DOTAC charging technology: a way for automotive and the energy industries to jointly reduce EV's Total Cost of Ownership and turn them into an grid balancing asset for the Gridreducing serviceclaim position in energy supply value chain

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Executive Summary

The combined rise of e-mobility and of connected car services offers ultimate chances for the automotive industry to play an active role in the development of energy services together with energy supply chain stakeholders.claim a position in the energy supply value chain. Remotely controlling the charging process via the connectivity of the electric vehicle can provide financial benefits and an even smaller CO2 footprint during use compared to internal combustion engine driven cars. The Direct-Over-The-Air-Controlled (DOTAC) charging technology enables both car manufacturers and energy suppliers to combine forces reduce the Total Cost of Ownership (TCO) for their shared customers and turn EV flexibility into a grid balancingn asset for the Grid.

Keywords: BEV, charging, connected, consumers, demand, dynamic charging, electricity, energy consumption, intelligent, onboard, smart charging, telematics, user behavior

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31 Introduction

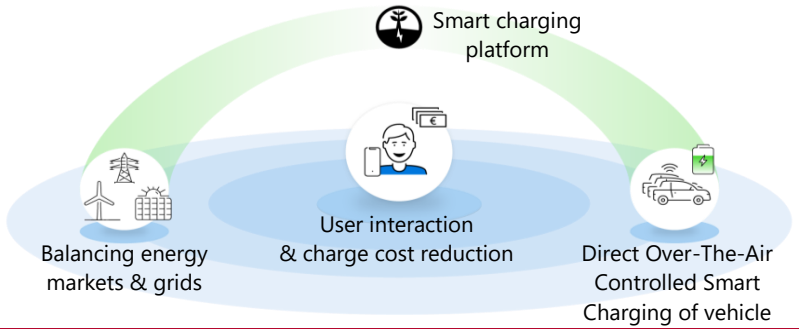
Global eElectric vehicles sales numbers are soaring as more than 2 million plug-in electric vehicles were sold in 2018 and first forecasts show that this trend will continue with a year-on-year increase of 40% in plug-in electric vehicles sales in 2019 compared to 2018.[1].. Where it took over 17 months to sell the first million vehicles, the last one million electric vehicles has been sold in 6 months' time.[2] Even though the debate about the Total Cost of Ownership (TCO) for electric vehicles is still higher than for an compared to internal combustion engine vehicles is still running depending on the cost of energy, numerous studies conclude that the local zero-emission aspect of electric vehicles is a main driver.[3][4] What we do know, is that with these

increasing adoption rates the integration of these electric vehicles in the energy system will become a main challenge. [5]. In the upcoming years it has to be ensured that electric vehicles will not become a hurdle but a tool to accelerate the energy transition. In order to make this possible, the French Transmission System Operator (TSO) RTE studied that the impact on the French grid would be limited if somewhat 60% of the charging electric vehicles would be controlled.[6] The DOTAC charging technology is a scalable and innovative approach to facilitate the so much needed vehicle-to-grid -integration, which Jedlix has not only developed a utterly scalable technology to enable the vehicle-grid integration and improve the sourcing of renewable energy at the same time, but its solution also provides a proactive role for the automotive industry to play in cooperation with the where up till now the energy industry was on its own.

In parallel of e-mobility, the Connected Car is gaining momentum. Especially because as from April 2019, all newly sold cars in the EU should be able to send an emergency call ('eCall') in case of a traffic accident and for this reason they are all equipped with a SIM card. [76] Obviously the automotive industry is trying to turn this cost center into a profitable investment by developing commercial over-the-air (OTA) services. ~~According to a study from management consulting firm McKinsey, 20% new car buyers state that they would be willing to switch to a different car for better Connected Car services. [7] Another study, conducted by multinational accounting and auditing firm PWC, found that "the value of digital product parts (including services) in new premium cars will increase from 35% to 50%", which emphasizes the increasing value of Connected Car technologies. Given these studies, it can be said that Connected Car technology could prove to be a valuable asset to an OEM.~~ This raises the question: how can OEMs create a value proposition with Connected Car technology? DOTAC charging is the next step to add purpose to the connected car. This paper will elaborate on the competitive edge of the DOTAC charging service. ~~Clean-tech startup Jedlix, has the answer.~~

42 DOTAC charging technology

Electric vehicle aggregator and smart charging service provider Jedlix is market leader in the enhancement of the Direct Over-The-Air-Controlled (DOTAC) Smart Charging solution. European top selling car brands Tesla and Renault [8] already confirmed their commitment and joined the Jedlix platform that brings together car manufacturers, power utilities and end-users (Figure 1). Independent from the type of charging infrastructure, the DOTAC charging technology stands for rich telemetry data collection (e.g. recovery of the State-of-Charge of the battery) and the possibility to control the demand and supply of the electric car by sending 'start/ stop charging' signals to the connected car via the car manufacturer's back-end. The algorithms behind the car interaction make sure that the vehicle will only be charged at optimal moments and so basically all connected electric vehicles can be transformed into flexible energy demand assets thanks to the DOTAC charging solution, while securing the autonomy target drivers are looking for. And finally, incorporating DOTAC Smart Charging helps car manufacturers to add value to the Connected Car, by using the Connected Car data and controls, and matching it to the users' preferences, that are indicated by the user via a dedicated Smart Charging app functionality.



On the other hand, energy market players wish to keep the power grid in balance to ensure continuous energy access for their customers. So, these energy market players have the interest to help secure the grid balance by relying on reliable sources of flexibility, such as controllable ~~(Figure 1). Together with partners in the energy markets, Jedlix optimizes the~~ charging ~~of~~ electric vehicles. Bringing both energy market players and car manufacturers together will allow both parties to benefit, by ~~and~~ monetizinges the value of flexibility that ~~is created this way~~comes from these relatively new distributed energy assets. ~~The results are lower mobility costs (lower TCO), increased usage of renewable energy and a lower carbon footprint. Customers of car manufacturers with 'Jedlix inside' profit financially by contributing to the energy transition. A true win-win situation.~~

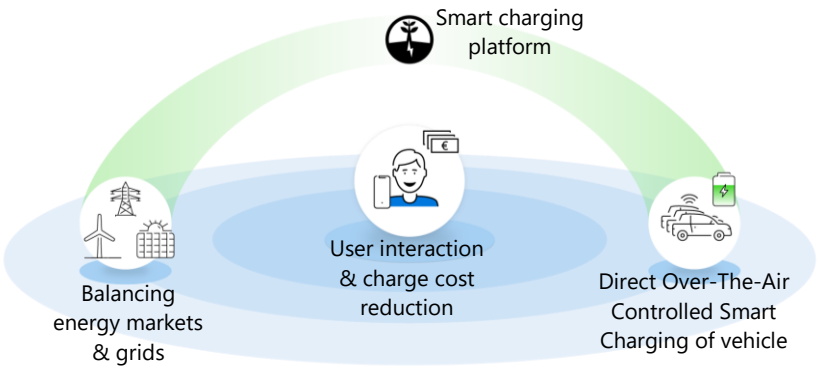


Figure 1: Overview DOTAC charging ecosystem

At the end, this means lower mobility costs (lower TCO), increased usage of renewable energy and a lower carbon footprint for the EV driver, as the connected electric vehicles will no longer be charged at moments when polluting power plants are activated. Depending on the national energy mix, Smart Charging will enhance the sourcing of renewable energy and will moreover reduce the carbon footprint of electric vehicles. [9] The shared customers of energy market players and car manufacturers, that adopted DOTAC charging, will profit financially by contributing to the energy transition. A true win-win situation.

~~Jedlix cooperates with – among others – Tesla, Renault and BMW. With its DOTAC technology, Jedlix is able to communicate with the vehicles, such as retrieving battery status and other telemetry data. The game changer is sending start and stop commands via the vehicle back-end of its OEM during the charging process, which makes the vehicle itself – and not necessarily the charging station – shift the load. The algorithms behind the car interaction make sure that the vehicle will only be charged at optimal moments: at the best price, often when renewable energy is available e.g. when the wind blows and the sun shines.~~

~~By incorporating the Jedlix DOTAC Smart Charging solution, Jedlix helps car manufacturers to add value to the Connected Car, by using the Connected Car data and controls, and matching it to the users' preferences, that are indicated by the user in the dedicated Smart Charging app.~~

A cost-efficient solution as a retrofit for current electric vehicles

To come back on the example of Jedlix, together with car manufacturers like Tesla and Renault, the technical feasibility on existing electric vehicle models has been proven and also confirms the ability to provide reliable fleet data to multiple energy suppliers in the Netherlands and other European countries. [10][11][12] This only confirms the relevance of the DOTAC charging solution.

Using the existing Connected Car infrastructure, DOTAC is a lightweight add-on to the electric vehicle services landscape, allowing the vehicle to participate in energy markets. Such a solution enhances the purpose of the Connected Car technology and therefore results in an unprecedented scaling opportunity.

Compared to the smart charging solutions via the charging infrastructure, it provides a lean solution that is cost-efficient and simplifies the entire value chain. Steering via the charging stations represents an additional investment cost for the electric vehicle driver which led to a very limited deployment of connected charging stations so far. Besides, the charging station comes with a scattered landscape with more than 150 charge point operators [13] and often also partly different backend providers, adding another hurdle regarding the scalability of a smart charging service for all.

84 A cost-efficient marketing process to distribute the service

Car manufacturers historically have been, are and will remain the most important information provider for a car owner. That is why the car manufacturer is able to build a trust relationship with its customers. When adopting new car services or even electric vehicle services, this trust is of utter importance to attain customer acceptance.

On the other hand, the energy retailer has also a strong and trusted relationship with its customers and engages into advanced Customer Relationship Management (CRM) programs to acquire and retain them. EV drivers are priority targets and strong Average Revenue Per User (ARPU) contributors. Here lies the opportunity to join forces and facilitate EV adoption and enhanced consumer experience together.

~~with your energy supplier, who has experience in communications regarding energy services and oftenly has developed a firm relation with the energy user and EV driver over the years, a big opportunity arrizes to~~ According to a study from management consulting firm McKinsey, 20% new car buyers state that they would be willing to switch to a different car for better Connected Car services.[14] Another study, conducted by multinational accounting and auditing firm PwC, found that "the value of digital product parts (including services) in new premium cars will increase from 35% to 50%"[15], which emphasizes the increasing value of Connected Car technologies. DOTAC Smart Charging can be a powerful service to improve consumer experience, increase stickiness, and transform the predicted impact of high battery-on-wheels volumes into a critical asset that can contribute to the efficient operation of the electricity grid. ~~technology could prove to be a valuable asset to an OEM. An e[...]lectric vehicle services, such as DOTAC~~

Finally, there is a game-changing difference between the DOTAC Smart Charging service and other vehicle services. Most of the current and future vehicle services are services for which one will have to pay. Smart Charging service is generating value across the chain and can be extended for free as a meaningful service for the individual and collective good. In fact, the car owner will get paid for using the service and this offers a unique selling point to the car manufacturer and the associated dealer network. Even more once the car manufacturer teams up with an energy supplier or a leasing company to create a package of services and maximize the customer benefits, while getting a happy and loyal customer in return. ~~the opportunity to distribute the service in a cost-efficient way while making use of both the energy market player's and the carmanufacturer's distribution channels, together with other services, and share the customer~~

~~9~~5 Conclusion

This paper has elaborated on a new technology called DOTAC smart charging, that will facilitate and support the adoption of electric vehicles in our society by making use of telecommunications infrastructure that is already in place and will be present in all new electric vehicles to come. DOTAC will create a meeting point for the automotive industry and energy supply chain stakeholders to incubate new partnerships and develop car-centric energy services. Remotely controlling the charging process via the connectivity of the electric vehicle can provide financial benefits and an even smaller CO2 footprint during use compared to internal combustion engine driven cars. Finally, the DOTAC controlled charging technology has a competitive edge when it comes to both operational costs and service distribution costs.

~~To be determined~~

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