

Vehicle-to-Grid: Integration of E-Mobility into the Energy System

Baerte de Brey

Chief International Officer – ElaadNL

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management by measurement

The logo for Elaad.nl, featuring the text 'Elaad.nl' in a blue sans-serif font. A yellow lightning bolt graphic is positioned below the text, pointing to the right. The entire logo is contained within a white rounded square with a thin grey border.

Elaad.nl

Vehicle=Grid

Integration of e-mobility into the energy system

The background features a stylized landscape. On the left, there is a silhouette of a city skyline with trees and buildings in yellow and blue. On the right, there are several wind turbines in yellow and blue. The sky is light blue with white clouds. At the bottom, there is a white road that curves from the left towards the right. In the bottom left corner, there is a blue charging station icon and a yellow car with a blue charging cable plugged into it.

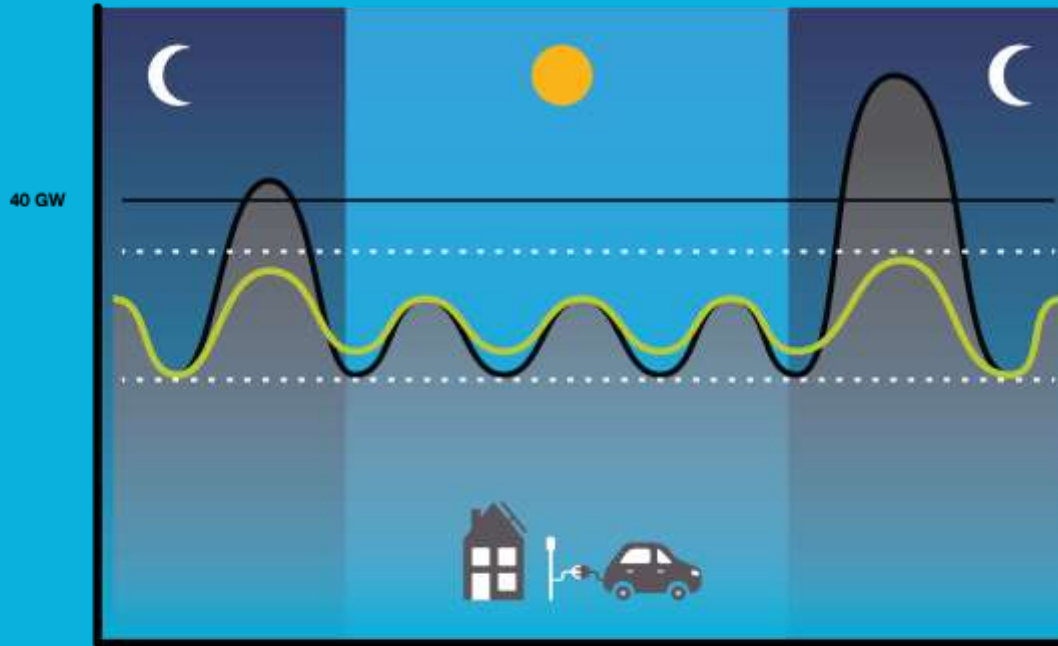
Baerte de Brey

17 september 2019



City of Utrecht: 70.000 new houses

Effect of smart charging



Unbalanced grid



SMART CHARGING



Gemeente Utrecht



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Utrecht eerste stad ter wereld met stadsbreed netwerk van publieke laadpalen die kunnen laden én ontladen

 16-01-2019

De gemeente Utrecht en het Utrechtse bedrijf 'LomboXnet' gaan dit jaar ten minste 145 publieke laadpalen voor elektrische auto's plaatsen. Deze innovatieve laadpalen zijn geschikt om zonne-energie op te slaan in de batterijen van elektrische auto's en terug te leveren aan de buurt. De laadpalen bieden dus zowel de mogelijkheid om een auto op te laden, als toekomstige auto's te ontladen.





BIDIRECTIONAL
ECOSYSTEM



Interoperability



Power quality



TS TESTING SYMPOSIUM



30-31 october, Arnhem, the Netherlands

Conclusion

- Interoperability
 - Power quality
 - Smart charging for $V=G$
- New type of regulation needed

We have identified the most important regulatory barriers for Smart Charging (both during first and second life use of EV batteries)



Regulatory barrier type	Short Description	Impact on type of SC ¹	Impact on Smart Charging along the value chain
1 Netting rule	Missing incentive (due to the netting rule) to optimise own consumption behind the meter using the battery of an electric vehicle	<i>Bidirectional, Mono-directional</i>	<ul style="list-style-type: none"> Limits the uptake of EVs and batteries at household level since there is no incentive for the E-driver to perform mono- or bi-directional Smart Charging behind the meter Beyond the meter, an E-driver is only incentivised to participate in bi-directional Smart Charging (i.e., V2G) if he/she is given additional compensation
2a Double energy tax	Double energy tax for several (or entire) tax component(s) while performing bi-directional Smart Charging	<i>Bidirectional</i>	<ul style="list-style-type: none"> Since storage is not defined separately as a 'fourth pillar' within the electricity market framework, an EV driver has to pay taxes every time he/she charges the car. Therefore, charging, discharging and charging again will result in double taxation. Hence, there is no incentive for an EV driver to join a Smart Charging initiative
2b Tax differences for public v/s private	Impact of the double tax issue differs per location as differences in tax rates apply based on consumption levels of a connection	<i>Bidirectional</i>	<ul style="list-style-type: none"> Different tariff structures apply to the energy consumption at different types of charge points (depending on the consumption levels of the location/connection point where the charging takes place.) This can increase the double taxing issue in some locations
3 Procurement of flexibility services by grid operators	It is unclear whether storage may be procured as a service by grid operators (i.e., Smart Charging may be deployed or not for flexibility purposes)	<i>Bidirectional, Mono-directional</i>	<ul style="list-style-type: none"> Instead of expanding its grid, a DSO might want to use EVs or second life batteries to perform congestion management. However, it is unclear whether it can do so under current regulation. It is clear that ownership and operations is not allowed, but in some countries it is unclear if procurement of flexibility services is allowed.
4 Unclear/Undefined market roles	Unclear/Undefined market roles related to flexibility services may lead to (1) business model conflict between CPO & third party flex provider, (2) congestion in regional grids due to lack of coordination	<i>Bidirectional, Mono-directional</i>	<ul style="list-style-type: none"> Several parties can experience problems from the lack of coordination of flexibility. DSOs might experience congestion due to uncoordinated flex initiatives on its grid. CPOs and Smart Charging initiatives have conflicting business models and can be affected by rules around the use of flexibility.
5 Grid connection costs	No incentive to roll-out Smart Charging infrastructure due to higher grid connection costs for higher capacities	<i>Bidirectional, Mono-directional</i>	<ul style="list-style-type: none"> As higher capacity connections are more expensive, CPOs may not have the incentive to install high capacity fast charging stations, especially when costs are an important element to win a tender for a public charge point. This reduces the potential to perform Smart Charging at public charging stations.

¹SC – Smart Charging