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Demand-driven Expansion of Charging Infrastructure for International Markets by the Example Germany

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Summary

With a growing market for electric vehicles (EV) the need for charging infrastructure is increasing. The challenge is to install the right type of charging infrastructure (AC, DC Fast, HPC) in the right amount. Only under this precondition the user acceptance towards charging is increasing and the provision of charging infrastructure becomes a profitable and therefore considerable option.

P3 has designed two interlocking tools, to derive market-specific needs for charging infrastructure and tested it already in Germany. On the one hand, the basis is formed by a "CO2 Compliance Tool", that enables P3 to define market- and even manufacturer-specific market development figures for EVs, based on the assumption that compliance to the CO2 regulation is the minimum requirement for the EV development. On the other hand, there is a database that considers EV announcements and their specific charging capacity as well as market-specific user behavior. With these tools the need for dedicated charging infrastructure and the location of charging infrastructure can be defined and therefore guarantee investment and planning security for different stakeholders in the charging infrastructure market.

Keywords: Business Model, Charging, EVSE, fast charge, market development, strategy

1. Initial Situation

The need for charging infrastructure in different areas, especially at home, at workplaces, at different destinations and in public is increasing. Not only to enable charging of electric vehicles, but also to give potential buyers of electric vehicles a feeling of safety and fulfil the potential demands. With the transition towards electric mobility, the use case of re-fuelling or then re-charging changes dramatically. In the future, charging takes place, where the cars are parked anyhow – therefore, the most important charging locations are at residential homes, at workplaces and, of course, at public places such as supermarkets, shopping malls, sports centres and parking garages in the city centres – just to mention some use cases. That means, that a high amount of charging infrastructure is necessary, to fulfil the EV customers' demands. Recent studies for the German market showed, that there is a need of 205.000 public charging points in 2025. As the invest in charging infrastructure is high, the roll-out of charging infrastructure needs to be targeted and especially demand-oriented.

Therefore, P3 developed a tool, to derive the need for charging infrastructure from several parameters, so that the charging infrastructure operators have a reliable forecast tool to manage the roll-out of charging infrastructure until 2030.

2. Challenge: Allocation of suitable charging hardware

The invest in charging infrastructure started several years ago, when the first EVs were announced. In Germany, many players are involved to build up charging infrastructure, e.g. public utilities, energy suppliers, automotive manufacturers and special purpose entities and a big public funding programme is ongoing. That's why there is an oversupply of charging infrastructure right now in the market. However, the situation might change with the number of EVs in the market increasing significantly in the upcoming years and especially from 2020 on.

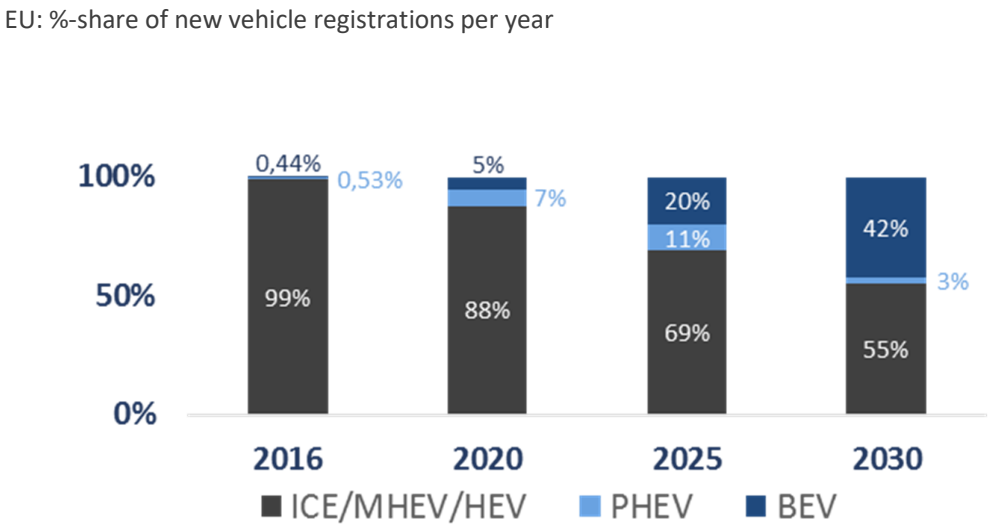

Figure 1: Estimated market development xEVs in EU (Source: P3 analysis)

So far, there are high invests necessary to build up charging stations, while, at the same time, the utilization rates are very low. Therefore, the operation and provision of charging infrastructure is not a viable business option today.

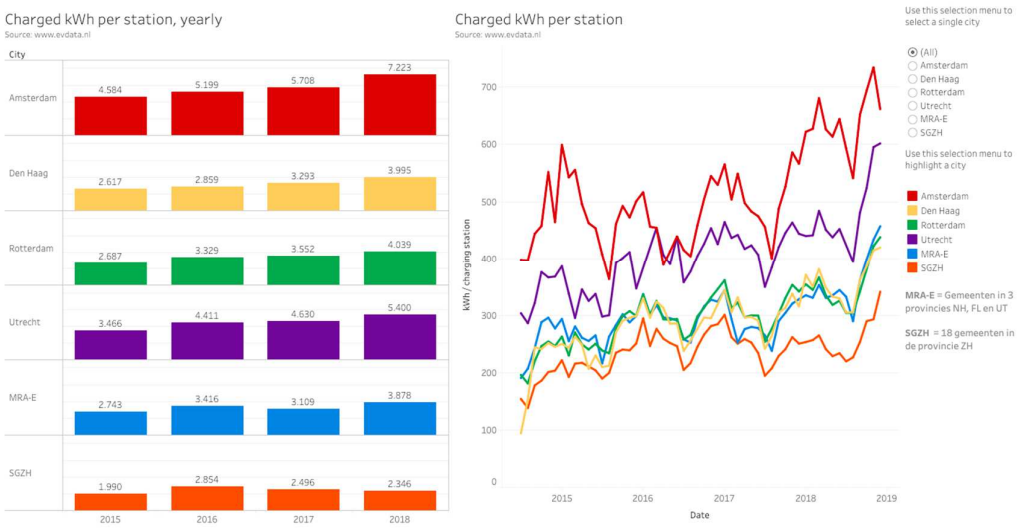

Figure 2: Charged kWh per station in public (Source: Evdata.nl)

The important issues are, when to build up charging infrastructure, how many charging points are needed and where the charging stations should be located. In addition, also the business perspective and the potential profitability is crucial for the decision, which charging infrastructure should be installed. While HPC offers higher revenue potentials in terms of electricity sales, the invests are higher – also the TCO perspective of individual charging sessions is therefore considered in the paper to also underline the economic perspective of the invest in charging infrastructure. As presented in the figure below, the costs per kWh for HPC are decreasing by more than 60% from 2018 to 2025. This is caused by increased utilization rate, but also by decreasing costs for power electronic components.

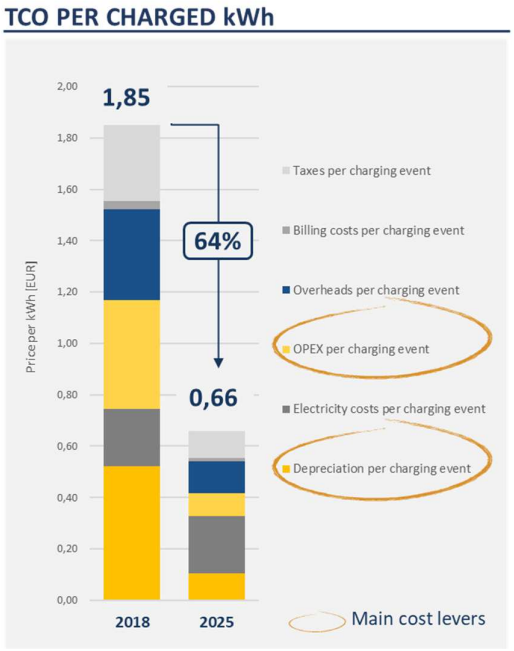

Figure 3: TCO per kWh for HPC charging (Source: P3 analysis)

The tool P3 developed, gives an indication of when and how many charging infrastructure of what type should be installed. The market-specific allocation of charging infrastructure is dependent on various factors. P3 combined the most important factors in the tool and is therefore able, to derive market-specific forecasts for the roll-out of charging infrastructure.

3. P3 Approach

P3 combines several tools and approaches to derive the need for charging infrastructure sorted by type per market. First of all, P3 has developed, a CO2 Compliance Tool, that considers the international market- and manufacturer-specific CO2 regulations to derive a market ramp-up scenario for electric vehicles. The results of the CO2 Compliance Tool are combined with an EV database. This database is managed and controlled by P3 and is a tool to track the EV announcements and production targets of the European, American, Japanese and Korean OEM – this combination allows a clear view into the future of electric driving. It is possible, to forecast the number of electric vehicles, also manufacturer-specific, the type and charging requirements of the EVs as well as the mix between PHEV and BEV.

As a third tool, P3 has forecasts on the charging split of home charging, public and fast charging, so that the charging use case split can be derived. Input for the charging use case split are the number of home parking facilities in the market, the mobility behaviour and the importance of the car for mobility. With this combination a market roll-out scenario for AC, DC fast and HPC charging points can be drawn for different markets to show the needs per year for charging infrastructure.

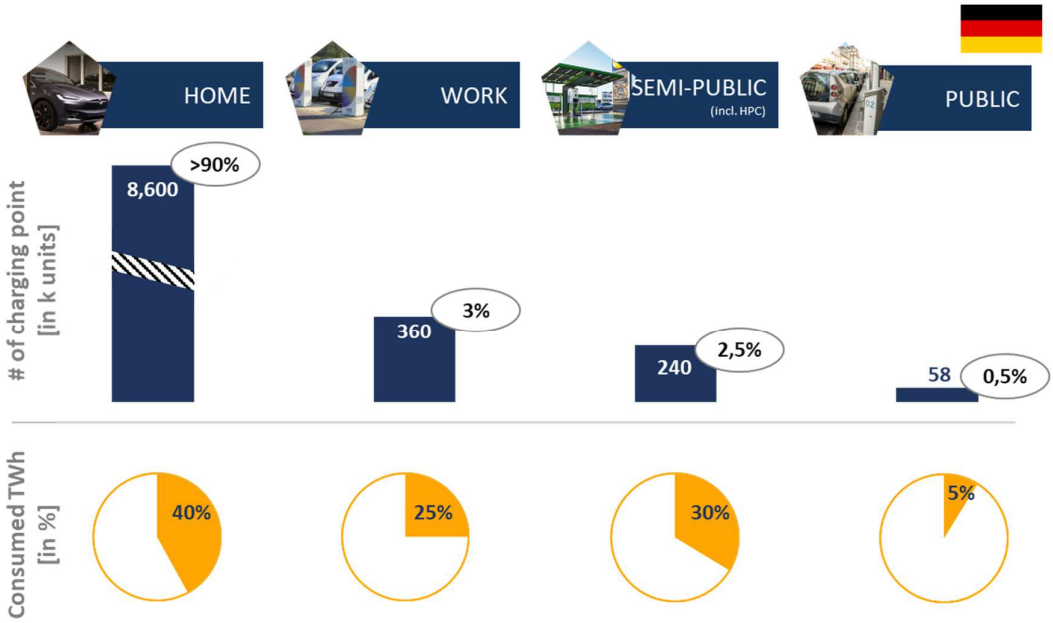

Figure 4: Overview of charging infrastructure in Germany by 2030 (Source: P3 analysis)

As presented in figure 4, P3 estimates a high need for charging points especially at home. There is a need for more than eight million charging points until 2030. In addition also the workplace charging and charging at shopping sites, restaurants and also gas stations will increase to more than 500,000 charging points until 2030. P3 sees only limited potentials for public AC charging.

4. Fields of Application

The fields of application for the demand-oriented expansion scenarios of charging infrastructure are diverse. On the one hand, it can be used as a base for a roll-out and invest plan for charging infrastructure providers. Furthermore, it can be used by political authorities to control the targeted roll-out of charging infrastructure and to allocate funding programmes. The adaption of the parameters to different markets or even regions are possible. Especially, the regional market development scenarios can also help regional utilities to plan the invest to charging infrastructure. On the other hand, it can be the base for a crowd sourcing approach to allocate specific charging infrastructure locations within the markets.

Besides, P3 also has different mobility behaviour data and can combine them under certain parameters with the roll-out scenarios to identify either very attractive sites for charging infrastructure or create a comprehensive network of charging infrastructure.

5. Outlook & Conclusion

The electric mobility is on the advance. The future of mobility will be electric and the topic of charging infrastructure is closely linked to that. To make charging infrastructure a profitable and viable business, the

timing and amount of the roll-out is crucial. With the P3 tool the demand-driven need for charging infrastructure helps to maximize planning and investment security for different stakeholders.

Authors

Johanna Heckmann works as a Senior Consultant for the P3 Group in the field of Electric Mobility and is team lead for all topic related to charging infrastructure. In different projects for major automotive manufacturers and energy suppliers she gained experience along the value chain – from standardization to market roll-out and operation of charging infrastructure. Before she worked for e-mobil BW, the State Agency for Electric Mobility in the German state of Baden-Wuerttemberg and was part of the project coordination office for the "Showcase for Electric Mobility – Living Lab BWe mobil". Johanna Heckmann is master graduate of the HTWG Konstanz, where she studied Business Management.