project demo phase. Therefore, the commercial relationship between the platform operator and the EVSEOs and EMSPs making use of it might be different. Still, EVSEOs and EMSPs need to agree on the economic conditions to permit roaming.

In **Spain**, the figure of the *Charge Manager* (*Gestor de cargas*), defined by the regulation [12], aggregates both the EMSP and EVSEO roles under the same stakeholder. The regulation also requires that charge managers should be connected to the TSO to permit the transmission of load management orders for congestion management. The characteristics of this communication are defined by the TSO. For the moment, the communication between the EV and the EVSE is not considered by EVSEO/EMSPs, so load management is foreseen based on EVSE control and open loop strategies (user response to variable energy prices). The Charge Manager is entitled to resell electricity, which can be purchased either at the wholesale market or from a retailer. The next figure shows the scheme under the Spanish regulatory framework.

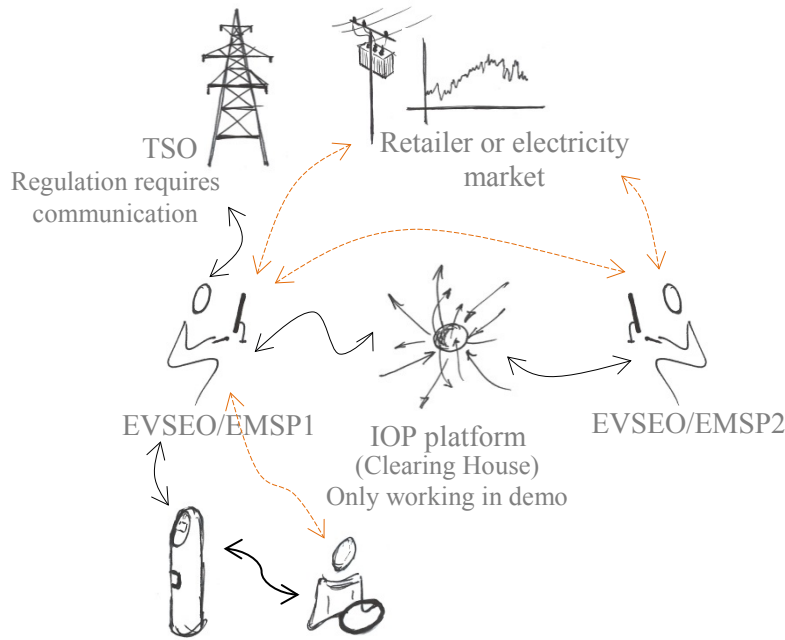


Figure 5. Spanish market model example

It might be possible that more than one interoperability platform may exist in the future at Spanish level and it is not still clear if they will all be interconnected.

The setting up of a national network is the model followed in **Portugal**. Both in this country and in Italy, regulations make a difference between the initial stages of the EV market deployment (demo phase) and the future competitive environment. In Portugal, there is a global interoperability platform able to control all CPs in the country. However, independent EVSEOs are allowed to install infrastructure. For the moment, they receive an income defined by regulation, which is paid by e-mobility electricity retailers (CEME). The infrastructure of EVSEOs must be interoperable with all CPs in the Portuguese network and must become part of this. In the future is expected that every EV user will have to hold a contract with an e-mobility retailer (acting as EMSP) but in the demo phase EVSE access was free of charge [13][14].

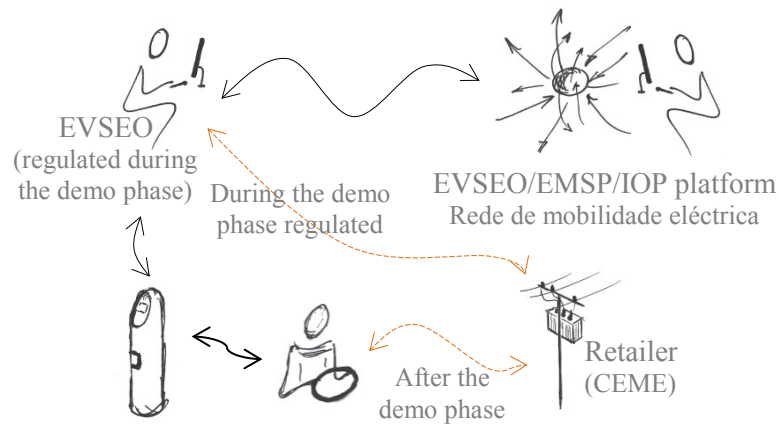


Figure 6. Portuguese market model example

The **Nagasaki EV&ITS** project is an example of the use of a different type of ICT platform, an EV user information platform, which addresses tourists driving in this region. As part of the proposed e-mobility model, the DSO performs charge management through an Energy Management System (EMS). ITS systems are included here for information broadcasting.

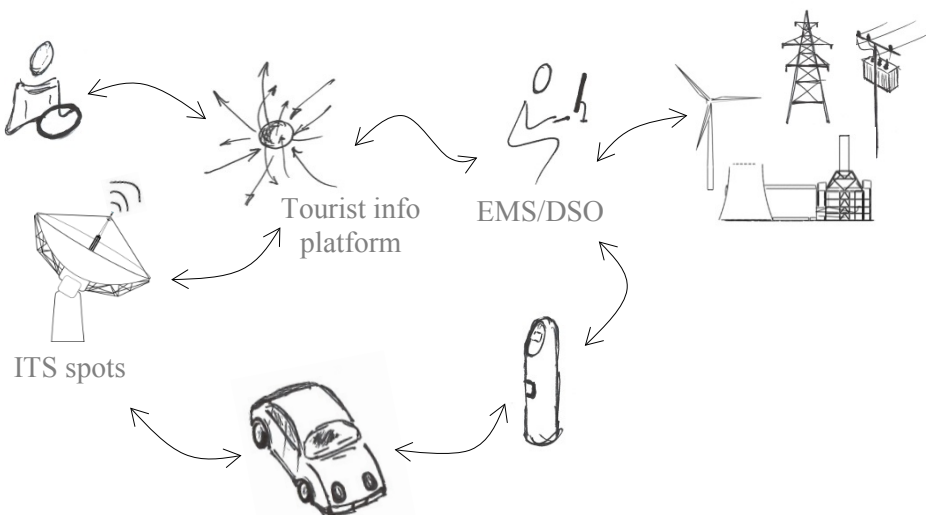


Figure 7. Nagasaki EV&ITS initiative model

For the moment marketplaces and platforms allowing roaming services between different EVSEOs and EMSPs are at demo phase in most of the cases. As a consequence, EV users can normally charge only in the infrastructure belonging to their e-mobility service provider (EMSP) which in this case exercises also a role of EVSE Operator.

In the most general case, EVSEO and EMSP roles are assumed by different companies. Normally, the EMSP will have a contract with a retailer, one or more EVSEOs and EV users; and the system operators might be in communication with either the EMSP or the EVSEO or both in order to be able to perform load management. Nevertheless, variations of this model, including just some of the communication channels and merging EVSEO and EMSP roles under one stakeholder, might be more common and could be used to describe several models deployed today (**RWE**, **EnBW**, **e-laad**, etc.). Both approaches are outlined through the next figures.

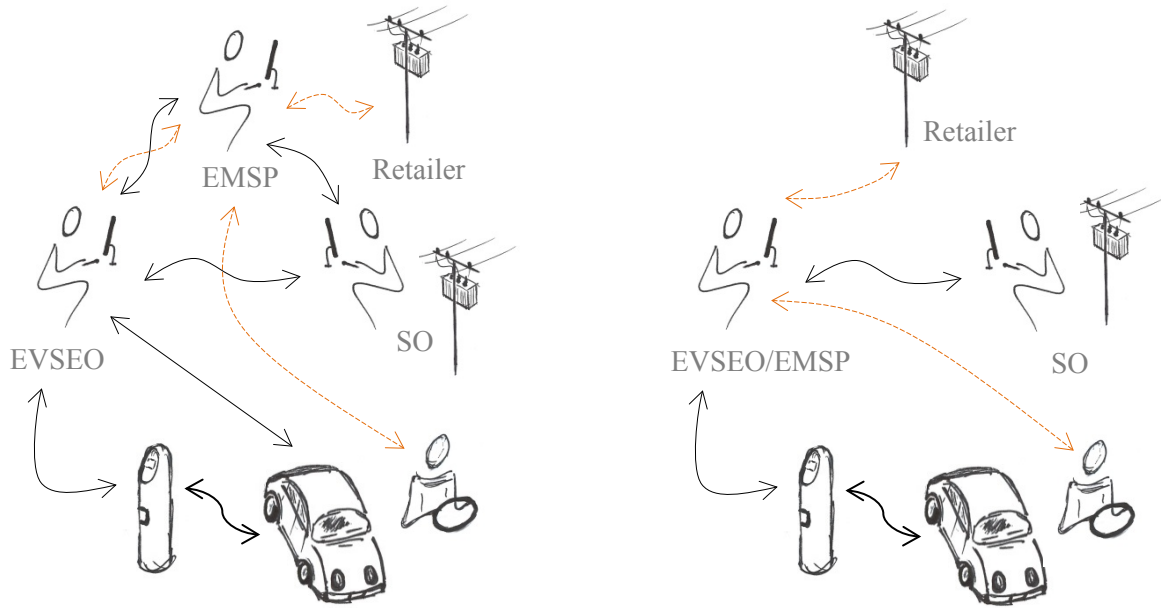


Figure 8. Market model example without roaming service. General (left) and particular case (right)

According to the majority of the analysed market schemes, the energy retailer is a choice of EMSPs, which might have a contract with the EV user and/or with the EVSEO. However, in Italy and Ireland EV users have the right to choose the retailer at the CP.

In **Italy**, the regulation defines a transitory research and demo period in which three EV service provision models are defined (*distributore*, *in concorrenza* and *in esclusiva*). According to [15] [16], EV users should be able to choose the electricity retailer at the CPs, while in service stations (*modello in concorrenza*) it could also be selected by the EMSP/EVSEO through a competitive process.

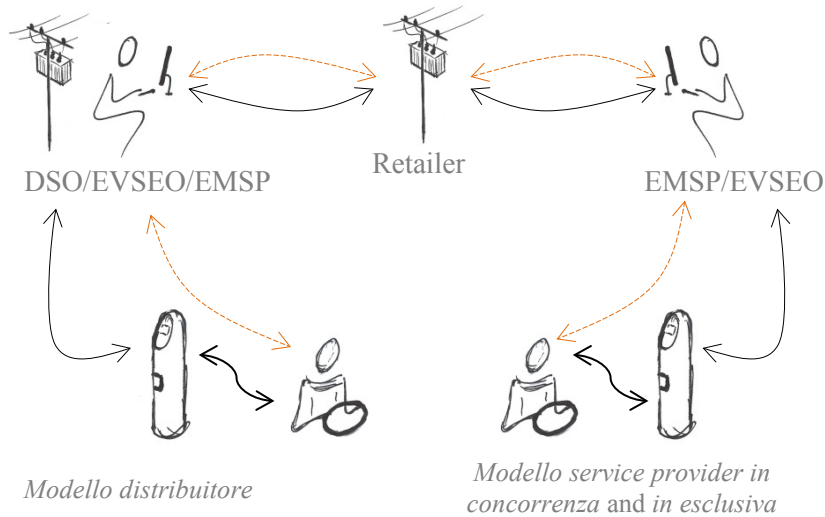


Figure 9. Italian market models example

In the case of **Ireland**, ESB wants to set up an IT platform that, in the future, will permit EV users to have access to an online account which will enable them to pay for public charging, choose an energy supplier, pre-pay using a credit or debit card and provide them other services.

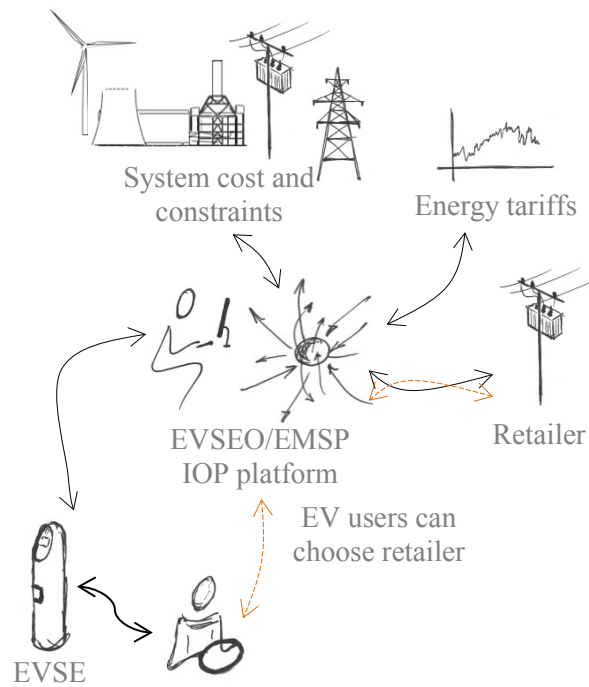


Figure 10. ESB market model example

In most cases, EV users hold a **contract** with an EMSP and payment and billing is performed on a regular basis (monthly, for example) according to the demanded service or to the contracted tariffs schemes (flat tariff, for example). However, other options are possible and they may well coexist: **pre-paid** or **top up cards**, allowing to charge at a certain EVSEO infrastructure without holding a contract; **ID card** allowing EV users to have access to the CPs integrated in a network formed by different EVSEO/EMSPs (**Charge Point** commercial initiative in the USA, for example), in this case the EV user is charged for the service provided by the owner of the CP; or **open access** CPs, permitting to pay for the service with a credit card or any other payment mean, for example, an on-line payment platform.

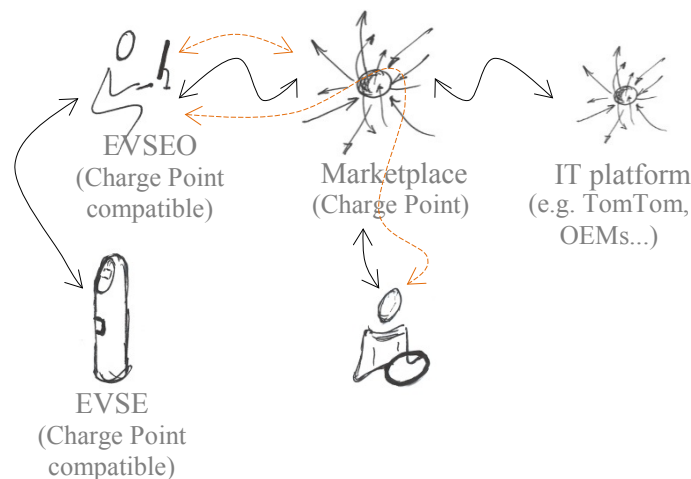


Figure 11. No subscription contract for EV users. Charge Point

For instance, **Iberdrola** believes that the EV charge service market may well evolve towards this last approach, which is described through one of the pictures below. The EV user would not require a subscription contract with the EVSEO/EMSP but only a commercial relationship when charging. The

payment platform would act as an interoperability platform and, therefore, no additional roaming system would be required.

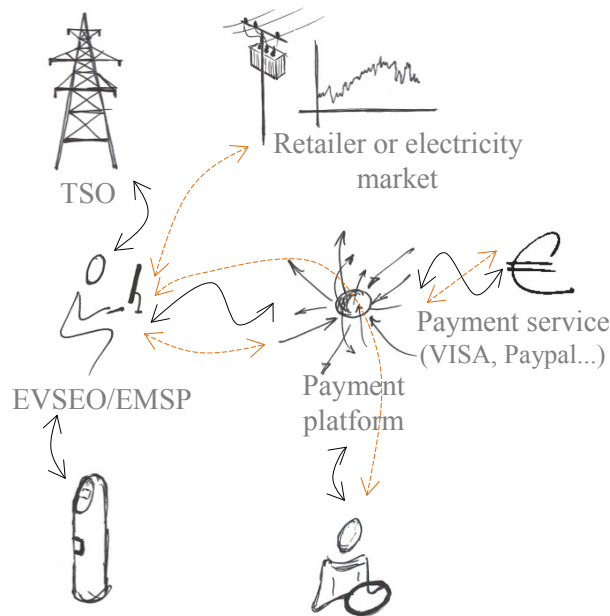


Figure 12. No subscription contract for EV users. Open access with payment platform

3.1.2. Private charging

The EV charge in the **private domain** (residential, industrial...) might require a different approach compared to that taking place in public or semi-public CPs. For example, the roaming service becomes unnecessary, while load management strategies might consider EVs just as any other residential electrical appliance. Though some EV users might have a contract with an e-mobility service provider and have installed a wall-box (EVSE) in their car parks, others might charge their cars using conventional domestic sockets and have just one electricity supply contract with their usual retailer.

In the first case, the market models could be similar to those presented above for public and semi-public charging. In the second, other systems like Community/Home/Building Energy Management Systems (CEMS, HEMS, BEMS...) might be used. This approach is very common in the **Japanese demos** that were analysed (Keihanna, Smart Melit, JUMPSmartMaui, Rokkasho...) and it was also found in the **Winter Trial** by ESB and in **Intellicharge** by EDF. It can be described in general terms by the next figure.

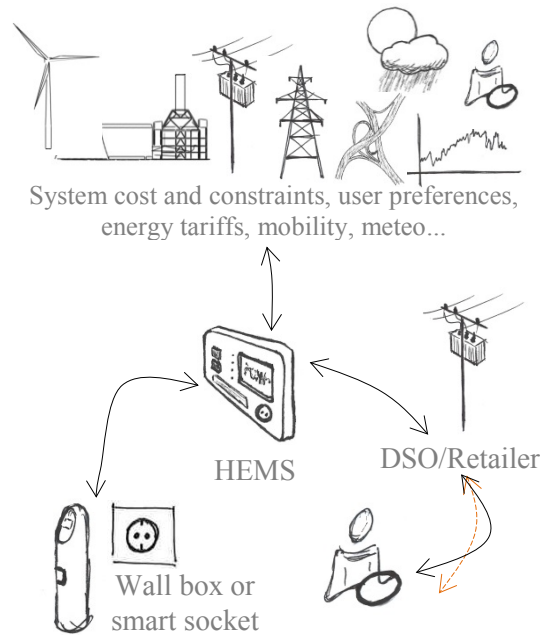


Figure 13. Private charging

Between the HEMS, which could also be a smart meter, and the DSO/Retailer, other intermediate systems may exist such as a community or building EMS or an EV dedicated EMS. Normally, the control is performed over the infrastructure, not over the EV (though it remains possible), and implemented actions are simple: stop/start the charge, charging parameters monitoring, charging start scheduling, etc. In some cases, the demand response actions are left to the EV users (open loop), as in **Keihanna Eco City project**, where an email is sent the previous day to customers when some specific consumption behaviour is required from them.

The **PowerUp** research project proposed technical solutions for the implementation and testing of the ISO/IEC 15118, allowing the execution of the use cases defined by this standard. A load balance controller, which might be part of the DSO/Retailer's back-end system, is able to define and manage the charging schedule of EVs by means of an end-to-end communication. Two different layouts were proposed in the project.

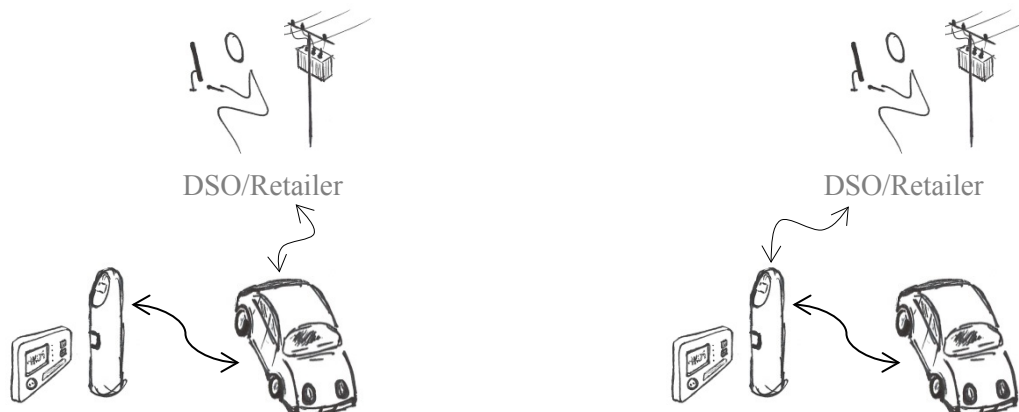


Figure 14. PowerUp project proposals for ISO/IEC 15118 implementation

3.1.3. Mobile metering

All the solutions mentioned above consider that the metering equipment is installed in the charging infrastructure. Nevertheless, other solutions and business models propose to include the smart meter

either on-board the EV or in the cable for EV-EVSE connection. This solution is valid especially for private CPs but it could be also suitable for public and semi-public infrastructure using standard domestic or industrial sockets. Both ELVIIS project and Görlitz company present variations of **mobile metering** solutions, the first was developed in the frame of a research project and the second is already a commercial product.

ELVIIS permits to consider EV user preferences and requires the charging schedule to be validated by the system operator. At the present, the driver needs to enter the specific power outlet ID, but in the future it will be possible to use vehicles' satellite navigation device to identify nearby outlets.

The solution proposed by **Görlitz** requires sockets, EVs and EV users to be registered at data base (interoperability platform), in order to carry out an automatic identification of the consumer and of the consumption point. The socket and EV communicate via PLC.

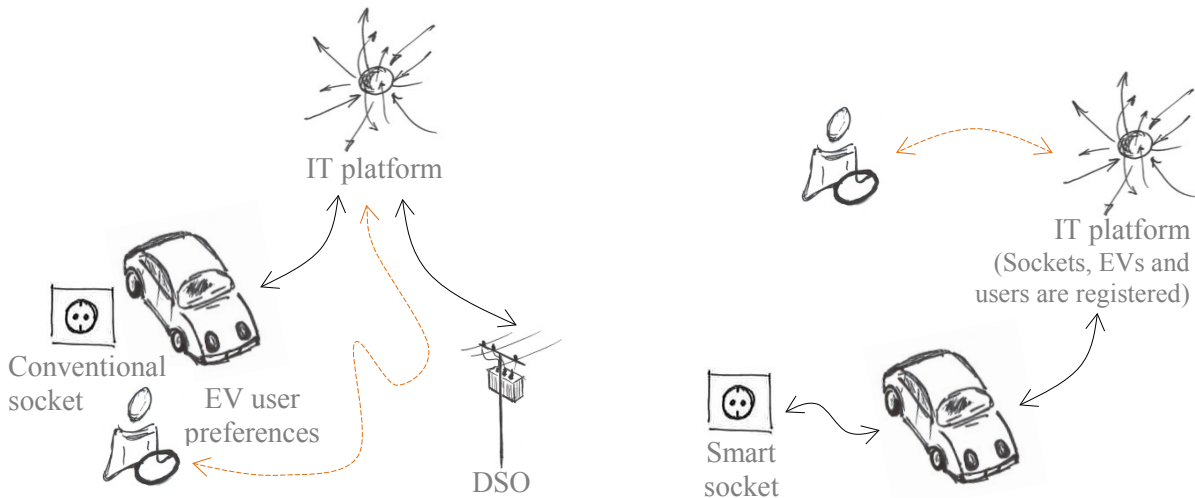


Figure 15. Mobile metering. ELVIIS (left) and Görlitz (right)

3.1.4. Fleet management

Fleet management, which affects both private (e-car sharing) and public businesses (public transport), might require some specific services compared to the charging schemes shown before, for example, EV monitoring.

The **E-bus OMS** demo presents a public transport initiative based on electric buses in Hitachi city (Japan). Smart charging was considered both to reduce the impact on the network and support the operation and maintenance of the coaches. In addition, an EV monitoring system and a customer information service were put in place in the framework of this project.

The next figure refers to this initiative while it could be also valid for other fleet management initiatives.

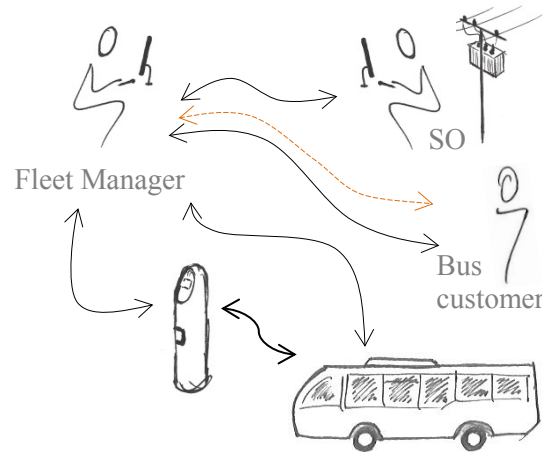


Figure 16. Fleet management. E-bus OEM initiative.

The **Flemish living lab**, in Belgium, and **Mi nuovo elettrico**, in Italy, projects propose, among other services, to extend the interoperability through the deployment of a common RFID card for EV charge and public transportation.

A particular case of the fleet manager is the one introduced in **Edison project**, in which this actor assumes the role of **flexibility aggregator** or **VPP operator**. According to the solution presented, the fleet manager decides the charge schedule of EVs based on day-ahead spot prices and ancillary services provision. To perform this, an extension of IEC 61850 standard was developed and used.

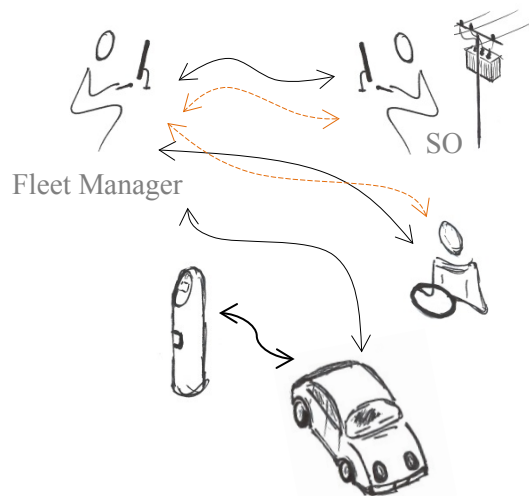


Figure 17. Fleet manager as flexibility aggregator. Edison project

3.2. Services and stakeholders

The analysis of initiatives led to the identification of services related to interoperability aspects of EV deployment as well as the stakeholders that may offer them. Due to the fact that we are dealing with demo projects, some services are being developed even if their regulatory or business feasibility is not completely validated. Therefore, their real applicability will depend on local regulatory aspects affecting both business models and stakeholders role definition, among others.

The next table summarizes the identified services and stakeholders that may provide or demand that service.



Table 4. Services and stakeholders

| Services | Service Demander | Service Provider |
|--|---|--|
| EV Charging: <ul style="list-style-type: none"> Public, Semi-public, Private. Access and payment: customer card holder with or without contract, pre-paid or under subscription; open access. | EV user | EMSP, EVSEO, Retailer |
| Marketplace (B2B platform): <ul style="list-style-type: none"> Data routing. Request authorization. Customer services offer. Connection to external ICT platforms. | All stakeholders wanting to offer or purchase services: EVSEO, EMSP, EV user, DSO, etc. | Marketplace operator |
| Roaming/Clearing House (CH): <ul style="list-style-type: none"> Data and/or economic clearance. Open access payment. | EVSEO and EMSPs EV users | Clearing House operator |
| Load management: <ul style="list-style-type: none"> EVSE control (close loop), EV control (close loop), Open loop. Capacity availability information and reserve. Renewable energy integration. V2G, V2B, V2H. EV user requirements consideration. | DSO, Energy Retailer EMSP, EVSEO | EV user, EMSP, EVSEO, Fleet manager |
| EVSE related services for EV users (even while roaming): <ul style="list-style-type: none"> Access: open, restricted. Status monitoring. Search. Reservation. Identification of optimal EVSE. Guidance to EVSE. Service price information. Retailer selection. Payment options. General information: connector type, owner, maximum charging rate, extra facilities, etc. | EV user | EMSP, EVSEO |
| Other information services for EV users: <ul style="list-style-type: none"> Contract information. Intermodal mobility: vehicle sharing, public transport, park and ride, etc. Traffic situation. Road conditions. Weather information. Driving support: trip planning, efficient driving, recharging advisor. News. Points of interest in the route. EV performance information: SOC, carbon | EV user, Fleet managers | EMSP, ICT platform operator, Information provider (mobility, meteo...) OEM |



| | | |
|---|-----------------------|--|
| <ul style="list-style-type: none"> • footprint, driven range, etc. • Driver preferences and patterns. | | |
| Customer interface: <ul style="list-style-type: none"> • Phone or internet notifications. • Smart phone apps. • Web portal access. • On-board technologies. • EVSE HMI. | EV user | EMSP, EVSEO |
| EVSE related services for EVSEO: <ul style="list-style-type: none"> • EVSE access: local, remote. • EVSE management. • EVSE monitoring. • EVSE diagnostics. • EVSE maintenance. • Connection to interoperability platforms. • Planning of infrastructure development. | EVSEO, Fleet managers | ICT solutions developer ICT platform operator |
| EMSP/EVSEO related services: <ul style="list-style-type: none"> • Customer management. • Billing. • Metered data retrieval. • Connection to external systems (DSO, information platforms, energy market, etc.). • Energy price information. | EMSP | ICT solutions developer |
| EV related services for fleet managers: <ul style="list-style-type: none"> • EV sharing management: reservations... • EV performance monitoring and prediction. • EV location: GPS... • EV remote maintenance. • Customer information. • Charging optimization and scheduling. | Fleet managers | ICT solutions developers, OEM |
| Secure and reliable payment | EV users, EVSEO, EMSP | Payment platform operator |
| Testing: <ul style="list-style-type: none"> • Interoperability assessment. | OEMs, EVSEO, EMSPs | Testing services provider |

3.3. Systems

The systems required to implement the services listed in Table 4 define an important part of the whole e-mobility architecture, including software and hardware assets. Some systems might be common for different businesses, services and stakeholders, at least to a considerable extent.

The next table sums up the assets that were identified in the analysed EV initiatives. More detailed information is available in the annexes of the present report.



Table 5. Systems

| Asset/System | Description |
|---|--|
| Marketplace ICT platform | B2B platform offering EV services exchange. Normally proprietary solution but open solutions might be used (e.g. FI-WARE) |
| Clearing House / Roaming ICT platform | ICT platform permitting data and/or economic clearance between EVSEOs and EMSPs. Normally proprietary solution. It may include some additional services (e.g. EVSE search), becoming a marketplace in a certain way. |
| Interoperability ICT platform | This term is used in this document meaning a generic platform permitting interoperability. It includes marketplace, roaming platforms and other possible ICT solutions for IOP. |
| End user Information services platform | ICT platform designed to offer customers (EV users, EVSEOs, EMSPs, etc.) information services (see Table 4 above). It could be operated by OEMs or third party services providers. |
| Payment platform | It acts as interface between customers, service providers and payment companies (VISA, Paypal...) adopting certain responsibilities in the charging process (to be further defined). |
| EVSEO back-end system (EVSE management system) | It gathers all applications required to develop the services linked to EVSEO's business model (see above), including EVSE remote monitoring and control. Normally, proprietary and some commercially available (offered by EVSE OEMs). |
| EMSP back-end system | System including all applications required to perform the EMSP's business model services (see above). Normally proprietary solutions. |
| DSO back-end | Diverse applications can be considered within the DSO back-end system: DMS, OMS, CIS, GIS, SCADA. We highlight here those intended for demand control. |
| Retailer back-end | Diverse applications can be considered within the Retailer back-end system. We highlight here those related to Customer Information Services (CIS). |
| TSO back-end | Diverse applications can be considered within the TSO back-end system supporting TSO activities. We highlight here those intended for demand control. Normally proprietary. |
| Fleet management back-end | Set of applications that enable the fleet manager to perform the functionalities required to carry out its business model (see above). Normally proprietary solution. |
| SA (EVSEO, EMSP, DSO, Retailer, TSO, Fleet management) front-end systems | Together with back-ends they define the main systems of the stakeholders. The front-end is responsible for collecting input and processing it to conform to a specification the back-end can use. The front end is an interface between the user and the back end. We include here web portals for customers, where customers have access to public or private information and perform actions related to their contract, services provision, etc. |
| EVSE | Charging modes: According to IEC 61851. Mode 1 (for small vehicles), 2 (normally used in private charging although some public CPs permit this type of charging), 3 (normally used in public |



| | |
|--|---|
| | <p>charging), 4 (fast DC charging).</p> <p>Connector types: According to IEC 62196. AC: normally type 2 (Mennekes) and type 3 (Scame), the latter mainly in Italy and France. Type 1 for connection case C (not detachable cable), since most of the EVs have currently this type of socket. In DC, normally CHAdeMO and CCS.</p> <p>Industrial or even residential sockets might be available at EVSE for small vehicle or/and interoperability purposes. More than one connector type might be available at the EVSE for the same reason.</p> <p>Power levels (per connector): Normally, AC maximum: 7,4kW (1phase) and 44kW (3 phases). DC maximum: 50kW.</p> <p>EV user access: mainly RFID (see next point on communications).</p> <p>Communication characteristics: EVSEs permitting mode 3 charging comply with IEC 61851 requirements. Few commercial models implement the IEC/ISO 15118, though it might be included in prototypes used for the demos.</p> <p>HMI: Some EVSEs may have a display permitting EV users to select charging preferences locally or, through an internet access, in external web sites or platforms.</p> |
| EV | <p>Normally, standard vehicles do not permit smart communication based on ISO/IEC 15118 but only basic communication based on IEC 61851-1. For demos, adapted EVs are used in occasions.</p> <p>The same happens with V2X functionalities, it is not commercial in EVs but it might be implemented for demos.</p> <p>They might have some on-board information system able to exchange information via wireless means (e.g. short range with EV user appliances or longer range through WAN). They may include data processing and presentation to the driver. The ITS vehicle station is an example of this.</p> |
| Energy Management Systems (EMS) | <p>Systems able to schedule and manage energy consumption by means of controlling smart electric appliances or other types of devices. Depending of their domain we speak of HEMS (home), BEMS (building), EV EMS (EV infrastructure), CEMS (a whole community/neighbourhood), etc. In the literature, CEMS also refers to Customer EMS. The Distribution level EMS is the DMS, which is included in DSOs' back-end systems. They may also behave as in-home gateway.</p> |
| Smart meter | <p>Apart from their common metering functionality, smart meters may act as home gateways, transferring incoming data to other systems (HEMS, display...). In some cases, they might even be able to perform certain control actions.</p> |
| Smart sockets/appliances | <p>Sockets or appliances with communication capabilities able to, in most cases, switch supply on and off.</p> |
| IOP gateway | <p>Ad-hoc designed device permitting the communication between EVSEs and secondary actors when they are not interoperable. They might as well add functionalities within an end-to-end communication. Examples in Mugielec and PowerUp projects.</p> |
| ITS infrastructure | <p>ITS central station and ITS roadside stations permitting ITS messages be broadcasted to vehicle ITS stations. Vehicle to vehicle communications are also possible.</p> |
| EV user systems: Smart | <p>Device used by the EV user for communication purposes. It might</p> |



| | |
|--------------------------------|---|
| phone or similar, PC... | be based on the mobile cellular communication network, short range wireless, ADSL, etc. |
|--------------------------------|---|

3.4. Communication and information

The systems described before are part of an end-to-end communication necessary to make feasible the provision of e-mobility services via message exchange and data processing.

However, one of the main problems of interoperability is that the deployed protocols are not common for all developed solutions, mainly in what refers to information data models. In some cases, the lack of available protocols when the implementation was designed led to the development of proprietary solutions; in other cases, the standards did not permit the development of certain services and modifications were introduced in them by service providers to suit their needs. This local implementations cause interoperability problems when wider areas are interconnected.

The next table presents the standards deployed in the analysed demonstration initiatives, with the focus set on information protocols.

Table 6. Communication and information

| Communication from - to | Applicable standards |
|--|---|
| SA systems - Interoperability ICT platforms | Based on web services: <ul style="list-style-type: none"> • Proprietary defined by the IOP platform. • OCHP with the Clearing House. |
| EVSE - Interoperability ICT platforms | Proprietary defined by the IOP platform: OICP (Intercharge), L2GWAN (RWE, also used for EVSE-EVSEO communication). |
| EVSEO/EMSP - SO | Proprietary defined by the SO. OSCP (e-laad). |
| EVSEO-EMSP (same company) | Enterprise service bus. |
| EVSE - EVSEO | Based on web services: <ul style="list-style-type: none"> • Proprietary defined by the EVSEO: sometimes based on OCPP with additional messages, others completely different. • OCPP: v1.2, v1.5. • Modbus. IEC 61850 meta model: IEC 61850-90-8. |
| EVSE - IOP gateway - EVSEO | The IOP gateway translates the Modbus or OCPP of EVSEs to EVSEO deployed protocol (Mugielec). |
| smart meter - DSO/Retailer | DLMS/COSEM (IEC 62056), specific extensions are possible. |
| HEMS/Smart meter - EVSE/smart socket | FNN EDL (German specification). Echonet (Japan). LonWorks (USA). |
| EV user - EVSEO/EMSP/Retailer/IOP and information ICT platforms | https (smartphone app). Web services. Batch messages (internet, SMS, etc.). |



| | |
|---|---|
| EV user - EVSE | RFID: Mifare classic and Mifare Plus (ISO 14443 type A), Calypso (ISO 14443 type B), Felica (Japan). Credit cards. QR code reading (with smart phone or similar). Key. |
| EV - Information services platform | ITS. TPEG over DAB+ (ITS, UER/EBU protocol). Web services. |
| EV - Fleet manager | Proprietary/Commercial: eCSM (Siemens based on XML). ITS. IEC 61850 extended for EVs, mapping to REST |
| EV - DSO/Retailer | ISO/IEC 15118, included mapping with IEC 61850-90-8 (PowerUp). |
| EV - EVSE | AC charge: <ul style="list-style-type: none">• IEC 61851-1.• ISO/IEC 15118: v. FDIS, final.• SCCPS. DC charge: <ul style="list-style-type: none">• CHAdeMO (messages to control the charging process, no further functionalities can be implemented). |
| EV - Smart socket | PLC communication for mobile metering solutions. |
| EV - EV user | Bluetooth, Wifi. |

The next figure tries to summarize the most representative information protocols in the table above in a graphical way.

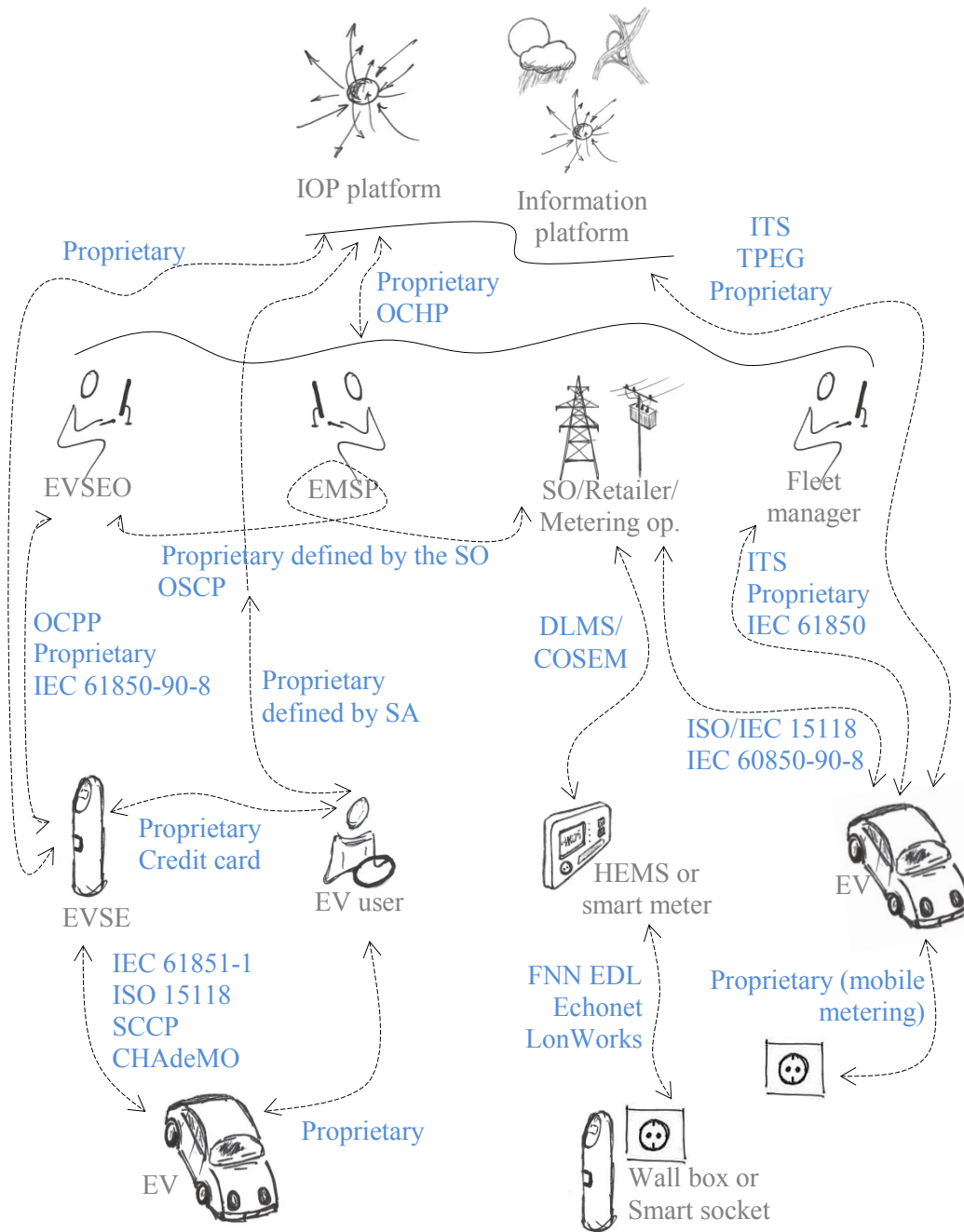


Figure 18. Information protocols summary

The related communication protocols according to the analysed demo projects are shown in the following figure.

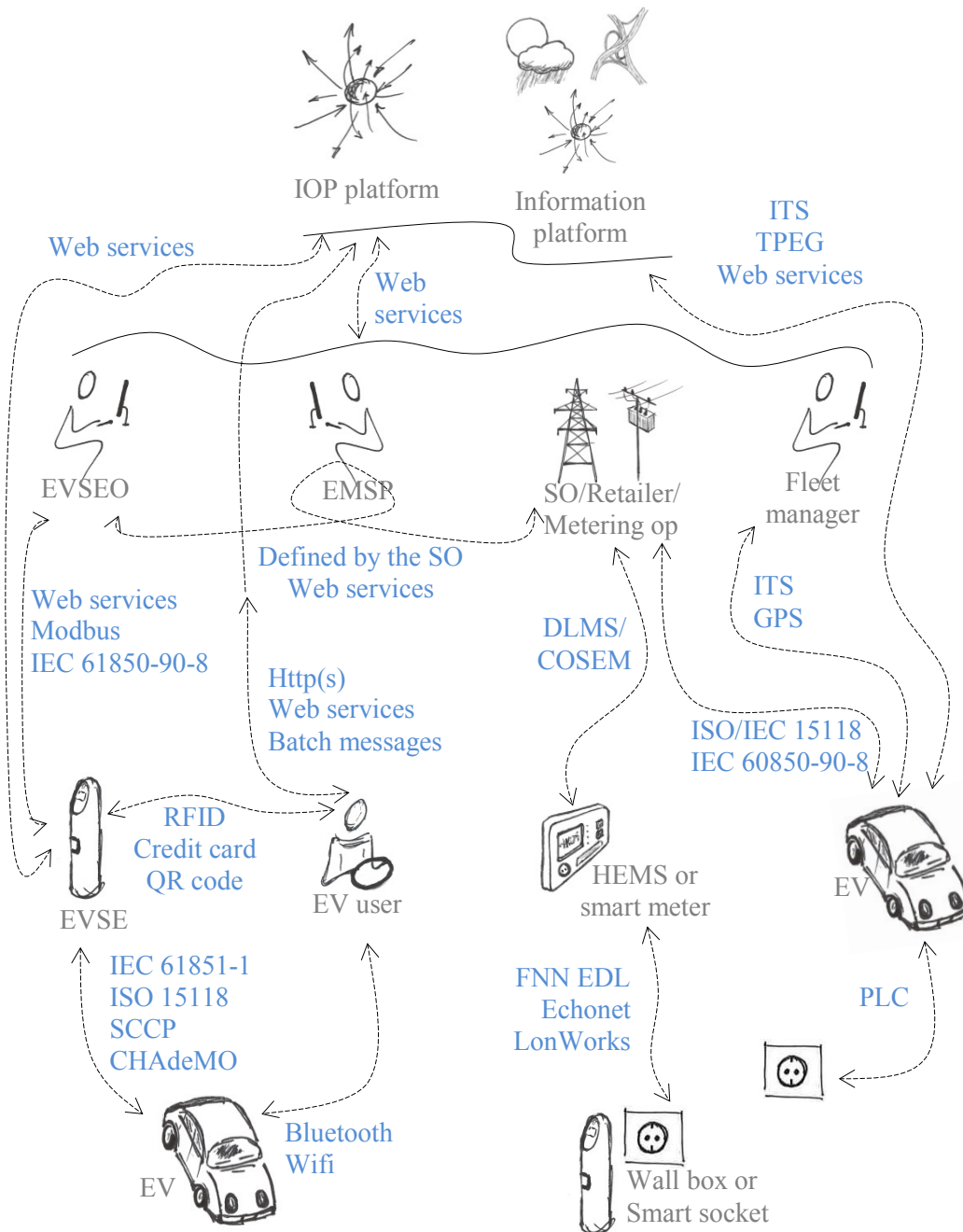


Figure 19. Communication protocols summary

3.5. Testing

Testing was dealt with by few of the analysed projects. The objective of this short chapter is not to go into the details of the implementations but to highlight those projects and demos addressing testing.

PowerUp, which is not really an EV deployment initiative, is the most remarkable research project addressing testing in the EV field. It developed and validated the vehicle to grid communication based on the ISO/IEC 15118-2 standard and it published a TTCN-3 based implementation of the conformance test cases, i.e. the application protocol [17]. Further extensions of this TTCN-3 suite, along with its incorporation into the ISO/IEC 15118-4 V2G testing standard are possible.



With a similar scope, the **eNterop** German research project tries to develop a test system for the charging of EVs according to the ISO/IEC 15118-2/4 vehicle-to-grid communication interface based on TTCN-3.

Usually, research projects including a demonstration phase require the field validation of the accomplished developments. This leads to a previous interoperability testing, in occasions based on simulation, which is normally performed according to procedures established in the frame of the project and with the scope of achieving its particular objectives. Therefore, this approach is different to that of PowerUp or COTEVOS projects, which seek to develop harmonized and replicable testing solutions for e-mobility.

Apart from standards, proprietary protocols do also require certification to assess and provide interoperability. For example, in the case of the connection of a system to an interoperability platform, its specifications have to be met to assure plug and play or other interoperability level communication. This happens for example with the **Hubject** platform which, through a third party, provides certification to those chargers and EVSE management systems compatible with their roaming platform: eRoaming Technology seal for chargers and Certified eRoaming System.

Renault deploys the ZE Ready Label [18], which demonstrates that a charging solution by a charging infrastructure supplier and/or a mobility operator is compatible with RENAULT Z.E. vehicles. Renault lists a set of standards that should be met to achieve the certification, which is performed in five steps: initialisation, declaration, validation, qualification and license.

3.6. Aspects for improvement

Even though many of the analysed projects were not finished yet, some aspects for improvement were identified. In addition, stakeholder experience was also used as input in this subchapter. The following list is a summary of the collected information, which is more extensively described in Annex B:

- **ICT platform interoperability:** more than one ICT platform will be used throughout Europe and not all of them will be interoperable. For example, two of the most important ones, Hubject and the GeM marketplace, are not currently interoperable.
- **Commercial agreements:** technical interoperability is not enough to achieve roaming. Commercial agreements between EVSEOs and EMSPs are necessary but business strategies might become an obstacle to achieve it.
- **RFID card coding and type:** RFID card coding may hinder interoperability, since aspects such as data semantics, data storing position, etc. might be difficult to agree in wide areas. The use of minimum information and intelligence at data centre level might become a solution to achieve interoperability for EV user identification at EVSEs. A multi-reader might be a solution when different standard RFID cards are used in a region.
- **OCPP implementation:** even if a system results compliant with a standard, in this case OCPP, interoperability might not be assured. For example, web services' policies and addressing might require a different implementation of the protocol in order to achieve interoperability.
- **EV user contract/ICT platforms disadvantages:** Subscription contracts require interoperability platforms for EV users to have more CPs at disposal. However, open access might involve an easier solution for the system: lower infrastructure required, ICT platform cost avoidance, no necessity to adapt EMSP/EVSEOs' back-end systems, etc. Payment platforms are proposed as a solution for this.
- **Proprietary/custom solutions:** in many cases, communications between EVSE and EVSEOs are based on OCPP or similar protocols but are proprietary. This requires that EVSE manufacturers develop different firmware depending on the customers which might involve higher infrastructure costs.



- **Early stage of development:** upgrading a system protocol (for example from OCPP v1.2. to 1.5) requires important modifications (EVSE, EVSE management system and affected applications in back-end system) which cannot be accomplished too often.

Other aspects for improvement related to particular solutions, e.g. ELVIIS project, were also identified. In this case, the following were highlighted for future versions: new functionalities for charging (amperage selection, for example), CP finding, route planning, EV user preferences selection...; notifications on EV performance, like the general state of the vehicle, SOC, charge end...; and improvement of the software and connect ability via the smart phone.



4. Conclusions

The interoperability can be addressed from many different points of view and the analysed demonstration projects are a good example of this statement. However, in the majority of the initiatives that were found, it is still considered only at local level, i.e. from a municipal, regional or, at most, national perspective.

At the current stage of development, solutions still seek to show that EVs are already a real mobility alternative to conventional vehicles. The first objective is to dissipate the main doubts of potential users, and one of the questions is *how and where do I charge my vehicle?* Advanced functionalities such as marketplace, load management or even roaming are back in the list of priorities of EV users. This is one of the reasons that make pure demonstration projects deal with basic interoperability aspects, i.e. those focused on permitting charging (definition of socket types, for example), while demonstrations connected to research projects dare to think about more advanced options.

Both types of projects are considered in this report and together with socket standardization, interoperability platforms and load management also find their place. Most of the reported results are still at a prototype phase and solutions are in many cases related to each project framework. Nevertheless, commercial solutions and business models start to arise.

Custom solutions have been identified as a barrier for interoperability. The development of different approaches enriches the technology level but, until one or a small group of solutions will not beat the others commercially (resulting in de-facto standards), interoperability will be hard to achieve. The EV related market and standardization need to be more mature to reach this point. In the meantime, proprietary/custom solutions are used to develop prototypes dealing with high level communication.

Some of the communication protocols allowing added-value services are still at development stage or have a short life. For this reason, many of the implementations that have been deployed so far rely on developments based on proprietary solutions, designed to address stakeholders' specific necessities, and/or in old versions of current standards (e.g. OCCP v1.2).

A few additional aspects hindering interoperability have been identified and it is believed that some of them should be considered in the frame of COTEVOS project, even if they are not directly related to testing. Some of these barriers are the following: a correct deployment of a specific standard in different implementations does not assure interoperability between them; proprietary solutions linked to ICT platforms "impose" their own standards (sometimes even through regulations, this is the case of energy markets) and it is likely that several of this proprietary standards will coexist throughout Europe; etc. Complex solutions, involving the end-to-end communications as proposed by the ISO/IEC 15118, are currently not amongst the most deployed solutions, but may need to be considered in the context of the COTEVOS project, as their importance is expected to grow in the years to come.

In order to be able to identify the most relevant IOP test cases, some of the questions that should be tackled by COTEVOS project at this stage, after the identification of regulatory and business models, systems and functionalities, and communication and information protocol trends in demo projects, are the following:

- Which end-to-end communications really need to be compliant with which standards in order to facilitate interoperability for the relevant system use-cases?
- Which solutions will be adopted when more than one possibility is available for service provision, for example to perform load management?
- Are there communications between systems that are not really required or that are less relevant for standardization?



- What is the roadmap for the different interoperability levels deployment in the framework of the EV market development? Which test should be addressed first from a business model perspective?
- How should COTEVOS deal with the existence of proprietary high level standards? Will testing infrastructures be flexible enough to implement custom developed data models?

Projects like PowerUp have advanced in ISO/IEC 15118 use case testing and in the mapping of IEC 61850 into this standard. Even if the approach is quite specific (load management considering Advanced Metering Infrastructure - AMI), it is important to consider, and possibly re-use, the proposed solutions. On the other hand, commercial testing is already being performed for plug and play interoperability with IOP platforms such as Hsubject, but here again the scope is based on proprietary solutions.

The identification of possible alternatives is important along this phase, in order to have a clear and broad overview of the different services that the market may demand in terms of interoperability tests. This is the main objective of this report, the contents of which need to be complemented with other fields of the state of the art developed in WP1, since demonstration initiatives might not be the best source to find specific developments on testing.



5. References

- [1] *Green eMotion FP7 EU project web site* [online: <http://www.greenemotion-project.eu>, accessed: 01/2014]
- [2] *Report on regional pilot – Deployment projects and best practice assessment*, ICT4FEV EU project, D.2.6, Berlin 12/07/2013 [available: <http://www.ict4fev.eu/publications/deliverables>]
- [3] *ICT4EVEU ICT PSP EU project web site* [online: <http://www.ict4eveu.eu/>, accessed: 05/2014]
- [4] *PowerUp FP7 EU project web site* [online: <http://www.power-up.org/>, accessed: 05/2014]
- [5] *Mobincity FP7 EU project web site* [online: <http://www.mobincity.eu/>, accessed: 05/2014]
- [6] *smartCEM ICT PSP EU project web site* [online: <http://www.smartcem-project.eu/>, accessed: 05/2014]
- [7] *Molecules FP7 EU project web site* [online: <http://www.molecules-project.eu/>, accessed: 05/2014]
- [8] *E-mobility smart charging*, CEN-CENELEC WG Smart Charging, edition 1.21, 15/12/2013
- [9] A. Zurbaryeva, C. Thiel, *Paving the way to electrified road transport*, JRC Scientific and Policy reports, Publications Office of the EU, EUR 25832 EN, 2013 [available: http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/27868/1/report_e-mobility_projects_final_online.pdf]
- [10] *EV city casebook 2012*, Organisation for economic cooperation and development/IEA, 2012, IEA, [available: <http://www.iea.org/publications/freepublications/publication/EVCityCasebook.pdf>]
- [11] *The EV&PHV town concept – Best Practices Handbook II*, Ministry of Economy Trade and Industry (METI) of Japan, November 2011 [available: http://mauieva.org/docs/BestPractice2_EN.pdf]
- [12] Ministerio de Industria, Turismo y Comercio, *Real Decreto 647/2011, de 9 de mayo, por el que se regula la actividad de gestor de cargas del sistema para la realización de servicios de recarga energética*, BOE num. 122, 23/05/2011 [available: http://www.boe.es/diario_boe/txt.php?id=BOE-A-2011-8910]
- [13] Ministério da Economia, da Inovação e do Desenvolvimento, *Requisitos técnicos para o licenciamento da actividade de operação de pontos de carregamento da rede de mobilidade eléctrica*, Portaria nº 1201/2010 de 29 de Novembro, Diário da República, 1.ª série — N.º 231 — 29 de Novembro de 2010 [available: <http://www.mobie.pt/documents/10156/13306/0538605388>]
- [14] Ministério da Economia, da Inovação e do Desenvolvimento, *Regime económico -financeiro da actividade de operação de pontos de carregamento*, Portaria nº 180/2011 de 2 de Maio, Diário da República, 1.ª série — N.º 84 — 2 de Maio de 2011 [available: <https://www.mobie.pt/documents/10156/13306/Portaria180-2011.pdf>]
- [15] *Disposizioni speciali per l'erogazione dei servizi di trasmissione, distribuzione e misura e del servizio di dispacciamento ai fini della sperimentazione dei sistemi in bassa tensione di ricarica pubblica dei veicoli elettrici*, Deliberazione 15 dicembre 2010 - ARG/elt 242/10, 20/12/2010 [available: <http://www.autorita.energia.it/it/docs/10/242-10arg.htm>]
- [16] *Disposizioni speciali per l'erogazione dei servizi di trasmissione, distribuzione e misura e del servizio di dispacciamento ai fini della sperimentazione dei sistemi in bassa tensione di ricarica pubblica dei veicoli elettrici*, Documento di consultazione DCO 37/10, 02/11/2010 [available: <http://www.autorita.energia.it/allegati/docs/dc/10/037-10dco.pdf>]
- [17] M.A. Reina, A. Plaza, Z. Jakó, *V2G Conformance Test Specifications*, PowerUp project FP7 EC INFSO-ICT 285285 Deliverable 6.1, February 2013 [available: <http://www.power-up.org/>]
- [18] Z.E. Ready, Bureau Veritas [online: http://www.lcie.fr/en/1017-your-industry/charging-infrastructure/z.e._ready.html, accessed: 1/6/2014]
- [19] J. Ratej, B. Mehle, M. Kocbek, *Global Service Provider for Electric Vehicle Roaming*, EVS27 Barcelona, November 17-20, 2013



- [20] F. Williams, M. Sund et al., *Electric mobility functional ICT architecture description*, FI.ICT-2011-285135 FINSENY EU project, Deliverable 5.3, May 2013 [available: <http://www.fi-ppp-finseny.eu/deliverables/>]
- [21] A. Kobayashi, *Introduction of electric vehicle in a smart grid project in Rökkasho Village*, Joint Japan-IRENA workshop presentation, 26/05/2012 [available: http://www.irena.org/documentdownloads/OkinawaMay2012/15_Akira%20Kobayashi_Hitachi.pdf]
- [22] C. Marquis, H. Zhang, L. Zhou, *China's quest to adopt electric vehicles*, Stanford Social Innovation Review, Spring 2013 [available: http://www.hbs.edu/faculty/Publication%20Files/Electric%20Vehicles_89176bc1-1aee-4c6e-829f-bd426beaf5d3.pdf]
- [23] M. Rapos et al., *Electric Mobility Business Requirements Enabling Services Through Central IT Platform*, Green eMotion project (FP7 265499), Deliverable 3.4, May 2013 [available: <http://www.greenemotion-project.eu/dissemination/deliverables.php>]
- [24] A. Herdt, J. Laczay, M. Rapos, *Core services and transactions design specification Release 2*, Green eMotion project (FP7 265499), Deliverable 3.6, September 2013 [available: <http://www.greenemotion-project.eu/dissemination/deliverables.php>]
- [25] V. Fricke et al., *Implementation of demo prototype for Release 2*, Deliverable 3.8, December 2013 [available: <http://www.greenemotion-project.eu/dissemination/deliverables.php>]
- [26] A. Tiosias et al., *ICT Standards & Protocols*, Green eMotion project (FP7 265499), Deliverable 3.9, April 2012 [available: <http://www.greenemotion-project.eu/dissemination/deliverables.php>]
- [27] A. Kovacs, *PowerUp project presentation*, PowerUp project FP7 EC INFSO-ICT 285285 Deliverable 1.12, July 2011 [available: <http://www.power-up.org/>]
- [28] A. Amditis et al., *PowerUp final V2G architecture*, PowerUp project FP7 EC INFSO-ICT 285285 Deliverable 3.2, September 2012 [available: <http://www.power-up.org/>]



Annex A. General description of IOP initiatives

| | |
|---|----|
| 4-S | 56 |
| BEVIP | 62 |
| Charge of EVs in Spanish RECI cities | 44 |
| CROME | 64 |
| Crossing Borders | 70 |
| E-Bus OMS | 84 |
| EDISON project | 52 |
| e-Gap | 55 |
| Eisenstadt e-mobilisiert | 71 |
| E-Kizuna | 81 |
| e-laad | 54 |
| ElectroDrive-Salzburg | 72 |
| ELVIIS | 65 |
| E-mobility Italy | 50 |
| E-Mobility On Demand Wien | 72 |
| E-moving | 51 |
| Endesa's pilots on IOP | 47 |
| Energy Conservation | 85 |
| eNterop | 57 |
| e-pendler in niederösterreich | 73 |
| ESB's pilots on IOP | 63 |
| ETREL Electromobility Roaming System | 59 |
| Finseny | 66 |
| Flemish Living Lab Electric Vehicles programme | 86 |
| GIREVE | 69 |
| Görlitz e-mobility smart charging solution | 67 |
| Green eMotion EU project | 43 |
| Großraum Graz | 73 |
| ICT4EVEU (Spain) | 45 |
| ICT4EVEU (UK) | 60 |
| ICT4EVEU EU project (Slovenia) | 57 |
| Intellicharge | 68 |
| iZeus | 75 |
| JUMPSmartMaui | 78 |
| Keihanna Eco City | 76 |
| L'HERA della mobilità elettrica | 52 |
| LIVE Barcelona | 48 |
| Mi Nuovo Elettrico | 50 |
| Mobie | 49 |
| MOBINCITY | 58 |
| MOLECULES | 62 |
| MOVELE Madrid | 46 |
| Mugielec | 47 |
| Nagasaki EV&ITS project | 78 |
| NIKOLA project | 53 |
| Nissan Leaf V2H & V2B | 82 |
| Osaka EVAP | 80 |
| PI-P: Plugged-In Places | 61 |
| Power Up | 55 |
| Rapid Charger Network | 75 |



| | |
|---|----|
| RWE's pilots | 75 |
| Smart Community Demonstration Project in China | 83 |
| Smart grid project in Rokkasho Village | 81 |
| Smart Melit | 77 |
| smartCEM | 60 |
| Spanish Data Hub | 44 |
| TECMUSA project | 49 |
| Ten Cities, Thousand Vehicles | 85 |
| The basis for energy security | 68 |
| The Yokohama Smart City Project | 82 |
| VERDE CENIT project | 46 |
| Vibrate | 70 |
| VLOTTE | 74 |



| | |
|-------------------------------|---|
| Name of the initiative | Green eMotion EU project |
| Type of the initiative | FP7 EU project |
| City/Region | Europe |
| Short description | <p>A Business-to-Business (B2B) IT marketplace for electromobility services has been developed within the project. The marketplace allows energy companies, car manufacturers and charging point providers to share and integrate services on one common IT platform. It provides the necessary requirements such as standard IT interfaces for various electromobility services to demonstrate its usability and flexibility across Europe. For this purpose, three demo regions - Berlin, Italy and Spain - connected their IT systems to the newly implemented marketplace.</p> <p>The first release of the software system focusses on so-called clearing house services (roaming scenario). Companies like German energy provider RWE, Irish energy company ESB, Spanish Endesa and Italy's Enel have already successfully tested the clearing house services.</p> <p>Enel and Endesa presented an end-to-end working demonstration of roaming service in Barcelona at EVS 27 conference. An Endesa RFID card was successfully authorized at Enel charging station by using the Green eMotion marketplace ICT platform provided by IBM with the clearing house services provided by SAP.</p> <p>Additionally to the clearing house services, an EVSE search service is implemented, which helps drivers to find appropriate charge points. Further functionalities for reserving charging points and energy load management will follow shortly. Over the next weeks (info from December 2013), more demo regions in Copenhagen, Bornholm, Malmö, Karlsruhe/Stuttgart, Strasbourg and Madrid will join the marketplace. In total, 12 demo projects are involved, in 9 different EU countries (more than 1200 charge points and 400 EV) to test mainly roaming services and the interaction with the marketplace:</p> <ol style="list-style-type: none">1. Demo Berlin: roaming through the marketplace.2. Demo Stuttgart/Karlsruhe: CROME project developed France-Germany cross border interoperability services through the CROME market. Integration of CROME and GeM markets will be performed. Roaming and EVSE search through the market will be accomplished.3. Demo Denmark: demonstrate roaming through the market at a battery switching station (Better Place model), EVSE location service and on-board HMI system to access services.4. Demo Malaga: roaming and load management through the market place.5. Demo Spain no.2: roaming through the marketplace, impact of EVs on the network.6. Demo Strasbourg: French side of Demo Stuttgart/Karlsruhe. Integration of CROME and GeM markets. Roaming and EVSE search through the market will be accomplished.7. Demo Ireland: roaming and EVSE search services will be demonstrated.8. Demo Italy: roaming and load management through the market place, Enel EVSE search app update to include GeM charging points.9. Demo Malmö: roaming through the marketplace.10. Demo Kozani (Greece): roaming and load management through the |



| | |
|----------------------------------|---|
| | <p>market place.</p> <p>11. Demo Budapest: roaming through the market place.</p> <p>This marketplace, together with the clearing house development, integrates the different demo cases throughout Europe.</p> <p>(http://www.greenemotion-project.eu/)</p> |
| Responsible Partner | Siemens (project), IBM (market place), SAP (Clearing House) |
| Other participants | RWE, Bosch, Endesa, Iberdrola, EDF, ESB, Enel, city of Malmö, PPC, ABB, Greenabout |
| Interoperability approach | Roaming, EVSE search, marketplace interaction and load management will be tested around Europe through an IT platform. |

| | |
|----------------------------------|--|
| Name of the initiative | Charge of EVs in Spanish RECI cities |
| Type of the initiative | Private (RECI Association) |
| City/Region | Spain |
| Short description | <p>The plan sought to make interoperable the charging process of EVs in all cities belonging to RECI (Spanish Network of Smart Cities), 11 in a first step and all of them after. A RECI card and an interoperability protocol were expected to be created for that purpose.</p> <p>(http://www.redciudadesinteligentes.es/)</p> |
| Responsible Partner | RECI (Red Española de Ciudades Inteligentes – Spanish Network of Smart Cities) – Urban Mobility Group |
| Other participants | The cities belonging to the Network, 49 in total at the moment: A Coruña, Albacete, Alcalá de Henares, Alcobendas, Alcorcón, Alicante, Alzira, Aranjuez, Ávila, Badajoz, Barcelona, Burgos, Cáceres, Castellón, Córdoba, Elche, Fuengirola, Gijón, Guadalajara, Huelva, Huesca, Las Palmas de Gran Canaria, Logroño, Lugo, Madrid, Majadahonda, Málaga, Marbella, Móstoles, Motril, Murcia, Oviedo, Palencia, Palma de Mallorca, Pamplona, Ponferrada, Rivas Vaciamadrid, Sabadell, Salamanca, Santander, Segovia, Sevilla, Tarragona, Torrejón de Ardoz, Torrent, Valencia, Valladolid, Vitoria, Zaragoza |
| Interoperability approach | <p>Ability to charge the EVs in all the cities of the network.</p> <p>It seems that the project was stopped due to the different approaches to interoperability. When municipalities in Spain installed the first public EVSEs, they did not have a data centre or any intention to perform billing. This caused that the charging process authorization was performed at the EVSE by means of an algorithm that checked if the RFID card was valid or not. The lack of data uniformity and the business model approach differences led to disagreement on EVSE access interoperability.</p> |

| | |
|-------------------------------|---|
| Name of the initiative | Spanish Data Hub |
| Type of the initiative | Private (RECI, FITSA associations) |
| City/Region | Spain |
| Short description | <p>An interoperability platform was proposed to coordinate the operation of EMSPs and to unify the conditions of the provision of services.</p> <p>(http://www.redciudadesinteligentes.es/, http://www.idae.es/)</p> |
| Responsible Partner | FITSA (Technological Institute Foundation for Security in the Automobile) |



| | |
|----------------------------------|--|
| | at a first stage, now IDAE is in charge. RECI (Red Española de Ciudades Inteligentes – Spanish Network of Smart Cities) – Urban Mobility Group |
| Other participants | Spanish Ministry of Industry, Spanish EMSPs, ANFAC, AENOR, AEDIVE |
| Interoperability approach | <p>Creation of platform for data sharing between EMSPs and valid to offer services to end users. In a first step it should be capable of providing real time information about charge authorization: Is the EV user authorized to perform the charging? Which is the EMSP taking the responsibility of service payment behind that EV user?</p> <p>In relation with this, CTN/178 committee of AENOR (Spanish Standardization Organisation) on smart cities, subcommittee 3 (Government and mobility) GT2 (Mobility) is developing a charging point interoperability legislative proposal (coordinated by AEDIVE).</p> <p><u>Current status</u></p> <p>The project scope has been limited.</p> <p>Difficult to reach to commitment between Spanish EMSPs. After a period in which work have been stopped, it seems that now the main objective is to create a CP location map at national level.</p> |

| | |
|----------------------------------|---|
| Name of the initiative | ICT4EVEU (Spain) |
| Type of the initiative | EU project (ICT PSP) |
| City/Region | Spain, Pamplona and Vitoria |
| Short description | <p>The general objective of the ICT4EVEU project, which will run demos in three different locations, is the integration of different management systems operating on the existing EV infrastructures through ICT services.</p> <p>In the Spanish demo, a general management system of EV infrastructures will be developed, assuring mobility in an area of 100 km between the cities of Vitoria and Pamplona.</p> <p>http://www.ict4eveu.eu/</p> |
| Responsible Partner | Navarra Regional Government |
| Other participants | Iberdrola (EMSP), EVE (Energy Agency of the Basque Country) - Ibil (EMSP), Tecnalia (Tech. centre), Zabala innovation Consulting, Ingeteam (EVSE manufacturer), CITEAN (Tech. centre), Pamplona city council, Vitoria city council (through CEA), CEIN (CEEI), Bristol city council, ETREL, Elektro Ljubljana, Elektro Maribor, BIM Mobilitäts Consulting and Engineering, Lades Energie Verein Steiermark |
| Interoperability approach | <p>Development of value added e-energy services for the EV drivers. It includes two different operators in two different regions, connected via a corridor, who will set up a roaming functionality. Charging posts are managed by two different companies but the manufacturer is the same. The systems of different companies will be interconnected to develop services on top of them. Smart phone applications or in-car technologies will be developed to offer the services to the users.</p> <p>Services that will be considered:</p> <ul style="list-style-type: none"> • Monitoring of the location and use status of charging points via specific hardware devices or smart phones (General Management System). • Reservation of charging points. • Integration of payment methods for users and cross-billing services |



| | |
|--|---|
| | <p>among EMSPs.</p> <ul style="list-style-type: none"> • Creation of an interconnected network of charging points accessed by Energy Management Companies. • Creation of specific ICT services for the management of an e-car sharing service (Vitoria). • Standardization of different instruments within the infrastructures of the pilots (charging points, communication standards, charging methods, SW protocols, etc.). • Creation of a tool for international verification of unique identification of charging stations, EVs and EV users. |
|--|---|

| | |
|----------------------------------|--|
| Name of the initiative | VERDE CENIT project |
| Type of the initiative | R&D project supported by the Spanish Government (CENIT programme) |
| City/Region | Spain |
| Short description | <p>The main objective of VERDE project was to research on the Electrical Vehicle (EV) concept as a whole, from the design of its functional parts, such as batteries, converter and electrical drive unit, to the charge infrastructure and network integration issues. A prototype vehicle was built and the principal research conclusions were tested and demonstrated on it. The consortium involved in the project consisted of both big size and SME industrial companies, which subcontracted part of their activities to technological research centres. In total, more than 30 firms took part in VERDE and they were all lead by the vehicle manufacturer company SEAT.</p> <p>(http://www.cenitverde.es/)</p> |
| Responsible Partner | SEAT |
| Other participants | Iberdrola, Siemens, Endesa, REE, Cegasa, Lear, Circutor, Mavilor, Infranor, Técnicas Reunidas, Fico Triad, Cobra, Green Power, Mapro, AIA, Rovalma, CTM, Ascamm, UPC, Aicia, Tecnalia, IIT, Circe, IREC, CSIC, Leitat, Cidetec, UC3 |
| Interoperability approach | <p>The connection between secondary actors and the EVSE/EV user was analysed. A demonstration of the developed concepts was performed at the end of the project. A whole charging process was simulated involving DSOs, EVSEs, and EMSPs. No specific communication standard was adopted, links between systems (EVSE – EV, EVSE – EVSE operator back-end...) were chosen according to the characteristic of the system to make the demonstration work. Web services were used and XML schemes were designed to carry out the message exchange related to energy utilities messages.</p> |

| | |
|-------------------------------|--|
| Name of the initiative | MOVELE Madrid |
| Type of the initiative | Action Plan for the EV development in Spain + private commercial solution |
| City/Region | Spain/Madrid |
| Short description | <p>The Action Plan 2010-2012 was part of the Strategy for the EV promotion in Spain 2010-2014. It consisted of several measures that sought a final objective of 250 000 EVs (PHEV and BEV) in the roads by the end of 2014. In the framework of this project, 3 big cities were selected to carry</p> |



| | |
|----------------------------------|---|
| | out EV pilots, based mainly on the EV and EVSE installation: Madrid, Barcelona and Seville. (http://www.movele.es/ , http://www.movilidadelectricamadrid.es/) |
| Responsible Partner | IDAE (public institute for the diversification of energy sources and energy saving) |
| Other participants | EMT (Madrid Transport Company), ACS, Endesa, Gas Natural Fenosa, Iberdrola, Atos, Tefónica |
| Interoperability approach | According to the Spanish regulation, all charging points should be managed by a Charge Manager ("Gestor de Cargas") who assumes the roles of EVSE operator and EMSP. The EVSEs installed in the first stages of Movele project had no EMSP behind and that is being legalized today. The 24 Movele CPs in Madrid will be managed by two different EVSEs that will have to make them interoperable for all EV users. |

| | |
|----------------------------------|---|
| Name of the initiative | Mugielec |
| Type of the initiative | R&D project supported by the Basque Government (ETORGAI programme) |
| City/Region | Basque Country / Spain |
| Short description | The main aim of the project was to develop all systems and equipment (infrastructure) necessary to optimise the charging of electric vehicles. No real demo was carried out as a whole but the Mugielec interoperability concept was proved on real EVSEs. [8] |
| Responsible Partner | ZIV |
| Other participants | Tecnalía, Aeg, Cementos Leona, Fagor, Gamesa, Iberdrola, Incoesa, Indra, Ingeteam, Ormazabal, Semantic Systems |
| Interoperability approach | The Mugielec concept sought to achieve infrastructure interoperation through the definition of a system architecture, while it tried to stay business-model independent by depicting the functionalities that were required for the successful deployment of an EV charging infrastructure and the associated services. If both receiver and sender complied with normalized communication, the message was sent directly. However, if one of them did not use the normalized message scheme, the message was translated by a gateway device. |

| | |
|-------------------------------|---|
| Name of the initiative | Endesa's pilots on IOP : ZEM2ALL, Green eMotion, Smartcity Malaga |
| Type of the initiative | Private, EU. NEDO International Smart Community Project in the frame of the JSIP (Japan-Spain Innovation Programme) |
| City/Region | Spain, Italy |
| Short description | The information gathered here is related to the most important demos that Endesa/Enel is carrying out in the electromobility field, even if some of them include already market solutions. The interoperability aspects are mainly related to ZEM2ALL (http://www.zem2all.com/en/) and Green eMotion projects (http://www.greenemotion-project.eu/). |



| | |
|----------------------------------|--|
| | <p>Endesa/Enel is operating a commercial ITC platform (EMMs) able to validate access to, monitor and control all AC charging points installed by the company. This platform is a commercial solution already working and is the basis for the development of additional features that are being tested in the demo projects in which the company is currently involved.</p> <p>http://www.endesa.com/es/conoceendesa/lineasnegocio/principalesproyectos/Endesayelvehiculoelectrico</p> |
| Responsible Partner | Endesa/Enel (Enel Group) |
| Other participants | ZEM2ALL: NEDO, Mitsubishi, Hitachi, Sadiel, Telefónica I+D Green eMotion: Siemens |
| Interoperability approach | <p>Within Green eMotion project a market place has been developed by IBM and a Clearing House by SAP. The latter permits to perform roaming and the first a way to market services.</p> <p>Within ZEM2All, a platform designed for the project is able to interact with the EMMs, providing residential charge point monitoring capabilities. This is the reference scheme for this project:</p> <p>www.nedo.go.jp</p> |

| | |
|----------------------------------|---|
| Name of the initiative | LIVE Barcelona |
| Type of the initiative | Municipal |
| City/Region | Barcelona |
| Short description | <p>Live is the platform that is promoting the electric vehicle in the city of Barcelona.</p> <p>http://w41.bcn.cat/en/</p> |
| Responsible Partner | Municipality of Barcelona |
| Other participants | AMB, Ministry of Industry, Energy and Turism, IDAE, ACS, Gas Natural, SEAT |
| Interoperability approach | <p>In the city of Barcelona it is possible to charge at different manufacturer charging points with a common ID card. There is a common system for EV user identification above those of the EVSE operators/networks (Mobec, Endesa, Siemens...).</p> |



| | |
|----------------------------------|---|
| Name of the initiative | TECMUSA project |
| Type of the initiative | National and UE (European Regional Development Fund – ERDF) funding |
| City/Region | Spain |
| Short description | <p>The aim of the project is to achieve urban transport of people and goods to be effective, energy efficient, environmentally friendly and accessible to all users. This will be accomplished by developing, testing and integrating the following aspects into platforms of electric and hybrid vehicles:</p> <ul style="list-style-type: none"> • A set of technologies associated with these vehicles. • Next generation fuels. • Electricity. • Fleet management information and communication systems. <p>Two different vehicle platforms were to be designed, one for heavy duty vehicles (buses) and other for light duty logistic purpose vehicles. On this platforms, the following aspects should be developed: advanced configurations of electric and hybrid powertrains, vehicle and user’s communication and information systems, new materials and energy storage and management devices.</p> <p>In a second phase these systems will be integrated on industrial prototypes to test all technologies involved in the project. (http://www.insia-upm.es/proyecto-tecmusa-24-fi.asp, [2])</p> |
| Responsible Partner | Insia-UPM |
| Other participants | Alsa, EMT, Cemusa, Castrosua, IVECO, Azkar, FCC, Siemens, Boyaca, Seur, Grupoetra, Saft, Citet, Avia Ingeniería, Endesa, 10 research groups within the UPM (Universidad Politécnica de Madrid) |
| Interoperability approach | Not clear in references but vehicle and user’s communication and information systems might be based on well know standards (no additional information has been found). |

| | |
|-------------------------------|--|
| Name of the initiative | Mobi.e |
| Type of the initiative | Public (Portugal’s electric mobility programme) |
| City/Region | Portugal |
| Short description | <p>Portugal’s electric mobility programme MOBI.E (http://www.mobie.pt/) seeks both building a nationwide recharging infrastructure and growing the domestic market for EVs.</p> <p>The Electric Mobility Network is an integrated network linking various stations in Portugal, managed by MOBI.E, which enables EVs to recharge, using a charge card. Its main mission is to contribute to a more sustainable mobility model, promoting the integration of the electric power coming from renewable sources into the functioning (high percentage of the electricity in the Portuguese system comes from renewable sources) and development of cities and maximizing its advantages. The MOBI.E vehicle electrification project includes installing charging stations in 25 municipalities and along main highways in its pilot phase, as well as developing its own 80-km range battery-electric vehicle Mobicar, primarily aimed at the export market.</p> |
| Responsible Partner | Mobi.e |
| Other participants | APVE, Prio.e |



| | |
|----------------------------------|---|
| Interoperability approach | Interoperability is achieved by building a national network with the same charge characteristics and requirements throughout the country. |
|----------------------------------|---|

| | |
|----------------------------------|--|
| Name of the initiative | E-mobility Italy in the context of AEEG/elt Resolution n. 242/10 |
| Type of the initiative | Private owned by Enel. AEEG resolution is a Public initiative to promote the EV business models for public charging. DSO Model : Private infrastructures owned by Enel Distribuzione (ED) + Private infrastructure owned by Hera Distribuzione (HD) http://www.enel.com/en-GB/innovation/smart_grids/electric_vehicles/emobility_italy/ , http://www.e-mobilityitaly.it/ |
| City/Region | e-mobility Italy: Roma, Pisa, hinterland Milano AEEG: Pisa (ED), Genova (ED), Bologna (ED) , Rimini (ED), Ravenna (ED), Forlì (ED), Cesena (ED), Piacenza (ED), Reggio Emilia (ED), Ferrara (ED), Imola (HD), Modena (HD) Bari (ED), Perugia (ED), hinterland Milano (ED) |
| Short description | Demonstration project in partnership with Daimler to test smart grids in real environment with real customers and economically and technically sustainable EV recharging infrastructure. Development of an EV recharging infrastructure with charging stations equipped with smart meter integrated (to allow the certified billing of the energy) and connected to a central system that remotely manages all the charging stations (to authenticate all the customers requesting recharge services and to enable the connection with DSO grid legacy systems, to allow smart charging). After the E-mobility Italy project Enel has deployed its EV recharging infrastructure all across Italy ensuring full compatibility and interoperability. |
| Responsible Partner | e-mobility Italy: Enel and Daimler AEEG: Enel Distribuzione and Hera Distirbuzione |
| Other participants | Municipalities involved in the project and Energy Vendors for dedicated offers to EV customers |
| Interoperability approach | Interoperability is addressed by developing a recharging infrastructure compliant with European standards in order to guarantee the possibility to recharge all the coming EV in the Italian market. Today all the charging stations installed in the Enel Distribuzione and Hera Distribuzione grid can be used by customer that can choose its preferred Energy Trader. |

| | |
|-------------------------------|---|
| Name of the initiative | Mi Nuovo Elettrico |
| Type of the initiative | Public, Regional level, in cooperation with all the Energy Providers |
| City/Region | Emilia-Romagna Region (RER) |
| Short description | Electric mobility development at regional level. For the development of the interoperable infrastructure, it has been considered that cities in RER are between 40-50 km. The charging network can be accessed with the regional encompassing mobility card <i>Mi Nuovo</i> . Thanks to this project people can drive all around the region regardless of the energy providers. Other polices |



| | |
|----------------------------------|---|
| | <p>include Low Traffic Zones (LTZ) facilitations (free park and free access to the LTZ).</p> <p>The location of infrastructure is decided by the municipality based on an electric mobility plan. The energy providers pay for the infrastructures. This project is related to the E-mobility project above.</p> <p>(http://mobilita.regione.emilia-romagna.it/mobilita-elettrica)</p> |
| Responsible Partner | Emilia-Romagna Region |
| Other participants | <p>Municipality of: Bologna, Cesena, Faenza, Ferrara, Forli, Formigine, Imola, Modena, Parma, Piacenza, Ravenna, Reggio Emilia, Rimini.</p> <p>Energy providers: ENEL, HERA, AMD-IREN</p> |
| Interoperability approach | <p>Interoperability between the energy providers and with all kind of public transport services.</p> <p>At the start of the project RER decided to push all the energy providers to reach an agreement for develop an interoperable charging network. Today, all the energy providers use the same technology that is interoperable with the regional mobility card <i>Mi Muovo</i> that allows to use in all region the bus, train, bike sharing, car sharing and, after 2014 summer, the charging points.</p> |

| | |
|----------------------------------|---|
| Name of the initiative | E-moving |
| Type of the initiative | National and Private |
| City/Region | Brescia and Milano (Lombardia) |
| Short description | <p>The original aim of the project was to set a complete charging system in the urban areas of Brescia and Milan to test charging infrastructure, EVs and their deployment.</p> <p>The first part of the pilot test took place from Dec 2011 to the end of 2012. Data is still being collected from private users of public and private infrastructures mainly from the 50 public poles.</p> <p>E-moving was rated as first in the list of the pilot projects admitted by AEEG to the national test on Charging System for EV through the Delib. 242/10.</p> <p>(http://www.e-moving.it/home/cms/emv/)</p> |
| Responsible Partner | A2A SpA |
| Other participants | For the first part of the project: Renault, Municipalities of Brescia and Milano and several private companies that hired the EV and Poles |
| Interoperability approach | <p>Interoperability is possible and flexible is improved in collaboration with ENEL and Repower.</p> <p>At the present, A2A CPs use the same kind of plug and EVSEOs are working together on a white paper for the definition of a common standard of card and on the protocol and services to exchange data over the respective data centre (authorization and charging information).</p> <p>In Italy the constraints defined by AEEG (Delib 242/10) must be respected. In particular all CPs must be open to any service provider with its own electricity vendor according to the open market.</p> |



| | |
|----------------------------------|---|
| Name of the initiative | L'HERA della mobilità elettrica |
| Type of the initiative | Private |
| City/Region | Italy |
| Short description | <p>The project involves different Italian DSOs. The main goal of the project is the development of a supervising system for CPs installed all over Italy. Through this system, each CP can be located on a map, its status (free/occupied) and the available type of plugs (Scame/Mennekes). Users can retrieve information on a website or through an app for smartphone.</p> <p>(http://eng.gruppohera.it/group/business_activities/business_energy/era_electric_mobility/)</p> |
| Responsible Partner | HERA (multi utility), ENEL (DSO) |
| Other participants | |
| Interoperability approach | Communications among charging points, independently from the EVSE which manages them, and a central control centre. |

| | |
|-------------------------------|---|
| Name of the initiative | EDISON project |
| Type of the initiative | National funding (Energinet.dk) |
| City/Region | Bornholm island and Roskilde |
| Short description | <p>The project goals were:</p> <ul style="list-style-type: none">• To develop system solutions and technologies for Electric vehicles (EVs) and Plug-in hybrid vehicles (PHEVs) which enable a sustainable, economic and reliable energy system where the properties of EVs are utilised in a power system with substantial fluctuating renewable energy.• To prepare and provide a technical platform for Danish demonstrations of EVs with emphasis on the power system integration aspects.• To develop standard system solutions for EVs, which are applicable globally, by utilising the Danish leading knowledge within distributed energy resources and operation of energy systems with high wind power penetration, and thereby, release the potential for Danish export of technology, system solutions, and knowledge. |



| | |
|----------------------------------|--|
| | <p>EDISON used a centralised design where an aggregator (EDISON fleet operator), based on the virtual power plant concept, would communicate with the EVs and modify their charging behaviour and interface them with the Nordic power and energy markets. The main emphasis was on charging according to day-ahead spot prices but the project also briefly touched upon ancillary services provided to the TSO. http://www.edison-net.dk/</p> |
| Responsible Partner | Dansk Energi |
| Other participants | DONG, DTU, EURISCO, IBM, Østkraft, Siemens |
| Interoperability approach | <p>Charging interoperability by having several OEM vehicles charge from a project-built prototype EVSE using IEC 61851.</p> <p>Communication interoperability was explored using IEC 61850 for EV communication. The data model was extended so the EVs could be described. Also, it was shown how the standard could be mapped to REST web services to increase interoperability.</p> |

| | |
|-------------------------------|--|
| Name of the initiative | NIKOLA project |
| Type of the initiative | Danish national funding (Energinet.dk) |
| City/Region | Roskilde and Lyngby |
| Short description | <p>Nikola is a demonstration project focused on the synergies between EVs and the power system. The project systematically and thoroughly investigates the services that will make the EV an attractive asset for the end users and an active resource to the power system.</p> <p>The services Nikola explores are divided into three categories: system wide services, which will grant the highest benefits for society and electricity grid; distribution grid services for mitigating adverse effects of distributed energy resources; and user value-added services that will help inform and empower the EV user. Moreover, the project addresses the need for testing and validating enabling technologies that will be used across different countries and vendors for bringing the mentioned services into reality in different market places.</p> <p>Service concepts will be validated through simulation platforms, in distribution grids and using the state-of-the-art facilities at DTU,</p> |



| | |
|----------------------------------|--|
| | <p>PowerLabDK and NEVIC centre.</p> <p>(http://www.nikola.droppages.com/)</p> |
| Responsible Partner | DTU for distribution services and user added services, NUVVE for system wide services, EURISCO for enabling technologies and standards |
| Other participants | SEAS-NVE |
| Interoperability approach | Integration of EVs into energy grid with special focus on communication interoperability. |

| | |
|----------------------------------|--|
| Name of the initiative | e-laad |
| Type of the initiative | National/Regional |
| City/Region | Netherlands (placement and maintenance of chargers)/Europe (founding member of the Open Charge Alliance and initiator of OCPP) |
| Short description | The e-laad (http://www.e-laad.nl/) foundation's main activity is to place and maintain public chargers for electrical vehicles. Already 2897 public chargers were placed through e-laad at the moment of writing. In addition to this, e-laad also has been (and still is) playing an important role in facilitating the required EVSE backoffice infrastructure interoperability. Recently the e-laad foundation has been split up into ElaadNL and EVnetNL. ElaadNL is to be considered as a Dutch knowledge and innovation centre in charging infrastructures and responsible for the coordination of EVSE grid connections, thereby representing Dutch grid operators. EVnetNL will manage the network of installed public chargers. |
| Responsible Partner | Liander, Enexis, Edinet, Cogas, Rendo, Westland Infra, Delta netwerkbedrijf |
| Other participants | Alfen ICU, Chargepoint, EV-Box, Mennekes, Hollander Techniek, The New Motion, several lease companies and several EV OEMs... |
| Interoperability approach | Interoperability between the EVSEs from the mentioned participating EVSE manufacturers and the EVs (sold in the Netherlands) is implicitly addressed by e-laad since e-laad is part of the customer support chain. As a consequence, e-laad has a clear view on the interoperability issues between EVs and EVSEs (in the Netherlands). Issues in this area are resolved by both the (partnering) EVSE manufacturers as well as the EV manufacturers (sometimes even in a shared effort). Next to this also the interoperability between EVSEs and backoffice has been explicitly addressed by e-laad and |



| | |
|--|---|
| | <p>major improvements have been achieved in this area.</p> <p>Although there are many public EVSE service providers (each with their own ID cards) in Holland (i.e.: The New Motion, EV-Box, ANWB, ecoGO, Essent, TravelCard, GreenFlux, Eneco, Radiuz, Nuon, Movenience, Flow and MisterGreen), it is possible to use each of those cards on any public charger in the Netherlands;</p> <p>All of the partnering EVSE manufacturers (in fact a whole lot more) support the OCPP and are therefore compatible from a EVSE operator's perspective.</p> <p>Next to placing and maintaining public chargers, the e-laad foundation was and still is actively involved in the definition of (open) EVSE-backoffice protocols (such as OCPP and OSCP).</p> |
|--|---|

| | |
|----------------------------------|--|
| Name of the initiative | Power Up |
| Type of the initiative | EU (STREP) |
| City/Region | EU |
| Short description | <p>PowerUp made progress through a full development cycle of physical and link-layer ISO/IEC 15118 interface specification, protocol design for scheduling of recharging and for accounting control, prototype implementation, conformance testing, integrated field trials, and standardization.</p> <p>It was not a demo project but it had some prototype development and its approach is interesting for COTEVOS.</p> <p>(http://www.power-up.org/)</p> |
| Responsible Partner | BroadBit |
| Other participants | Corinex, CRF, Denso, ETSI, Itron, Technolution, Volvo, PPC / Systema |
| Interoperability approach | Conformance Testing of V2G (ISO 15118-2) |

| | |
|----------------------------------|--|
| Name of the initiative | e-Gap |
| Type of the initiative | National |
| City/Region | Germany (Garmisch-Partenkirchen, Bayern) |
| Short description | <p>The town of Garmisch-Partenkirchen in Bayern has been selected to carry out an electromobility programme in order to research on new mobility concepts.</p> <p>Within the research project a community electromobility model, a holistic mobility concept, is developed. Its aim is to solve through simulation future mobility challenges and tests the innovative technologies that will achieve that goal based on their functionality, effectiveness and user acceptance.</p> <p>Several services are offered dealing with: smart charging, e-car sharing...</p> <p>http://www.e-gap.de</p> |
| Responsible Partner | Fraunhofer IAO |
| Other participants | Audi, BMW, TU München, GE, DB Bahn, Continental, Leber... |
| Interoperability approach | <p>Load management (smart charging).</p> <p>EV driver gets information about available charging spots.</p> |



| | |
|------------------------|--|
| Name of the initiative | 4-S |
| Type of the initiative | National |
| City/Region | Berlin, Erlangen, München |
| Short description | <p>The goal of the “4-Sustainelectromobility” (4-S) project is to find out how electric vehicles can be integrated into everyday traffic, and which challenges still remain.</p> <p>The 4-S project addresses the components of future electric mobility scenarios. The 100 vehicles in the project will be put on the road gradually, and each new project phase will involve the addition of new technical components.</p> <p>Power Grid Management, Charging Station Management, Fleet management.</p> <p>http://www.siemens.com/innovation/apps/pof_microsite/_pof-spring-2011/html_en/electric-vehicles.html</p> |



| | |
|----------------------------------|---|
| | |
| Responsible Partner | Siemens AG |
| Other participants | |
| Interoperability approach | Smart Charging, Load management, e-Car-sharing-Management |

| | |
|----------------------------------|--|
| Name of the initiative | eNterop |
| Type of the initiative | National (Germany) |
| City/Region | Germany |
| Short description | V2G conformance Test System (http://www.siemens.com/innovation/en/news/2013/e_inno_1303_1.htm) |
| Responsible Partner | Siemens |
| Other participants | BMW, Mercedes, VW, Siemens, RWE, TUD, Fraunhofer |
| Interoperability approach | Conformance Testing of V2G (ISO 15118-2) |

| | |
|-------------------------------|--|
| Name of the initiative | ICT4EVEU EU project (Slovenia) |
| Type of the initiative | European |
| City/Region | Ljubljana-Maribor (Slovenia) with observers from Austria. |
| Short description | <p>The Ljubljana-Maribor pilot deals with development of services on top of the present charging infrastructure already developed in these cities. The pilot will check the present ICT charging infrastructure solutions in different regions and try to identify present capabilities for data collection, compare them, and suggest changes in order to develop the state-of-the-art ICT system capable of safe, reliable, and fast data exchange needed for roaming and billing purposes. An important output will be a standardised set of data, protocol for data-exchange and the semantic definition of a charging station, an EV and an EV user/owner.</p> <p>(http://www.ict4eveu.eu/)</p> |
| Responsible Partner | Etrell |
| Other participants | Elektro Ljubljana, Elektro Ljubljana OVE, Elektro Maribor, others outside Slovenian pilot. |

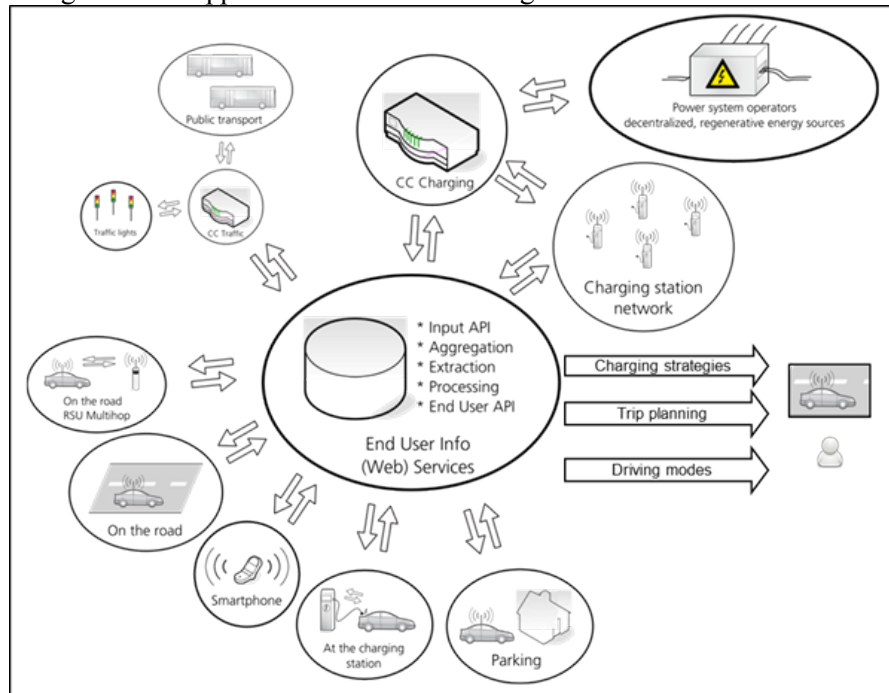


| | |
|----------------------------------|--|
| Interoperability approach | <p>A prototype bilateral roaming system between two electromobility service providers in Slovenia (Elektro Maribor and Elektro Ljubljana). On a demonstration level, also the roaming connectivity was established between the two mentioned service providers in Slovenia and one service provider in Spain (Iberdrola).</p> <p>Harmonisation (on at least European level) of EV user ID structure, EVSE ID structure and of messages exchanged between EVSEOs, EMSPs and EMCH.</p> <p>Potential IOP aspects: roaming, user services, EVSE access, EV user identification, EVSE management.</p> |
|----------------------------------|--|

| | |
|----------------------------------|--|
| Name of the initiative | MOBINCITY - SMART MOBILITY IN SMART CITY |
| Type of the initiative | European |
| City/Region | Ljubljana (interaction of EV with transport and energy infrastructure); Italy (interaction of EV with energy infrastructure). |
| Short description | <p><u>Pilot Ljubljana: Interaction of EV with transport infrastructure</u> A system is to be implemented able to receive information from the surrounding environment, which can have influence in the vehicle performance (traffic information, weather and road conditions, parking booking and vehicle sharing systems, energy grid and charging infrastructure). The core of the system (Proactive Intelligent Information System - PIIS) will optimise the trip planning and routing of EVs based on information acquired from the EV via Master Interaction Aggregator (MIA installed in the EV) as well as from external actors via the Smart transport Middleware (STM). The Master Interaction Aggregator (MIA) will acquire the data from the EV (related to EV performance and battery state) and from the EV user (via On-board Information System – OIS). The field tests (demo pilots) are scheduled to be performed in the second half of 2014.</p> <p><u>Pilots Ljubljana and Italy: interaction of EV with energy infrastructure.</u> The pilot deals with integration of charging infrastructure (EVSE, EVSE back-end, end-user information services related to EV charging) with grid actors (DSO, DER Operator, Retailer) and will be focused on integration of EV users' needs in control strategies of charging infrastructure. In addition, the functionalities of ICT infrastructure will be enhanced with capability to support the EV user's needs also during the process of trip planning by providing information from charging infrastructure to the system (PIIS) which deals with trip planning.</p> <p><u>Demonstration:</u> implementation of an ICT tool for planning the development of charging infrastructure (CIPT – Charging Infrastructure Planning Tool) (http://www.mobincity.eu/)</p> |
| Responsible Partner | ITE for planning the development of charging infrastructure; ETREL for interaction with energy infrastructure; ETRA and CIT for interaction with transport infrastructure; Fraunhofer Institute for Communication Systems; Oprema Ravne for system integration; Elektro Ljubljana and ENEL for field tests. |
| Other participants | EIHP, Hrvatski Telekom, Technomar, CRAT. |
| Interoperability approach | Bringing together energy grid, transport infrastructure, and EV with ICT and have all relevant data available to EV drivers through a single entry point (information aggregator): Proactive Intelligent Information System |

(PIIS).

Integration of data on public transport, charging infrastructure, grid, etc. in a single mobile app for EV drivers. See image below:



Possible IOP aspects: EV charging load management, user services, EVSE access, EVSE management, smart grid, traffic & weather information.

| | |
|----------------------------------|--|
| Name of the initiative | ETREL Electromobility Roaming System |
| Type of the initiative | National |
| City/Region | Slovenia |
| Short description | <p>Some of the largest Slovenian electromobility service providers have agreed to cooperate and connect their EVSE control centres within a common platform – the Global Service Provider (GSP) system, developed by Etreel. As a result, all EV users who have a contract with any of the participating service providers can charge their electric car on all charging stations controlled by any of the service provider that is included in the GSP system, allowing them to use the charging infrastructure throughout the country with a single contract and a single means of identification (RFID card or smart phone). The characteristics (location, address, type of socket, max. power ...) and current status (free, occupied, out of service, reserved) of all EVSE controlled by the EVSEs which join the scheme are presented on a single portal for EV users which allows also the reservation of charging spots.</p> <p>[19] http://www.siol.net/avtomoto/zanimivosti/tehnika/2014/05/etrel_napredna_polnilna_storitev_gostovanje.aspx, http://polni.si/, in Slovenian language)</p> |
| Responsible Partner | Etreel |
| Other participants | DEM, Elektro Maribor, Elektro Ljubljana and potentially any other charging station operator or electromobility service provider. |
| Interoperability approach | EV users can charge on all EVSE controlled by any of the service providers that are a part of the roaming system (joined under the umbrella of the |



| | |
|--|--|
| | Global Service Provider) with a single contract and ID card. IOP aspects: roaming, user services, EVSE access, EVSE management. |
|--|--|

| | |
|----------------------------------|--|
| Name of the initiative | ICT4EVEU (UK) |
| Type of the initiative | European |
| City/Region | Bristol (UK) |
| Short description | The main scope of this pilot is the integration of commuters in the urban area. The key elements of the pilot are the development of a general management system (GMS) for management of charging points and billing, including software communications to interact with proprietary software provided by hardware suppliers, and making the public part of the GMS available to the public and accessible with smart mobile phones. (http://www.ict4eveu.eu/) |
| Responsible Partner | Bristol City Council |
| Other participants | Charge Your Car, Source West |
| Interoperability approach | Connection of all public charging infrastructure in the council area into one management system (allowing also for payments and other services), charging applications and payment for smartphones. Potential IOP aspects: roaming, user services, EVSE access, EVSE management. |

| | |
|-------------------------------|---|
| Name of the initiative | smartCEM – Smart Connected Electro Mobility |
| Type of the initiative | European (CIP ICT PSP 1.3) |
| City/Region | Newcastle (among others) |
| Short description | SmartCEM is a demonstration project with four scale pilots in Barcelona, Gipuzkoa, Newcastle and Turin aiming to raise the potential for EV in urban and interurban contexts. Five complementary services will be developed and tested: <ul style="list-style-type: none"> • EV-navigation: it starts from eco-navigation and integrates EV-related Point of Interest (POIs), like charging points and stations. • EV-efficiency driving: it is intended to support energy efficient driving styles. • EV-trip management: it starts from existing multi-modal journey planning systems and provides a new management system that includes EV-sharing as a transport option. • EV-charging station management: it includes station operation, station energy management, power supply status, range estimator, charging point booking, payment and scheduling. • EV-sharing management: it starts from existing on-line and off-line systems for vehicles. The Transport Operations Research Group at Newcastle University coordinates the operation of all four pilot sites and is responsible for managing the Newcastle site. SmartCEM's key objectives are to: <ul style="list-style-type: none"> • Prove that user acceptance of EVs can be increased by at least 15% thanks to the piloted services. |



| | |
|----------------------------------|--|
| | <ul style="list-style-type: none"> • Evaluate to what extent transport efficiency can be optimised. • Develop tools for assessment and evaluation of the impact electromobility has on CO2 emissions. • Identify deployment opportunities, barriers and solutions. • Support pan-European interoperability. • Support integration of new schemes and development of business models. • Increase adoption of electromobility in all types of road transport. <p>(http://www.smartcem-project.eu/)</p> |
| Responsible Partner | Fernando Zubillaga Elorza Asociación Clúster de Movilidad y Logística de Euskadi (Spain); E-mail: fzubillaga@mlcluster.com ; Tel: +34 677326587 |
| Other participants | ERTICO — ITS Europe (Belgium); Ajuntament de Barcelona; Gipuzkoako Foru Aldundia; Ayuntamiento de Donostia-San Sebastián; Citta di Torino; Pluservice srl; University of Newcastle; Deutsches Zentrum für Luft- und Raumfahrt; Fédération Internationale de l'Automobile; Centro Recherche FIAT SCPA; Tecnalía; TeamNet International S. A.; IDIADA Automotive Technology S.A; Ennera Energy and Mobility S. L.; Compañía del Tranvía de San Sebastián; NEC Europe Ltd; Gre cav Auto Srl; Energy Resources SpA; Bosch GmbH; Gateshead College; Creafutur; ICOOR; AVID; Affiliated Computer Services B. V.; PTV; Fomento de San Sebastián; Università degli Studi di Modena e Reggio Emilia; Reial Automòbil Club de Catalunya; Automòbil Club Assistència, S.AU. |
| Interoperability approach | Support pan-European interoperability by standardisation between operations performed by different services and facilitating the interoperability between different systems and vehicles. Implementation of eco-driving driver interface of smartCEM into EVs in the pilot, allowing the services provided in smartCEM to be tested and evaluated on a sizable fleet of electric vehicles which are at an advanced level of technological maturity. |

| | |
|----------------------------------|---|
| Name of the initiative | PI-P: Plugged-In Places |
| Type of the initiative | National, Regional |
| City/Region | East of England, Greater Manchester, London, Midlands, Milton Keynes, North east England, Northern Ireland, Scotland. |
| Short description | The Government supports 8 UK regions to install a large network of charging points (>4000 charging points in 2013, most of them publicly accessible). (https://www.gov.uk/government/publications/plugged-in-places) |
| Responsible Partner | UK Government + local authorities |
| Other participants | Outside of PI-P, other councils and private providers are also installing charging points. |
| Interoperability approach | The different regions (Plugged in Places) are not yet as interoperable as they will become (eventually be compatible with one another). All charging points in the country (including of course those in PiP regions) are visible on the Zap Map which is developed by Next Green Car and backed by the UK government. Advisable to follow the projects' progress to see if they move towards |



| | |
|--|---|
| | nation-wide interoperability; meaning that an EV user can use all infrastructure, possibly with only one contract and a single means of identification. Otherwise not really focused on interoperability at the moment. |
|--|---|

| | |
|----------------------------------|---|
| Name of the initiative | BEAMA’s Electric Vehicle Infrastructure Project (BEVIP) |
| Type of the initiative | Private – a consortium of companies |
| City/Region | UK |
| Short description | BEAMA (British Electrotechnical and Allied Manufacturers' Association) is the independent expert knowledge base and forum for the electrotechnical industry for the UK and across Europe. BEAMA recognises the market potential for the electrotechnical industry, in the development of a robust and interoperable infrastructure to support a mass market of EVs, a reason why BEAMA and their members saw the need to establish BEVIP. BEVIP was founded to accompany the rapid development of the electric vehicle market in the last years on the side of the grid infrastructure, metering and other technologies. BEVIP sees the integration and interoperability of public and private charging assets within the built environment to be of key importance. (http://www.beama.org.uk/en/other-associations/electric-vehicle-infrastructure-project/) |
| Responsible Partner | Group of BEAMA members: Alstom, Cooper Bussmann (UK) Ltd, Eaton, MK Electric, Schneider Electric Ltd, Secure Meters (UK) Ltd, Siemens. |
| Other participants | |
| Interoperability approach | Integration and interoperability of electric vehicle infrastructure with other mandated smart technologies and the functionality for demand response and smart charging. Close cross sector engagement with BEAMA Smart Grid Task Force. Actively participating in the development of a Code of Practice for the installation of domestic, commercial and public electric vehicle charging infrastructure in the UK. Of special interest may be the activities on the side of the grid – demand response, smart charging + smart metering, etc. |

| | |
|-------------------------------|--|
| Name of the initiative | MOLECULES - Mobility Based On Electric Connected Vehicles In Urban And Interurban Smart, Clean Environments |
| Type of the initiative | FP7 EU project |
| City/Region | Europe (Berlin, Barcelona, Grand Paris) |
| Short description | MOLECULES is a demonstration project with three large scale pilots in Barcelona, Berlin and Grand Paris aiming to use ICT services to help achieve a consistent, integrated uptake of Smart Connected Electromobility (SCE) in the overall framework of an integrated, environmentally friendly, sustainable mobility system. The project will include multiple types of EVs, exploit synergies with ongoing initiatives, build on/liaise with relevant stakeholders and emerging standards. The ICT service categories to be tested in MOLECULES are: <ul style="list-style-type: none"> • Personal trip planning. • Electric Vehicle sharing/pooling. • Personal recharging advisor. |



| | |
|----------------------------------|---|
| | <ul style="list-style-type: none"> • Personal carbon footprint advisor. • Electro-mobility billing support. • Incentives to electro-mobility. • Network strategies. <p>(http://www.molecules-project.eu/)</p> |
| Responsible Partner | ETRA Investigación y Desarrollo, S.A. (Coordinator: Antonio Marqués, address: Tres Forques, 147 46014 Valencia, Spain, e-mail: amarques.etra-id@grupoetra.com) |
| Other participants | Barcelona Digital, Mopeasy S&E, Senatsverwaltung Fur Stadtentwicklung, Deutsches Zentrum Für Luft - Und Raumfahrt Ev, Polis, Ajuntament De Barcelon, Going Green, Collect Car Bv, Vmz Berlin Betreibergesellschaft Mb |
| Interoperability approach | <p>MOLECULES will adopt an implementation approach which specifies a number of ICT services categories which should set a common "high level language" for the three pilots-sites (in Barcelona, Berlin and Grand Paris) including stakeholders involved, input/output data, etc. MOLECULES services won't be limited to specific types of EVs (demonstration refers to e-motorbikes, PHEV, fully EVs, electric vans, etc.). The main goals are:</p> <ul style="list-style-type: none"> • Integration of EVs in the overall mobility systems, including ITS infrastructure. • ICT services implementation. • Integration/interoperability of Smart Connected Electromobility (SCE) with: <ul style="list-style-type: none"> ○ Multiple electricity suppliers & associated grid infrastructure. ○ Other transport modes & associated ITS infrastructure. • Support and contribution to standards, use of open architecture - MOLECULES will follow the relevant ITS, GRID and ICT standards (e.g. ISO/IEC 15118), and report its results into national and international electromobility and standardization bodies (e.g. CENELEC). |

| | |
|-------------------------------|---|
| Name of the initiative | ESB's pilots on IOP: Mobi.e Ireland, ESB winter trials, Green eMotion |
| Type of the initiative | Private (ESB, Intel, SAP) |
| City/Region | Ireland |
| Short description | <p>Ireland has committed to 10% of all road energy to be from renewable sources by 2020 and 10% of the country national fleet to be electric by 2020 (ca. 250 000 vehicles).</p> <p>ESB is rolling a trial to test charging points, IT systems and grid impact, including benefits evaluation.</p> <p>ESB Winter Trials: 10% of the residents in a residential area will use an EV and the impact of charging, both with and without control will be analysed. Home and workplace EV chargers are controlled via HEMS (Home Energy Management System) offering energy cost savings to the customer and allowing greater use of sustainable energy while charging the EV.</p> <p>(http://www.esb.ie/electric-cars/index.jsp)</p> |
| Responsible Partner | ESB |
| Other participants | EPRI Smart Grids, Northern Ireland Plugged-in-Places, Green eMotion, Enevate, Mobi.Europe, Finseny & Finesce, TEN-T, Treaty of Vaals |



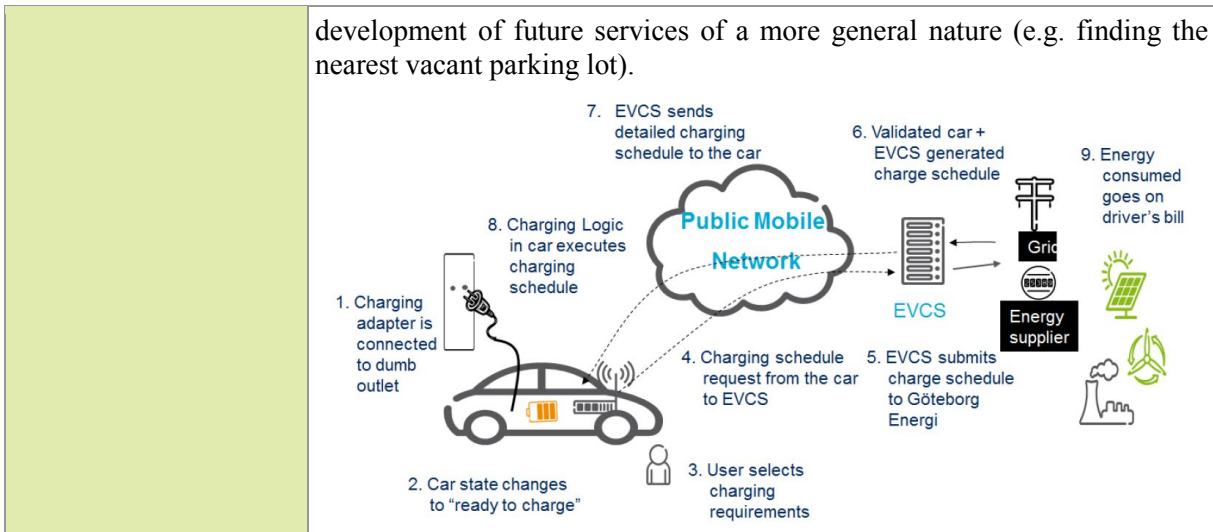
| | |
|----------------------------------|--|
| | (international roaming) ESB Winter Trials: Intel, SAP |
| Interoperability approach | <p>ESB is currently developing the supporting payment and IT systems for the Irish charge point network. When the IT and payment system is up and running EV users will have access to an online account which will enable drivers to pay for public charging. Through this account, they will be able to choose an energy supplier, pre-pay using a debit or credit card and check their current balance. The system will be able to recall users' normal charging pattern and let them know, via mobile phone, when they need to top-up. Users will be able to see the best current online electricity tariff and change energy supplier at any time with no penalty.</p> <p><i>ESB Winter Trials:</i> The HEMS generates a charging profile to optimise the charge pattern of the vehicle to best utilise renewable energy and lower electricity prices for the customer. The HEMS should get data from the network (renewable generation), traffic situation, weather, EV user requirements, electricity contract prices and EV requirements in order to calculate the charging schedule.</p> <p>Cross-border roaming between Dublin and Belfast is the scope of Mobi Europe project in the Irish trial.</p> |

| | |
|-------------------------------|---|
| Name of the initiative | CROME: CROss-border Mobility for EVs |
| Type of the initiative | National (both German and French support) |
| City/Region | France (Alsace – Strasbourg - and Moselle) and Germany (Karlsruhe, Baden-Baden, Freiburg, Stuttgart) |
| Short description | <p>The project CROME is one of the first cross-border field tests among the meanwhile several electric mobility projects in Europe. The main aim of the project, whose funding is performed since 2011 by different Ministries on both sides of the boundary, is to create and test a safe, seamless, user-friendly and reliable mobility with electric vehicles between France and Germany.</p> <p>The diagram illustrates the CROME project architecture, divided into two main layers: Hardware Interoperability and Service Interoperability. The Hardware Interoperability layer shows 'French & German electric vehicles' connected to a 'Public charging station or place with type-2 & type-3 plug'. A blue arrow indicates that 'Every EV can connect to a charging spot'. The Service Interoperability layer is titled '*Information Communication Technology' and features 'Existing ICT* Service Platforms' including EDF, EnBW, BOSCH, and Partners. These platforms provide services such as Access / Authentication, Charging, Billing / roaming, Smart functionalities, and Operation. A 'Roaming Service Layer' at the bottom facilitates 'connector / data exchange' between the platforms. A green arrow indicates that 'Every user can authenticate and control the charging process of its EV'.</p> <p>(http://crome-project.eu/)</p> |
| Responsible Partner | Bosch, Daimler, EDF, EnBW, KIT, Porche, PSA, Renault, Siemens, Schneider electric |
| Other participants | Region Alsace, Strasbourg, EIFER, E-Werk mittel-baden, IFSTTAR, |



| | |
|----------------------------------|--|
| | Toyota, Dept. Moselle, Star EnergieWerke Rastatt, Stadtwerke baden-baden, Stadwerke Karlsruhe, VDA, Nissan |
| Interoperability approach | Cross-border EVSE access. It demonstrates an interoperable easy-to-use charging infrastructure (plug, cable, etc.) and customer oriented services (authentication, billing, roaming, reservation, etc.) |

| | |
|----------------------------------|---|
| Name of the initiative | ELVIIS (Electrical Vehicle Intelligent Infrastructure) |
| Type of the initiative | Regional |
| City/Region | Sweden |
| Short description | <p>The overall vision of the ELVIIS-program is to contribute to a mass-adoption of electric vehicles by making it simpler to use and own an electric vehicle, and it is realized by developing and demonstrating an open ICT platform (including e.g. telematic devices, computing devices, displays, etc.) that enables the development of future new services, with a special focus on services for electric vehicles. A schematic illustration of the information system can be seen here:</p> <p>Figure 1: Schematic picture of an open information platform for an intelligent electric vehicle infrastructure. [8] (https://www.viktoria.se/projects/elviis)</p> |
| Responsible Partner | Viktoria Swedish ICT |
| Other participants | Ericsson, Göteborg Energi and Volvo Cars are the project participants. The project is funded by Region Västra Götaland, Göteborg Energi Foundation for Research and Development |
| Interoperability approach | The solution uses the mobile telecom network to coordinate the charging of cars, which increases the efficiency of the grid. The driver decides how and when to charge the car. The information is sent over the mobile network to a system that determines the best time for charging, based on the lowest cost and current demand on the grid. After that, the driver's bill is charged, no matter which power outlet is used. At present, the driver needs to enter a specific power outlet ID, but eventually, it will be possible to use the car's satellite navigation device to identify nearby outlets. Much of the platform work done within the program's framework is generic and not only applicable for electrified vehicles, but all types of vehicles. There are some services that are specific to electric vehicles, but the work platform enables |



| | |
|------------------------|---|
| Name of the initiative | Finseny |
| Type of the initiative | EU project (FP7) |
| City/Region | EU |
| Short description | <p>Using the Future Internet and FI-Ware platform*, Finseny will demonstrate the control of vehicle charging to react to grid fluctuations and disturbances. It will work within notional service quality contracts and assess the factors of Demand Side Management (DSM) including speed and amplitude of responses as well as the impact on the grid. Furthermore the project will model the scalability of DSM control along with response times and evaluate the cost benefit of increased integration. The project will assess a range of technology options for implementation and report on the effectiveness of each. (http://www.fi-ppp-finseny.eu/)</p> <p>FINSENY High Level Architecture</p> <p>source:[20]</p> <p>*FI-WARE is an innovative, open cloud-based infrastructure for cost-effective creation and delivery of Future Internet applications and services. FI-WARE API specifications are public and royalty-free, driven by the development of an open source reference implementation which accelerates the availability of commercial products and services based on FI-WARE</p> |



| | |
|----------------------------------|--|
| | technologies (http://www.fi-ware.org/). |
| Responsible Partner | Nokia Siemens Networks (Germany) |
| Other participants | Siemens, ABB, Acciona, Alcatel, Atos, BAUM, EDF, ESB, EON... (http://www.fi-ppp-finseny.eu/consortium/) |
| Interoperability approach | <p>Within the Finseny Project, the area of DSM has been considered. As part of a Phase 2 proposal the partners will demonstrate the use of the FI-ware Generic Enablers (GE's) and Domain Specific Enablers (DSE's) in the implementation of a DSM control system. The project will evaluate Fibre networks and 4G technologies in the control of charge, as well as considering the impact on the electrical system. While the infrastructure and trial vehicles will be located in Ireland, analysis and modelling will take place at Rwth, Aachen University.</p> <p>Trials expected but not certain if they have been completed (no information or mention in the web site).</p> |

| | |
|----------------------------------|---|
| Name of the initiative | Görlitz e-mobility smart charging solution |
| Type of the initiative | Private |
| City/Region | Koblenz, Germany |
| Short description | <p>The main scope of GÖRLITZ' Smart Charging Solution for electrical vehicles is to enable the existing electrical infrastructure to cope with EVs in a mass market also including an accounting and billing concept which allows fair cost allocation for generation and consumption of electrical mobility energy.</p> <p>The basic idea is to enable the already existing infrastructure to cope with the wide use of electric vehicles. Each standard socket may become a private or even public charging spot for electric vehicles which will be billed according to its usage correctly.</p> <p>[8]</p> |
| Responsible Partner | Görlitz AG |
| Other participants | |
| Interoperability approach | <p>It is necessary to enable the socket to identify itself and to communicate with the electric vehicle, e. g. via the charging cable by adding a simple communication (e. g. PLC) and identification module to the socket itself.</p> <p>The owner of the identifiable standard socket registers his EV charging socket at a clearing house. The owners of electric vehicles also register themselves and their vehicles at the same clearing house.</p> <p>The electric vehicles will have an on-board meter and, if not already integrated into the vehicle itself by default, a communication device like a GPRS/UMTS/LTE modem.</p> <p>After plugging the EV into the socket and a successful handshake for the communication, the PLC chip of the socket sends its unique ID to the car. The car adds his own unique ID and forwards this set of data including some other technical information to the clearing house asking for validation and approval. If everything is fine, the owner of the car receives an offer for charging his vehicle which may be accepted e.g. by pressing a button, initiates the loading process and closes the loading contract for this action. After the charging process is completed (or interrupted by failure or accident) the amount of consumed energy measured by the on-board meter of the car will be transmitted to the clearing house. This generates the</p> |



| | |
|--|--|
| | <p>delivery receipt for the energy consumed by the EV. The owner of the EV then receives a notification that the loading process is completed incl. the total cost.</p> <p>The Smart Charging Solution of GÖRLITZ has already been implemented successfully in pilot a project with a major German car manufacturer. Additional details not available.</p> |
|--|--|

| | |
|----------------------------------|---|
| Name of the initiative | Intellicharge |
| Type of the initiative | Private (?) |
| City/Region | France |
| Short description | <p>Intellicharge by ERDF is a series of projects which share a common logic for smart charging in relation with technical and economic aspects of distribution system.</p> <p>The scope of the first project is to design ERDF fleet management including a high rate of EV, and develop smart charging within its parking buildings. This comes with the purchase of about 2000 EV, to be delivered until 2015.</p> <p>ERDF leads two other projects to fit smart charging for residential buildings, especially inside multi-unit dwellings, and for public charging spots within a city.</p> <p>Altogether, these projects aim at a common interface between the DSO and charging spots installation in all situations so that global charging of multiple EV in a network area be organised optimally, taking into account cost and quality of service of the distribution system.</p> <p>[8]</p> |
| Responsible Partner | ERDF |
| Other participants | EDF R&D, other |
| Interoperability approach | <p>The charging management has to fulfil constraints from the end user point of view, in terms of operational and economical efficiencies, while making the best use of networks and energy resources, including upstream electrical system at stake (DSO, TSO, energy and capacity markets).</p> <p>The concept relies on a global approach of the eco-system, beyond the charging spot and the EV which are part of it. Smart charging itself is based on the adequate design of the customer energy management system (CEMS) and its communication with the smart grid connection point (SGCP) of the distribution system, which includes three functions: metering compliant with regulation for electricity purchase on the market (MID), energy tariffs information (TAS) and maximum power availability control (PDA).</p> |

| | |
|-------------------------------|--|
| Name of the initiative | The basis for energy security - Building a market for electric vehicles, their infrastructure charging |
| Type of the initiative | European Regional Development Fund. The operational programme innovative economy. |
| City/Region | Mielec, Gdańsk, Katowice, Warszawa, Kraków. |
| Short description | The project concerns the initiation of electric vehicles market in Poland. The aim of the project is, among others: the construction of a multifunctional urban EV, remote monitoring system of the vehicle, |



| | |
|----------------------------------|--|
| | standard construction site electric cars, the construction of models and the implementation of the charging system test city, construction of power house. (www.marr.com.pl) |
| Responsible Partner | Agencja Rozwoju Regionalnego MAAR S.A. ul. Chopina 18; 39-300 Mielec; Jerzy Czerkiew; Mobile: 00 48 17 788 18 58; www.maar.com.pl |
| Other participants | Agencja Rozwoju Regionalnego MARR S.A., Stowarzyszenie Elektryków Polskich, Fundacja Polska, Electric Cars Sp. z o. o., Europejska Korporacja Inwestycyjna, Eki Cars Sp. z o.o., Usługi Elektromechaniczne Zbigniew Kopeć, Venakon Ryszard Skrocki, Velokraft Kamil Manecki, ELTE GPS Sp. z o.o., Instytut Elektrotechniki, Urządzenia i Systemy Zasilające PowerSys, Ekonapędy Anna Walasek, Leopard Automobile-Mielec Sp. z o.o., Assisto Kancelaria Doradztwa Gospodarczego Sp. z o.o., MP-Consulting i Partnerzy s.c, Branżowy Ośrodek Badawczo - Rozwojowy Maszyn Elektrycznych KOMEL, CASITI Sp. z o.o., AS Motors Sp. z o.o., MBC Zakład Elektroniki Profesjonalnej Marek Bojarski, Keratronik Sp. z o.o., MERA Błonie Systemy Sp. z o.o. MKT Serwis Maziarz Sp. j. |
| Interoperability approach | Monitoring of electric vehicles and their charging infrastructure. Monitoring stations system – central collection of information about parameters station during the charging process. Monitoring system was installed in cars on-board and charging stations, which allowed collection the charging parameters with electric vehicle and charging stations. |

| | |
|----------------------------------|--|
| Name of the initiative | GIREVE (Groupement pour l'Itinérance des Recharges Électriques des Véhicules) |
| Type of the initiative | National and private |
| City/Region | France |
| Short description | The main goal of the project is to make charging points usable for all EV users. GIREVE provides a common platform for data management, serving players in the electro-mobility to facilitate the development of services related to electric vehicle charging: <ul style="list-style-type: none"> • Location of public access services via GPS navigation, PDAs or Internet terminals. • Information on availability, possibility to book. • Ability to access and pay for charging even when the terminal is not operated by the usual operator of the user. • And any other services made possible through transactions between operators within this platform. Users will be able to recharge their vehicles without restriction regarding EV model or CP operator. (http://www.gireve.com/en/index.html) |
| Responsible Partner | ERDF, Peugeot-Citroën and Renault |
| Other participants | Caisse des Dépôts, Compagnie Nationale du Rhône |
| Interoperability approach | The project deals with different aspects of interoperability: <ul style="list-style-type: none"> • Among EVs and CPs. • Among CPs and CP operators. • Among CPs and the common data management platform. |



| | |
|----------------------------------|---|
| Name of the initiative | Vibrate |
| Type of the initiative | Co-financed by the “Crossborder cooperation program Austria – Slovakia 2007-2013” |
| City/Region | Vienna and Bratislava, cross-border region between Vienna and Bratislava |
| Short description | <p>VIBRATE - Vienna BRATISLAVA e-mobility is a two-year pilot cross-border project focused on the development of electromobility and a green highway between the two capitals (Bratislava and Vienna) and in the neighbouring region. The aim of the VIBRATE project is to create a network of fast-charging stations for electric cars. The high priority of the project is to install 16 private charging points and 4 fast charging stations on the highway. Also approximately 10 charging spots at public and semi-public locations (i.e. shopping centres and supermarkets) are planned as a low priority.</p>  <p>The map illustrates the e-mobility network between Vienna, Austria, and Bratislava, Slovakia, along the Danube river. It shows various charging spots (green icons) and wind turbine parks (orange icons) distributed across the region. Key locations include Vienna International Airport, Bratislava Airport, and National Park. The map also features logos for EVN, Verbund, and other partners, along with the European Union logo and the text 'creating the future'.</p> <p>http://www.emobility-vibrate.eu/at/home</p> |
| Responsible Partner | Verbund (AT) |
| Other participants | Partners: ZSE (ZSDis mother company) (SK), Wien Energie (AT), EVN (AT), ECB (SK) |
| Interoperability approach | <p>Interoperability between the EVSE's on private, semi-public and public charging spots. RFID for authentication on publicly accessible stations. Data exchange platform between EMSP.</p> |

| | |
|-------------------------------|---|
| Name of the initiative | Crossing Borders |
| Type of the initiative | Funded by the Austrian Climate and Energy Fund |
| City/Region | Munich – Austria – Bratislava |
| Short description | <p>The goal is the creation of intelligent cross-border systems in the field of e-mobility in the regional west axis of the three participating countries (Slovakia, Germany and Austria). <i>Crossing Borders</i> builds upon the development work undertaken within the EMPORA-Beacon projects. The focal points lie on the construction of around 30 charging stations and their</p> |



| | |
|----------------------------------|---|
| | <p>incorporation into a cross-border roaming and billing plan. On top of this a cross-border, usable, intermodal route planner will also be developed to make energy efficient travel possible. The intended aim of all the project partners is customer comfort. Additionally a rewards system will test to see which bonuses would bring about sustainable behavioural changes regarding mobility patterns.</p> <p>http://www.verbund.com/cc/en/news-media/news/2013/12/05/crossing-borders)</p> |
| Responsible Partner | Verbund (AT) |
| Other participants | Partners: ZSE (ZSDis mother company) (SK), AIT (AT), E.ON SE (DE), Ecotech (AT), Smatrics (AT), Fluidtime (AT), IFSTTAR (FR), Ovos (AT), Ubimet (AT), Kaefer (AT), Siemens CVC (AT), PDTS (AT) |
| Interoperability approach | <p>Interoperability between the EVSE's on private, semi-public and public charging spots.</p> <p>RFID for authentication on publicly accessible stations.</p> <p>Data exchange platform between EMSP – bilateral and platform-based.</p> |

| | |
|----------------------------------|--|
| Name of the initiative | Eisenstadt e-mobilisiert |
| Type of the initiative | National |
| City/Region | Eisenstadt with the surrounding communities Großhöflein, Müllendorf, Trausdorf and St. Margarethen. |
| Short description | <p>The goal of the demo region is to improve the environmental friendliness of the traffic in Eisenstadt. There is not a public transport system, which covers the main part of the population and of the commuters. So the main part of the populations is depending on their car.</p> <p>The following milestones should be achieved during the founding period:</p> <ul style="list-style-type: none"> • Conversion of 50% of the city taxis into electric vehicles. • Central electric vehicle fleet for residential neighbourhoods. • Support of intermodal transport system. • E-Mobility for commuters. • Strengthening the environmental network (foot, bicycle, public transport) compared to the motorized individual transport by attractive alternatives in the area of e-mobility. • Multiple use of electric vehicles by commuters, companies, associations or public institution. • Carpooling with electric vehicles. <p>http://www.e-mobilisiert.at)</p> |
| Responsible Partner | Eisenstadt e-mobilisiert GmbH |
| Other participants | Denzel, The Mobility House (Elektromobilitätsdienstleister); WKO, Land Burgenland (öffentliche Verwaltung); ÖAMTC, VOR, ÖBB (Öffentlicher Verkehr); PEW (Erneuerbare Energie); Mobilitätszentrale Burgenland (Projektpartner); FH Pinkafeld, TU Wien, Josef-Ressl Zentrum Pinkafeld, ftw (Forschung); Gemeinden Großhöflein, Müllendorf, St. Margarethen, Trausdorf. |
| Interoperability approach | EVSE access: Citizen card (RFID) for charging stations. |



| | |
|----------------------------------|---|
| Name of the initiative | ElectroDrive-Salzburg |
| Type of the initiative | Regional, Austria |
| City/Region | Salzburg Province |
| Short description | <p>The scope of the demo region is the investigation of charge, traffic and grid behaviour of the newest generation of EVs.</p> <p>At the beginning of the demo region there was the offer for <i>mobility by subscription</i>. Electric vehicles were available including charging from public CPs, with optional insurance and service packages for a fixed monthly rent. For electric cars there was additionally an e-car charging package, which consisted on a home charging station including montage, checking of the electricity supply installation, supply with green electricity and access to public charging stations. However, the leasing of electric vehicles is no longer offered by ElectroDrive Salzburg. There are only additional packages such as the e-car charging package available.</p> <p>Since 2012 the scope was changed, providing a charging infrastructure for electric vehicles from renewable energy sources (2 photovoltaic and 2 biogas power stations to power the electric vehicles were built).</p> <p>This Demo Region works in close contact with the EV sales offices.</p> <p>Some identified aspects for improvement are the following:</p> <ul style="list-style-type: none"> • Electric vehicles need more support. They are still not competitive compared to combustion engine vehicles in terms of initial costs. • Public charging stations are important for e-mobility acceptance. Especially fast charge stations would increase the security of users. • The charging occurs mostly in private areas. <p>http://www.electrodrive-salzburg.at</p> |
| Responsible Partner | ElectroDrive Salzburg GmbH (fully owned subsidiary of Salzburg AG). |
| Other participants | Salzburg AG, ElectroDrive Salzburg GmbH, The Mobility House GmbH, EMIL e-mobility GmbH, ÖAMTC, Land Salzburg, WKS, TU Wien, Karmasin Motivforschung, Renault, Denzel, Frey, ÖFAG. |
| Interoperability approach | <p>EV user services: charging station finder, fuel savings calculator, etc. Smart phone apps.</p> <p>EVSE access: DriveCard for public charging stations; RFID Card for home charging stations; ChargeNow; Intercharge-Network (eRoaming).</p> <p>The demo region uses the Hsubject platform eRoaming system that has been established in the intercharge-network EU-project http://www.hsubject.com/.</p> |

| | |
|-------------------------------|--|
| Name of the initiative | E-Mobility On Demand Wien |
| Type of the initiative | National |
| City/Region | Supply area of Wien Energie GmbH (Vienna, parts of Lower Austria and Burgenland and communities of Ybbstal) |
| Short description | <p>The scope of the demo region is the testing of the components of the “new mobility”. The electric vehicles are to be used in the following applications:</p> <ul style="list-style-type: none"> • Economic transactions. • For complementary transport services in multi-modal mix (e. g. taxi, car sharing...). • Special vehicles with special application profile. • In public transport (e. g. electric buses). |



| | |
|----------------------------------|---|
| | In principle, the electric mobility is to be established where there are no alternatives for vehicles to reach a destination. It should be an addition to public transport and not an alternative. (http://www.tanke-wienenergie.at/) |
| Responsible Partner | Neue Urbane Mobilität Wien GmbH |
| Other participants | Wiener Stadtwerke Holding AG, Wiener Linien GmbH & Co KG, Wien Energie GmbH, WIPARK Garagen GmbH, A1 Telekom Austria AG, LeasePlan Österreich Fuhrparkmanagement GmbH, Raiffeisen-Leasing Fuhrparkmanagement Gesellschaft m.b.H., Spar Österreichische Warenhandels-AG, Stadt Wien / MA 48, Wien Energie Stromnetz, TU Wien, AIT – Mobility Department. |
| Interoperability approach | EV user services: charging station finder. EVSE access: Tanke-card (RFID). |

| | |
|----------------------------------|---|
| Name of the initiative | e-pendler in niederösterreich |
| Type of the initiative | National |
| City/Region | 49 communities between Vienna and Wiener Neustadt |
| Short description | The goal of the demo area is to make commuting traffic more energy-efficient and climate-friendly. This should be achieved by the shift to public transportation in connection with the use of electric vehicles. In this regard, four multiplication models will be applied: <ul style="list-style-type: none"> • Multimodal electro mobility: individually useable electric vehicles for the drive to and from the public transportation nodes. • Together electro mobility: commuting car pool for the ride from the meeting place to the work and reverse with an EV. • Electro mobility in the community: electrification of existing mobility offers (e. g. city buses, call taxis...). • Electro mobility to try out: electric vehicles should be available to potential users to test the various applications. Furthermore the needed charging infrastructure and photovoltaic power stations are going to be built up (2014 - 2015). (http://www.e-pendler-noe.at) |
| Responsible Partner | EVN AG |
| Other participants | Wien Energie GmbH, Raiffeisen-Leasing GmbH, ecoplus. Niederösterreichs Wirtschaftsagentur GmbH (adviser function). |
| Interoperability approach | EV user services: multimodal electromobility |

| | |
|-------------------------------|--|
| Name of the initiative | Großraum Graz |
| Type of the initiative | National |
| City/Region | Graz and 80 surrounding communities |
| Short description | The scope of the demo region is the optimization of the overall traffic situation and the efficient integration of electro mobility in the complete system. The business model consists of the following points: <ul style="list-style-type: none"> • Leasing models for EVs such as pedelecs, e-scooters and Segways. |



| | |
|----------------------------------|--|
| | <ul style="list-style-type: none"> • Car sharing. • Bike rental system. • Electric vehicle rental. • Different mobility options for the public transport and the use of EVs for private and business customers. • Testing possibilities for electric vehicles. • Mobility centre as information and testing centre. <p>Photovoltaic power stations are built to deliver energy from renewable energy sources for the electro mobility. (http://www.emobility-graz.at)</p> |
| Responsible Partner | e-mobility Graz GmbH (legal successor of Holding Graz, Energie Graz and Energie Steiermar). |
| Other participants | Raiffeisen-Leasing, Leaseplan, BMW Leasing und BMW alphabet Fuhrparkmanagement GmbH, Autohaus Peugeot Edelsbrunner, Autohaus Citroen Koncar, Autohaus Citroen Fior, Denzel, Renault Vogl, Autohaus Wittwar, Mercedes Benz; Gady Lebring. |
| Interoperability approach | EV user services: information about charging stations. EVSE access: current fuel cards of Energie Graz GmbH & Co KG for charging stations of Energie Graz GmbH & Co KG; and cash card for charging stations of Energie Steiermark AG. |

| | |
|----------------------------------|---|
| Name of the initiative | VLOTTE |
| Type of the initiative | National |
| City/Region | Region Rheintal and surrounding land (area: 260 km ²), Vorarlberg, Austria |
| Short description | <p>The scope of this demo region was the preparation of the market in Vorarlberg for renewable electrical vehicles and the investigation of the suitability for daily use of electrical vehicles.</p> <p>In the course of the project the necessary infrastructure was built: charging stations, renewable power station (photovoltaic and hydroelectric), distributors and car repair shops for electrical vehicles.</p> <p>The current business model looks like follows: Vlotte costumers have the possibility to get a mobility card for a fixed monthly rent. This mobility card contains the electric vehicle leasing, the maintain costs of the electric parts, a network card for the transport group of Vorarlberg and free recharging on public charging stations. Additionally, the costumers get also a free membership of ÖAMTC (Austrian automobile club with roadside assistance service).</p> <p>Currently the offer is not available for private persons. (http://www.vlotte.at).</p> |
| Responsible Partner | illwerke vkw |
| Other participants | Land Vorarlberg, Verkehrsverbund Vorarlberg, Energieinstitut Vorarlberg, Vorarlberger Landesversicherung, ÖAMTC, Raiffeisen Leasing GmbH, TU Wien, Autohaus Rohrer, Autohaus Josef Bickel, Kairos Wirkungsforschung and Entwicklung GmbH. |
| Interoperability approach | EV user services: information about charging stations and charging station finder; app for Android "LEMnet" and iPhone "illwerke vkw Stromstellen" charging station finder. EVSE access: RFID Card. |

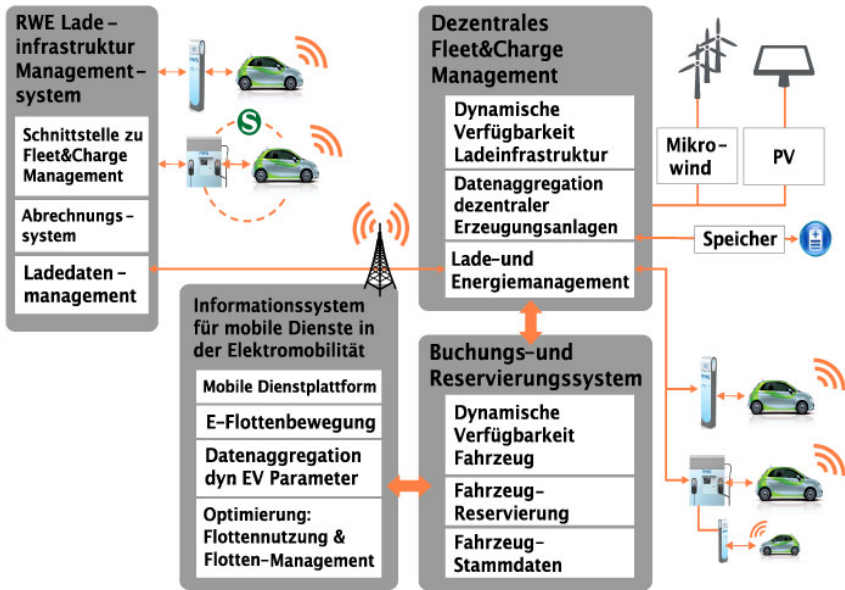


| | |
|----------------------------------|--|
| Name of the initiative | Rapid Charger Network |
| Type of the initiative | EU (TEN-T Program) |
| City/Region | UK, Republic of Ireland, Northern Ireland. |
| Short description | The Rapid Charge Network project is the development of a multi-standard, rapid charge network for electric vehicles throughout the UK and Ireland. The network, running on two priority road axes on the mainland, will link major ports and cities with connections to existing networks in Dublin and Belfast. (www.rapidchargenetwork.com) |
| Responsible Partner | Nissan |
| Other participants | ESB (Electricity Supply Board, Renault), BMW, Volkswagen. |
| Interoperability approach | Plug-In: multi-standard rapid charge points, compatible with cars using 44kW DC CCS, 44 kW DC CHAdeMO and 43 kW AC systems. User Services: Charge point locations viewer, real time information on the availability of charge points. EVSE access: RFID charge point card. |

| | |
|----------------------------------|---|
| Name of the initiative | iZeus – Intelligent Zero Emission Urban System |
| Type of the initiative | National |
| City/Region | Baden Württemberg |
| Short description | Integration of electro-mobility and energy generation in Smart grids through ICT development and deployment. Objectives of the project are: <ul style="list-style-type: none"> • Development and test of standards for the controllable charge of EVs. • Integration of renewable energies in the network. (http://www.izeus.kit.edu/english/index.php) |
| Responsible Partner | KIT, Fraunhofer, SAP |
| Other participants | Opel, EnBW, Daimler, PTV group, ads-tec |
| Interoperability approach | The project will be coordinated with Hsubject and econnect Germany projects and the roaming/clearing house concept will be tested. The objective is to exchange authentication, authorization and billing data using standardized data exchange formats and interfaces and in compliance with data protection regulations. An ICT architecture for roaming will be developed and tested. During the test/demo phase the system will be continuously optimized. |

| | |
|-------------------------------|---|
| Name of the initiative | RWE's pilots : Metropol-e, Green eMotion |
| Type of the initiative | Private |
| City/Region | Ruhr and Germany in general |
| Short description | RWE Effizienz (https://www.rwe-mobility.com) is a supplier of smart charging infrastructure and IT services and offers intelligent e-mobility solutions for cities, vehicle fleets and private users of electric vehicles. |



| | |
|----------------------------------|--|
| Responsible Partner | RWE |
| Other participants | metropol-E: PTV group, EWald Consulting, Stadt Dortmund, TU Dortmund, TU Berlin GeM: check detailed information about the project |
| Interoperability approach | <p>RWE has developed standards for charging plugs and for data communication between a charging station and an electric vehicle. The international standard IEC 62196 for the e-mobility Type-2-connector is a result of this.</p> <p>The company researches how the integration of electric vehicles into the energy system can be enhanced in order to optimize the usage of renewable energy. These findings are already introduced by the company in cross-industrial international standardization activities like the communication between electric vehicles and charging infrastructure (ISO/IEC 15118).</p> <p>RWE is one of the six shareholders of Hubeject GmbH joint venture, which created the "intercharge" eRoaming platform (http://www.hubeject.com/).</p> <p>Metropol-E (elektromobilität Rhein-Ruhr, http://www.metropol-e.de) is a German research project in which smart charging is considered. The following figure shows the main scheme of the concept that is being tested.</p>  <p>The diagram illustrates the main scheme of the smart charging concept. It features three main interconnected systems:</p> <ul style="list-style-type: none"> RWE Ladeinfrastruktur Managementsystem: Includes a 'Schnittstelle zu Fleet&Charge Management', 'Abrechnungssystem', and 'Ladedatenmanagement'. Dezentrales Fleet&Charge Management: Includes 'Dynamische Verfügbarkeit Ladeinfrastruktur', 'Datenaggregation dezentraler Erzeugungsanlagen', and 'Lade- und Energiemanagement'. It is connected to 'Mikro-wind' and 'PV' energy sources and a 'Speicher' (storage) unit. Informationssystem für mobile Dienste in der Elektromobilität: Includes 'Mobile Dienstplattform', 'E-Flottenbewegung', 'Datenaggregation dyn EV Parameter', and 'Optimierung: Flottennutzung & Flotten-Management'. Buchungs- und Reservierungssystem: Includes 'Dynamische Verfügbarkeit Fahrzeug', 'Fahrzeug-Reservierung', and 'Fahrzeug-Stammdaten'. <p>Electric vehicles (EVs) and charging stations are shown interacting with these systems via wireless communication.</p> |

| | |
|-------------------------------|---|
| Name of the initiative | Keihanna Eco City |
| Type of the initiative | R&D (Japan Smart City) |
| City/Region | Japan, Keihanna (Kyoto) |
| Short description | The Keihanna Eco-City Next-Generation Energy and Social System Verification Experiment Project is being carried out in Kansai Science City in order to save energy and reduce CO ₂ emissions throughout the community without adversely affecting quality of life. Various initiatives are being promoted for households, companies, transportation, etc. The project involves HEMS (Home Energy Management Systems), BEMS (Building Energy Management Systems), and an EV charging management system targeting 100 EVs, with all of these consumer EMS connected to the CEMS (Community Energy Management System), which manages the supply and demand of energy for the entire community, leading to a diverse |



| | |
|----------------------------------|---|
| | range of applications, such as the large-scale electricity of Demand Response (DR) issuance that has now been expanded to cover approximately 700 households within the experimentation community, etc. (www.jscp.nepc.or.jp) |
| Responsible Partner | |
| Other participants | Kyoto prefecture, Kizugawa and Kyotanabe cities, Seika town, Kansai research institute, Kyoto center for climate actions, urban renaissance agency... (http://jscp.nepc.or.jp/en/keihanna/index.shtml) |
| Interoperability approach | Within the framework of global energy demand and CO ₂ emissions reduction, an EV charging management system will be tested linked with other energy management systems and processes. The EV charging management system will verify the peak shift effect obtained by sending demand response requests. The EVs will be linked to the Community Energy Management System (CEMS) for this purpose. The EV-charging management system sends out DR requests with the use of e-mail issued the previous evening (between 6pm and 9pm) to the 60 EV users in accordance with requests received from CEMS, asking them not to charge their vehicles during the specified timeframes. People responding to DR requests are provided with rebates through Ponta membership point award. With regard to V2X, the research will try verify the use of EV storage batteries for the supply of power to factories (Mitsubishi Motors Corporation, for example). |

| | |
|----------------------------------|--|
| Name of the initiative | Smart Melit |
| Type of the initiative | R&D (Japan Smart City) |
| City/Region | Japan, Toyota City, Aichi prefecture |
| Short description | As a model city for the EV&PHV Town Concept and ITS operational experiments, Toyota City has commenced the introduction of next-generation vehicles and transport systems, and is working towards the realization of a low-carbon society. The power transfer patterns of a variety of devices, including next-generation vehicles, will be integrated and controlled by HEMS. A range of energy sources will be used including city gas and biomass, and full use of heat and electricity will be made. (www.jscp.nepc.or.jp) |
| Responsible Partner | |
| Other participants | Toyota city, Nagoya university, Aisin seiki co. ltd., Eneres, Toyota, Yamaha motor... (http://jscp.nepc.or.jp/en/toyota/index.shtml) |
| Interoperability approach | The home energy management system (HEMS) will control, among others, the charge and discharge of the EV. The best transportation choices, using private and public means, will be made available to users. An Energy Data Management System (EDMS) will be introduced and deployed for the smart “operation” of the whole area by getting information about energy consumption and forecasting future energy demand. It will use storage and demand response strategies to balance supply and demand. The Ha:mo Ride car-sharing service has been expanded since October 2013 to incorporate 100 vehicles and 22 stations equipped with parking space and recharging facilities. Fees are now charged for the service in line with this, and the business model verification experiment has been started. The system in the Ha:mo Ride Support Center monitors in real time EV |



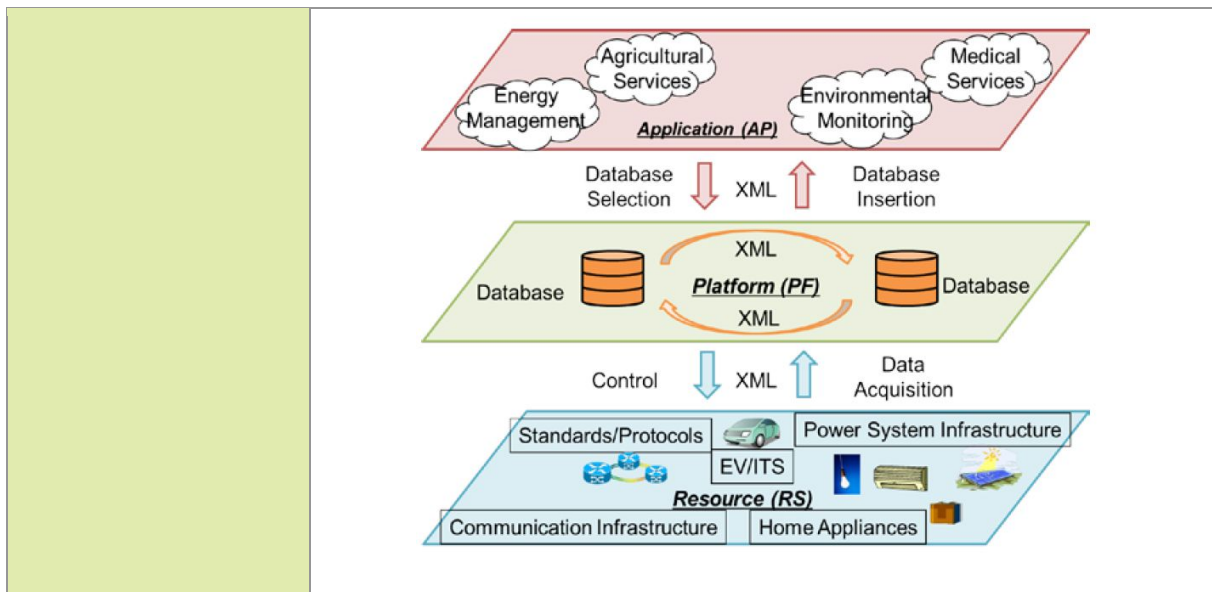
| | |
|--|---|
| | <p>current locations with the use of a GPS (Global Positioning System), remaining charge capacities, recharger connection conditions at stations, the status of the electricity supply, etc. With the exception of the people in charge of monitoring, the system is basically capable of unmanned operations.</p> <p>The Multi Modal Navi route guidance system, which supports low-carbon and seamless movement, provides recommendation information via smartphones when users are traveling. Ha:mo provides guidance on route navigation, on the available PR (Park-and-Ride) parking lots, and on the times of departure and arrival and transfer routes for trains, buses and other forms of public transportation. Routes connecting cars with trains, buses and other forms of public transportation can be searched for with a single operation. This service is linked in with Ha:mo Ride, so in addition to displaying the transportation methods to use along the route, a link is also provided to the Ha:mo reservation page from the top page.</p> |
|--|---|

| | |
|----------------------------------|---|
| Name of the initiative | JUMPSmartMaui (Japan-USA Island Grid project) |
| Type of the initiative | Public R&D (NEDO, based on an agreement between USA and Japan governments) |
| City/Region | USA, Maui island, Hawaii |
| Short description | <p>The goal of this project is to demonstrate smart grid technologies that will enable the efficient use of renewable energy in island regions. The demonstration site has been designed to respond to the rapidly changing energy supply from renewable sources, which will be made possible through the use of EVs and other innovative technologies. The demonstration site will be in operation by March 2015.</p> <p>www.nedo.go.jp, www.jumpsmartmaui.com/</p> |
| Responsible Partner | Hitachi |
| Other participants | NEDO, Mizuho bank, Cyber Defense Institute, State of Hawaii, County of Maui, Hawaiian Electric Company, Maui Electric Company, Maui economic development board, Hawaii Natural Energy Institute, DOE labs (Sandia, PNNL, NREL) |
| Interoperability approach | Hitachi has established an EV energy control centre (EVECC) and an Energy Management System (EMS) for all island energy surveillance and control (transmission level). It has put in place also a distribution management system (DMS) and smart homes (with micro DMS), electric power storage systems and EV charging stations, at distribution level. The goal is to control the balance of supply and demand and support renewable energy integration in the system. Loads in homes are also directly controlled in order to face renewable energy supply variations. |

| | |
|-------------------------------|---|
| Name of the initiative | Nagasaki EV&ITS project |
| Type of the initiative | Public R&D (national project) |
| City/Region | Goto islands, Nagasaki, Japan |
| Short description | In 2009, the Nagasaki Prefecture established the Nagasaki EV&ITS Consortium, a collaborative effort by industry, academia and government to promote EVs and intelligent transportation systems (ITS) throughout Nagasaki. The goal of the EV&ITS project is to create “Driving Tours of |



| | |
|---|--|
| | <p>the Future” by incorporating EVs and ITS (Intelligent Transportation System) technology into the local tourism industry. Nagasaki is working with local residents to develop new ideas such as tourist services with navigational guidance, new EV development by local industries, utilization of renewable energy such as solar or wind power, and the establishment of a system for regional smart grid integration with EVs.</p> <p>This project has introduced about 140 EVs to the islands (rental cars and taxis). It has installed quick chargers and developed a futuristic driving tourism system by utilizing ITS spot services. These spots provide up-to-date detailed information on charging spots and sightseeing spots to driving tourists. It is intended as a model experiment which combines mobility and information system with energy system and is expected to develop local industries and create new industries.</p> <p>http://www.pref.nagasaki.jp/ev/ev&its/en/index.html [11]</p> |
| <p>Responsible Partner</p> | <p>Nagasaki prefecture</p> |
| <p>Other participants</p> | <p>Nagasaki EV&ITS consortium (members from the auto industry, infrastructure providers, academies, associations, local companies, cities and towns, and observers from governments, other prefectures and cities, and has since grown to 200 members).</p> |
| <p>Interoperability approach</p> | <p>There is a network structure supporting the project which consists of an Integrated Tourist information Platform (Regional data centre gathering tourist, EV charger and Safety&Security information), ITS spots that get information from EVs (probe information) and give information to the EV navigation system (information on tourism, safety, weather, nearest charging points, low battery alert, battery level forecast according to route, public transport information, reservation service, etc.) and EMS (Energy Management System).</p> <div data-bbox="502 1205 1396 1556" data-label="Diagram"> <p>The diagram illustrates the network structure supporting Nagasaki EV&ITS, divided into three main sections: Information Network, Energy Network, and Mobility Network.</p> <ul style="list-style-type: none"> Information Network: Includes Tourist Information (from Tourist Agents, NPO, Local Residents, Tourists), Integrated Tourist Information Platform (Regional Data Center), Tourist Information Service, and an EMS Center (Energy Management System). It also lists services like Sightseeing Spots, EV Charge Information, and Safety and Security Information. Energy Network: Shows a Smart Grid connected to a Regional Grid, which is linked to Power Grid, Solar Power, Wind Power, and Charging Facilities. It also includes Rechargeable Batteries and data on charging and battery levels. Mobility Network: Features an ITS Compatible Car Navigation System, Mobile Phone, Smart Phone & Computers, and various ITS Spots (for EVs, sightseeing, and charging). <p>At the bottom left of the diagram, it is labeled "Network structure supporting Nagasaki EV&ITS".</p> </div> <p><i>Fusion project</i> (National Project selected by the Ministry of Internal Affairs and Communications): the integrated control of various demand and supply sources in Goto islands (wind and solar energy, EVs, ITS data centres, EMS...) presented the problem of different data communication protocols. The project proposes a meta standardization of communication protocols based on a XML platform.</p> |



| | |
|----------------------------------|--|
| Name of the initiative | Osaka EV Action Program (Osaka EVAP) |
| Type of the initiative | Public (Municipal?) |
| City/Region | Osaka, Japan |
| Short description | <p>The Osaka EVAP started in 2009 with the goals of promoting the use of EVs, building a low-carbon society and encouraging the development of new energies related industries in Osaka. The Osaka EV action council is working to translate the goals into reality. The main activity lines are the following:</p> <ul style="list-style-type: none"> • Town development: charging infrastructure development, EV taxi projects... • Goods development: EV and related technologies development. • People development: fostering of researchers on EVs. <p>[11]</p> |
| Responsible Partner | Osaka Prefecture |
| Other participants | Osaka EV Action Council. It gathers industrial, academia and administrative representatives from Osaka. |
| Interoperability approach | <p><u>Osaka Recharge infrastructure network</u></p> <p>Osaka prefecture is taking steps to deploy charging facilities together with communication networks in order to deploy reservation, authentication and other advanced services:</p> <ul style="list-style-type: none"> • The chargers of various manufacturers were networked through a communications infrastructure in March 2010. This network makes possible to reserve chargers via mobile phones and to make personal authentications using FeliCa cards. Distributed information: charger reservation, user authentication, usage conditions, station location, real time data, etc. • By August 2011, a total of 35 chargers were operating based on interconnectivity among 3 company systems. Three of them are expected to be used with storage batteries. • Information on quick charger availability is provided in real time to car navigation systems installed in Nissan Leafs. • There are plans for networks standardization through a regional |



| | |
|--|--|
| | <p>association in Kansai and its further expansion throughout other areas.</p> <p><u>Implementation of an EV taxi programme</u></p> <ul style="list-style-type: none"> An EV operation optimization system is being (?) developed in order for system companies to support the dispatch and charging of EV taxis. A trial implementation system is scheduled (no additional information has been found). EVOT system (EV on-demand Taxi). |
|--|--|

| | |
|----------------------------------|--|
| Name of the initiative | Smart grid project in Rokkasho Village |
| Type of the initiative | Private founded (JWD – Japan Wind Development, Toyota, Panasonic Corporation, Hitachi) |
| City/Region | Rokkasho Village, Aomori Prefecture, Japan |
| Short description | <p>This is a smart grid project in which EVs are involved just as other demand and supply technologies. The two main objectives are the following:</p> <ul style="list-style-type: none"> Energy supply side: developing CO₂ free electric power supply by means of centralised and distributed renewable energy sources. Other objectives are keeping cost low, create network stability, meet the needs of each local area. Demand side: develop demand side management systems using heat storage, batteries and controllable loads, among them PHEVs. <p>[21]</p> |
| Responsible Partner | JWD – Japan Wind Development, Toyota, Panasonic Corporation, Hitachi |
| Other participants | |
| Interoperability approach | <p>The PHEVs load is controlled, as the rest of home loads, by a HEMS, which monitors and controls electricity use. The HEMS receives Demand Response signals. In the next step, a micro DMS system is expected to control loads at LV level.</p> <p>Configuration of the demonstration system:</p> <p>Rokkashomura-Futamata Wind Power Station Simulated core grid Wind power generators (51 MW: 34units) NAS batteries (34 MW: 17units)</p> <p>Smart Grid Pilot Facilities Simulated distribution grid</p> <p>Supply side Charge and discharge HUB-battery (NAS batteries) PV (100 kW)</p> <p>Role of Control Center Control information links between supply side and demand side services Manage supply-demand at the grid level</p> <p>Energy Management Use ICT to adjust supply-demand targeting the demand side as well</p> <p>Information Management Control center CEMS Server data center</p> <p>Demand side Smart meter Rooftop PV Home Battery Home Heat Pump PHV Home Charger PHV Home Charger Smart meter Home Battery Home Heat Pump PHV Home Charger Rooftop PV Smart meter Home Battery Home Heat Pump PHV Home Charger Rooftop PV Smart meter Home Battery Home Heat Pump PHV Home Charger 6 smart houses</p> <p>PHV : 8 of Toyota Plug-in PHV Storage : Hub-Battery (100Kw), Each Smart Home has Home Battery, Home Heat Pump</p> <p>— Electricity flow - - - Information flow</p> |

| | |
|-------------------------------|-----------------|
| Name of the initiative | E-Kizuna |
| Type of the initiative | Private (Honda) |



| | |
|----------------------------------|--|
| City/Region | Saitama City, Japan |
| Short description | Smart homes. The objective of the project is the optimization of energy generation and usage. The demonstration was started by Honda through the testing of two smart home system equipped houses. A third house will be equipped with energy management systems of both Toshiba and Honda. The two companies seek to optimize home energy in everyday life and be able to supply energy during emergency periods. The control of energy is made through smart home appliances complying with the ECHONET life standards, solar power generation, a gas engine cogeneration system, batteries and electric vehicles. [11] |
| Responsible Partner | City of Saitama |
| Other participants | Honda, Toshiba Corporation |
| Interoperability approach | The two companies will explore the possibility of collaborating their cloud-based services, realizing the interconnectivity of their products and reusing Toshiba's battery installed in Honda EVs. HEMS will be in charge of controlling energy generation and demand. |

| | |
|----------------------------------|---|
| Name of the initiative | Nissan Leaf V2H & V2B |
| Type of the initiative | Private (Nissan) |
| City/Region | Atsugi city, Japan (Nissan advanced technology centre) |
| Short description | Field test of the Nissan Leaf as an electrical power storage and supply to office buildings. Nissan has carried out an early field test of a system that permits six Nissan Leaf vehicles supply energy to the distribution network. Charging is stopped during the day, at peak hours, and in this period the building draws power from the cars. When electricity becomes cheaper the power flows the other way. The system ensures that the vehicles are fully charged by the end of the working day for their owners to drive home. The results have led to a 2,5% reduction of electrical power use during peak hours (in summer). Nissan plans to further test and refine the “vehicle to building” system, which is a development of the “Leaf to home” system. “Leaf to home” power units provide an uninterrupted flow of electricity stored in the batteries of the vehicle to residential homes. (http://www.nissan-global.com/EN/NEWS/2013/_STORY/131129-01-e.html) |
| Responsible Partner | Nissan Motor |
| Other participants | Nichicon Corporation |
| Interoperability approach | Power supply is achieved by the “Leaf to home” system using the “EV power station” unit developed by Nichicon. This unit is similar to an external air-conditioning unit and conforms to the CHAdeMO protocol. Its estimated cost is 330.000 yen all inclusive. Electricity is stored or supplied automatically in accordance with a household's electricity capacity and consumption. |

| | |
|-------------------------------|---|
| Name of the initiative | The Yokohama Smart City Project (YSCP) |
| Type of the initiative | R&D (Japan Smart City) |



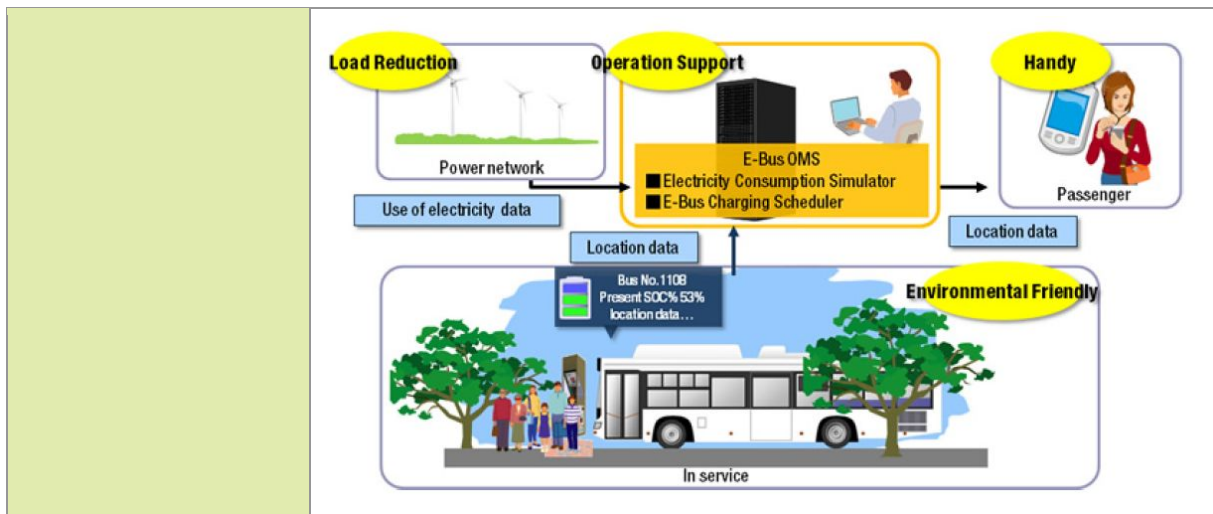
| | |
|----------------------------------|---|
| City/Region | Yokohama, Japan |
| Short description | <p>The aim is to transform Yokohama into a low-carbon city while maintaining the comfort of its residents. In order to do so, a CEMS (Community Energy Management System) will be introduced and management systems will be developed and operated optimized for this region. PV generation and other forms of renewable energy will be used, and work will be performed to change the way that citizens relate to energy. HEMS for homes will be introduced as well as BEMS for offices and commercial buildings, FEMS for factories, and EV and charging stations for the transport sector. Peak energy demand will be curbed and energy conserved through their mutual linkage.</p> <p>(http://jscp.nepc.or.jp/en/yokohama/).</p> |
| Responsible Partner | City of Yokohama |
| Other participants | Nissan Motor, Tokyo Institute of Technology, JX Nippon Oil & Energy corporation, NEC and others. |
| Interoperability approach | <p>EV management by EMSs.</p> <p>V2H was tested by using Nissan Leaf capabilities. The EV is charged from the distribution board in the house and provides the house with electricity via a quick-charge port and discharge PCS (Power Conditioning System). The HEMS (Home Energy Management System) installed for use when recharging and discharging the EV not only controls electricity charging and supply for the EV via a PCS based on EV information, household electricity consumption and other data, it is also linked up to the CEMS that manages energy throughout the entire area. This enables the timing for recharging EVs to be shifted and electricity to be supplied by the vehicles' storage batteries based on electricity supply and demand information received from the CEMS.</p> <p>Nissan Motor is establishing recharge/discharge plans that incorporate the use of EVs. In more detail, the times during which users actually use their EVs are forecasted from traveling records and other data transmitted to Nissan's Data Centre by the LEAF vehicles. At the same time, the amount of electricity generated by solar power based on weather forecasts and the amount of electricity consumed by households, etc. are predicted so that HEMS can issue recharge/discharge plans for the EVs from a combination of these data sources.</p> |

| | |
|-------------------------------|--|
| Name of the initiative | Smart Community Demonstration Project in China |
| Type of the initiative | Japan-China Joint project |
| City/Region | Gongqingcheng, Jiangxi Province, China |
| Short description | <p>Demonstration of a Smart Community Model for small and medium size cities aiming to achieve both an economic growth and a low carbon society. The project will include the following activities:</p> <ul style="list-style-type: none"> • Establishment and demonstration of an integrated EMS for the community. • Demonstration of smart grid related technologies using renewable energy. • Demonstration of a low carbon traffic management system. <p>It is still in the feasibility study phase, according to the last available information. Further definition will come after its completion.</p> |



| | |
|----------------------------------|--|
| | http://www.nedo.go.jp/content/100494626.pdf |
| Responsible Partner | Gongqingcheng municipality, State Grid Corporation of China, NEDO |
| Other participants | Toshiba Corporation, Toshiba Solutions Corporation, Toshiba (China) Co., Ltd., Smart Communications, Inc., ITOCHU Corporation, ITOCHU (China) HOLDING CO., LTD. and NTT DOCOMO, INC. |
| Interoperability approach | <p>A traffic management system will be developed according to the following scheme:</p> |

| | |
|----------------------------------|--|
| Name of the initiative | E-Bus OMS (Operation Management System) Demonstration Project in Hitachi City |
| Type of the initiative | R&D project (NEDO, Demonstration of Smart Communities) |
| City/Region | Hitachi city, Japan |
| Short description | <p>The main objectives of the project are the following:</p> <ul style="list-style-type: none"> • Charging optimization: Design an optimized operation plan to mitigate the deterioration of bus batteries. The planning is based on the predicted electricity consumption, the charging schedule and the charging amount. • Peak shift during the charging to several buses: design optimized power charging schedules based on routes and operation schedules. This also includes peak shifting the demand. • Addition of functionalities for energy supply in times of disaster: disaster-recovery buses. <p>http://www.hitachi.com/products/smartcity/case/hitachi/index.html</p> |
| Responsible Partner | Hitachi |
| Other participants | Hino motors |
| Interoperability approach | <p>Hitachi performs the operation management including:</p> <ul style="list-style-type: none"> • The prediction of electricity usage, considering the supply network. • Bus location and battery status estimation and confirmation. <p>Future vision:</p> |



| | |
|----------------------------------|--|
| Name of the initiative | Ten Cities, Thousand Vehicles |
| Type of the initiative | National Chinese (in China, the development of the whole EV industry is guided mainly by the government) |
| City/Region | Cities: Beijing, Shanghai, Chongqing, Changchun, Dalian, Hangzhou, Jinan, Wuhan, Shenzhen, Hefei, Changsha, Kunming, Nanchang, Tianjin, Haikou, Zhengzhou, Xiamen, Suzhou, Tangshan, Guangzhou, Shenyang, Chengdu, Nantong, Xiangfan and Hohhot |
| Short description | The objective of the initiative is to demonstrate the electric vehicle technologies in a number of cities across the country. The “Ten Cities, Thousand Vehicles” (TCTV) project, born in 2008, implements various approaches to EV and EVSE technologies in different regions of China on a pilot basis. The successful demonstrations are to be replicated across the country. [22] |
| Responsible Partner | |
| Other participants | The initiators of the project: Ministry of Finance, National Development and Reform Commission, Ministry of Industry and Information Technology and the Ministry of Science and Technology. |
| Interoperability approach | <ul style="list-style-type: none"> • Demo in Beijing focused on creating public sector support of EVs. • Demo in Shanghai focused on replicating international rental models. • Demo in Shenzhen focused on creating a leasing model through strategic partnerships. • Demo in Hangzhou focused on rental model. • Demo in Chongqing focused on developed of fast-charging EV technology. |

| | |
|-------------------------------|---|
| Name of the initiative | Energy Conservation |
| Type of the initiative | Funded by the State of California |
| City/Region | California, USA |
| Short description | The goal of the project was energy conservation and reducing peak loads, included shifting the recharging of batteries to off-peak hours. Southern California Edison (SCE) wanted to enable customers to be able to |



| | |
|----------------------------------|--|
| | conveniently and easily shift their battery charging to off-peak times. SCE determined that by providing customers with the proper control equipment, they would be able to accomplish this goal. A charger management solution was developed for the Peak Load Reduction Program (PLRP). [8] |
| Responsible Partner | Southern California Edison (SCE) |
| Other participants | California Energy Commission, Echelon Corporation, VaCom Technologies. |
| Interoperability approach | Each Battery Charger Control Panel (BCCP) installation consisted of one or more of Echelon devices, which monitored current flow and controlled the battery charger relays; an Echelon scheduler, which works like a timer; LonWorks data logger that provides a history of on/off cycles and power usage; Echelon LonWorks based communications; internet connectivity; and smart meters. |

| | |
|-------------------------------|---|
| Name of the initiative | Flemish Living Lab Electric Vehicles programme (Vlaamse Proeftuin Elektrische Voertuigen) |
| Type of the initiative | Subsidized, national |
| City/Region | Belgium, Flemish region |
| Short description | <p>The Programme Office currently (2011-2014) coordinates/supports 5 Flemish living lab electric vehicle platforms:</p> <ol style="list-style-type: none"> 1. EVA (Electric Vehicles in Action): The platform, under the coordination of Eandis, is designed as a representative large-scale charging infrastructure platform with more than 200 charging stations spread out over 80% of the Flemish region (semi-public and public domain). A lot of municipalities are participating because of the significant impact on the public domain. A wide range of electric vehicles (161 vehicles of different brands and types) will be monitored to study user behavior. Other topics to be studied: geographical coverage needed for public charging stations, the impact on the grid, easiest way to charge fees to the user, etc. 2. EVTecLab: The platform, under the coordination of Punch Powertrain, is a consortium of ten Flemish companies and research institutions and will focus on new technologies for electric heavy-duty vehicles like vans (Ford Connects made by Punch Powertrain), trucks (made by E-Trucks) and buses (made by Van Hool). The vehicles will be used for freight and public transport in daily operation. 3. iMOVE: The platform, coordinated by Umicore, is a consortium of eighteen Flemish companies and research institutions and aims for a breakthrough of electric vehicles and sustainable mobility. A large test population (in companies but also residential) will use 175 electric vehicles and 180 charging stations in daily use for three years. The innovation projects will focus on three main themes: renewable energy and smart grids, new battery and vehicle technology and mobility behavior. 4. Olympus: The platform, coordinated by railway operator NMBS Holding, is a meeting place for the various players in the field of sustainable mobility, where information and knowledge in the field of travel behavior, green technology and smart electricity grids are |



| | |
|----------------------------------|--|
| | <p>exchanged with the purpose to promote and improve the technology. As a provider of transport solutions the NMBS Holding can be the engine of networked mobility, where different modes of transport (bicycle, car, public transport...) seamlessly connected.</p> <p>5. Volt-Air: The platform, coordinated by Siemens Belgium, aims to support innovations to integrate electric vehicles in company fleets and local micro-grids. The Volt-Air platform consists of three sublabs linked together through a common data platform for data exchange. There is the micro-grid lab on the Siemens site in Huizingen, focusing on smart micro-grids integrating EV and renewable energy sources. The EV lab at Volvo Cars Ghent consists of electric Volvo C30's fitted with equipment for logging technical data. The users lab in Kortrijk, finally, consists of a pool of about 60 electric vehicles from Westlease which will be used by local companies in their daily fleets and will experiment with new business models.</p> <p>Platform projects are running from 2011 to 2014. More information is expected by the end of 2014.</p> |
| Responsible Partner | Programme Office - Flemish Living Lab Electric Vehicles, Boeretang 200, B-2400 Mol, Belgium |
| Other participants | <p>EVA leader: Eandis (and partners: Blue corner, Telenet, Federauto, 4IS, VUB (VAB, University Gent)), EVTecLab leader: Punch Powertrain (and partners: VanHool, E-trucks, De Lijn, Triphase, Bombardier, Emrol, VUB, iMinds, Flanders Drive), Olympus leader: B-Holding (and partners: Infrabel, Blue-mobility, Blue-bike, Rectical, Smit, VIM, Syntigo, Cambio, VUB, University Gent, Transport Mobility Leuven, Katholieke Hogeschool Limburg, Katholieke Universiteit Leuven, Hasselt, Leuven, Gent, Antwerpen), Volt-Air leader: Siemens (and partners: Volvo, West lease, Elexys, E.vanWingen, Powerdale, Katholieke Hogeschool Limburg, Katholieke Universiteit Leuven, Vito, stad Kortrijk, iMOVE leader: Umicore (and partners: Punch Powertrain, Interparking, Janssen, Ernst & Young, EDF Luminus, Infrac, Hendrix, The Plugin Company, P&V Elektrotechniek, Belgacom, REstore, Delhaize, Antwerpen, Mobile-For, Fleet&DriverCare, VUB, Flanders Drive, iMinds)</p> |
| Interoperability approach | <p>336 vehicles of different brands and types and more than 500 charging spots are used within the mentioned platforms.</p> <p>Both iMOVE as well as EVA have a focus on public charging and therefore interoperability is (implicitly) an important aspect within these platforms.</p> <p>The Olympus platform can be considered as Belgium's interoperability platform for sustainable mobility in general. It also enables EV user identification by means of RFID (Calypso reader, they consider to go to a multi-reader).</p> <p>In Belgium on national level the living lab Working Groups give advice to the industry on choices for protocol and connectors etc. Twice a year a report will be published. The next one in second half of 2014 will contain experiences gained in the different projects.</p> <p>Highlights:</p> <ul style="list-style-type: none"> • Universal plug type in Belgium (IEC62196-2 Type 2 plug). • The use of one ID card for public transportation and charging (MOBIB card). • As with the Dutch EVSE manufacturers, also the Belgium EVSE |



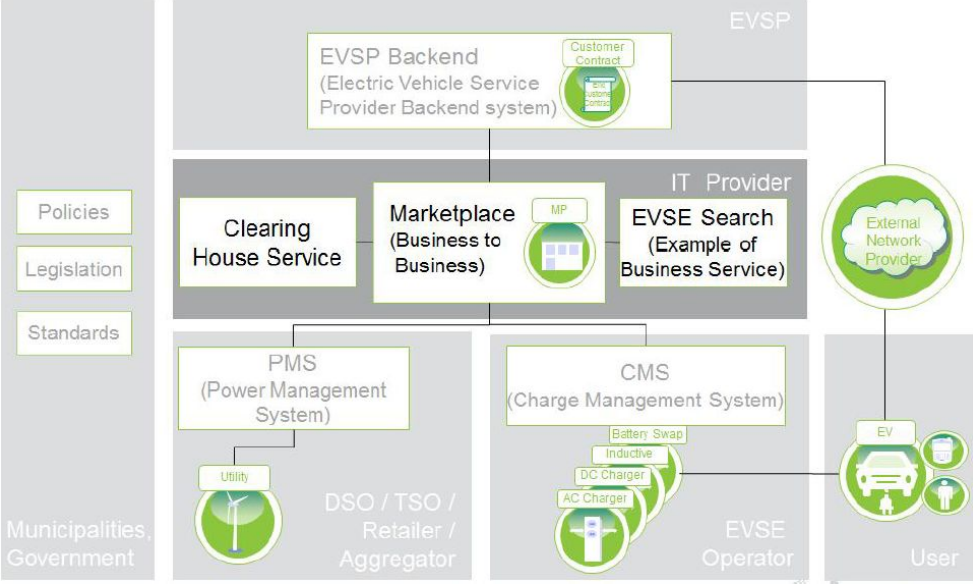
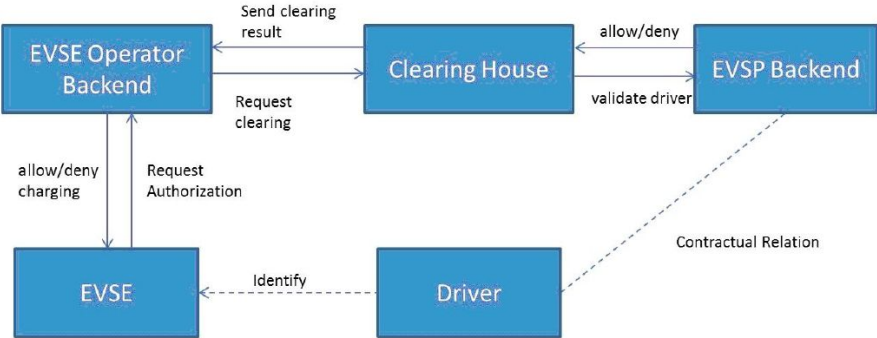
manufacturers are more and more supporting OCPP. There is however no formal commitment made by the industry.

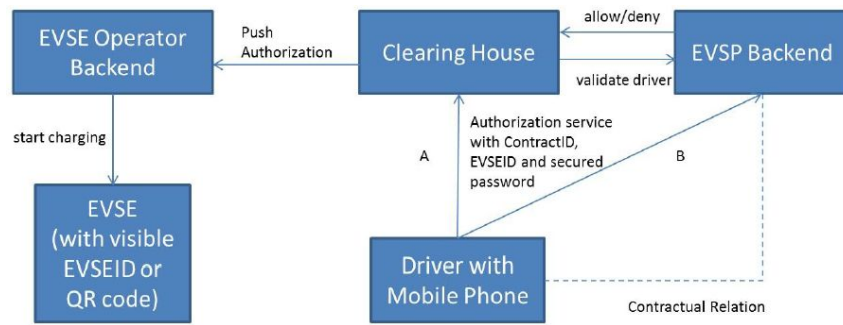


Annex B. Interoperability solutions dealt in the different initiatives

| | |
|---|-----|
| A2A | 101 |
| Bristol City Council | 115 |
| CROME platform | 106 |
| Danish Initiatives | 120 |
| e-Gap project | 113 |
| e-laad | 102 |
| ELVIIS approach | 119 |
| EnBW | 107 |
| Endesa/Enel | 96 |
| ESB | 117 |
| ETREL | 113 |
| Green eMotion Marketplace and Clearing House | 90 |
| Hubject Interchange | 103 |
| Iberdrola | 98 |
| IBIL | 93 |
| ICT4EVEU roaming platform (Spain) | 92 |
| Mugielec IOP concept | 95 |
| Portuguese approach | 100 |
| PowerUp project | 110 |
| RWE | 105 |
| Siemens | 108 |
| SmartCEM project | 116 |
| ZSE-Verbund | 118 |



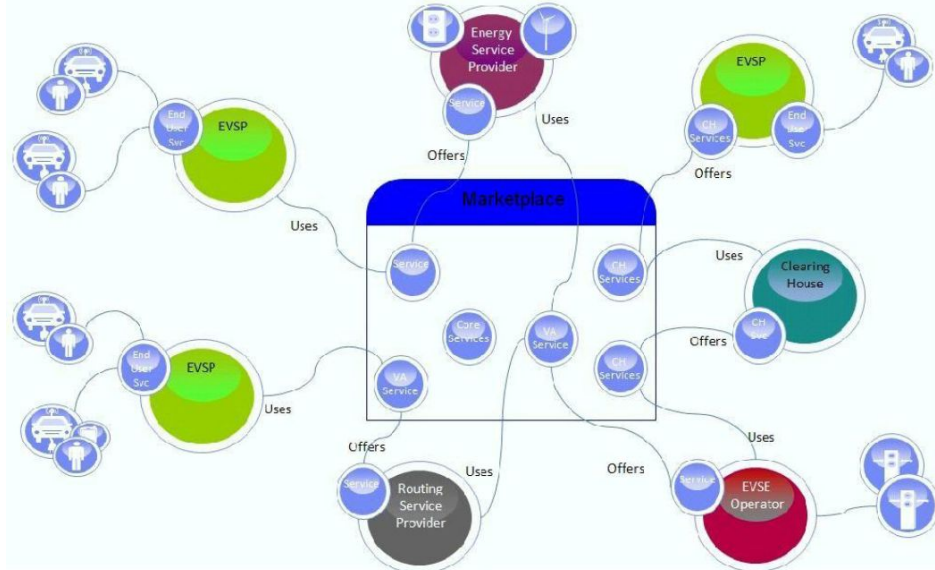
| | |
|-----------------------------|--|
| Name | Green eMotion Marketplace and Clearing House |
| Responsible partners | IBM (marketplace), SAP (Clearing House) |
| Description | <p>Marketplace and Clearing House developed in the frame of Green eMotion EU FP7 project. Some GeM characteristics are extracted from project public deliverables and presented below.</p> <p>D3.6. [24] comprises the service interfaces agreed among the major e-mobility partners. The highlighted area in the following picture illustrates the scope of the deliverable, including the components and the interfaces from, to and between them.</p>  <p>D3.6. describes service interfaces and business objects through their attribute, data type and constraints in the following domains:</p> <ul style="list-style-type: none"> • General electric mobility. • Roaming. • Energy: load management. • Marketplace and multi-marketplace. <p>The authorization process in a roaming case will be performed according to the following diagram (at EVSE, up, and via smart phone, down).</p>  |



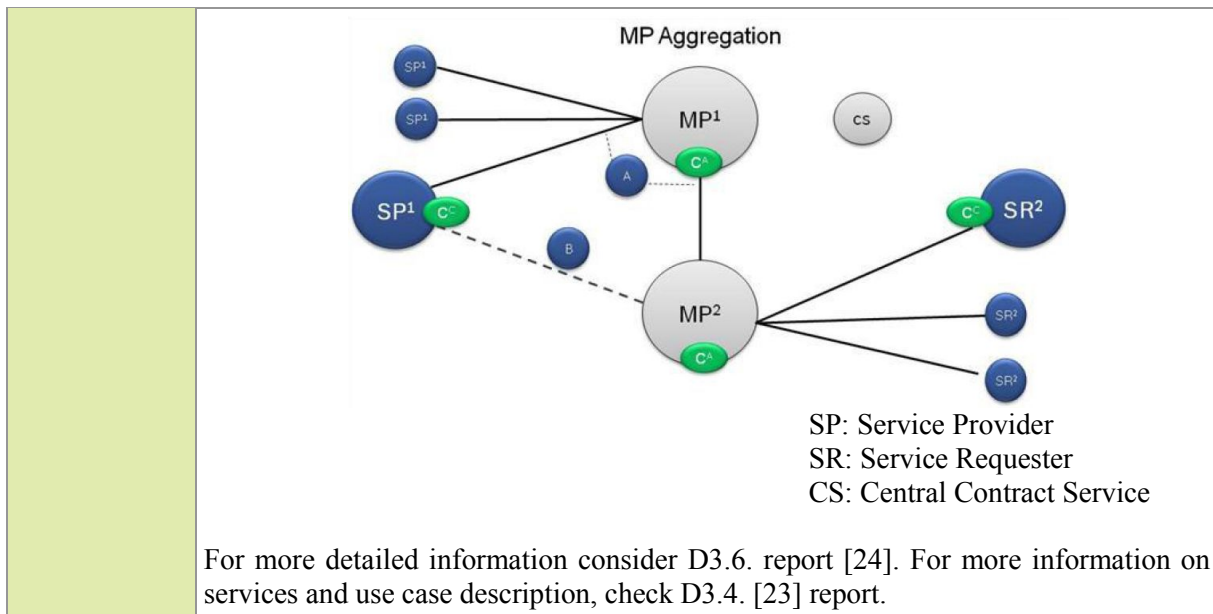
Load management is described through several use cases, among which the following:

- The DSO sends a load reduction order (in the form of a target load curve) to the EVSE back-end for a specific area.
- EVSE back-end gets load areas update for peak saving, balancing or ancillary services from DSO.
- DSO retrieves aggregated EV charge overview from EVSE back-end.

The Green eMotion marketplace is a virtual B2B market for e-mobility related services. It can be split into two major areas: the technical part, which performs the actual execution of the IT services through the interconnection of the back-end systems of all participants (it is called DSG), performing not only data routing but request authorization as well; and the commercial part, which supports the processes to register parties and offer/contract services (registration, authentication, creation and maintenance of services categories, creation and publication of service offers, creation and termination of contracts, search functionalities...).



The multi marketplace domain model seeks to offer services to a higher number of participants. The communication is done via the market places. Contracts can be aggregated by the market place but bilateral contracts are possible.



| New Services | | | Service Responsible (Stakeholder) | |
|--|-----------|--|-----------------------------------|----------------------|
| Marketplace | | | Marketplace operator (IBM) | |
| Clearing House. The clearing house has the list of those IDs permitted to perform charging. It is accessed through the marketplace | | | Clearing House operator (SAP) | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| Marketplace | 1 | Prototype | | |
| Clearing House | 1 | Prototype | | |
| Communication from - to | | Applicable standards | | |
| Marketplace - SA back-end systems | | Web services. Information to be exchanged has been defined specifically within GeM project. Information available in D3.4 [23] (use cases), D3.6 [24] (core services and transaction design) and D3.8. [25] (implementation of demo prototype) public deliverables among others. | | |
| IUT/SUT/EUT | | Conformance testing | Interoperability testing | |
| | | | | |
| Aspects for improvement | | A system able to interoperate with GeM marketplace would not be able to interoperate with the European commercial roaming platform Hubject, because the exchanged information is different. | | |

| | |
|-----------------------------|--|
| Name | ICT4EVEU roaming platform (Spain) |
| Responsible partners | Iberdrola, Ibil, Tecnalia |
| Description | Develop a general management system of EV infrastructures assuring mobility in an area of 100 km between the cities of Vitoria and Pamplona. This development takes as reference GeM marketplace and clearing house developments. The platform is already working and it might also be deployed after the end of the |



| | | | | |
|---|------------------|---|--|---------------------------------|
| project. | | | | |
| New Services | | | Service Responsible (Stakeholder) | |
| Roaming though Clearing House | | | Global Service Provider - Tecnia is developing the CH but currently is under negotiation who will be the charging operator | |
| End-user information services: Reservation of charging point, even while roaming Smart phone notifications Identification of optimal CP, even while roaming Guidance to optimal CP, even while roaming CP monitoring, even while roaming | | | EVSE operator = EMSP: IBIL and Iberdrola | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE | 8 | Ingeteam | 1, 2, 3 | Charging mode 3 characteristics |
| EVSE | 6 | Ingeteam | 1, 2, 3 | Charging mode 3 characteristics |
| IMS | 1 | Infrastructure Management System: it consists of 3 parts, EVSE operator system, EMSP system and the EUIS (providing web and mobile interface) | | |
| GSM | 1 | Clearing House platform: initially OCHP was taken as reference but services have evolved based on EMSP operator requirements | | |
| Communication from - to | | Applicable standards | | |
| EV user - EVSE | | RFID (Mifare classic) | | |
| EV - EVSE | | IEC 61851-1 | | |
| EVSE - EVSE operator | | GPRS/UMTS, OCPP v.1.2 | | |
| EVSE op. - Other actors (clearing house) | | Web services; SOAP, XML, HTTP Compatible with GeM clearing house. Basic services are common with those of GeM (authorization and charge data records) although some new attributes have been added. New functionalities will be added based on the same GeM design. Connection with GeM project is performed through Iberdrola. | | |
| IUT/SUT/EUT | | Conformance testing | Interoperability testing | |
| | | | | |
| Aspects for improvement | | | | |

| | |
|-----------------------------|------|
| Name | IBIL |
| Responsible partners | IBIL |



| | | | | |
|-----------------------------------|--|--|--|---|
| Description | <p>IBIL is one of the most important EVSEOs and EMSPs in the Spanish market. At the moment, it has the larger public infrastructure for the charge of EVs, including both AC and DC charge. It also has charging points and customers in the residential sector.</p> <p>IBIL considers that the interoperability exists when real time charge authorization and billing is performed.</p> <p>In the frame of ICT4EVEU, project IBIL, together with Iberdrola and TecNALIA, is involved in the development of a clearing house platform that permits the relationship between e-mobility providers in order to offer roaming services.</p> <p>More information about this platform is available at ICT4EVEU (Spain) description. Apart from this EU project, IBIL is involved in some of the initiatives presented in Annex A, like Movele Madrid.</p> <p>The infrastructure developed by IBIL permits EVSE remote control, allowing load management. (https://www.ibil.es/)</p> | | | |
| New Services | | Service Responsible (Stakeholder) | | |
| Roaming (ICT4EVEU Spain) | | interoperability platform operator | | |
| Load management (EVSE management) | | EVSEO=EMSP, TSO | | |
| Asset type | Asset No. | Model/ Prototype | Charging mode & connector type | Power supply options |
| EVSE | | IBIL Box 100 (wallbox) | Mode 3. Type 1 or 2 (connection case C) | 1ph. 230/32A |
| EVSE | | IBIL box 200 | Mode 2. Schuko (Type F, CEE 7/4) Mode 3. Type 2 | 1 ph. 3 ph. 230/400V 32A (22kW max.) |
| EVSE | 18 | IBIL box 300 | Mode 4. CHAdeMO | 400/125A (50kW max.) |
| EVSEO back-end | 1? | Proprietary | | |
| Communication from - to | | Applicable standards | | |
| EVSE - EVSE operator | | OCPP v1.2. as base with seven additional messages. | | |
| EVSE - EV user | | RFID (no contact credit cards might be a possibility for the future) | | |
| EVSEO - TSO | | TSO specifications apply (regulation establishes that the EMSP=EVSEO should be connected with the TSO in order to receive settings, but details are still to be defined) | | |
| IUT/SUT/EUT | | Conformance testing | | Interoperability testing |
| Aspects for improvement | | <p>Having an interoperability platform is only the first step to implement roaming (technical interoperability) but a more challenging aspect is to establish the commercial relationships that will make the interaction between EMSPs and EVSEOs effective.</p> <p>It is easy that more than one interoperability platform will be developed at EU level, therefore it would be interesting to assess the possibility of interoperability between different platforms.</p> <p>Complex RFID coding is a barrier for interoperability. The use of the UID to check the identity of the issuer of the card may permit higher levels of interoperability, transferring the intelligence of the identification and authorization process to the</p> | | |



| | |
|--|--|
| | back-end systems instead of achieving it through a complex data encoding in the RFID card. |
|--|--|

| | | | | |
|--------------------------------|------------------|--|---|-----------------------------|
| Name | | Mugielec IOP concept | | |
| Responsible partners | | Tecnalia | | |
| Description | | The Mugielec concept seeks to achieve infrastructure interoperability through the definition of a system architecture used as gateway. | | |
| | | New Services | Service Responsible (Stakeholder) | |
| | | Load management at EVSE: start, stop and power limitation | EVSE operator = EMSP | |
| | | Car park intelligent reservation: it allows more features than the OCPP protocol does (cut load if someone comes to a reserved charge point...) | EVSE operator = EMSP | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| Gateway | 1 | Prototype permitting services (intelligent charge point reservation, charge authorization, load management) and the communication between any EVSE and secondary actors. It is a software installed in a PC. | | |
| Charging points | | Different brands and different communication implementations: OCPP, CHAdeMO, Modbus | | |
| Communication from - to | | Applicable standards | | |
| EV user - EVSE | | RFID authentication with white lists or at the Gateway | | |
| EVSE - EVSEO=EMSP | | OCPP v1.2. all messages were implemented. | | |
| EVSE - EVSEO=EMSP | | Modbus | | |
| EV - EVSE | | Based on modems (not in real equipment). Only the communication between EV modem and EVSE was tested. | | |
| EV - EVSE (DC) | | The CHAdeMO communication protocol was implemented and tested with real EVs (is not really dealing with interoperability) | | |
| EVSE - Gateway - EVSEO/EMSP | | The gateway translates the Modbus or OCPP of EVSEs to a proprietary protocol based on OCPP but different to it (allowing for more services compared to v1.2.) to communicate with other upstream actors | | |
| IUT/SUT/EUT | | Conformance testing | Interoperability testing | |
| | | | | |
| Aspects for improvement | | Depending on web services' policies and addressing, implementation might need to be carried out in a different way. Even if a system results compliant with OCPP, the web service implementation might prevent interoperability. | | |



| | |
|-----------------------------|--|
| Name | Endesa/Enel |
| Responsible partners | Endesa (Enel Group) |
| Description | <p>Endesa/Enel is operating a commercial ITC platform (EMMs) able to validate access to, monitor and control all AC charging points installed by the company. This platform is a commercial solution already working and is the basis for the development of additional features that are being tested in the demo projects in which the company is currently involved.</p> <p>In GeM [26], a short description of this central control system for electromobility management (EMM) is provided. It allows a real time remote control and management of the charging points installed by EVSE operators. It is based on a proprietary protocol and on a custom architecture.</p> <p style="text-align: center;">marketplace services and management</p> <div style="text-align: center;"> <p>The diagram illustrates a multi-layered architectural stack. At the top is the 'marketplace services and management' layer, which connects to a 'Custom Protocol' layer (referred to as 'like ISO 15118'). Below this is the 'TCP-IP' layer, which contains two ovals: 'Recharging process (Custom port: 63000)' and 'Other processes (i.e. software updating) (FTP, NTP port etc.)'. A green box labeled 'Evolution towards SSL / ...' is positioned between these two ovals. The 'TCP-IP' layer sits on top of an 'IP network' layer, which is supported by 'ADSL' and 'GPRS' connections. The bottom layer is labeled 'users and infrastructure'.</p> </div> <p>The protocol used on top of the architectural stack is similar to the ISO 15118 but with significant differences. No management protocol was chosen but a custom approach was considered for flexibility purposes (i.e. SNMP). The messages exchanged are composed of two parts:</p> <ol style="list-style-type: none"> 1. A header that is the same for every message. 2. A payload that is particular for each message. <p>Some ISO 8583 standard (<i>Financial transaction card originated messages — Interchange message specifications</i> used for payment cards) conventions were considered for message specification. The structure of the message is the following.</p> <div style="text-align: center;"> <p>The message structure is shown as a horizontal bar divided into several colored segments. From left to right, the segments are: a yellow segment for 'length (4 bytes)', a green segment for 'type (4 bytes)', an orange segment for 'timestamp (5 bytes)', a blue segment for 'protocol type + Var (3 bytes)', a red segment for 'requestID (8 bytes)', a dark red segment for 'Cn_of (20 bytes)', a light blue segment for 'extension (3 bytes)', a grey segment for 'signature', and a final grey segment for 'payload (var)'. Arrows point from each label to its corresponding segment in the bar.</p> </div> <p>All the charging stations installed in the Enel Distribuzione grid should permit</p> |



| | customers chose their preferred Energy Trader (AEEG D.242/10). | | | |
|--|--|--|---|---------------------------------|
| New Services | | | Service Responsible (Stakeholder) | |
| Roaming/Clearing House (Green eMotion) | | | Clearing House Operator (SAP) | |
| Marketplace (Green eMotion) | | | Marketplace operator (IBM) | |
| Load management (Endesa/Enel - EMMs), currently a power limit could established manually at each EVSE, in the future automatic setting of power supply limits is foreseen (commercial approach, ZEM2ALL, E-mobility Italy) | | | DSO=EMSP=EVSE operator (Endesa/Enel) | |
| Load management, a power limit is established at the EVSE (Green eMotion) | | | DSO=EMSP (Endesa Enel), EMSP op. (Siemens) | |
| Connection of different platforms for monitoring: smart city, EVSE op. (ZEM2ALL) | | | NEDO (EMS), EVSE op. (Endesa/Enel) | |
| Information about the location and the real time status of the charging stations (E-mobility Italy) | | | EMSP = OEM (Renault, BMW) | |
| Prepaid, flat rate and ToU applicable tariffs (E-mobility Italy) | | | Energy Retailers (Enel Energia, Heracomm, Acea, Iren) | |
| Customer interface for the customers (app, web portal) (E-mobility Italy) | | | DSO=EMSP (Enel Distribuzione) | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| AC EVSE | E-mobility: 350 1300 | Enel Group (ZEM2ALL, E-mobility) Pole station (public) Box station (home) | Each EVSE has a smart meter Type 2 Type 3a in Italy | 3,7 kW Max. 44kW |
| AC EVSE | 10 | Siemens (GeM)/Prototype | Mennekes, Schuko | Able to perform load management |
| DC EVSE | | Enel Group (commercial) | Chademo, Mennekes, CCS | |
| DC EVSE | 20 | Hitachi and Mitsubishi (ZEM2ALL) | Mode 4, CHAdEMO | 50kW |
| EVSEO/EMSP back-end system | 1 | EMM (Enel Group, commercial) | | |
| Marketplace | 1 | Prototype (GeM) | | |
| Clearing house | 1 | Prototype (GeM) | | |
| Communication from - to | | Applicable standards | | |
| EV - EVSE (E-mobility Italy) | | ISO 15118 | | |
| EV user - EVSE | | RFID (Endesa/Enel ISO 14443): user ID is sent (Endesa/Enel) (Mifare) RFID (GeM): this standard permits to provide information about the country, EMSP and user ID. This would permit a direct connection with the market place. | | |
| EVSE - EVSE op. (EMMS) | | Proprietary. Based on XML. Proposed in EMI3 work group as | | |



| | | |
|---|---|---------------------------------|
| Endesa/Enel, AC) The EMMs system is located in Italy and all Endesa/Enel EVSEs are connected to it | standard. GPRS communication through a specific SIM and VPN | |
| EVSE - EVSE op. (Endesa, DC) | OCPP 1.5. (authorisation, monitoring) | |
| EVSE - EVSE op. (Siemens) | Proprietary. Proposed in EMI3 work group as standard. | |
| EMMs - EVSE op. (Siemens) | Messages defined in GeM | |
| EMMs - marketplace (GeM) | Web services. Information to be exchanged has been defined specifically within GeM project | |
| Roaming (GeM): EV user - EVSE - EVSE op. (optional) - Marketplace - Clearing House and back | See previous connections regarding GeM project. When a charging point able of performing roaming detects an ID that does not belong to its users, it forwards it to the marketplace, that derives it to the clearing house, where a list with accepted IDs is located. If the ID is valid, a confirmation is requested to the EMSP of the customer, that will authorise or not the charging in roaming mode. | |
| EMMs - other users upstream | Not available commercially at the moment. Web services with GeM marketplace. | |
| IUT/SUT/EUT | Conformance testing | Interoperability testing |
| | | |
| Aspects for improvement | Various RFID identification options have been found and this makes interoperability more difficult. | |

| | |
|-----------------------------|---|
| Name | Iberdrola |
| Responsible partners | Iberdrola |
| Description | <p>Iberdrola group is a company for energy services provision including electricity and gas supply and electricity generation and distribution. One of its companies is an e-mobility service provider and charging point operator. They participate in EU projects such as the ICT4EVEU and Green eMotion in which they present pilots dealing with EV deployment.</p> <p>In the frame of ICT4EVEU, project the company is involved in the development of a clearing house platform that permits the relationship between e-mobility providers in order to offer roaming services (with IBIL e-mobility provider).</p> <p>This platform is based in web services and apart from the authorization to perform the charge and to supply charging data, it will be able to perform reserves, update charging point status and manage client aspects. The platform is further discussed in the ICT4EVEU (Spain) reference.</p> <p>If a new e-mobility or EVSE operator should join the roaming platform, it should implement the required communications in its system, based on a specification. The maintenance of the platform and specification conformance testing of new incomers should be performed by a third party.</p> <p>Iberdrola considers that all EV users should be able to charge their vehicles at any charging point (independently from the EVSE operator), including those clients who do not have an e-mobility service contract.</p> <p>With respect to smart charging, Iberdrola considers the open loop as the best option, i.e., the customer responding to different electricity prices within a demand response strategy (not specific for the EV).</p> |



| | | | | |
|---|---|--|--|-----------------------------|
| https://www.iberdrola.es/clientes/hogar/movilidad-verde | | | | |
| New Services | | | Service Responsible (Stakeholder) | |
| roaming (ICT4EVEU Spain) | | | interoperability platform operator | |
| roaming (long term) | | | EVSE operator and payment service platform | |
| Charging point management | | | EVSE operator | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| | | | | |
| Communication from - to | | Applicable standards | | |
| EVSE - EVSE operator | | OCPP v1.2. as base, with four additional messages. | | |
| EVSE - EV user | | RFID | | |
| EVSE - EV user (long term) | | Through a smartphone app involving a payment platform and the EVSE operator. | | |
| IUT/SUT/EUT | Conformance testing | Interoperability testing | | |
| EVSE back-end system | | Though it is not performed currently, someone connecting to a interoperability platform should certify that its system is working according to the platform specifications | | |
| Aspects for improvement | <p>The following drawbacks are considered from Iberdrola's point of view to the interoperability platform system:</p> <ul style="list-style-type: none"> • EV users are required to have a contractual relationship with an e-mobility provider. • EV users can only charge at the charging points of the EMSPs linked with that platform. • It requires a big infrastructure, application... investment for the e-mobility providers. Web services should be implemented and other parts of the management software of the company may also be affected. <p>Iberdrola thinks that the market will evolve towards a system in which no contract is required, all charging points can be accessed by EV users and no interoperability platform is required. The solution might be to access to a payment platform after the charging point ID (number, code...) has been introduced in your smart phone. An intermediate payment platform, between clients, EVSE operators and payment companies like VISA or Paypal (independent, external service), would provide different payment options (VISA, Paypal) and would also be responsible for the operation (it is not a simple payment like those provided in web sites). The involved parties would only be the EV user, the EVSE operator and the payment platform. This would be economically possible only with a high number of operations (when the financial costs of these micro-payments will be compensated by the incomes of the service).</p> <p>Most EVSE operators in Spain (IBIL also) seem to have their own protocol to control their EVSEs based on OCPP v1.2 but with modifications fitting their own services (new messages added). This means that EVSE manufactures must adapt the firmware of their equipment depending on the client.</p> <p>To update the protocol (for example from OCPP 1.2. to 2.0) means to modify the firmware at the EVSE, the communication layer at the EVSE management system and all the other applications that might be affected by the change. This is why it is not advisable to perform this type of upgrade too often.</p> | | | |



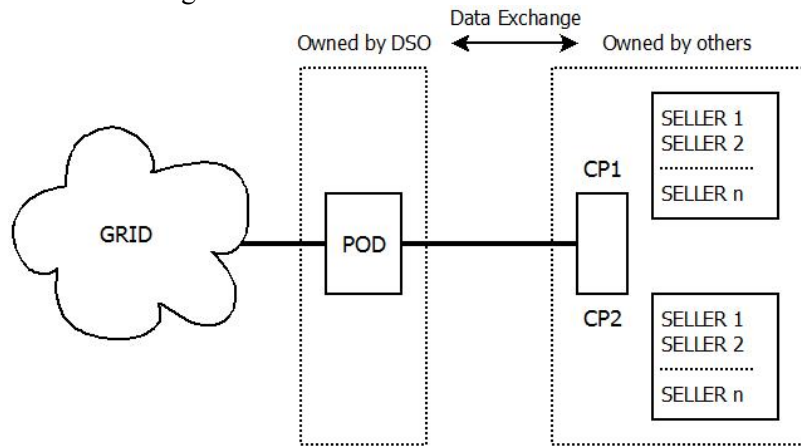
| | | | | |
|--|------------------|---|---|--|
| Name | | Portuguese approach | | |
| Responsible partners | | Mobi.e | | |
| Description | | <p>Interoperability is achieved by building a national network with the same charge characteristics and requirements throughout Portugal.</p> <p>Third parties can install new EVSEs but they must be interoperable with those of the Mobi.e network (Portaria 1201/2010) and they must be included in the e-mobility National Network (Rede Nacional de Mobilidade Eléctrica, Portaria 252/2011). EVSE operators are allowed to enter the business but both infrastructure access and electricity prices for EV charge are, somehow, regulated (Portaria 180/2011, for EVSE operators).</p> <p>In the Mobi.e Intelligence Center the use of EVSEs is monitored in real time. Information on economical and energy fluxes is managed and operation and maintenance activities on EVSEs can be accomplished remotely. It also operates as an interoperability platform between the different actors in the EV field (sort of clearing house).</p> <p>According to the not fully updated information at the web site, until June 2011, electricity and system and infrastructure access was free of charge. Between July 2011 and the end of the pilot phase (envisaged for the end of 2012), each Electric Mobility Electricity Retailer (CEME) may charge for electricity at its market price. The free use of the pilot network will continue, but private locations available to the public may charge a fee for infrastructure access, which will have to comply with a ceiling defined annually by the regulator.</p> | | |
| | | New Services | | Service Responsible (Stakeholder) |
| | | Mobi.e intelligence center | | EVSE operator (centralised) |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE | | The meter inside the EVSE is defined: JANZ brand, Ecostar model | <p>Mode 3. Four wheel vehicles of more than 2,5kW. IEC 62196 type 2 sockets</p> <p>Mode 1. vehicles of 2, 3 and 4 wheels under 2,5kW.</p> <p>For normal charging points with more than one socket, at least one IEC 60309 industrial socket must be available</p> | 230/400V 63A max. |
| Communication from - to | | Applicable standards | | |
| EV user -EVSE | | RFID Myfare. Initially the Calypso standard was planned so a multi-standard reader is a plus. | | |
| EVSE - EVSE management system (Mobi.e intelligence centre) | | 4G/3G/GPRS modem for SIM card, which is provided by the Clearing House entity Mobi.e proprietary communications protocol. It is a SOAP protocol but different to OCPP which was created later. Definition on whether this protocol should be maintained or changed is currently under discussion. | | |
| IUT/SUT/EUT | | Conformance testing | | Interoperability testing |
| | | | | |
| Aspects for improvement | | | | |



| | | | | |
|---|--|--|---|--|
| Name | A2A | | | |
| Responsible partners | A2A | | | |
| Description | <p>E-mobility implementation has been performed by means of the E-moving initiative in the north of Italy.</p> <p>At the present a flat tariff is being used for the card, in order to minimize the impact of the payment of each charging, avoiding the distribution of the equipment cost components through distributor, seller and service provider.</p> <p>A2A is testing the so called business model “service provider in exclusive way” as it is not a DSO nor a UdD according to the AEEG Delib. 242/10. AEEG gives A2A an incentive on each public CP to share the data with them.</p> | | | |
| New Services | | Service Responsible (Stakeholder) | | |
| Roaming between EVSEO | | EVSEO=EMSP (ongoing work) | | |
| SMS for diagnostic and end of charge | | EMSP | | |
| Payment on consumption (future) | | EMSP | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE public | 50 | | Two connectors: Mennekes for cars Scame for quadricycles and scooters | double CP: 3 phase 22kW each 1 phase 3,7kW |
| EVSE private | 170 | | Mennekes for cars Scame for quadricycles and scooters | Walbox single CP, poles double CP |
| EV | 47 | Renault (Kangoo, Fluence) | | |
| A2A Data centre | | Proprietary | | |
| Communication from - to | | Applicable standards | | |
| EV - EVSE | | IEC 61851-1 (PWM), CEI 64-8 V1 (Italian standard), ZE ready (Renault standard) | | |
| EV user - EVSE | | RFID Myfare plus (a common standard with Enel and Repower is under definition) | | |
| EVSE - EVSEO back-end | | Proprietary | | |
| EVSEO back-end - EVSEO back-end (roaming) | | Under definition in Italy for authorization and exchange of charge data | | |
| IUT/SUT/EUT | | Conformance testing | Interoperability testing | |
| Charging point | | ZE Ready + all standards | From Charging point to EV | |
| Smart card | | | Switch from MYFAIR CLASSIC to MYFAIR+ (not already) | |
| Aspects for improvement | | Difficulties arise in managing the charging payment in the electrical market (as required by AEEG) for roaming in a POD. The POD is installed by the DSO but several vendors can have access to the CP, which is not accessible by the DSO. For poles with single CP, the energy vendor changes from time to time, while | | |



for poles with two CPs different vendors can be present at the same time. The DSO should charge each vendor for the electricity it sells at the CP asking for relevant data to the owner of the CP.

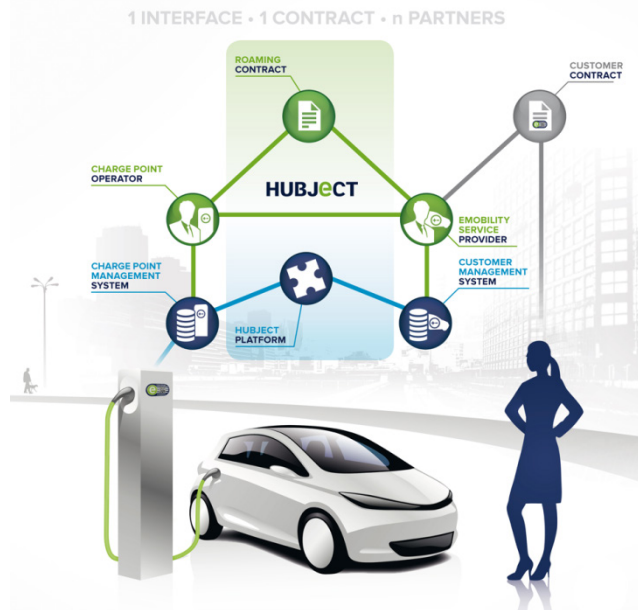


| | | |
|-----------------------------|--|--|
| Name | e-laad | |
| Responsible partners | e-laad (foundation including DSOs, EVSE and EV OEMs, EMSP...) | |
| Description | <p>Next to placing and maintaining public chargers, the e-laad foundation was and still is actively involved in the definition of (open) EVSE-backoffice protocols (such as OCPP and OSCP):</p> <ul style="list-style-type: none"> • E-laad developed, together with a few partners (such as Logica/GCI, Alfen and Enexis), the Open Charge Point Protocol (OCPP). OCPP is an open standard that allows (amongst a few other things) back-office systems to access EVSEs for unlocking, starting, stopping, data exchanging, diagnosing, resetting and updating an EVSE. Through OCPP the EVSEs can send out authorizations, notifications, meter values and other data to the back-office system. All of the mentioned EVSE partners support the OCPP protocol and a growing number (> 50 countries) of European, American and even Asian EVSE manufacturers and EVSE service providers support this open standard for their devices and services. OCPP is now managed through the Open Charge Alliance (http://www.ocppforum.net/). • For allowing the benefits of smart charging to be exploited at grid level, e-laad (with partners such as Enexis) are working on the Open Smart Charge Protocol (OSCP). The OSCP (amongst other things) provides mechanisms for exchanging information on, and for negotiations about, available capacity, reserve capacity and current and future electricity prices. OSCP in combination with OCPP (version 2) would complete the back-office infrastructure required for smart charging and V2G. <p>e-laad (and a few of their partners) published a web-site on which EV drivers can search for public chargers (see: http://www.e-laad.nl/zoek-een-oplaadpunt/). On the e-laad site information is shared the exact location of the EVSE, its connector type, the owner, the maximum charging rate, whether it is currently occupied, what payment method is to be used and which extra facilities are provided by, or in the vicinity of, the EVSE. On https://www.oplaadpunten.nl/ a smartphone app can be downloaded for Apple, Android and Windows platforms, revealing the public charging stations. The “Love to load” app from The New Motion has a similar approach.</p> | |
| | New Services | Service Responsible (Stakeholder) |



| EVSE monitoring and control | | EVSEO | | |
|---|---|--|--|-------------------------------|
| Smart charging | | EVSEO/DSO | | |
| EVSE location and information (web and smart phone app) | | EVSEO | | |
| EVSE access (common RFID card) | | EVSEO | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE | 2897 | Alfen ICU, Chargepoint, EV-Box, The New Motion | Mode 1, mode 3 and mode 4 | < 2,3 kW; 3,7-20 kW; 20-43 kW |
| EVSE-back-end | 1? | e-laad proprietary | | |
| Communication from - to | | Applicable standards | | |
| EV user - EVSE | | RFID ISO14443a/b | | |
| EV - EVSE | | IEC 61851, IEC 62196, SAE 1772 | | |
| EVSE – EVSEO back-end | | OCPP | | |
| EVSEO back-end - DSO back-end | | OSCP | | |
| IUT/SUT/EUT | Conformance testing | | Interoperability testing | |
| EVSE | | | Renault ZE Ready label (charging solution compatible with Renault Z.E. vehicles) | |
| EVSE | Dekra seal for safety, quality and sustainability | | | |
| EV/EVSE | | | Pre-test new combinations of EV and EVSE in a test environment or in the field | |
| EV/EVSE | | | Regression tests on physical or simulation/test environment. | |
| Aspects for improvement | | | | |

| Name | Hubject Interchange |
|----------------------|--|
| Responsible partners | BMW group, Daimler, RWE, Siemens, EnBW, Bosch (joint venture) |
| Description | <p>Hubject (http://www.hubject.com/) connects charging infrastructures all over Europe and enables an easy access to charging stations for electric vehicles (roaming). It connects e-mobility market participants to a strong network while at the same time offering IT services for new business models. Using the interchange logo they provide a symbol that identifies all compatible charging points that can be used. It is based upon a business and IT platform. E-mobility providers must be connected to Interchange in order for EV users to be able to charge in all stations compatible with Interchange. Currently, stakeholders from Germany, Benelux and Austria are connected to Interchange.</p> |



<http://www.hubject.com/pages/en/index.html#4-4-check.html>

Working on behalf of Hubject GmbH, a Berlin-based joint venture between the automotive, IT and energy industries, the IT company secunet has developed the world's first operational e-mobility certificate authority for master certificates. Such certificates will be required in future to ensure that electric vehicles can safely communicate with the corresponding charging infrastructure. They also lay the groundwork for use of the plug & charge system, which allows automatic, cash-free settlement at any publicly accessible charging station.

Individual electronic certificates enable the respective customers and charging stations to identify each other in an unambiguous and reliable manner in the course of the communications process taking place during the charging process. The certification authority (Root CA) being placed into service by Hubject generates master certificates for automobile manufacturers, charging infrastructure operators, and EV electricity suppliers, who can then use these master certificates to create derived certificates for use in their own products.

The international ISO standard 15118, which governs the proper charging of electric vehicles at the “wall boxes,” the personal charging units installed in garages, as well as at public charging stations, stipulates a “Root Certificate Authority” as a prerequisite – i.e. precisely the type of certificate authority that Hubject is now operating and making available to its European partner companies via the Hubject Platform.

| New Services | | | Service Responsible (Stakeholder) | |
|---|-----------|---------------------|--|----------------------|
| Roaming | | | Clearing House Operator/Roaming services provider (Hubject) | |
| Connect (Hubject): platform for e-Mobility providers (EMSP back-end system) | | | Clearing House Operator/Roaming services provider (Hubject) (service for e-mobility providers) | |
| Share (Hubject): platform for EVSE operators (EVSE back-end system) | | | Clearing House Operator/Roaming services provider (Hubject) (service for EVSE operators) | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| IT platform | 1? | Hubject proprietary | | |



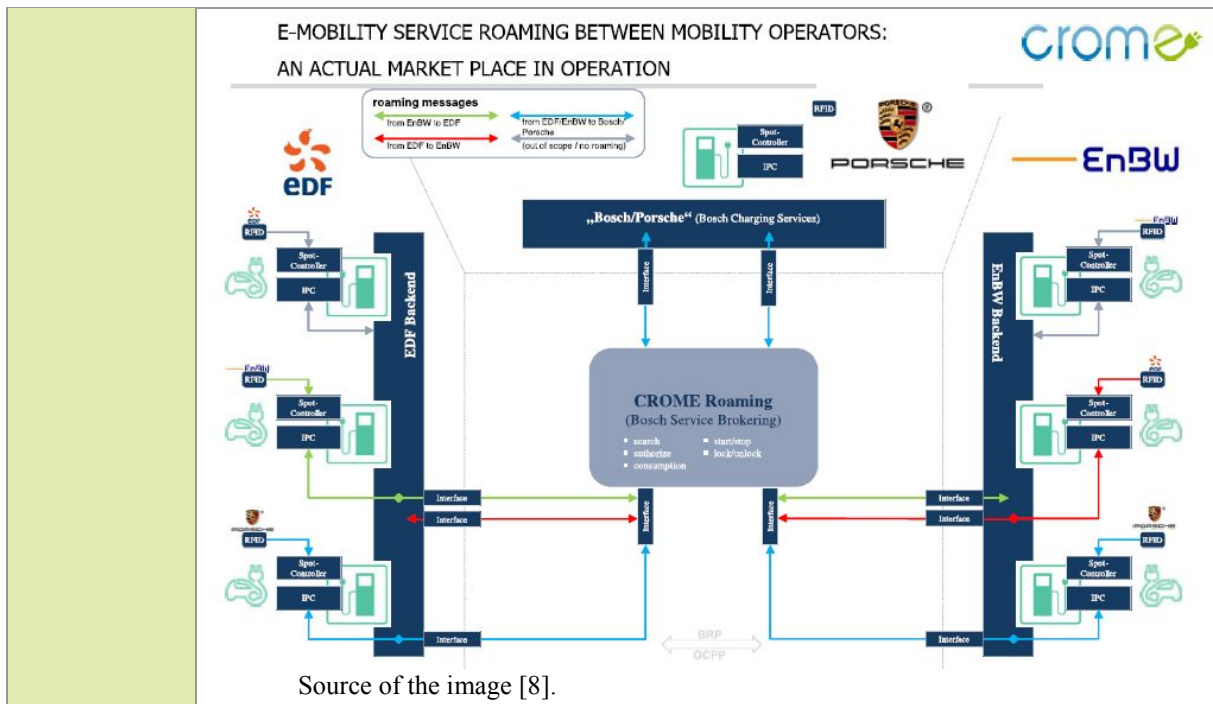
| Communication from - to | | Applicable standards |
|---------------------------------------|---------------------|---|
| Intercharge chargers - EV user | | QR code in the charging spots enables users to activate charging transactions by means of a free smart phone app. RFID cards or identification via PLC are also possible for the authentication depending on the technical equipment of each charging station operator. |
| Intercharge EVSE Interchange platform | | - Hubject data model and OICP (Open InterCharge Protocol), defined and used by Hubject and maintained by the Belectric Group. A software is being developing eMI3 and OICP bindings (https://github.com/eMI3/OICP-Bindings) |
| IUT/SUT/EUT | Conformance testing | Interoperability testing |
| EVSE | | eRoaming Technology seal: Hubject gives a seal to those chargers compatible with its roaming platform. Hubject testing platform. |
| Charging station management systems | | Certified eRoaming system: Hubject gives a seal to those charging station management systems compatible with its roaming platform. Hubject testing platform. |
| Aspects for improvement | | |

| Name | | RWE | | |
|--|--------------|---|--------------------------------|--|
| Responsible partners | | RWE | | |
| Description | | RWE Effizienz (https://www.rwe-mobility.com) is a supplier of smart charging infrastructure and IT services and offers intelligent e-mobility solutions for cities, vehicle fleets and private users of electric vehicles. RWE is one of the six shareholders of Hubject GmbH joint venture, which created the "intercharge" eRoaming platform. | | |
| New Services | | Service Responsible (Stakeholder) | | |
| roaming | | Clearing House Operator/Roaming services provider (Hubject) | | |
| Smart charge | | DSO through EVSEO | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE | 2700 (total) | RWE eBOX, eStation | Type 2, mode 3 | 400V-16A, 230V-16A |
| EVSE | | RWE eBOX smart, eStation smart, eStation combi | Type 2, mode 3 | 400V-32A, 230V-32A (eStation two outlets 44kW, eBox one outlet 22kW) |
| EVSE | | RWE eStation combi | CHAdeMO, JARI level III | 50kW DC |
| Communication from - to | | Applicable standards | | |
| EVSE - WAN (connection with RWE's IT system, EVSE back-end system) | | L2GWAN data protocol has been published (it is open now) to allow other EVSE manufacturers install it in their equipment enabling them to use RWE's operator's services. It is a protocol accommodating all customer processes of the ISO/IEC 15118: it allows transparent billing, roaming, smart charging (charging is faster with renewable energy availability), the charging process can be controlled by a smart phone (to save costs or reduce the load on the electricity grid), etc. | | |



| | | |
|---|---|-----------------------------------|
| | Additional functions: charging is done automatically (Plug&Charge) and launched by customer cards or smartphone apps; and mobility services such as the reservation of charging points are covered by the open interface. It is based in GPRS communication. | |
| EVSE back-end system - EMSP back-end system | Enterprise service bus | |
| EVSE - EV AC (eBOX, eStation) | Controls the charging power via the pilot signal according to IEC 61851:2010/SAE J1772:2010. | |
| EVSE - EV AC (eBOX smart, eStation smart, eStation combi) | Plug & Charge via PLC communication in accordance with the ISO/IEC Standard 15118:FDIS supported by RWE and the SCCPS (Smart Charge Communication Protocol Suite, predecessor of ISO/IEC 15118, part of a pilot project initiated by Daimler and RWE in 2008) standard developed by Daimler and RWE; other authentication options depending on respective infrastructure operators. CSCC (Charging Station Control Center) with GSM-link; PLC modem (Power-Line-Communication) required for Plug & Charge; controlling of pilot signal in accordance with IEC 61851:2010/SAE J1772:2010 | |
| EVSE - EV DC (eStation combi) | CHAdEMO protocol. On the spot payment (EC direct payment / mobile payment) | |
| EVSE controller - smart meter | FNN EDL (German specification for smart meters) | |
| | IUT/SUT/EUT | Conformance testing |
| | | Interoperability testing |
| EVSE | | Hubject eRoaming Technology seal |
| Charging station management system | | Hubject Certified eRoaming system |
| Aspects for improvement | | |

| | |
|-----------------------------|---|
| Name | CROME platform |
| Responsible partners | EnBW, EDF, Bosch/Porche |
| Description | It demonstrates an interoperable easy-to-use charging infrastructure (plug, cable, etc.) and customer oriented services (authentication, billing, roaming, reservation, etc.). CROME is a platform allowing roaming between EDF, EnBW and Bosch/Porche systems. |



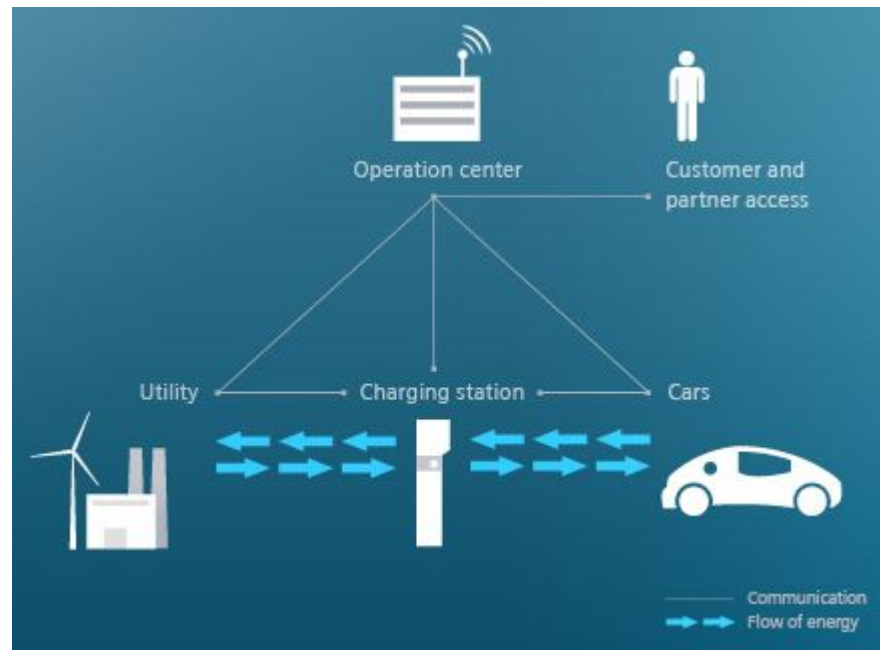
| New Services | | Service Responsible (Stakeholder) | | |
|---|---------------------|-----------------------------------|--|----------------------|
| Roaming (cross border) including authorization, CP search, charge start/stop, CP lock/unlock and consumption data exchange, billing between EMSPs | | CH operator (Bosch) | | |
| Common EVSE access | | EVSEO | | |
| Connection to GeM marketplace | | CH operator | | |
| Customer oriented web site and smart phone applications | | EMSP | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| roaming platform | 1 | COME roaming (Bosch) | | |
| EVSE (public) | | | 2 sockets: types 2 and 3. Type 2 is used in Germany and 3 in France Mode 3 | |
| Communication from - to | | Applicable standards | | |
| EV user - EVSE | | RFID | | |
| EVSEO back-end Roaming platform | | - Proprietary (web services?) | | |
| IUT/SUT/EUT | Conformance testing | | Interoperability testing | |
| | | | | |
| Aspects for improvement | | | | |

| | |
|-----------------------------|------|
| Name | EnBW |
| Responsible partners | EnBW |



| | | | | |
|--|---|---|---|-----------------------------|
| Description | EnBW has a network of charging points (KEBA manufactures for EnBW), provides charging service through the Elektronauten RFID card and participates in Research projects on electromobility such as CROME and iZeus (based on MeRegio Mobil). EnBW is one of the six shareholders of Hubeject GmbH joint venture. https://www.enbw.com/privatkunden/energie-und-zukunft/e-mobilitaet/projekte/index.html | | | |
| New Services | | Service Responsible (Stakeholder) | | |
| roaming (Hubeject) | | Clearing House Operator/Roaming services provider | | |
| roaming (CROME) | | Clearing House Operator/Roaming services provider | | |
| Smart charging (iZeus), focusing on renewable energy integration | | DSO/EMSP | | |
| V2G (iZeus) | | | | |
| Intermodal mobility systems (iZeus) | | EMSP | | |
| EVSE access | | EVSEO | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE | | EnBW-Ladestation | Mode 3. Type 2 (Mennekes) cars Mode 2. Schuko (2 wheel vehicles) | 22kW 3,7kW |
| EVSE | | e-Call | Mode 2. Schuko (2 wheel vehicles) | 3,7kW |
| Fleet energy management system | | iZeus project prototype | | |
| EV | | | | V2G |
| Communication from - to | | Applicable standards | | |
| EV user - EVSE | | RFID or key | | |
| EV - EVSE (iZeus/MeRegio Mobil) | | ISO/IEC 15118 | | |
| EVSE - Intercharge platform | | Hubeject | | |
| IUT/SUT/EUT | Conformance testing | | Interoperability testing | |
| EVSE (KEBA) | | | Hubeject eRoaming Technology seal | |
| Aspects for improvement | | | | |

| | |
|-----------------------------|--|
| Name | Siemens |
| Responsible partners | Siemens |
| Description | Siemens offers products and solutions for e-mobility, including electric motors, wall boxes and a comprehensive software portfolio, from the ICT architecture for EVs to mobility management, smart grid integration, etc. |



Siemens is one of the six shareholders of Hubeject GmbH joint venture.
 In GeM project, Siemens EVSE management system is connected for load management purposes with Enel system through web services, defined to allow the implementation of Enel group EV smart charging services.
 Siemens is the leader of the projects: eNterop and 4-S.
[\(http://www.siemens.com/electromobility/\)](http://www.siemens.com/electromobility/)

| New Services | | Service Responsible (Stakeholder) | | |
|--|---------------------|--|--------------------------------|--|
| EVSE management - Smart charging (GeM) | | EVSEO | | |
| EVSE management (proprietary) | | EVSEO | | |
| Fleet management (4-S) | | Fleet manager (EMSP/EVSEO) | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE | | WB100A, WB 110A, WB140A | Mode 3, Type 2 | 2ph: 230V, 16/20/32A 3ph: 400V, 16/20/32A |
| EVSE management system | | Proprietary | | |
| Fleet management system | | Proprietary | | |
| Communication from - to | | Applicable standards | | |
| EV-EVSE | | IEC 61851-1 | | |
| EV-EVSE (eNterop) | | ISO/IEC 15118 | | |
| EVSE - EVSEO back-end | | Proprietary. Involved in EMI3 | | |
| EV - Fleet management system (4-S) | | eCSM (Proprietary, based on Siemens PLM XML, which is open and based on W3C XML) | | |
| IUT/SUT/EUT | Conformance testing | | Interoperability testing | |
| EV/EVSE (eNterop) | ISO/IEC 15118-2/4 | | ISO/IEC 15118-2/4 | |
| Aspects for improvement | | | | |



| | |
|-----------------------------|---|
| Name | PowerUp project (This is not a demo project but it is considered of high interest) |
| Responsible partners | BroadBit, Volvo, CRF, Denso, Corinex, iTron, Technolution, PPC, ETSI |
| Description | <p>The scope of PowerUp project is to develop and validate the V2G communication interface. PowerUp shall progress through a full development cycle of physical and link-layer specification, protocol design for scheduling of recharging and for accounting control, prototype implementation, conformance testing, integrated field trials, and standardisation.</p> <div data-bbox="510 627 1244 1299" data-label="Diagram"> </div> <p style="text-align: center;">Image source: Public charging [27]</p> <p>Smart electric meters for automated meter-reading are the primary entry point into a smart-grid network and, therefore, PowerUp will develop V2G-ready electricity meters. As an alternative approach, PowerUp will also aim to develop infrastructure side V2G adapters that can be installed at the local low-voltage transformer site. The project will specify an open interface between an electric utility and ITS service providers. Through this interface ITS service providers may poll real-time status and schedule information of the EV charging spots.</p> <div data-bbox="670 1568 1101 1904" data-label="Diagram"> </div> <p style="text-align: center;">Image source: [27]</p> <p>For ensuring that follow-up deployments are compliant to V2G standards, the project will develop a detailed conformance and interoperability test specifications through which future implementations of the V2G interface could be tested for compliance.</p> |



The institutional framework for administering such interoperability testing events will be also established at ETSI.

The prototyping activities in the project will be focused on:

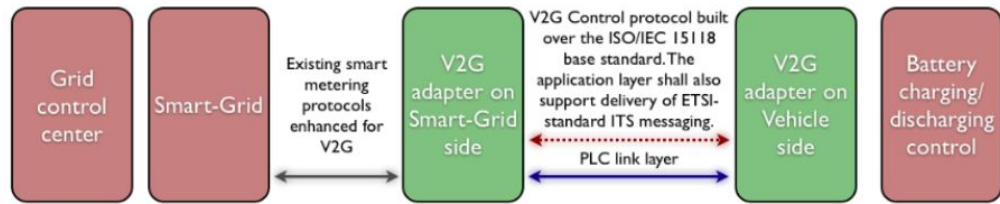
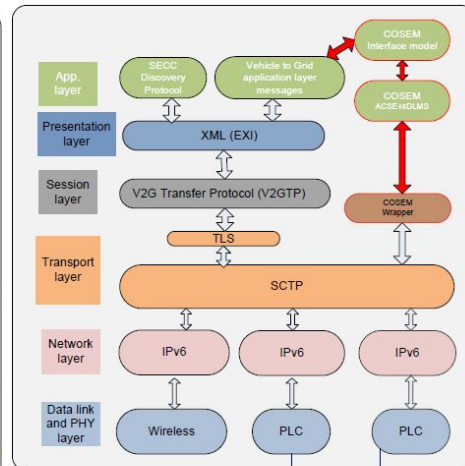
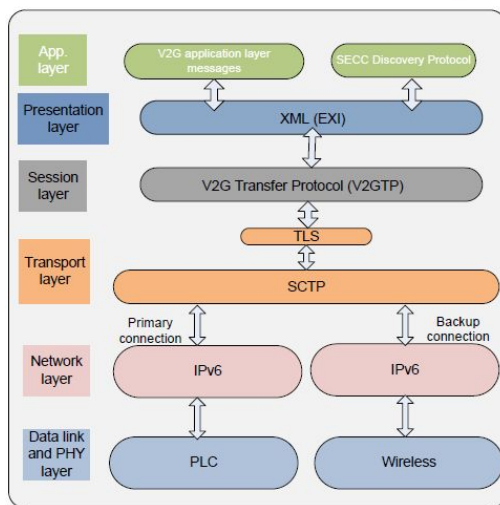
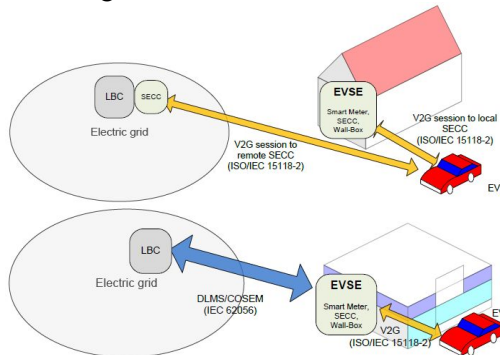


Image source: [27]

Two approaches are considered for residential charging: using only ISO/IEC15118 and using also DLMS/COSEM. The next figures show both approaches.



The PLC interfaces on the COSEM and V2G sides may be same or different technologies

Image source: [28]

The "only ISO/IEC 15118 case" permits the integration of DER management specified in the IEC 61850-90-8 standard. This enables the EVSE operator to define the interaction rules between DER and energy consumption. There is an ongoing work on the information mapping between the two previous protocols the load balance controller (LBC) could directly use V2G sessions for controlling EV charging processes in its domain.

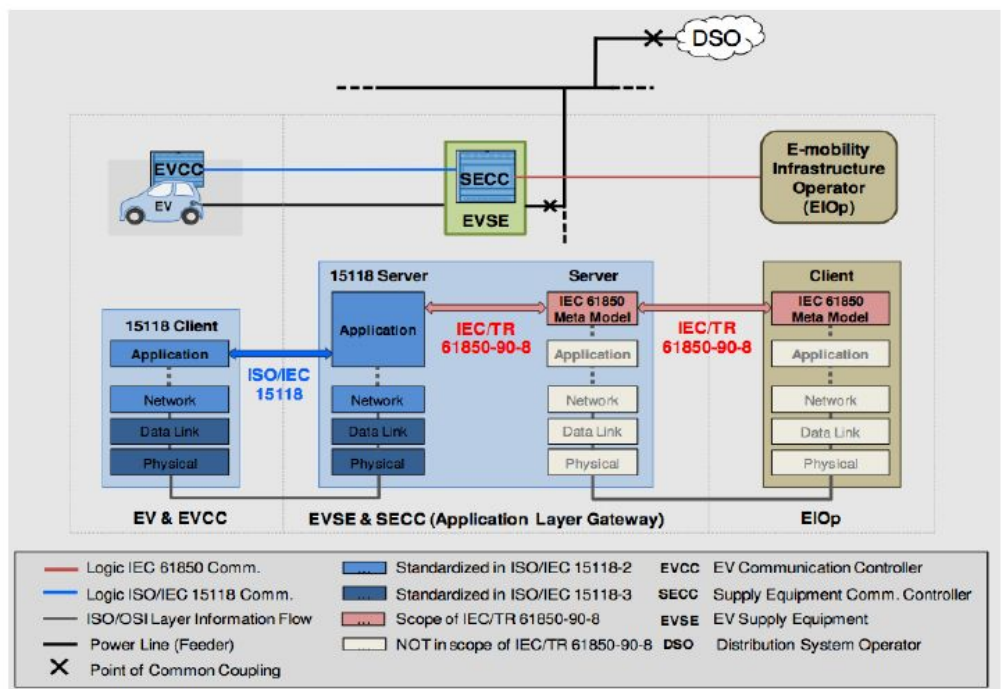


Image source: [28]

The Load Balancing controller architecture for the "ISO/IEC 15118 plus Cosmem case" is depicted as follows.

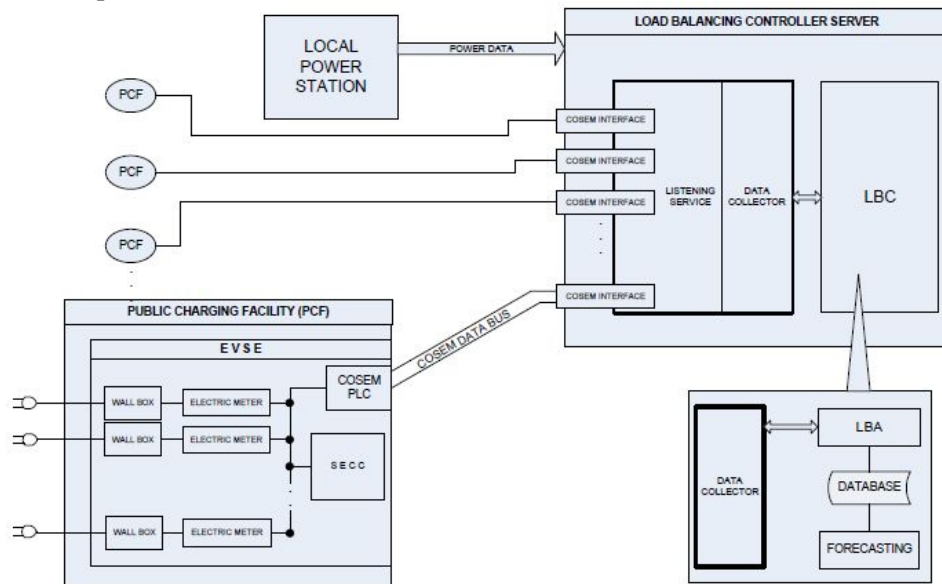


Image source: [28]

| New Services | | | Service Responsible (Stakeholder) | |
|--|-----------|-------------------|-----------------------------------|----------------------|
| Load management (integration with smart meters), flexibility algorithm development (LBA) | | | DSO (smart meters will be used) | |
| ISO/IEC 15118 interoperability test | | | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| V2G adapters on smart grid side | | PowerUp prototype | | |



| | | | |
|--|---|---|---------------------------------|
| V2G adapter on EV side | | PowerUp prototype | |
| Communication from - to | | Applicable standards | |
| EV-EVSE | | ISO/IEC 15118, G5, HPGP, UPA PLC | |
| EVSE - EVSEO | | IEC 61850-90-8 | |
| Smart meter - DSO back-end (load balance controller) | | IEC 62056 (DLMS/COSEM) with specific extensions | |
| IUT/SUT/EUT | Conformance testing | | Interoperability testing |
| EV/EVSE | ISO/IEC 15118-2 (TTCN-3 based implementation of conformance test cases) | | ISO/IEC 15118-2 |
| Aspects for improvement | | | |

| | | | | |
|--------------------------------|--|--|---|-----------------------------|
| Name | e-Gap project | | | |
| Responsible partners | Fraunhofer IAO, IRT, Chargepartner, Gemeindewerke Garmisch-Partenkirchen, BMW, Audi, TU München... | | | |
| Description | In eGAP they used TPEG to broadcast the status of the charging spots to all end-users. It is a protocol normally used with Digital Audio Broadcast (DAB+) mostly in Germany. In Germany, the actual traffic situation like traffic flow, accidents, road works, etc. are transmitted with the TPEG protocol over DAB+. | | | |
| New Services | | | Service Responsible (Stakeholder) | |
| Load management | | | DSO | |
| EV user services | | | EVSEO (status of CPs) | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| | | | | |
| Communication from - to | | Applicable standards | | |
| EVSEO- EVSE | | IEC 61850-90-8 | | |
| EMSP-EV | | TPEG over DAB+ (ITS, UER/EBU protocol) | | |
| IUT/SUT/EUT | Conformance testing | | Interoperability testing | |
| | | | | |
| Aspects for improvement | | | | |

| | | | | |
|--|--|--|---|--|
| Name | ETREL | | | |
| Responsible partners | Etrrel, Elektro Ljubljana, Elektro Maribor, ITE, DEM... | | | |
| Description | Various projects with demo development are taking place in Slovenia. Etrrel and Elektro Ljubljana take part in many of them: Slovenian Electromobility Roaming Platform (SEMRP), Mobincity and ICT4EVEU. A summary of the solutions deployed in these projects will be presented below. | | | |
| New Services | | | Service Responsible (Stakeholder) | |
| Roaming (charging and charging spot reservation) | | | Global Service Provider (acting as EMCH), | |



| | EVSEO, EMSP | | | |
|---|--|--|---------------------------------|----------------------|
| End-user information (traffic, weather, infrastructure...) and driving support (charging strategies, charging spot reservation, trip planning, driving modes...) services (public portal, smart phone access, on-board) | Global Service Provider, EMSP, EVSEO | | | |
| EVSE access (all EVSE are accessible irrespective of the EMSP or EVSEO) | EMCH, EVSEOs, EMSPs | | | |
| EV charging load management | EVSEO and information providers (EV and/or EV user, DSO, DER operator, Retailer) | | | |
| planning of charging infrastructure development | EVSEO | | | |
| Asset type | Asset No. | Model/ Prototype | Charging mode & connector type | Power supply options |
| EVSE | 4 | ABB | 1 x DC Mode 4, CHAdeMO | 500 V, 120 A |
| EVSE | app. 30 | Etrell | 2 x AC Mode 3, Type 2 Connector | 3-phase, 400 V, 32 A |
| EVSEO back-end | 3 | Etrell | | |
| EMSP back-end | 3 | Etrell | | |
| EMCH | 1 | Etrell | | |
| Portal for EV users | 1 | Etrell | | |
| PIIS (End user info services platform) (Mobincity) | 1 | CIT | | |
| CIPT (Charging Infrast. Planning Tool) (Mobincity) | 1 | ITE prototype | | |
| EV (with on-board info system) (Mobincity) | 1 | Oprema Ravne - Chebela (prototype) | | |
| Communication from - to | | Applicable standards | | |
| EVSE – EVSEO back-end – EMCH – EMSP back-end | | GPRS/EDGE/UMTS/HSDPA, Ethernet; W3C, SOAP, WSDL Native ETREL protocol (based on OCPP) | | |
| EVSEO back-end – EMCH – EMSP back-end | | GPRS/EDGE/UMTS/HSDPA W3C, SOAP, WSDL Native ETREL protocol (based on OCHP) | | |
| EV user – EVSE | | RFID ISO14443A | | |
| EV user – EVSEO back-end | | Smartphone (for identification) | | |
| EV user – public portal | | PC, smartphone (https) | | |
| Transport information providers - STM (Smart Transport Middleware) | | REST/JSON, SOAP | | |
| STM - PIIS | | JSON (ECMA-262), SOAP | | |
| EVSE - EVSEO back-end - PIIS | | GPRS/EDGE/UMTS/HSDPA, Ethernet; W3C, SOAP, WSDL | | |



| PIIS – MIA (Master Interaction Aggregator in EV) | | SOAP |
|---|--------------------------------|--|
| MIA - OIS (On-board Information System) | | Bluetooth (IEEE Project 802.15.1) |
| MIA – EV user | | Bluetooth (IEEE Project 802.15.1) |
| EV - EVSE | | IEC 61851, ISO 15118 |
| EVSEO – Grid actors | | SOAP |
| IUT/SUT/EUT | Conformance testing | Interoperability testing |
| communication EVSE – EVSEO back-end | conformance with OCPP standard | Interoperability of different EVSE and EV user identification in the same EVSEO back-end, verification of charging and reservation of charging spot in roaming |
| communication EVSEO back-end – EMCH – EMSP back-end | n.a. | Verification of charging and reservation of charging spot in roaming (native solution based on OCHP) |
| communication EV user – EMCH portal | n.a. | Access to public part of the portal (characteristics and current status of EVSE) and to private part of the portal (reservation of charging spot) via PC or smartphone |
| Aspects for improvement | | |

| Name | Bristol City Council | | | |
|---|--|--|---|----------------------|
| Responsible partners | Bristol Municipality | | | |
| Description | <p>In the frame of the ICT4EVEU project Bristol City Council will install a General Management System (GMS) for charging points, which can be accessed by EV users through a smart phone.</p> <p>Within this project, the testing in Bristol and Slovenia pilot was the same (as regards the functional aspect). There is only one technical difference with regard to the system architecture: in Slovenia the validation of EV user's contract goes through the specially developed EMCH, while in Bristol this is validated through banks (validity of EV user's bank account).</p> | | | |
| New Services | | Service Responsible (Stakeholder) | | |
| Any EV user can access all EVSE (operated by any EVSEO) | | EMCH, EVSEO, EMSP | | |
| End user public portal for EV users | | EMCH | | |
| Smart-phone based services for EV users | | EMCH, EVSEO, EMSP | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EVSE | 53 | Chargemaster, APT, Elektromotive, PodPoint | 2 x AC Mode 3, Types 2 and 3 (dependent on EVSE type) | 3-ph., 400V, 16/32A |
| EVSE back-end | 1 | Charge Your Car | n.a. | n.a. |
| EMCH | 1 | | | |
| Communication from - to | | Applicable standards | | |



| | | |
|--|----------------------------|---|
| EV user – EVSE | RFID ISO14443A | |
| EVSE – EVSEO back-end | GSM, OCPP | |
| EVSEO back-end - EMCH | OCHP | |
| IUT/SUT/EUT | Conformance testing | Interoperability testing |
| communication EVSE – EVSEO back-end – EMCH | n.a. | Field functionality tests: verify charging in roaming, verify end user information services |
| Aspects for improvement | | |

| | | | | | |
|---|--|---------------------------------|---|-----------------------------|--|
| Name | SmartCEM project | | | | |
| Responsible partners | Clúster de Movilidad y Logística | | | | |
| Description | To encourage the use of EVs smartCEM is running pilots for five advanced mobility services: EV-navigation, EV-efficient driving, EV-trip management, EV-charging station management and EV-sharing management. | | | | |
| New Services | | | Service Responsible (Stakeholder) | | |
| EV navigation (charging points, charging stations). | | | EVSE operator, EMSP | | |
| EV efficiency driving support | | | Fleet managers, EMSP | | |
| EV trip management | | | Fleet managers, EMSP | | |
| EV – charging station management | | | EVSEO | | |
| EV sharing management | | | Unknown yet | | |
| Asset type | Asset No. | Model/ Prototype | Charging mode & connector type | Power supply options | |
| Busses and cars (in Newcastle) | 44 | | | | |
| Charging points (in Newcastle) | 200 (current) - 1300 (future) | | | | |
| Cars and van for light goods transportation (Reggio Emilia) | 10 | | | | |
| Charging points (Reggio Emilia) | 14 (more under construction) | | | | |
| Motorcycles (Barcelona) | 45 | | | | |
| Charging points | 249 (and rising) | | | | |
| Hybrid bus (San Sebastian) | 1 | | | | |
| EV | 30 | | | | |
| Charging points | 33 | | | | |
| Communication from - to | | | Applicable standards | | |
| EV (on-board units or web interface) – EVSE back-end (Back office platform) | | | GSM/UMTS, 5.9 GHz-M5(ITS) | | |
| IUT/SUT/EUT | Conformance testing | Interoperability testing | | | |
| | | | | | |



Aspects for improvement

| | |
|-----------------------------|--|
| Name | ESB |
| Responsible partners | ESB |
| Description | <p>ESB ecars are working with Transpoco company in developing car sharing software. Arekibo another Irish company, are a digital media company who have worked with ESB ecars in developing an mobile app to help electric car drivers locate the nearest charge point to them through an online map.</p> <p>The next figure shows a more detailed IT system overview proposed for public charging points.</p> <p>PROPOSED PUBLIC CHARGE POINT SYSTEM</p> <p>ESB and IBM recently launched a joint project to build and implement a cloud-based, electric vehicle IT platform. The platform will be accessible through the charging points. It will also give drivers the choice to use a mobile device or web browser to locate the nearest charge post and check its availability. The system will also facilitate users choosing and changing energy suppliers at any time. The project will provide the services needed to operate, manage and maintain the network of charge-points in a secure and reliable manner.</p> |

| New Services | | | Service Responsible (Stakeholder) | |
|--|-----------|------------------|---|----------------------|
| ecar connect app | | | It allows users to view charge point locations and get news updates from ecars. In the future the app will give real time information on the availability of charge points. | |
| EV charging smart control | | | Integration of home EVSE and HEMS (ESB Winter Trials). | |
| International roaming between Dublin and Belfast | | | Mobi Europe, Ireland | |
| Asset type | Asset No. | Model/P rototype | Charging mode & connector type | Power supply options |
| EVSE home | >600 | | Mode 3. Type 2 / fixed cable | 230V-16A |
| EVSE public | >645 | | Mode 3. Type 2 | 400V-32A |



| | | | | |
|--------------------------------|----------------------------|---------------------------------|---|--|
| EVSE fast | 40 approx. | | Mode 3. Fixed cable Mode 4. Fixed cable. CHAdeMO | 400V-63A (44kW) DC 400V-120A (50kW) |
| Communication from - to | | Applicable standards | | |
| EVSE - EV user | | RFID card | | |
| EVSE - WAN | | OCPP (Mobi.e) | | |
| IUT/SUT/EUT | Conformance testing | Interoperability testing | | |
| | | | | |
| Aspects for improvement | | | | |

| | | | | |
|--|--|---|---|-----------------------------|
| Name | ZSE-Verbund (Austria-Slovakia roaming) | | | |
| Responsible partners | Verbund (AT), ZSE (ZSDis mother company) (SK), E.ON SE (DE) and others | | | |
| Description | Both ZSE and Verbund participate in two EV cross-border roaming projects: VIBRATE and Crossing Borders. In Vibrate driving usage is monitored using the GPS technology. Each car is equipped with a GPS module with a SIM card to be monitored online: driven km, average speed, journey duration, distances, etc. OCPP integration, OCHP integration, market based roaming. | | | |
| New Services | | Service Responsible (Stakeholder) | | |
| Roaming | | Clearing House Operator | | |
| EVSE access | | EVSEO | | |
| Online monitoring of EVs | | EMSP | | |
| Asset type | Asset No. | Model/ Prototype | Charging mode & connector type | Power supply options |
| Data exchange platform between EMSP – bilateral and platform-based | 1? | | | |
| EV monitoring platform | 1 | | | |
| EV | 16 | Peugeot iOn, Citroen C-Zero, Renault Kangoo | Mode1, Mode3, Mode4 | |
| Wall-boxes | 16 | various | Mode1 | 230V/16A 3,7kW AC |
| DC chargers | 2 | ABB, DBT | Mode4 | 400V, 50 kW DC |
| Communication from - to | | Applicable standards | | |
| EV user - EVSE | | RFID | | |
| EVSE – EVSE back-end | | OCPP 1.2 and 1.5 | | |
| EV to Data Centre | | GPS technology with SIM card | | |
| IUT/SUT/EUT | Conformance testing | Interoperability testing | | |
| | | | | |
| Aspects for improvement | GPS coordinates are not sufficient to display the charging sport, pictures | | | |



of the area are necessary as well.
 OCPP integration on the site of the EVSE suppliers is not on the same level – more integration necessary.

| | | | | |
|--|--|---|---|-----------------------------|
| Name | ELVIIS approach | | | |
| Responsible partners | Viktoria Swedish ICT | | | |
| Description | Experiments with a “lean” charging approach where the cost of infrastructure is reduced. Two of the objectives of the projects are to: <ul style="list-style-type: none"> • Identify and describe the perceived value for EV users (benefits and drawbacks). • Explore the experience of the IT used in the EVs. | | | |
| New Services | | Service Responsible (Stakeholder) | | |
| “Dumbplug” charging | | EVSE owner | | |
| Billing | | EVSE owner | | |
| Intelligent Loading | | Energy system operator | | |
| Mobile interface for charging monitoring | | EV owner | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EV | 5 | Volvo C30 | J1772 | n.a. |
| Communication from - to | | Applicable standards | | |
| EV User – Billing Service | | Proprietary, Web API | | |
| EV – EVSE | | Proprietary, API | | |
| EVSE – Grid Energy Supplier | | Proprietary, API | | |
| IUT/SUT/EUT | | Conformance testing | Interoperability testing | |
| Aspects for improvement | | <p>The results revealed 326 value drivers, which describe the perceptions of the interviewed drivers; 114 benefits and 212 sacrifices. The identified benefits and sacrifices are related to the product, service and relationship aspects of the value. These are identified for three applications (in-vehicle, smartphone, web). A selection of improvements:</p> <ul style="list-style-type: none"> - Need a function for changing amperage (Smartphone, web). - Need a function for automatic amperage selection when (in-vehicle). - Need notifications when EV is charged to a required level, pop-up like an SMS (smartphone). - Need notifications about the EV state (Smartphone, web). - Need a function for route planning (Smartphone, in-vehicle). - Need a function for finding charging spots (Smartphone, web, in-vehicle). - A function to associate a given charging spot to a given electricity agreement (Smartphone, web). - Need a notification when the SOC is getting low while the EV is not used (Smartphone). - It should be possible to connect several smartphones to one user account (Smartphone). - Need a function for creating own overview page (Smartphone, web). | | |



| | |
|--|--|
| | <ul style="list-style-type: none"> - It should be possible to select own optimization preferences (Smartphone, web). - There should be an "Early Departure" function (Smartphone, web). - Text and text fields need to be more user-friendly and possible to change (Smartphone, in-vehicle). - Dynamic feedback on energy consumption (in-vehicle). - It should be possible to plug-in a smart-phone (in-vehicle). |
|--|--|

| | | | | |
|------------------------------------|---|---|---|-----------------------------|
| Name | Danish Initiatives (Nikola and EDISON) | | | |
| Responsible partners | Technical University Of Denamrk, Danish Energy Association | | | |
| Description | Danish projects with an emphasis on electric vehicle smart grid integration | | | |
| New Services | | Service Responsible (Stakeholder) | | |
| Frequency Regulation – Normal | | EV owner and TSO | | |
| Frequency Regulation – Very Fast | | EV owner and TSO | | |
| Secondary Regulation | | EV owner and TSO | | |
| Tertiary Regulation | | EV owner and TSO | | |
| Adaptive Charging | | EV owner and TSO | | |
| Synthetic Inertia | | EV owner and TSO | | |
| LV Congestion Management | | EV owner and DSO | | |
| LV Network Balancing | | EV owner and DSO | | |
| LV Over-Voltage Management | | EV owner and DSO | | |
| MV-LV Lines Over-Loading | | EV owner and DSO | | |
| Islanded Microgrid and Black Start | | EV owner and DSO | | |
| Charging Management | | EV owner | | |
| Charging Information | | EV owner | | |
| Charging Flexibility Assessment | | EV owner | | |
| Vehicle-to-X | | EV owner | | |
| Interoperability and roaming | | EV owner and EVSE operator | | |
| User mobile interfaces | | EV owner | | |
| Fast charging/battery swap | | EV owner and Swapping station/EVSE operator | | |
| Asset type | Asset No. | Model/Prototype | Charging mode & connector type | Power supply options |
| EV | 3 | Prototype - BYD (Lithium Iron Phosphate) | 2, CEE plug | Rated power 30 kW |
| Stationary EV | 3 | Prototype - Kokam (Lithium Polymer) | 2, CEE plug | Rated power 43,5 kW |
| EV, eBox | 1 | Prototype - Converted Toyota Scion | 2, Mennekes | 63 Amp/ 1ph. |
| EVSE | 3 | Prototype - Rittal enclosure | 2, Mennekes | 16 Amp/ 3ph. |



| | | | | |
|-------------------------------------|---|---|---|---------------------|
| EV | 1 | Prototype - Converted Fiat Fiorino Combi | Unknown | Unknown |
| EV | 4 | Retrofitted electric Citroen C1 | 2, Mennekes | 16 A |
| EV | 3 | BYD (Lithium Iron Phosphate) | 2, CEE | Rated power 30 kW |
| Stationary EV | 3 | Kokam (Lithium Polymer) | 2, CEE | Rated power 43,5 kW |
| Communication from - to | | Applicable standards | | |
| EV-EVSE | | IEC/ISO 15118, IEC 61851, PWM / pilot pin | | |
| EV-Aggregator (Fleet operator, VPP) | | IEC 61850, GSM/GPRS | | |
| Aggregator-EV user | | GSM/GPRS | | |
| IUT/SUT/EUT | | Conformance testing | Interoperability testing | |
| EVSE-EV | | | Multiple EVs to a prototype EVSE, via IEC 61851 | |
| EV-Aggregator | | | Multiple EVs to aggregator, via IEC 61850 | |
| Aspects for improvement | | | | |