

Are electric vehicles tackling climate change?

Governments across the world are encouraging the switch to electric vehicles as part of the global effort to combat climate change. California recently enacted regulations to require 100% of new vehicles sold in the state must be electric, hybrid or hydrogen-powered by 2035. The UK government is more ambitious, intended to end the sale of new petrol and diesel vehicles by 2030 and for all new cars and vans to be fully zero emission at the tailpipe by 2035.

Consumers appear to be embracing electric vehicles; in 2021, 190,000 battery-powered electric vehicles (EVs) were sold in the UK. This was more than the five previous years combined, and nearly 1 in 8 of all new cars sold. We have all seen more electric vehicles on the road, and public transport is not being left behind. First Bus recently announced that it has placed one of the UK's largest electric vehicle bus orders. So, the switch to electric seems to be well under way.

To cope with the increasing electric vehicles on our roads, carparks, workplaces and homes are including charging stations. The UK Government wants to have 300,000 public charge points as a minimum in the UK by 2030. However, 75% of electric vehicle charging is estimated to be from home.

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The above table taken from the Digest of UK Energy Statistics (DUKES): electricity (updated 28 July 2022) shows the share of electricity sources of the national grid for the years 2015 to 2021.

It is clear the electricity which is charging the electric vehicles is not necessarily green. Volvo research for their C40 range shows if you charge a battery electric version with the global energy mix over 200,000 km driven, emissions are only about 20% less than the

petrol version. Volvo also conclude that, even when charging with fully renewable energy, an electric vehicle only has lower overall emissions than the petrol version after driving 49,000 km!

Then there is the high carbon footprint of an electric vehicle's Lithium-ion battery production to consider. Volvo's reports note the battery has a contribution of approximately 30 per cent each to the total footprint of all materials and components in the C40 Recharge. Interestingly, one of the reasons for the high carbon footprint of producing lithium batteries is the source of energy used during the manufacturing process. Typically, the batteries are made in countries such as China that still today produces 60% of its electricity from coal.

The carbon footprint of an electric vehicle is thus inextricably linked to how green the electricity source is, not just in the use phase but during production too. It seems clear that we need to transition more quickly to renewables or low-carbon energy sources, which also may have a positive knock-on effect on today's energy prices across Europe. The UK is currently building offshore wind farms with the world's largest offshore wind farm Dogger Bank currently under construction off the Northeast coast of England. In the Net Zero Strategy, Government set out that, subject to security of supply, all UK electricity will come from low carbon sources by 2035. Of course, the move to clean energy sources needs to be a worldwide effort to encompass the Lithium-ion battery production carbon footprints. The UK has also placed a high importance on Gigafactories which produce batteries for electric vehicles. Forecasts suggest that the UK will host up to eight gigafactories by 2040.

A key part of greening up our energy sources and lowering the carbon impact of electric vehicle production is innovation. Innovative ideas directed towards higher energy capture, easier installation, more efficient transport are just a few mechanisms of improving our current and future green sources. Patents can be used to protect these innovations and claim revenue to offset the R&D investment.

In 2011, electric vehicles overtook consumer electronics as the biggest growth driver for Li-ion battery-related inventions measured in terms of international patent families (IPFs), each of which represents a high-value invention for which patent applications have been filed at two or more patent offices worldwide.

While only some of these inventions may relate to improving the carbon footprint it seems plausible that certain improvements in battery technology also contribute to reduce the carbon footprint of running an electric vehicle. BASF have stated "By 2025, with our innovations in electric car battery materials, we aim to double the driving range of midsize cars from 300 to 600 km on a single charge." Could increasing the range of an

electric vehicle on a single charge reduce the overall energy consumption?

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In recognition of the importance of green innovation the UKIPO has a green channel which speeds a patent toward grant if the invention has an environmental benefit. The UK was the first country to introduce the green channel and also further encourages innovation through tax relief incentives such as the patent box and R&D tax credits. Greater battery production in the UK has the potential to be both economically and environmentally favourable. While not yet in effect, there seems to be positive signs of China looking to implement green patent policies too.

So, are electric vehicles really tackling climate change? The answer seems to be an eventual yes. However, the importance of encouraging companies to innovate to reduce the global carbon footprint at all stages of the electric vehicle's lifetime cannot be understated.