



BUSINESS - 29/SEPTEMBER/2023

## UK battery sector can focus on quality over quantity

Having missed out on early-mover advantage and unable to compete with other markets in terms of scale, a UK battery sector will need to focus on high-quality niche applications if it wants a share of the pie

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**Indecision and political infighting have left the UK's industrial sector directionless**

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**UNAMBITIOUS POLICY** The UK's ambitions to develop its own battery supply chain have been too small

**BUSINESS CASE** Focus on alternative technologies may be one option, but risk of being too small in scale to make investment sense

**KEY QUOTE** The UK could focus on niche products where recyclability and second-life opportunities

become more valued

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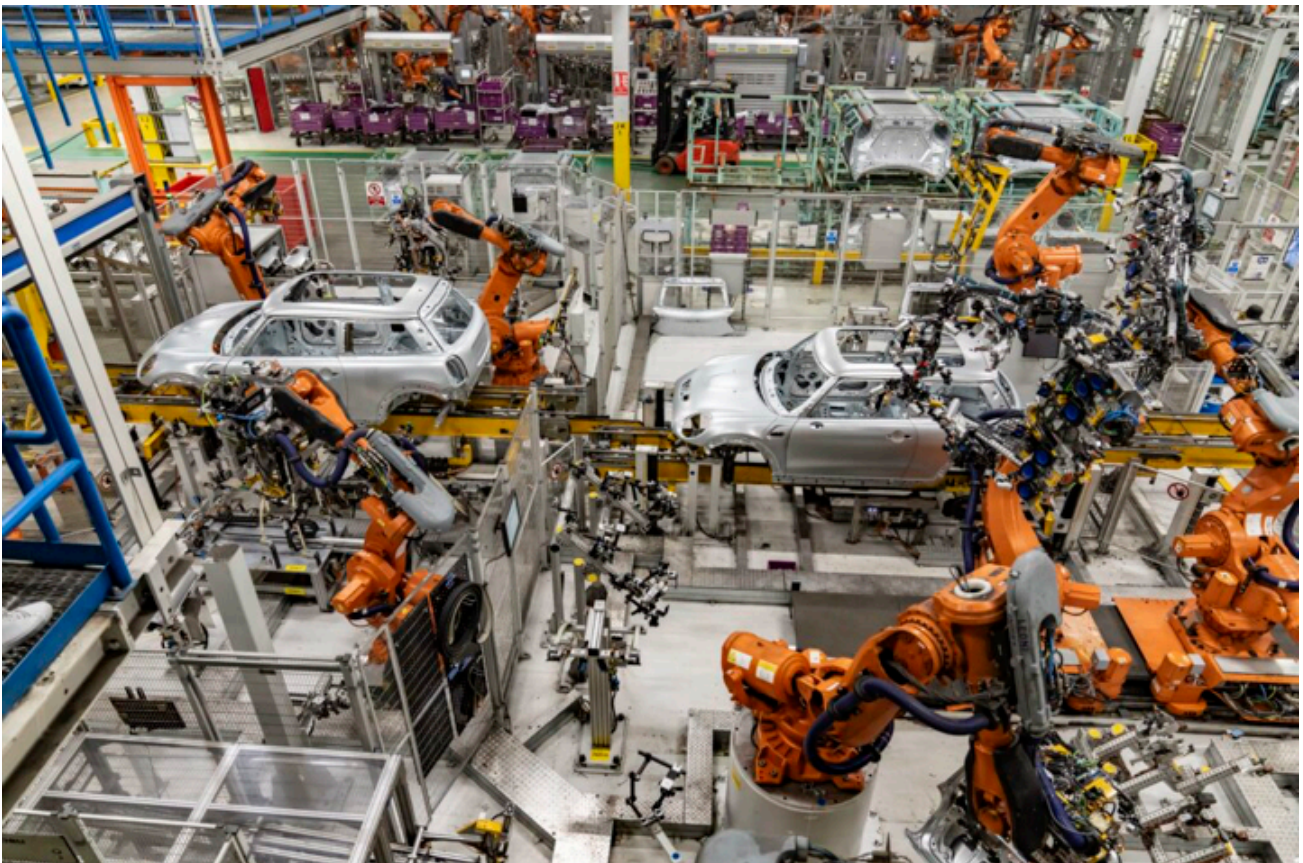
A U-turn on net zero promises and a new push-back on the ban of new petrol and diesel cars from 2030 to 2035 has undermined the UK's troubled car industry.

Aside from ripping up the cross-party climate consensus, the new policy switch from British Prime Minister Rishi Sunak announced in September 2023 has drawn sharp criticism from major car makers like Ford. Industrial policy volatility affects long-term investment attractiveness and credibility.

The government-funded battery action group, the Faraday Institution, predicts the UK needs battery production capacity of at least 80 gigawatt-hours (GWh) per year by 2030—1 GWh being enough to power around 750,000 homes— if the UK is to support a manufacturing base, swerve EU tariffs and support tens of thousands of jobs.

For its part, the UK battery and automotive sector is fighting to keep its UK manufacturing base alive with gigafactory investments. In July 2023, India's Tata Group pledged £4 billion to a battery gigafactory in southwest England. The Tata commitment, promising around 40 GWh a year capacity and sweetened by up to £500 million of state aid from the UK government, has a first production date slated for 2026.

In isolation, the deal appears impressive, but the US through its Inflation Reduction Act, Europe's Battery Alliance development programme and significant support in China, means the UK remains, still, well behind.



## **INDUSTRIAL REVOLUTION**

On May 9th, 2023, a parliamentary committee, questioned a group of prominent minerals experts about the UK's electric vehicle (EV) battery manufacturing future. One of those on the panel was Simon Moores of Benchmark Minerals Intelligence, a market observer, who expressed frustration at the lack of holistic thinking when it comes to developing a battery sector.

“This is a brand new industrial revolution. You cannot expect to build the downstream and have the midstream and the upstream happen. You cannot build the upstream and expect the downstream to happen. You have to build all of it, all at once,” Moores told the committee.

“We do have a great chemical sector. We should be using that more. We have good industrial sites. We have freeports. We could be doing more there. Ultimately, until we have energy prices that compete with the EU... we are always going to be at a disadvantage,” he added.

Moores thinks at least three gigafactories are needed if the UK is to successfully replace its internal combustion engine (ICE) output as well as meet the demand for other power sources. In other words, to have a fully fitted-out gigafactory supply chain in place.

But Sunak's rollback on the sale of new diesel and petrol cars to 2035 has divided the UK's car industry. Further delays or uncertainty will harm plans for gigafactory investment. The uncertainty is supercharged even higher by a looming 2024 general election—all major UK opposition parties say they will reverse Sunak's decision.



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## **BATTERY BOOST**

Dominic Tribe from Vendigital, an automotive supply chain engineering consultancy, does not think the UK has to be all in. There is more UK opportunity in high-end premium battery technology, he says.

“You might make an ultra-high capacity battery, for example. Or be first to market with a sodium battery. Or first to market with a fully solid-state battery. You can charge more for it, the sum of its parts plus a healthy margin,” he says. The UK could focus on niche products where recyclability and second-life opportunities become more valued. “Lower volume,” says Tribe “[but] get yourself into more cutting-edge products.”

A public obsession with EV battery range is a distraction from powertrain technology, Tribe thinks. “How do we make the whole thing more efficient, so we’re not putting more batteries into vehicles than we need? How efficient is the motor system? How efficient are the batteries working with the whole system?” Tribe asks. These questions could feed into an alternative battery sector research and development (R&D) plan.

A more niche approach could avoid over-investment in obsolete technology, especially as battery tech improves.

## **ALTERNATIVE TECHNOLOGIES**

As well as batteries, the UK could also look towards alternative fuel source specialisms.

Lithium extraction for use in batteries is “unsustainable”, there is a lack of control around battery pack recycling and its supply chain is still emerging, says Pablo Martinez-Moore of engineering company North Ridge Pumps, which develops applications for synthetic e-fuels and hydro-processed vegetable oil products.

ICE vehicles running on alternative fuels would preserve jobs—but it is going up against the mass policy pivot to EVs, he claims.

Elsewhere, scaling up investment in green hydrogen could lessen the pressure on gigafactory infrastructure. Hydrogen cars are not going mainstream but for trucks and buses, it is more nuanced even if renewable hydrogen investors face headwinds.

Alternative options would lessen the pressure on any domestic battery sector. However, Duncan Kerr, from engineering company Aeristech, which builds fuel cells for the transport industry, says hydrogen production companies also face demand and supply issues alongside erratic stock market conditions.

## **WIND LOSS**

The biggest frustration for Kerr is wasted wind power generation due to a lack of storage, while gas-fired turbines continue to burn when wind speeds are lower. This unused wind power could instead be used to make green hydrogen, Kerr says.

The UK government set a target of installing ten gigawatts (GW) of green hydrogen production capacity by 2030, much of it powered by wind turbines he says but, “there’s quite a struggle to make these electrolyzers bigger”.

E-fuels derived from hydrogen however remain deeply expensive. The UK’s Department for Transport has given no hint it considers e-fuel innovation a viable alternative to fossil fuels.

## **BRITISH BATTERIES**

Following Britishvolt’s demise in January 2023, UK gigafactory momentum was jump-started by the Tata investment in July. In September, BMW confirmed a £600 million investment to build its new electric Mini in Oxford, helped by an estimated £75 million worth of UK government subsidies from its Automotive Transformation Fund (ATF).

While both investments are a much-needed vote of confidence in the UK, no battery supplier is yet named by BMW for the new Mini factory. If the UK’s flagging car industry is going to be meaningfully electrified then more companies need to invest—but they need persuading. The new watering down of green policies by the Sunak government in September is likely to slow momentum.

China’s BYD brand ruled out the UK in March when it considered a European plant shortlist. “Even on the long list we didn’t have the UK,” BYD told the *Financial Times* newspaper. Currently, the UK has one gigafactory compared to more than 100 in China and is likely to need ten by 2040, says the Faraday Institute.

The Society of Motor Manufacturers and Traders (SMMT) which represents UK car makers, prefers to re-frame demand need in gigawatt-hours. “By 2030,” says the SMMT’s Paul Mauerhoff, “We will need something like 60 GWh of capacity to produce around a million EVs.” Tata is looking to get to 40 gigawatt hours by 2026, he adds.

Yet it can take up to five years to design and build a gigafactory: finding the site, securing licences, as well as constructing the plant itself.





## The UK is good at the hard science but les

### **KEEP IT LOCAL**

The gigafactory pressure is further complicated by “rules of origin” content levies on EV sales from the EU and UK. By 2027 as much as 70% of a battery’s cost must come from either the UK or the EU, while an intermediate 40% threshold kicks in on January 1st, 2024. This agreement is part of the post-Brexit trade deal. Keeping the supply chain local is increasingly critical.

“[This] is probably playing on the [UK] government’s mind more than the industrial strategy around battery location,” says Michael Lewis at the University of Bath School of Management, Centre for Sustainable and Circular Technologies.

Around 80% of UK vehicle output is exported while most EU-produced cars, bar German vehicle output, stay inside the EU. Which means the UK is exposed to trade tariffs. Lewis worries about production and scaling costs—and obsolescence battery risk too. New technology requires vehicle re-engineering. Such high-end innovation pressures may not work in favour of an industrial-lite, but flexible, UK.

“UK technology is rarely traded at scale, it’s often been about nimble operating systems rather than the hardware. Niche semi-conductors rather than massive inductors. One can envisage that, again, if we do see a pivot to solid state [battery technology],” says Lewis.

EVs are often criticised for their weight. Automakers Nissan and Toyota are close to developing solid-state batteries which, crucially, do not rely on a cooling system making them less bulky and lighter. Solid-state batteries also recharge faster and offer longer range.

### **ERRATIC ENVIRONMENT**

Understanding, then, why the UK's battery sector has failed to meaningfully take off means raking through several layers of frustration.

Promises of a longer-term low-carbon industrial commitment, encouraging investment, hardened substantially in 2018 when then-British prime minister Theresa May and business minister Greg Clark confirmed a range of commitments at the UK's first Zero Emission Vehicle Summit. The Faraday Institution had been born a year earlier. An ecosystem was evolving.

But the Covid-19 pandemic, the Russia-Ukraine war, damaging inflation, supply chain complexity and squabbling within the ruling Conservative Party followed. The UK government has appointed six science ministers in five years. In such an out-of-control environment establishing longer-term goals and policy direction has been hugely challenging.

The journey from R&D to product commercialisation and production is heavily pock-marked and the shadow of Britishvolt's demise remains long. Britishvolt had investment from heavyweight companies like Glencore and Ashtead but it had few orders for a product that remained in development.



**BUSINESS CONFIDENCE?** UK prime minister Rishi Sunak announced changes to the UK's ban on ICE vehicles in September 2023

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## **HISTORY REPEATS**

For much smaller players like battery developer AMTE Power in Scotland, the parallels look painfully close. In late July 2023, the company, which had hopes of opening its own big gigafactory at a former

Michelin tyre factory site in Dundee, warned it was running short of cash.

Euan McTurk of Plug Life Consulting, a battery market analyst, blames the lack of British government support. “AMTE Power has simply not been given anywhere near the support [it needs] despite sitting on a couple of next-generation chemistries.”

One such chemistry is the sodium-ion cell, eliminating the need for nickel, cobalt and lithium—key components of today’s lithium-ion technologies, but that come with difficult and polluting supply chains. “In addition to that you can safely discharge them completely flat and ship them halfway around the world and recharge them again and they will work perfectly,” McTurk says.

McTurk also recalls the case of Oxis Energy which fell into insolvency in May 2021. Oxis had developed a lithium-sulfur battery. Sulfur is super-abundant and more cost-effective than lithium-ion and good for aerospace and EV applications.

Oxis worked on its commercial scale prototypes “but they ran out of financial runway and collapsed”, McTurk says. Its intellectual property rights—the company made more than 300 patent filings—were then picked up by Johnson Matthey, a British multinational speciality chemicals and technologies company, and absorbed its battery materials business.

“Just about any developed nation in this world would have supported [Oxis] so they could scale things up,” says McTurk. The failure is even more abject if you consider that, in 2012, Nissan’s Sunderland plant was churning out batteries to support its pioneering Leaf model. The UK’s early mover advantage was given up quickly.

## **NOT SO PICKY**

What is less well understood but still central to the UK battery investment debate is the recycling supply chain. Up-cycling past-their-best batteries into second-life applications such as storage or powering appliances is complex and the degradation and pre-sorting demands exacting—which plays to UK electro-chemistry strengths and expertise.

Jeff Townsend of the UK’s Critical Minerals Association thinks the UK could also extract value from a better understanding the recycling supply chain. But forecasting with accuracy when lithium-ion batteries reach the end of their natural life is difficult and the sourcing outlets are diverse, from car leasing companies to scrapyards and battery maker re-sellers.

The Faraday Institute’s EV lithium re-use batteries project currently estimates around 16,500 tonnes of battery packs will need to be processed by 2028 “and the volumes will continue to rise thereafter”.

## **OVERLY LAB-BASED**

Gavin Harper, part of the Met4Tech UKRI Interdisciplinary Circular Economy Centre for Technology Metals, is cautious about relying on just science as a major arm of UK industrial policy. The challenge for the UK is not just batteries and critical materials.



“You can look at the history of UK innovation, and it’s a bit of a trope that gets repeated, that the UK is good at the hard science but less good at the translation and making money out of it,” Harper says.

Do not give up on heavyweight UK battery manufacturing in the near term, Harper advises. The UK cannot get by purely on science research. “By the time you get something of value then you wouldn’t have the industrial capacity to translate that value into commercial application. And you wouldn’t have the consumers within the UK supply chain to take up that innovation.”

While keeping “high science” laboratories funded, avoiding the longer-term industrial investment decisions is not plausible, he adds. “It’s almost an attractive sell to governments because you’re not asking for too much,” says Harper.

“You’re just asking to protect the citadel of academic research—what’s relatively small beer in the scheme of things—and you’re promising wins that are going to come along the line.”

### **Understanding the EV odometer**

For now, the UK battery landscape remains fractured. Until the Tata plant comes onstream, the UK has one major gigafactory—the Chinese-owned AESC’s plant in Sunderland—and no major recycling facility.

Even with an abundance of UK electro-chemistry expertise, getting a fix on the bigger picture is difficult not just for government policy-making but consumers, the key to EV demand.

“Go back a few years,” says Michael Liebreich, a market observer and analyst, “and people were saying, ‘Oh, you have to swap the battery every few years, you’ll need a new battery and how is that supposed to work?’ Even with car batteries that were produced five to seven years ago, the real experience is very little degradation—10% over 200,000 miles is common.”

What the UK has got to be better about, Liebreich thinks, “is [to] think of [gigafactory investment] as platforms. The gigafactory doesn’t become redundant just because there’s a big change in battery chemistry”.



### **STRANDED INVESTMENT RISK**

Other voices are less hopeful, especially on the larger battery sector picture. In July 2023, Paul Drechsler of the Society of Chemical Industry (SCI), an industry body, told the *BBC* that the UK still has no clear industrial strategy.

“We had one up to around 2021 [until] it was thrown in the bin. And now the very idea of having a rigorous, detailed plan to make our economy more successful through industry, R&D and science, they [the government] don’t want to have anything to do with it.”

While industrial policy is discussed it is less often defined, sprawling across economics, supply chains, trade policy and even branding.

The relationship between car makers and battery suppliers is also changing. Car makers want control over battery costs yet competition makes investment in batteries high risk. More twists in the battery supply chain relationship are inevitable.

Fusing the laboratory front end with the back end—building factories for better quality jobs—could prevent a potential loss of £230 billion from the economy, Drechsler claims. Other observers say the UK Net Zero 2050 pathway already showcases the UK industrial roadmap.

What is just as important is reliable detail across infrastructure, innovation and low-carbon policy, including urban planning and materials constraints. And plausible, consistent UK government policy support that can be relied on, right across the massively expensive transport transition. A populist resetting of the government’s net zero strategy to 2035 will make this journey harder. •

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