

# Viewpoint



## The Inconvenient Truth about Electric Vehicles



Politicians and press are extolling the virtues of the electric vehicles (EV's) that are coming to market in 2011 and the Government provides a subsidy of £5,000 per car. It is said that EV's solve both the air quality and global warming issues. Well there is no doubt they are very good for local air quality, but what about reducing CO2 emissions?

First, let's consider what an EV is actually replacing. Whilst EVs are often claimed by their supporters to replace 'average' cars (such as a Ford Mondeo, with CO2 of 140 g/km), in reality the 6 EVs on the grant register are cars in the same class as the following:

<b>Golf diesel</b>	<b>99 g/km</b>	<b>Toyota Prius</b>	<b>89g/km CO2</b>
<b>Ford Focus diesel</b>	<b>99 g/km</b>	<b>Astra diesel</b>	<b>104 g/km</b>

So, for the Nissan Leaf class, let's assume an average CO2 of 100 g/km on a 'tail-pipe' basis. This needs to be increased by 15% to give an overall Well to Wheel emissions of 115 g/km

Now let's look at the Nissan Leaf EV. According to the US EPA (UK figures are not available on the official UK website [www.vcarfueldata.org.uk](http://www.vcarfueldata.org.uk)), it has electricity consumption of 34 kWh per 100 miles or 0.21 kWh per km. The minimum electricity demand in a year is during summer night-time, at approximately 23 GW. Nuclear and wind generation can currently produce a maximum output of 14 GW at any one time. This means that the net extra electricity used to charge an EV from the grid will be generated by burning coal or gas at least until 2020. A.D. Hawkes\* produced a detailed analysis of the Marginal Emissions Factors for CO2 emitted from electricity. His 2016 central estimate is 600 g/kWh, however, if the emissions in respect of the production and transportation of the gas and coal are taken into account this increases to around 660 g/kWh. In addition, around 6% of electricity is lost in transmission and distribution so that the figure becomes 700 g/kWh at the EV charging point. So, on that basis the Leaf emissions in the UK are 0.21 X 700 = 147 g of CO2 per km.

But it gets worse. When it is cold, the EV uses a significant proportion of energy for the heater, whereas a diesel has 'free' heating from the engine cooling system. This is not taken into account in the official CO2/km figures but means that the Leaf EV is now causing a 50% increase in emissions of CO2 compared to its low emission peers.

One of the reasons the EV is so poor is the weight. At 1,521 kg the Leaf weighs 207 kg more than the Golf diesel, equivalent to having two 16 stone rugby players in the back. It takes a lot of energy to drive rugby players around.

Furthermore, the range of an EV is limited to short journeys, making the use of a second vehicle necessary to travel greater distances. In contrast, the Golf, Astra and Focus can be used for all journey types. Given that the EV owner's second car is unlikely to be as efficient as the Golf, this puts the EV even further behind.

It is manifestly clear from the above calculations that the new generation of EVs are not the best option in terms of CO2 emissions in the UK if they use grid electricity. Whether they become less bad, is dependent on nuclear, offshore wind and coal/gas with CCS. The likelihood of these projects going ahead depends on an increase in the world carbon price to enable the UK to finance these projects. It also depends on natural gas prices, which are significantly linked to the cost of shale gas production.

This is discussed in the CNG Services submission to the Energy and Climate Change Committee inquiry into Shale gas which makes the case that dual fuel 75% compressed natural gas – 25% diesel trucks should be encouraged: <http://www.publications.parliament.uk/pa/cm/201011/cmselect/cmenergy/writew/shale/sg17.htm>

It may be that the abundance of shale gas means that EVs should go the route of the Nimrod and be broken up for scrap before they are used. Maybe in 20 years we can look at them again if we have low CO2 electricity, though the target set by the internal combustion engine will also be much lower due to the advances we are seeing now that manufacturers are focussing on efficiency. This new scrapping scheme would avoid all the extra CO2 emissions by the EVs in the next decade or so.

My final point is that if I bought an EV and received a £5,000 subsidy from the UK Government I would be both ashamed and embarrassed. Ashamed because I would be taking money from taxpayers that should be invested in something that actually reduces, not increases, CO2 emissions, such as insulating a house with solid walls.

Embarrassed because I would be sending a message that I do not understand where energy comes from and have been taken in by 'zero emissions' nonsense. Oh dear.