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# Electric Vehicles Management for carbon neutrality in Europe

# Deliverable D10.5
# Exploitation Plan

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## Disclaimer



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[1] https://ev4eu.eu

## Executive Summary

The *Exploitation Plan* (D10.5) outlines the EV4EU's initial exploitation plan for the solutions proposed in the project, at a high level. During the next 2 years, a complete exploitation plan will be prepared to be submitted at M36 (*Exploitation Plan-Update* – D10.6).

This deliverable has been prepared by the Task leader of 10.3 – Smart Energy Lab (SEL) and counts with the contribution of each demonstrator' site leaders, to present a preliminary version of exploitation plan for each demonstration case.

With this first exploitation plan defined, we now have this first step accomplished. The process of building a complete exploitation plan will be iterative and will consider new findings from all partners and all the progress of the EV4EU project during the next 2 years.

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## Keywords, Acronym

| | |
|---|---|
| ADMS | Advanced Distribution Management System |
| AMI | Advanced Metering Infrastructure |
| BtM | Behind the Meter |
| BEMS | Building Energy Management System |
| BM | Business Model |
| BMC | Business Model Canvas |
| BUC | Business Use Case |
| CPO | Charging Point Operator |
| CS | Charging Station |
| DR | Demand Response |
| DoA | Description of the action |
| DER | Distributed Energy Resource |
| DSO | Distribution System Operator |
| DMS | Distribution Management System |
| EDA | Eletricidade dos Açores |
| EV | Electric Vehicle |
| EVSE | Electric Vehicle Supply Equipment |
| EMSP | Electromobility Service Providers |
| ERP | Enterprise Resource Planning |
| GIS | Geographic Information System |
| HV | High Voltage |
| HEMS | House Energy Management System |
| KER | Key Exploitable Results |
| LV | Low Voltage |
| LREC | Regional Laboratory of Civil Engineering |
| MV | Medium Voltage |
| PLEMS | Parking Lot Energy Management System |
| PMU | Phasor Measurement Units |
| PV | Photovoltaic |
| SROPC | Regional Secretariat for Public Works and Communications |
| SREA | Regional Statistical Service of Azores |
| RES | Renewable Energy Sources |
| SEL | Smart Energy Lab |
| SAP | Systems Applications and Products |
| SCADA | Supervisory Control and Data Acquisition |
| TSO | Transmission System Operator |
| UC | Use-cases |
| V2X | Vehicle-to-Everything |
| V2G | Vehicle-to-Grid |
| WP | Work Package |

# 1 Introduction

## 1.1 Scope and Objectives

This document, **Exploitation Plan**, **D10.5**, deliverable of the EV4EU WP10, outlines the EV4EU's initial exploitation plan for the solutions proposed in the project.

According to Horizon Europe [1], *exploitation* refers to the actions required for the knowledge to be transferred and the results used or commercialised into new products and services. As EV4EU project will propose and implement bottom-up and user-centric Vehicle-to-Everything (V2X) management strategies creating the conditions for the mass deployment of electric vehicles, it is important to define a strategy to exploit all the results that emerge during the course of this project.

At this stage, the proposed exploitation plan consists of a preliminary version, based on the information already available, and counting with the important contributions of each demonstrator' site leaders.

## 1.2 Structure

This document is divided into five sections. Section 1 introduces and gives the context of the deliverable. Section 2 presents the exploitation objectives and methodology, presenting EV4EU main target groups and sub-groups, EV4EU stakeholders' relationships and the selected Business Use Cases (BUCs), and the project Business Models (BMs). Section 3 describes the exploitation strategy, presenting the Key Exploitable Results (KER) already defined and presented at deliverable 10.1[2]. Section 4 presents the exploitation plan for each demonstrator site. Section 5 presents conclusions and considerations about this deliverable.

## 1.3 Relationship with other deliverables

The exploitation strategy discussed in this document was already stablished at **D10.1** (**Plan for the dissemination and exploitation of results including communication activities***,* M6 [2]), and the main aspects to consider are target users (D10.1, section 2), presented in **Figure 1**, and Key Exploitable Results (D10.1, section 6), presented in **Table 1**. Some details will be added to this strategy in this deliverable, due to new developments since M6. More information and content will be added to this strategy at D10.6 to be submitted in M36, to have an updated and more extensive plan at that time of the project.

Regarding BMs and EV4EU stakeholders, **D1.4** (**Business models centred in the V2X value chain***,* M10 [3]) contributes with some inputs to this deliverable, which defined the BMs to be followed during the project.

Regarding the Use Cases (UCs) defined on EV4EU proposal, some different BUCs were proposed to be more aligned with the activities to be performed in demonstration sites and were submitted in **D5.1** (**Information Exchange needs to enable different UCs***,* M8 [4]). Also, the definition of actors and stakeholders were performed in this deliverable.

# 2 Exploitation Objectives and Methodology

In this chapter, the exploitation objectives and methodology are described. Although the exploitation objectives are defined for the project, the exploitation methodology may change during the duration of task 10.3, as results emerge, and knowledge is consolidated.

## 2.1 Exploitation objectives

The objective of EV4EU exploitation plan is to identify the potential exploitation and commercialization opportunities of the project results. The main goal is to maximize the value and the impact of the project outcomes, as new technologies, products, or services, with an overall framework for their exploitation, ensuring that they are effectively disseminated, utilised and commercialised by the relevant stakeholders.

The purpose is to present the most valuable exploitable results and actions of the project, as well as the result of the involvement of the project partners and how they will exploit the results post-project, creating opportunities for economic growth and innovation.

## 2.2 Exploitation methodology

In this topic, it is important to state the methodology adopted to guarantee that the project results are effectively exploited after project completion and beyond the scope and the duration of the consortium.

Since the beginning of the project, the exploitation methodology has started to be elaborated and some progress has already been made at this point of the project.

The methodology has been designed according to the specific objectives and characteristics of the project. However, throughout the duration of the project, some adjustments and reconsiderations of the methodology approach may be necessary.

At the time of planning and structure the EV4EU project, the development of tools, methodologies, services, technologies, and solutions was proposed. To achieve this, four demonstrators, one for each EV4EU country (Denmark, Greece, Portugal, and Slovenia), were idealized to test and evaluate the proposed solutions. The demonstrators' activities were organized in twelve UCs.

The exploitation methodology adopted for EV4EU, started by identifying all potential beneficiaries of the project's results. Several target audiences were identified at the very beginning of the project, and they are all presented at section 2.1 of D10.1 [2]. As stated at this deliverable, the list of EV4EU target groups may change to adapt to new strategies and solutions that may arise during the project. **Figure 1** includes the EV4EU main target groups and sub-groups.

The next step was to clarify an overall strategic goal regarding dissemination, communication, and exploitation plans, to ensure that the project's results are effectively communicated to potential customers, investors, and stakeholders. The work done in this regard is presented at section 1.1 of D10.1 [2], which will be updated at M24, and can be read in **ANNEX I**.

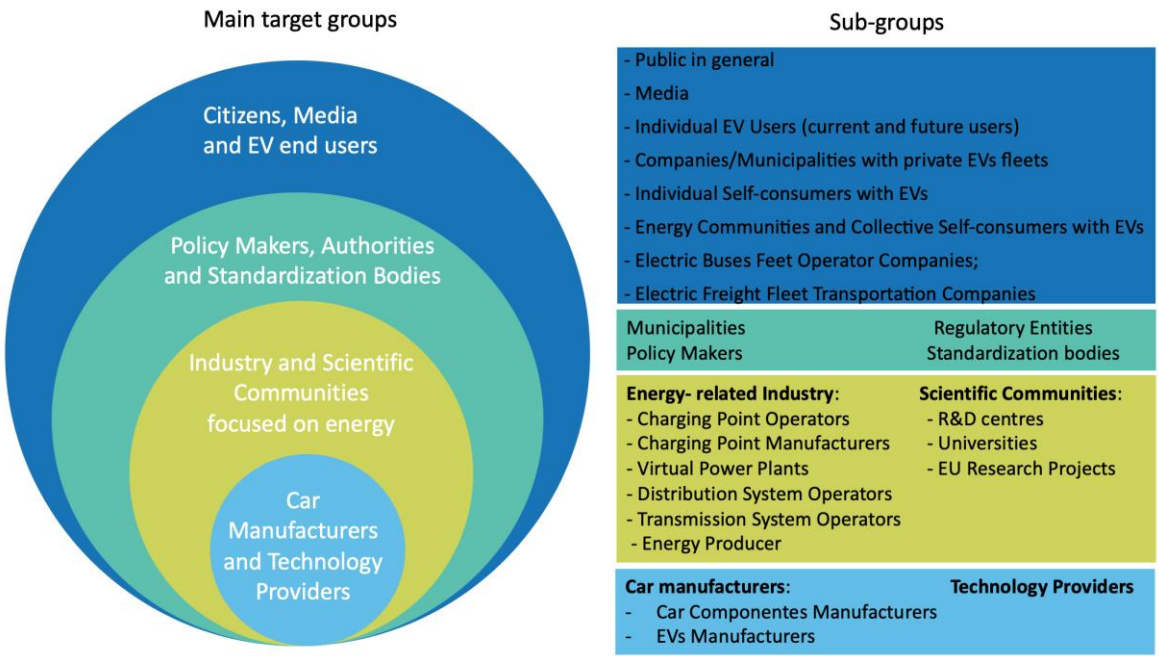


**Figure 1: EV4EU main target groups and sub-groups [2]**

Then, KER were identified also in D10.1 (section 6) [2], pointing out 13 KER across BMs and services, technologies, and tools. At the same stage the partners involved, the potential users and uses for these results were also identified. Further details are given in section 3 of this document.

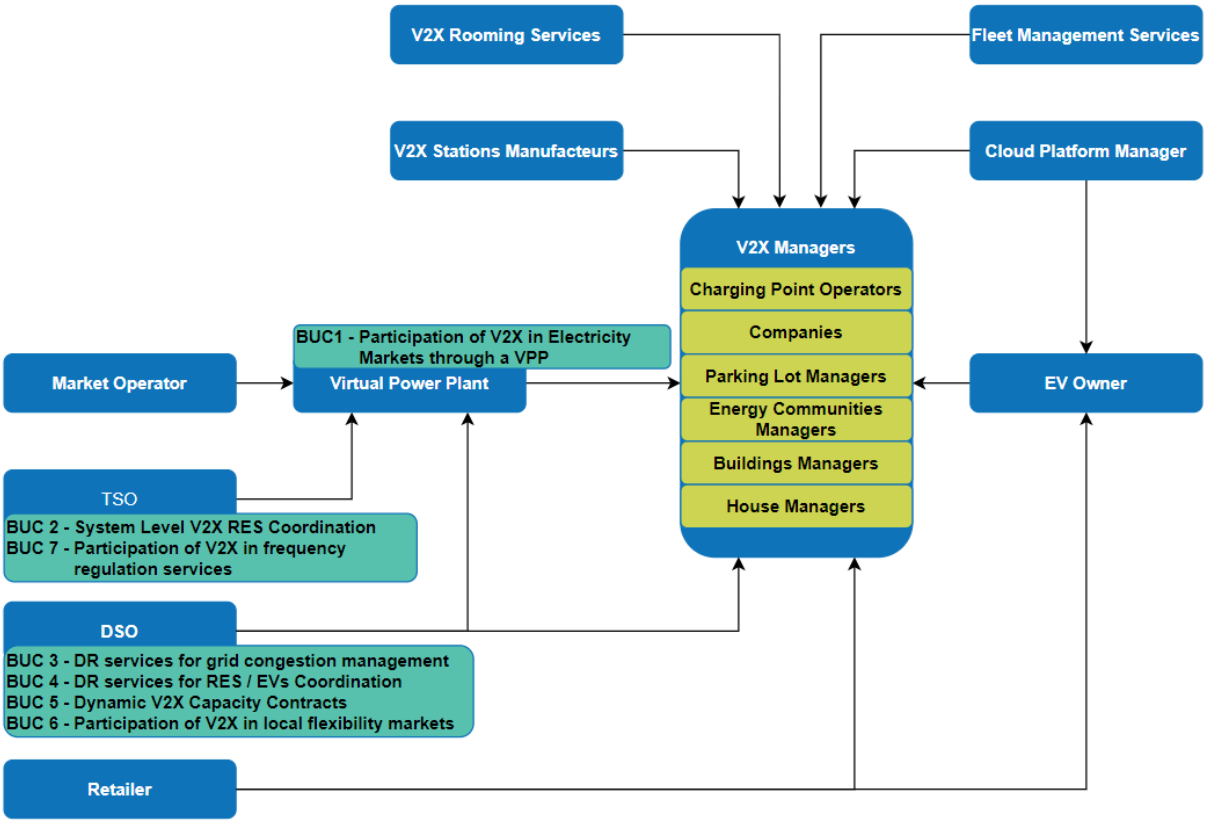


**Figure 2: EV4EU Business Use Cases, stakeholders, and their connections [4]**

At this point, the main actors and stakeholders in EV4EU project and the interactions between them were introduced, allowing the development of BUCs for each of the four demonstrators in EV4EU project that will occur in Portugal, Slovenia, Greece and Denmark. EV4EU stakeholders are presented in more detail with connections representing their relationship in **Figure 2**, including the selected BUCs [3].

During this last step, BMs were defined for new services related to V2X [3]. Twelve BMs were identified, and they will be explored and field-tested during the EV4EU project. As stated at D1.4 [3], the BMs defined should be seen as a work in progress, as they will evolve throughout the project, as we get results from field tests. A summary of the Business Model (BM) is presented in **Figure 3.**

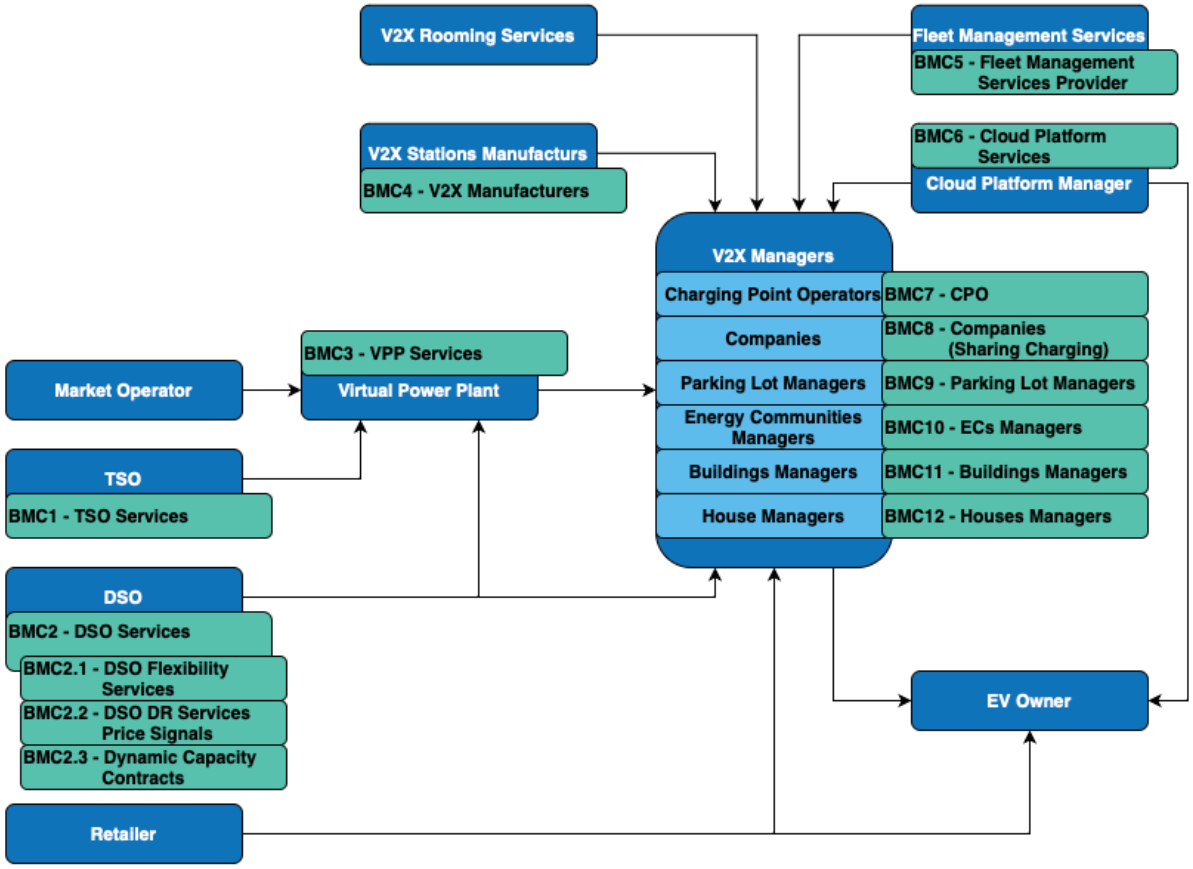


**Figure 3: EV4EU proposed Business Models [3]**

# 3 Exploitation Strategy

The EV4EU's exploitation strategy aims to explore the project results and services developed, and as described in Part B of Description of the action (DoA), is based on three complementary paths to exploitation:

- A joint exploitation path where all partners will work collaboratively in community development, based on established partner networks and customer accounts. This exploitation path ensures sustainability and wider acceptance of the project, with an engaged community of stakeholders.
- A path that involves defining detailed exploration plans by each partner, in accordance with each one's business and research strategy. Nevertheless, at the end of the project, it is intended that the project results will have an impact at European level, since the propose of the project is to create conditions for the mass deployment of EVs.
- EV4EU partners involved in the implementation of UCs will be responsible for their exploitation, namely the demos that will be used to validate the project's developments. These UCs will allow testing the project's functionalities at an early stage and will gradually evolve in terms of maturity and market readiness towards viability. This deliverable already presents some content in this direction, with the contribution of the demo leaders to think and describe the exploitation strategy of their demo sites at this stage of the project.

This strategy was designed to maximise the use of the project results by assessing how these results could be transformed into new products or services to be commercialised, to create impact and to ensure the long-term sustainability of the project's results.

To guarantee that this strategy is properly exploited, it is essential to do an iterative analysis during the project duration. This analysis could include market monitoring for new partners or new target users, identification of new potential BMs for EV4EU solution, new BUCs that fit properly to the project findings along the project lifetime.

During the proposal and Grant Agreement preparation, 13 exploitable results were identified. They are all presented at **Table 1**, divided by type (Business Models and Services, Technologies, and Tools) together with partners involved and the potential users and uses for these results.

## 3.1 Key exploitable results

**Table 1: EV4EU Key Exploitable Results, including project's exploitation strategy [2]**

| Type | Solution/ Responsible partner | Partners | Exploitation |
|---|---|---|---|
| Business Models and Services | Green Charging (New Solution) | EDA[2], BEOF[3], HEDNO[4], CELJE[5], GEN-I[6], PPC[7], DTU[8] | Green Charging is a new service that can be offered by the Distribution System Operator (DSO) in collaboration with Virtual Power Plants (VPPs) and Charging Point Operators (CPOs). The service will be tested by HEDNO/PPC in Greece and DTU in Denmark. In function of the results obtained in the project, the service can be part of the entity's portfolio. |
| | Sharing Charging (New solution) | INESC-ID, EDA, CB[8], DTU[9], DRE[10], SEL[11] | Sharing Charging is a service that can be used by the end-users (industrial, tertiary). The service will be tested in EDA using the charging solution proposed by SEL. The service will be exploited by these entities. |
| | Demand Response (DR) for V2X (partner HEDNO) | EDA, BEOF, HEDNO, CELJE, GEN-I, PPC, DTU, UL[12], INESC-ID, SEL, NEW[13], CITROEN | DR services and flexibility contracts will be mainly exploited by the system operators and retailers. VPPs and CPOs can also adopt these strategies in their portfolio to be adapted to the user's needs. |
| | Flexible capacity contracts for V2X (New solution) | EDA, BEOF HEDNO, CELJE, NEW GEN-I, PPC, CITROEN | |
| | Participation of V2X in markets and services (partner Gen-I) | EDA, BEOF HEDNO, CELJE, GEN-I, PPC | Participation in flexibilities in the markets is the core activity of VPPs. GEN-I will try these services and can be part of the GEN-I portfolio in a few years. |
| Technologies | V2X Stations (partner SEL) | All | Solutions proposed by SEL and by ABB will be tested in the project. It is expected that the proposed solutions can be offered in the markets until 2024. |
| | Parking lot Energy Management System (partner DTU) | DTU, ABB[14], Circle, GEN-I, PPC, UL, SEL, INESC-ID, NEW, CITROEN | Parking lot and house/building management solutions will be demonstrated in Denmark and Portugal. Circle and SEL will include these solutions in their portfolio until 2025. |

[2] EDA- Electricidade dos Açores, S.A.
[3] BEOF – Bornholms Energy & Forsyning
[4] HEDNO – Hellenic Electricity Distribution Network Operator
[5] CELJE – Elektro Celje
[6] GEN-I, trgovanje in prodaja električne energije, d.o.o.
[7] PPC – Public Power Coorporation
[8] CB- Campus Bornholm
[9] DTU – Technical University of Denmark
[10] DRE – Direção Regional de Energia
[11] SEL- Smart Energy lab
[12] UL- University of Ljubljana
[13] NEW – EDP NEW
[14] ABB- ABB inzeniring

| | | | |
|---|---|---|---|
| | Houses/Building energy management (partner INESC-ID) | DTU, ABB, Circle, GEN-I, PPC, NEW, UL, SEL, INESC-ID, CITROEN, DRE | Additionally, these solutions are also important to car manufacturers and end-users. |
| Tools | Decision Support tools for VPPs (partner GEN-I) and CPOs (partner PPC) | ABB, Circle, GEN-I, PPC, UL, INESC-ID, CITROEN | These solutions will be tested in Slovenia and Greece and will be exploited by GEN-I (VPP) and PPC (CPO) |
| | Open V2X management platform (partner PPC) | ABB, Circle, GEN-I, PPC, DTU, HEDNO, CITROEN | This platform will be exploited by PPC. It is expected that an industrial version of the platform can be available two years after the conclusion of the project |
| | Integration of V2X management in DMS (partners ELCE; EDA HEDNO; BEOF) | EDA, BEOF HEDNO, ELCE, GEN-I, PPC | V2X management will be integrated with the management system of ELCE and can be exploited in real operations during the project. Similar methodologies can also be used by the other DSOs participating in the project. |
| | Co-simulation platform for V2X (New Solution) | NEW, UL, SEL, INESC-ID, DTU, DRE, PPC, GEN-I | Co-simulation platform will be exploited mainly for research purposes. Nevertheless, real applications can be tested by the different partners for validation purposes |
| | V2X management strategies: high-level coordination tool (New Solution) | All | These strategies will be used mainly by policymakers. However, the strategies can include strategies at different levels allowing their use in different situations. |

# 4 Exploitation Plan

This chapter briefly describes each pilot that is being explored in EV4EU, with the contribution of all demonstration site leaders (EDP New, GEN-I, HEDNO and PPC, and Circle). For each demonstration site, each leader outlined the target users and how they will promote the use of project results. Additionally, they illustrated their strategy to commercialize or use the results in a way that generates revenue or other forms of value for the organisation.

On this chapter, the information provided was processed and organized into four sub-chapters:

- The first section aims to present a detailed analysis of each demonstrator, with information such as where it will be implemented and what are the main characteristics of the installation.
- The second section describes the commercialization potential of the demonstrator and what would be the economic viability.
- The third section details the target users that best apply to each demonstrator.
- The fourth section presents a simple and high-level go-to-market strategy, a strategy for how to bring the asset to the market or otherwise leverage it for commercial or strategic advantage.

## 4.1 Analysis of the Demonstrators

### 4.1.1 Portuguese Demonstrator site

In Portugal, the demonstrator will be implemented in São Miguel, 1 of the 9 islands in the Azores islands and an autonomous region of the Portuguese Republic, located ~1500 km from Lisbon. São Miguel has 133,390 inhabitants (according to the 2021 Census) and a total area of 744.6 $km^2$, while being 63.54 km long and ranging in between 8 and 15 km width-wise.

In 2022, electricity generation in São Miguel amounted to 452 GWh, 43.9% of which of renewable and endogenous origin. Geothermal energy is atop the island's Renewable Energy Sources (RES), representing over 33.9% of its total electricity generation. The island is not electrically interconnected with any other system (in fact, there is no electrical interconnection between the Azores islands, nor between these and Portugal's mainland).

Concerning the e-mobility public charging network at São Miguel, it is relevant to note there are currently 19 Charging Stations (CSs) – including 7 fast CSs – adding up to a total charging capacity of 38 EVs at any given time. These stations are strategically placed to ensure no more than 30 km between any two of them. Moreover, according to the Regional Statistical Service of Azores (SREA), there were 925 new EVs in Azores between January 2015 and December 2022.

The Portuguese demonstrator aims to implement, evaluate, and validate prototypes to enable smart charging strategies and V2X solutions in residential, building, and company environments.

The Portuguese demonstrator's residential environment will encompass 5 to 8 houses belonging to residents of São Miguel, at least one of which will be equipped with a solar Photovoltaic (PV) system, to test the coordination between EV charging/discharging actions and the operation of Distributed Energy Resources (DER).

On the other hand, building environment tests will take place in the office building of the Regional Laboratory of Civil Engineering (LREC), belonging to the Azorean Regional Government, namely, to the Regional Secretariat for Public Works and Communications (SROPC). The building in question serves more than 40 users through different sections (*e.g.*, laboratory, offices, meeting rooms, auditorium), encompassing a total useful surface area of 2,751 $m^2$ and allocating 2 of its parking spaces to support

the Portuguese demonstrator's activities. Energy-wise, the building has a contracted power of 116.25 kW and an installed solar PV capacity of 15 kWp, annually consuming 130.57 MWh (data from the building's 2019 energy certificate). Furthermore, in 2021, SROPC installed the necessary connecting infrastructure between the location of the foreseen EV charging parking spaces and the building's low voltage electrical panel.

Moreover, company environment tests will be undertaken in the campus of EDA – a vertically integrated electricity utility responsible for the Azorean region – in São Miguel, which encompasses a total surface area of approximately 23,000 $m^2$ and has a contracted power of 400 kVA, annually consuming about 52 MWh (2022 data). Furthermore, it is worth noting EDA's maintenance team's fleet embodies 30 EVs, while 10 of EDA's employees are EV users. For the Portuguese demonstrator's completion, EDA will contribute with 3 to 6 of its campus' parking spaces, 10 EVs from its maintenance team's fleet and 3 EFACEC alternate current CSs (with a nominal power of 20.7 kW + 7.4 kW).

### 4.1.2 Slovenian Demonstrator site

In Slovenia, the demonstration will take place in two locations where the impact of V2X on the power grid will be analysed.

The first location is the business building in Krško with demo equipment already integrated. The facility has been equipped with six controllable CSs (each charger has two sockets capable of delivering up to 22 kW) that can be autonomously controlled to provide Behind the Meter (BtM) services. These services include limiting consumption at the point of common coupling or maximizing the consumption of locally generated renewable energy from PV systems (100 kWp) located on the roof of the building. This facility is already part of the VPP portfolio (GEN -I). At this location, ABB will install additional five charging stations, as this will allow analysing the impact of V2X on the grid and capacity.

The second site will target existing GEN -I customers within the pre-selected substation (in Elektro Celje area). A smart V2X station will be set up for participating households. At this location, additional five charging stations will be installed. During the V2X evaluation period, we will use V2X cars to ensure meaningful demonstration. The main objective is to analyse the impact of domestic V2X management on the grid and the required capacity (as it will be done in Task 4.1 of the project) as well as on the VPP portfolio.

The management of V2X by the VPPs will be offered in markets at the national and local level. The national flexibility market in Slovenia is overseen by the Transmission System Operator (TSO), Elektro-Slovenija, d.o.o. (ELES). At the local level, the market is supervised by DSOs, Elektro Celje in the case of the Slovenian demonstrator. The flexibility market is not yet fully established in Slovenia, but the current legislation regulates very strictly and precisely a similar solution, namely the request for flexibility from multiple actors.

The specific aims of Slovenian demonstrator are:

- To demonstrate and evaluate the performance of energy management algorithms to be used by a VPP;
- To demonstrate the participation of VPP, aggregating V2X, in national markets and ancillary services;
- To demonstrate the participation of VPP, aggregating V2X, in services organized by the DSO;
- To demonstrate the VPP aggregating V2X control process, using Advanced Distribution Management System (ADMS) advanced modules for technical activation, control, and performance monitoring of VPP.

### 4.1.3 Greek Demonstrator site

The Greek pilot demonstration will primarily take place in Mesogia, an area located in the east side of the Attica region–on the outskirts of the Athenian metropolis. This semi-rural region comprises the municipalities of Koropi, N. Makri, and the interconnected islands of Kea, Andros, and Tinos, with a total of approximately 245,840 electricity consumers, out of which 245,145 are Low-Voltage (LV) customers and 695 are Medium-Voltage (MV) customers. All MV customers, about 900 of major LV customers (> 55 kVA) and about 500 of small LV customers use smart meters that provide (near) real-time data. These customers range from households to small, medium, and large industries. The area has installations of various forms of renewables, PV systems, with net metering and rooftop PVs. The distribution network of Markopoulo section has multiple voltage feeders (20 kV) connected to three HV/MV transformers, with a capacity of 50 MVA.

Regarding the penetration of RES, there are more than 200 PV producers and 40 PV net metering installations with an installed power of 27.043 MW connected to the Distribution Network. Additionally, there are 20.7 MW of PV plants awaiting approval for connection to the Distribution Network.

In terms of EV charging infrastructure, there are currently 42 public CSs, operated by PPC, in the Mesogia region, excluding those installed at Athens International Airport – Eleftherios Venizelos, as reported by the Ministry of Infrastructure and Transportation.

The Mesogia region, including the Greek demo site, is equipped with GIS (Geographic Information System) technology to support network functions and management operations, such as DMS-SCADA, SAP ERP systems, among others. GIS is invaluable for grid planning, optimization, repair, and maintenance strategies. The Greek DSO uses GIS to monitor all three MV lines that supply the area, to control, manage and supervise them.

Additionally, the Greek DSO has an Advanced Metering Infrastructure (AMI) system which collects data every 15 minutes from smart meters of all MV and the LV customers which were mentioned above, to the telemetry center. The DSO uses DMS-SCADA systems and multiple Phasor Measurement Units (PMU) installed at some points in the distribution network as well as technologies like ERMIS (Greek National Interoperability Framework and Service Delivery Platform) software to achieve controllability and observability of the network.

### 4.1.4 Danish Demonstrator site

The Danish demonstrations of the EV chargers will take place in both Risø and Bornholm.

The facility in Risø will have 8 autonomously controlled chargers (with supply outlets capable of supplying up to 11+11 kW), with BtM services such as limitation of consumption at the point of common coupling or maximization of the consumption of local RES from PV plants or wind turbines. Risø is equipped with the world-class laboratory SYSLAB, an excellent laboratory for research and testing control strategies for power systems.

The second location is at Campus Bornholm (Rønne, Bornholm Island), it has a 180 kW rooftop PV plant, its own 10/0.4 kV transformer station, 124 parking lots at Minervavej, and 372 car arrivals per day. This location will get 6 EV chargers (each with 2 outlets) installed with similar technology that will be installed at Risø.

The installed EV chargers will be a combination of fully extruded versions and pole mounted versions. The two different versions can handle 22 kW on each outlet, but the entire charger is limited to 43 kW in total.

Denmark has a stated goal of having 1,000,000 EV's on the road by 2030. DTU has in cooperation with Hybrid Greentech, Dansk e-Mobility, and COWI created a calculation tool under the project FUSE (Frederiksberg Urban Smart Electromobility). With this tool they have calculated that the need for public EV chargers will grow by almost 20,000 from the current 7,500 chargers established today and if they are to reach the goal of 1,000,000 EV's in 2030 there will be a need for around 67,000 public chargers. Furthermore, one of the conclusions in the article is that semi-public chargers will need to play a much bigger role than they do today to reach this number [5]. The entire personal vehicle industry results in 3 million, meaning if the Danish national goal will be reached, then EVs will occupy the third of this in 2030. [6]

Given that 67,000 EV chargers are needed, and a large share has to be established at parking lots in correlation with buildings, and EVs will make up for a third of the vehicle industry, the building owners will have both a legal obligation [7] to setup chargers but will also inevitably have EV users who will desire access to EV chargers. The market potential of the estimated number of installed EV chargers by 2030 is 20,000.

## 4.2 Assessment of Demonstrator's market potential

### 4.2.1 Portuguese Demonstrator site

Before market entry, according to a consistent and structured innovation methodology, the Portuguese demonstrator aims to validate a wide array of technical solutions that include, but are not limited to, smart charging hardware and software – *e.g.*, V2X enabled CS –, and complementary software stack – *e.g.*, energy management systems, virtual power plant and charging point operator decision support tool, V2X management platform, V2X high-level coordination tool, V2X integration tool, V2X simulation platform.

In this context, 2 BUCs centred around private and semi-private CSs will be tested in São Miguel, namely:

- **System Level V2X RES Coordination (BUC2)** – the Azores region has an important amount of wind curtailment, mainly during the night. With this in mind, the flexibility operator will receive information from EDA and coordinate EV charging actions of multiple V2X managers (typically, EV owners) through a proprietary or third-party platform, so as to follow the wind generation curve, hence mitigating wind curtailment. It is worth mentioning that, currently, this service is not yet regulated in Portugal. The service's specific features should be defined by the Energy Services Regulatory Authority. The correspondent tests will take place in the homes of preselected residents of São Miguel, LREC's office building, and EDA's campus.
- **Participation of V2X in Implicit DR to voltage control and V2X RES coordination in distribution system (BUC4)**:
    - Sharing charging BM – Electric Vehicle Supply Equipment (EVSE) suppliers or V2X managers will adapt EV charging/discharging actions through a proprietary or third-party platform, to:
        i. optimize the loads' consumption of a building, thus maintaining its demand below the infrastructural limits and ensuring the substantial mitigation of the building manager's global costs; and
        ii. ensure the efficient supply of the energy needs of an individual customer, such as a visitor to the building who owns and/or uses an EV. The correspondent tests will take place in LREC's office building.
    - Optimal operational expenditure for EV fleets BM – a fleet management entity will resort to its own servers, local controllers, control software, and development and technical support teams to customize the EV charging/discharging actions of a large

EV fleet belonging to a company, with the ultimate goal of minimizing its related operational expenditure. The correspondent tests will take place in EDA's campus.

- Voltage regulation BM – a flexibility operator will receive information from EDA and coordinate V2X managers through a proprietary or third-party platform, in order to activate voltage regulation services in the local low voltage network. In the context of this flexibility service, a dead-band function will be tested. The correspondent tests will take place in the homes of preselected residents of São Miguel, LREC's office building, and in EDA's campus.

### 4.2.2 Slovenian Demonstrator site

The Slovenian demonstrator focuses on the integration of V2X in the problem solving of the electricity grid. In this sense, the optimal equipment for charging will be provided by ABB.

Two main services will be developed and tested within the Slovenian demo, and they are structured on two BUCs. Below, is a description about each service:

- **Participation of V2X in Electricity Markets through a Virtual Power Plant (BUC1)**: VPP will manage this service and intends the negotiation of EVs energy needs and flexibilities in electricity markets. The participation in ancillary service markets is also included in this service. All end users and customers benefit, as the grid is more stable and secure. Since EVs are mobile and can be connected in places where other forms of electricity generation or energy storage systems are unattractive. This gives the aggregator an advantage over other market players and, consequently, higher revenues. Part of the profit should be shared with participating V2X managers and. this should increase the willingness of EV users to participate in V2X services, to agree to the services, and to connect EVs even when they are not charging.

- **Participation of V2X in local Flexibility Markets(BUC6)**: The DSO with the goal of solving grid problems (congestion and voltage constraints) activates this service, so the main product and service here would be congestion management, voltage control, peak shaving, and hosting capacity. The DSO will obtain flexibility services from V2X aggregation. The participation of the EVs in this service should be coordinated by the VPP.

### 4.2.3 Greek Demonstrator site

The Greek demonstrator focuses on two BUCs that are expected to raise a potential for commercialization and ensure the economic viability of their demonstration. In this direction, the two BUCs are shortly described, along with an explanation of the business model.

- **Participation of V2X in Implicit DR to voltage control and V2X RES coordination in distribution system (BUC4):** This BUC can be shortly described as Green Charging in the terms of the Greek demo deployment & demonstration. The role of the DSO is to detect reverse power flows, translate these data into price signals and forward them to the CPO, along with the location. The main role of the CPO is to identify the CSs that match with the location signal of the DSO, transform the price signals into actual adjusted prices and update the adequate CSs. Through the platform, EV owners will be informed for the revised prices. The EV owners will then manage their flexible loads (in this case the EV batteries) accordingly, by starting/raising or reducing/pausing the charging session power.

- **Participation of V2X Managers in Dynamic Contracts to support DSO operation (BUC5):** This BUC can be shortly described as Dynamic capacity contracts. During the day ahead (and intraday) scheduling, the DSO identifies the projected network congestions. Then, the DSO recognizes

the adequate stakeholders to provide the flexibility services (in this case the CPO) and provides it/them with the requested service details (in this case the capacity limits). The CPO translates the data, determining the appropriate charging stations to utilize, in order to respond to DSO's request, along with the definition of the charging session choices. This procedure leads to the update of the power capacity limit in the charging stations, as well as the notification of the EV owners for the charging sessions choices. The EV owner, as the end-user, designates his preferred session and through the platform informs the CPO.

The Greek demo site deployment and demonstration has been structured in four phases to facilitate the test of them and that correspond to the two previous BUCs that are planned to be tested in this pilot. The main mechanisms to be tested and validated in the Greek demo can be summarized in Green Charging and Dynamic capacity contracts. Following there is a short description regarding the phases of the demo site:

- Phase 1 – Open V2X Management Platform: The developed platform will be tested in PPC innovation hub, to ensure communication and interoperability, as well as conduct proof-of-concept scenarios.
- Phase 2 – New DR and Flexible Capacity Contracts: Validation of the methodologies for EV integration, including DR (Green Charging) and flexible capacity contracts, regarding the impact on the distribution network and the public chargers' optional operation.
- Phase 3 – V2X management by CPO: Test the cooperation of the platform with all end-users, to identify efficient mechanisms for smart charging and Vehicle-to-Grid (V2G). Field tests for the platform functionalities.
- Phase 4 – Activation of V2X services by DSO: Integration of the platform with DSO's systems. Operation in a realistic validation environment and assessment of the proposed solution.

In the Greek demo site, the CPO and the platform operator are the same entity (PPC) and therefore all the operations to be provided by the platform operator are included in the CPO operation. The replication of this model in other sites, where the CPO and the platform operator are different entities, should consider a slight differentiation in the described procedure.

### 4.2.4 Danish Demonstrator site

The Danish demonstration site focuses on two BUCs that are expected to result in the development and testing of a market-ready version of the EV charger, complete with an accompanying mobile application and software.

- **Participation of V2X in Explicit Demand Response to Congestion Management Service (BUC3):** Both locations will host a practical demonstration of parking lots participating in DR. The main objective of this integration is to meet the EV demand of the users while also lowering energy consumption during peak hours. A two-way communication system between the parking lot manager and the utility company is required for the integration of the parking lots with the DR program.
    - The utility company may ask the parking lot manager to reduce energy use during times of high electricity demand. In response, the manager of the parking lot has the option of delaying or slowing down the rate at which the EVs are charged at the CSs. In this way, the parking lot can reduce energy use during peak hours and assisting in the grid's balancing.
    - The goal of the practical demonstration of DR participation in parking lots is to illustrate how well the strategy works to meet the EV users' demand while also advancing a more sustainable and effective energy system.

- **Participation of V2X in frequency regulation services (BUC7):** The FCR practical demonstration will take place in both locations, with the main goal of meeting customer EV demand while also providing frequency regulation services to the grid. The parking lot manager will be integrated with the FCR market for the FCR demonstration. To balance the supply and demand for electricity, the parking lot manager will use advanced software to monitor the CSs in the parking lot and manage the charging cycles of EVs. The parking lot manager can tweak the charging cycles of EVs in the parking lot by temporarily reducing, increasing, or stopping the charging process to balance the grid when there is frequency instability.

Both locations will offer valuable knowledge regarding EV charger market, including viable charging strategies, maintenance requirements, product lifespan, parking lot management needs, and mobile app requirements. This knowledge is essential for developing a mature product that is user-friendly, has low installation costs, and can assist in performing grid optimization tasks.

## 4.3 Target Users

According to the information provided by the project partners, Target Users for the technologies being developed can be listed as below:

- EV users that use V2X equipment and services (Portugal, Slovenia, Greece, Denmark);
- Electromobility service providers (Portugal, Slovenia, Greece, Denmark):
  - Charging point operators;
  - Building and campus managers;
  - Parking lot managers.
- DSOs (Portugal, Slovenia, Greece)
- TSO (Portugal, Denmark)

## 4.4 Go-to-Market Strategy

### 4.4.1 Product Strategy

The Portuguese partners will develop new products and services to be preliminarily tested within the Portuguese demonstration site, according to the aforementioned BUCs. Parking Lot Energy Management System, House Energy Management System, Building Energy Management System, V2X co-simulation platform, V2X management strategies are examples of such products.

The Slovenian partners will develop new products and services that will be tested during the project and launched to the market afterwards. The markets to address will be the Slovenian market followed by the EU. Gen-I's plan is to expand its existing range of products and services, therefore opening new markets for the partners involved on the project.

The Greek partners have already a defined product to launch. In terms of the research project, Open V2X Management Platform (O-V2X MP) will communicate with the DSO systems, receiving signals about reverse power flows and congestions in the grid and translate these signals into price signals for the EV owners. This procedure will include the EV charging stations managed by one CPO, who will also be the operator of the O-V2X MP.

The Danish partners also have a defined product, and plan to take advantage of the flexibility it brings. The envisioned EV charger has two outlets, allowing two vehicles to charge at the same time, meaning a larger number of vehicles can be plugged in, offering higher flexibility and a potential queue system.

The charger uses smart charging technology developed in funded research projects, which will use user input data to determine urgency and charging needs. The two-outlet version also reduces the number

of potential needed installation and digging costs, compared to installing the same amount of single charge point chargers.

### 4.4.2 Pricing Strategy

It is still too early in the project to have defined price strategies for the products to introduce in the market. However, directions are already defined by some of the Partner.

Greek partners are planning to position the price as a tool to bring stability to the grid. During the period of the demonstration pilot activities, the reverse power flows in the network and potential congestions are going to be identified, reflecting the price signals, provided to end users (EV owners). That can be translated into energy bundles with varying prices during the day in order to provide grid flexibility and stability to the DSO.

Danish partners are betting on the cost efficiency of the product and its installation to lower necessary investment costs and therefore bring flexibility to the business models. By including two outlets to each charger, the installation cost is lowered and more resources can be spent on the charging technology, offering more costly technology at the same price point. The payment for electricity can be fitted and adapted to the parking lot owner and can depend on the vision for the product. Whether it is to earn money on electricity or to offer a green sustainable solution which enables charging when electricity price is lowest, and the grid load is lowest. Therefore, the CPO can setup revenue streams through contracts, loyalty programs, frequency of use or a set fee on each kWh charged.

### 4.4.3 Partnership Strategy

There is the agreement between partners that establishing new partnerships will be key to increase efficiencies, network coverage, access to data, knowledge sharing and interoperability between platforms, as well as fundings and resources to further support EV charger deployment.

The main stakeholders identified to take part in future partnerships are TSOs, DSOs, energy supply companies, potential EMSPs, CPOs, EVSE suppliers, urban mobility policymakers.

### 4.4.4 Pilot Projects

Partners see the project's demonstrators as testbed that can be used for public events to showcase the products and strategies, as well as tools to collect data and understand user behaviour of customers in the upcoming era of EVs.

It is still to be defined if partners will plan additional pilots after the end of EV4EU project.

### 4.4.5 Expansion

The Portuguese partners want the solutions arising out of the Portuguese demonstrator to be able to continue operating in all its forms after 2026. They want that all utilized equipment remain operational after the project's end, enabling the commercial implementation of the proposed BMs and they will begin immediately after the project's end to do data integration with Mobi.e, in the role of information integrator. In order to ensure the aforementioned solutions are sustainably integrated in prospectively commercialized products and services, the following strategy has been delineated and is detailed below, on **Table 2**:

**Table 2: Expansion strategy for the solutions arising out of the Portuguese demonstrator**

| Solution | Expansion Strategy |
|---|---|
| **BMs** | Become a part of the portfolio of EDA, as well as of flexibility operators, CPOs, EMSPs, and EVSE suppliers |
| **V2X Enabled CS Prototype** | Launch a commercial version of the V2X enabled CS (by 2024) |
| **PLEMS<br>HEMS<br>BEMS** | Become a part of the portfolio of SEL (by 2025) |
| **Open V2X Management Platform** | Launch an industrial version of the platform (by 2028) |
| **V2X Flexibility Service Activation Algorithms/Tools** | Become a part of EDA's management system (by 2026) |
| **V2X Co-Simulation Platform** | Attain wide awareness within the electromobility research community |
| **V2X Management Strategies** | Integrate the toolkit of urban mobility policymakers |

The Slovenian and Danish partners are planning that, after the completion of the project, the new products will be expanded on a data-driven approach that identifies high-demand areas and potential partners to support the development and operation of EV chargers and V2X solutions.

For the Greek partners, the solutions to be developed through the project, as well as the metering equipment and the EV charging stations installed, are the first step in a large-scale deployment procedure that will follow the mass integration of EVs and the real-time monitoring and management of the distribution grid. Moreover, the O-V2X- platform, could integrate further functions, e.g., signals either price based or environmental based, when surplus of RES production occurs.

# 5 Conclusion

This deliverable presents a first exploitation plan for the EV4EU project results. An exploitation plan focused on the information that exists at this point of the project and based on each demonstrator leader's expectations of what their vision is for their demonstration site. It also presents the exploitation methodology implemented so far and the exploitation strategy defined for EV4EU project to maximize the use of the project results, including the key exploitable results.

With the contribution of each demonstration site leader, the main purpose of this document was accomplished. This document presents the first version of EV4EU exploitation plan to create conditions for the mass deployment of electric vehicles and V2X dissemination in Europe, according to what they know today and what they have planned for their demonstration site, each partner has started to define its path to develop and build a solid exploitation plan till the end of the project.

All partners have their Business Use-Cases defined, and it is on these that they will focus to guarantee the commercialisation potential and ensure the economic viability of the demonstrator. These Business Use-Cases meet the technical, regulatory and design characteristics of each demonstration site.

Regarding the Business Models described, all partners have the same goal which is to make the adoption of electric cars easier for all potential users. To do this, they have defined services and products that can include and benefit all stakeholders involved and are developing the expansion plans for the solutions being tested in their demonstrators. These solutions may include services to meet grid congestion; to meet building needs adapting EV charging/discharging actions; to reduce operational costs on EV fleets by customizing EV charging/discharging actions; to provide flexibility to local network; to give tools to EV owners to manage their EV batteries as flexible loads; and to frequency control purposes.

To ensure successful exploitation of the results of the project, the next steps start with involving all partners in the joint effort of developing the final exploitation plan. As mentioned before, all partners have committed to contribute to achieve this objective, and the current version of the exploitation plan will be updated during the project with the aim of defining an overall EV4EU exploitation plan.

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# ANNEX I

The EV4EU dissemination, communication and exploitation main strategic goals are:

- To ensure maximum visibility of the EV4EU project in the target audiences via appropriate key messages and appropriate channels.
- To make the research, scientific and technological knowledge generated in the EV4EU project available within and beyond the project´s consortium, maximizing its impact.
- To promote knowledge and innovation transfer by establishing networks with other projects and initiatives.
- To engage the targeted audience to get feedback and validate the project´s results.
- To attract potential users and stimulate the appropriate market segment to support the project´s exploitation strategy.
- To encourage additional outcomes in new initiatives.

These objectives will strongly rely on the commitment of all consortium partners to carry out the actions described in this deliverable. Due to the multidisciplinary of the consortium, EV4EU is in a great position to reach a multitude of audiences and influence decisions, behaviours and strategies towards EV adoption. EV4EU partners have well established networks in specific fields, being able to reach and influence certain target groups more easily than others. Thus, all partners should carry out the activities proposed here to reach all relevant audiences. Nevertheless, all communication and dissemination activities undertaken by the partners must be communicated to the EV4EU Coordination Team that is leading and managing the WP10 of Knowledge transfer and dissemination and keeping a record of all the actions.