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“Energy at home”

The electric vehicle: an asset for the electrically autonomous house ?

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Abstract

The first new generation electric cars were introduced in Belgium by the end of 2010. Laborelec and Electrabel have implemented an in-depth monitoring in the first available Peugeot iOn cars, with support from the Vrije Universiteit Brussel. The tests were started in June 2011 and are still continuously running almost three years later. This initiative is the first of its kind in Belgium.

A high flexibility potential was identified for the charging sequences, allowing smart charging, by controlling the moment and the profile of the charging sequences in function of several parameters.

From a user point of view, the statistical distribution and profile of the charging sessions shows that most of the charges could be shifted to later times without problem. Charges show different energy content, and could therefore be adjusted, e.g. optimizing the reservation or selection of a car within a fleet, depending on the necessary autonomy and available vehicles. A lot of short charging cycles is observed, that could be easily shifted.

From the car point of view, the possible impact of smart charging on EV batteries was evaluated, based on the global battery capacity evolution of each car in function of different parameters, like the charging frequency, charging content and charging moment. No significant influence is observed of repeated charging sequences on the battery capacity. Some attention must however be paid regarding the maximum accepted amplitude of the resulting cycles. Based on the charging just after parking or just before leaving doesn't seem critical for the battery lifetime.

Based on their strong experience with electrical grids and the positive results of the EV monitoring, Laborelec and GDF SUEZ are now focusing on the energy point of view of smart charging. As an example, the car can work as an energy buffer, to better manage the energy peaks coming from an excessive decentralized electricity production. The authors are testing that scenario, by coupling EV charging with local stationary storage and PV or fuel cell micro-cogeneration. On the way to the electrically autonomous house, the Vehicle-to-Home solution, in which the car is able to send energy back to the house, is another necessary, medium-term milestone. This configuration is also evaluated by the authors, at lab scale and in a pilot project with the Belgian race circuit at Francorchamps.

Practical results from the EV monitoring will be presented, as well as the status, first results and next steps of the energy-related smart charging activities.
