EPFL-TTO

EPFL Innovation Park J
CH-1015 Lausanne
Switzerland
+41 21 693 70 23
http://tto.epfl.ch/

Research Contact

Prof. Jean-Yves Le Boudec
+41 21 693 66 31
jean-yves.leboudec@epfl.ch

TTO Contact

Dr. Thomas Bourgeau
+41 21 693 33 54
thomas.bourgeau@epfl.ch

Licensing Opportunity

TTO – Technology Transfer Office

Real-Time Control of an Electric Vehicle Charging Station

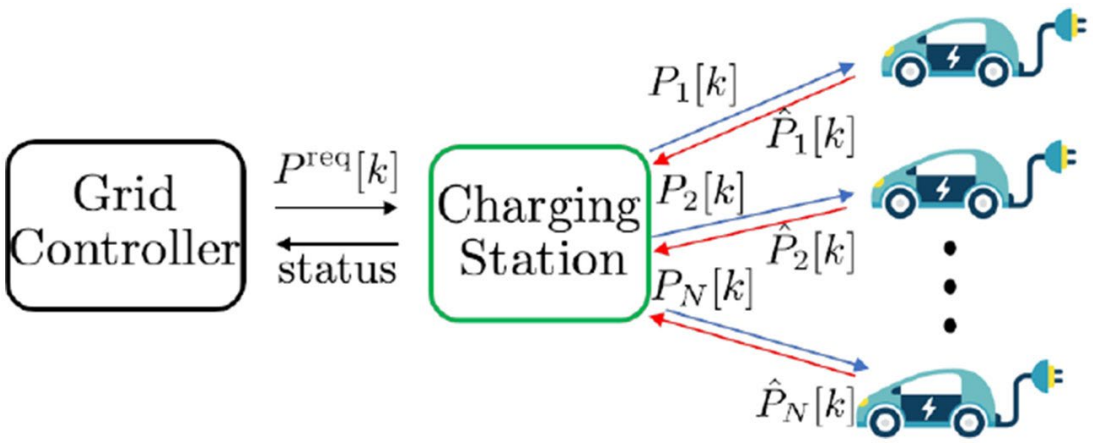

Figure 1: Method for controlling the charging of electrical vehicles (EVs) connected to a single charging station (CS)in real-time.

Ref. Nr

6.1978

Keywords

Charging Station, Grid Controller, Electric Vehicle

Intellectual Property

US Patent US2022250500A1
EP Patent EP3983258A1

Publications

Rudnik, Roman, et al.Real-Time Control of an Electric Vehicle Charging Station While Tracking an Aggregated Power Setpoint, IEEE Transactions on Industry Applications, 2020.

Date

13/02/2023

Description

The high penetration of electric vehicles (EVs) charging stations (CSs), together with the progressive availability of distributed energy resources, increases the risk of grid overloading and power-quality degradation. Uncoordinated and random EV charging might severely impact supply quality and continuity, solution is to dynamically control the power consumed by charging stations (CSs) and to keep the grid in safe operating conditions.
The allocation of power to EVs is a difficult task as power setpoint can be different for every EV with change in a few seconds making the problem computationally heavy and might not be applicable in actual real time.
Real-time control has been advocated as an alternative to costly grid reinforcement. However, the problem is computationally heavy and might not be applicable in actual real time.

To cope with these limitations, our novel method controls the charging of electric vehicles (EVs) connected to a single charging station that follows an aggregated power setpoint from a main controller of the local distribution grid.

To reduce the problem complexity, we have also proposed a heuristic that reduces the number of integer variables enabling it to be solved in real time.

Advantages

Our method works at sub-second scale and allows the CS to adapt to the rapidly changing state of the grid caused by highly volatile energy resources, such as photo-voltaic (PV) plants. It also allocates the powers to EVs so that such fluctuations are not directly absorbed by EV batteries. When the CS tracks the aggregated power setpoint, the overall consumed power is allocated fairly among the connected EVs, and the effect on the each EVs battery life is minimized. Experimental results on real world scenario have demonstrated the performance of the method and show that it can be deployed in the field.

Applications

- Charging station
- Grid controller
- Smart Grid