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Reference guide for electromobility pilot projects

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List of Abbreviations

B2B	Business to Business
B2C	Business to Costumer
CA	Consortium Agreement
CU	Charging Unit
DoW	Description of Work (Annex I of Grant Agreement)
DSO	Distribution System Operator
D3.1	Deliverable 3.1 “Business analysis: Description of Business scenarios including best practice analysis, stakeholder analysis and identification of critical success factors”
D3.6	Deliverable 3.6 “Core Services and Transactions Specifications”
D4.2	Deliverable 4.2 “Recommendations on grid-supporting opportunities of EVs”
D8.2	Deliverable 8.2 “Tests reports regarding the usability of each prototype”
D8.3	Deliverable 8.3 “Framework integration and report on system interplay”
D9.4	Deliverable 9.4 “Envisaged EU mobility models, role of involved entities, and Cost Benefit Analysis in the context of the European Clearing House mechanism”
D10.7	Deliverable 10.7 “Electromobility Best Practice Policy Development Guidance Document”
D10.8	Deliverable 10.8 “Report on how to ensure the sustainability of the project activities and achievements”
EU	European Union
EV	Electric vehicle
EVSE	Electric Vehicle Supply Equipment (Charge Point)
EVSP	Electric Vehicle Service Provider
HEDNO	Hellenic Electricity Distribution Network Operator S.A
ICT	Information and Communication Technology
IT	Information Technology
OEM	Original Equipment Manufacturer

RFID	Radio Frequency Identification
SDR	Service Detail Record
SRV	Service Interface
WP	Work Package
WP3	Work Package 3 “Electromobility services / ICT solutions”

1 Executive Summary

As EV sales share is steadily increasing, with a market outlook of 2% of new sales in Europe for 2020 and some EU countries reaching 5 to 6 % already in 2014, a whole set of opportunities will be given to the conventional electricity stakeholders chain, where value could be harvested by brand new products.

At the core of Green eMotion R&D effort there is the implementation of a routing marketplace of products and services, where conventional businesses (such as electricity utilities or asset operators (EVSE Operators)) can trade services with completely new comers (e.g. electric mobility providers or EVSP) in order to execute innovative value models around the electrified transport business ecosystem.

Amongst the products demonstrated in Green eMotion, service interoperability or "roaming" is probably the most significant one, as it enables a seamless customer experience throughout Europe: if each and every EVSE Operator or EVSP could implement in a near future the set of interfaces specified by Green eMotion, even through a multi-marketplace approach, customers could "roam" freely from one infrastructure to the other, regardless the ownership of the infrastructure itself [Ref. Figure 1.1].

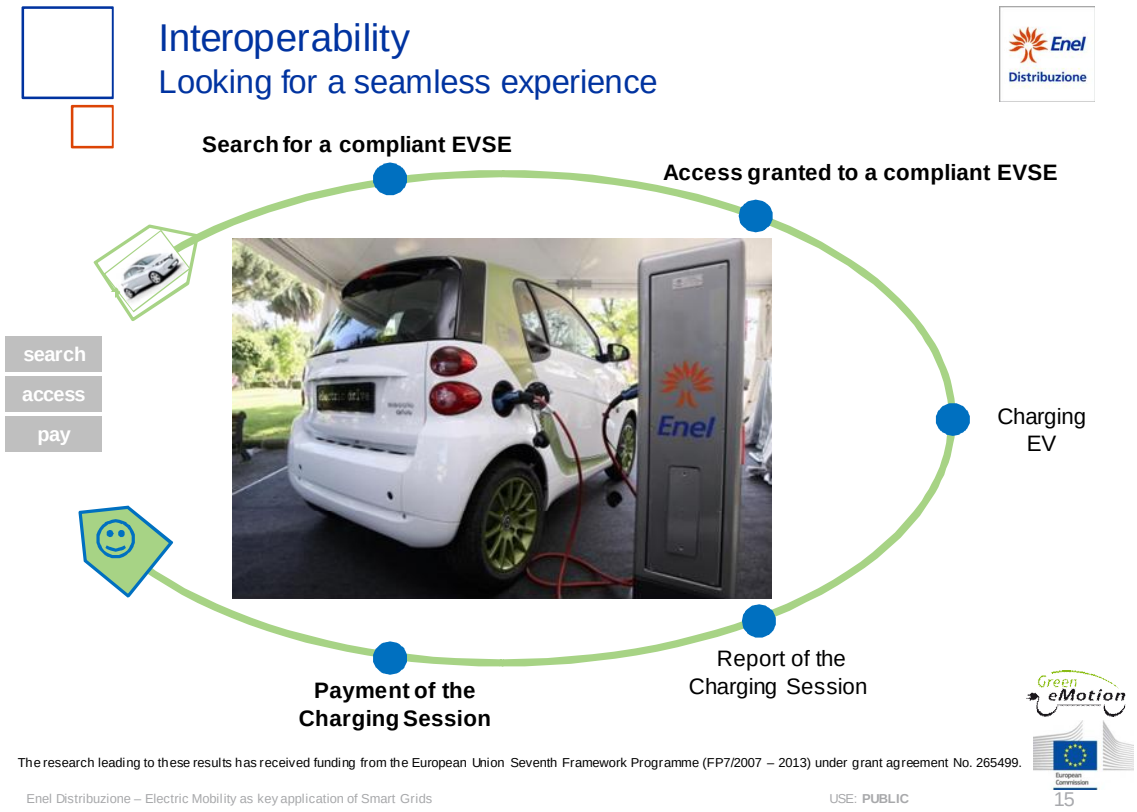

Figure 1.1: Meaning of "roaming" product as demonstrated by GeM

This would be in a perfect analogy to the conventional gas stations, although there is electricity fueling vehicles, a very specific, innovative and regulatory-wise complex fuel product: therefore this requires a precise IT interfaces infrastructure to make it happen, an infrastructure which could be derived by Green eMotion activities.

Green eMotion's main legacy is in having demonstrated that enabling customers to access electricity everywhere, regardless the ownership of the infrastructure and the specific business model implemented in the region, could be executed properly via a set of enabling IT infrastructure, connecting each regional/local pilot projects to a wider framework, widening the set of customers that might access the local infrastructure, pushing electric mobility beyond the initial golden cage of urban areas, a key enabler alongside the scaling up of battery capacity.

Nevertheless, the experience of Green eMotion replication regions and municipalities has proven that the most complex hustle for a regional e-mobility initiative is actually getting started, especially in a business and regulatory environment which is completely inexperienced with electric mobility itself.
This document is a the reference guide for pilot projects that are going to be established in the next years throughout Europe, in order to give them an overview of what the hurdles could be in getting started locally, how to overcome them and how to strengthen the local initiative by connecting it to a wider framework, increasing the number of possible customers and granting the continuous update of technical infrastructure in a way that it can be operated for value throughout its life cycle.

This reference guide is built by reporting the experience of Greece as main Green eMotion replication region. The replication was focused on a selection of Green eMotion use cases: AC charging in big cities (Athens) and smaller ones (Kozani), alongside the integration of local demonstration into the general idea of wider EU framework (e.g. through the "search" and "roaming" services). In Greece within the timeframe of 1 year an electric mobility initiative was initiated, 15 charging stations deployed and the local pilot was connected to Green eMotion wider framework, finally demonstrating some of the main Green eMotion products, such as "SEARCH", allowing customers to display charging stations from all EU on Green eMotion website and "ROAMING, described above. The Greek experience shows the need for stakeholder involvement at the earliest possible opportunity, avoiding possible setbacks and allowing the uniformity among activities, projects and tools.

Besides reporting the local set up of the electric mobility pilot from PPC, this document includes also a useful review of Green eMotion "ROAMING" product specification/use case, precisely how to leverage it for going beyond a local pilot in this case the Greece demo region of Green eMotion. The document also provides an expected market outlook of Green eMotion R&D in terms of European marketplaces for electric mobility products and services, which are currently being developed as the main industrial exploitation of this project, and useful guidelines for subsequent R&D on this matter.

2 The start-up of an electric mobility pilot project

2.1 Greece Demo Region as an example of starting up e-mobility initiative

As mandated by Green eMotion DoW, PPC in Greece executed a pilot project by installing from scratch a charging infrastructure made up of 15 charging stations, each of them with double Type 2 AC plug, the new EU standard for AC charging as mandated by recent Directive on Alternative Fuels Infrastructure [3].

Therefore Greece, as GeM replication demo region, serves as example to highlight the main hurdles of setting up an e-mobility initiative and of connecting it to a more general framework for the development of a sustainable, integrated market. Greece successfully completed the start-up of the local e-mobility initiative as well as its connection to the international framework fostered and demonstrated by this project, as reported in Figure 2.1 showing the charging stations of Greece as available for search across Green eMotion project website search engine (www.greenemotion-project.eu).

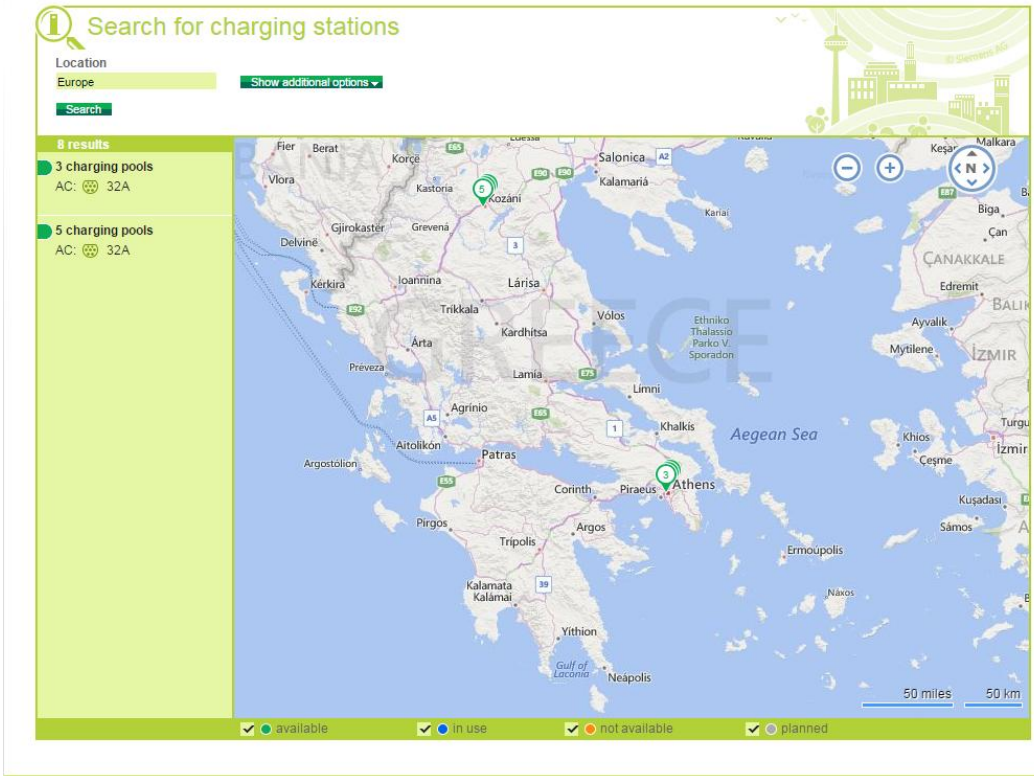

Figure 2.1: Overview of first charging stations installation in Greece, as updated by November 2014

The Greece demo region was in principle design to be leveraging infrastructure installed in Kozani, West Macedonia, where PPC has significant business operations.

The mission of the Kozani demo case is to provide an example of an e-mobility initiative built from zero and to contribute to the roll out of the tested prototypes designed in WP 3 in more EU regions. As

stated in project DoW, the new equipment and services have been firstly assessed in the test regions and any modifications required have been implemented. After the successful adaptations, the designed framework and the tested infrastructures have been implemented in new regions. Kozani, Greece, is one of the regions that adopted the GeM system solution after having built the local e-mobility pilot. Kozani demo case stands therefore as a dissemination proof of the standards and system solutions developed within GeM project. The scope of the Kozani pilot project is to demonstrate e-mobility both at national and EU level. At national level, Kozani demo will be the first integrated system solution involving public charging stations that enables the integration of electric vehicles into power grids. At European level, Kozani will be a model paradigm where the GeM system solution is adopted and different services such as searching and smart charging will be implemented.

2.2 The choice of suitable area for the e-mobility pilot project in Greece

During the proposal phase, the municipality of Kozani was chosen by PPC and accepted to host the e-mobility pilot project. The original plan foresaw cooperation only with the municipality of Kozani, installation of 15 charging stations to the pavements and cooperation with a corresponding number of electric vehicles purchased by PPC through leasing for the duration of the project.

The municipality of Kozani is a small city with a population of approximately 55.000 situated in Northern Greece. It is close to lignite mines and thermal units of PPC and thus there is a very good and close collaboration between the municipality of Kozani and the local PPC. Furthermore the public is very positive and aware of PPC's other local activities and also very informed and sensitive to environmental issues, so an e-mobility project in their town would be more than welcomed. Since it is a relatively small town, there are personal and direct communications among all the involved parties in an e-mobility project and this has been proven helpful in the course of the project.

Moreover, from the very first contact, before the beginning of the project, local authorities expressed enthusiasm and eagerness to be a part and host an e-mobility project. Finally, the fact that there are photovoltaic in the roof of two schools would be a plus in the project, as it gives the opportunity for connection between the photovoltaic and the electric vehicles charging unit and at least implement a simulation of one of the services designed in WP3 (Load Management, ref D3.6 [1]).

All these reasons led PPC to choose the municipality of Kozani for implementing the Green eMotion project.

During the course of the project, the representatives of Green eMotion in Greece find it very crucial to make some adjustments to the original plan in order to make the most out of the implementation of the Green eMotion project in Greece.

The municipality of Kozani was an excellent choice for the implementation of the project, but it was secluded from major cities and far away from any decision making center regarding the future for e-mobility in Greece. Just implementing the Green eMotion project in Kozani, would be a major project, as it would be the first project of e-mobility in Greece with installation of public charging stations on the pavements and cooperation with electric vehicles, but with local influence. As there is not yet any rules and regulatory framework for the e-mobility infrastructure deployment in Greece, implementing Green

eMotion project close to decisions taking centers could give the project an additional very important role.

It was essential within the framework of the Green eMotion pilot project to create the initial collaborations between the different involved parties, institutions and partners that will need to combine their actions for the installation of the e-mobility project and also to inform them about which issues need to be defined for the wide spread of e-mobility, also pointing out the necessity of an institutional framework for this purpose.
That was the reason that PPC changed the original plan into installing a second demo pilot project in Athens.
Athens is the capital of Greece, with a population of approximately 3 million people, with all decision making centers located in it and a major tourist destination.

The final plan for the Greek demo project included for these reasons installation of 8 charging stations to the pavements of Kozani, 7 charging stations to the pavements of Athens and use of a corresponding number of electric vehicles purchased by PPC through leasing for the duration of the project. The Green eMotion project web site report and disseminate them through its charging station search engine.

2.3 A review of typical hurdles of setting up an e-mobility initiative

Coming to the practical work of installing an e-mobility project, one has to answer the following questions:

When planning a new e-mobility project, questions like the following should be answered.

1. Which is the purpose of the infrastructure to be deployed; meaning what kind of mobility will be served. Which type of road will be chosen, how much traffic, etc. Answering that question indicates the charging post power level (standard charging, fast charging or combination).

2. Given the above how can one choose the best locations for public post installations and their optimal number?

3. What type of standardized sockets, plugs, standards to be respected, communication protocols and interfaces providing access to the marketplace?

Although, an important number of guidelines for Charging Point Installation exist, there was no manual providing a standard reliable methodology to be implemented. Meaning, a list of the main Charging Point Installation criteria regarding:

✓ AC, DC or Mixed Charging Points
What type of Charging Point infrastructures is the most convenient?

- AC Charge Points,
  - the AC to DC power conversion takes place on-board the EV,
  - Charging times: 1÷8 hours for standard charging or approximately half hour for fast charging.

- DC Charge Points,
  - the AC to DC power conversion takes place off-board the EV,
  - Charging times: approximately half hour for standard charging.

- Mixed AC/DC Charge Points,

✓ Charging Post Power Level

Both fast and standard charging stations should be considered.

- Standard charging stations (Level 2) at homes, workplaces, transport stations (medium and long terms), hospitals, malls, hotels, public parkings in order to ensure the recharge in common places.

- Fast charging stations on highways, public parking and strategic locations in the city to ensure user's recharging on their trips and their way back. Fast charging stations along major highways connecting the larger cities are very important, especially in a country where long distances are common.

Also to be taken into account,

- Possibility of dedicated parking area.

- The use of land of each specific area (households, offices, industrial area), and the type of buildings (single houses with or without yard, apartment buildings with or without parking).

✓ Charging Post Location

The development of the EV charging infrastructure needs to be the optimal in order to serve the immobility without overestimating the investments needed. The charging points need to be installed at appropriate places that easily serve the EV users' needs. Furthermore, the selection process needs to take into account certain other aspects such as:

- Area (urban, rural etc)
- Use of land of each specific area (households, offices, industrial area),
- Type of buildings (single houses with or without yard, apartment buildings with or without parking).
- Existence of grid infrastructures nearby / Required grid reinforcements,
- Restrictions of the power system,
- Accessibility,
- Visibility,
- Convenience,
- Coverage area,
- Parking place
- The combined usage of other transport means (i.e. near train stations),
- Trip behavior,
- Future upgrades on e-mobility network.

At the first stage of e-mobility deployment special attention must be given in signing of the relative EV charging points especially in areas where citizens are not well aware about EVs. Even though the installation of charging infrastructure in public areas is subject of free market, there should be some minimum pre-requirements in planning the installation of charging spots that should be fulfilled in order to facilitate electro-mobility. The minimum range of the coverage area should be planned by an institutionally accredited authority.
The density of EV charging stations is in direct connection with the charging location problem that we had referred. Even if it is important for the EV users to know that they will easily charge their EV, care must be taken in order for the charging network not to be oversized. The decision of the necessary number of charging points should be done by an institutionally accredited authority, possibly the same authority for Charging Post Location.
Given the e-mobility infrastructure deployment model adopted per country, formula calculating the minimum and maximum number of charging posts should be provided

✓ Charging Point Equipment

The required equipment for charging point installation depends on host and the location (households, apartment buildings, airports, ports, park facilities etc). Some equipment options that charging point designer should evaluate are,

- Single or Multiple Charge Interface Pillars,
- (Under)ground vaults,
- Protection Equipment.

✓ Interoperability – Standardization

EU standards for charging infrastructure are necessary in order to ensure interoperability. Focus should be placed in the following areas:

- Hardware (ex. cables, plugs etc)
- Communication protocols or proposed standards (ex. RFID card standards)
- Interoperability Interfaces
- Guidelines for the required coding data for service providers

✓ Regulatory Issues

The authorities responsible to discuss decide and provide the necessary regulatory framework that will support the spread of e-mobility should answer multiple questions such as:

- Who is authorized and responsible for the development of charging points?
  This issue is related directly to the political decision of the model adopted regarding the deployment of emobility infrastructure. In any case rules may be defined related to the permission of installing the charging posts in public areas
- What about the installation cost?
  It has also to do with the model of infrastructure deployment adopted. In the case of the DSO model the infrastructure cost is included to the regulated asset base charged to every customer related to the general grid fees. In the case of the integrated market model no DSO investments are necessary and the charging post cost is related only to the emobility customers resulting in higher emobility services fees, but no increase of the regulated asset base.

- Who is the charging post operator?
  It is clear that in the DSO model the charging post operator is the DSO permitting multi ventor use of the charging stations' network in a not discriminatory way for all emobility service providers. In the case of integrated market model it is mostly common for the charging post owner to have the role of charging post operator permitting access to different service provider through roaming contracts.
- Who is responsible for measuring charging energy consumption data?
  In the DSO model it is quite clear being responsible for the installation of the charging post and having a direct access to the metering equipment will install a meter according to the DSO's specifications, thus having the possibility of direct measurements of the energy consumption meanly in its telemetering center.
  In the case of another charging post operator regulatory issues regarding DSO's obligation to have direct access to the meters used to measure the energy consumption of each individual customer may lead to the following possibilities:
  1. A DSO approved meter dedicated to be handled by DSO itself may be installed in the charging post with or without direct view through a window.
  2. Drivers of the meters already installed in the charging post may be adopted and installed in the telemetering center of the DSO permitting access only to the total consumption data of the charging post. This is subject of permission of the specific network management code.
  3. Installation of an additional certified by the DSO external pillar in a different pillar next to the charging unit providing direct and certified measurements to the DSO.

Attention must be taken to the fact that in the first (1) and the third (3) possible choices, extra cost should be calculated for the charging post operator, especially in the case 3 where an estimated cost of 300-1000euros may be added.

Further issues such as parking place acquirement, ownership of the infrastructure, grid reinforcement, and their depreciation mechanism, type of certificates necessary for the charging posts to be used, as well as, installation of public charging posts in areas with no big market interest, should be somehow clarified.

2.4 The Greek paradigm

Referring to the Greek e-mobility project, precisely because of its pilot nature, it had that the two first questions dealing with the number and the type of charging post were pre-specified.

The number for charging stations was 8 for the Municipality of Kozani and 7 for the Municipality of Athens.

As for the type of the charging that has been chosen is:
Three-phase AC power in:

- Rated Nominal Voltage 230/400 V ± 10 %
- Frequency 50 Hz
- Two Type 2 Three-phase sockets, with connector locking device
- Maximum power: 7/22 kW
- Maximum current: 32 A
- Smart Meters: two three-phase Smart Meters, one for each socket, inside the EVSE

And a capability of two simultaneous charging processes mono or three-phases in any combination.

The number of 8 public charging stations for the municipality of Kozani, which is a relatively small city, is sufficient for the first phase of the deployment of electric mobility and the number of electric vehicles that are to be circulating the city in the near future.

On the contrary, for the municipality of Athens the number of charging posts installed (7), is too small, but the role they have to fulfill is that of promotion of the project and involvement of authorities' representatives to the pilot project.

1. Given the above solved, the next step was to determine the location of the charging station.
   In this stage two different approaches were taken for the two demos.

   I. Municipality of Kozani

   Since the municipality of Kozani was involved from the beginning in the project, there were continuous contacts and physical meetings with the involved authorities.
   There was scheduled a systematic and continuous briefing concerning the actions of Green eMotion project.

   In these meetings the involved authorities were:

   - PPC's representative, responsible for the Greek pilot project
   - Local Authority of Kozani
   - Technical Direction department of Kozani Municipality
   - West Macedonian Regional Authority
   - West Macedonian University
   - West Macedonian Technical Educational Institute
   - Executives from the Lignite Mines and the Thermal Plants of PPC
   - Executives from the Kozani Distribution Network

The criteria used to select the locations generally are:

- Points of view and safety
- Accessibility
- Visibility
- Convenience
- Coverage area
- Existence of available space parking
- Existence of grid infrastructures nearby / Required grid reinforcements
- Restrictions of the power system
- Correlation with EV users
- Parking and Trip behavior

At the specific case the main criteria was to choosing locations with high visibility, in order to ensure the best dissemination of the project and the availability of parking spaces to be dedicated to electrical vehicles. Also the safety of the public charging units was very crucial, so the selected locations should have very good night lighting or to be in a 24hour guarded place.
Following all the above criteria, the initial definition of the potential installation places was selected by the involved parties.

II. Municipality of Athens

In the Municipality of Athens a quite different approach was selected regarding the charging post location.
The authorities that need to be the most informed regarding e-mobility and have access to the pilot project, are those that will have to be involved in the project, in order to be able later to establish

- the national plan of e-mobility and the rules that will define e-mobility in Greece, by defining the roles of the old and the new players in the market
- the model of e-mobility and its deployment
- the licenses for the public charging stations
- the economic and other incentives to withdraw the barriers for the deployment of e-mobility.

That is the reason why the locations chosen for the pilot project of Athens are:

- 2 charging stations in the Headquarters of PPC
- 1 charging station in the Headquarters of the Greek DSO
- 1 charging station in Ministry of Environment, Energy and Climate Change
- 1 charging station in Ministry of Infrastructure, Transport and Networks
- 1 charging station in the Headquarters of Regulatory Authority for Energy
- 1 charging station in the City Hall of Athens

To all these authorities electric vehicles were granted for the duration of the pilot project, from the electric vehicles that PPC acquired through leasing for the demo purposes of Green eMotion in Greece. Thus, the opportunity was given to responsible authorities for the future of e-mobility in Greece, to be a part of the project, driving the e-cars and using the charging infrastructure.

2. DSO made an evaluation for the adequacy of the grid at the proposed locations for both the municipalities.

3. After the checking and the approval by the DSO, came the finalization of the localization process.

   I. Municipality of Kozani
   Having the approval of the DSO for the initial locations, the finale localization took place. So, finally the decided positions were:

   - Regional DSO's Office
   - Court House
   - Offices of the District of Western Macedonia
   - Central Parking Station (Old Bus Station)
   - Military Recruitment Office
   - Technological Educational Institute of Western Macedonia
   - Saint Dimitrios Park
   - Festival Area Niameros

   II. Municipality of Athens
   As for the Municipality of Athens, the initial locations where fixed with small adaptations.

4. The next step was to get the permission of installing the charging post to the pavement of the city. The authorization was subject of the Technical Direction of the Municipality. That proved to be one of the biggest obstacles to face in the duration of the project, as there was not any relevant legal framework, not even a reference to the existing laws related to the licensing procedure for the installation and occupancy of pavements referring to charging posts.

   I. Municipality of Kozani
   As for the municipality of Kozani, that task has been solved in an easy way. From the proposal phase of the project Kozani's mayor has expressed his willingness to support the project, even more, so with continual meetings and direct communication between all the involved parties and municipality services a temporary solution was adopted given the possibility to overcome the problem.
   With respect to the common adapted solution, the Technical Direction of the Kozani Municipality forwarded a request to the Mayor and the Municipality Board to give their permission for installing a specific number of pilot charging posts, at the chosen locations.

   II. Municipality of Athens
   Since the very first approach the mayor of Athens expressed his fully support to the deployment of e-mobility throughout the city. Municipality of Athens is the biggest municipality in Greece, having quite a big Organization Chart, with many different Directions and distributed services. Many Departments may be responsible for the different parties of the same procedure so different persons were involved in the approval needed for the project fulfillment. Distributed services with long and impersonal communicational paths, lack of legal justification made a stiff

barrier, so even in the education installation of the first charging post; there were interventions from municipality services ordering the cancellation of further works.
The occupancy of the pavement is set by specific laws and regulations, in which there was no reference for EV charging posts. Even if the installation was taking place within the building line of a property, a license from the Regional Planning and Urban Department was necessary, complicating things even more. Additionally there were several Municipalities Comities, like the "Life Quality Committee", that they should be summoned and discuss the occupancy permission of the pavement to give their approval, without any predefined rules to rely on to make a decision.
The attempt to ensure city council permission for the installation, as done before in the municipality of Kozani, did not work in the case of Athens, because due to predefined problems and organization issues it has been impossible for the technical directions to formulate a recommendation to the City Council.
Given the expressed support of the mayor of Athens to the project, a political solution was found, only for the duration of the Green eMotion project or until the relevant legal framework was prepared. The solution was to treat the charging posts as components of the network serving its use, based on jurisdiction of the Distribution Network Company and given that the installation of the new components do not violate the general regulation for pavement occupancy.

5. All the above highlighted the necessity not only to prepare the regulatory framework, but also the regional and local authorities to formulate the necessary instructions and guidelines that will permit hosting charging posts, and will facilitate their deployment keeping the safety rules and the smooth use of pavements by the pedestrians.
   The involved authorities for solving the issue, seems to be, the Ministry of Environment, Energy and Climate Change, Ministry of Infrastructure, Transport and Networks, Ministry of Interior and the regional and local authorities. These are also relevant authorities in the Italian demo region of Green eMotion, to which the execution of pilot project at local level in Greece was looking at as a paradigm for the management of relations with institutional stakeholders.

6. Fulfilling the process of definition of the charging posts and having overcome the permissions issues for the installation of charging posts to the pavements, after considerable delays, the next step was a Network Connection Analysis that was made by the DSO for each of the selected charging posts location.

7. As the specifications of hardware and software were predefined at the DoW of the project, the 15 charging units were Type 2, three-phase AC power. Next step was the training of PPCs' and DSOs' technicians by visiting the Enel's e-mobility control center in Milan and the visit of Enel's technicians to Greece for the installation of the first charging unit in Athens and the on the field training. The skills and the education of the technicians that will be able to install, maintain and operate charging posts in the future are still to be defined and probably will be certified in Greece. Trained technicians are required to minimize subsequent effort that could be put in performing fixes at operation and maintenance of the charging stations. It is recommended therefore for future replication regions that trained technicians are used for installation activities.

8. Next step was to determine the relationship of the GeM representative that would play the role in GeM Marketplace of the charging post operator with the supplier that is a relevant department of PPC. Although this involves two different Divisions of the same company, their relation has to be institutionally identified for the reselling of the energy for charging electric vehicles.
   In the Greek legislation there has already been done the adaptation of the role of the final user of electricity and so the resale of energy for charging electric vehicles can be done.

9. Charging station supply and execution of the civil work for the charging station installation.
   The specifications of the charging post to be installed has come as an input from Green eMotion partners and work done on relevant work packages with respect to the standards adopted, see D7.8 [4]. In case that some extra features are necessary (a metering system installed by HEDNO in the charging post in case of obligation of direct metering of the DSO) some extra requirements should be included.

10. Charging Stations Installation
    This stage may take one to two days regarding the distance of the connection to the grid point as well as the materials used for the foundation of the post. Some extra time may be required if an external DSO meter is installed in a separated pillar.

    After the installation of the charging posts, the two reserved parking spaces in front of each charging unit were fully painted green with a white logo of Green eMotion project.
    It was proven necessary as non EVs take the parking space if it is not clearly scared and reserved for EVs. In cases as in Greece were emobility and EVs is not widely known, it is quite possible that drivers are not familiarized of that specific use of the parking place in front of the charging post. The vivid labelling of that area, not only helps in reserving the space free, but also disseminates emobility and highlight also the advantage of easy access to public charging.

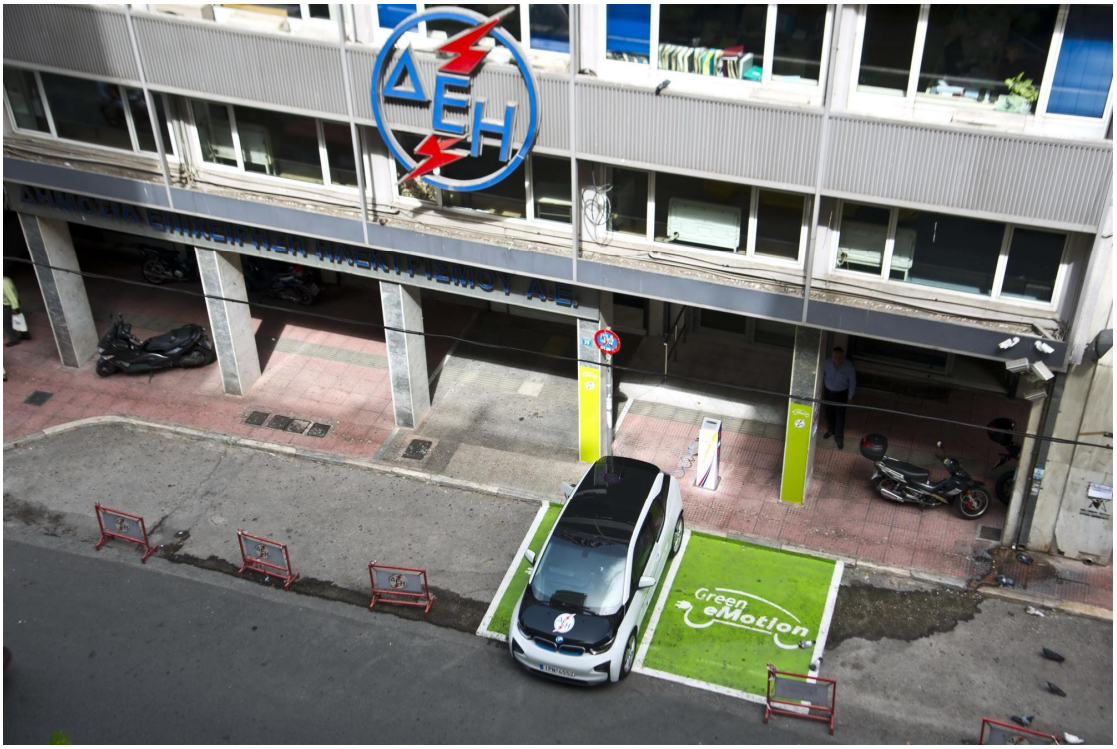

Figure 2.2: Two reserved parking spaces painted green in front of PPC's headquarters.

11. Connection to the grid – electrification

It is obvious that in this step the involvement of DSO in the project is the main element in deployment of GeM pilot project. It is quite obvious that the role of DSO in the installation of the charging posts is very important even when dealing with independent e-mobility market.
In the beginning of the project PPC was a vertical company incorporating the Distribution Network as a General Division. So the connection to the grid and the electrification of the charging stations would be an easy task, with no regulatory problems anticipated.

One of the most serious issues that had to be addressed before connecting all the other charging stations to the grid, was the fact that the responsible division of HEDNO requested direct metering of energy consumption during the pilot period.
In Greece, as in other European countries, DSO (HEDNO) has the obligation and the responsibility of direct access to the final user meter, which is certified and installed by DSO itself.
As far as the charging post serves also as a final user (with direct connection to the grid) DSO needs to control the metering system. In countries and cases where the DSO model is adopted it is obvious that this issue is automatically addressed. In case that independent emobility model is preferred different solutions may be adopted.
This led to new meetings and discussions, in order to find an acceptable solution for both HEDNO and the representatives of GeM in Greece.

The model tested in Greece within the context of the pilot project is that of independent e-mobility market. In this model, the DSO retains its role in metering the energy consumption of the charging posts.
The simplest solution and cost effective is that the DSO will have access through telemetering to charging posts, keeping measures of the total energy consumption to be charged to the charging post operator.
Since there was no consensus with the relevant departments of HEDNO to accept the pilot operation of the charging units until the end of the project, without direct measurements, alternatively solutions were explored.

GeM representatives in Greece proposed a direct communication of HEDNO to the e-mobility Control Center in Milan, in order to obtain measurements of consumption per each charging unit, per day etc.
This option was rejected by HEDNO, as their legal obligation is to take measurements with direct access to the meter, without the involvement of any other authority.

The only possible solution was the installation of an additional certified by HEDNO meter (counter) either in the charging unit or in a different pillar next to the charging unit and take direct and certified measurements.
The possibility of installing a new meter within the charging unit as it was not included in the supplying contract would void the 2 year factory guarantee of the unit, degrading the equipment and causing problems in a potential failure.

So the most plausible solution and the one that was decided to be adopted, was to place an external meter, certified and owned by HEDNO, in a watertight pillar next to the charging unit. Similar topics could be found in other demo regions, where external parties (local DSO) might need for regulation the installation of a dedicated meter and request a beyond the meter installation. However, in case of Greece replication region, the products installed already had a MID certified meter and an evolution in regulation could allow PPC to carry over metering duties on behalf of HEDNO by using the embedded meter.

The selection of the appropriate pillar, the place of the installation and the lack of any technical standards, not even instructions or guidelines, as well as the matter of who will make the installation, led to new discussions and meetings.

After the implementation of the agreed solution in two locations in Athens, new problems have aroused, as a new round of asking permission for the installation of the extra pillars have been started with the Technical Direction of the Municipalities.
Finally, the solution was abandoned just for the project period given the pilot nature of the project.
Also, for the duration of the project the electricity consumption of the company's e-cars fleet was agreed to be declared by the Greek pilot System Operator via the control center database in Milan.

Figure 2.3: DSO external meter next to a charging station.

All the above mentioned considerations have to be taken into account as it led to significant delays in the project schedule. Nevertheless, it was exactly all these discussions and delays in the project, that made HEDNO (Greek DSO) and PPC acquire a direct perception of the guidelines and the rules that should be decided for the collaboration for the deployment of emobility infrastructure and also acquire a knowledge of the role that they may be asked to undertake in the future depending on the model that Greece will adopt regarding emobility.

These problems and delays associated with regulatory - organizational issues and related to distribution of responsibilities and lack of technical standards, although characterizing a difficult process, accomplished the goal of the pilot project that has a pilot project; namely, the acquisition of knowledge about the arrangements to be made for the widespread application of e-mobility and installation of infrastructure.

The deployment of the pilot project in Greece the following steps were also performed:

16. Connection of charging stations to the e-mobility control center in Milan (EMM Platform)

The pilot project for Greece, except the installation of the charging units, foresaw remotely management of the charging units for load management and participation to the marketplace of GeM, enabling roaming services. These functionalities demand a control center with enhanced possibilities In Green eMotion, PPC did not invest in the developing a Control Center, using the e-mobility Control Center in Milan for the pilot project period. That's a proven solution coming from demo region Italy, where the Green eMotion IT interfaces where successfully implemented and executed prior to the replication in Greece. The reason is obviously economic, as PPC has not definitely declared its business involvement in e-mobility at the specific period, nor the model for Greek e-mobility deployment of charging stations has been determined yet. The connection to the Enel's EMM Platform (emobility center of ENEL in Milan) is a replication paradigm of a proven solution already installed, which may be a case for deployment of emobility in an area/country at the first stages using the installed infrastructure in a mature country (like the case of GR and IT demo regions of Green eMotion).
For these reasons it was decided that the 15 charging units installed by PPC for pilot purposes will be operated through the supplier's e-mobility control center in Milan for the duration of the project.

17. Registration to the market place of the PPC charging post operator and PPC service provider for Athens and Kozani

Roaming has the scope to merge and push cooperation among different service providers and charging post operators. In this use case, PPC as charging point operator permits the use of the installed charging post (in Athens and Kozani) from other service providers such as the Green eMotion partners and also as service provider uses the charging posts installed from other Green eMotion partners through participation in the marketplace.

The registration in the market place was necessary in order to make possible the roaming services for PPC acting as charging post operator, meaning permitting to other emobility systems users to use the charging posts installed by PPC, and for PPC acting as an emobility service provider meaning to give the possibility to its clients to use other charging post operator infrastructure.
In that way the different operators' networks formulate a virtual unique e-mobility network making using and driving e-cars user friendly, absolving EV drivers from range anxiety.
In the first stage of implementing e-mobility, especially if the DSO model is not preferred, it is quite essential to facilitate roaming contracts establishment.
In the case of DSO model choice, roaming is much easier through DSO's established infrastructure at national level, as DSO model (infrastructure deployed as a regulated asset base of DSO) all service providers must access to the infrastructure without discriminations [5].

2.5 Electromobility context

Awareness and behaviour change, mostly based on how municipalities can stimulate electromobility through communication activities, is important for an electromobility project deployment.

The context of an electromobility project is very important and it is one of the first points to be taken into account before starting the development. In deliverables D9.7 and D10.7 [2] it's explained the importance of the vision and goal of each project and the incentives promoted. A successful project requires:

- Charging Infrastructure
- Supply of EVs at reasonable prices
- Public Policy support through financial and non-financial incentives
- Public education on the benefits to both the individual and society of electromobility.

It is better to set the context before the deployment problems emerge and to do so it is important that the stakeholders involvement in the earliest possible opportunity.

Each country must consider then the charging infrastructure, the EVs, the location of the installation and its legislation and the people, not just considering the customers and its satisfaction but also taking into account the non EV customers and its education regarding the new sustainable transport as it is the electromobility. Dissemination, education and a conscious vision of sustainability will allow the project deployment and the e-mobility growth.

As mentioned each project before starting to implement the steps defined in Figure 3.2 "Emobility deployment phases" has to define the vision of the project, which can be given by a sustainable energy action plan, a complete decarbonisation of the mobility in the city plan, a promotion of sustainable transport system or the need to reduce air pollution.

One main goal has to be foreseen for each vision, such the reduction of CO2 emissions or encourage of the most relevant mode of transport. Initiatives have to be taken into consideration in order to reach the scope of the project, giving a public knowledge about the project and the e-mobility. The creation of good conditions for EV owners, decarbonisation of the inner city centre, administrative support to e-vehicles diffusion, the use of EVs in the Municipalities, public e-fleets, sharing of e-vehicles are some initiatives which would help on the e-mobility dissemination (see D9.7 and D10.7 [2] for further details). Give residents a chance for testing an EV, getting people inside an EV and test it is one of the most effective actions towards removing psychological barriers.

Public education can be given from the municipalities, but also from the schools. Driving schools are the first behind the wheel for many drivers and therefore a good opportunity to show the future generation of drivers that EVs are real alternatives and a very good driving experience.

Furthermore, the municipality has to ensure an optimal coordination and implementation. The municipality should:

- Integrate the strategy in the overall Municipality Plan so the strategy is anchored at highest level.
- Ensure cross-sectorial coordination of electro-mobility strategies.
- Ensure coordination across local, regional and national authorities.
- Communicate the electromobility strategy towards a broad range of stakeholders: Residents, companies, educational institutions and the municipality staff.
- Use the municipality's urban development plans and construction plans to leverage the infrastructure roll-out. The future need for EV-infrastructure should be incorporated in all new-constructions as well as urban renewal projects. This should also include encouraging housing associations or housing agencies to invest in charging infrastructure as part of their property and maintenance investments.
- Ensure access to charging stations (also for potential customers with no access to private parking)

Regarding the last dot, the experience shows that an increasing number of local authorities impose requirements of "open access" when deploying charging infrastructure in the public sphere. In many cases there are no clear definitions of open access. There is the need for regulating the deployment of infrastructure, solving the experienced problems with EV charging spots being occupied by non-EVs (e.g. internal combustion engine vehicles).

Considered the context, the recharging infrastructure analysis and deployment phase can begin (described in chapter 3.2 "Technical aid-kit for EU-wide framework integration").

2.6 Mind the customers

There could be no success of even a tight e-mobility initiative without a proper set of customers designed to demonstrate the reliability of a new technology like electric mobility, which somehow breaks through the conventional mobility user experience in several ways.

Apart from the installation of the infrastructure deployment for the purposes of the pilot project, PPC had also the intention of leasing a certain number of electric vehicles in order to also include real customers dealing with their needs, preferences and claims.
The process of PPC leasing 15 electric vehicles for the period of the project was proven to be more difficult than first anticipated.
Undergoing an economical crisis, Greece is a relative small market for electric vehicles.
Major car importers did not have any planning for importing electric vehicles and OEMs did not schedule Greece as a priority for electric mobility.

That was the reason why there were:

- Problems in delivering electric cars in the Greek Market.
- Difficulties in delivery time of the e-cars.
- Triggering leasing companies to resolve procedural issues related to the new product. As it was their first contracts that they had to draw for leasing electric cars.

Nevertheless, after many communications and discussions with several companies, two companies, that are also partners in the Green eMotion project, gave their offers for the leasing of the 15 electric vehicles for the usage during the pilot project.

From business model perspective, pilot project is currently implementing with a "sole service provider" model: e.g. PPC installs, owns, operates and sells charging services. Although the installation of Green eMotion charging stations was subsidized, such a business model looks hard to be profitable in the short term, especially in country at low EV market share penetration (ref. Green eMotion – Deliverable D9.4 [2]). Future evolution in local regulation might allow regulated models (such as the ones experimented in Italy within the AEEGSI ("Autorità per l'energia elettrica ed il sistema idrico"), Italy's national authority, where the charging stations are remunerated through grid tariffs and multiple service providers could compete on the same infrastructure. This business model could produce interesting market performance in the short term, allowing an easier uptake of electric mobility.
Regulatory framework discussion is just started in Greece, and that's probably the most significant result for the outlook of electric mobility in Greece funded by Green eMotion: showing off that it works, and start talking about how to regulate it an way that it is sustainable and aligned with latest EU framework, first and foremost the Alternative Fuels infrastructure Directive (94/2014).

2.7 Replication insights from Greece

Greece provides an useful example of typical issues for a replication region that would like to set up an e-mobility initiative in a way that it is integrated in the wider EU market. This paragraph will provide an overview of the main insights that might be derived from Greece, in a Q&A fashion.

Needed EVSEs

EVSEs should be installed in a way to comply with EU Directive 94/2014 [3], deploying at least AC Type 2 for AC charging (that could be up to 43 kW), with CCS and CHAdeMO needed add-ons for fast charging EVs until 2020. Due to budget constraints all EVSEs deployed in Greece were chosen as double AC Type 2, each socket up to 22 kW, in order to provide a cost-effective deployment of a first limited network of charging stations in the replication region.

How to anticipate market growth

As e-mobility initiative in Greece was started within 2014, PPC will analyze usage data for the first year of pilot project to detail a growth plan for installation. However, a detailed deployment plan could only be designed within a stable regulatory framework, with clear responsibilities over charging stations ownership and operation, national subsidies, possibility to involve regulated parties in the ownership and operation of charging stations. Therefore it is key to immediately kick-off regulatory discussion within the replication region in order to effectively leverage the results coming from the first year of operation of the service, as minimum needed time to design a deployment plan until 2020.

Area/locations to be covered with infrastructure
Within Greece as replication region, public AC charging use case was tackled in urban area (Athens) and sub-urban area (Kozani). While the first was chosen in order to effectively disseminate project's content and result, the reason for choosing the second one was mainly due to the synergy with other demo owner's facilities in the surroundings (PPC holds power plants in Kozani area). Typically a combination of both criteria – urban areas for dissemination/marketing/customer perspective and sub-urban areas for operational reasons – is recommended, as this was also the strategy by which other GeM regions, e.g. Italy, kicked off e-mobility initiative prior to Green eMotion project. Both use cases deliver insights over customer behavior, charging stations usage, charging stations deployment plan according to market shares (urban areas) but also sound economics for side products related to fleet management, integration with other plants (sub-urban areas).

Planned EVs
When kicking off an e-mobility initiative it is definitively needed to bring the first EVs on the streets, in order to disseminate that the project works and it is waiting for customers. This was brilliantly executed by PPC in a very short time frame in Greece, as a result of proper planning in the project's Description of Work. The growth of EVs share on the streets must be properly monitored in order to feed the deployment plan of charging station and any adjustment to the regulatory framework. More precisely, an evolution of the regulatory framework is foreseen as EVs market share increase, moving from initial subsidies in the hardware deployment (as done through Green eMotion in Greece) to lower or zero subsidies when the technology adoption gets into market maturity.

3 Integration of a pilot project into EU-wide framework

3.1 EU-wide framework scope and Green eMotion purpose

The goal of Green eMotion is to facilitate the mass deployment of electro mobility in Europe. The most reliable results will be obtained aggregating the data collection and experience obtained by each Green eMotion demo region partner. Communication between local demonstration sites is essential to integrate and standardize all monitoring procedures and integrated with a pan-European vision.

Different business models, business actors, technical specifications and standardizations have been created during the project. The scope of this deliverable is to define the emobility mass roll out by following the GeM patterns. Hence, PPC was given access to the Enel charge management system, allowing introducing emobility to Greece, disseminating the GeM results and giving to the project the deployment experience.

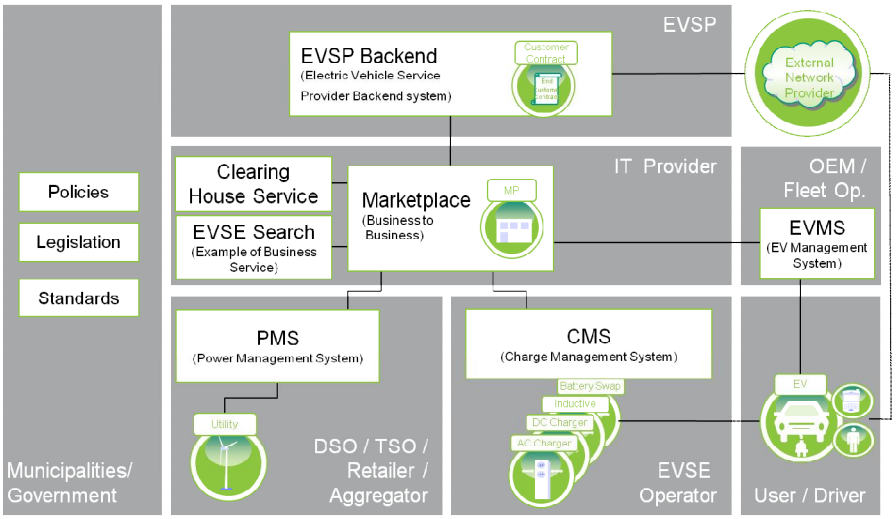

Figure 3.1: GeM ICT reference architecture

In this test case PPC plays the role of EVSE Operator, and other GeM partners (Enel) play the role of EVSP. PPC chargers were used as EVSE infrastructure, connected to the Enel EVSE backend (Charge Management System in Figure 3.1), the EMM Platform. Hence, Marketplace would also contain information from Greece. In any case, PPC have also the possibility to act as EVSP, both roles are relevant for a Greenfield installation of Electromobility.

3.2 Technical aid-kit for an EU-wide framework integration

The PPC deployment experience is fundamental for a pragmatic recommendation for future e-mobility exploitation. The main topics that should be taken into consideration are summarized in deployment phases.

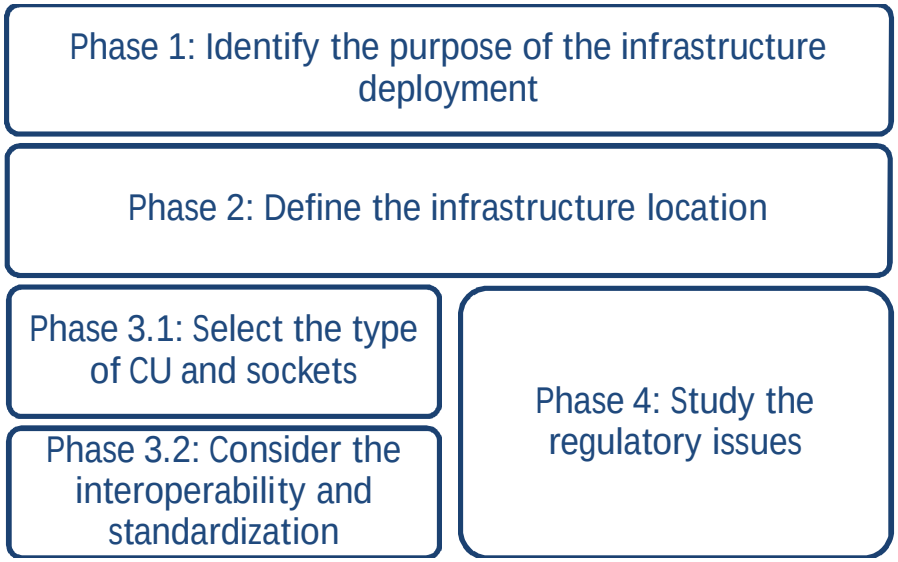

Figure 3.2: Emobility deployment phases

The above figure shows the phases that should be carried out by new e-mobility regions, based on the Greece demo region experience (explained in Chapter 2). Each phase is explained below, considering the actions included in each on and the time scale.

Understanding the main uses, customers and further reasons why the chargers are being installed it is possible to define where the chargers will be installed. Once the scope and locations it's been defined two steps can be performed contemporary, by one side the selection of the charger characteristics and by the other side the study of the regulatory obligations.

Considering the first point, with the bases of the customer needs, the charger characteristics can be defined (AC/DC, mono phase/tri phase, fast/medium/low recharge, kind of plugs). The interoperability and standardization has to be taken into account once is clear the charger technology that will be adopted, giving a further service to the emobility customer by creating a European Ecosystem.

Contemporary, it is recommended to study the regulatory issues. As demonstrated from PPC experience, there are several difficulties installing chargers in places where electro mobility doesn't exist yet. Furthermore, also being in the same country, each municipality has different patterns and legislative rules to be followed.

Once the chargers have been installed in Greece (Athens and Kozani), PPC has been involved in several demo cases: Search, AC charging and Load management as described in D8.2; and Roaming in D8.3 [2], in order to allow integration of Greece replication region into the wider framework at EU level defined by the project.

Interoperability is the basis of the European emobility ecosystem, that's why roaming takes an important role defining the technical aid-kit for EU-wide framework integration. Connecting to a roaming platform is relevant as it enables customers of foreign EVSPs to use the newly build

infrastructure and thus helps the business case of electromobility in the new region. Plus, the same technical interfaces can be used to allow interoperability across charging networks hosted in the very same country, or city, as it happens in Milan (Italy) where Green eMotion interface are being used to provide interoperability between infrastructure operated by A2A in Milan and Enel infrastructure in areas surrounding Milan. Roaming would introduce the "Business Services" component relates to the Business Services Sub Domain of the Marketplace. The component will implement the following functionality and expose it to users of the marketplace through User Interfaces and - for some functionality that needs to be accessed by other systems, as the Clearing House - also through Service Interfaces:

- Service Store
- Partner Management
- Contract Management

The clearing house deals with incoming authorization request and SDRs. It is used to enable roaming.
The authorization requests can come from the EVSE operator or from the EVSP. In the first case the EVSE operator sends an AuthorizationRequest defined in SRV Authorization to the clearing house if it recognizes an unknown EVCOID. In the second case the EVSP sends a PushAuthorizationRequest defined in SRV Push Authorization to the clearing house if he receives a charge request of his customer.
In both cases the SDR is send after a charging process. If a charging process has been started without the use of the clearing house, a SDR can be send anyway.

Hence, the technical aid-kit for a EU-wide framework integration is based on the Authorization Request and the Push Authorization Request (D.3.6 [1]).

- SRV Authorization

The clearing house interface which deals with requests from EVSE operators to determine if an EV driver is allowed to charge.
The same interface is implemented by the EVSPs so that the clearing house can ask the EVSP if a customer is allowed to charge at the specified charge point.

AuthorizationRequest

Attributes	Datatype	Constraints	Description
sessionId	string	1	will be created by EVSE operator backend system (just unique in one EVSE Operator system)
EVCOID	2165: BO EVCOID	1	Contract ID which contains EVSP ID and Customer ID. The ID is split up into 3 sub elements (CountryCode, EVSPID, CustomerID)
EVSEID	2127: BO EVSEID	1	Charge Point ID
VIN	string	0..1 see ISO 3779 and others	Vehicle identification number
BIN	string	0..1	Battery identification number

Table 3.1: Authorization Request [D3.6 [1]]

AuthorizationResponse

Attributes	Datatype	Constraints	Description
sessionId	string	1	will be created by EVSE operator backend system (just unique in one EVSE Operator system)
responseValue	boolean	1	if true is sent back to the EVSE operator system, the customer is allowed to charge, if false is returned, the customer is not allowed to charge

Table 3.2: Authorization Response [D3.6 [1]]

- SRV Push Authorization

The clearing house interface which deals with requests from EVSPs to trigger the charging process at an EVSE.
The same interface is implemented by the EVSE Operator so that the clearing house forward the push authorization message to the corresponding EVSE Operator at which the customer of the EVSP wants to charge.

PushAuthorizationRequest

Attributes	Datatype	Constraints	Description
transactionId	string	1	will be created by sending system (just unique in the sending system)
EVCOID	2165: BO EVCOID	1	Contract ID which contains EVSP ID and Customer ID. The ID is split up into 3 sub elements (CountryCode, EVSPID, CustomerID)
EVSEID	2127: BO EVSEID	1	Charge Point ID
endOfCharge	datetime	0..1	can be set to stop the charging at a specific point in time, timestamp in UTC
duration	int	0..1	can be set to restrict the charge duration, in minutes
kwh	int	0..1	can be set to restrict the amount of kilowatt hours which are provided by the charge point, in watt hours
speedOfCharge	int	0..1	can be set to restrict the speed of charge, in watt
typeOfCharge	2374: BO ENUM TypeOfCharge	0..1	can be set to restrict the type of charge

Table 3.3: Push Authorization Request [D3.6 [1]]

PushAuthorizationResponse

Attributes	Datatype	Constraints	Description
transactionId	string	1	the transactionId of the request to associate the request to the response.
sessionId	string	1	will be created by EVSE operator backend system (just unique in one EVSE Operator system). null if the EVSE operator denies the charging for any reason
endOfCharge	boolean	0..1	value of true is a confirmation of the EVSE Operator that this restriction will be applied, value false or if the field is missing in the response means the restriction cannot be assured
duration	boolean	0..1	value of true is a confirmation of the EVSE Operator that this restriction will be applied, value false or if the field is missing in the response, the restriction cannot be assured
kwh	boolean	0..1	value of true is a confirmation of the EVSE Operator that this restriction will be applied, value false or if the field is missing in the response, the restriction cannot be assured
speedOfCharge	boolean	0..1	value of true is a confirmation of the EVSE Operator that this restriction will be applied, value false or if the field is missing in the response, the restriction cannot be assured
typeOfCharge	boolean	0..1	value of true is a confirmation of the EVSE Operator that this restriction will be applied, value of false or if the field is missing in the response, the restriction cannot be assured

Table 3.4: Push Authorization Response [D3.6 [1]]

Main technical guidelines from using the above reported interfaces can be found within the proceedings of Green eMotion Deliverable 8.3 [2], where interoperability demonstration has been executed in several countries, including Greece. Amongst the key technical findings:

- Standardization is needed for the RFID ID and EVCO ID in order to use RFID properly as an access mean to charging service, allowing customers to “roam” across multiple charging networks. To this purpose, a dedicated technical committee within ISO TC 68 has been initiated by Green eMotion partners, in order to create an RFID standard for electric mobility
- Standardization is needed for all the relevant Business Objects (BO) used in the transactions between EVSE Operators and EVSPs to execute interoperability. All stakeholders must use the same BOs to declare the identification of the charging station (EVSE ID), the identification of the physical electric point of delivery (POD ID), the identification of customer’s contract ID (EVCO ID), and more. eMI^3 initiative (www.emi3group.com) was kicked off by Green eMotion partners to guarantee that project findings might be leveraged for a ready-to-use IT standard when it comes to interfaces between electric mobility platform.

Future access to electric mobility services seems to be more feasible through smartphone application, as it relies on the BO standardization (Ref. Green eMotion D8.3 [2])

3.3 Regulatory aid-kit for an EU-wide framework integration

Although electric mobility is moving its early steps as a mass market, an international regulatory framework should be established in order to guarantee that interoperability (key topic of Green eMotion activities) is at the core of future policies within EU.

Withiout interoperability, there is no viable customer experience for EV charging. In a general scenario of a multiple marketplace environment where data transactions regarding charging sessions are exchanged, there is need of establishing a clear pattern of responsibilities and roles, especially for accessing the charging service in public places.

A significant effort in that sense has been made by utilities partners of Green eMotion and Eurelectric, also partner of Green eMotion, in the publication of the last Eurelectric white paper "Deploying publicly accessible charging stations: how to organize the market" [5], from which the following figure is retrieved.

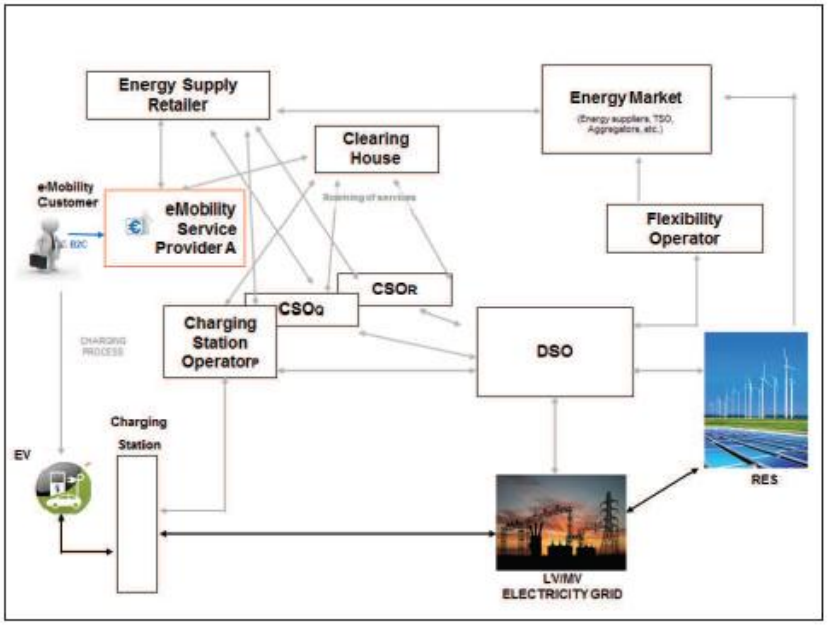

Figure 3.3: Role model for interoperable electric mobility

Such a paper, widely accepted as reference of future market organization in Europe, has been inspired by Green eMotion reference architecture and is amongst the key results achieved by Eurelectric initiative within the project.

When setting up an e-mobility initiative, local pilot projects should be designed in a way to be matching a general role model in order to be ready for market uptake. The above figure reports the general role model of an interoperable electric mobility, where possible roaming of service is performed alongside roaming of electricity (with customers possible switching energy supplier at any charging station, in compliancy with what foreseen by some Member States where a regulated deployment of charging stations is performed).

In this role model, the E-Mobility Service Provider buys electricity from an Energy Supply Retailer of its choice for charging its customers' vehicles at all the public charging stations. The Charging Station Operator acts as a "neutral" market player applying "*a multi-vendor approach*": he has an ICT back-end system in place that is able to "identify" the e- Mobility Service Provider that has a B2C contract with the e-Mobility customer, requesting to charge at the public Charging Station, i.e. it "clears" the B2B agreements. A B2B agreement links the Electricity Supply Retailer with the E-mobility Service Provider.

Thus, the e-Mobility customer cannot choose any electricity supplier on the charging station as such, as the electricity supplier will be associated (or by itself) to the e-Mobility Service Provider chosen by the customer with his B2C relationship [3]. All the interactions between Charging Station Operators and eMobility Service Provider enable a seamless customer experience and are based on Green eMotion specs.

4 Outlook for an EU-wide e-mobility framework

Beyond the establishment of regulatory innovation for effective implementation of electric mobility as a business reality, technical steps must be undertaken in order to favour a multi-marketplace environment, inspired to the Green eMotion project.

Within the framework of EU-wide interoperability of services, there is a significant opportunity in the months ahead right beyond the end of Green eMotion project to implement a concrete set of IT infrastructure services to enable the interoperability between existing Platforms at EU level. The purpose of this business process to be established in Europe is to properly exchange data and services (EVSE Search, RFID Authorization info, Charge Detail Record) in a way that perfectly exploits the demonstration performed by the "Multi-MarketPlace" or "Multi-Platform" demo case of Green eMotion , see D8.3 [2].

The first aim of such cross-platform exchange should be to widen the market opportunity of each Platform Operator and its Platform Customers. Such a cross-Platform protocol could additionally enable harmonization even in the Platform Customers management, moving towards the creation of a single EU Platform with a precise structure of share holders all across Europe, as a possible outcome of single Market Place scenario after the early phase of transition in the market.

A new region should connect to a wider roaming platform in order to secure new market streams coming from other market participants and allows seamless customers experience across a divers charging networks in the European continent.

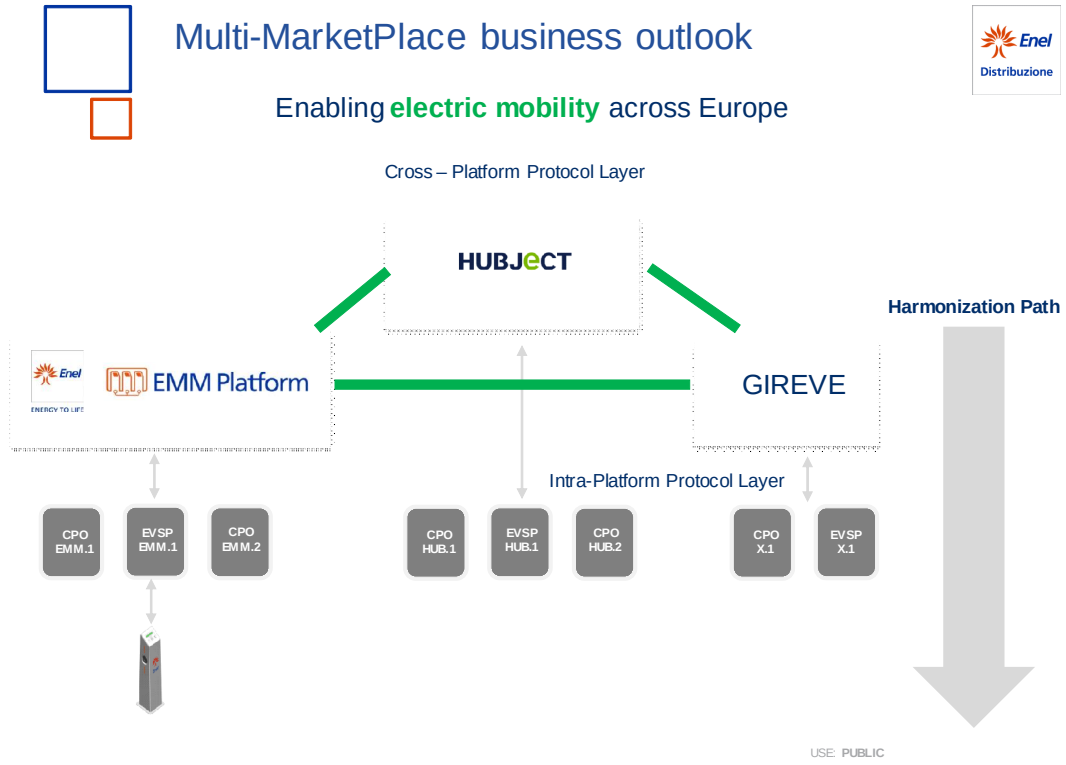

Figure 4.1: Example of multi-marketplace environment beyond Green eMotion project

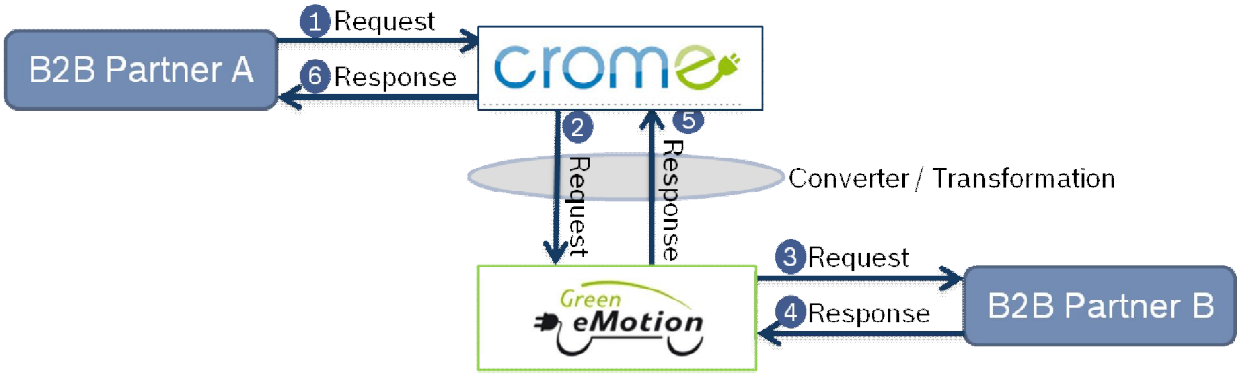

Figure 4.2: General Communication Set-up

Within the Green eMotion project, the idea of multi-marketplaces was demonstrated through a dedicated demo case performed by Bosch, within DE02 demo region (Reference D8.3 [2] and Figure 4.2).

Such a goal (a common EU framework) could be easily enabled through the following technical path:

1. Development of cross platform interoperability through a single communication protocol between Platforms, enabling each Platform Customer to access / provide services that might be given / acquired by outer Platform Customers, in accordance with Figure 3.1: GeM ICT reference architectureFigure 3.1 and eMI^3 specifications (deadline: end 2015).
2. Development of intra-platform protocol, as an extension backward-compatible of existing intra-platform protocols, serving as a technical enabler for the possible creation of a single EU Platform (deadline: end 2016)
3. (In case there is a shared interest amongst EU players) Creation of a single EU Platform by merging all national / regional Platforms (deadline: early 2018).

Point 1 to 2 should leverage as much as possible existing solutions and should deliver solutions backward compatible with existing ones. For Point 1, rather than starting from scratch, there is opportunity to start from one intra-Platform protocols (such as OICP) and build a new release of that which could be compliant to the cross-Platform use case.

5 References

[1] http://www.greenemotion-project.eu/dissemination/deliverables-ict-solutions.php

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[3] Directive 2014/94/EU of the European parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure. Available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0094&from=IT

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