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The Norwegian support and subsidy policy of electric cars. Should it be adopted by other countries?

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ARTICLE INFO

Keywords:

Electric vehicles
Climate
Subsidies
Pollution
Bus lanes
Free parking

ABSTRACT

As a result of generous policies to increase the use of electric vehicles (EVs), the sales of EVs in Norway are rapidly increasing. This is in sharp contrast to most other rich countries without such generous policies. Due to the subsidies, driving an EV implies very low costs to the owner on the margin, probably leading to more driving at the expense of public transport and cycling. Moreover, because most EVs' driving range is low, the policy gives Norwegian households incentives to purchase a second car, again stimulating the use of private cars instead of public transport and cycling. These effects are analysed in light of possible greenhouse gas (GHG) emission benefits as well as other possible benefits of utilizing EVs versus conventional cars. We discuss whether the EV policy can be justified, as well as whether this policy should be implemented by other countries.

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1. Introduction

Road traffic gives rise to various health-damaging pollutants, noise and accidents. It requires expensive road construction as well as substantial maintenance and management costs, and the roads often occupy large and valuable land areas. Road traffic thus entails considerable social costs and at the same time places a significant burden on the public purse (Verhoef, 1994). Therefore, many countries have systems whereby the government collects considerable revenues through fuel taxes, road taxes and turnpike tolls. Norway is no exception in that respect and has additionally high excise taxes on gasoline and diesel-fuelled car sales, on top of the standard 25 per cent value-added tax (VAT).

In contrast, electrical vehicles (EVs) are treated much more leniently in Norway. This includes certain tax exemptions as

well as various driving privileges, like the use of bus and collective lanes in cities, exemption from parking fees in city centres and often battery charging at zero cost. As a result of this policy, the sales of EVs have increased dramatically over the last few years. While the number of EVs running on Norwegian roads counted only a few hundred up to about 2005, it constituted 1.4 per cent of the conventional new car sales in 2011 (see Table 1). That fraction increased to 5.5 per cent in 2013, and the stock of EVs doubled almost five times from 2011 to 2013, now (spring 2014) accounting for about 25,000 vehicles. The proportion of EVs is dramatically higher in Norway than in most, if not all, other countries. In Sweden, for example, which has basically the same taxes on EVs as on conventional cars, EVs represented well below 1 per cent of the new car sales in 2013. Denmark, like Norway, has also introduced certain tax exemptions on EV purchases as well as exemption from parking fees in Copenhagen. However, the

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<http://dx.doi.org/10.1016/j.envsci.2014.06.006>

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Table 1 – Yearly new vehicle sales in Norway. Fraction of EVs in brackets (as a percentage).

	Number of conventional cars	Number of EVs
2011	138,345	1996 (1.4)
2012	137,967	3950 (2.8)
2013	142,151	7882 (5.5)

Source: Opplysningsrådet for veitrafikken (ofvas. no).

EVs' proportion of the new car sales in 2013 was also below 1 per cent here. In the US, there are also certain tax exemptions with new car purchases of EVs, and the sales reached over 1 per cent of the new car sales in 2012. The world EV car sales in 2012 were led by Japan, with a 28 per cent market share of the global sales, followed by the United States with 26 per cent, China with 16 per cent, France with 11 per cent and Norway, housing a population of only 5 million people, with 7 per cent (Clean Energy Ministerial and International Energy Agency, 2013, Wikipedia Electric cars).

It seems quite clear that the high number of EVs in Norway is the result of the generous policy for purchasing and using EVs. In this paper, we will review this policy and discuss whether the Norwegian EV policy can be justified and whether this policy should be implemented by other countries. We start in Section 2 by reviewing the Norwegian EV subsidy policy and taking a first view of the arguments for this policy. In Section 3, data on greenhouse gas (GHG) emissions related to EVs and conventional cars are reviewed, while in Section 4 we present a numerical example in which the cost of the possible GHG emission gain of EVs is assessed. Based on surveys, we discuss in Section 5 whether EV driving may in fact increase the total use of cars and possibly also increase the number of cars. In Section 6, some technological lock-in problems related to EV technology are discussed. Finally, Section 7 summarizes our study where we conclude that it is doubtful whether the Norwegian EV policy has a positive environmental effect. The crucial issue is whether EVs replace conventional cars or whether the present EV policy induces families to add an EV to their already-existing conventional car. The policy is under any circumstances extremely costly, and should not be adopted by other countries.

2. The Norwegian subsidy policy

The generous Norwegian EV policy has been gradually implemented during the last 10–15 years and is now an integrated part of the so-called Climate Agreement ('Klimaforliket') among the parties in the Norwegian Parliament. The policy is rooted in certain laws and regulations, basically set by the Norwegian Ministry of Finance and the Norwegian Ministry of Transportation.¹ These laws and regulations, together with the policy measures implemented in some of the main cities, constitute the Norwegian EV policy. It consists broadly of a tax exemption package together with certain driving and economic privileges for the users of EVs. At present, it includes the following points:

- EVs are exempt from VAT and other taxes on car purchases and sales.
- Parking in public parking spaces is free.

- EVs can use most toll roads and several ferry connections free of charge.
- EVs are allowed to use bus and collective traffic lanes.
- The company car tax is 50 per cent lower on EVs, and the annual motor vehicle tax/road tax is also lower.
- Battery charging is free at a rapidly growing number of publicly funded charging stations.²

The Norwegian EV policy is founded on the widespread notion that EVs are far more environmentally friendly than conventional vehicles using gasoline and diesel fuel. The arguments are partly related to the possible short-term benefit of EVs and partly related to what *may* happen in the long term. The reduction of local emissions and the reduction of GHGs to fulfil the Norwegian emission reduction goals are an important part of the short-term story, while technological changes and possible battery technology improvements form part of the long-term picture. We discuss these arguments in terms, starting with the short term, and the local emission issue.

There is some support for the EV subsidy policy regarding local emissions, particularly in comparison with diesel vehicles. However, modern gasoline engines fitted with catalysers emit harmful substances in relatively moderate quantities (Ji et al., 2012). The reduction in health-damaging pollutants due to a shift to EV driving should therefore not be exaggerated. Additionally, if the purpose of the EV subsidy policy is to mitigate local environmental problems, promoting a switch from diesel vehicles to gasoline models is possibly both a simpler and a cheaper expedient. It is therefore a paradox that the Norwegian car tax policy favours diesel cars while sacrificing gasoline, meaning that the current (spring 2014) pumping price of gasoline is about 1 NOK/litre above that of diesel. Another local environmental problem related to car driving in Norway, especially in cities, is the use of spike tyres during the winter driving season and the associated asphalt particle pollutants. Therefore, if an important argument for the EV subsidy policy is rooted in local environmental problems, it is paradoxical that driving with these spike tyres in most big cities is not curbed at all, or not more curbed than today's practice. In Norway's third-largest city, Trondheim, for example, the previous policy of paying a tax for using spike tyres was abandoned in 2011.

Car noise is also often a local environmental problem. The tyres, not the engines, represent the most serious problem here. Depending on the driving speed, Sandberg and Ejsmont (2000, p. 50) found that the noise from the power unit varied between about 76 dB and 79 dB. When the speed is around 50 km/h, the noise from tyres is approximately at the level of the engine. However, when the speed reaches 90 km/h, the noise from the tyres is around 88 dB and hence clearly exceeds

¹ Important here are Ministry of Finance (17 March 2008): FOR 2001-03-19 nr. 268: Forskrift om engangsvgift på motorvogner and Ministry of Finance (1 September 2008): LOV 1969-06-19 nr. 66: Lov om merverdiavgift.

² Customers pay for electricity at fast-charging stations. A fast-charging station can recharge a battery in about 30–50 min, but only 1 vehicle at a time. A fast-charging station costs about NOK 100,000 (17,000 USD). A normal charging station needs about 8 h and costs in the vicinity of NOK 30,000 (around 5000 USD).

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