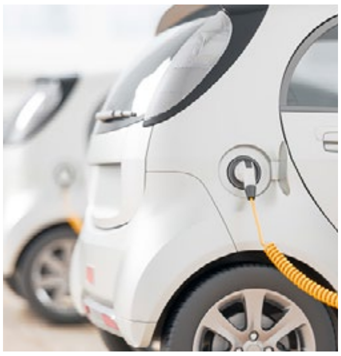
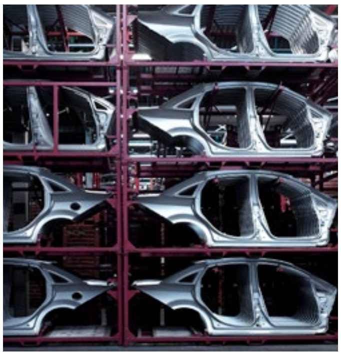
COP26 and Automotive
Steering round the curves





Taking transport green will require huge change across society and business. We explore key issues for the sector

Road transport accounts for over 10% of global greenhouse gas emissions, with emissions in the sector rising faster than in many others. In the run up to COP26, Boris Johnson has made cars one of the UK Presidency's four focus areas, calling on governments to abandon the use of the internal combustion engine (ICE) and transition to electric vehicles (EVs). The UK's Committee on Climate Change (CCC), a government advisory body, is of the view that global emissions from road transport must fall to around zero by 2050 as part of global efforts to meet the Paris Agreement goals and that a rapid transition to a full EV fleet across the world is required by then, alongside other actions, including increased public transport use, walking and cycling.

Together in electric dreams

The electric transition in passenger cars is well underway and increasing apace in fully industrialised nations. *The Financial Times* reported in October 2021 that one in 12 cars sold across continental Europe between April and June 2021 was a battery-only vehicle (BEV). Including hybrid PHEV/MHEV models this rises to one in three, with sales of electric cars in Europe expected to be total 1.17m in 2021. Critically, for many consumers who are able to buy a new vehicle, that purchase could well now be electric.

COP26 ambitions

The UK Presidency's ambition for COP26 with regard to the automotive sector is:

- For governments to ensure that all new car and van sales are zero emission vehicles (ZEVs) by 2035 (in advanced markets) or 2040 (in all other markets), and to put in place policies to accelerate the uptake of zero emission cars, vans, buses and trucks;
- For OEMs to commit to selling only ZEVs by 2035 or earlier;
- For fleet-owning businesses to commit to achieving a fully zero emission fleet by 2030 or earlier and join the EV100 initiative; and
- For civil society to build support for all of the above measures.

A number of countries, plus industry representatives, are already working together on this path in the form of the Zero Emission Vehicle Transition Council (ZEVTC). The ZEVTC consists of ministers and representatives from California, Canada, Denmark, the European Commission, France, India, Germany, Italy, Japan, Mexico, Netherlands, Norway, Spain, South Korea, Sweden, the UK and the US, and first met in November 2020 with a shared objective to overcome strategic, political and technical barriers, accelerate the production of ZEVs, and increase economies of scale. This will involve boosting investment, bringing down costs (a critical element in delivering a fast ZEV transition) and increasing the uptake of ZEVs. Part of this involves considering opportunities for ensuring lifecycle sustainability of ZEVs and ensuring the necessary supporting infrastructure is in place such as EV charging points and hydrogen refuelling facilities. Together, council members cover more than 50% of the global car market.

The EV100 initiative referred to above is promoted by The Climate Group (a non-profit organization that works with business and government leaders around the world to address climate change), and aims for electric transport to become the 'new normal' by 2030. Its members commit by 2030 to:

- Electrify their directly controlled fleet;
- Place requirements for EVs in service contracts;
- Install EV charging at all premises to support staff to use EVs; and
- Install EV charging at all premises to support customers to use EVs.

Its members commit to report on their progress annually for the EV100 Progress and Insights Report.

There is no doubt that fleet owners and operators (particularly in the burgeoning last-mile delivery space) will be important drivers of the EV revolution, as they have the scale and capital to deploy such fleets quickly (and will benefit over time from lower running costs), and can navigate around some of the logistical issues (eg via self-owned/operated depot-based charging).

EV tipping point?

The concept of a battery powered vehicle is itself not a recent phenomenon and EVs have been talked about as a serious solution to mitigate climate change for years. However, it is only recently that momentum has built to make the prospect of a complete transition from ICE to BEV seem a reality and many feel that we are not at or close to the tipping point for widespread EV adoption in mature economies.

The IEA Global Electric Vehicle Outlook provides a comprehensive review of EV trends and forecasts. Its 2021 edition shows that EVs have experienced massive sales growth around the world over the past decade. More than 10 million electric cars were on the world's roads in 2020, with BEVs driving the expansion. This was a 43% increase over 2019, and EVs represented 1% of all car stock. EV new car registrations increased in major markets in 2020 despite the Covid-19 pandemic. 2020 was a record year, with Europe – accounting for two-thirds of registrations (1.4 million) and two-thirds of the global car stock – overtaking China, which had 1.2 million registrations in 2020 and a fleet of around 4.5 million electric cars (the world's largest). By contrast, Europe has 3.2 million. The United States registered 295,000 new EVs in 2020, but the initial steps taken by the new Biden administration, including setting a goal for 50% of all new passenger vehicles to be EVs by 2030 (latched on to by the US OEM majors such as GM and Ford) look set to see the US EV transition build momentum.

For buses, recent estimates showed there to be almost 425,000 electric buses currently on the road, with some estimating that by 2050 they will form four-fifths of the global bus stock. Public EV buses have tended to benefit from significant governmental support, including under the EU CEF Transport Blending Facility programme.

Fuel efficiency and tailpipe emissions standards

The take off in popularity of EVs has been driven by fuel efficiency regulations (such as Euro 6d-ISC-FCM), especially those which impose hefty fines on emissions exceeding a certain amount per unit of distance travelled or distance achievable per unit of fuel. The EU introduced tailpipe emissions standards in 2009 to much consternation from European OEMs at the time, principally due to the potential for very large fines for failure to comply. The regulations gave OEMs time to adapt their plans for future models and also allowed them to combine the emissions of the various models in their range to produce a fleet wide average, and even to pool emissions with other OEMs. For example, to date Tesla has received millions of euros for offsetting other OEMs' ICE emissions footprints. This softened the blow for most, but was difficult for OEMs specialising in larger vehicles such as 4x4s, who had to invest heavily in the R&D necessary to lighten powertrains or make other technological innovations in order to improve fuel efficiency.

By 2019, mandatory fuel efficiency or tailpipe emissions reduction standards existed in 10 jurisdictions comprising 80% of the global market for passenger vehicle sales: China, India, Mexico, Brazil, EU, Canada, US, S Korea, Japan and Saudi Arabia.

In April 2019, the EU approved new CO2 emissions standards, defined as a percentage reduction from 2021 starting points:

- Cars: 15% reduction from 2025 onwards and 37.5% reduction from 2030 onwards; and
- Vans: 15% reduction from 2025 onwards and 31% reduction from 2030 onwards.

Also in 2019, the EU introduced a CO2 emissions performance standard for heavy-duty vehicles which apply to large trucks (which are responsible for 65-70% of the CO2 emissions from heavy-duty road transport in the EU).

Fast forwarding to 2021, the EU's "Fit for 55" package includes revising the CO2 emission performance standards for new passenger cars and vans to introduce new, more ambitious targets from 2030 onwards.

EV pricing

Tailpipe emissions standards have been coupled in many countries with consumer incentives such as scrappage allowances for more heavily emitting older vehicles. In addition, incentive discounts and tax breaks (for example, no vehicle duty and reduced VAT/sales taxes and company car tax) have been granted to purchasers of new EVs.

OEMs have accordingly stepped up to offer a greater selection of EV models. However, the increased build costs of EVs and lack of (initial) scale have made the cost of EVs too high for many consumers. The price of EV batteries is one critical factor in this, as they can cost around one-third of the total sale price of the vehicle. Battery costs are, however, falling and that trend is predicted to continue. The International Council on Clean Transportation note that battery prices are key to unlocking more affordable EVs, the cost having fallen by nearly 90% over the decade 2010-2020. Price parity between the cost to buy BEVs and ICE models is predicted to be achieved in the next 4-8 years. Some of this will be achieved simply due to scale and high levels of investment and competition driving efficiencies, but some will come from improvements in technology, both in the traditional lithium-ion battery cell (including by swapping out some of the most expensive raw materials such as cobalt) and in potentially game-changing developments, such as a successful commercialisation of solid-state batteries. A key cautionary note is the commodity pricing of scarce key raw materials such as cobalt, nickel and manganese, as well as the likely increased costs of bulk transportation (as result of decarbonisation of the marine transport sector).

ICE bans

A growing number of countries have gone a step further than tightening emissions standards and market incentives to ensure the phase out of new ICE cars and vans in the near term. Seventeen countries have announced 100% ZEV sales targets or the phase out of new ICE vehicles by 2050. Many of these include bans to come into force by 2040 or before. Amongst them Norway has set its target date for 2025. The UK began with 2035 but later brought this forward to 2030:

- Step 1 will see the phase-out for the sale of new petrol and diesel cars and vans in 2030; and
- In Step 2, the UK will require all new cars and vans to be fully zero emission at the tailpipe from 2035.

Between those dates, new cars and vans can be sold if they have the capability to drive a significant distance with zero emissions (for example, PHEVs or full hybrids), and what is 'significant' in that context this will be defined through government consultation.

There is a danger in thinking that having adopted a future ban, no more is required. However, it has been estimated that 2 billion ICE cars will continue to be placed on the global market before the bans take hold. The difference between building those 2 billion vehicles to current efficiency standards and building them to more stringent, but still technically and economically feasible standards, is estimated to be about 38 gigatons of carbon emitted into the atmosphere, roughly equivalent to an additional ten years of carbon emissions from the entire global transportation sector at 2050 levels. Hence, ICE fuel-efficiency standards (such as the proposed Euro 7 standard due to be introduced from 2025), continue to matter a great deal in the interim. Fuel efficiency standards reduce carbon emissions (and other polluting emissions such as nitrogen oxide), but also save consumers money at the pump. Perhaps more importantly, as the boundaries of technical improvements are reached, OEMs will no longer be able to manufacture and sell certain ICE or hybrid models economically, and therefore this will increasingly drive them to switch all product development to ZEVs well ahead of the target dates for the bans.

The supporting policy environment

To avoid a cliff edge when their ICE bans kick in, countries need to adopt complementary interim policies promoting ZEV sales ahead of the phase out date. Those policies include supporting a scale EV battery supply chain (currently lacking in the EU and UK) and the roll out of the necessary EV charging infrastructure, leading by example with public authority green procurement rules and to adopting wider transport plans such as low or ultra-low emission zones in urban areas, and requiring developers of new homes and workplaces to install EV charging points. In the UK alone, the Climate Change Committee has forecast that by 2035 about 370,000 public charge points will be needed, and UK electricity regulator Ofgem estimates that up to 19 million home charge points may be required.

It's not only about carbon

For OEMs, contributing to the Paris Agreement targets is not just about the reduction in tailpipe emissions. It is also about them reducing carbon emissions generated in the vehicle manufacturing process (Scope 1) and carbon emissions within the extensive supply chain for materials and components. As with the general move towards the decarbonisation of other industries, so using renewable energy in the manufacturing processes, including, over time, green steel will also be important steps in the automotive sector. In terms of an OEM's wider sustainability (and ESG) performance, however, reducing its carbon footprint should, if possible, not lead to increasing other environmental or social impacts from its activities.

Potential dangers await OEMs' transitioning to BEVs. The rare earth metals required for battery production are found in only a few known locations and those, including the extraction of lithium from salt flats depend on potentially environmentally damaging mining, extraction and ore processing methods, as well as high energy (and freshwater) usage for processing, battery manufacture and transportation. There may also be social and human rights impacts.

There is increasing focus on pollution from rubber tyre manufacture and tyre-wear (ironically exacerbated in the generally heavier BEVs) and the use of plastics in vehicles. At the other end of the vehicle lifecycle, these raw materials need to be recovered and recycled to avoid patterns of wasteful consumption and avoid damage to the environment through poor disposal of contaminated parts and residues. EVs have a more materials-intensive portfolio than ICE vehicles and as of yet there is not a sufficiently efficient recycling and reuse process in place.

In other words, climate change is not the only environmental issue, and it is important to take a holistic approach.

The law of unintended consequences

Poorly thought-through regulations increase the prospects of unintended consequences. This is what happened when in the late 1990s a focus on meeting the Kyoto Protocol targets led governments to promote diesel vehicles over petrol, since diesel engines have comparatively lower carbon emissions. However, diesel exhaust fumes, if not adequately controlled, contain higher particulate emissions and nitrogen oxides, which have been increasingly recognised as being harmful to public health. When it later emerged that some OEMs had been cheating the emissions tests by the use of defeat devices and the fact that, for various reasons, real world emissions performance was worse than under laboratory conditions, there was a public backlash and diesel cars were unceremoniously dumped as the eco car of choice. This led to a major shift away from diesel vehicles to petrol. In the UK for example, the Society of Motor Manufacturers and Traders (SMMT) reported a 29.6% drop in diesel registrations, and diesels typically emit 15%-20% less CO_2 than petrol cars (based on like-for-like performance). So although new cars sold in 2018 in the UK had CO_2 emissions that were 31.2% lower than in 2000 and 20% lower than the average car then in use, average CO_2 emissions of all new cars purchased rose 2.9% to 124.5g/km.

In the EU at least, the disparity in emissions between diesel and petrol in new cars has since been controlled by imposing emissions limits within type approval (product) standards for new cars. The result has been that the emissions limits which diesel cars must now meet for CO_2, nitrogen dioxide and particulates are very similar to those of petrol cars. However, this leaves older, more polluting diesel cars in use on the road which do not conform to the latest type approval category. The move to ZEVs, whether BEV or better hydrogen (with only water vapour being produced as a by-product of combustion) could in time transform urban air quality.

Super-sizing

Unfortunately, the trend towards bigger vehicles such as SUVs is bucking the downwards CO_2 emissions trend in some countries, and this is coupled with the fact that BEVs are heavier than their ICE counterparts. This is despite the car industry delivering new models that improve in terms of CO_2 emissions on the ones they replace. The worldwide market share of SUVs went up 15% between 2014 and 2019, growing to 40% of the global light passenger and delivery vehicles market. In North America and Australia, SUV sales were around 50% of new cars sold. Pickup trucks also had a larger than average share of those markets.

The case for Hydrogen

The electric battery has its limitations in terms of the total power and energy density it can deliver to move heavier vehicles (and the time taken to recharge). This means that so far it has been considered less suitable for HGVs which need to travel long distances, pull a heavy load and where long stops for recharging increase costs and inefficiencies. For lorries (and large agricultural and construction vehicles) therefore, hydrogen fuel cells (FCEVs), perhaps in combination with electrification, are being considered. However, the refuelling infrastructure to support hydrogen vehicles is less advanced.

In its Hydrogen Strategy, the UK Government views transport as a crucial early market for hydrogen, with over 300 hydrogen vehicles on UK roads and support for its use via a £23 million Hydrogen for Transport Programme. It expects future hydrogen demand for transport to be mostly depot-based transport such as buses, noting that FCEV buses have a range similar to their diesel counterparts. It is, however, also planning to sponsor research and innovation activity on more difficult-to-decarbonise transport modes, such as heavy road freight. It expects there to be diversification in transport end uses for hydrogen in the late 2020s and early 2030s leading to its use across a range of transport modes, including HGVs, buses and also rail, along with early stage uses in commercial shipping and aviation. Other European countries, such as France and Germany, are also developing hydrogen transport strategies.

However, as for EVs, the green credentials of hydrogen vehicles will depend on the hydrogen itself being produced with the minimum of associated CO_2 emissions, as well as factors such as the use of mined platinum and gold in the fuel cell stack.

Whatever happened to…biofuel?

Finally, is there any future for biofuel? The original concept involved turning fields over to the production of energy crops for the production of biofuels with the idea being that growing new plants absorbs CO_2 from the atmosphere and so, although this is later released from the biofuel when it is combusted, the process has no net negative impact. It does, however, have the potential to displace land needed for food production and also involves planting a single crop across large swathes of countryside and hence faces the objection that it is harmful (or at least no better than arable crops) for biodiversity. Other concerns were the ability of older engines to run properly on a high biofuel mix. So the popularity of biofuel soon waned after much effort had gone in to producing subsidy regimes. These include, for example, the Renewable Transport Fuel Obligation in the UK, which incentivises oil refineries supplying motor fuels to blend biofuels into petrol destined for station forecourts. Nevertheless, these regimes have stood the test of time and in fact the proportion of biofuel allowed in petrol in the UK recently doubled with hardly anyone noticing. Biofuel therefore remains an important contributor to emission reduction until the phase out of the ICE has occurred and may for example have a continued role in fuel for HGVs.

Whilst the transition to EVs, and particularly BEVs, may seem the most viable option to propel the decarbonisation of road transport, it comes with all sorts of challenges, and other alternative fuels should not be ruled out in the longer-term.

OEMs are now embracing the electric transition with vigour, heavily incentivised to do so by ever more stringent emissions standards and stakeholder views on climate change. However, the provision of accessible EV charging infrastructure even in developed countries is patchy at best and will require more public funds and government support. The other key task of reducing the cost of BEVs will also have to be addressed, as there is a danger that mass-EV adoption will stall if price parity (or at least total cost of ownership parity) with ICE vehicles is not reached within the next five years. The discussion at COP26 may also usefully focus on how the lessons learnt to date can be applied in less developed parts of the world.

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