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EVs in bus lanes – controversial incentive

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Abstract

Electric vehicles are becoming a usual sight in the streets of Oslo. Thousands of commuters have chosen and EV because they are comparable in price to a conventional vehicle, and offer substantial savings in time and money. As new models, especially from Nissan and Mitsubishi have hit the market from late 2010, the sale of EVs has gone up significantly. This growth is expected to continue in the time to come, as more types and brands of EVs are coming.

One of the strongest incentives is that EV drivers are allowed to use the bus lane. This incentive applies all over Norway, but saves more time for users in Oslo, and in particular in the western corridor towards Oslo. As EV numbers increase, and more models will come, there is a growing awareness that EVs sooner or later will impede bus traffic to an extent that will make it impossible to continue this incentive.

At the same time, Norway has committed to goals that require a sharp increase in the sale of EVs by 2020. It will be necessary to quickly come up with new powerful and robust incentives to continue the positive trend in Norway in the years to come. In this paper we will present the result of an EV count in a bus lane in Oslo, compared with a similar count in 2009. Though the increase is perhaps less than anticipated, there are now more EVs than buses in this selected bus lane. As it is likely that this development will lead to the termination of the incentive not too far into the future, and it is necessary to prepare a transition to a new package of incentives now.

Keywords: EV, incentive, city traffic.

1 Introduction

EVs have become a relative success in Norway; outselling most of Europe's other national markets. A bundle of incentives targeted towards potential buyers has made Norway unique in that most EV owners are private individuals. The incentive that allows EVs to drive in the bus lane is one of the most powerful in and around Oslo. In May 2009 there were about 2605 EVs in Norway. A study was conducted by Prosam to assess how many of them contributed to rush-hour congestion in the bus lane. One lingering statement from this study was that, although EVs did not yet pose a threat to traffic flow, they would sooner or later impede buses. Seemingly, this has created an image that EVs are clogging up, and slowing down public transport.

The highway in towards Oslo from the west is now the area with the highest EV concentration. The highway consists mostly of two lanes for cars, and one lane to the right for buses, taxis, EVs and

motorcycles. On ramps where cars are entering the highway, cars can sometimes end up stationary in the bus lane, while trying to fit into a slow moving line in the two car lanes. Buses will then have to slow down to trickle through this traffic, and sometimes a number of EVs in the bus lane could add to the problem, making the bus spend more time passing.

A Norwegian cross-party political agreement promises to continue EV incentives until the end of 2017, or there are 50 000 EVs registered in Norway. We want to assess how EV traffic in the bus lane has evolved in later years, and suggest fruitful ways to maintain a package of incentives that will help continue the transition away from fossil fuelled vehicles in Norway.

2 Background

2.1 The findings of 2009 in today's context

In 2009 the organization Prosam conducted a study of the role of the EV in the public transport lane. Access to the bus lane was seemingly one of the most important incentives for users at the time. Cars had relatively low range, and were expensive, but could help reduce commute times for their owners significantly. Of the 2605 EVs, most located in and around Oslo, where bus lane access causes the greatest savings in time.

In figure 1 we have chosen to focus on one of the counting points in the study, as it is the one with the most registered EVs. It shows statistics for different types of vehicles passing in the bus lane, between 7 AM and 9 AM on March 17 and April 28 in 2009. As we can see, buses, taxis, and sometimes even private cars illegally driving in the lane outnumber EVs.

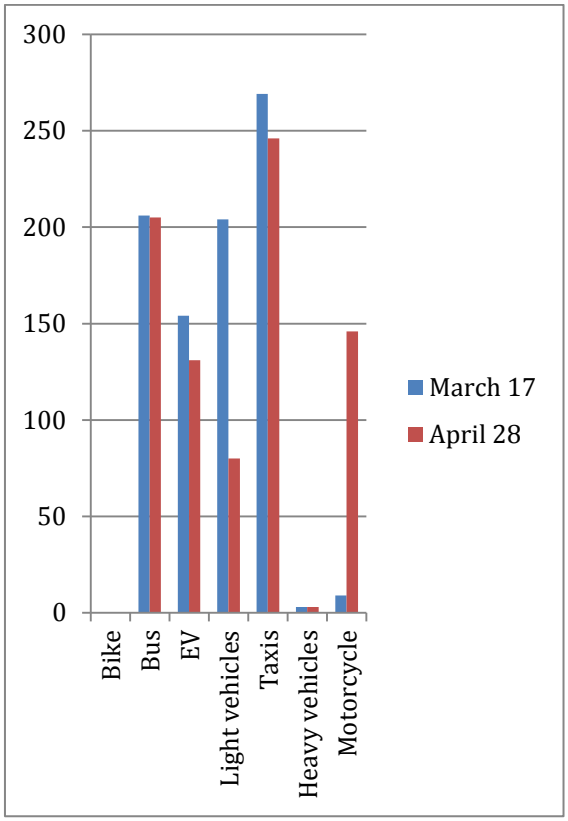

Figure 1 Types of vehicles registered during rush hours between 7 am and 9 am on March 17 and April 28 in 2009. Light vehicles and heavy vehicles refer are vehicles not authorized to drive in the bus lane.

Since 2009 the number of EVs has risen dramatically, counting around more than 12 000 by mid-2013. However, we also see that the increase in the sale of EVs in 2012 has been higher in other cities, and rural areas.

2.2 The bus lane controversy

The incentive to allow EVs in the bus lane is controversial in several aspects. It can be seen as competing with public transport, giving the wealthy free access to a public good. Further, some see it as detrimental to public transport, in that some people will choose an EV instead of taking the bus, but causing the same congestion problems in the city center.

Others see it as a low-cost, but strong incentive that is actually effective in phasing in EVs, and creating technological change. Also, as public transport is regarded to be running at full capacity during peak hours, EVs could be seen as a zero emission contribution, even if drivers were previously on a bus.

The consensus however, is that this incentive will at some point lose its function, as too many cars in the lane will make it just as slow as the other lanes.

In practice it is likely to be discontinued if the EV access causes a great delay to the buses.

2.3 Political and practical implications

The ambition behind letting EVs into the bus lane is not to let well-off commuters save time to work, but to stimulate the introduction of clean energy vehicles in the Norwegian transportation system. The goal should be that the Norwegian car fleet gradually gets more and more based on renewable fuels instead of fossil fuels.

Given a continuously increasing sale of EVs, the bus lane on the west of Oslo, as referred to in Figure 1, will eventually get too crowded. The challenge then would be to somehow continue supporting the gradual transition to EVs. There are two aspects that need to be considered.

First, if one part of the bus lane gets full, the right approach to continue the incentive as long as possible, is not to discontinue the whole incentive, but rather to limit EV access in some spots where high numbers cause problems. It is not in the bus lane as a whole that an increase in EVs causes problems, but rather at some junctions, where conventional cars cross the bus lane to get into the queue of cars, that EVs could prevent the buses from efficiently pass.

Secondly, we should look into incentives that could further strengthen the transition to zero emission vehicles, once the current bus lane is at capacity. Surely, we want the good Norwegian EV sales trends to continue and increase. We should create new incentives that will lead us towards the goal of a zero emission urban traffic. One such could be making another lane EV only.

3 More EVs in the bus lane in 2013, but fewer than could be expected

On May 29 2013, ZERO conducted a new counting in the bus lane, at the counting point used in the 2009 Prosam report, as shown in Figure 1. We have chosen one that we believe would have the highest count of EVs, at Vækerø, on the highway E18 heading in to Oslo from the west. We chose the same time frame, from 7 am to 9 am, but on a different date than the counting from 2009. Figure 1 shows the 2013 count.

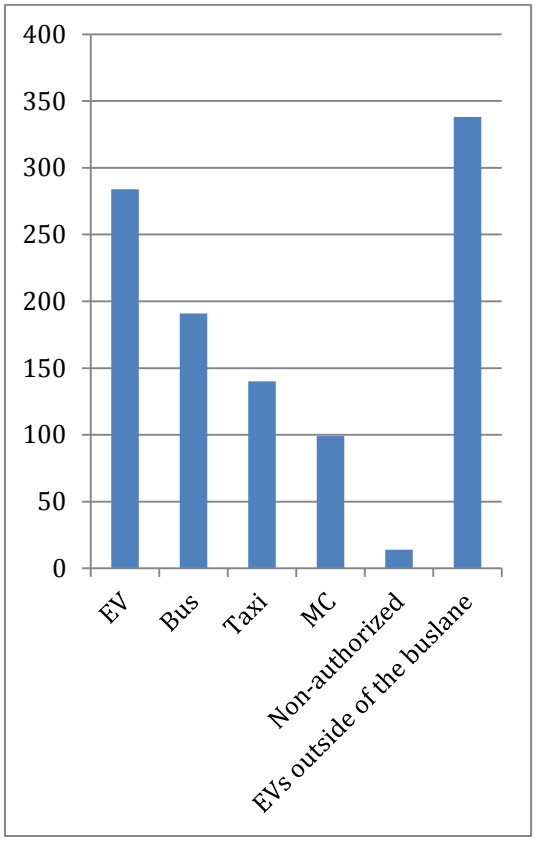

Figure 2 Traffic in the bus lane on May 29 2013.

In Figure 2 we can see the number of different vehicles in the bus lane. Comparing with Figure 1 we can see that the number of EVs has gone up from 154 and 131 on the two dates in 2009, to 282 in 2013. We can see roughly a doubling of vehicles. However, at the location of the counting, the traffic was not very congested at the 2013 counting. Traffic is usually more congested further out from the city, but at this location the density is reduced. Also, the bus lane resumes at the counting point, after having been missing for a few hundred meters. This has the result that many EVs do not use the bus lane at this point. A weakness of the 2009 counting is that it did not count EVs outside of the bus lane. In our 2013 count we found that a majority, 338 EVs did not use the bus lane. Thus, a total of 622 EVs passed the counting point in two hours, and it is reasonable to think that the number of EVs occupying the bus lane would be higher further west where there is more congestion.

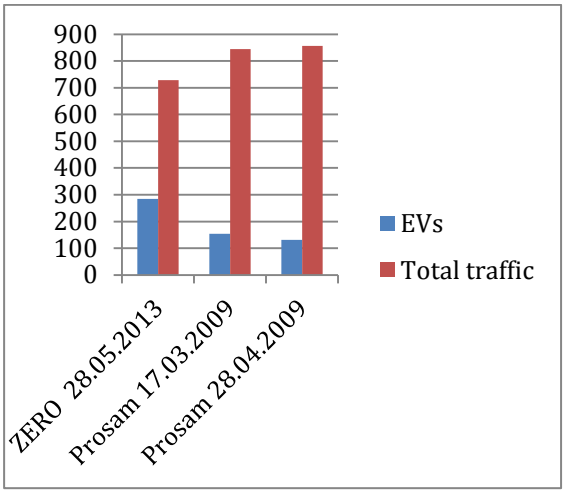

Figure 3 The share of EVs in the bus lane has gone up significantly from 2009 to 2013. There could be some seasonal changes in traffic patterns, and we see that the total traffic is less in 2013 than in 2009.

We can see from Figure 3 that the share of EVs has gone up for approximately 20 % in 2009 to about 40 % in 2013. Figure 4 shows the percentages, adjusted for unauthorized vehicles. We registered fewer buses and fewer unauthorized vehicles in the lane than registered in 2009.

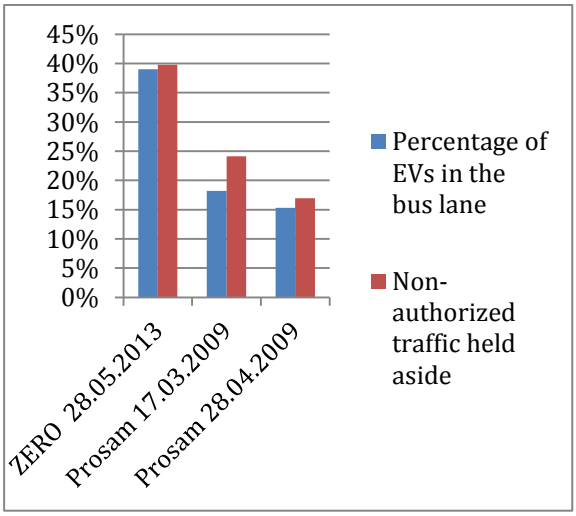

Figure 4 Percentage of EVs in the bus lane at different count times.

In our counting in 2013, we included EVs outside the bus lane. The number was large, and had they been in the bus lane, the EV share would be 58 %.

3.1 EV population changes between 2009 and 2013.

At the time of the counting of the Prosam report, there were only quite few EVs registered in Norway. Models of the Norwegian EVs Think and Buddy were dominant, together with the EV lineup from French manufacturers, such as the Citroën Saxo, Peugeot 106 and Renault Clio. The total number per May 2009 was 2605 [1]. At the end of June 2013, there were 12625 EVs registered in Norway [2]. We can compare the number of EVs passing our counting point to the total amount of EVs. In 2009 about 6 % of all Norwegian EVs passed that counting point, while our counting shows that in 2013 only about 2 % passed the same point. However, if we do include the EVs not driving in the bus lane, the percentage in 2013 would also be close to 5 %.

3.2 Changing patterns of EV distribution

While EVs in 2009 were largely found in and to the west of Oslo, we see tendencies that this is about to change now. In 2009, there were 0.6 EVs per 1000 inhabitants in Norway, while in the west there 4.8. If we look specifically at the two municipalities Asker and Bærum, the inhabitants of which are like to make up a large portion of commuters from the west of Oslo, we can see contours of this.

2009			
	Population	EVs	EVs per 1000
Asker	57606	472	8.2
Bærum	116974	363	3.1

Table 1 EV population in the municipalities of Asker and Bærum in 2009. An approximation based on Prosam report [1].

We see from Table 1 that these numbers are massively over the 2009 average for the country. If we now compare these numbers with updated information from 2013, we can see that the change in Asker and Bærum is less than the country average.

2013			
	Population	EVs	EVs per 1000
Asker	57606	1169	20.3
Bærum	116974	1004	8.6

Table 2 EV population in the municipalities of Asker and Bærum in 2013.

We see from Table 2 that the EV density in the area has more than doubled. The EV density per June 30 2013 is (with an approximation that the population is 5 million at the same time) is 2.5 EVs per 1000 inhabitants, more than a tripling since 2009. Thus, we can safely say that the

growth in EVs has not been geographically proportionate to the situation in 2009. This could help keeping the bus lane open to EVs longer than could be expected in 2009.

3.2.1 New markets

As mentioned, in 2009 there were only a few EV models available. It is likely that the introduction of the Mitsubishi i-MiEV and the Nissan Leaf has made EVs a more feasible choice for more people, also outside of the 2009 core area. In fact, in June 2013, Hordaland superseded for the first time the Oslo region in EV sales. This is the region of which Bergen, Norway's second largest city is a part. At the end of 2013, and the beginning of 2014, more EVs will hit the Norwegian market, most notably the Tesla Model S, the BMW i3, VW E-Up!, VW E-Golf and several electric vans. These could significantly increase sales, and create new markets.

4 EVs in the bus lane could remain an incentive

Our counting shows that the number of EVs driving in towards Oslo from the west has increased significantly since 2009. There is also reason to believe that more of the EVs driving outside of the bus lane would be occupying the bus lane further west, where traffic is more congested. It could therefore be interesting to conduct more observations at different points. Buses are already impeded in passing oncoming traffic, when conventional vehicles are stuck trying to enter a queue. EVs in the bus lane could lead to even longer passing time.

Figure 5 Example of a bus being hindered in continuing in the bus lane, by traffic entering a queue. More EVs could increase the time it takes for buses to pass. Photo from a central street in Trondheim, 2009 Prosam report [1].

Already, we are seeing an example that EVs are being excluded from the bus lane. During road works on the south-east side of Oslo, road authorities limited the bus lane to buses and taxis alone.

Figure 6 Sign indicating changed use of the bus lane. Photo: elbil.no

This goes to show that EVs are already being detected as a significant element in traffic. It also shows that it is possible to continue using this incentive for as long as possible, by closing excluding EVs from bus lanes only where they pose a problem. Allowing EVs to drive in the bus lane in other areas, and other cities, could help maintain this incentive as a powerful drive for EV introduction for several years to come.

5 New incentives to get EVs to the next step

Allowing EVs to drive in the bus lane is clearly something that will only work for as long as EVs are a niche. The key role for incentives should be to adequately target the market to quickly and continuously drive a transition away from fossil fuel powered vehicles to EVs and others running on renewable fuels. Well before it proves impossible to continue with EVs in the bus lane, we should develop powerful new incentives. However, while Norwegians have adopted EVs at a higher rate than in most other countries, EVs make up only about 0.5 % of Norway's cars. That means that even incentives to take over for the bus lane incentive, are likely to be niche oriented.

We can further encourage people to choose EVs over conventional cars, include new ways to create access, or range at the expense of other vehicles. In the short term though, it is important that a full bus lane at one location should not mandate that all bus lanes are closed to EVs.

5.1 City center access

Giving EVs access to the bus lane is to give their drivers extra speed where others are slow, in a way giving them a type of range that makes up for the inconvenience of the limited autonomy for the EV. Another way of creating such range could be to close off city centers, for instance in Oslo, for all traffic except zero emission vehicles. That would create new "range" for EVs, a higher value compared to conventional vehicles. Such a measure could be limited only to private passenger vehicles, but could also include delivery vans and taxis, to spur faster introduction of EVs in more markets.

Benefits of such a strategy would be a more quiet, safer and less polluted city, and in the short term less trafficked centre. If such a measure came in place before bus lanes are put under further pressure, it could prove a valuable incentive for a transition to EVs and hydrogen vehicles.

Arguments against such a strategy could be that some would argue that with such strong measures, we might just as well go for an entirely car free city.

5.2 Zero emission lane

Facing a bus lane at full capacity, one option is to reserve another lane for zero emission vehicles. This would create a very strong signal, that EVs, and other zero emission vehicles, such as hydrogen cars, and perhaps biofuel vehicles will be strongly favored. On the mentioned highway in towards Oslo from the west, there are two lanes for general traffic, plus a bus lane. This strategy would leave only one lane left for the remaining general traffic. Given that EVs only make up a small share of cars, this would be a very bold and likely very unpopular move. However, if such a lane was also to include commercial traffic, such as delivery vehicles, trucks, etc. it could prove popular in the business sector. Benefits of such an incentive would be that could turn out to be very powerful, and be a very strong signal that zero emission vehicles will be prioritized and that they are not meant to stay a niche. One difficulty is that in the short term, this would create a major shock, as capacity would be seriously reduced for the current normal traffic. Another is that if one wanted to allow other traffic, such as car poolers, and commercial traffic, it could be challenging to enforce the rules, and prevent conventional cars from driving in the zero emission lane. However, with Oslos growing population, strict traffic measures are due, to increase smart, and zero emission transport.

5.3 Toll roads

EVs in the bus lane is one of several incentives for EVs in Norway. Tax and toll road exemption are other strong incentives. Conventional vehicles typically pay 2-5 Euros to enter the largest Norwegian cities, and there are also toll roads between regions. While the bus lane has obvious physical restraints, toll roads could be administered in a purely fiscal way to allow for more EVs to enter the roads. As more and more EVs come on the market, there will be a loss of income through the toll road system. But instead of removing this incentive when the loss of income becomes too high, we should compensate for this by increasing the fees on conventional vehicles. In fact, by increasing the toll on conventional cars further, while keeping fees on EVs at zero, this could even compensate for a possible removal of other incentives.

6 The future of EV sales and bus lane capacity

The same cross-political agreement that ensures EV incentives at least until 2017, also states that there should be a goal that new vehicles sold in 2020 should have an average CO2 emission of less than 85 g/km. This goal is tighter than the EU goal of 95 g/km and will require a significant share of EVs. Our calculations show that we would need to sell around 20 000 EVs in the year 2020 to reach that goal.

	Sales	Stock by end of year
2012	4300	9500
2013	6000	
2020	20000	

Table 3 Sales in 2012, estimation for 2013, estimated goal for 2020

If EVs are something we actually want to encourage, the growth in sales from about 6 000 in 2013 to about 20 000 does not seem unreasonable. An estimation with a yearly exponential growth in the period between 2013 and 2020 is shown in Table 4.

	Sales	Stock by end of year
2012	4300	9500
2013	6000	15500
2014	7126	22626

2015	8463	31089
2016	10052	41141
2017	11938	53079
2018	14178	67258
2019	16839	84097
2020	20000	104097
Yearly growth		18,767 %

Table 4 Estimations of EV sales until 2020

We see that this scenario, which would be considered a successful introduction of EVs, in line with political goals, would result in an EV population of about four times that of 2013. We see from our study that already with a population of about 12 000 vehicles, EVs already stands for more traffic than buses in the bus lane.
Many more EVs, together with the introduction of more luxurious and larger electric vehicles, it is likely that there will be more negative attention around this incentive in the years to come. It is also quite likely that this will occur well before 2017 or 50 000 vehicles are sold.
It is therefore imperative that we are able to assemble a new package of incentives, to continue the phasing in of EVs in the years to come.

7 Conclusion

EVs are successful in Norway, but the package of incentives to encourage the phasing in of EVs is under pressure, both politically, and due to physical constraints. The current development will render the most powerful incentive useless within a relatively short time. To avoid loss of momentum in the transition away from fossil fuels, we should discuss and create powerful and robust new incentives that in total would make it practically or economically favorable to buy an EV instead of a conventional fossil fueled car. Such incentives, like closing parts of the city to cars that emit CO_2, or separating a new lane exclusively for EVs could create powerful new means to continue the budding transition towards zero emission mobility.

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Benjamin Myklebust is an electrical engineer with a master in science, technology and society studies (STS). At the Zero Emission Resource Organisation, he has promoted fast charging in Norway, at an early phase from 2010. Since 2011 ZERO has contributed to European EV development through the North Sea Region project E-Mobility.