Written evidence submitted by the Society of Motor Manufacturers and Traders (SMMT)

Introduction and Sector Overview

1. The Society of Motor Manufacturers and Traders (SMMT) is one of the largest and most influential trade associations in the UK. It supports the interests of the UK automotive industry at home and abroad, promoting the industry to government, stakeholders and the media. The automotive industry is a vital part of the UK economy accounting for £78.9 billion turnover, £15.3 billion value added and invests more than £3 billion each year in automotive R&D. With some 180,000 people employed directly in manufacturing and 864,000 across the wider automotive industry, it accounts for 13% of total UK exports of goods with over 150 countries importing UK produced vehicles, generating more than £100 billion of trade. More than 30 manufacturers build more than 70 models of vehicle in the UK supported by over 2,500 component providers and some of the world's most skilled engineers.

2. Automotive is one of the UK's most valuable economic assets, embedded in communities across the country. The sector is fundamental to delivery on the government's priorities: reaching net-zero, levelling-up, COVID-19 recovery and the global trade agenda. The start to 2021 continues to be challenging. Despite this, we remain ambitious as a UK industry, and seek to work collaboratively with government to deliver for the UK economy. As the Green Industrial Revolution 10-point plan (November 2020), and the recent 'Build Back Better: Plan for Growth' set out, the importance of the UK as an automotive market, for both the transition to zero emission vehicles, as well as a leading and competitive country in which to manufacture and build vehicle and parts and components cannot be understated. We hope to see this commitment supported through the continuation of an automotive-specific sector strategy and joined-up coherent policy making across government – including for gigafactories and the electric supply chain investment and development.

3. The automotive industry is fully committed to the electrification journey towards zero tailpipe emission vehicles and a future of greener and more sustainable mobility. This commitment is evidenced in recent years by the various announcements of vehicle manufacturers' electrification plans. There are currently more than 150 ultra-low emission vehicle (ULEV) models available for UK consumers alone – one in three models available to buy today is zero-emission capable. More than 300 models are expected to be available in the market in Europe by 2025.

4. To deliver on zero emission ambitions measures supporting all aspects of this transition are essential. The government and other key sectors involved must match manufacturers' commitment by investing in the incentives and infrastructure needed to drive uptake. To deliver on its own ambition, the government must urgently develop a clear and credible transition plan combined with a consistent package of support for consumers and industry, commensurate to this generational challenge and its accelerated trajectory. The plan must be equipped with a clear cross-sectoral roadmap, backed by equally ambitious funding, and should include binding commitments and targets on all sectoral stakeholders. For it to be credible, the plan must also contain clear milestones and gateways that trigger the next course of policy action, including potentially accelerating uptake through further incentives, upon regular progress reviews. Therefore, we welcome the opportunity to contribute to the Select Committee's timely inquiry.

5. Britain's transition to zero emission vehicles – in market, engineering, and production, whether electrified or through other alternatively fuelled powertrains and technologies – can deliver a greener, cleaner future; one that will create new jobs, drive economic growth, and help the country achieve its net zero goals. In any transformational technological transition, the impact on employment is not consistent with jobs both created in new and emerging fields but inevitably lost in others. The transition to zero emission mobility in the UK must be carefully managed to take account of the accompanying employment transition (and its uneven effects) on businesses, regions and communities, with a concerted focus on retention,

retraining and upskilling. Therefore, this transition can only succeed if the right policy framework and government support is in place, every stakeholder plays their part, and we ensure these vehicles are accessible, affordable and increasingly made in Britain. With less than nine years to go until 2030, there is no time to lose.

INQUIRY QUESTIONS

What contribution could battery electric vehicles make to achieving net zero by 2050?

6. Battery Electric Vehicles will make a significant contribution to achieving net zero by 2050 with the automotive sector already undertaking the greatest technological transformation since the invention of the combustion engine. The end of sale of petrol and diesel engines by 2030, and hybrids by 2035, mean all new vehicles will be zero tail pipe emission capable vastly reducing the contribution of road transport to overall UK emissions. We expect over 95% of cars in use to be zero emission, whilst other technological innovations such as hydrogen fuel cells will support other uses, such as heavy duty vehicles, to significantly reduce their environmental footprint. The sector is also making great strides to increase the efficiency of vehicle production, increase use of clean energy sources, working on improving the circularity and sourcing of batteries, and minimising the use of critical raw materials where technically possible.

7. UK automotive is in the vanguard of the drive to electrification and net zero. The transformation timetable set by government across the Road to Zero, Plan for Growth and 10 Point Plan for a Green Industrial Revolution are extremely challenging and ambitious – more so than those imposed on any other sector – and government must therefore be a partner to the UK automotive sector in order to deliver our shared net zero goals on schedule, in a sustainable way, which protects our environmental and economic interests, and positions the UK as the best place to manufacture and invest in next generation vehicles, and evolve our highly skilled workforce and talent pipeline to into the green workforce of the future.

8. More than 150 models of battery electric, plug-in hybrid, fuel cell and hybrid electric vehicle are now on the market, meaning one in three models available to buy is zero-emission capable. Acceptance of electric vehicles has been accelerating, accounting for one in 10 registrations in 2020. However, the vast majority of zero-emission cars registered last year were for business or fleet purchasers – not the private consumer. This has been driven, in part, by favourable business taxation and incentivisation and an increased focus on corporate sustainability. Just 4.6% of new consumer vehicles were battery powered. There is a significant market yet to be won, with the environmental benefits that will contribute. UK automotive is already committed to, and delivering, zero-emission motoring, therefore the reduction of the Plug-in Car Grant and Plug-in Van Grant is the wrong move at the wrong time leaving the UK consumer with an uncompetitive retail offer compared to almost every major European neighbour market.

How well is Government policy aligned with high-level commitment for growth of battery electric vehicles to support its net zero ambition?

9. At a high level, government targets are heavily geared to Battery Electric Vehicles as a significant contributor to its overarching net zero ambitions. The government has placed significant and challenging dates for the end of sale of petrol and diesel engine vehicles by 2030, and hybrids by 2035, upon the automotive sector; an accelerated timetable compared to other sectors, and well in advance of 2050 commitments. The delivery plan, however, must be further developed with clear funding, cross-sector commitments, and targets for all stakeholders – including energy providers and infrastructure – if the electric revolution is to be made real. The automotive sector invested over £3.7bn in research and development in 2019 alone as we invest in the future. Further support to augment this is needed to accelerate the desired changes and foundations for long-term success.

10. The government's Road to Zero ambition is driven by a strong resolve to meet the net-zero target by 2050 here in the UK, but must also consider wider environmental responsibilities and ethical issues, such as those related to the mining and extraction of critical raw materials for ULEV batteries, reuse and recycling, and disposal – detailed further in this paper.

11. When viewed from an overall lifecycle perspective, technologies other than zero emission vehicles (ZEVs) are also capable of reducing greenhouse gas emissions. For example, depending on production, use and the source of electricity for charging, an average plug-in hybrid electric vehicle (PHEV) could emit as much or less greenhouse gases over its lifetime compared to a battery electric vehicle (BEV).[1] Therefore, discriminating against certain technologies does not necessarily help reduce greenhouse gas emissions towards achieving net-zero by 2050. Taking a technology neutral approach preserves consumer choice, challenges industry to innovate and increases the likelihood of successful transition of the market to ZEVs.

12. Until consumer uptake barriers are genuinely overcome, technologies such as PHEVs, hybrid electric vehicles (HEVs) and even more efficient ICE vehicles have a role for millions of motorists for whom BEVs may not yet be a viable or affordable alternative. PHEVs, for example, play a vital role in helping consumers make the transition to ZEVs and provide an introduction to the need for charging whilst sustaining confidence in range, and are available on the market today. With the aid of automatic geofencing technology and increased electric range to about 50 miles, most journeys in PHEVs could be achieved with zero tailpipe emission. Curtailing the sale of PHEVs just because they have an ICE is to address the most visible source of pollution while ignoring their actual lifecycle contribution to the environment.

Are the UK supply chain opportunities around supply of batteries and power electronics, machines and drive supply chain clear?

13. The UK has a long and successful history in automotive manufacturing with ICE vehicle manufacturing in the West Midlands for over 120 years and automotive embedded across the UK. We have the expertise and engineering experience to make superior, desirable and high-quality cars and commercial vehicles sought after by consumers all over the world. Investments in ULEV production announced in the last two years are proof that the UK can be a location of choice for vehicle manufacturers. As consumer demand for ULEVs grows, increased investment in domestic manufacturing will be necessary. Decisions to locate future production of ULEVs in the UK will depend to a large extent on the availability of a local battery supply chain. This invariably means two things: battery manufacturing at scale and a strong supply chain for battery materials and related chemicals.

14. Automotive manufacturing and its supply chain are key contributors to the UK's economic prosperity, accounting for £82 billion turnover and £18.6 billion value added annually and 13% of total UK exports to over 150 markets worldwide. 823,000 people are employed in the entire automotive sector, of which 168,000 are directly employed in manufacturing. More than 30 volume, low volume and specialist vehicle manufacturers build in excess of 70 vehicle models in the UK, supported by around 2,400 component providers and some of the world's most skilled engineers. Sustaining the UK automotive supply chain and providing adequate support to help the industry transition to new technologies is essential and critical to the global competitiveness of the UK, particularly in the post-Brexit era. Currently large sections of the UK automotive industry are geared towards producing internal combustion engines (ICE) and ICE vehicles. Of the 1.3 million cars that were built in the UK in 2019, over 190,000 (15%) were alternatively fuelled vehicles and 3.4% were battery electric vehicles (BEVs), while every one of the 57,000 commercial vehicles built in the UK was conventionally fuelled. The industry takes pride in its skilled workforce and its ability to produce 2.5 million engines per annum for use across the world. UK light duty vehicle engine production is worth £8.5 billion per annum and supports some 8,000 jobs, of which around 3,500 are reliant on diesel engine production alone. Therefore, the opportunity still available to grow a zero emission supply chain is visible

[1] International Energy Agency (2019), Global EV Outlook 2019, available at www.iea.org/reports/global-ev-outlook-2019.

if the conditions to enable industrial transformation are favourable. Significant expansion of the fledgling ULEV supply chain includes focused support and investment in power electronics, motors, drivetrains, fuel cells and other components relevant to electrification.

15. The most tangible and visible commitment – securing battery gigafactories and associated strong battery materials supply chain – represent a considerable industrial opportunity for the UK. The Advanced Propulsion Centre (APC) has identified £12 billion worth of opportunities, not just in final cell assembly but also in cathode and anode manufacturing, electrolyte manufacturing and the supply of components for battery modules and packs.[2] Volume production of ULEVs is usually concentrated in regional locations where there is an adequate battery supply chain. This is not just because of restrictions in transporting lithium-ion batteries over long distances, but also due to the synergies that proximity can offer, such as increased flexibility for just-in-time production, greater reliability of supply and insulation against foreign exchange volatility and geopolitical uncertainties. If the vast majority of gigafactories required for battery manufacturing at scale and associated supply chains are located abroad, there is a serious risk that vehicle manufacturers may decide to invest in future ULEV production outside the UK.

16. European total battery manufacturing capacity is expected to reach nearly 450GWh per annum by 2030. Germany has emerged as the leading location, accounting for 38% of capacity, followed by Poland (16%) and Sweden (13%). European total capacity is projected to top 1.2TWh per annum by 2040. Until Britishvolt's planned 35GWh capacity factory in Blyth is fully commissioned[3] and other potential projects in the pipeline, the UK share of the total capacity is just approximately 2.5GWh per annum. Several competitor countries, including across Europe, have created favourable business environments to attract ULEV and battery manufacturers, the UK needs to make an urgent commitment to battery manufacturing if it is to become a global leader.

17. The need for battery production at scale to support ULEV manufacturing cannot be overstated and if this opportunity is fully realised in Britain, it can unlock support and investor enthusiasm for electrified supply chain value creation and wider manufacturing investment to transform OEM operations, and build a strong and competitive electrified ecosystem here in the UK.

18. Based on the assumption that a 15GWh capacity battery production facility will feed the production of up to 250,000 BEVs each with up to 300 miles range, four gigafactories with a combined capacity of 60GWh per annum will be needed to produce one million BEVs by 2030 averaged across all segments (or more ULEVs, if a mix of different electrified powertrains are considered) per annum. An annual capacity of 120GWh will then be needed by 2040 if the longer-term ambition is to produce two million BEVs. Should this capacity be available in the UK by 2040, it would still only be approximately 10% of the projected 1.2TWh of European battery production capacity per annum by 2040. Setting up a fully functioning gigafactory takes anything between 30 and 42 months from design, development and construction to test-runs and commissioning. It can also take time to ramp up and realise a new site's full capacity over the course of the early years of production, which should also be factored into our planning and wider understanding when seeking to accelerate UK battery capacity to meet already ambitious timescales. The UK has missed the boat in commercialising the lithium-ion technology that it introduced to the world; we cannot afford to be left behind in ULEV production.

19. The £318 million investment into the Faraday Battery Challenge over the 2017-2021 period to fund fundamental research, innovation projects and the UK Battery Industrialisation Centre (UKBIC) is a good start. While £129 million UKBIC will play an important role to support the development of vehicle prototypes and supply chain capacity, the validation of cost, performance and quality of materials, and the proofing of processes, it is not a giga-scale

[2] Advanced Propulsion Centre (2020), Strategic UK Opportunities in Passenger Car Electrification, available at https://www.apcuk.co.uk/app/uploads/2020/06/APC-Passenger-car-electrification-report-online-v1.pdf.
[3] Burgess, R. (2020), "Start-up Britishvolt to open UK's first gigafactory in South Wales", Autocar, 29 July, available at https://www.autocar.co.uk/car-news/industry/start-britishvolt-open-uk%E2%80%99s-first-gigafactory-south-wales.

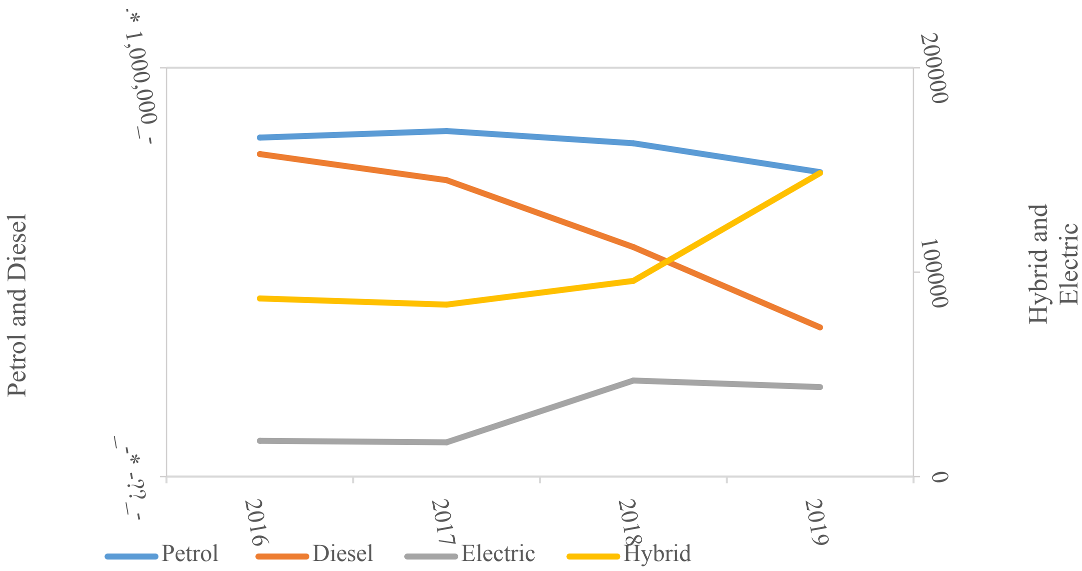
production facility suitable for manufacturing the industrial volumes required to sustain the industry. To attract substantial investments by established large-scale battery cell manufacturers, co-ordinated leadership across government and partnership between government and industry are essential. Other European governments are already expending every effort to secure and grow a new battery industry. For instance, Germany and France have announced €1 billion and €700 million respectively of financial support towards battery production.[4] For the UK to become a location of choice for potential investors, the government must create the right conditions urgently given the immediacy of decision making by global investors looking to build low carbon capability now. This means ensuring we are globally competitive, that there is a streamlined process for obtaining the necessary permits and licences, easy access to skilled and productive labour and competitively priced clean energy.

20. Ensuring a critical economic mass combining vehicle production, battery manufacturing and a battery materials supply chain, with the right technology in the right place at the right time, is the surest foundation for success. Gigafactory investors value proximity to vehicle production (i.e. customers) and materials suppliers. Of the current total annual car production in the UK, only 15% are alternatively fuelled. Gigafactory investments need to be de-risked by long-term offtake agreements with vehicle manufacturers to ensure a win-win outcome on both sides – giving confidence to battery investors that there will be enough customers and assuring vehicle manufacturers that there will be enough battery supply. This is where the government must also play a central role to attract gigafactory investments by helping to secure both existing manufacturing sites and new volume ULEV model production in UK-based plants. In other words, the government must give a compelling reason for vehicle manufacturers to commit to producing future ULEVs in the UK.

21. The industry and successive governments have worked very hard over decades to make the UK a location of choice for automotive investment and production. These efforts have resulted in the creation of a competitive supply chain, world-class research and development (R&D) and engineering, and a strong skills base in conventional powertrains. It cannot be taken for granted that the UK will remain an attractive location for vehicle manufacturers to invest in future research, design, engineering and production of ultra-low emission vehicles (ULEVs). Investment in new technologies and in retooling existing production facilities is based on a strong business case that revolves around, among other factors, the availability of a substantially different supply chain and the right skills within the workforce and a strong and sizeable domestic market.

UK automotive production by fuel type, 2016-2019.

[4] Reuters (2018), "Germany has set aside 1 billion euros to support battery cell production: minister", 13 November, available at https://www.reuters.com/article/us-europe-batteries-germany/germany-has-set-aside-1-billion-euros-to-support-battery-cell-production-minister-idUSKCN1NI0XF; and Electrive.com (2019), "France to invest €700M in battery cell production", 14 February, available at https://www.electrive.com/2019/02/14/france-to-invest-700-million-in-battery-production/.



Source: SMMT production data.

22. Government must also create the right conditions for a state-of-the-art, high efficiency, financially viable national battery recycling industry to create a steady stream of secondary materials to feed into UK-based gigafactories and vehicle assembly. Direct employment in automotive and battery manufacturing could grow by 29% to 220,000 by 2040 if there is substantial increase in vehicle production and a strong industry in battery pack, cell and electrode manufacturing.[5] By contrast, a decline that is precipitated by ULEV manufacturing moving abroad may lead to losses.

23. Lastly, when looking at how we can further attract supply chains to the UK ahead of growing ULEV production, government should also explore and better understand the aggregated industry needs for future parts (including batteries and PEMD) and likely total volumes we hope to deliver, to effectively demonstrate the opportunity available to potential businesses in advance of landing that production, and to help increases the chances of successful transformation by developing and incentivising strong foundations today.

What natural advantages in terms of access to raw materials, renewable energy supply, technological readiness, IP or other competitive advantage does the UK have to encourage development of battery manufacture in the UK?

24. The UK has a number of natural advantages and can boast five design centres and 20 R&D centres amongst one of the most diverse automotive sectors anywhere in the world, in addition to major volume manufacturers and over 100 specialist vehicle manufacturers operating across every nation in the UK, exporting to the world through global networks. The true diversity and hidden depths of the sector are further reflected in the contribution afforded by some of the lesser recognised, but ever-present specialist manufacturers – the taxis, accessible and adapted vehicles, hearses, limousines, and motorhomes.

25. This is enabled by a highly skilled workforce from engineers to factory floor, capable of supporting the development and evolution of such a range of technologies, particularly if the government supports the workforce transition alongside the technological advances, as further detailed below (paras. 50-53).

[5] The Faraday Institution (2020), UK Electric Vehicle and Battery Production Potential to 2040, available at https://faraday.ac.uk/wp-content/uploads/2020/03/2040_Gigafactory_Report_FINAL.pdf.

26. On raw materials, the UK needs to secure a stable and sustainable source of virgin critical raw materials as a complete move away from their use might not be possible in the near future. To supplement the global sources, it is vital that a resilient raw material supply chain in the UK is established. The UK has significant capacity to refine and produce the critical metals needed for the UK EV market e.g. Cornish Lithium. Whilst this may not meet all our future demands for a UK electrified fleet it would help reduce embedded carbon if supported by a local battery recycling facility.

27. As government progresses with its ambition to accelerate the uptake of zero emission vehicles, assuming battery chemistry remains consistent, the demand for lithium cobalt and nickel used to manufacture EV batteries will increase significantly. As many countries around the world are adopting the same broad electrification timeline, the annual global production level will need to be rapidly scaled up to avoid security of supply issues for raw materials. It is expected that a quadrupling in global lithium and a doubling in global cobalt production will be needed between 2018 and 2035 (source: The Faraday Institution) to fulfil the demand.

28. Lithium, cobalt and nickel are predominately found in a small number of countries. The Democratic Republic of Congo (DRC) is the biggest producer of cobalt, supplying more than 60% of the world’s demand. Also, the majority of cobalt extracted in Congo is processed in China, home to over half of the world’s cobalt refineries. China also holds over 60% of global graphite supply, while large quantities of lithium are found in Chile, Australia and Argentina. This concentration of resources creates significant risks around the supply chain and the security of supply.

29. For many UK automotive businesses, competition is not just with other companies within the sector, it is also with other locations within their businesses. Automotive is a global industry, with companies locating production sites across the world. Every 4-7 years companies must compete against their sister plants across Europe and the world for future product allocations. These are complex decisions, based on a number of factors. Many of these factors have been assessed in work undertaken by the Automotive Council UK International Competitiveness workstream, which has highlighted the key performance indicators (KPIs) fundamental to investment decision making and tracked the UK’s progress towards global competitiveness[6]. The UK must create and sustain a competitive business environment, maintain our unique and diverse automotive manufacturing base, and leverage all our natural advantages to compete internationally for battery investment and production, and future electrified vehicle model allocations.

30. Continued efforts to deliver a high proportion of renewables into the energy grid mix is also important to manufacturers who want to demonstrate and improve total life-cycle assessments (LCA) of their products. Battery and BEV manufacture is also likely to be more energy intensive – translating into climate and cost impacts as detailed below – thus cleaner upstream energy input is highly desirable. Other in-built disadvantages include high business rates bills while national critical infrastructure and logistics play an important role to service global automotive trade networks and maintain just-in-time and just-in-sequence manufacturing processes.

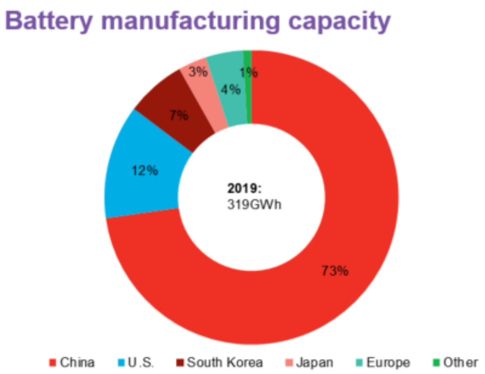
31. Notably, the UK also benefits from a robust legal system, highly skilled workforce, and strong intellectual property (IP) safeguards.

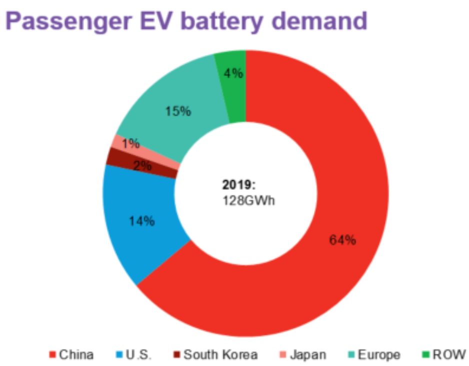
What action is needed to support investment and establishment of UK gigafactories?

32. Government should urgently support and invest in the development of gigafactories for large-scale battery manufacturing and a battery materials supply chain for sourcing of local content and to support international trading ambitions. This would enable greater control of raw material sourcing, production process efficiency and overall carbon footprint as well as minimising any future trade tariff risks – particularly as the UK-EU Trade and Co-operation

[6] https://www.automotivecouncil.co.uk/wp-content/uploads/sites/13/2018/11/Automotive-Council-International-Competitiveness-of-the-UK-Automotive-Industy-2018-Report-FINAL.pdf

Agreement (TCA) origin rules become increasingly stringent for electrified vehicles and batteries from 2024, and again in 2027. From this date, the UK-EU TCA will apply Rules of Origin which will mean tariffs will be applied to any UK produced electric vehicle unless its battery is manufactured in Britain or the EU (the UK exported 81.0% of its vehicle production in 2019 – 55.0% of which was to the EU, and the balance to 160 different overseas markets). Electric and hybrid vehicle production has grown, accounting for 18.8% of production in 2020. Locating the first UK gigafactories close to auto hubs, i.e. West Midlands and North East, is also crucial and would provide a significant strategic advantage for the UK auto sector. A Global Britain must also ensure producers and consumers have tariff-free access to import and export ULEVs and BEVs as seen in the UK-EU TCA if we are to accelerate the journey to electrification, maintain pressure on charging infrastructure growth and meet government's 2030 ambitions. In many cases this means modernising and futureproofing Free Trade Agreements to account for the evolving origin content and shifting value chain of next generation vehicles and powertrains.





Source: *Bloomberg*

33. Battery manufactuing capacity and demand is highly concentrated in Asia, helped by both higher sales volumes and availability of scarce raw materials. Currently the European production capacity is low and does not fulfill the demand. This fact makes the UK very reliant on production in other regions, which then impact the availability and battery specifications. Therefore it is vital to secure a reliable local battery production to ensure future availability and high production environmental and ethical standards. Further action is needed across the full automotive sector to ensure continued UK production and vehicle assembly. Gigafactories are highly likely to co-locate with production or be vertically integrated into full production plants due to challenging transportation requirements and the synergies that proximity can offer, such as increased flexibility for just-in-time production and greater reliability of supply and insulation against foreign exchange volatility and geopolitical uncertainties. Thus, decisions to transform vehicle production sites – where more government support is still needed – and locate future production of battery electric vehicles in the UK will depend to a large extent on the availability of battery manufacturing at scale and a strong supply chain for battery materials and related chemicals, and strong UK industry demand.

34. As aforementioned, to secure the UK as a premier vehicle manufacturing location of choice, we believe the ambition must be not one, but multiple domestic gigafactories (or unfettered access to equivalent capacity) to facilitate an associated electrified supply chain and maximise the benefits of the green revolution for advanced manufacturing in Britain. The Government could also support site identification and preparation, given the limited number of ideal sites currently available and necessary energy grid connection required to operate at scale. With the introduction of the 2030 end of sale date in for ICE vehicles in the UK, and progressive green policies in key export markets, it is highly likely this need will need to be comprehensively re-assessed and accelerated to meet the growing demand for next generation vehicles at home and abroad. To reiterate, this must be comprehensively complemented by a strong market, supportive investment frameworks and domestic fiscal

conditions, ease international trade and access to overseas talent, and a full electrified supply chain that provides parts and components that enable both battery production and wider electric powertrain manufacture.

What should the Government do to ensure that gigafactories have a safe, reliable power supply which meets net zero requirements?

35. The move to decarbonise vehicle fleets and manufacturing processes is expected to see a significant uplift in electricity use, including for gigafactories – government's recent Energy White Paper says demand could double to 2050. Despite record levels of renewable electricity generation, renewables accounted for just over a third of total generation in the whole of 2019. Generation from renewable sources has increased year on year and in 2020 exceeded the generation from fossil fuels for the first time in the published data series, albeit with reduced overall demand and generation caused by Covid-19.[7] Yet with just 13.2% of energy consumption in the UK in 2019 coming from renewable sources[8], the UK has a long way to go before it can boast of having among the cleanest energy systems in Europe.

36. Government must therefore ensure there is an abundant supply of low-carbon electricity available at a cost that is comparable to other automotive manufacturing destinations. We welcome government's plans to transition to clean energy by 2050, but it needs to be accelerated so that is in advance of the switch of new vehicle fleets to zero emissions by 2035, and we further recognise the CCC ambition for zero carbon electricity production by 2035. Clean energy sources must be reliable, stable, and competitively priced, with costs fairly apportioned to support businesses and consumers through this transformational period. It must also be accompanied by a massive uplift in regional and rural energy infrastructure and vehicle recharging provision.

37. Low cost, low carbon energy is absolutely crucial to the competitiveness of the vehicle manufacturing process. Energy is the second largest in-house cost, after labour, to vehicle manufacturers and, with electricity prices 70% above our EU-competitors, the sector is at a competitive disadvantage. Government must consider measures that would help to mitigate or overcome these high energy costs, looking at policies including Renewable Obligation Certificates (ROCs) and Feed-in Tariffs (FITs), and look at other options to support zero critical industries in similar fashion to sectors that benefit from Energy Intensive Industry (EII) status.

38. Faster progress towards Net Zero would also be achieved if the government incentivised industry to invest in radical decarbonisation solutions throughout the manufacturing process, by scaling up and making the Industrial Energy Transformation Fund more broadly accessible and attractive, and taking action through business rates reliefs for renewable technologies and Annual Investment Allowance increases. Notably, competition funding such as the IETF is targeted at new technologies; as an industry UK automotive needs proven technologies to transform our energy supplies, for example, to power paint shops and boiler houses critical to automotive production. The industry cannot afford to risk untested technologies because the risk of failure is too great, and would impact massively upon manufacturers financially and on production output. Meeting the new, challenging UK Emissions Trading Scheme will further divert funds away from potential energy saving investments. The government must ensure the electricity used to power production and electrified vehicles by 2035 is as green as the vehicles themselves, and not solely focus on the tailpipe. Further action is required by the energy sector in order to decarbonise and provide reliable, affordable, clean energy for both the manufacture of, and consumer usage.

[7] BEIS Energy Trends (March 2021) - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/894920/Press_Notice_June_2020.pdf

[8] BEIS Statistical Press Release: UK Energy Statistics, Q1 2020 - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/894920/Press_Notice_June_2020.pdf

39. The government should look to international examples, such as the Norwegian example, if its 2035 ambition is to have any genuine green credibility. 100% of the electricity used to charge plug-in vehicles in Norway comes from renewable sources. Government policy must therefore be equally ambitious in greening up electricity generation by ensuring there are binding targets for electricity to be generated from renewables or nuclear so that the electricity grid is zero carbon to truly benefit and maximise BEVs' environmental potential.

40. Lastly, the foundation of any significant Gigafactory site will also need a major grid connection or upgrade which is efficient and reliable. Government could support site preparation and secure brownfield sites in collaboration with local authorities as the high capital expenditure required upfront and lack of suitable sites is a deterrent to investment.

What action is needed to support growth of associated power electronics, machines and drive supply chain, including securing supply of raw materials and material processing?

41. Government support required for the transformation of the UK automotive industry must be commensurate with government ambition. If the UK is to become not only a leading market for ULEVs but also a leading location for the design, engineering and manufacturing of ULEVs, the choice is not between investing in gigafactories or supporting the development of a wider electrification supply chain – both are cornerstones of the future UK automotive industry.

42. The strength of a supply chain for power electronics, motors and drives (PEMD) is a critical factor that influences vehicle manufacturers' decision to locate future ULEV production in the UK. A recent study has identified £12 billion worth of PEMD and cell manufacturing market opportunity within the UK's geographic reach in the next five years.[9] To achieve optimal ULEV performance in terms of power, weight and range, a new generation of high-performance power electronics based on compound semiconductors will be needed. The current semiconductor shortages have been well publicised. The UK has significant capability in power electronics, along with sensors and passive components such as inductors and capacitors. The main opportunities in electric machines, i.e. traction motors, can be found in the manufacturing of magnets, manufacturing of electrical steel and assembly of the electric machines. Although the UK has inherent strengths in these areas, government support is required to widen and deepen the PEMD supply chain to ensure the economies of scope and scale can be achieved.

43. While the government's £80 million investment in the Driving the Electric Revolution (DER) programme is laudable, more investment is needed to seriously leverage the UK's world-leading R&D capabilities in PEMD and to help industry create a supply chain necessary to manufacture PEMD products required for ULEV production in the UK and for export. Requisite focus should be two-pronged: high volume, high efficiency supply chains, which should be the priority of mass market segments in automotive; and low volume, high value supply chains, which should serve specialist, niche and off-highway segments in automotive, as well as adjacent sectors such as rail, maritime and aerospace.

44. Towards this end, creating a nationwide network of DER centres of excellence is essential for addressing existing gaps and a lack of capacity in the UK PEMD supply chain, which has resulted in low levels of local content in existing UK manufactured products. The DER centres will also play an important role in addressing the lack of specialist engineers, as they are geared towards delivering production-ready manufacturing process solutions aligned with industry needs and implementing knowledge capture and transfer.

45. Furthermore, while the government's commitment to enable the industry to transition to electrification-centric supply chains as part of the Automotive Transformation Fund is welcome, the delivery, allocation and spend for the Fund in its entirety needs to be expedited. This is crucial for the future of the PEMD supply chain, the strength of which, along with the

[9] Advanced Propulsion Centre (2020), Strategic UK Opportunities in Passenger Car Electrification, available at https://www.apcuk.co.uk/app/uploads/2020/06/APC-Passenger-car-electrification-report-online-v1.pdf.

presence of giga-scale battery manufacturing and a battery materials supply chain, will determine whether the UK will be a leading producer of next generation zero emission vehicles in the future.

The Government has announced £1 billion of funding to support the electrification of UK vehicles and their supply chains. Is this figure sufficient? How should it be split between supply chains and gigafactories?

46. We welcome the Automotive Transformation Fund (ATF) for capital centric investment projects to support industrialisation of the electrified supply chain, however, the scale of the challenge ahead means that delivery in full and release of the funds available are needed at pace. ATF spending must be neither delayed nor overly diluted so that it has maximum impact. This funding should also be taken in parallel to securing investment into battery production at scale and other measures to support the conversion of mass manufacturing to greener, more efficient processes throughout the entire value chain. The sector itself has already invested huge sums in automotive products, R&D and capital investment. This zero critical industry can only meet our decarbonisation goals in partnership with the government, and must be considered for additional future funding streams, grants, and complementary policy instruments as part of a coherent strategy commensurate to the generational challenge we face throughout this decade to 2030 and beyond. Without dedicated and focussed funding our ultimate 2050 decarbonisation targets will be difficult – if not impossible – to achieve.

47. There must also be a greater spotlight on net zero skills for advanced manufacturing to undertake battery and BEV production at scale and deliver the expansion of a corresponding PEMD supply chain. The current funding envelope is not only too little, but essentially non-existent with regards to dedicated training programmes targeted at automotive despite the high level of ambitions over a condensed timeframe to deliver placed upon the sector.

48. A lack of visibility over general long-term R&D funding remains a concern which, along with Budget provisions in the autumn, the next multi-year Spending Review must clarify along with the future role of state aid in the UK. The future subsidy control regime – currently under development – also needs to be fit for purpose and internationally competitive to enable and empower zero critical industries. These measures, collectively, are all crucial to enable the future industrial supply chain.

49. In contrast, European and overseas competitors are also securing significant investment at pace, arising from broad and large-scale Covid recovery funds and well as through national efforts, for example, to supercharge green transformation and futureproof industrial capability (e.g. in the automotive sector), and specifically, into securing battery manufacturing and gain the initiative as leading manufacturers in technologies fundamental to the next decade of advanced manufacturing and meeting global climate commitments. Government must make decisions now, even if that may involve accepting a higher level of risk.

The £1 billion Net Zero Innovation Portfolio will focus on research into low carbon technologies. What proportion of this funding should be directed towards battery electric vehicle research? What areas should ARIA target in distributing funding for high-risk, high-reward research into battery electric vehicles?

50. A significant sum from the Net Zero Innovation Portfolio announced in the government's 10 Point Plan should be made available and targeted at battery solutions (whether under the goals of energy storage and flexibility, industrial fuel switching, or disruptive technologies) and hydrogen which have multiple applications, and are key to the decarbonisation of road transport as detailed above. However, the UK needs both gigafactory capability and an electric supply chain to ensure future success and rollout of the ATF and other schemes which are already delivering today. This should form part of a coherent industrial strategy to attract investment in UK battery production and electric supply chains, and combined with other new and existing funding streams such as the Automotive Transformation Fund to make the UK the most attractive place to build, design, research, develop, and market BEVs, and

transform critical export-led UK automotive production from ICE vehicles to next generation, alternatively fuelled vehicles, as part of both the government's Net Zero and Global Britain ambitions.

What steps should be taken to ensure the UK workforce has the necessary skills to staff gigafactories and their supporting supply chains?

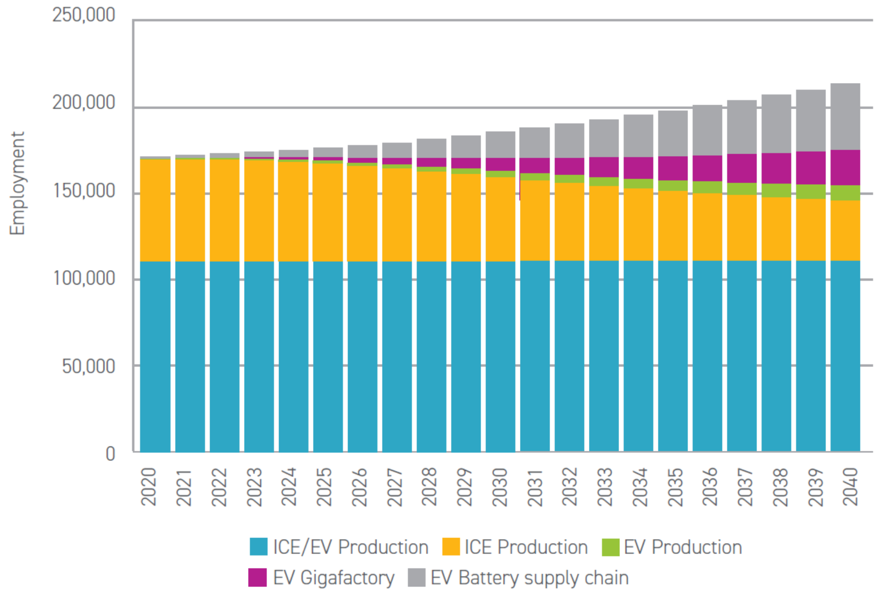
51. The UK has the opportunity to become one of the leading producers in every stage of the manufacturing of ULEVs and the production of batteries – from design and development, through to retrofitting and remanufacturing. With substantial increase in vehicle production relative to today and a strong industry in battery pack, cell and electrode manufacturing, the Faraday Institution estimates direct employment in automotive and battery manufacturing could grow by 29% from 168,000 to 220,000 by 2040. This includes 78,000 new jobs created in battery gigafactories / production and the battery materials supply chain.[10] For battery cell manufacture, the Faraday Institution identifies several hundred qualified workers are needed now, increasing to 3,000-4,000 by 2025 and 7,500-10,000 in 2030.

52. Since automotive has such high retention rates and low levels of workforce churn, the priority for the sector is around retention of talent and transitioning the existing workforce as the sector itself transforms. Many of the skills, tools and metrics are transferrable, while technical skills will need to be taught. To support this, automotive would like to see government provide multi-year, funded support for the HVMC's Emerging Skills Project and the long-term continuation of the Faraday Battery Challenge. Both programmes have undertaken extensive foresighting to understand the emerging and future skills required by the industry. The next stage of this work that government must support is the development, and crucially delivery of, modular content in the net zero and digital realm. It is also important that government gives greater long-term emphasis on STEM subjects in the national curriculum to develop the next generation of engineers. This should all form part of a 'national Green Jobs Strategy,' that build on the government's Ten Point Plan for a Green Industrial Revolution, Skills for Jobs White Paper and HM Treasury's Net Zero Review to support the creation and development of high skilled, green jobs.

53. The Automotive Council estimates over 80% of job roles that involve powertrain competencies today will be impacted in the next ten years by the use of transforming technologies in Engineering, Materials, Planning & Logistics, Purchasing, Quality and Manufacturing. Key roles that will be significantly impacted are in procurement, cost estimating and supplier quality. A strong focus is therefore required on retaining, retraining and upskilling the existing workforce. Government support in the form of retraining schemes will therefore be as important as developing the next generation of engineers and innovators. Any Strategy should also focus on regional / localised development and delivery of the requisite EV battery skills courses to support ongoing production and invest in the necessary training infrastructure in place to temporarily take employees out of the business for training purposes to de-risk the business case for prospective investors.

The potential impact of battery manufacturing and battery materials supply chain on UK automotive jobs, 2020 – 2040.

[10] The Faraday Institution (2020), UK Electric Vehicle and Battery Production Potential to 2040, available at https://faraday.ac.uk/wp-content/uploads/2020/03/2040_Gigafactory_Report_FINAL.pdf.



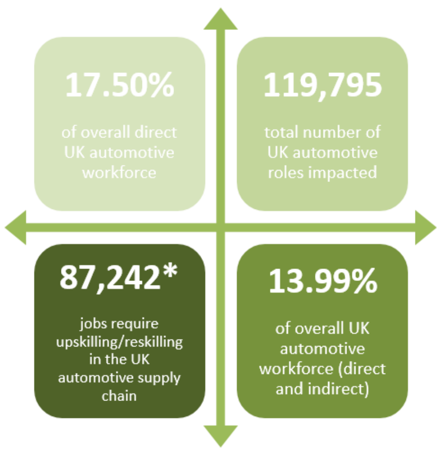
Source: The Faraday Institution (2020), UK Electric Vehicle and Battery Production Potential to 2040, available at https://faraday.ac.uk/wp-content/uploads/2020/03/2040_Gigafactory_Report_FINAL.pdf.

54. Producing batteries, battery materials and chemicals will require different skills and qualifications throughout existing and future employees' careers. This includes operators and technicians who perform codified manual tasks of varying complexity and are responsible for the efficient functioning of automated manufacturing processes. Together these two categories account for around 75% of the workforce in a gigafactory and would typically require L3 qualifications. The remaining 25% of positions are highly skilled jobs requiring higher-level qualifications. Some of the engineering positions such as systems engineer, database development engineer and thermal management engineer would require a very high level of skills and qualifications (e.g. PhDs). Higher skills would not only be required for the technical nature of cell manufacturing but also to develop a competitive edge by keeping abreast of factory advances such as the industrial Internet of Things, data-driven production, optimisation, automation, materials analysis, continuous improvement and simulation. Also specialised training will most likely be required for those handling chemicals and hazardous materials. Reconfiguration and recalibration of the Apprenticeships Levy specifically for automotive would be one existing route which could be geared towards solving this challenge.

UK automotive workforce upskilling requirements (2019-2024)

Category	Number
Production	8100
Maintenance	2550
Production support	5340
Support staff	3843
Product related	7460
Product Development	5260
Total	**32553***

*Based on the ONS automotive employment multiplier of 2.68



Source: Automotive Council Skills Working Group

UK automotive workforce: Estimated job descriptions where 50% or more of the skills and responsibilities will change in the next 10 years

	Technology			
AIP Job Family	**Batteries**	**Electric Machines**	**Power Electronics**	
Engineering	47%	84%	59%	**63%**
MP&L	61%	0%	0%	**20%**
Purchasing	38%	61%	40%	**47%**
Quality	78%	91%	23%	**64%**
Manufacturing	40%	19%	0%	**20%**

Source: Automotive Council Skills Working Group Workshops

What measures should the Government take to ensure that minerals for battery electric vehicles are sourced in a responsible way?

55. Mining companies, traders and smelters should be certified to ISO 45001 and ISO 14001 and other relevant ISO and BREF standards. The industry is conscious of, and proactively addressing, challenges linked to sourcing of certain raw materials for example, concerns around working practices of cobalt mining in artisanal and small-scale mines (ASM) in the DRC. A range of international efforts have been made to increase transparency and traceability of the supply chain. These include: Cobalt Industry Responsible Assessment Framework (CIRAF), Delve (Global Platform for ASM mining data), Global Battery Alliance, Pact's Mines to Markets (M2M), Responsible Cobalt Initiative (RCI) and Responsible Minerals Initiative (RMI).

56. There is also an automotive initiative Drive Sustainability (DS) created as a partnership between 11 automotive companies (BMW Group, Daimler AG, Fiat Chrysler, Ford, Honda, Jaguar Land Rover, Scania CV AB, Toyota Motor Europe, Volkswagen Group, Volvo Cars and Volvo Group). DS has a set of common guidelines – the Guiding Principles – that outline expectations for suppliers on key responsibilities including business ethics, working conditions, human rights and environmental matters. DS agreed on standardised Business and Human Rights due diligence tools and a grievance mechanism to proactively tackle issues related to the United Nations Guiding Principles on Business and Human Right.

57. Government should also explore and enable companies to use new technology, for example blockchain-like digital ledgers, to aid supply chain traceability and due diligence.

What action can Government take to support growth of secondary markets to extend lifetime use of EV batteries?

58. Currently electric vehicles typically have an 8 year or 100,000-mile battery warranty, with usually 75-80% capacity remaining after that period. With electric vehicle technology still in relative infancy the data on end-of-life batteries is insufficient. Current experience gained over recent years shows that EV batteries can last for the lifetime of a car or longer. Individual battery performance will depend on its usage, as a heavily utilised battery using mostly fast and rapid charging might need to be retired earlier as the effects of degradation will set in quicker than in batteries with lower utilisation, good maintenance, and consistent slow charging patterns. A greater understanding and a refinement of battery management systems including the assessment of State of Health (SOH) of individual cells can extend the lifetime of batteries and support the used electric vehicle market. This will provide greater access to electric vehicles for a greater proportion of consumers at varying price points. Ongoing funding for the Faraday Battery Challenge needs to be secured until the battery technology is mature and the required battery production capacity is established. Keeping

batteries in use not only protects scarce resources but also provides financial saving by extending the battery's utilisation period.

59. The Custom Automotive Lithium-Ion Battery Recycling (CALIBRE)-project, part of the Faraday Challenge, concluded that cells in batteries do not age in a linear manner and therefore replacing around 5%-30% of cells below the required State of Charge (SoC) of 80%, can bring SoC back to 100% multiple times. This would minimise the need for whole battery replacement, preserving resources. Therefore, design for remanufacturing and repair is essential. Tax incentives for remanufactured batteries should also be introduced to increase uptake and create the right conditions that underpin reuse and redevelopment of battery components other than cells.

60. Both within and beyond automotive – in line with circular economy principles and waste hierarchy – a product's life should be extended as far as possible. The second life applications of lithium batteries are also still in the early stages of development; however the numbers are growing annually. It is presumed that their performance requirements will depend on the particular application they are used for and the type of battery being used, as a full BEV battery and a PHEV battery have very different profiles. With a second life, lifetime expectation at around 5 to 10 years, they present serious competition to new batteries.

61. In addition, taking into account the fact that batteries account for around 40% of EVs' Life Cycle emissions their second life can partially offset carbon linked to their production by removing the need for new batteries, while preserving resources. Enabling second life applications requires joined-up policy with other sectors, for example with the energy and infrastructure sectors in reusing decommissioned BEV batteries for stationary energy storage or grid balancing purposes. Currently the extended producer responsibility for second life batteries (for non-automotive purpose) is not clearly defined which makes it a less attractive proposition.

62. EV battery second life applications should be promoted and incentivised by fiscal benefits for participating companies, combined with other benefits to the end user (e.g. no VAT) to discourage premature recycling. In addition, a purchasing incentive plan for second life applications should be considered (similar to those for the EV chargers). Any barriers to battery reuse and second or third life should be removed and lines of responsibility for batteries clearly defined when moved to non-automotive purposes in alignment with the recently proposed EU Battery Regulation requirements and any UK equivalent.

What steps should be taken to ensure that EV batteries are recycled at the end of their lives and not simply sent to landfill?

63. Critically, it must be stated that EV batteries cannot be sent to landfill under the current regulations. This includes those for full Battery Electric vehicle (BEV) and all hybrid vehicles (currently classed as industrial in the legislation), which are jointly and generally referenced as batteries in this paper. There is a responsibility on battery producers to take EV batteries back, and send for recycling when appropriate. This is outlined in the waste battery regulations, a revision of which will be undertaken in the UK in Q4, 2021.

64. OEMs will accept used batteries and direct them to reuse or recycling. Batteries are also accepted by waste operators for treatment at Approved Battery Treatment Operator (ABTO) or exported via an Approved Battery Exporter (ABE). Vehicle manufacturers (VMs) provide dismantling information for all vehicles put on the market via International Dismantling Information System (IDIS). This includes guidance on how to make safe and remove EV batteries from vehicles. VMs are also working with fire services to ensure safe handling of EVs in emergency situations.

65. It should be noted that currently a large proportion of end of life vehicles end up outside the legal take back network, therefore ending up in hands of illegal operators. If the current system is not sufficiently tightened and enforcement stepped up, in future a similar number of

EVs might be processed by individuals insufficiently trained to handle EV batteries, which might result in health and safety issues and batteries staying outside the closed loop system. Therefore, it's vital to address the situation before volumes of end of life EVs increase.

66. Government needs to create the right conditions for a state-of-the-art, high efficiency, financially viable national battery recycling industry to create a steady stream of secondary materials to feed into the UK based gigafactories. To fulfil government's ambition to phase out ICE vehicles, the uptake of battery-powered vehicles also needs to increase significantly, resulting in large numbers of batteries in need of recycling.

67. Therefore, investment in Li-ion battery recycling infrastructure and facilities is necessary and complementary to support the growing EV market. Currently the number of batteries reaching the end of their life is low and those batteries are transported to the EU for recycling as there is no facility here in the UK. This results in potential raw materials for battery production being lost for UK-based production processes. It also creates additional carbon emissions and high transportation costs. These shipments might also become more difficult and costly following the UK's exit from the EU. Therefore, establishing battery recycling facilities in the UK would both support circular economy principles and the competitiveness of the UK as an EV manufacturing location. Their development would also result in reduced end of life costs, by minimising logistical movements and further reducing the carbon footprint.

68. Battery recycling is unlikely to significantly contribute as a source of raw materials before 2030 and end of life battery volumes may be too low in the next 10 years to justify a self-sustaining commercial investment in battery recycling operations in the UK, potentially resulting in vital resources being exported which might require government intervention.

69. Furthermore, the extraction of secondary materials from batteries during the recycling process, would contribute to the UK originating content when used in new battery production and the value-added requirements, helping to maintain zero tariffs with the EU and other markets in the future. It would also ensure compliance of UK batteries with the proposed new EU Battery Regulation, which will most likely require recycled content provisions to enter the EU market and likely equivalent rules here in the UK in the years ahead.

70. Notably, companies placing any batteries (portable, automotive and industrial) on the UK market on professional basis for the first time, either as a component or integrated into another product, are classed as producers. Vehicle manufacturers which fall into that category, are obliged to accept waste EV batteries and provide information on the take back procedure, typically outlined on their websites. SMMT's website provides further details on how the industry fulfils its current obligations and take back procedures.

71. Lastly, classification of batteries taken out of a vehicle needs to be clarified. Waste classification should not prevent the battery reuse or remanufacture within a controlled system. Companies storing and transporting waste batteries have certain regulatory obligations to fulfil and presently, it is unclear when a battery taken out of a vehicle becomes waste, which might result in some batteries being classed as waste prematurely. Meanwhile, changing a waste status from waste to non-waste creates additional unnecessary administrative burden. Government should move quickly to fix this issue.

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