【欧州】【自動車】

Road/Railways - Environmental friendly vehicles: The EU's EV market development and the need to accelerate the expansion of EV charging infrastructure network

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【概要：Summary】

In recent years, Europe has gone through the initial adoption phase of electric mobility with the utilisation of Electric vehicles (EVs). Electric vehicles are expected to be a main element of a new sustainable mobility and a cornerstone of the energy transition. Electro mobility is also seen as a key element in the efforts to move towards zero-emissions vehicles, reach the EU's GHG emission reduction targets and the goals of the Paris Agreement. The European Commission has also made plans to revise CO2 standards as part of its new Green Deal.

However, there are still barriers for mass-market uptake of EVs. Generally, consumers still tend to be concerned about several EVs characteristics, including higher purchase costs, driving range limits, and the limited availability of recharging infrastructure. Accordingly, the EU Member States should harmonise their measures to support the EVs uptake, including the set up of a sufficient number of public charge points. The Commission has recommended (based upon expert advice) there should be one public recharging point for every 10 EVs on the road. The analysis shows that in the EU, in average there were about 5 EVs on the road per public charging point and by 2020, with the growth in both, the number of EVs and recharging points, the ratio will be around 10 EVs per public charging points in 2020, assuming that the EU Member States deliver on their plans. A total of about 220,000 chargers should be available by 2020. By 2025 there are estimates varying between 1 million and 2 million charging points necessary. In 2030, 3 million will be necessary. The policies and incentives should further try to direct the consumer behaviour, by preparing better preconditions for the various elements surrounding low emission mobility and supporting full-scale commercialization of electric vehicles. Adequate policies need to be introduced to support the further uptake of EVs. Without good charging infrastructure, any other incentive or regulatory measure to support the purchase of EVs has little impact, as consumers will be reluctant to buy EVs if there are limited charging stations. However, the delivery of an adequate number of charging points is a necessary but not sufficient requisite for a transition to electro mobility.

【記事：Article】

1. EV market development in Norway and the EU

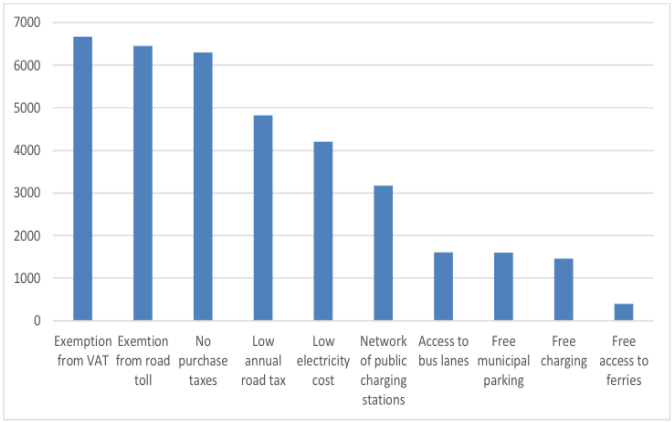
The EU's automobile market is still dominated by petrol and diesel vehicles. However, the market share of electric vehicles has reached about 2% in the third quarter of 2018. Nevertheless, the largest market for EVs is still found in Norway. Although Norway is the largest oil and gas producer in

Western Europe, at the same time, it is also a pioneer and leader in the field of electric mobility and transport in Europe and beyond. In May 2018, for the first time, more than half (56%) of all new cars sold in Norway were either pure battery EVs (BEVs) or hybrid electric vehicles. It underlines that the EV policy is working so well in Norway and that the larger part of consumers opt for EVs when buying a new car. In the first quarter of 2019, the battery electric vehicles market share reached 48.4% in Norway, according to statistics for new cars registered from the Norwegian Road Federation (OFV). Furthermore, since 98% of electricity in Norway is generated from clean hydropower, the country is getting closer to the target of decarbonising the transport sector and to reach sustainability. The Norwegian parliament has agreed upon a 2025 target, when the new passenger and light commercial car market should consist of 100% zero emissions vehicles (ZEVs), thereby aiming for reaching its zero-emission target in the transport sector. Regarding the further expansion of e-mobility in the EU, the Norwegian example is of great importance as it can serve as a testing laboratory for EU Member States within an early market and EV uptake.

According to a an analysis by the International Council on Clean Transportation (ICCT), the EU's market and in particular the German EV market is picking up in the number of new EV registrations. In 2019, Germany has become the largest market in Europe for BEVs and plug-in hybrid EVs (PHEV) in absolute numbers. From January to October 2019, 86,316 EVs were registered in Germany. Thereby, for the first time, German EV registrations surpassed the smaller EV markets of France (48,231), the UK (54,337), and Norway (67,653) in the same timeframe. It also shows that, at last, Europe's largest passenger car market Germany has overtaken Norway as the largest EV market on the continent, however only in absolute numbers. In relative numbers, the average new car EV share over the past 12 months in Germany reached 2.8% together with France and the UK (both also at 2.8%), and is still far lower than in Norway (56.1%) or even Sweden (11.0%). However, regardless this recent increase, the barriers for mass-market uptake of EVs still seem to persist in the EU.

2. The limiting aspects of increasing the EVs' market share in Norway and the EU

Considering the market barriers for the uptake of EVs, consumers tend to be concerned about several EV characteristics. The concerning factors include the comparable high purchase costs, the limited driving range, the low availability of recharging infrastructure, the limited model choice, possibly higher maintenance costs, as well as vehicle performance and driving experience. In this respect Norway can again be used as an example for analysing the importance of these concerning factors when consumers make their decision to purchase a BEV or another type of passenger car. In fact, Norway uses a comprehensive package of incentives for promoting the purchase and utilization of BEVs. The incentives include tax breaks at time of purchase and EV, in combination with a comparably higher purchase tax for diesel and petrol cars. This helps EVs as passenger cars in Norway to compete with internal combustion engine (ICE) cars on the purchase price. Instead, in the EU, the sales price of EVs is generally higher than that of its comparable models of passenger cars with ICE, according to the European Commission's science and knowledge service Joint Research Centre (JRC)' s study of 2017. In the EU, on average an EV currently costs at least 40% more than a comparable conventional car. For certain brands and models this difference can even go beyond 100%.



Graph 1: Most important EV incentives according to Norwegian EV owners. (Question: Select the 3 most important EV incentives)

Source:https://elbil.no/wp-content/uploads/2016/08/EVS30-Charging-infrastrucure-experiences-in-Norway-paper.pdf

Therefore, in the EU, at the moment of purchase, the EVs cannot compete with the conventional cars, as there are not enough financial incentives that would make the EVs a beneficial alternative to a conventional car. However, as the Norwegian example shows, the economic incentives have been and still are the backbone of the EVs' Norwegian market success. According to 2015-2017 Norwegian EV owners' surveys, the percentage of BEV owners who have BEV as their only vehicle(s)has increased from 23% to 30% from 2015 till 2017. However, in Norway, there is a growing need for a public fast charging infrastructure to help expand the customer base beyond the initial buyers. A well developed fast charging infrastructure is the most important perquisite after the purchase of an EV. The availability and development of EV recharging infrastructure could become an increasingly important limiting factor for the further development of electro-mobility.

The JRC's Science for Policy Report entitled "Electric vehicles in Europe from 2010 to 2017: is full-scale commercialisation beginning? An overview of the evolution of electric vehicles in Europe", aims at providing evidence-based scientific support to the European policymaking process and analyses the EV deployment in Europe during the past eight years covering the period between 2010 and 2017. While EVs were mainly niche cars in 2010, most of the car brands now offer EVs. In the passenger car market, a clear distinction between the various EV powertrains exists. This typically includes BEV, PHEV and FCEV (Fuel Cell EVs). PHEV typically present higher numbers of registrations in the larger car size segments, while BEV present higher numbers in the smaller car size segments. FCEV vehicles still comprise a very small fraction of the market and are targeted at mid-sized vehicles or sport utility vehicles (SUV). Most of the current PHEV models offered are derived from conventional internal combustion engine (ICE) cars, while BEV models offered mainly include unique models specifically developed as BEV only.

The purchase price of an EV is in general still higher than that of a comparable conventional vehicle. According to the JRC, on average "…an EV currently costs at least 40% more than a comparable conventional car". A 2016 study by the European Consumer Organisation (BEUC) shows that even if small tax breaks were to be applied, by 2024 the average four-year cost of running an EV would be expected to match that of a petrol car, and by 2030 that of a diesel car.

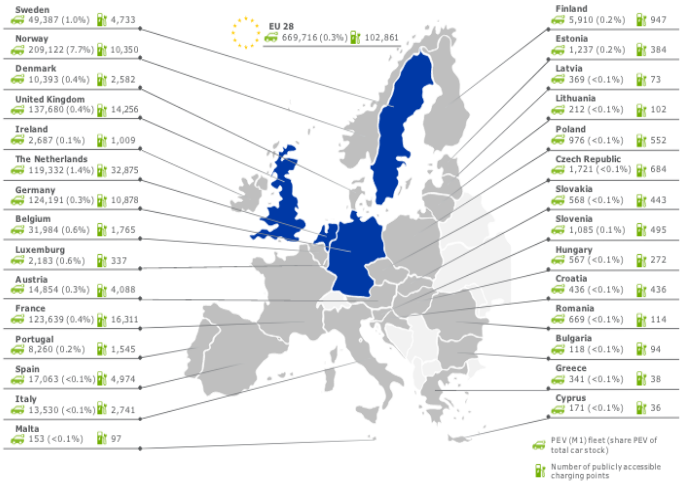
Therefore, policies and initiatives to support the purchase of EVs remain crucial to overcome market barriers at national and European level. The Norwegian example shows that offering a VAT and registration tax exemption for EVs on the one hand and keeping both taxes comparatively high for diesel and petrol cars, shows a positive effect on the decision in favour of EVs. While tax initiatives and grants for the purchase of EVs are crucial to making them more affordable, also after-sale's measures during ownership are of increasing importance.

Since EVs run on rechargeable batteries it will need a good public charging network in the EU Member States. Many governments subsidise the built-up of charging infrastructure. However, also the standardisation of chargers is key in this context as there are still several different charging modes,

connection cases and plug types available on the market. Governments, private investors and EV owners have a strong interest that EV plug-ins also fit charging stations in neighbouring countries in order to make best use of the infrastructure.

3. The need to expand the charging infrastructure

Charging infrastructure is crucial for the uptake of EVs. This includes also public charging infrastructure and a reliable network of charging stations in cities and on highways. In the context of setting up the charging infrastructure during the early stages of market introduction of EVs, the "chicken and egg dilemma" of what comes first, the mass introduction of EVs or the public charging infrastructure has been a source of considerable discussion. However, it is undeniable, that the limited availability of public charging points could be a psychological barrier to the EV uptake for drivers of conventional vehicles. The approach is that without good charging infrastructure, any other incentive or regulatory measure to support the purchase of EVs has little impact, due to the consumers' reluctance to buy EVs because they have no place to charge them. Analysis by the NGO Transport and Environment on the roll-out of public EV charging infrastructure in the EU of 2018 show that on average there are about 5 EVs on the road per public charging point. According to an analysis of the Platform for electro mobility, the average infrastructure sufficiency in the EU is around 6 EVs per public charging point and all Member States except Belgium (sufficiency ratio of 18) have at most 10 EVs per public charging point. This suggests that the current level of recharging infrastructure is in line with the European Commission's recommendations and requirements, which considers a ratio of 10 EVs per public charging infrastructure as sufficient. Access to city centre charging points will also be within the Commissions proposed 10:1 vehicle to charging point ratio indicating sufficient initial coverage.



Graph 2: Number of PEVs and publicly accessible charging points in the EU 28 and Norway in 2017

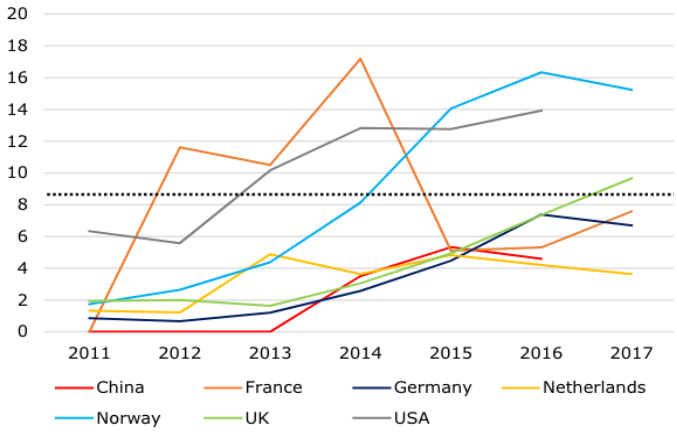
Source: Spöttle, M., Jörling, K., Schimmel, M., et.al. https://www.europarl.europa.eu/RegData/etudes/STUD/2018/617470/IPOL_STU(2018)617470_EN.pdf

Regarding the European overview of the existing recharging points, most European countries have ratios of less than ten PEVs per publicly accessible recharging point. Most publicly available recharging points in the EU can be found in the urban areas of the Netherlands, Germany, the United Kingdom and France. Norway, the globally leading country in EVs market share, has a ratio of 18 PEVs per publicly accessible recharging point as a countrywide average. However, the ratio is worse in specific areas, such as Oslo, where it seems that consumers may fear a lack of available recharging points.

Since the availability of charging infrastructure is not uniformly distributed, the limited availability of public recharging in some regions can undoubtedly be a psychological barrier to EV uptake for drivers of conventional vehicles. However, the possibility of private charging at home is one of the advantages of EVs. Several studies have shown that access to home recharging is an important factor in encouraging consumers to purchase EVs. This market has considerable growth potential just by focusing on citizens with access to a home charger. However, in future, more EV buyers will have to rely solely on public charging because they have no private

parking available. Therefore, more users will have to rely on public charging.

Therefore, the number recharging points will have to increase significantly. According to estimates by Maria Niestadt and Amalie Bjørnåvold in their briefing to the European Parliament of April 2019, around 440,000 publicly accessible recharging points will already be needed now, by 2020, and around 2 million by 2025. This number of recharging points would roughly be necessary for the estimated number of 13 million electric vehicles that could be on European roads by 2025. While assuming that around 44 million electric vehicles could be on European roads by 2030, some 3 million public charging points would have to be available by 2030 in order to sustain the rise in electric vehicles needed for Europe's long-term climate objectives. This will require an enormous effort in building charging points as at the moment there are only about 185,000 points of public charging in the EU.



Graph 3: Development of numbers of EVs per charging point, 2011-2017

Source: Spöttle, M., Jörling, K., Schimmel, M., et.al. https://www.europarl.europa.eu/RegData/etudes/STUD/2018/617470/IPOL_STU(2018)617470_EN.pdf

The EU has taken measures to incentivise Member States to increase the number of recharging points and make them more standardised and interoperable. In the EU, the 2013 clean fuels strategy aimed at ensuring that electric recharging points have a standardised design and use, and in 2014, the EU adopted the Alternative Fuels Infrastructure Directive in 2014 (Directive 2014/94/EU). This directive recommends introducing a minimum level of infrastructure for charging EVs across the EU (around one public recharging point for every 10 EVs). However, there are no explicit targets related to charging infrastructure at EU level, but rather a multitude of supporting measures.

In addition to the lack of charging stations, there are different standards concerning the connectors and power needed on the charger and vehicle side, as well as various payment methods. A clear dominance of the Combined Charging System (CCS) fast charging technology, meanwhile adopted by more than 60% of world car industry, has been observed. It was accompanied by good progress of important standards like ISO 15118 and IEC 61851. However, the different Japanese and Chinese high-power charging fast standard based on the Japanese CHAdeMO and the Chinese GB/T standard may jeopardise the charging infrastructure expansion.

There has been a lot of discussion also about the interoperability of charging types and the lack of standardisation for physical plugs. This problem needs to be tackled through targeted infrastructure investments and grid reinforcements and upgrades. Interoperability of charging stations is key, especially for the realisation of cross-border travel within the EU. As a result, the business case for deploying a network of charging stations becomes even more challenging, because either all standards are accounted for or the operator risks narrowing the potential customer base to only those that have the matching connector. Furthermore, also potential grid restrictions may need to be considered. Also due to these technical issues, which also have a further influence on the limitation of the number of charging stations, governments will need to strongly support the early built-up of charging infrastructure through subsidies or public and private partnerships, as long as the charging stations cannot be operated economically.

4. Conclusion

In general, the density of charging points infrastructure correlates positively with EVs adoption. A good charging infrastructure will be needed to support the positive effect of all other incentives or regulatory measures. However, the influence of charging infrastructure as a variable differs depending on the national context and the market development. In fact, the range of other factors need to be considered that correlate with the EVs uptake, such as model availability, financial incentives for the purchase of an EV, urban density, etc. At this point of early market development in the EU, it is still unclear how these different factors interact with and influence the further uptake of EVs. However, as the example of market development in Germany and Norway shows, a low ratio of EVs per charging point like in Germany does not automatically guarantee a significant increase of the EV's market share. Vice versa, a high ratio of EVs per charging points of 18:1 like in Norway does not automatically lead to a stop of an increase of the EVs' purchase numbers. In fact, due to the significant influence of other economic factors, including financial incentives and tax abatement measures for the purchase of EVs, the correlation between the number of public charging points and market uptake of EVs is not positive per se, as seen in Norway and Germany.

The expansion of the charging infrastructure is necessary, but it is not a sufficient precondition for the EVs adoption in a market. Future increases in numbers of EVs will have to be mirrored by increasing the number of public charging points in the EU Member States. However, currently, it would be important to introduce tax reductions for EVs and at the same time to increase the levies for ICE cars in order to encourage consumers to seriously consider the purchase of an EV. As the Norwegian example shows, policies that address the EVs' purchase price are most effective in their contribution to a positive development of the EVs' market shares. The initiatives to support the purchase of EVs should be accompanied by a system of measures to discourage the purchase of ICE cars. In a further step, these incentives and measures related to the purchase of EVs could then be supported by a coordinated and harmonised introduction of charging infrastructure across the EU.

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