ETT3 - Smart V2G EVs Charging

Intelligent and optimal control algorithms

DESCRIPTION

Intelligent and optimal control algorithms provide coordination and control of vehicles charging in order to help reduce the negative impacts from simultaneous charging on the grid while decreasing electricity costs for users. These algorithms optimize the charging schedule for each parked vehicle based on the user parking time. This provides a user-centric solution where the user is assured that its desired state of charge is reached and, at the same time, meets the needs of other related parties such as the building manager or the grid operator. This is assured as long as the charging duration is smaller than the parking period, otherwise, there is no flexibility and the optimal solution is to immediately start the charging. When flexibility exists, the optimal operation is achieved by shifting the operation of charging stations within the user parking time frame. If the charging station is shifted to off-peak hours the charging cost and subsequently, the electricity bill, can be reduced as well as the peak power.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

Context dependent

Already demonstrated in Lighthouse cities No

Cultural heritage compliance Yes

PERFORMANCE

Lower electricity costs

Lower peak loads

COST

To be defined

DIMENSION

Software solution that can be applied at building level

TIME

Real-time operation

SAFETY

Charging power limitation

GDPR compliant

SUSTAINABILITY

Promotes sustainable mobility

KEY REQUIREMENTS

An EV charging management platform is required for the deployment of these algorithms. The charging platform will interact with the algorithms and send the charging signal to the charging stations. The development of this platform is also an innovative element from Integrated Solution 3.1 - Smart V2G EVs Charging.

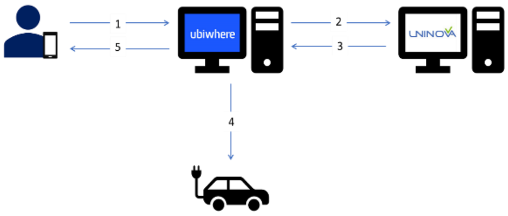
ENVISAGED DEMONSTRATION IN POCITYF

LOCATION

During POCITYF these algorithms will be demonstrated at DECSIS datacentre and SONAE's Continente store (both located in Évora).

TIMELINE

The first version of the algorithms is already available.



DETAILS

At POCITYF the Intelligent and optimal control algorithms will provide the best scheduling for EV charging. As depicted in the figure, the EV charging platform will communicate with the UNINOVA server and then send the information provided by the server to the charger.

TARGETED OUTPUT

The application of these algorithms will reduce the price of the charging and consequently the electricity bill. Additionally, buildings peak load associated to EV charging will be decreased.

IMPACT ON COMMUNITY

Positive impacts on community include lower EV charging costs and decreased peak loads for buildings and distribution grids. No negative impacts are expected.

CULTURAL HERITAGE BUILDINGS COMPLIANT

Intelligent and optimal control algorithms refer to a software solution with no negative impact on cultural heritage.

ETT3 - E-MOBILITY INTEGRATION INTO SMART GRID

Bidirectional smart inverters for EV smart charging and V2G

DESCRIPTION

The smart bidirectional inverter for EV smart charging and V2G is an energy storage solution targeting the modern mid and large size installation, were there is presence of renewable sources and electric vehicles, and a high degree of flexibility is pursued. It is part of a comprehensive solution integrating EV chargers with V2G capability (AC and DC), stationary energy storage, PV plant and coordinated control of all these resources using data from the load/consumption of the overall installation. It is being developed by INESCTEC in partnership with a manufacturer with field proven solutions, to achieve a high level of technological advance and innovation, but still ensuring the ruggedness, performance and safety required for continuous operation in industrial environments. One of the main distinctive features is the ease of scalability, installation, and commissioning. The transport and handling is also one of the key aspects, being facilitated by a standard Euro pallet form factor.

INDICATORS

POTENTIAL DEGREE OF USEFULNESS

80%

Already demonstrated in Lighthouse cities No

Cultural heritage compliance Yes

PERFORMANCE

High conversion efficiency

Compact dimensions and easy installation

Modular design

COST

(estimated) <30k€/equipment in mass production

DIMENSION

Size: 1200x600x600mm

Weight: approx. 350 kg

TIME

Backup time: >2h full power

(estimated) Lifespan >10 years

SAFETY

Outdoor weatherproof enclosure

Rugged steel construction for mechanical protection

Password protected/remote control

SUSTAINABILITY

Leverages self-consumption for commercial/industrial consumers

KEY REQUIREMENTS

To have a PV plant and V2G compatible Electric Vehicles.

ENVISAGED DEMONSTRATION IN POCITYF

LOCATION

The solution will be tested PEB2 and PEB3.

TIMELINE

At least one years (for baseline and KPI determination).

DETAILS

The smart bidirectional inverters for EV smart charging and V2G will be field demonstrated in two or more commercial/industrial installations of PEB2 and PEB3. It is expected to significantly contribute to increase the renewable energy usage and to fulfil EV charging needs while guaranteeing flexibility to the building installation.

TARGETED OUTPUT

The expect output is an efficient and cost-effective solution that can be adopted by a mass market of commercial/industrial consumers, EV fleet operators and collective buildings.

IMPACT ON COMMUNITY

This solution aims to enable the next step in the energy transition for mid and large size electric installations and consumers. The coordinated operation of energy buffers with V2G ready EVs, will allow high flexibility in the LV/MV networks, which is required to continue the replacement of conventional energy sources with renewable energy.