Smart charging

Using sustainable energy production

Charging when the sun shines

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

The advantages of local usage

The advantage of the local usage of energy locally generated by consumers themselves is that it provides direct and visible returns for the consumers: their own, 'personal' sustainable energy. This also means that the potential discontinuation of subsidy on energy fed back to the grid no longer constitutes a threat for consumers. Furthermore, using locally produced energy locally is more effective for the grid, as the energy in question does not need to be transported across significant distances by the grid manager. In the long term, this saves on maintenance and reduces the necessity for grid expansion.

Prediction of sustainable production

In order to make charging using sustainable power production possible, an IT link is required between the sustainable sources, the parties that manage the charging of cars and the electric vehicle (EV) owners. Creating a direct link between all solar panels and wind turbines in the Netherlands would be a complex project; a smart alternative would be to work with weather data. By correlating the measured levels of sun and wind with grid measurements, a relationship may be identified between these, allowing predictions to be made of local sustainable production based on weather forecasts. By matching these predictions to the requirements of e-drivers, charging schedules for electric vehicles may be designed thus that charging makes maximum use of locally produced power. Enexis is putting this principle into practice with the Smart Grids In Balans (Smart Grids in Equilibrium) pilot project.

Insight into sustainable production

Two ways of informing EV owners of actual and sustainable production have been conceived in the context of the Smart Grids In Balans pilot project. To begin with, an app has been developed that indicates for each individual charging station whether the power provided through that station originates from sustainable sources or not. The app also has additional functionality; users can, for instance, apply filters so that only charging stations providing sustainable energy are displayed.

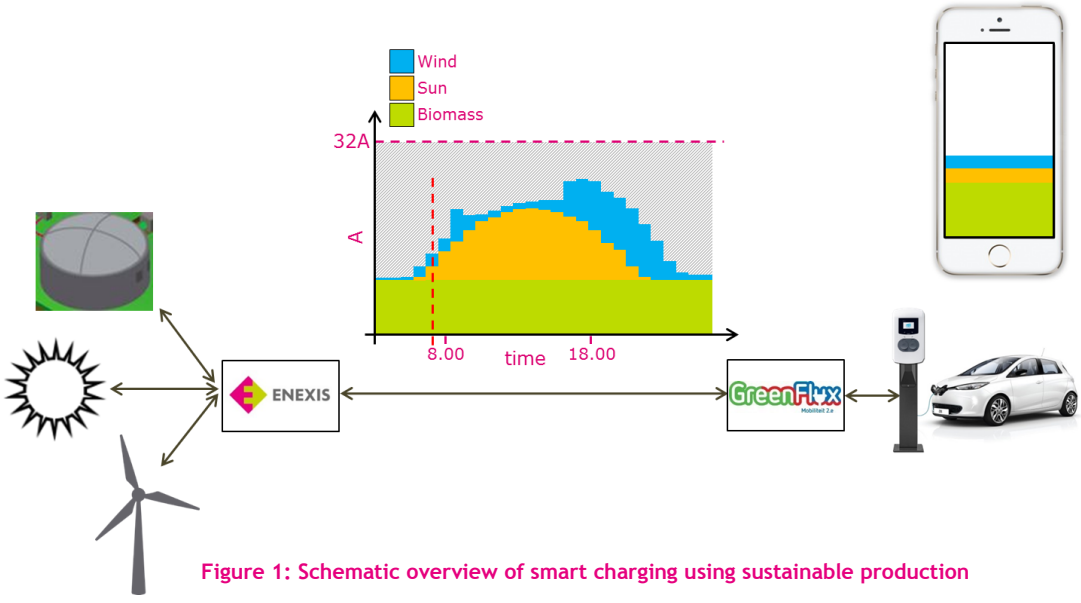

Figure 1: Schematic overview of smart charging using sustainable production

Smart charging

Information is also available regarding the (estimated) costs of charging, as well as directions to assist in navigating towards the charging station.
In addition to the app, a dashboard has been developed that gives overviews of areas with multiple charging stations. Such an overview shows not only which stations are in use at that time, but also where power used in that area originates from. In addition to the level / percentage of locally generated (renewable) energy, the dashboard also shows what proportion of the energy is drawn from the national grid.

Use of open standards

In order to link predicted sustainable production and the charging of electric vehicles, a number of systems have been connected. This has been achieved using open standards either already in existence or currently being developed. The reason behind the choice for open standards is that these allow for the solution to be scalable and broadly applicable. The protocols used are schematically represented in Figure 2 and explained below:

- **OSCP:** the weather forecasts are processed by Enexis using an algorithm, generating a message which is sent to the party that manages the charging stations: the chargepoint operator. This communication from the grid operator uses the Open Smart Charging Protocol, with an expansion that allows for the support of information concerning sustainable sources.

- **OCPI**: an open standard has also been used for the exchange of information between the app and the chargepoint operator, namely the Open Charge Point Interface protocol. This protocol was specially developed for the exchange of information concerning charging points between various parties and /or systems.

- **OCPP:** for the managing of the charging stations themselves, the Open Charge Point Protocol is used. This is a protocol through which the charging station manager can control the individual charging stations themselves. The OCPP is the most widespread of the standards represented in Figure 2, and is already being applied in many countries throughout the world.

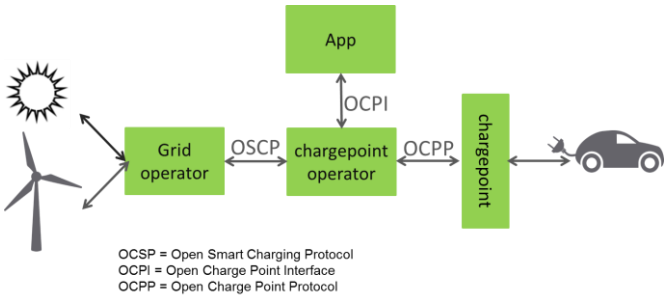

Figure 2 : Open standards used

Follow-up steps

Expectations are that both the production of energy through sustainable sources and the use of electric cars will only increase. Considered independently, these developments may constitute a threat to the stability of the electric grid. However, by accurately balancing these two phenomena in a smart grid, they may actually together lead to a stable grid, sustainable energy supply and a sustainable form of transportation.

Asset management / Innovation
Lennart Verheijen
+31 (0) 6 212 910 68
lennart.verheijen@enexis.nl

ICT
Paul Klapwijk
+31 (0) 6 120 47 046
paul.klapwijk@enexis.nl

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.
enexis.nl