

# UK AUTOMOTIVE SECTOR: SURVIVING THE NET ZERO TRANSITION.

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**MECHANICAL  
ENGINEERS**



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With Net Zero deadlines looming, the UK auto sector is facing significant headwinds and an uncertain future. Though activity levels have been increasing, the UK is behind the curve as it progresses its transition to a zero emission fleet and Net Zero goals; many significant hurdles have yet to be effectively addressed and the UK's future competitive position as a global vehicle manufacturing nation is at stake. The sector generates revenues of almost £80 billion each year and employs close to 1 million – the impact of an ineffective transition will be profound and potentially irreversible. With urgent action the situation is recoverable but the window of opportunity to do so is closing.

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135<sup>th</sup> IMechE President (2020–21)

The Institution of Mechanical Engineers (IMechE) represents professional engineers from all sectors and strongly supports the transition to Net Zero.

This report has been produced by the IMechE Automobile Division, which comprises more than 10% of our members who have indicated that they work in the automotive and associated industries.

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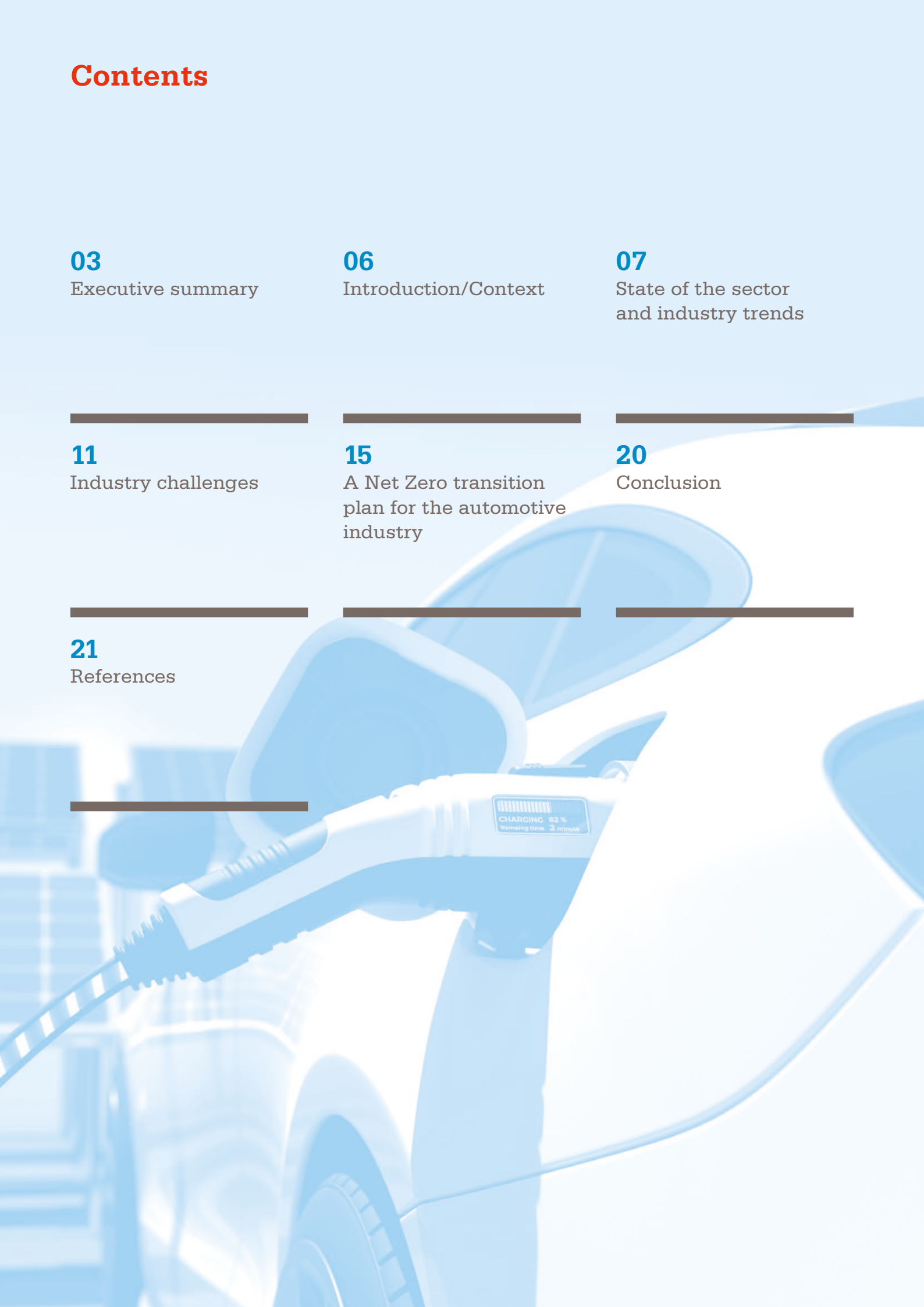
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# Executive summary

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The UK risks damaging its automotive sector unless significant effort is made by government and industry in collaboration. Car design and manufacturing employs approximately 200,000 people directly and 800,000 in the wider automotive industry.<sup>[1]</sup> Many of these jobs are high-paid, high-skilled, and in economically deprived parts of the country. The sector has shrunk in recent years in the face of strong headwinds. The economic, social, and industrial cost of allowing this decline to continue would be vast and very difficult to reverse.

The proposed zero emissions vehicle (ZEV) mandate, a scheme whereby auto-makers' fleets sold in the UK would have to be comprised of an increasing percentage of ZEVs each year from 2024, cannot successfully drive this transition unless it is feeding a receptive market. It is clear that a suite of other policies is needed to make battery electric vehicles (BEVs) an economically viable and practical proposition to consumers. The Government is proposing to mandate an increase in supply without making comparable interventions to promote the uptake of zero emissions vehicles by the public.

More support and incentives for existing and potential UK-based car manufacturers is also required. The £850 million Automotive Transformation Fund, though welcomed, is insufficient. Global competition for jobs and investment is intense. It has been estimated that to provide equivalent support to the USA's Inflation Reduction Act would amount to a £64 billion outlay by the UK Government between now and 2030.<sup>[2]</sup> However, if the country ends up importing most of the cars currently made here, it will mean a capital outflow of hundreds of billions of pounds over the same period, much of it going to new market entrants such as China.

It is not too late to save the industry and this report presents a plan to do so. Targeted strategic interventions will allow one of the UK's globally iconic industries to survive and thrive in a future where road transport must transform to be smarter and completely decarbonised.



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The Institution of Mechanical Engineers (IMechE) recommends:

A level playing field for UK-based manufacturers:

- Both the EU and UK auto sectors depend on and benefit from a close relationship. A technical fix in the short term needs to be agreed to allow frictionless trade with the EU beyond the Trade and Cooperation Agreement (TCA) Rules of Origin that are due to come into force on 1st January 2024 that will specifically affect BEVs. In the longer term, work towards trade rules that align with achievable transition goals of both the UK and the EU auto-industries.
- Increased support and strategic investments in the industry from central Government, but conditional on a high percentage of domestic manufacturing and employment. A new automotive task force to work on creating the right conditions for foreign direct investment that will maintain and build the UK's manufacturing capacity and supply chains.

Support electric vehicle roll-out:

- A holistic approach to incentivisation of BEV private purchase, whether users have access to domestic charging or have to rely on public charging. Private buyers making the transition to a BEV should not be economically disadvantaged when compared with petrol or diesel.
- Boost electric charge-point deployment. There needs to be mandated targets from central government and programmes for measuring what works at a local level should be developed between local governments and researchers, with central Government learning from best practice and adjusting policy accordingly over time. To ensure charge point delivery continues apace in the light of the delay of the 2030 ban on petrol and diesel sales, the Government should consider underwriting the investment risk of the charge point providers.

- A nationwide skills and retraining plan for the auto industry. A whole sector approach is required, with increased focus on upskilling the entire supply chain and aftermarket to enable the transition to zero emission vehicles.

Domestic battery production capacity:

- Create the right conditions for volume battery production in the UK, including enabling funding, supply chain development, securing and processing of critical minerals. Incentivise local clusters around each factory to develop supply chains for other key parts of electric vehicles, not just batteries.

Innovation and value capture:

- More schemes and funding to expedite the scale-up and commercialisation of new battery technologies and other Net Zero supportive technologies for commercial exploitation benefiting the UK.
- Build on the UK Government's Critical Minerals Strategy and develop an auto-specific strategy to ensure the UK can source, mine, and process the materials required for a domestic electric vehicle supply chain. Exploit domestic resources of lithium (and other key materials) and their processing to battery grade where economically viable.
- Increased consideration of recycling and the circular economy in the auto industry. Develop, patent, and exploit technologies that make recycling of batteries economically viable. Create a regulatory environment to make the UK a leader in this field so that the industry reduces its environmental footprint, and the country is less reliant on an increasingly challenging international market for critical materials. Expand Government oversight of end-of-life recycling beyond Defra to join-up responsibility across departments and promote innovation.

More context and the rationale for these recommendations is given in the later sections of the report.

# Introduction/Context

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This report was inspired by a lecture given by 2021 IMechE President Terry Spall in February 2023 entitled *Driving Ahead: The Future of the Car*<sup>[3]</sup>. By this time, it was becoming clear that the UK's historic position as a leader and significant global player in the automotive industry was at risk. The Institution's Automobile Division, which has existed since 1947, put together a working group to examine the challenges facing the sector and put forward a plan to overcome them.

Other organisations have already made significant contributions in this area, including the Society of Motor Manufacturers and Traders (SMMT), who published *Manifesto 2030: Automotive Growth for a Zero Emission Future*<sup>[4]</sup> Green Alliance have also published *Powering up the UK battery industry*, which puts forward a plan to boost domestic battery manufacturing capacity.<sup>[5]</sup>

This IMechE report explores the challenges facing the sector and puts forward proposals for what needs to be done to maintain and grow a large and viable automotive industry in the UK. In particular, it focuses on how the Government and industry need to work together to ensure that the transition to zero emissions cars and vans is successful.<sup>[6]</sup>

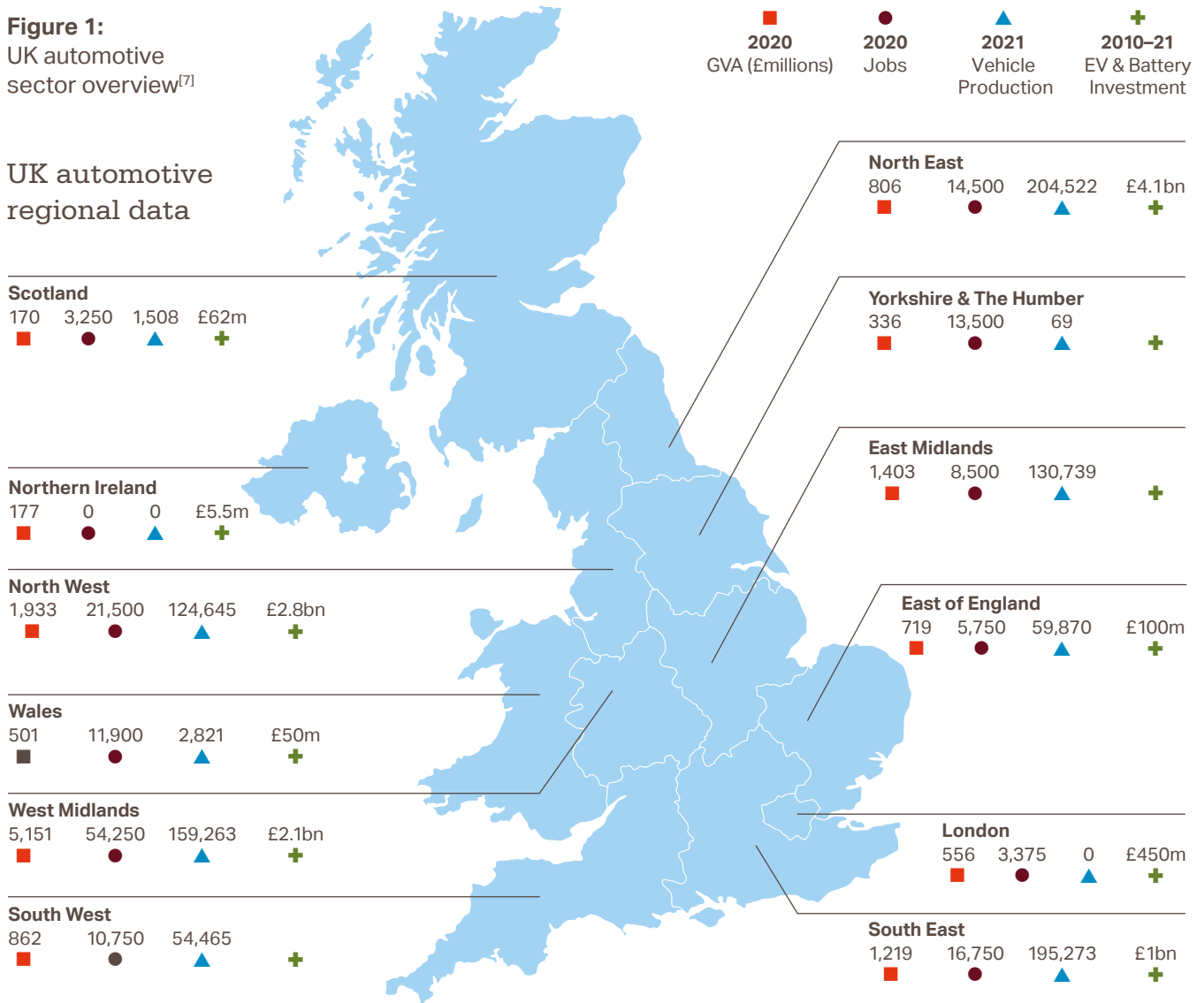


# State of the sector and industry trends

## The UK Automotive Sector

The contribution of the British automotive industry to the UK economy in 2023 is summarised in **Figure 1** below.

**Figure 1:** UK automotive sector overview<sup>[7]</sup>



## The UK automotive industry in numbers

<b>7</b>	<b>9</b>	<b>5</b>	<b>10</b>	<b>60+</b>
Major premium and sports car manufacturers	Design centres	Commercial vehicle manufacturers	Engine manufacturers	Specialist car manufacturers
<b>5</b>	<b>20</b>	<b>8</b>	<b>2,500+</b>	<b>£10.8bn</b>
Mainstream car manufacturers	R&D centres	Bus & coach manufacturers	Suppliers	EV & battery investment 2010-22s

The number of ultra-low emission vehicles (ULEVs – see **Box 1** for definitions) in the UK has increased substantially in recent years. The growth in ULEVs was initially in plug-in hybrid electric vehicles from 2014 onwards. However, growth in battery electric vehicles from early 2019 meant they outnumbered plug-in electric vehicles from Q4 2020 onwards (see **Figure 2**).

The UK was an early adopter of electric vehicles, boosted by domestic manufacturing of the Nissan Leaf in Sunderland from 2010.

Research by What Car?, revealed 56% of car buyers are considering choosing a hybrid, plug-in hybrid, or pure electric car as their next vehicle.<sup>[9]</sup> However, despite a buoyant market for electric vehicles, the total UK car sales in 2022 were the lowest they have been in 30 years.<sup>[10]</sup>

### Box 1: Types of low emission vehicles

**Hybrid Electric Vehicle.** These are powered by an internal combustion engine, but also have a small battery to improve efficiency and/or propel the vehicle at low speeds. Example: Toyota Prius.

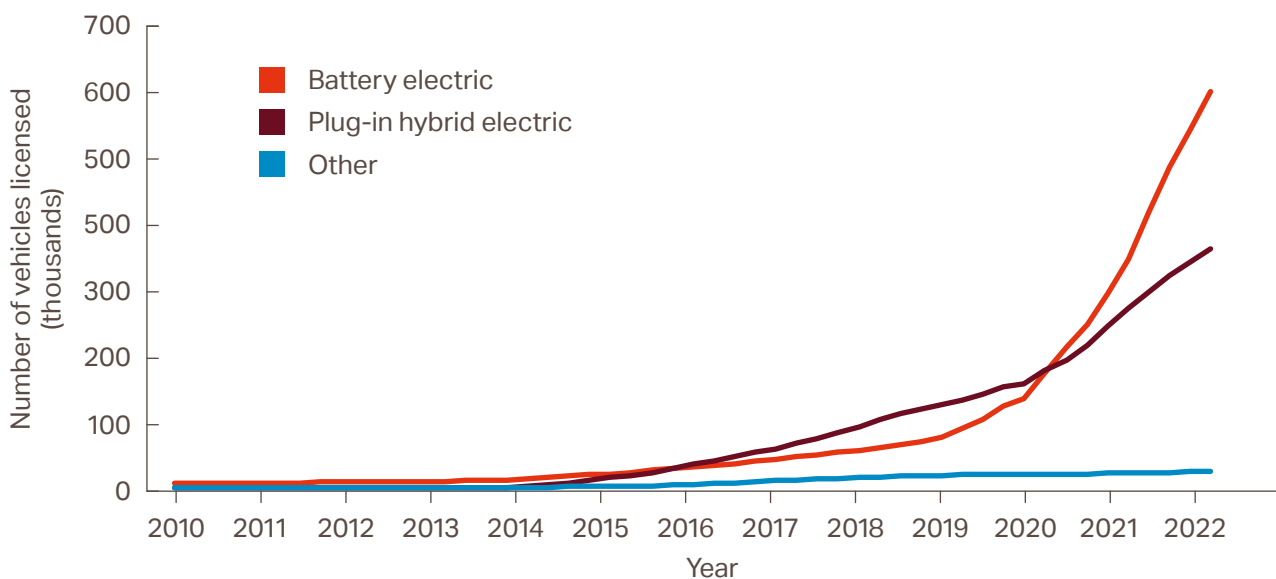
**Plug-in Hybrid Electric Vehicle (PHEV).** Has a larger battery than a non-plug-in hybrid that can be charged up using an external source of electric power. Such vehicles also have engines that propel the vehicle when the battery is depleted. Example: Mitsubishi Outlander.

**Battery Electric Vehicles (BEV).** Is powered by a battery pack and an electric motor alone. It has no engine or fuel tank. Example: Nissan Leaf.

**Fuel Cell Electric Vehicle (FCEV).** An electric vehicle that is propelled by and electric motor using a hydrogen fuel cell as a source of electricity, rather than a battery. Example: Toyota Mirai

**Ultra Low Emissions Vehicle (ULEV).** Any vehicle that emits less than 75 grams of carbon dioxide from the tailpipe.

**Figure 2:** Cumulative ULEV vehicle registrations (in thousands) in the UK by type<sup>[8]</sup>



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Rapid change in the industry is being driven by regulation and in particular the Government's commitments to decarbonise the economy in line with commitments in the Climate Change Act. The key policy in the UK has been the ban on sales of new diesel/petrol cars and light vans from 2035 (pushed back by five years from 2030 in September 2023 by the Government). From 2035 all new vehicles must be zero emission at the tailpipe.

The Government's commitment to electrify the light road transport has been backed by significant investment into institutions and R&D to underpin it, including<sup>[11]</sup>:

- £318m Faraday Battery Challenge ZEV battery development;
- £1.4bn Advanced Propulsion Centre;
- £80m Driving the Electric Revolution – power electronics, electric drivetrains;
- £2.5bn Office for Zero Emission Vehicles funding for R&D, infrastructure and purchase grants;
- £850m Automotive Transformation Fund;
- £440m Connected Automated Vehicle Technology;
- £130m UK Battery Industrialisation Centre.

Clear signals from the governments globally of an end date for internal combustion engine vehicle sales has incentivised industry to also bring forward their own electrification plans. Announcements from major auto manufacturers have included:<sup>[12]</sup>

- Ford plan for every car sold in Europe to be PHEV by 2026 and pure-electric by 2030;
- General Motors plan to sell only electric vehicles by 2035 and be carbon neutral by 2040;
- Groupe PSA, which includes Peugeot, Citroen, DS Automobiles, Opel and Vauxhall, have committed to offering electrified versions of all their vehicles by 2025.
- JLR are investing £15 billion in electrification.
- BMW are aiming to make 50% of vehicle sales electric by 2025.<sup>[14]</sup>



# Industry challenges

## Decline in recent years

The British automotive sector is a vital part of the UK economy but has been facing significant headwinds resulting in the contraction of output summarised in **Tables 1** and **2**.<sup>[15]</sup>

The number of cars built in the UK has halved in five years yet the total number on UK roads has increased 16% over that time, suggesting an increase in imports compared to domestic production. Investment in the UK automotive manufacturing industry has significantly decreased.

**Table 1:** Manufacturing statistics

	2017	2019	2022	Change in 5 Years (%)
<b>Employed across the UK</b>	856,000	864,300	780,000	-8.9
<b>Cars built</b>	1,671,166	1,303,135	776,014	-53.6
<b>Commercial vehicles built</b>	78,219	78,270	101,600	29.9
<b>Engines built</b>	2,722,325	2,520,165	1,500,000	-44.9
<b>Cars on UK roads (million)</b>	34.7	35.1	40.5	16.7

**Table 2:** Economic statistics

	2017	2019	2022	Change in 5 Years (%)
<b>Turnover (£ billion)</b>	82	78.9	67	-18.3
<b>Investment – net capital (£ billion)</b>	4	3.1	2.1	-47.5
<b>R&amp;D investment</b>	3.65	3.72	3	-17.8
<b>Added value (£ billion)</b>	20.2	15.3	14.1	-30.2
<b>Exports worth (£ billion)</b>	44	42.4	32	-27.3
<b>Exports (% of total exports)</b>	12.8	13	10	-21.9

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## Challenges facing the auto industry

It has been a challenging environment for the automotive sector, with common issues affecting the industry as a whole, including:

- **Supply chain – critical minerals (see Box 2).** The supply chain for critical minerals is international, but UK needs to ensure security of supply. Recognising the risk, the Government has developed a strategy for securing these minerals for all sectors.<sup>[16]</sup>
- **Supply chains – general.** The automotive industry is finding it increasingly difficult to be globally competitive and the UK's supply chains are not yet robust enough to support the take-off of a UK-based battery manufacturing ecosystem.<sup>[17]</sup>
- **Trade and co-operation with the EU.** For example, under the 'Rules of Origin' requirements in the UK-EU Trade and Cooperation Agreement (TCA), at least 40% of the finished EV (and 50-60% of the battery pack) must originate in the EU or UK by 31 December 2023, rising to 45% by 31 December 2026 and 55% from 1 January 2027.<sup>[18]</sup> Vehicles that do not meet this requirement will face a tariff of 10%.

- **Protectionist policies and subsidies offered by other similar countries.** For example, in the USA, Inflation Reduction Act (IRA) extended tax credits of \$7,500 for the purchase of BEVs come with a requirement that the vehicle must undergo final assembly in the North America, and have at least 40% of battery material sourced from the US or a country the US has a free trade agreement with.<sup>[19]</sup>
- **High energy costs.** Energy costs have been particularly impactful on the UK's international competitiveness for automotive manufacturing, especially with regard to electricity prices. For example, the UK had the third highest electricity costs for businesses between 1 January to 30 June 2022 among the EU-14 (member states prior to 2004).<sup>[20]</sup>
- **Zero emissions vehicle mandate.** Explored in more detail in the subsequent section.

### Box 2: Definition of critical minerals (taken from The UK's Critical Mineral Strategy)<sup>[21]</sup>

"Modern economies rely on countless raw materials. Many minerals have important uses but, by dint of plentiful supply, functioning markets or an ability to substitute them, do not warrant the focus that others may at this stage. By necessity of focus, only some are defined as "critical".

These "Critical minerals" are not only vitally important but are also experiencing major risks to their security of supply. These risks can be caused by combinations of factors including but not limited to rapid demand growth, high concentration of supply chains in particularly countries, or high levels of price volatility. Many of these critical minerals are produced in comparatively small volumes or as companion metals (i.e., produced as by-products of other mining activities), are non-substitutable in their applications and have low recycling rates."

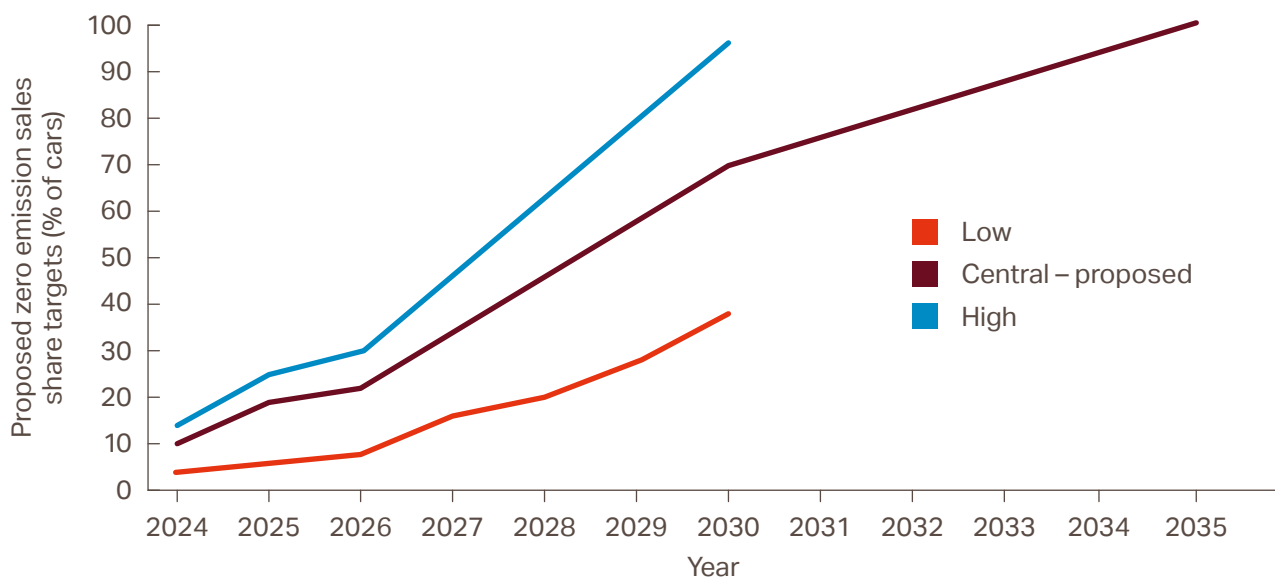
Critical minerals include: copper, lithium, cobalt, nickel, manganese and the rare earth elements.

### The zero emission vehicle mandate

The UK Government has proposed a zero emissions vehicle (ZEV) mandate on manufacturers. This policy would mean auto-makers' fleet sold in the UK would have to be comprised of an increasing percentage of ZEVs each year. The UK Government's plan is to introduce such a mandate for light vehicles (cars and vans) from 2024. While the EU also has legislation that all cars and vans should be zero emission by 2035, there is currently no enforced ramp rate for manufacturers between now and then.

Manufacturers in the UK that miss the average target would have to buy allowances from others (or meet other specific alternative requirements) could face fines of £15,000 per vehicle. The graph in Figure 3 shows the proposed trajectory for the industry as a whole. The breakdown by each manufacturer and the effect on them will be different. Forcing the average on every manufacturer will disproportionately affect some.

**Figure 3:** The proposed trajectory of the ZEV mandate<sup>[22]</sup>



At present, even if the industry is ready to deliver on the ZEV mandate, there are many signs suggesting that vehicles produced by the manufacturers may not find buyers, including:

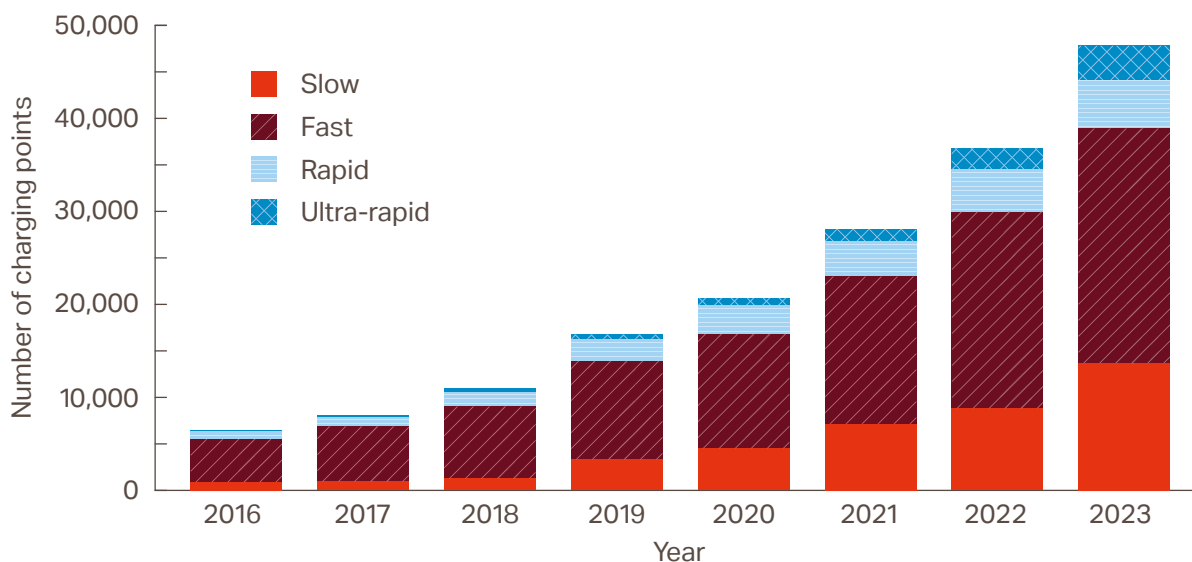
- **Sluggish private BEV sales.** There are still signs of low public enthusiasm for fully electric vehicles.<sup>[23]</sup> Headline figures for high and rising BEV sales are masking the fact that ~80% are company cars. These benefit from much more generous incentives than private sales.<sup>[24]</sup>
- **Cost of material.** The cost of new electric vehicles has been driven up by competition for critical minerals.<sup>[25]</sup> Combined with the withdrawal of the Plug-In Car Grant, this means consumers could face a significant premium for purchasing electric vehicles for some time.
- **Public charging infrastructure.** The UK is behind the targets set by Government for charge-point roll-out (see **Figure 4** for current trajectory).<sup>[26]</sup> Households that do not have, or cannot install, their own charge-point also face a significant premium in having to pay to use public infrastructure. If high-rate public chargers are used, the cost per mile of a BEV could be higher than a petrol car. Zapmap data shows that there was an increase of 46% in the cost of public charging from July 2022 to July 2023.<sup>[27]</sup>

- **Skills shortage.** A recent Recharge UK report highlighted the need for more trained charge-point installers and for retraining across the sector, in particular for technicians in the aftersales market to be retrained in servicing BEVs.<sup>[28]</sup>
- **Vehicle Excise Duty.** Electric vehicles are currently exempt from Vehicle Excise Duty. This exemption is due to end in 2025.<sup>[29]</sup> All BEVs would then align with fossil fuelled vehicles and pay the standard rate of VED currently £165, in addition, any BEV which cost more than £40,000 (and many do) would be subject to the 'expensive car supplement' (from which they are currently exempt. Whilst this generates essential revenue for the treasury, removing the exemption does not incentivise consumers to make the transition.

There will also be a general election by January 2025<sup>[30]</sup>, which could slow legislative output and mean more regulatory uncertainty.

Despite these challenges, the ban on the sale of diesel and petrol cars and vans is widely supported in the automotive sector and manufacturers are already making significant investments to gear up for it. However, the Government's current approach of giving companies targets for sales through the ZEV mandate, without adequate policies to make BEVs an attractive proposition for consumers, needs to change.

**Figure 4:** Installed public charge-points over time<sup>[31]</sup>





# A Net Zero transition plan for automotive industry

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## A level playing field for UK manufacturers

Government and industry need to come together. To consolidate the sector as it stands, as well as taking advantage of rapid changes in the market, a new Net Zero transition plan for the auto industry is required. The first phase of this needs to be developed and implemented in months not years.

In the medium-term, there will be opportunities for the UK to build on its strengths and develop new opportunities. For example, luxury high-performance cars is an area of comparative advantage that will need specific support through the transition to zero carbon road transport. However, the initial focus should be on ensuring volume-market UK-based manufacturers are operating on a level playing field with international competition.

Every country in the G20 has some form of government supported action for their domestic automotive industry, either to protect it, enhance it, or both. These include import, minimum domestic content requirements, direct subsidies for both R&D and plants. Government subsidies for Chinese car makers has prompted the European Commission to investigate whether the EU should impose tariffs on import of these vehicles.<sup>[32]</sup>

Countries such as Thailand and Vietnam are growing domestic car production through subsidies. Mexico benefits from being included in the NAFTA bloc along with US & Canada. The EU is putting in place domestic content and especially battery sourcing requirements. In the face of this competition, the UK risks making itself uniquely uncompetitive. This has created a risk of significant migration of capacity and investment to elsewhere in Europe.

If the UK ends up importing electric cars rather than manufacturing them, it may also have negative environmental consequences. Britain's electricity system emits less carbon per kilowatt produced than many comparable nations. The Faraday Institution estimate that manufacturing electric vehicles in the UK could mean 12% lower carbon emissions when compared with the EU average.<sup>[33]</sup>

**Recommendation:** Both the EU and UK auto sectors depend on and benefit from a close relationship. A technical fix in the short term needs to be agreed to allow frictionless trade with the EU beyond the Trade and Cooperation Agreement (TCA) Rules of Origin that are due to come into force on 1st January 2024 that will specifically affect BEVs. In the longer term, work towards trade rules that align with achievable transition goals of both the UK and the EU auto-industries.

**Recommendation:** Increased support and strategic investments in the industry from central Government, but conditional on a high percentage of domestic manufacturing and employment. A new automotive task force to work on creating the right conditions for foreign direct investment that will maintain and build the UK's manufacturing capacity and supply chains.

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## Supporting the low carbon transition

The Government have set targets for the transition away from diesel- and petrol-powered vehicles. These are widely supported by the industry, and the IMechE endorses them in principle, but without stronger investment and Government intervention to enable the transition – the greatest the sector has ever seen – they may not be achievable. The £850 million Automotive Transformation Fund, though welcomed, is insufficient and eligibility for access to support is not wide enough.

The proposed zero emissions vehicle (ZEV) mandate, a scheme whereby auto-makers' fleet sold in the UK would have to be comprised of an increasing percentage of ZEVs each year from 2024, cannot drive this transition unless coupled with suite of other policies to make battery electric vehicles (BEVs) more attractive to consumers.

Statistics showing battery electric vehicles (BEVs) sales sharply increasing are masking the fact that the vast majority of these are company cars. This is because tax benefits and other perks often make them a much more attractive proposition than for private buyers.<sup>[34]</sup>

The roll-out of electric charge-points is behind what is needed and there appears to be no overall strategy for delivering on targets. Many motorists also remain sceptical, with the economics of the transition to a BEV being out of reach of many, especially for the 44% of household who will not have access to the low-cost option of charging their vehicle at home.<sup>[35]</sup> The transition to electric cars needs to be made more palatable for motorists by rapidly expanding public charge-point deployment and ensuring a thriving market, with good regulation, to keep prices down for consumers.

Without the right incentives and higher public confidence in an electric future, the Government will be mandating the sale of vehicles before the market is ready. The Government is proposing to mandate an increase in supply without taking comparable interventions to promote the uptake of zero emissions vehicles by the public.

**Recommendation:** A holistic approach to incentivisation of BEV private purchase, whether users have access to domestic charging or have to rely on public charging. Private buyers making the transition to a BEV should not be economically disadvantaged when compared with petrol or diesel.

**Recommendation:** Boost electric charge-point deployment. There needs to be mandated targets from central government and programmes for measuring what works at a local level should be developed between local governments and researchers, with central Government learning from best practice and adjusting policy accordingly over time. To ensure charge point delivery continues apace in the light of the delay of the 2030 ban on petrol and diesel sales, the Government should consider underwriting the investment risk of the charge point providers.

**Recommendation:** A nationwide skills and retraining plan for the auto industry. A whole sector approach is required, with increased focus on upskilling the entire supply chain and aftermarket to enable the transition to zero emission vehicles.

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## Domestic battery production capacity

There has been strong support for research in battery development, but funding to incentivise commercial manufacturing capacity has not been high enough and the UK has fallen behind other comparable nations in this area. Local supply chains are developing but immature and without intervention more and more cars and light vans will be imported, rather than produced domestically, with a significant negative impact on the gross value added by the sector.

Strategic investment will also be required to grow BEV supply chain capability. Government needs to create the right conditions for foreign direct investment (FDI) to boost manufacturing capacity at all levels in the supply chain, including manufacture of other key components like motors and power electronics. BEVs are more than just the battery.

In assessing investment plans, electric vehicle manufacturers are likely to want battery production in close proximity to full vehicle assembly. Indeed, in a recent evidence submission to Parliament, Nissan stated<sup>[36]</sup>:

“Given the vital importance of batteries as a component in electric vehicles, few manufacturers will choose to build EVs in a separate location to their batteries, and Nissan sees this as an important factor in its partnership with Envision AESC, co-located on the Sunderland site.

Automotive manufacturing is a highly competitive, global market. Decisions are made at a global level based on competitiveness between markets. The UK must, therefore, continually prove that it is a strong destination for both vehicle and battery manufacturing. Government can support this with a competitive business environment, a clear industrial strategy, continued investment in R&D and facilitating access to critical raw materials.”

The Advanced Propulsion Centre (APC) estimates that there will be sufficient demand in the UK to support at least four or five gigafactories at viable scale by 2030.<sup>[37]</sup>

According to the Faraday Institution, European gigafactory capacity projected for 2030 has more than doubled from 450 GWh (Gigawatt hours) per annum to over 1,100 GWh, with over 40 plants now expected to be open and producing cells by the turn of the decade. Globally, there are now around 300 gigafactories and 6,400 GWh of lithium-ion battery capacity in the pipeline.<sup>[38]</sup> China is expected to achieve a capacity of over 3,200 GWh by 2030.<sup>[39]</sup>

To take full advantage of the low carbon transition in road transport, the UK needs substantially greater battery manufacturing capacity and upstream materials supply, including multiple new gigafactories and manufacturing plants for key high value inputs such as anode, cathode and electrolyte materials.

Without UK battery manufacturing capacity, there is a significant risk that major investments in UK vehicle plants will fail to be attracted resulting in significant direct and indirect employment losses and the closure of several UK assembly plants and which are typically located in regions of relatively low GDP per capita, increasing the societal and economic impacts. The UK automotive sector has historically manufactured 1.0-1.6 million vehicles every year, this would ultimately not be ‘future-proofed’ resulting in multiple plant closures and job losses across the regions.<sup>[40]</sup>

**Recommendation:** Create the right conditions for volume battery production in the UK, including enabling funding, supply chain development, securing and processing of critical minerals. Incentivise local clusters around each factory to develop supply chains for other key parts of electric vehicles, not just batteries.



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## Innovation and value capture

Securing an affordable and sustainable supply of critical minerals required to manufacture batteries for electric vehicles should also be a strategic priority.

Limited UK capacity and capabilities already exist in lithium mining and processing, as well as graphite anode production. There is also significant potential for deep sea harvesting of critical minerals. This issue has attracted attention due to uncertainty of the environmental consequences and a moratorium has been proposed by some. Extraction of minerals, whether land or ocean based comes with environmental and ecological challenges. It is right to be very cautious, but the UK has strong marine engineering capabilities and expertise in environmental mitigation and could play a role in determining whether these critical minerals (in the form of 'polymetallic nodules' which are rich in nickel, cobalt, manganese and copper) can be harvested responsibly and with minimal impact on the environment and ecology.

In addition to sourcing newly mined materials, there needs to be a greater focus on recycling materials from vehicles at the end of their lives. The UK could innovate in developing new efficient ways of dismantling and reusing and recycling valuable materials from road vehicles. The engineering community, in academia and industry, should also work on designing vehicles to be more readily recyclable. In the longer term, a Net Zero transition plan for road transport needs to be about creating and expanding new markets.

Finally, decarbonisation of road transport should be technology neutral and will likely need to include hydrogen and/or low carbon liquid fuels ('e-fuels') for certain types of vehicles. Government should continue to fund research and develop infrastructure to support this.

**Recommendation:** More schemes and funding to expedite the scale-up and commercialisation of new battery technologies and other Net Zero supportive technologies for commercial exploitation benefiting the UK.

**Recommendation:** Build on the UK Government's Critical Minerals Strategy and develop an auto-specific strategy to ensure the UK can source, mine, and process the materials required for a domestic electric vehicle supply chain. Exploit domestic resources of lithium (and other key materials) and their processing to battery grade where economically viable.

**Recommendation:** Increased consideration of recycling and the circular economy in the auto industry. Develop, patent, and exploit technologies that make recycling of batteries economically viable. Create a regulatory environment to make the UK a leader in this field so that the industry reduces its environmental footprint, and the country is less reliant on an increasingly challenging international market for critical materials. Expand Government oversight of end-of-life recycling beyond Defra to join-up responsibility across departments and promote innovation.

# Conclusion

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The UK risks damaging its automotive sector unless significant effort is made by government and industry in collaboration. Car design and manufacturing employs approximately 200,000 people directly and 800,000 in the wider automotive industry.<sup>[41]</sup> Many of these jobs are high-paid, high-skilled, and in economically deprived parts of the country. The sector has shrunk in recent years and in the face of strong headwinds. The economic, social, and industrial cost of allowing this decline to continue would be vast and very difficult to reverse.

The proposed zero emissions vehicle (ZEV) mandate, a scheme whereby auto-makers' fleet sold in the UK would have to be comprised of an increasing percentage of ZEVs each year from 2024, cannot successfully drive this transition unless it is feeding a receptive market. It is clear that a suite of other policies is needed to make battery electric vehicles (BEVs) an economically viable and practical proposition to consumers. The Government is proposing to mandate an increase in supply without taking comparable interventions to promote the uptake of zero emissions vehicles by the public.

More support and incentives for existing and potential UK-based car manufacturers is also required. The £850 million Automotive Transformation Fund, though welcomed, is insufficient. Global competition for jobs and investment is intense. It has been estimated that to provide equivalent support to the USA's Inflation Reduction Act would amount to a £64 billion outlay by the UK Government between now and 2030.<sup>[42]</sup> However, if the country ends up importing most of the cars currently made here, it will mean a capital outflow of billions of pounds over the same period, much of it going to new market entrants such as China.

It is not too late to save the industry and this report presents a plan to do so. Targeted strategic interventions will allow one of the UK's globally iconic industries to survive and thrive in a future where road transport must transform to be smarter and completely decarbonised.

# References

- 1 SMMT (2023). Manifesto 2030: Automotive Growth for a Zero Emission Future.
- 2 Green Alliance (2023). The cost of implementing the IRA's electric vehicle policies in the UK.
- 3 Available online: [https://www.youtube.com/watch?v=8zQrr9\\_HXSk](https://www.youtube.com/watch?v=8zQrr9_HXSk)
- 4 SMMT (2023). Manifesto 2030: Automotive Growth for a Zero Emission Future.
- 5 Green Alliance (2023). Powering up the UK battery industry.
- 6 UK Government (2023). A zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK, Department for Transport.
- 7 SMMT (2022). Full Throttle to Full Charge: Driving Forward UK Automotive.
- 8 House of Commons Library (2023). Electric Vehicles and Infrastructure.
- 9 <https://www.whatcar.com/news/electric-car-charging-the-best-home-charging-solutions/n21685>
- 10 <https://www.bbc.co.uk/news/business-64165689>
- 11 UK Government (2022). Automotive Roadmap: Driving Us All Forward.
- 12 House of Commons Library (2023). Electric Vehicles and Infrastructure.
- 13 <https://www.jaguarlandrover.com/news/2023/04/jlr-invest-ps15-billion-over-next-five-years-its-modern-luxury-electric-first-future>
- 14 <https://www.bmw.co.uk/en/topics/discover/electromobility/sustainability.html>
- 15 Source of data for tables 1 and 2: SMMT Motor Industry Facts.
- 16 UK Government (2023). Resilience for the Future: The UK's Critical Minerals Strategy.
- 17 Nissan Motors UK (2023). Evidence submission to House of Commons BEIS Select Committee Inquiry on 'Batteries for electric vehicle manufacturing'.
- 18 House of Commons Library (2023). Electric Vehicles and Infrastructure.
- 19 <https://home.treasury.gov/news/press-releases/jy1379>
- 20 Nissan Motors UK (2023). Evidence submission to House of Commons BEIS Select Committee Inquiry on 'Batteries for electric vehicle manufacturing'.
- 21 UK Government (2023). Resilience for the Future: The UK's Critical Minerals Strategy.
- 22 Department for Transport (2023). A zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK.
- 23 Department for Transport (2023). National Travel Attitudes Study (NTAS): Wave 7. <https://www.gov.uk/government/statistics/national-travel-attitudes-study-wave-7/national-travel-attitudes-study-ntas-wave-7>
- 24 <https://www.autoexpress.co.uk/news/105893/uk-new-car-sales-2023-july-sees-one-new-ev-registration-every-60-seconds>
- 25 <https://www.energymonitor.ai/finance/risk-management/data-shows-how-the-cost-of-energy-transition-minerals-has-soared-since-2020/>
- 26 <https://www.thisismoney.co.uk/money/electriccars/article-12099511/Government-miss-electric-vehicle-charging-point-target.html>
- 27 <https://www.zap-map.com/ev-stats/charging-price-index>
- 28 <https://greenfleet.net/news/27072023/government-urged-address-electric-vehicle-skills-gap>
- 29 <https://www.gov.uk/government/publications/introduction-of-vehicle-excise-duty-for-zero-emission-cars-vans-and-motorcycles-from-2025>
- 30 <https://www.bbc.co.uk/news/uk-politics-62064552>
- 31 Source: Zapmap Database <https://www.zap-map.com/ev-stats/how-many-charging-points>
- 32 <https://www.reuters.com/world/europe/eu-launches-anti-subsidy-investigation-into-chinese-electric-vehicles-2023-09-13/>
- 33 Gifford, S. (2021) 'The UK: a low carbon location to manufacture, drive and recycle electric vehicle', the Faraday Institution.
- 34 <https://www.smmt.co.uk/2023/09/consumer-support-key-to-faster-and-fairer-ev-transition-as-market-enters-new-phase/>
- 35 <https://www.fleetnews.co.uk/news/latest-fleet-news/electric-fleet-news/2023/01/04/almost-half-of-uk-homes-unsuitable-for-electric-vehicles>
- 36 <https://committees.parliament.uk/writtenevidence/118626/pdf/>
- 37 Nissan Motors UK (2023). Evidence submission to House of Commons BEIS Select Committee Inquiry on 'Batteries for electric vehicle manufacturing'.
- 38 The Faraday Institution (2022). UK electric vehicle and battery production potential to 2040.
- 39 <https://www.spglobal.com/marketintelligence/en/news-insights/research/lithium-ion-battery-capacity-to-grow-steadily-to-2030>
- 40 Nissan Motors UK (2023). Evidence submission to House of Commons BEIS Select Committee Inquiry on 'Batteries for electric vehicle manufacturing'.
- 41 SMMT (2023). Manifesto 2030: Automotive Growth for a Zero Emission Future.
- 42 Green Alliance (2023). The cost of implementing the IRA's electric vehicle policies in the UK.

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