



INNOVATION FUND

Driving clean innovative technologies towards the market

EVVE: First European Large-Scale Vehicle-To-Grid Demonstrator for an efficient decarbonisation of the energy sector

The Innovation Fund is 100% funded by the EU Emissions Trading System



Project summary

The EVVE project aims to demonstrate a first-of-a-kind, large-scale vehicle-to-grid (V2G) technology in Europe, based on the implementation of a virtual power plant (VPP), which draws upon the energy storage capacities of hundreds of Electric Vehicles (EVs) across the EU. The project has an innovative business model based on the smart management of EV batteries, providing a stack of services such as electricity bill management, peak shaving and ancillary services. The solution will generate savings and revenues for the users and avoid all greenhouse gas (GHG) emissions compared to current conventional technologies.

COORDINATOR

Electricité de France (EDF)

LOCATION

France

SECTOR

Intra-day electricity storage

AMOUNT OF INNOVATION FUND GRANT

EUR 3 794 946

RELEVANT COSTS

EUR 6 324 160

STARTING DATE

01 April 2021

PLANNED DATE OF ENTRY INTO OPERATION

01 January 2025

A virtual power plant for large-scale V2G enabling smart energy management

Integrating renewable energy sources to decarbonise the energy system raises some challenges related to the intermittency and low production predictability of renewable energy. The V2G approach offers a valuable solution to this challenge by using the electricity storage capacity of parked EVs, which are able to both recharge the batteries and feed energy back into the grid. EVs and Bidirectional Charging Stations (BCS) equipped with the right hardware and software can offer a wide range of functionalities once connected to the grid.

The EVVE project, based on the V2G system, will build a virtual power plant of 800 EV and bidirectional charging stations spread across Europe, mainly located in France and aggregating up to 8.36 MW. Besides the innovative idea in line with the evolution of the energy and transportation systems, an innovative element that brings advantages beyond the state-of-the-art is the remote control of the V2G chargers. This allows to efficiently manage charging and discharging processes of EV batteries, based on electricity price and CO₂ market signals, reducing electricity peak loads and providing ancillary services – such as frequency regulation – to the grid while ensuring EV users' mobility needs.

Environmental and economic benefits in a unique solution

The EVVE project uses the electricity storage capacity of EV's batteries, when these are parked (this corresponds to 95% of the time), to support the electricity grid while consumption is booming, and charges those EV while the energy production exceeds other energy needs. The key customer

segments identified include professional EV fleets, fleets of delivery vehicles, fleets of company's car sharing schemes including EDF own fleet, with idle periods mostly at night, but also long stay duration parking lots and car depots with predictable usage time. The planned aggregated storage capacity of the EV fleets targeted in this project round represents the potential avoidance of more than 25 000 tCO_{2e} net absolute GHG emissions during the first ten years of operation.

By thus using idle EV's batteries as buffers, the project aims at shaving energy consumption peaks, which are both costly to manage and detrimental to the environment as mostly fossil fuel based flexible capacities are used to cover those peaks of demand. By remotely managing the participating EV's batteries, the project will also improve the usage of renewable energy sources (RES). During peaks renewable energy production, (partially) empty batteries could be charged, thus avoiding RES curtailment. The EVVE idea could create new revenue streams and savings for EV owners in exchange of grid flexibility.

High potential for scaling-up at project level and beyond the regional economy and sector

The EVVE project has high potential of scaling-up the technology at project level and far beyond. The solution has high capacity for more EVs to connect to the VPP, and the control system proposed can ensure the management of a higher number of bidirectional charging stations. EVVE project also aims to demonstrate that future EVs can natively be capable of V2G through standards, thus enabling unprecedented capacity storage for the European power system (considering EVs roll outs one Europe). V2G will thus enable a better integration of RES in the system and the optimal planning of battery recharging to avoid CO₂ emissions. The possibility of generating revenues or savings for EV owners in exchange of grid flexibility will also support market development as well as an appropriate regulation that will take into account the specificities of this distributed technology. The technology can also be replicated beyond the regional economy and sector, allowing the incorporation of more renewable sources and CO₂ savings in the electrical grid in both the short and long term.