Written evidence from Professor Ian Henry (Managing Director at AutoAnalysis) - (BEV0009)

**About Ian Henry**

I have been an analyst and consultant in the automotive industry for nearly 40 years. I specialise in vehicle production forecasting and supply chain analysis, mainly in Europe:

- I work for industry bodies, governments, vehicle companies, suppliers throughout the supply chain and financial institutions with an interest in the sector.
- In the build-up to Brexit, I developed a Brexit Impact Assessment model which analysed the possible impact of different tariff and trading regimes on UK vehicle production. BEIS used this in its assessment of the potential impact of Brexit on the UK automotive industry and in its submissions to the UK team involved in negotiating the UK-EU TCA.
- I hold pro bono academic posts at Birmingham City University where I am a Visiting Professor in Automotive Business Strategy and at Royal Holloway, University of London where I am an Honorary Lecturer in the Department of Geography.

The views expressed in this submission are my own, based on my experience of the UK and European automotive industry, my long-standing relationships with decision-makers responsible for vehicle production allocations or purchasing decisions and exposure to a wide variety of suppliers who have established production facilities across the UK and Europe in response to vehicle company demand.

## 1. Opening comments

1.1. I fully support and would like to see battery cell factories operating in the UK. That said, I am submitting this evidence because I believe there has been a misguided narrative surrounding the UK automotive battery sector.

1.2. The term gigafactory is loosely used but is most commonly used in reference to the production of battery cells. Some gigafactories are fully vertically integrated, ie they make the cells and assemble complete batteries. Tesla confuses the issue as well because it refers to its Chinese car factories – which do NOT make battery cells – as gigafactories.

1.3. In this paper, I refer to battery cell factories rather than gigafactories to avoid confusion.

1.4. UK government "policy" (insofar as there is a formal industrial policy for the battery sector), the views of some government agencies and several industry commentators and much of the business press reporting on this sector seem to be based on the idea that establishing battery cell factories is a panacea to the challenges facing the UK automotive industry as it moves from internal combustion engine (ICE) power to battery electric powered vehicles.

1.5. This view lacks proper understanding of the structure of automotive demand and the decision-making practices of the industry, particularly with regard to the vehicle companies' processes for choosing electric vehicle (EV) and battery cell production locations, component suppliers and other power solutions, eg hydrogen.

1.6. Specifically, the idea that that establishing a battery cell factory without known customers, and without proven battery technology, is a route to success is, in my opinion, misguided.

1.7. Suppliers of automotive components – including battery cells – establish their factories in response to demand from the vehicle manufacturers. It does not work the other around: battery cell factories are built, or will be built, by or for vehicle companies which want to buy cells from these factories.

1.8. Building, or attempting to build, a cell factory without an anchor customer is a classic case of putting the cart before the horse. The successful development of a battery cell factory requires guaranteed demand commitments from customers, ie vehicle manufacturers. This is what happened with Northvolt in Sweden, the development of which was secured on early business awards from German vehicle manufacturers.

1.9. By way of historic example, the large number of Japanese automotive component suppliers in the UK came here in the 1980s and 1990s in response to demand from the European factories of Nissan, Toyota and (before it decided to leave the UK), Honda. They did not come here first in the hope of securing business. They followed their customers, having been awarded supply contracts for the UK factories by decision-makers in Japan.

1.10. In addition, a new entrant in battery cells faces an increasingly crowded market. In the last couple of years, major vehicle companies, notably Volkswagen, have announced substantial investment in their own in-house or joint venture battery cell facilities. As these come on stream, vehicle manufacturers will increasingly use these new facilities while they reduce their purchasing from independent battery cell suppliers.

1.11. Vehicle companies are investing in their own battery facilities because they want to control as much of the value chain as possible (replacing their in-house ICE and conventional transmission business) and reduce their dependence on external suppliers.

1.12. As a result, the market for battery cells sourced from independent suppliers will become tougher and more price competitive. New entrants, without established or more advanced technology and customer relations, will find business development increasingly challenging.

1.13. Where external suppliers continue to be used, vehicle companies will generally use proven, known suppliers, especially the Koreans (LG, SK and Samsung) and Chinese (notably BYD, CATL and Envision). Vehicle companies are actually risk averse with regard to using new suppliers, especially for large, high value elements of their vehicles, such as batteries.

1.14. The key policy implication of this is that for the UK to develop a battery cell sector at scale, the government needs to work closely with the end customers for the cells, ie the vehicle companies, both those already in the UK, and potential new investors.

## 2. Questions asked by BEIS select committee.

In what follows, I address each question as articulated by the committee in its call for evidence, in the order that they were listed on the original call for evidence. Where I cannot comment on a specific question, this is noted.

### 3. Is there enough UK vehicle manufacturing demand in the UK to support gigafactories?

3.1. Demand for UK battery cell factories' output is expected to come predominantly from UK-made electric vehicles. There may be some exports of UK-made cells or fully-assembled batteries. However, this will likely be marginal, add-on business as opposed to core business for a UK battery cell factory. Continental European demand for cells or batteries will largely be supplied from European factories, replacing imports from China or Korea.

3.2. Therefore to answer this question, we need to understand the potential scale of UK EV production and the timescale for this potentially increasing. My commentary here refers to the major five manufactures in the UK, ie Nissan, Mini (BMW), Jaguar Land Rover, Stellantis (Vauxhall) and Toyota; the low volume premium companies (Rolls Royce, Bentley, Lotus, Aston Martin, McLaren) and the London Taxi company [LEVC] together make less than 50,000 vehicles a year and will have, at best, only a marginal impact on the success or not of the UK battery sector.

3.3. Most UK demand for automotive components comes from the five main vehicle manufacturing companies noted above. These companies have different technology strategies and timelines for EVs and do not represent a single market.

3.4. Demand for components at the UK vehicle companies is also dependent on the production allocation strategies of major car companies with factories in the UK, but whose decision-makers (Jaguar Land Rover apart) are based outside the UK.

3.5. Total UK car production in 2022 was 775,000 units, along with 80,000 light commercial vehicles (vans and taxis); in 2017, production was over 1.7 million. I exclude trucks and buses from this commentary, but their total UK production volume in 2022 was c21,000.

3.6. At present there are only two 100% electric models made in the UK, namely the Mini Electric and the Nissan Leaf. Moreover:

3.6.1. The current Mini Electric is due to stop production soon and will be replaced by imported electric Minis from China. BMW has indicated that it will make electric Minis once again in Oxford but has not given a timescale for this.

3.6.2. The current Nissan Leaf will also soon be replaced by a new electric vehicle or series of vehicles (which may or may not retain the Leaf name). Nissan has indicated that this new vehicle programme will be made at a much higher rate than the Leaf. Batteries are currently supplied from a dedicated vertically integrated factory next to its car plant in Sunderland which is owned by Envision. Envision is building a new battery factory for the Leaf replacement vehicle, with increased battery cell capacity.

3.6.3. Jaguar will switch to an all-electric vehicle line-up and Land Rover will introduce all-electric variants in the mid-2020s. Currently the only EV at Jaguar Land Rover is the Jaguar I-PACE which is made in Austria. Tata, the owners of Jaguar Land Rover, has said that it will build a battery cell factory, either in mainland Europe or the UK.

3.6.4. Stellantis runs two UK factories under the Vauxhall name: the Ellesmere Port factory near Liverpool is just about to start assembly of a small electric van for the various Stellantis brands, ie Peugeot, Citroen, Fiat, Opel and Vauxhall. This supplements production of the same van in Spain. The Luton factory makes larger ICE-powered vans, supporting a factory in France which makes ICE, hybrid and electric versions.

3.6.5. Toyota currently makes only hybrid vehicles in UK. Toyota has not yet announced when or where it will start electric vehicle production in Europe.

3.7. A further issue is that the types of batteries each company uses differ, in terms of size, shape, power, chemistry and type of cell; these could be cylindrical [AA shape, but bigger], prismatic or pouch types. Each cell type requires its own production facilities, ie the different cell types cannot be made on the same production line.

3.8. My key conclusion from the above is that to maximise the UK's chances of securing new battery cell factory investment, government policy and strategy needs to begin with the customers (the vehicle companies) and understand their differing battery needs for electric replacements for ICE-powered vehicles, or for new vehicle manufacturers coming to the UK:

3.8.1. Government policy needs to be based on understanding the EV production plans, battery cell sourcing plans and technology preferences of the vehicle companies to support the development of a UK battery cell sector backed by real demand.

3.8.2. Approaching the market by planning to build a number of battery cell factories, but without understanding the structure and potential evolution of demand, its timing and its technological requirements, will not work.

**4. Will the UK have sufficient battery production supplies by 2025 and 2030 respectively to meet the government phase-out plans for petrol and diesel vehicles?**

4.1. This question conflates the issue of producing vehicles, electric or ICE-powered, with consumer demand for vehicles and therefore confuses the issue.

4.2. Around 80% of the cars made in the UK are exported, mostly to the EU; only around 20% of UK-made cars are sold in the UK, equivalent to c150,000 in 2022.

4.3. The UK market for new cars in 2022 was just over 1.6m; around 90% of these were imported, mainly from the EU.

4.4. These ratios have been broadly stable for several years, despite the ups and downs in both production and sales volumes in the UK.

4.5. This means that the UK government's plans to ban the sale of pure ICE vehicles from 2030 could be met largely with imported EVs; this is already happening, with Teslas, various German brand EVs and Chinese brand EVs increasingly common on UK roads.

4.6. Although the export markets for UK-made vehicles are on a similar trajectory in terms of banning the sale of pure ICE vehicles, in general, overseas markets will introduce their ICE bans later; and in many cases they will likely allow hybrid vehicles to be sold for longer than is expected to be the case in the UK.

4.7. The key implication of the above is that the issue of whether there are sufficient battery production supplies in the UK (whatever sufficient means in this context) is not directly relevant to the government's ban on the sale of ICE-powered vehicles. More relevant is whether there will be sufficient supplies of EVs for importers to sell.

4.8. In addition, although beyond the scope of this enquiry, the level of take-up of electric vehicles will be heavily influenced by the purchase price of EVs and the robustness of the charging infrastructure and electricity prices.

**5. Is UK-based battery production necessary to support the manufacture of electric vehicles in the UK?**

5.1. To answer this question, the key stages in battery production need to be set out.

5.2. The production of batteries begins with mining of nickel, lithium and other chemicals. These are then processed into the materials which form the core of the battery.

5.3. Battery production consists of three main stages:

5.3.1. The production of cells, including key components, ie cathode and anode (note that cathode active material is not normally made at the cell factory itself).

5.3.2. Assembling cells into modules.

5.3.3. And finally assembling varying number of modules into a complete battery, also known as a battery pack.

5.4. The size of the battery pack will be determined by the power required for the vehicle concerned. A particular car model could be offered with a number of battery outputs; these will involve essentially the same battery structure, just with a different number of cells or modules to generate different power outputs (this is similar to a car being offered with more than one petrol or diesel engine with different sizes or hp ratings).

5.5. As noted above, the term gigafactory is used very loosely; it should only be used in reference to the first stage, the production of cells. Some battery cell factories are fully vertically integrated, ie they make the cells, assemble them into modules and assemble modules into complete batteries which are delivered direct to the vehicle assembly line.

5.6. By contrast, at several Volkswagen and Audi factories in Europe cells are made in Eastern Europe (especially in Poland and Hungary) and shipped, either as cells or as modules, to the car plants where the full battery packs are assembled.

5.7. It is likely that the industry will continue to exhibit a mixture of production arrangements:

5.7.1. Where the cell plant is close to the vehicle plant, then the cell plant will likely also be a fully integrated operation (as is the case at Nissan and Envision).

5.7.2. But where the end use vehicle plant is located at a distance from the cell plant (often in another country), it is more likely that the model and/or the final assembly stages will be close to or inside the vehicle plant (eg Audi Brussels).

5.7.3. There are cases where fully assembled batteries are transported long distances, but this is not ideal because of the costs involved (batteries are heavier than engines and transmissions for example) and concerns regarding the carbon footprint surrounding the long distance transport of heavy components such as fully assembled batteries.

5.7.4. Specific assembly arrangements will depend on the volumes involved and other logistics arrangements at the vehicle company concerned.

5.8. The key implication of the above is that, while far from ideal, UK electric vehicle assembly could continue without local production of battery cells, with either local module and pack assembly arrangements using imported cells or imported fully assembled batteries.

**6. What are the risks to the UK automotive industry of not establishing sufficient battery manufacturing capacity in the UK?**

6.1. The key risks of "insufficient" battery cell production capacity in the UK are that:

6.1.1. The UK could effectively become an assembler of vehicles using imported components.

6.1.2. Vehicle production could continue to decline, with new vehicle programmes not allocated to the UK.

6.1.3. Factories which produce engines and conventional transmissions, as well ICE-specific components (such as exhausts or engine cooling systems), will lose business.

6.1.4. All of the above would mean reduced economic output for the country and attendant job losses.

**7. What other domestic end uses for batteries would provide a market for UK battery production?**

This is not my area of expertise.

**8. Does the UK have a sufficient supply of critical materials to support vehicle battery production?**

This is a vehicle company issue, rather than a country issue. Vehicle companies manage their own supply chains; some are now investing in mines in order to secure key mineral supplies.

**9. How ready are UK vehicle producers for the EU-UK Trade and Cooperation Agreement (TCA) rules of origin (ROO) phasing in from 2024?**

I cannot comment on this issue in a public document for client confidentiality reasons.

**10. What can the UK learn from investment in other countries in the establishment of gigafactories?**

Battery cell factories in the EU have been or are being built with specific vehicle company contracts underpinning their output. This is the key lesson which the UK needs to learn.

**11. Do we have the skills in the workforce required for the production of batteries? If not, what needs to be done?**

There is no inherent reason why UK workers cannot be trained to make batteries; and in any case, there are already UK workers producing EV batteries, at Envision for Nissan.

**12. Will the cost of UK batteries be competitive compared with batteries produced elsewhere?**

As a general observation, I would draw the committee's attention to recent statements by Nissan regarding the cost competitiveness of the UK, especially with regard to energy costs.

**13. What impact will the European Union's proposed Carbon Border Adjustment Mechanism have on UK production?**

I have not yet investigated this issue in any depth, so I cannot comment on this issue at this point.