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DEPARTMENT OF BUSINESS DEVELOPMENT AND TECHNOLOGY

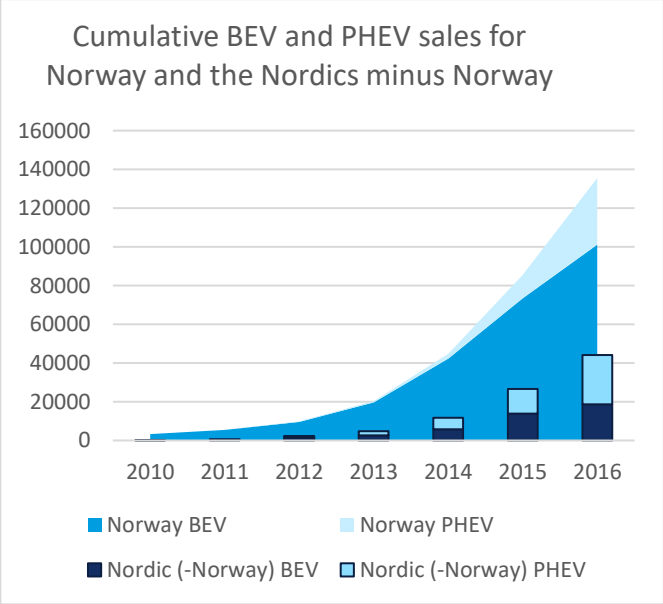
THE STATUS AND CHALLENGES OF ELECTRIC VEHICLES IN NORWAY - 2017

Summary

Norway is the current frontrunner of electric vehicle deployment in the Nordics, as well as the entire world. This is based on a history of EV development, which instantiated the many government support mechanisms, and a recent desire to keep these in place as transport is the most likely of the remaining sectors to be decarbonized. Moreover, electric vehicles are widely supported by cities with the goal of reducing local air pollution, which poses a significant risk in many of the more populated cities. In addition, Norway's robust and plentiful electricity system allows for comparatively easy integration of electric vehicle charging.

Consequently, Norway has the highest EV-adoption rate per capita in the world. However, while the interviewees acknowledged the continued success of electrification of personal vehicles, many also suggested that there is still substantial work to be done to reach full penetration.

In contrast to the ambitious electrification of personal vehicles, the potential role of vehicle-to-grid was much more minor in Norway than in the other Nordic countries, largely as a result of the substantial hydroelectric reservoir storage capacity.



Source: E-ACEA (2017)

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About this project:
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Transport challenges

Norway, like the rest of Scandinavia, faces the challenge of being a very long, yet sparsely populated country. In addition, Norway also faces the challenge of difficult winter conditions and a varied topography. As a result of this situation, a common challenge was the development and maintenance of roads for personal vehicles and the organization of a public transportation system that is capable of reliably meeting people's transportation needs.

Another central challenge to the transportation system was the decarbonization of the transport sector, especially keeping in mind the long distances of the country. Because of the topography and distance, public transportation was seen as a difficult solution to the decarbonization of intercity travel, which is characterized by a relative large aviation share. Likewise, the adverse winter conditions posed challenges to the electrification of personal vehicles for long distance travel, such as trips to winter (or even summer) cottages.

Another challenge related to transportation was poor air quality, especially in wintertime when the topography created adverse conditions around cities, such as Oslo or Bergen. Thus, decreasing the use of emission-based fuels is a central challenge in transportation, especially given the potentially large technical challenges to the geography and weather.

THE ELECTRICITY SYSTEM IN NORWAY FACES THE COUNTERINTUITIVE CHALLENGE OF HAVING TOO MUCH ELECTRICITY

Electricity challenges

Norway clearly benefits from its large development of hydroelectric power. Many experts had difficulty in conceptualizing challenges to the electricity systems, with largely no barriers on capacity or production. Many of the experts eventually concluded the largest barrier was in fact that Norway continually had a surplus of electricity. This in turn led to low electricity prices, which posed potential future problems for Norway. Because of these low electricity prices, there was little motivation to develop other types of renewable electricity, even though Norway for example benefits from rich wind resources.

Likewise the cheap and plentiful availability of electricity has led to a consumer mindset that does not prioritize energy efficiency, but rather the consumer's assumption that electricity should be cheap and available everywhere. Though not an immediate challenge, some experts believed this mindset may lead to challenges in the future if electricity prices were to increase due to either further domestic electrification or increased export capacity.

In addition to the potential barrier of complacency, some experts also acknowledged technical challenges to the grid, though these were commonly framed in terms of congestion on the local utility side of the grid, especially in the south of Norway. In northern Norway, the grid issues are seen to be more substantial, and posing challenges both on the local and regional grids.

Electric Vehicles & V2G Benefits, Barriers

First, the benefits of electric vehicles were primarily focused on their environmental benefits. By far the most common benefit to be discussed was the potential reduction to local particulate matter emissions, especially during the winter time, when air pollution can increase over the acceptable levels and become a threat to personal health.

Building upon the environmental benefits, the next benefit was the decarbonization of the transportation system. Many people characterized this benefit in terms of the non-ETS versus ETS sectors. While Norway has already essentially decarbonized its ETS sector, especially its electricity system, experts foresee that when non-ETS sectors are included in carbon regulations, transportation will likely face heavier carbon cuts than other,

more difficult sectors, like industry or agriculture.

Beyond the environmental benefits, many of the interviewees were cognizant of the technological and economic advantages of electric vehicles as compared to conventional vehicles. As one expert said, the government should incentivize electric vehicles only if it were because they performed better than conventional vehicles, not to mention the environmental benefits.

Finally, many of the experts viewed electrification as a potential, but so far very limited, source of economic activity for Norway as they could lead the development of electric vehicle technologies, such as battery technology, and electrification of other means of transport, such as ferries and buses.

Due to the success of Norwegian government policies, many of the experts did not see that many substantial barriers to electric vehicles. Of those who did discuss barriers, many focused on charging infrastructure and the range of the battery. First, charging infrastructure was discussed in terms of the development of DC fast chargers to extend the range of trips that electric vehicles can take, e.g., in order for consumers to be able to reach their summer cottage. Secondly, many believed that the access to and availability of chargers for those who live in apartments or in townhouses may also pose a challenge to getting the entire vehicle fleet to switch to electric. Third, the discussion focused on the availability of chargers, referencing queuing times, as the country continues to move towards mass EV penetration.

Another potential barrier, especially in northern Norway, is the potential impact to the grid, as the grid is not equipped to handle the type of current of EVs and the increased load from electric vehicles on a local level. However, this was perceived to be less of a barrier in the southern parts of Norway, with the local grids believing that smart charging, tariffs, and potential stationary batteries would handle the increased loads in most cases. Lastly, another discussed barrier was the lack of diversity in available car models, implying that despite the substantial benefits electric vehicles receive in Norway, some consumers may still choose to drive conventional vehicles today if only because they want an SUV or four-wheel drive.

Noteworthy, although not referred as barriers but consistently noted, was the penetration of plug-in hybrids (PHEVs) into the market, after a recent extension of government support for that sector. This extension was seen as affecting the full electric vehicle uptake, even though these hybrid vehicles can be a less than optimal solution for decarbonisation, local pollution and driving efficiency (power and fuel usage). Additionally, Norway was probably the country with most discussion around hydrogen, not only for transportation as it addresses the issue of range, but also for the grid as it addresses the power surplus challenge. Other fuel types, such as biofuels, receive less public focus in Norway compared to the other Nordic countries, although it was accepted that they are necessary for short-term CO2 targets and long-term heavy fleets and freight.

PRACTICALLY ALL EXPERTS IN NORWAY ENCOURAGED THE GOVERNMENT TO CONTINUE SUBSIDIES, BUT VISIBLY PLAN THEIR PHASE OUT

Moving along to vehicle-to-grid, the benefits were much more muted as compared to the benefits of electric vehicles. As stated before, Norway's substantial hydroelectric capacity in many ways obviates the need for vehicle-to-grid. Many experts believed that the role of vehicle-to-grid would be on a more localized level, in order to reduce line congestion and defer capacity investments. On an even more local level, many other experts imagined vehicle-to-grid occurring primarily on vehicle-to-home level, with electric vehicles providing storage of rooftop solar or emergency backup power.

Electricity experts were wary of the potential benefits of vehicle-to-grid, but some did believe

that vehicle-to-grid could have benefits albeit much further down the road. Indeed, experts believed that vehicle-to-grid could be a useful technology, however market conditions would have to change substantially for that, including a drastic increase of export capacity and a decreasing nuclear presence in Sweden. Additionally, vehicle-to-grid would only come into play after complete utilization of so-called "lower hanging fruit", like storage available in domestic water heaters. Finally a select few believed that Norway should actively develop vehicle-to-grid, not for any benefit for the grid, but rather so that Norway could have a domestic industry that they can then export to other countries in tandem with the electrification of their vehicle fleet.

Offered suggestions

First and foremost, practically every expert urged the government to continue the myriad of benefits it currently offers electric vehicles, until the technology is price competitive on its own; to avoid, for example, the experience of Denmark with its early phase-out of EV incentives. However, the experts did readily acknowledge that the benefits could not last forever, so they also suggested the government should begin to plan the phase-out of the (secondary) benefits, but do so in a very visible way in the market, so that both industry and consumers could have certainty when making investment decisions. For instance, start charging EVs for toll roads, but do so on a level equal to or just above public transport.

Beyond the existing benefits, the central suggestion for government was to increase the investment for charging infrastructure, first to coordinate regionally to deploy high-speed DC chargers to allow long distance travel, and secondly to support further standardized regulation and information on charging options, to speed up local decisions by parking authorities, housing associations, and other private and semipublic bodies with limited expertise and opportunity to gain such knowledge about charging infrastructure.

At the same time, there were not many barriers to vehicle-to-grid. The central barrier was the low electricity prices and potential weak business case. In that same thread, there was widely perceived to be no need for vehicle-to-grid, and no urgency to resolve the barriers or to develop a pilot project for it.

Many experts mentioned both the local grid capacity as well as the current market structure as potential barriers to vehicle-to-grid, but again, the lack of perceived need implied that there is no need to resolve these barriers. Many experts believed that these more technical barriers could in theory be resolved, but would only be resolved contingent on factors changing in the electricity market that would increase the need for vehicle-to-grid.

Other policy recommendations included for instance to re-evaluate the type of vehicles, for example plug-in and non-plug-in hybrids, that are eligible to receive the various public benefits to better reflect the 'real driving emissions'. In turn, on a local level recommendations focused on the 'stick' and a balance between the preferred position of EVs and an overall automobile sector that is subject to increasing restrictions in order to decrease traffic. For instance, through potential environmental zones and an increase and more flexible peak pricing in road tolls.

For vehicle-to-grid, many of the experts did not recommend much of an active role for government. Instead, they believed that if there was a role for vehicle-to-grid in Norway, it should be developed purely by the market. Some of the experts believed that Norway should wait and see how Denmark and its vehicle-to-grid pilot project perform. If Norway were to take any role, it should be primarily coordinated with a potential need of the local DSO grid in mind. But more often than not, experts limited the government's role to only create the market conditions that allow for vehicle-to-grid, in that the government should not create any additional barriers to a potential deployment of vehicle-to-grid.