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Stakeholders interests, expectations, and strategies regarding the development and implementation of electric vehicles: The case of the Netherlands

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ABSTRACT

In this paper, we study the strategies of the most relevant stakeholders with regard to the development and commercialization of electric vehicles (EVs) and their recharging infrastructure. Building on the perspective of socio-technical transitions, we relate the strategies of stakeholders to their current and future interests, as well as to their expectations with regard to EVs. Our analysis is based on a series of 38 semi-structured interviews with representatives of a variety of stakeholders in the Netherlands.

EVs pose both opportunities and threats to various stakeholders. They therefore participate in the development of the emerging EV system, primarily in order to learn about the potential positive and negative impacts of these systems on their interests and, ultimately, to be able to grasp the opportunities and mitigate the threats. In other words, the expectations, interests, and resulting strategies of stakeholders relate to and depend upon the specific configuration of the emerging socio-technical system for electric mobility. We identify six potential conflicts of interest: the division of tasks within a public recharging infrastructure; the allocation of charging spots; the ways in which charging behavior can be influenced; the role of fast-charging, technical standards for charging equipment; and supportive policies for full-electric and plug-in hybrid vehicles.

In general, the stakeholders do not seem overly concerned about either short-term returns on investments or long-term negative impacts. In this regard, the early phase of the transition can be understood as a relatively carefree phase. In order to continue the development of the emerging EV system and to keep it on the right track, however, for the foreseeable future, supportive policies will be necessary in order to provide a stable and reliable basis for further market expansion.

1. Introduction

The transport sector is facing the challenge of reducing its overall carbon footprint and becoming less dependent upon fossil fuels. For example, the European Commission has adopted a roadmap towards 2050 that aims to reduce transport related carbon emissions and dependency on imported oil by 60%, relative to 1990 levels (European Commission, 2011). Because such reductions are particularly difficult to achieve in aviation, shipping and long-distance haulage, even further

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emission reductions will probably be needed in automobility. While changes in travel patterns and mode choices can certainly contribute to these goals, technological change is needed as well (Litman, 2013). In the short term, much can be gained from further incremental improvements in conventional drivetrain technologies , but in order to attain the 2050 goals, a transition towards more radical alternatives is necessary nonetheless (European Expert Group on Future Transport Fuels, 2011). Therefore, the EU, the US, and Japan are pushing the automotive industry towards the further commercialization of low- and zero-emission vehicles with the introduction of ever more stringent regulations. The most notable example is the European legislation that requires car manufacturers to reduce the average emissions of their passenger cars to 95 g of CO_2 per kilometer by 2020 (European Commission, 2012). From the variety of technological options that are available to meet this requirement (including biofuels and natural gas), virtually all car manufacturers have placed at least a portion of their bets on fully electric or plug-in hybrid vehicles (Dijk et al., 2012; Sierzchula et al., 2012a). After a number of failed attempts in the past, EVs are now a serious option. In contrast to the earlier attempts, they are now actually available on the market (Bakker et al., 2012a). The success of the transition toward electric mobility, however, will not depend upon car manufacturers alone. Cooperation among a broad set of stakeholders is needed in order to produce affordable vehicles, as well as to develop an early market and the necessary recharging infrastructure.

Previous research regarding the development and commercialization of EVs has focused on either the supply side (by identifying strategies employed in the automotive industry) or the demand side (by gauging consumer acceptance of EVs). Supply-side studies show that, although the automotive industry is developing electric-drive vehicles (including "regular" hybrids, plug-in hybrids, and fuel-cell vehicles), it is doing so as part of a wider portfolio strategy in which the most attention and resources are still geared toward incremental improvements in conventional vehicle technologies (Dyerson and Pilkington, 2005; Frenken et al., 2004; Magnusson and Berggren, 2011; Oltra and Saint Jean, 2009; Sierzchula et al., 2012a,b; Wells and Nieuwenhuis, 2012; Wesseling et al., 2013). Demand-side studies show that the vast majority of consumers are unwilling to pay a premium for electric vehicles, given their limited performance in terms of range and recharging times, as well as the lack of a high-density recharging infrastructure (Campbell et al., 2012; Dimitropoulos et al., 2013; Graham-Rowe et al., 2012; Hidrue et al., 2011; Lebeau et al., 2012; Lopes et al., 2014; Pearre et al., 2011; Schuitema et al., 2013; Tamor et al., 2013). The reluctance of the car manufacturers and the lack of enthusiasm among consumers could easily lead to an impasse in the innovation trajectory. However, a broad range of stakeholders is nonetheless paving the way for the large-scale introduction of EVs. These stakeholders include the car manufacturers, national and local governments, the main stakeholders in the electricity industry, newly started businesses, and even some of the traditional oil companies. The extent to which the transition will be successful depends on the question whether these stakeholders continue their involvement and are able to coordinate their efforts. In this paper, we therefore ask why these stakeholders support this transition and whether or not their strategies, and underlying expectations and interests, are mutually aligned, today and in the future. To this end, we adopt a socio-technical transitions perspective which considers the emerging technology, as well as the emerging socio-technical system of which it is a part (Geels, 2002, 2012; Smith et al., 2005; Whitmarsh, 2012).

In the following section, we elaborate our theoretical framework in more detail, followed by an explanation of our research methodology in Section 3. In Section 4, we present an overview of our findings for the selected stakeholder groups, highlighting a number of potential conflicts of interest between stakeholders in Section 5. Finally, in Section 6, we present our conclusions and implications for the design of supportive policies.

2. Theoretical framework

2.1. Socio-technical transitions

The transition from an automobility system based on fossil fuels and internal combustion engines to one based on electricity, batteries, and electric engines entails more than technological substitution alone. For this transition to be successful, simultaneous organizational and institutional change is also necessary (Geels, 2002, 2012; Schwanen et al., 2011; Whitmarsh, 2012). The literature on such socio-technical transitions describes dynamics of large-scale (and often long-term) structural changes as a process of the co-evolution of technological designs alongside organizational and institutional designs. The term "regime" is used to describe the existing set of technologies, organizations, and institutions (i.e., the formal and informal rules of the game) that dominate socio-technical systems. In other words, the prevailing technological solution is very firmly embedded within society and the economy, and all of the actors and institutions are geared towards this one solution. As a result, radically different technologies and alternative practices are excluded, and innovation is limited to incremental changes within the boundaries of the regime. Technological and societal development can therefore be described as path dependent, with a tendency to reinforce and reproduce existing systems, instead of being open to anything that is radically different. Socio-technical transitions thus entail a true struggle, in which the regime resists the emerging system both passively (through existing rules and routines) and actively (by incumbent actors). Despite these difficulties, windows of opportunity occasionally emerge from which radical innovations can benefit. As historical studies have shown, such opportunities are often the result of external pressures (e.g. environmental concerns) that destabilize the existing regime (Turnheim and Geels, 2012).

Breaking down the existing regime and building up the newly emerging system are both long-term processes. During this time, the new and still vulnerable system needs some form of protection from an otherwise hostile market environment.