

Smart charging

Overview

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There are various parties who benefit from the smart charging of electric cars. This document gives an overview of the interested parties and their specific questions. The pilot programmes that Enexis is conducting in the various areas surrounding smart charging are described in separate documents.

What are the developments?

The government's objectives with regard to electric transportation are:

- ◆ 2015: 20,000 electric cars
- ◆ 2020: 200,000 electric cars
- ◆ 2025: 1 million electric cars

The speed of current developments (Figure 1) greatly exceeds these objectives. The figures that the government has set as objectives are therefore far from unrealistic.

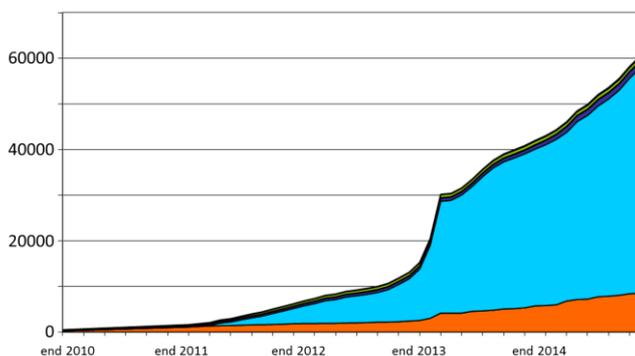


Figure 1: Rise of electric transportation in the Netherlands

Flexibility of electric cars

A car in the Netherlands drives approximately 37 kilometres per day. This means that the average car in the Netherlands spends less than an hour per day in actual operation, and is stationary for more than 23 hours. The required charging time for 37 kilometres driven on electricity is at maximum two hours. This means that there is a 23-hour window in which a two hour charging session must take place. This offers great flexibility, which offers

opportunities for various parties. This is schematically represented in Figure 2.

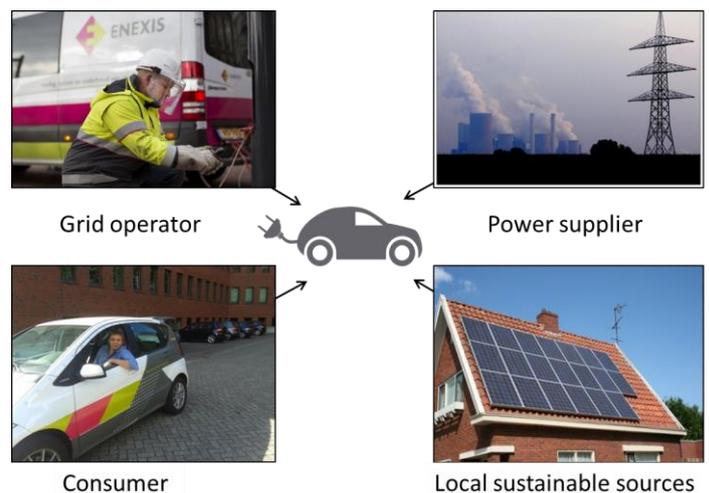


Figure 2: Interested parties in electric car flexibility

Flexibility: grid operator

The consumption on the low-voltage grid varies throughout the day. This means that it is well possible to charge the number of cars required if people switch to electric cars in great numbers. Things will go wrong, however, if too many people attempt to charge their cars at the same time. The total power consumption can in that case cause the circuit breaker in transformer substations to trip and cause blackouts in entire neighbourhoods. If charging sessions can be charged flexibly, however, there should be no problems at all. This is illustrated in Figure 3. Enexis has calculated that in an uncontrolled charging situation, 10 electric cars in a neighbourhood may already lead to problems. Smart charging, however, can allow for the charging of up to 150 cars (depending on the local situation).

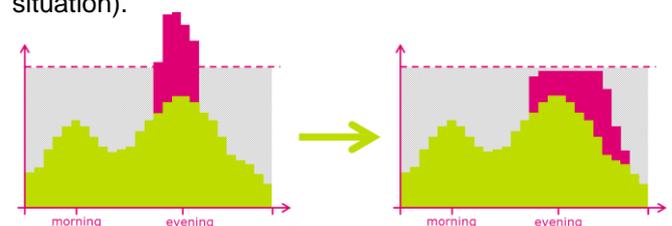


Figure 3: Uncontrolled charging vs. smart charging

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Flexibility: power supply

TenneT is responsible for maintaining balance in the power grid: supply and demand must constantly be in equilibrium. In order to achieve this, TenneT works together with programme responsible parties. These parties must provide a prognosis each day of the production and the use of power by the clients in their portfolio. By matching these, supply and demand are played out against each other, until a balance is ultimately reached. On the day itself, however, deviations from the predicted course of events will always occur, e.g. because the wind is stronger than expected. Such deviations cause imbalances, and quick action must then be undertaken. Much money can be earned or saved in those situations by quickly ensuring less or additional power supply or demand. Electric cars offer an excellent opportunity in this regard. Imagine that in 2025 there are indeed 1 million electric cars in the Netherlands, whose power consumption when charging is only 4 kW (the approximate charging power of a plug-in hybrid electric car). Even if only 10% of those cars are available to act on the imbalance market, this still amounts to a total capacity of 400 MW. This is a significant figure, and electric transport can thus provide a major contribution to the stability of the national electricity system.

Flexibility: local power sources

Increasing numbers of people have roof solar panels, generating their own sustainable power. Yet much of the power they thus generate is supplied to the grid during the day, while power is drawn from the grid in the evening. This, especially in the event of a significant increase in local power production, is not only inefficient from the point of view of the grid, but also financially undesirable in the event that the subsidy on energy fed back to the grid is discontinued in the future.

A smart solution would be to use the locally produced energy locally. This could be done at an individual level, or within a local energy cooperation. Here, too, electric cars are highly suitable, as the charging process can be delayed until such time as the sun is shining.

Flexibility: consumer

Because flexibility has value for the grid operator and on the energy market, consumers can save money by flexibly charging their cars. If a consumer can fully charge their car using the power generated by their own solar panels, they can even drive in a fully sustainable manner. For that, consumers do have to maintain constant control over the charging process. The fundamental principle would be that the car battery must always be full when the consumer needs to use the car.

Smart grid

It is essential not to serve the interests of just one party, but to realise a model that allows room for all parties. Interests can stack, but can also conflict with each other. In order to provide for all interests in the best possible manner, a so-called smart grid is necessary. Enexis is conducting studies with regard to all axes in Figure 2 to determine accurately what role flexibility can play. The combined learning experiences gained through these studies should contribute to the establishment of an optimally functioning smart grid. Each of these studies is described in more detail in individual papers.

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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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