

Low Emission Optimised tyres and road surfaces for electric and hybrid vehicles



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The use of electric vehicles in Norway

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1. BACKGROUND

This report describes the market development of electric vehicles (EV) and Plug-in hybrid electric vehicles (PHEV) in Norway. This information will be used as a basis to estimate the possible influence on the general traffic noise levels and on CO₂-emissions, as the number of such vehicles is increasing in the vehicle fleet.

2. VEHICLE POPULATION IN NORWAY

By the end of the year 2012, the total vehicle population in Norway was approximately 3 million vehicles¹. The fleet can be divided into 4 categories, as shown in table 1. All numbers rounded to the nearest 500.

Tab.1 Vehicle fleet in Norway by 31.12.2012¹.

Passenger cars	Delivery vans ¹	Heavy goods vehicles ²	Buses	Total
2 433 000	430 000	122 000	18 000	3 003 500

1) Vehicles less than 3500 kg, but with green license plates, and with only front seats (2/3 passengers)

2) Net vehicle weight more than 3500 kg

The number of new passenger car registered each year in Norway is approximately 135-140 000.

3. INTRODUCTION OF ELECTRIC VEHICLES IN NORWAY

The introduction of electric vehicles in Norway can be divided into 5 phases:

- 1) 1970-1990: The concept development phase. Development of prototype EVs and propulsion systems.
- 2) 1990-1999: Test phase: The first EVs were tested in public test programs, mainly through enterprises and organizations. The first Norwegian developed EV Think was launched. Besides the Think, most EVs were produced by the Danish company Kewet, making the Buddy EV. Both companies went bankrupt during this phase.
- 3) 2000-2009: Early market phase. Think were bought by Ford Motor Company and a new model introduced, mainly for the U.S. market. A new production of the Kewet was established in Norway. Some limited user friendly and economic incentives were introduced in Norway (see also chapter 4).
- 4) From 2009: The market introduction phase. A new Think (Norwegian owned) was introduced in Norway (Ford Motor Company had withdrawn from the production company). In 2010/11 the big car manufacturers Mitsubishi, Peugeot, Citroën and Nissan launched their EVs. In October 2013, Tesla Model S was introduced on the Norwegian market. The company that

owned Think went bankrupt in 2012. In 2012, plug-in hybrids (PHEV) were introduced in the Norwegian market, but without the same user and economic incentives as for the EV (only minor reduction of sales taxes). The sales of PHEVs have therefore been very slow compared to EVs (only 344 sold in 2012).

Figure 1 show a historic development of EVs in Norway in the period 2000-2012².

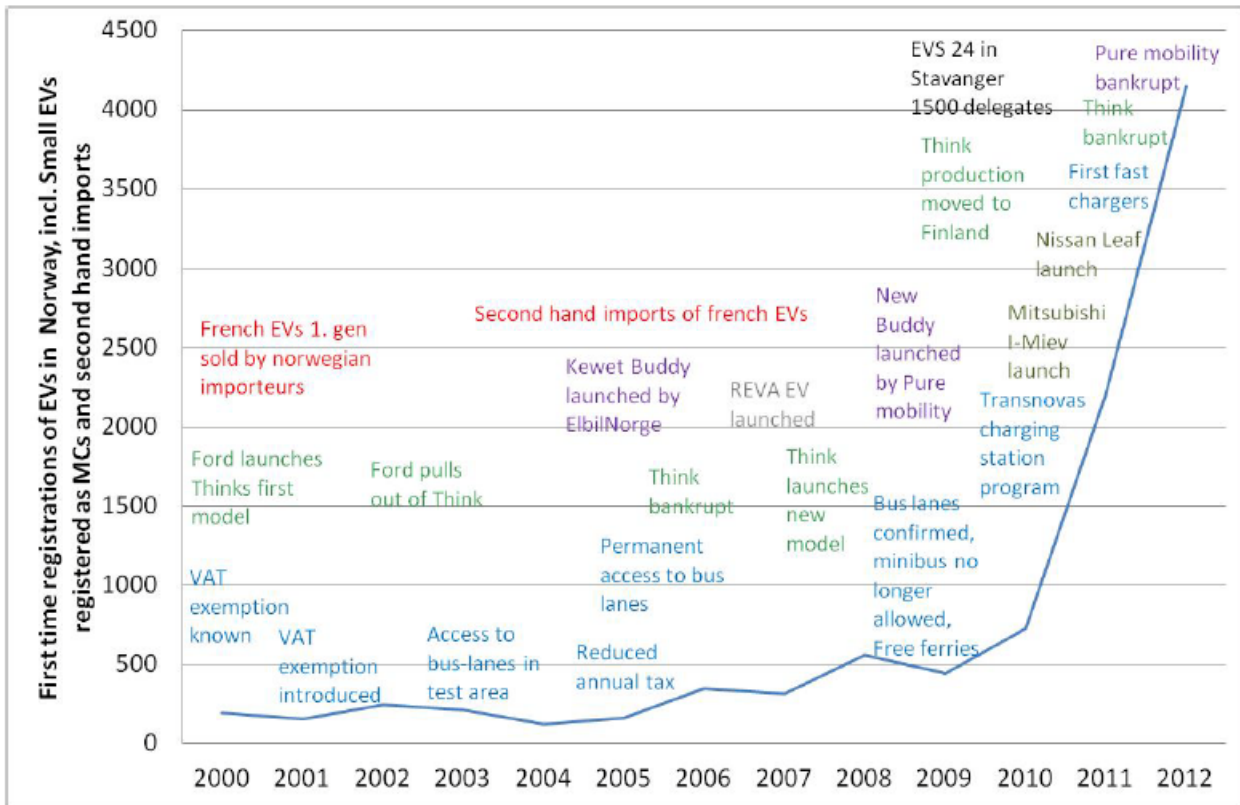


Fig.1 Estimate for sales of EVs in Norway 2000-2012, and main historical events. Sales figures for early years are uncertain. Source: TØI².

4. ECONOMIC AND USER INCENTIVES FOR EVs IN NORWAY

The Norwegian Government has decided that within 2020, the average CO₂-level of new passenger cars shall be below 85 g/km. To reach this goal, it is necessary to increase the number of EVs and PHEVs in the fleet. As a mean to reach this goal, a number of both economic and user friendly incentives have been introduced in Norway. Normal hybrid vehicles (HV), such as the Toyota Prius or plug-in hybrids like Opel Ampera are not included in these policies, even if the Opel Ampera has some reduction in vehicle taxes, as it do not use the combustion engine for normal driving, only to charge batteries.

These are:

1) Economic incentives:

- No VAT (normally 25 %)
- Low annual vehicle tax (52 € compared to 360-420 € for conventional vehicles, 2013 figures)
- Free parking (on public parking areas)
- No paying on toll roads
- Reduced rates or no payment on national ferries
- Free charging locations (normally combined with designated parking places)

2) User incentives:

- Free access to bus/taxi lanes
- Free parking on public parking areas (also an economic benefit).

It has been decided that these incentives shall not be changed before 2017 (or as long as the number of EV/PHEV is less than 50 000).

However, there is already now a concern that there are so many EVs using the bus/taxi lanes coming into Oslo from the western areas (a rich area!) at the moment, that they may delay the buses. There may be a ban to use this lane on this specific road before 2017 (which may cause a massive protest from EV drivers using this road). An environmental NGO has proposed that instead of using the bus lane, zero (or low) emission vehicles may have a separate lane reserved for themselves.

In 2013, the PHEVs have been allowed to use the parking places with charging possibilities originally only reserved for EVs. It is assumed that a PHEV will reduce the CO₂ with approximately 44-68 % compared to a normal car with combustion engine. The figure is based on an assumption that the PHEV is running in electric mode in a percentage equal to this range.

5. THE ELECTRIC VEHICLE MARKET IN NORWAY

Table 2 show EV models (passenger cars, class M1) currently available on the market in Norway. Current prices (approximately price in Euros, rounded to the nearest 500) are also shown.

Tab. 2 EV models in Norway

Model	Price, €
Citroën C-Zero Seduction	23000
Mitsubishi i-MIEV	24000
Peugeot iOn Active	24000
Renault Kangoo ZE Maxi	17000
Nissan Leaf	27000-32500
Fiat e500	35000
Micro-Vett Fiat e500	53000
Tesla Model S	55000-83000
Tesla Roadster	81500-95500
VW e-up!	23000
BMW i3	30000
Ford Focus EV	33000

Next year, more pure EVs are expected to be introduced, like the electric version of the VW Golf.

In table 3, plug-in hybrids (PHEV) currently available in Norway (class M1) are shown, with price range in Euros.

Tab. 3 PHEV models in Norway

Model	Price, €
Opel Ampera	45000-46000
Volvo V60 D2 AWD Plug-in	74500-76500
Toyota Prius Plug-in	40000-45500

In late 2013/early 2014, a Mitsubishi Outlander PHEV will be available on the Norwegian market.

Table 4 shows EV delivery vans (class N1) currently available in Norway.

Tab. 4 EV delivery vans in Norway

Model	Price, €
Mitsubishi i-MIEV	23000
Renault Kangoo ZE	23000-25000

For the Renault, rental costs for batteries are added to these costs.

As shown in figure 1, there has been a significant increase in the number of EV in Norway from 2011/2012. However, it is really in 2013, that the sales figures of EVs really have risen. This is mainly due to the introduction of more EV models and delivery conditions. Especially the Nissan Leaf and the Tesla Model S are dominating the sales statistics at the moment. The first vehicles of the Tesla Model S were delivered to customers from October 2013, and customers have been (and still are!) on waiting lists for many months.

In November 2013, a total of 12079 new passenger cars were sold in Norway.

Of these, the number of new EVs was 1434, a market share of 11.9 %. If imported used EVs are included, the number is 1683. This is an increase of + 357 % since November 2012. In the same month 849 new HV were sold, with a marked share of 8.9 %. By the end of October, a total of 6609 EVs have been registrated so far in 2013, while the number of HVs in the same period is 9275 (an increase of 57 % from 2012).

The EV marked is mainly dominated by private passenger cars. Of the 1434 EVs sold in October, only 7 were delivery vans (N1). So far, a total of 163 EV delivery vans have been sold.

It is expected that by the end of 2013, more than 18 000 EV/PHEV will be on the roads in Norway, making this country the largest market for EV related to the total vehicle fleet and population (~5 million in Norway).

Table 5 shows the top 10 list of the most sold models in Norway in November 2013 and table 6 the list of 2013 by 30.Nov.2013.

Tab. 5 The 10 most sold passenger cars in Norway in November 2013.

No.	Model	Number
1	VW Golf	666
2	Tesla Model S (EV)	527
3	Toyota Auris	525
4	Skoda Octavia	524
5	Nissan Leaf (EV)	512
6	Toyota Yaris	383
6	VW up!	383 (275 of e-up!)
8	Volvo V70	306
9	Volvo V40	260
10	Toyota RAV4	259

It is to be noted that already 3 pure EVs are on the top 10 list!

Tab. 6 The 10 most sold passenger cars in Norway in 2013 (by 30.11.13).

No.	Model	Number	Market share, %
1	VW Golf	6905	5.3
2	Toyota Auris	4507	3.4
3	Nissan Leaf (EV)	4367	3.3
4	Mazda CX-5	4200	3.2
5	Toyota Yaris	4039	3.1
6	Volvo V40	3291	2.5
6	Skoda Octavia	3278	2.5
8	Toyota RAV4	3210	2.5
9	Ford Focus	2990	2.3
10	Mitsubishi Outlander	2839	2.2
	Total	130756	100

For the Tesla Model S, the figures are a total of 1433 vehicles registered by the end of October 2013.

6. TYRES USED ON EVs AND HVs IN NORWAY

Table 7 gives an overview of summer tyres found on EV/PHEV and some HVs in Norway. The table is based on a visual inspection at dealers of such vehicles in Trondheim, Norway. It can be concluded that the HVs do not have special summer tyres, but use normal summer tyres and dimensions also found on cars with combustion engines only.

Tab. 7 Tyres fitted on EV/HV and PHEV vehicles in Trondheim, 2013.

Model	Type	Tyres	Dimension
Nissan Leaf	EV	Bridgestone Ecopia EP150	205/55 R16 91V
Nissan Leaf	EV	Michelin Energy Saver	205/55 R16 91V
Nissan Leaf	EV	Dunlop ENASAVE EC300	215/50 R17 91V
Mitsubishi i-MIEV	EV	Dunlop ENASAVE 2030	145/65 R15 72S (Front)
Mitsubishi i MIEV	EV	Dunlop ENASAVE 2030	175/55 R15 77V (Rear)
Tesla Model S	EV	Michelin Pilot Sport	245/35 R21 ZR XL 95Y
BMW i3	EV	Bridgestone Ecopia EP500	155/70 R19 84Q (Front)
BMW i3	EV	Bridgestone Ecopia EP500	175/60 R19 86Q (Rear)
Toyota Auris Hybrid	HV	Dunlop SP FastResponse	225/45 R17 91W
Toyota Prius 7+	HV	Bridgestone Turanza ER33	205/60 R16 92V
Toyota Prius 7+	HV	Yokohama Advan dB V551	205/60 R16 92V
Toyota Prius	HV	Michelin Primacy HP	215/45 R17 87W
Lexus CT200h	HV	ContiSportContact3	215/45 R17 87V
Opel Ampera	PHEV	Michelin Energy Saver	215/55 R17 94H

7. REFERENCES

- [1] Opplysningsrådet for veitrafikken (OVF). Kjøretøystatistikk for 2013. (Information Bureau for Road Traffic in Norway). (<http://ofvas.no/bilsalget/>) (accessed December 10, 2013)
- [2] E.Figenbaum, M.Kolbenstvedt: Elektromobilitet i Norge – erfaringer og muligheter med elbiler. TØI Rapport 1276/2013 (Institute of Transport Economics: Electromobility in Norway – potential and challenges).