



THE STATUS AND CHALLENGES OF ELECTRIC VEHICLES IN DENMARK - 2017

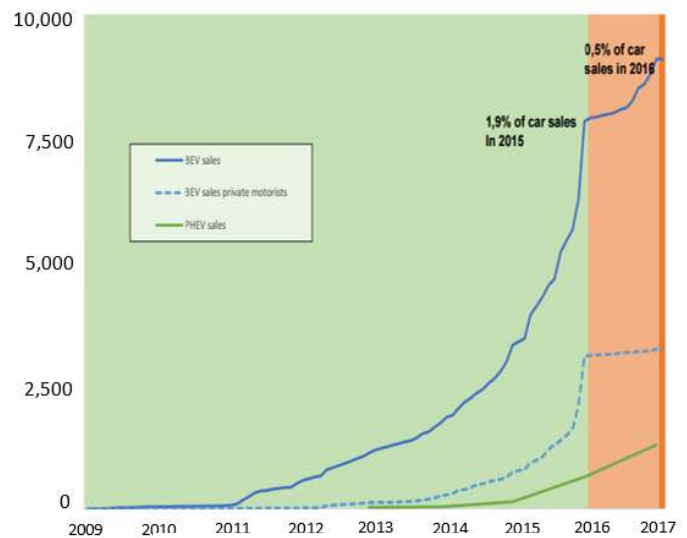
Summary

Denmark has habitually been seen as a leader in mitigating climate change, and has had several success stories, such as the deployment of wind power, combined heat and power, bicycling, etc. In comparison, the decarbonizing of transport has historically lagged behind, and the use of electric vehicles remains comparatively low. As such, there is much focus on developing the electrification of personal (and public) transport.

Electric vehicles were seen as providing many benefits for Denmark, such as reducing carbon emissions, local health impacts and noise pollution. At the same time, electric vehicles face an uphill struggle, with a phasing out of the tax incentives and a political discussion dominated by fiscal concerns and a potential overhaul of the car registration tax scheme. That said, Denmark has the first commercialized V2G pilot project, and experts were more knowledgeable of the benefits and barriers of V2G, than in other Nordic countries. The benefits included better utilization of

renewable energy and short term balancing of the grid, but it was also noted that it adds system costs (e.g. higher EVSE costs) and a lack of feasible business models for further commercialization.

BEV and PHEV Sales in Denmark over Time



Source: Danske Elbil Alliance

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About this project:

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Transport challenges

Based on our interviews, Denmark has three central, potentially interrelated transport challenges; decarbonization, congestion, and public transportation. As Denmark continues to make strides in decarbonizing its other sectors, future climate abatement goals will rely more on the decarbonization of transportation. Relatedly, the transition to a carbon neutral transportation system is seen as capital-intensive and potentially politically unpopular, affecting both the electrification of personal vehicles as well as the development of public transportation, namely train systems. As an

example, some experts commented on the lack and non-electrified train infrastructure between cities in Denmark, and remarked the lack of development, based on the outdated rails and high cost to replace.

On another note, one of the most common challenge acknowledged was the increasing congestion, especially in the Copenhagen area. However, some other interviewees characterized this as an overstated barrier, especially compared to other larger European cities. Nonetheless, many believed that this was the major challenge, and one that would be increasing in the future.

THE CENTRAL TRANSPORTATION CHALLENGES IN DENMARK ARE THE DECARBONIZATION OF TRANSPORT AND PERCEIVED CONGESTION

Electricity challenges

The interviewees characterized Denmark as having a strong electricity grid that is continually integrating more intermittent electricity sources. Given Denmark's ambitious goals of approximately doubling wind energy share in the electricity grid by 2030, the integration of intermittent renewables and dependency on interconnections with other countries were commonly named as potential barriers to these goals. However, many believed the technical integration of renewables does not pose such a challenge, but rather they framed the challenge as being able to control new loads (e.g., electric vehicles, heat pumps, etc.) in order to make better use of future excess renewable generation.

Electric Vehicles & V2G Benefits, Barriers

The benefits of electric vehicles were firstly characterized in terms of their carbon emission reductions. Beyond that, many of the benefits were more focused on a local level, namely, reduction of local health impacts and reduction of noise pollution. The latter was particularly seen as a major benefit for the city of Copenhagen, where several mentioned the

This challenge was two-pronged. First, there needs to be the development and adoption of these technologies, especially for electric vehicles. At the same time many experts recommended increased electric connection to already-existing systems, such as district heating, or to new systems, such as power-to-gas. Next, the second prong of this challenge is how to organize the electricity market mechanisms in order to encourage the use of these loads and other demand-side management technologies. This discussion is already under place with the advent of the Market Model 2.0 at Energinet.dk, but the roles of distribution system operators and other actors need to be resolved.

impacts of noise pollution on housing prices. Finally, many experts saw electric vehicles as a stepping stone to autonomous driving, which some see as one of the central potential solutions to the increasing traffic that Copenhagen faces. Other benefits, such as better performance and economic savings of electric vehicles were less common in the interviews.





The central barrier to a faster electric vehicle uptake was practically unanimously agreed to be the price, and relatedly, how the tax scheme incentivizes consumers to go “green”. In terms of the latter, even though EVs before 2015 had 100% exemption on registration tax, fuel efficient petrol and diesel cars also receive substantial tax deductions from the standard 105% registration tax, creating a significant cost difference against EVs. Additionally, the registration tax exemption on electric vehicles was allowed to expire in 2015. Thus, electric vehicles were taxed at 20% in 2016, 40% in 2017 increasing until 100% by 2020. Because electric vehicles are generally more expensive compared to the typical A-segment cars bought

appeared in Denmark a few decades ago, and thus would not seriously consider them as “true” vehicles. Consumer knowledge was partially confirmed in our focus group, where many of the participants were not aware of the types of electric vehicles (other than Tesla), nor the existing charging infrastructure network, but were aware of the increase in taxes for electric vehicles. Thus, as one expert put it, the messaging from government about electric vehicles may be more important than actual policies to alleviate consumer-based knowledge barriers.

Moving on to the benefits specific to vehicle-to-grid, one of the principal benefits characterized by the interviewees were higher

THE CENTRAL EV CHALLENGES IN DENMARK ARE THE PRICE, THE TAX SYSTEM BENEFITING ICEVs, AND THE LACK OF POLITICAL WILL

by Danes, the lack of financial support made electric vehicles untenable for the general public. Further confounding matters, many viewed the car registration tax system, as well as the tax system in general, to be both under extreme pressure not to reduce revenues and as overly complex. Many interviewees commented that subsidizing electric vehicles may impact funding of social welfare programs, such as schools and hospitals. Thus in order to reintroduce electric vehicle tax exemptions, the entire tax system would need to be rebalanced.

As a result, another related challenge to electric vehicles was the perceived lack of political will to support them, particularly as it relates to the tax scheme. Likewise, other spending or benefits related to electric vehicle, such as free parking and or implementation of a carbon-based road tax were also perceived to lack political support. In spite of its green reputation, the Danish public was perceived as unsupportive of further spending to encourage electric vehicles.

Likewise, the third barrier experts brought up was the lack of knowledge and experience of electric vehicles in the general Danish population. A number of experts noted that many Danes likely imagined electric vehicles similar to the types of electric vehicles that first

utilization of existing and future intermittent wind energy and decreasing reliance on interconnections to other transmission systems. Likewise, the experts also introduced the various types of ancillary services that the electricity system could readily integrate and utilize, such as frequency regulation. Despite the presence of the vehicle-to-grid pilot project, detailed knowledge of the project, particularly its impact on the battery and the financial contribution to the vehicle owner, remained relatively low outside those working directly with it.

On the other hand, several barriers were discussed across our interviews. There were two immediate barriers to electric vehicles providing vehicle-to-grid; firstly, the comparatively expensive cost of the DC chargers, and secondly, the current energy tax scheme, which taxes electricity storage “double”, both when it is stored and when it is discharged. This first barrier would require either mass production of DC chargers or conversion to a cheaper AC system, while the second requires a change in market regulation in line with the development of a demand-side management market.

Some of the electricity experts remarked that even if these barriers were resolved, the future





role of vehicle-to-grid would still be limited by the lack of robust business models, especially as current markets are flooded with capacity. Others believed that the highest value storage markets would require more capacity than vehicle-to-grid can potentially provide, such as seasonal storage.

Offered suggestions

Given that the dominant barrier to electric vehicles was the price and tax scheme, our interviews would recommend stabilizing long-term government initiatives on EVs, particularly the price. While many encouraged the reintroduction of the tax exemption, the larger barrier was that inconsistent government policies regarding electric vehicles prevented stable investment into electric vehicles and its infrastructure. Likewise, some experts believed that more importantly, the messaging of the government carries more social weight than the government is willing to admit, and thus electric vehicle sales depend on visible government support.

In that thread, many saw a larger role for fleet operators and municipalities to locally encourage the development of electric vehicles within their respective cities, especially in light of hesitancy from the central government. Experts believed municipalities could further encourage the transition to electrification by continuing to deploy electric vehicles in their own fleet, thereby providing local benefits to private electric vehicle owners, such as free

Finally, some expressed concern regarding the financial incentive of consumers to participate in vehicle-to-grid, especially given the interviewee's uncertainty of the impacts on the battery and consumer acceptance thereof. Thus, a final barrier to vehicle-to-grid may be social acceptance.

parking and public charging infrastructure. Others suggested that EVs could be rapidly introduced by improving company car incentives, which currently favors ICEVs.

Beyond city charging infrastructure, developing charging infrastructure was often mentioned as a means for government to encourage electric vehicles. Many of the interviewees agreed that the focus should not be on the currently-sufficient public infrastructure, but rather on the development of chargers at both houses, apartments and at work to support the transition to electric vehicles. Building regulations could play a key role in this respect.

Specifically for vehicle-to-grid, experts recommended the development of rules for demand-side management in electricity markets to allow for participation of technologies that both consume and produce electricity. Beyond this, there was a more limited role of government, with things such as subsidies for vehicle-to-grid capable chargers and further spending on pilot projects mentioned less frequently.

