



# Can innovative business models overcome resistance to electric vehicles? Better Place and battery electric cars in Denmark

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## HIGHLIGHTS

- ▶ We explore the context for an innovative emergent business model to deliver battery electric car mobility in Denmark.
- ▶ We explore the interplay between battery electric cars, renewable energy generation and smart grids.
- ▶ We discuss the integration of electric cars in energy systems based on renewable energy sources.
- ▶ We discuss the likely success of the Better Place business model.

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## ABSTRACT

This paper explores the geographical and policy context for an emergent business model from Better Place to deliver battery electric car mobility in Denmark. It argues that the combination of radically different technologies and a highly complex multi-agency operating environment theoretically provide the conditions and requirements for such an emergent business model. While focused on battery electric cars, renewable energy generation and smart grids, the paper has wider applicability to an understanding of the interplay between place, innovation and sustainability which suggests that diverse solutions are likely to be the characteristic solution rather than ubiquity and standardization. The paper argues, however, that the innovative business model, the deployment of electric vehicles, and the use of renewable energy systems, in this case largely based on wind power, while mutually supportive and contributing to wider policy aims with respect to the reduction of carbon emissions, may still fail in the face of entrenched practices. At the theoretical level it is concluded that theorization of business models needs a broader perspective beyond the typical 'value creation, value capture' rubric to better understand the wider role such models have in meeting societal goals, and to understand the structural impediments to organizational and technical innovation.

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## 1. Introduction

Research into innovative business models has highlighted the ways in which competitive advantage may be secured by creating new businesses premised on novel structures and approaches, or by re-engineering the architecture of existing businesses. In broad terms, the two primary conditions to allow or promote business model innovation are technological innovations (in the product/service offered or in the underlying business processes) or economic distress under which existing business models are losing their

competitive power. Research in this area tends to focus on the innovative cases and on the success stories. In contrast, the ability of entrenched business models or other forces for inertia to resist change tends to be neglected. As this paper argues, the instance of electric vehicles would appear to offer theoretically good reasons to expect that profound technological changes in the nature of the product, allied to repeated economic distress evident in the existing dominant business model for vehicle manufacturing, would yield the perfect opportunity for business model innovation to flourish. Indeed, such innovations in business organization have been claimed to be a pre-requisite for the successful electrification of automobility (Berger, 2011; Wells, 2010a).

According to the Inter-governmental Panel on Climate Change (IPCC) global emissions of CO<sub>2</sub> must be reduced by 50%–85% by 2050 in order to avoid global warming exceeding the 2 °C threshold

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temperature for catastrophic climate change (UNFCC, 2011). This reduction target means that the developed countries need to reduce their emissions by 80%–95% by 2050 to counter-balance growing emissions in developing countries (EU, 2011). Two of the main contributors of CO<sub>2</sub> emissions are energy conversion and transport activities. A potential route to climate change mitigation is via the phased substitution of fossil fuels with renewable energy sources such as solar, wind and hydro power. These renewable energy sources all share the same challenge of reconciling fluctuating energy conversion against variable current consumption patterns.

Climate change mitigation in the transport sector has been more challenging as CO<sub>2</sub> emissions caused by transport activities in most countries more or less follow continuing economic growth (EEA, 2010). Private car use is one of the main contributors to CO<sub>2</sub> emissions from the transport sector (EEA, 2010). Incremental achievements in the CO<sub>2</sub> performance of new cars have been achieved in Europe via voluntary action and, more recently, by the direct regulation of CO<sub>2</sub> emissions (EU, 2009a), but more radical solutions are needed (EEA, 2010). One of the most promising radical solutions is that of battery electric vehicles (BEVs; in this paper taken to include plug-in hybrid vehicles as well). BEVs are more energy-efficient than conventional diesel or petrol fuelled combustion engine vehicles and allow the introduction of renewable energy sources in the transport sector if parallel transition is taking place in the energy sector.

There are many potential strategies to reduce the CO<sub>2</sub> emissions from transport, ranging from advanced public transport systems to substitution via increased use of information and communications technologies. However, the combined introduction of electric cars in the transport sector and renewable energy sources in the energy sector via innovative business models is particularly interesting due to the fact that fluctuations in electricity production via renewable energy sources can potentially be managed by so-called intelligent charging of BEVs whereby vehicle charging is controlled and performed according to the actual production patterns in the energy sector in a 'smart grid'. Intelligent charging requires a completely new way of organizing the interface between the transport sector and the energy sector. While much research has identified the technological challenges in terms of vehicle and infrastructure design to achieve the transition to low-carbon mobility (Sperling and Gordon, 2009), rather less attention has been given to the implications for business structure and organization (Wells, 2010b). There is recognition that in broad terms new business models are likely to be a feature of the emergent automotive corporate landscape (Kley et al., 2011; Berger, 2011; Wolfson et al., 2011), and that the technological and business solutions for sustainable mobility are likely to be highly diverse and context-dependent, but in the absence of actual cases there is little understanding of how those innovative business models might be characterized, or how they will relate to and compete against entrenched practices.

This article explores the creation of such a business model by looking at the implementation of BEVs in Denmark by Better Place, a new 'intermediary' interface between BEVs and renewable electric power. We have chosen Better Place Denmark because it is at the forefront of these intertwined technological and corporate changes (Wolfson et al., 2011). Denmark has a high proportion of installed wind power capacity and supportive policy context such that electric cars are expected to penetrate the vehicle fleet faster than elsewhere. The article first reviews the significance of innovative business models in theory, along with the material circumstances of the nascent BEV segment that may allow or even compel organizational innovation. Thereafter, the specific case of Better Place in Denmark is considered. The article concludes with an exploration of the implications of the case study within the wider theme of the quest for sustainable mobility and the potential contribution of business model innovation.

## 2. Business models in turbulent technological and regulatory contexts

There has been a growing academic and managerial interest in business models over recent years (Baden-Fuller and Morgan, 2010), stemming from a realization in the early period of the 'dot.com' boom of the latter 1990s that innovative business models could offer new ways to create and capture value, and that thereby the traditional market incumbents could to some degree be bypassed (Osterwalder et al., 2005; Osterwalder and Pigneur, 2010; Wirtz et al., 2010). That is to say, such organizational innovation allows the terms of competition to be changed in such a manner that the traditional incumbents find it difficult to respond. Typically but not necessarily, new business models emerge in turbulent technological, economic and regulatory contexts, when new ways of conducting business become possible. Equally, innovative business models can be independent exogenous forces for change—with perhaps The Body Shop as a paradigm example. It is increasingly argued that business model innovation is not only important for the attainment of wider sustainability goals, but also that government should intervene to support such innovation (Birkin et al., 2007). However, where technology is changing quickly, and where the regulatory context is also under change, then traditional barriers to new entrants or novel ways of conducting business may be lowered or disappear altogether. Innovative business models can therefore be deployed to access existing markets, or may be co-emergent with entirely new markets. It is expected, therefore, that a business model is unlikely to be a static 'blueprint' so much as an evolving entity, dynamic and emergently flexible according to internal transformational processes and external stimulus (Demil and Lecocq, 2010). So while the case of Better Place in Denmark is outlined here it may be expected that the business model will change over time, perhaps tending to stability as the wider market becomes more settled.

More fundamentally, as is the case discussed here with Better Place, it might be that innovative technologies that have the potential to meet key sustainability targets are not easily introduced by existing business models within a sector, and that only by changes to the business model would such technologies become commercially viable (Beaume and Midler, 2009). In this sense, innovative business models may be a pre-requisite to the success of new technologies in the market and hence to the contribution such technologies might make to broader environmental targets. Moreover, technological product changes may arise as a response to, but also call for, changes in governmental regulation of the product or the market that the product serves. This in turn can erode the distinctions between sectors, such that the existing boundaries or demarcations of commercial interest become blurred or even disappear. In some respects such a process of boundary erosion has already occurred in the previously distinct sectors of telecommunications and computers, as networked services brought in new entrants (such as Skype) and merged the previously separate interests of computer hardware suppliers and telephone service suppliers. It is pertinent to note that recent theorization on business models has underlined the significance of relationships beyond the boundaries of the firm itself (Zott and Amit, 2010).

In terms of the quest for low-carbon mobility and the use of BEVs a similar type of convergence appears to be underway, with the need to integrate the traditional automotive industry activity of vehicle manufacturing and sales with sectors that have previously been quite distinct (Mitchell et al., 2010; Waller, 2011). This process includes the electricity generators, the electricity distributors (including wholesale supply and purchasers), mobile telecommunications providers, digital mapping and information suppliers, physical infrastructure providers (both of road networks and items such

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