MASTER THESIS – PUBLIC ABSTRACT

WHO HAS THE POWER TO MOVE TOWARDS A NEW PARADIGM?

The Need for a European Public Charging Infrastructure for Electric Vehicles from the Perspective of Cross-border Business

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Preface

This public abstract is written by Geraldine Goijen as partial fulfilment of the requirements for the degree of Master of Science, program in European Studies, at the University of Twente, August 2018.

This abstract contains the information of the closed research project that is authorized to be publicly available. Bear in mind that the closed thesis contains information of a business-case study. This information available in this abstract therefore does not contain any business information and only focuses on the qualitative research conducted and focused on EU and national regulation. The abstract contains a short introduction to the purpose of the paper, relevant literature, and the aim of the paper. Then it provides information on the methodology that is used to conduct the research. After this the results are shown and analyzed in a short discussion. Finally, the conclusion will answer the main research question.

Written by Geraldine Goijen
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Abstract

Over the past years, the European Commission has become more active in the field of environmental friendly transport. Subsequent to Directive 2009/28/EC on promotion of the use of energy from renewable sources in transport fuels (European Parliament & The Council, 2009a), and Directive 2009/33/EC on promotion of energy efficiency and the reduction of pollutant emissions in the transport sector (European Parliament & The Council, 2009b), the Commission presented the White Paper 'Roadmap to a Single European Transport Area – Towards a Competitive and Resource-Efficient Transport System' in 2011 (European Commission, 2011). The White Paper called for the reduction of oil dependence in transport, the reduction of transport greenhouse gas emissions by 60% by 2050 compared to 1990 and by around 20% by 2030 compared to emissions in 2008. The Paper called for an array of policy initiatives for achieving these goals, including the development of a sustainable alternative fuels strategy and an appropriate European infrastructure (European Commission, 2011). As electric vehicles become more prevalent throughout Europe, EU Member States will face legal issues at the policy and legislative level while European companies will need to face legal issues in the context of their strategic decisions and day-to-day operations (Desai, 2011). The European Commission predicts that electric vehicles will constitute a substantial part of the total vehicle fleet in the European Union, growing to 30 percent by 2030. The total market for electrically chargeable vehicles in the EU and the European Free Trade Association (EFTA) expanded in 2017 by 38.7% to 287,270 cars or a share of 1.4% of the total European new car market. The total was almost equally spread between battery electric vehicles and plug-in hybrids. Hybrid car sales increased by over 50% to nearly half a million vehicles in total. New EV registrations increased by 38.7% to 287,270 cars. During the fourth quarter 2017, the increase was slightly weaker at 37% to just over 86,000 electric cars. Despite the strong growth in electric car sales in Europe in 2017, electrically chargeable vehicles still have a market share of only 1.4%, which is approximately one in sixty new cars (ACEA, 2018).

In Europe, the Netherlands leads the way with a network of over 32.000 public charging positions in 2017 (EAFO, 2018). In this research public charging stations are those that are available to the public. Other countries with large numbers of public charging points include Germany (more than 14 000), France (more than 13 000), the United Kingdom (around 11 500) and Norway (more than 7 600). Some countries are slowing down the installation of new public slow-charging points, with more focus shifting to the expansion of fast-charging infrastructure. The European Commission defines charging with less than 22kW as 'slow' and more than 22kW as 'fast' charging. However, due to technological developments the EEA categorized the types of charging in four different categories, see figure 1. The fifth category is not officially determined yet, but technological advancement calls for another category for charging stations that can charge to up to 350kW. For the development, support of the construction, and upgrading of transport infrastructure, the EU established the Trans-European Transport Network (TEN-T) program. On the high power-charging infrastructure for electric vehicles, the program has invested in various projects to help enable the long-distance driving of electric vehicles and promote sustainable transport (European Commission, 2018).

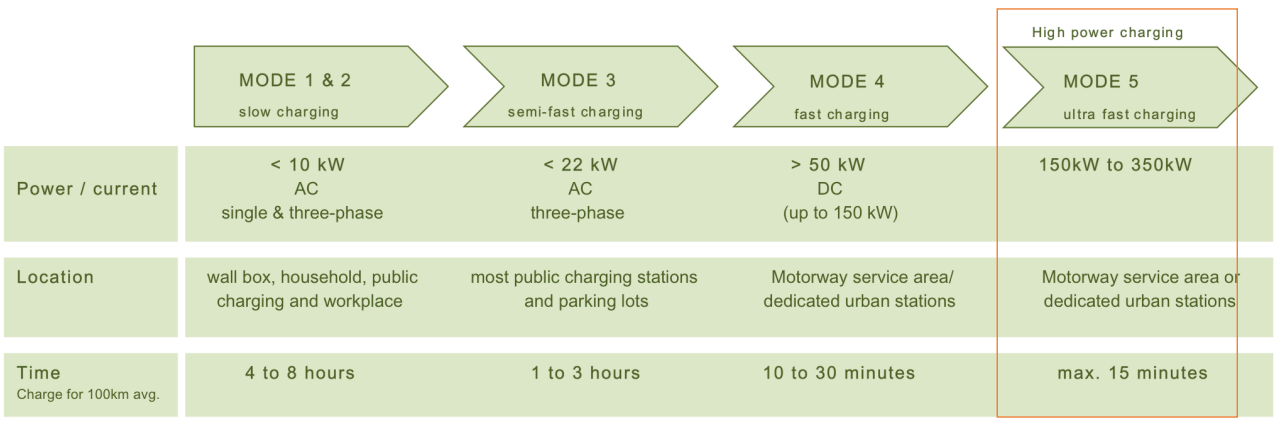

Figure 1 Overview EV charging modes

Electric vehicle sales will not increase if the current charging infrastructure remains static. However, it also makes little sense to expand charging infrastructure significantly without knowing how individual mobility in general, and especially the electric vehicles market, will develop in the future. Ideally, both the vehicle market and the infrastructure grow simultaneously. The European strategy for low-emission mobility highlights the importance of publicly available electric charging points. In order to achieve mass acceptance and deployment of electric vehicles, it recognizes that charging and maintenance infrastructure needs to become widely available throughout Europe (European Commission, 2016).

Combining the individual pieces of information, results in a twofold research objective of this thesis: on the one hand it aims to analyse the way EU and national regulation actually attributes to or impedes the efforts of unfolding an international infrastructure for high power charging, in Europe. This is a descriptive and evaluative part of the report on the various regulations existing at the European and national level with a focus on the development of a high power-charging infrastructure in Europe. On the other hand, the aim of this research is to provide a company with the necessary information to have a better understanding of the regulatory framework it is working in. The focus on high power-charging is chosen since this is the most interesting charging method for the formation of an international network, with the main reason that it is the fastest way to charge and the assumption that expanding the volume of EVs will never 'work' if the charging takes too long, as seen in figure 1. The overall mapping exercise of this master thesis aims to investigate how EV-business is influenced by the regulatory procedures developed by the European Union and national governments. Thus, the central research question of this master thesis research project reads: 'To what extend do EU- and national regulations related to the development of an international high power charging-infrastructure facilitate or impede cross-border business?'

In research methodology, the term 'variable' is used to explain the variance the researcher aims to explain (Babbie, 2011). A variable is either seen as a result of a force, a dependent variable, or as a force itself that influences the change of another variable, an independent variable. The independent variable is the variable that is manipulated in a controlled manner by the researcher to evoke a change in the dependent variable. This research is a qualitative research, which means that the data is used, is mainly written data (reports, regulations, directives, books, etcetera). Therefore, the variables are of a descriptive nature and not an actual number or fixed value. In this study, the dependent variable is the development of an international high power-charging infrastructure, the independent variable is the level on which the regulation is ratified, and the intervening variable is the type of regulation, see figure 2.

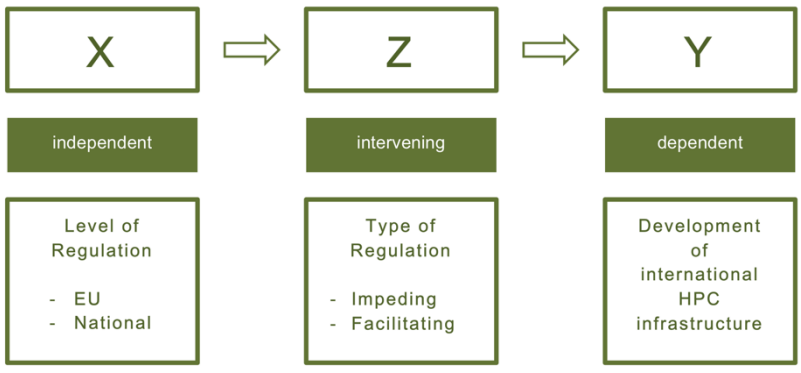

Figure 2 Conceptual model with intervening variable

The research is defined as qualitative research. Qualitative research is an inquiry process of understanding, based on distinct methodological traditions of inquiry that explore problem. To analyze legal documents this research makes use of official governmental documents, governmental studies, observations, case study, qualitative reviews, and statistics. The regulations that are analyzed in this thesis are identified as either

impeding or facilitating. In this thesis facilitating regulations are understood as those rules, procedures, and practices that are helpful for businesses to engage in EU cross-border activities, with the focus on EV-charging. The impeding regulations are understood as those that make it more difficult or even impossible for businesses to expand the activity of realization of an HPC-charging network in other EU member states.

A case study design has been selected to obtain practical information on the influence of EU and rational regulation on the realization process of an international high power-charging infrastructure. However, the information on the case study is not publicly available but the analysis of EU and national regulation and their impact on the realization of an international high power-charging infrastructure is public, since all the regulations are freely accessible. This research is categorized as qualitative research. A central issue in qualitative research is credibility. Data triangulation is one of the most commonly used methods of establishing trustworthiness in qualitative studies. By verifying information that is obtained through interviews with the interviewee itself, with comparative interviews of peer-employees, and by any documentation on the processes, the triangulation method is put into action. By making sure during the analysis of the data, that the criteria of trustworthiness are being met, it is possible to establish validity in this qualitative research.

Throughout Europe, different charging protocols, plug designs and billing systems have been developed and introduced. There is a problematic tension between early attempts to define national standards and the eventual need for international interoperability to enable cross-border travel with electric vehicles (Bakker & Trip, 2015). By having broad definitions in regulations, it is possible that they are interpreted in different ways, which can lead to chaotic executions of processes or even proper miscommunication. In general, there is broad agreement that a public charging infrastructure is important to the growth of the electric vehicle market, and an environmentally friendly way of transportation. However, there has been limited research into how strongly regulation, on any given governmental level, has an influence, either positive or negative, on the development of an international high power-charging infrastructure. This may be partially due to the data availability, since the market is relatively new, and it is more difficult to have a specific set of rules when it is not possible to predict any outcomes about the EV-market. It may also be due to the quickly evolving state of electric vehicle technology itself, where electric vehicles and charging infrastructure will grow and coevolve together with patterns that still remain largely unclear. previous research shows that there is no commonly accepted manner to research the influence of regulation, especially the regulation of the vehicle charging market. Focus lies mainly on market share, financial incentives, and compliance. However, Coglianese (2012) mentions the importance of analyzing the implementation of regulation and in combination with a method used in research by the EC, in which content of the regulation of the vehicle charging market is analysed, this research uses a combination of both approaches to answer the research question.

This research was conducted to answer the question that to what extend EU- and national regulations related to the development of an international high power-charging infrastructure facilitate or impede cross-border business. By analysing the current HPC infrastructure and both the EU as national regulatory incentives the following conclusions can be made.

The current situation of the high power-charging infrastructure within European borders shows that the current international HPC infrastructure is being rolled out based on the Nine Core Network Corridors. These were identified to streamline and facilitate the coordinated development of the TEN-T Core Network. The CEF is in charge of the funding of the projects on the different Corridors, with relevant member states obliged to align national infrastructure investment policy with European priorities. In 2014 the Alternative Fuels Infrastructure Directive (AFID) proposed charging point targets for each EU Member State. Governments were required to design national action plans on a charging point infrastructure and to install an 'appropriate number of electric recharging points accessible to the public' by the end of 2020. On average the total number of charging stations grew considerable over the past eight years. However, Belgium stays behind with the realisation of charging stations and has on average 20 EVs per station driving around. Three large HPC-networks are currently being developed across EU. Ultra-e, Ionity and MEGA-E.

General EU regulation focused on HPC charging is non-existing. However, direct regulatory influences are identified. General regulation has a main focus on the privacy of consumers charging data, competition rules between companies, and the voluntary standardization of products. Facilitating efforts exist in the forms of directives that call for national policy frameworks (the AFID), regulations that establish the technical standardization platform CENELEC (Directive 2014/94/EU) and provide funding, and communications that show that the EU sees there is a need for research towards regulatory barriers and control of implementation of national set targets on the deployment of alternative fuels infrastructure. Impediment on EU level is mainly linked to the current focus on private charging stations and lack of enforcement of standardization.

The regulation of the vehicle charging market on a General Dutch level calls for a focus on private charging, and therefore impedes the HPC infrastructure development. Tax reductions for both charging stations and EVs will increase the overall takeover of transport electrification but have no direct facilitating powers towards HPC. Even though this is the case, the Netherlands still is the leading country when it comes to HPC infrastructure rollout. All NPFs set out a broad range of support measures, but uncertainties remain. Either the measures have not yet been adopted or they seem too limited to have tangible market impacts for HPC. There is a clear focus on normal- and private charging, with some countries offering several incentives for this kind of charging power, both at national and/or regional levels. However, the kind of support differs largely, from exclusive funding programs in Germany, France, and the United Kingdom, to the participation in EU-funded projects by Belgium and the Netherlands. With regards to the governmental level of policy implementation there are big differences. France offers exclusively tools at national level. Belgium has no policy on a national level but only the regional governmental support. The Netherlands, United Kingdom and Germany have tools on all levels. Two factors are mainly responsible for this phenomenon: the size of the country, and the institutional situation and political organisation.

Many regulations that facilitate the development of an HPC network, focused on targets and goals of reducing greenhouse gas emissions and increasing EV-sales, or increasing the number of charging stations and do not facilitate the realization process. The rules that do influence the actual realization process are Regulation (EU) 1025/2012 on European Standardization and Directive 2014/94/EU on the deployment of alternative fuels infrastructure in Europe. Part of this Directive concerns the electric charging points for motor vehicles and facilitating efforts to the HPC infrastructure. The Directive imposes the Combined Charging System (CCS) as common standard for high power DC charging and type 2 as common normal power AC charging. CCS integrates single-phase AC-charging, fast three-phase AC-charging, faster DC-charging at home and ultra-fast DC-charging at public stations into one vehicle inlet.

The impact or effectiveness of a policy is an essential component and can be identified by measuring the implementation of new regulation. The Regulation and Directive that actually directly influence the development of the electric vehicle charging market are identified as Regulation (EU) 1024/2012 and Directive 2014/94/EU. The European Commission drew up a report in 2017 on the evaluation of the implementation of Directive 2014/94/EU. Not all the member states have implemented the Directives' standards in their National Policy Frameworks or executed them on national level. So, although both the Regulation and the Directive imply to be of facilitating effect for the realization process of an HPC network, the adaption of the standardization is purely voluntary. This means that the specific EU- and national regulation related to the development of an international high power-charging infrastructure is currently mostly of impeding nature due to the fact the enforcement of standardization is not enforceable at the moment.

Every research has its limitations, whether it is financial, time-wise, or data-wise. When executing a qualitative research in a field that is still taking its baby-steps, it is necessary to be careful deciding which data can be useful. Especially in a qualitative research it is important to first get a grasp of the scope of information that is available, for this research and with a focus on the relatively 'new' market for electric vehicles and their charging infrastructure it is possible that the information is taken from a too wide of a platform and the research did not go deep enough. The information provided reflects partially the subjective perception of the researcher. By deducting a qualitative research, the researcher has chosen to personally interpret the regulatory frameworks.

It is possible that a biased approach to observation of the data has influenced the outcomes. There are ranges of statistical techniques that can be used, but these require the right sort of data to be available, or comparison with historical data if feasible. There are some incentives to future research. The development of HPC stations is still underway and new technologies are lurking around the corner. Some NPFs include goals for different types of charging, but do not take development of new technologies into account. Quantitative research in the field policy effectiveness is essential but can only be conducted if enough data is available. One mayor incentive that is not included in this research but will determine the future of not only the international HPC infrastructure, but the future of the whole European Union is the exit of the United Kingdom from the EU. Will the regulatory frameworks stay the same, or will the UK change things without the controlling eye of the EU? Ans how will international business look like? Research to the impact of Brexit on the HPC infrastructure would be recommended to research next. Furthermore, the NPFs are reinforced but research to the actual implementation and should be interesting to find out if reinforcement had any effect.

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