

Smart charging

The role of the power supplier

Smart charging based on electricity prices

The price of electricity is broadly speaking determined by two mechanisms: the mechanism of supply and demand and the price incentives that arise to counter mismatches between supply and demand. As electric cars are flexible in their power requirements, they can profit from both mechanisms and thus charge against low(er) costs.

Supply and demand

As in all markets, the price of energy is determined through the interaction of supply and demand. For electricity, this takes place in the APX market. Producers can indicate per hour of the day how much power they can produce for which price. Consumers can similarly indicate, for each hour of the day, how much they wish to consume and at which price. These bids combine to generate the price of electricity for the next day, which varies by the hour: the APX price.

Imbalance

Besides the APX price, there is a second mechanism that influences the price of electricity: the costs of imbalances. For the electric grid to operate properly, supply and demand must always be in balance. TenneT is the party responsible for maintaining this balance in the Netherlands. When imbalances occur, e.g. because of incorrectly predicted wind power generation, TenneT determines a so-called imbalance price. This imbalance price indicates how much it is worth to engage or disengage a certain amount of capacity.

Challenge for electric transportation

The interplay of supply and demand and the ability to be an actor on the imbalance market, is meant for large players. Low-volume users are not charged dynamic APX prices by their suppliers, but pay an average rate. In order to be able to act on the imbalance market, a party must be able to

bring significant capacities to bear. The combined capacity of all electric cars in the Netherlands is enormous – the problem is that it is scattered across a great many individual cars. As a result the flexibility of these cars cannot be implemented on the electricity market within the current framework of market mechanisms.

Logical allocation

With the Logical Allocation pilot project, Enexis is testing a solution to the “fragmented potential” of electric transportation. Logical allocation means, essentially, that the grid manager does not register the measured power usage of a grid connection at the physical point where the power usage occurs, but at a logical (virtual) connection. The effect of this is represented in Figure 1a, which shows a simplified version of current practice: a direct link between the individual connections and the supplier (1a). The effect of logical allocation is shown in Figure 1b: an E-mobility service provider concludes a single electricity contract with an energy supplier for all its customers. If the service provider has many customers, this contract represents a very large volume. Logical allocation thus has two significant effects:

- ◆ It combines many low-volume users, as a result of which the combined volume is large enough that a service provider can put the flexibility of these users into effect on the APX and imbalance markets.
- ◆ Because service providers can conclude contracts with multiple suppliers, consumers can freely choose between energy providers at charging stations (this freedom currently does not exist).

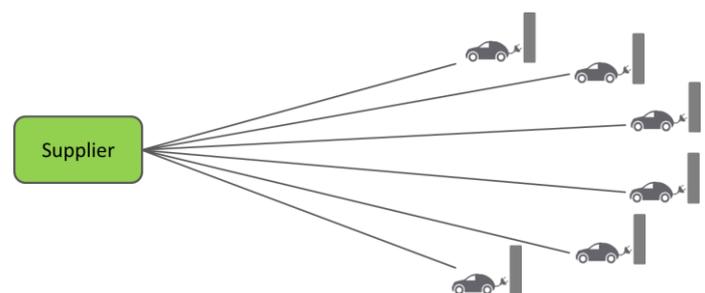
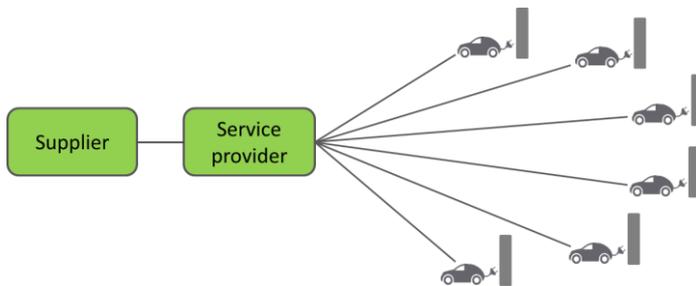


Figure 1a: ‘market model’ without logical allocation

Smart charging



Figuur 1b. 'market model' with logical allocation

Smart charging in Brabant

In January 2014, a first pilot project went into operation, in which Enexis put the principle of logical allocation into practice using 100 public charging stations in Brabant. In April 2015, a second phase of this pilot followed, involving 155 charging stations. In this second phase, logical allocation was combined with smart charging: via smart algorithms, electric cars are charged at the moments when electricity is at its cheapest. In the pilot, two different service providers each concluded a contract with a supplier. Due to the large volume the contracts represent, it is sufficiently worth the supplier's while to charge the actual (dynamic) APX prices. EV (electric vehicle) users who frequently use (one of) the 155 charging stations in question can profit from these dynamic prices via their service provider (see Figure 1b). In practice, the APX rate is reduced to a day and night rate for EV users, meaning that the charging sessions of EV users participating in the pilot project are postponed until 12 midnight, after which charging automatically starts. Charging thus occurs against a rate that is 2 cents lower per kWh than during the day. The EV user can at all times overrule this system using an app to immediately begin charging, but in such cases the higher day rate applies

Unique

The Brabant pilot project is unique in the world for several reasons:

- ◆ It is the first instance in the entire world of smart charging on the basis of dynamic electricity prices.
- ◆ It is the first instance in the entire world of smart charging being available at public charging stations.
- ◆ It is the largest-scale smart charging experiment conducted so far with regard to the number of charging stations involved (150).
- ◆ It is the largest-scale smart charging experiment conducted so far with regard to the number of participating electric cars (>50).

First step

This pilot is the first step towards fully managed charging based on electricity prices. The ultimate objective is to have the charging speed of electric cars fluctuate along with the price of electricity, enabling the problem-free large-scale production of sustainable energy as well as a problem-free transition towards sustainable transportation.

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The availability of energy is a major determining factor in how we live, work, produce and travel. Energy thus occupies a central position in society. What drives us at Enexis is our desire to bring energy to the places where people need light and warmth. We spend each and every day working on a smarter, safer and more sustainable grid – with expertise and personal commitment..

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