



VEHICLE EMISSIONS: ELECTRIC CARS ARE NOT ENOUGH

By Alasdair Beal

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Much criticism has been directed at the UK government for its decision to delay the phasing out of petrol- and diesel-powered cars and vans in favour of their electric (or possibly hydrogen) equivalents, but rather less has been said about the need for a wider range of transport options to reduce emissions of carbon dioxide (CO₂), nitrogen oxides (NO_x) and particulates in order to help tackle climate change and air pollution.

Forgotten emissions

In recent years, filters and catalysts have cleaned up petrol and diesel car exhausts considerably, but they still emit some particulates and large amounts of CO₂ and NO_x – and particulates are also emitted from brake and tyre wear. Electric cars are often described as ‘zero emissions’ but in reality allowance should be made for emissions from the power stations which generate the electricity and also the particulates they emit from brake and tyre wear. Therefore, although electric power is cleaner, the benefits are not as large as they first appear.

The thermal efficiency of a typical car engine is 20-30% (petrol) or 30-40% (diesel), depending on driving conditions. Even the latest Toyota Prius hybrid is still only 41% efficient. Thus, most of the energy in the burning fossil fuels is wasted.

On the other hand, generating electricity from wind, solar panels or hydro-power stations produces no direct emissions, although there are emissions from construction and maintenance.

Photo credit: Chad Russell, Two White and Red Tesla Charging Station, Idaho Falls. <https://www.pexels.com/photo/two-white-and-red-tesla-charging-station-2480315/>.

However, a substantial amount of UK electricity also comes from gas, nuclear, coal, bioenergy (wood pellets and anaerobic digestion), oil and other sources. Gas-fired power stations have a typical efficiency of about 50%; coal-fired power stations in the past were typically 30-35% efficient but current designs can achieve 40-45%

Increased combustion of biomass – most commonly in the form of wood fuels – has contributed to an increase in particulate emissions, worsening air quality. In addition, net CO₂ emissions – the emissions once forest regrowth is appropriately accounted for – have generally being underestimated, [as a recent paper in Nature showed](#). In short, burning wood is also a lot worse for the climate than many had thought.

Nuclear power is also often claimed to be zero-carbon but this omits emissions from mining and processing fuel, power station construction, maintenance, and waste disposal. We should also not forget the problem of nuclear waste management and the connection with nuclear weapons production.

Table 1 shows the breakdown of UK electricity generation in 2021 and 2022 according to the government publication, [UK energy in brief](#).

Table 1. Facts and Figures of the La Paz Mi Teleférico Ropeway Network		
Energy Source	2021	2022
Onshore wind	9.5%	10.8%
Offshore wind	11.5%	13.8%
Solar	3.9%	4.1%
Hydro	1.8%	1.7%
Fossil ('natural') gas	39.8%	38.4%
Bioenergy	11.9%	10.1%
Landfill gas	1.0%	1.0%
Coal	2.1%	1.7%
Oil & other	3.5%	3.7%
Nuclear	14.9%	14.7%
Source: https://www.gov.uk/government/collections/uk-energy-in-brief		

Thus in 2022, 30.5% of UK electricity was generated from the 'cleanest' sources: wind, solar and hydro power; 54.9% was generated by burning fossil gas, biomass, coal, oil, and landfill gas; and 14.7% was generated from nuclear power. Thus, the cleanest renewable sources are now producing over 30% of total electricity generated. It could be argued that the picture is rather better than this, as a gas-fired or nuclear power station creates rather less CO₂ per kilowatt-hour (kWh) than a car engine. However, although emissions from electricity generation are lower than petrol or diesel engines, electric power is 'reduced emissions', not 'zero emissions'.



Photo Credit: Alexandre Loureiro, Nuclear Power Plant Under the Blue Sky. <https://www.pexels.com/photo/nuclear-power-plant-under-the-blue-sky-7097967/>.

In order to achieve the government's timetable for changing to battery-powered cars, a massive number of new charging stations will need to be constructed in the next few years, including arrangements for charging cars parked on the street. Policies recommendations by the [Climate Change Committee](#) would have seen the proportion of all-electric cars on the roads reach 55% by 2032, with all diesel and petrol cars being replaced by 2050. In practice, reaching a level of 50% for all-electric cars may not now be achieved until some time after 2035 and it may be significantly later than 2050 before petrol and diesel cars are completely eliminated.



Another issue to consider is the weight of electric cars: plug-in hybrids are typically 20-25% heavier than similar petrol or diesel cars and all-electric cars with a reasonable range are typically 40-50% heavier. Added to this, consumers have been buying the heavier ‘sports utility vehicles’ (SUVs) in much greater numbers – [44% of new electric vehicles are now SUVs](#), a proportion even higher than among fossil-fuelled vehicles. Therefore, if all else is equal, all-electric cars will consume more energy and emit more particulates from tyre wear.

So changing to electric cars is not a panacea: the resulting reduction in CO₂ emissions is likely to be more limited and take rather longer than many hope. However, given what climate scientists are saying about the action necessary to hit the targets in the Paris Agreement, a narrow focus will not be nearly enough. The idea that the problem can be solved by changing over to electric cars while we continue with ‘business as usual’ in the meantime is a fantasy.

Pursuing a wider range of options

The only way to achieve major CO₂ reductions in the transport sector in the timescale that is required will be to focus initially on measures which can be implemented and produce results quickly without waiting for new technical developments. Other developments can then be planned to complement these, so that their effects combine for maximum benefit.

Measures which would significantly reduce transport CO₂ emissions and could be introduced almost immediately at little cost are:

- (i) reduce maximum speed limits for cars and coaches to 60mph (100km/h) on motorways and dual carriageways, and 50mph (80km/h) on other roads;
- (ii) reduce maximum speed limits for lorries to 50mph (80km/h) on motorways and dual carriageways, and 40mph (65km/h) on other roads;
- (iii) increase fuel duty and the number of toll roads;
- (iv) expanding the use of car clubs;
- (v) increase the cost of flying, e.g. by taxing aviation fuel and increasing airport landing charges;
- (vi) improve surface public transport by taking buses, trams, and trains back under public control, and reduce fares and improve services;
- (vii) construct more and better cycle lanes.

Measures which could reduce transport emissions further in subsequent years include:

- (viii) introduce more electric trams and trolley buses in towns and cities to replace conventional buses;
- (ix) a rolling programme of railway electrification and line improvements, including more high-speed services to link with mainland Europe, and replace short-haul air transport;
- (x) construct a comprehensive, effective, and robust nationwide network of charging points to encourage use of electric cars and vans;
- (xi) further expansion of wind, solar and tidal electricity generation and storage.

These proposals are generally obvious, well known, would be practical to implement and would substantially reduce transport CO₂ emissions. Items (i) and (ii) could reduce transport CO₂ emissions almost immediately by at about 15%, with further reductions following as measures (iii)-(vii) start to affect behaviour and reduce the amount of travel by car or aeroplane. Substantial further reductions in emissions could then be expected over time as progress is made on items (viii)-(xi).

Listing these measures illustrates what could and should be done to reduce emissions but it also raises a question: if this is what needs to be done, why are government plans for items (viii)-(xi) so sketchy and undeveloped – and why are there so few plans for items (i)-(vii), which should be happening now if they are serious about tackling climate change?

I think the answer is that making vague promises about possible future technological improvements in cars, trains and buses is easy. However, although introducing measures which would make people drive more slowly, make fewer road journeys, and stop flying abroad for cheap holidays would make perfect sense in climate terms, from a political point of view these would all be regarded as ‘difficult’ or ‘courageous’.

Politicians fear that people would simply not accept them and a government which tried to implement them might find itself voted out of office at the next election. However, these changes are technically the easiest and cheapest to implement and the only way to achieve sizeable reductions in emissions within the next few years. Furthermore, they will also be an unavoidable part of any plan to achieve more ambitious emission reductions in future.

The purpose of this article is not to argue against electric cars, or other actions to tackle climate change. It is to draw attention to the scale of the challenge we now face: it is easy for politicians (and scientists and pressure groups) to make speeches about the dangers of climate change and announce grand plans and ambitious targets for reductions in CO₂ by 2030, 2040 or 2050. The hard part is making the necessary changes actually happen in practice.

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Photo credit: Nik, Somerset, UK. <https://unsplash.com/photos/group-of-person-with-signage-vbFC9BCo95M>.