

# Automotive World MAGAZINE

Issue 46 | October 2023



**How could a UAW strike  
impact US automotive  
electrification?**

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Published in October 2023 by:

# Automotive World est. 1992

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**ISSN:** 2634-9531

**Registered number:** 04242884

**VAT number:** GB 815 220 173

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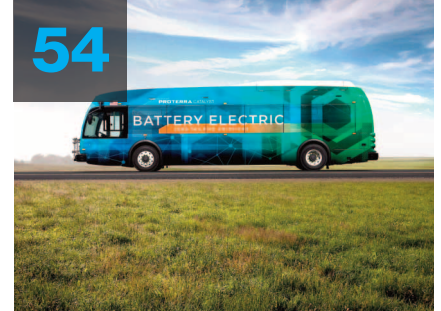
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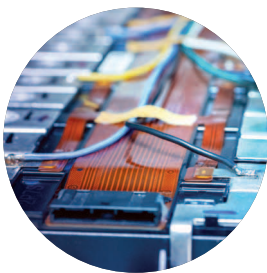
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# How could a UAW strike impact US automotive electrification?

As UAW members prepare for strike action against the Big Three, market forces could mean suppliers are the worst affected. Will Girling hears more

**O**n 25 August 2023, United Auto Workers (UAW) members voted 97% in favour of strike authorisation at GM, Ford, and Stellantis. If new labour contracts are not agreed by 14 September, strike action will likely take place. Demands include a 46% wage increase, cost-of-living adjustments, and an end to tiered wage systems that disadvantage veteran workers.

During a Facebook Live session, UAW President Shawn Fain made it clear that the ball was in the OEMs' court: "Our goal is

not to strike. I want to make that very clear. Our goal is to bargain good agreements for our members." Nonetheless, he reaffirmed that the 'Big Three' would face industrial action if negotiations fell through. The union currently represents around 150,000 workers.

With decision time looming, what could be the long-term impact of strike action on the US automotive industry? Furthermore, how could it affect a wider supplier ecosystem that has been embattled since the COVID-19 pandemic?

## Electrification threatens labour?

The momentum for strike action has arguably been building for several years. "At the heart of it, the UAW is trying to protect its members against the effects of electrification," states Mark Barrott, Partner at management consulting firm Plante Moran. "It believes, perhaps with some justification, that this transition will be bad for workers."

The electric powertrain has 90% fewer moving parts than an internal combustion engine,





© Ford

streamlining but also scaling down manufacturing operations. EVs' more simple architectures also enables greater automation. For example, Tesla's Gigacasting process uses two Giga Press machines to create the front and rear ends of a car from molten aluminium, mitigating the need for approximately 170 welds. The automaker claims that doing so can cut 40% of the manufacturing costs for its Model Y. Barrott adds that Toyota, Geely, and Volvo are all exploring similar ideas, while GM is scaling back its vehicle platforms from 14 to two.

"The UAW is looking at this and realising that less labour will be required for car manufacturing in the long term," observes Barrott. Any reassurances from OEMs that workers will retain their previous value in a new industry, he continues, are unlikely to be believed. Combined with manufacturing moving away from the traditional, unionised heartlands of the US (Michigan, Ohio, Indiana, etc.) and record profits for automakers amid wage stagnation, the stage has been set for an "us versus them" industry showdown.

## Suppliers feel the squeeze

Market research company Wards Intelligence found that US vehicle sales dropped 8% year-on-year in 2022. Despite this, the Big Three posted record profits: US\$21bn for GM (17.86% higher than 2021), US\$24bn for Ford (9.08%), and US\$37bn for Stellantis (6.54%).

This can partially be explained by sales of high margin models like pick-ups and SUVs, which the International Energy Agency found to be particularly





“

Even if the strike lasted longer than expected, it won't create a fork in the road for the industry

resilient during the COVID-19 pandemic. In March 2023, *US News & World Report* stated that average new EV transaction prices had topped out at US\$50,000 by the end of 2022. It was a strong financial period for OEMs, but not necessarily for suppliers.

“Suppliers bore the brunt of EV supply chain volatility during the pandemic, including higher material, labour and energy costs,” says Barrott. “Although some companies have been able to recover this extra expenditure from OEMs, most of the small

and mid-sized suppliers have been squeezed significantly. A UAW strike will put even greater pressure on them.” Furthermore, strike action will disproportionately affect those located in the US heartlands and primarily serving the Big Three. “Diversified suppliers will have an easier time, as German, Japanese, and Korean automakers in the US are likely to escape strikes for now.”

In Barrott's opinion, the UAW's wage increase demand is unlikely to be met, creating a difficult situation from which suppliers will struggle to benefit. “The UAW sees the industry's increased profits



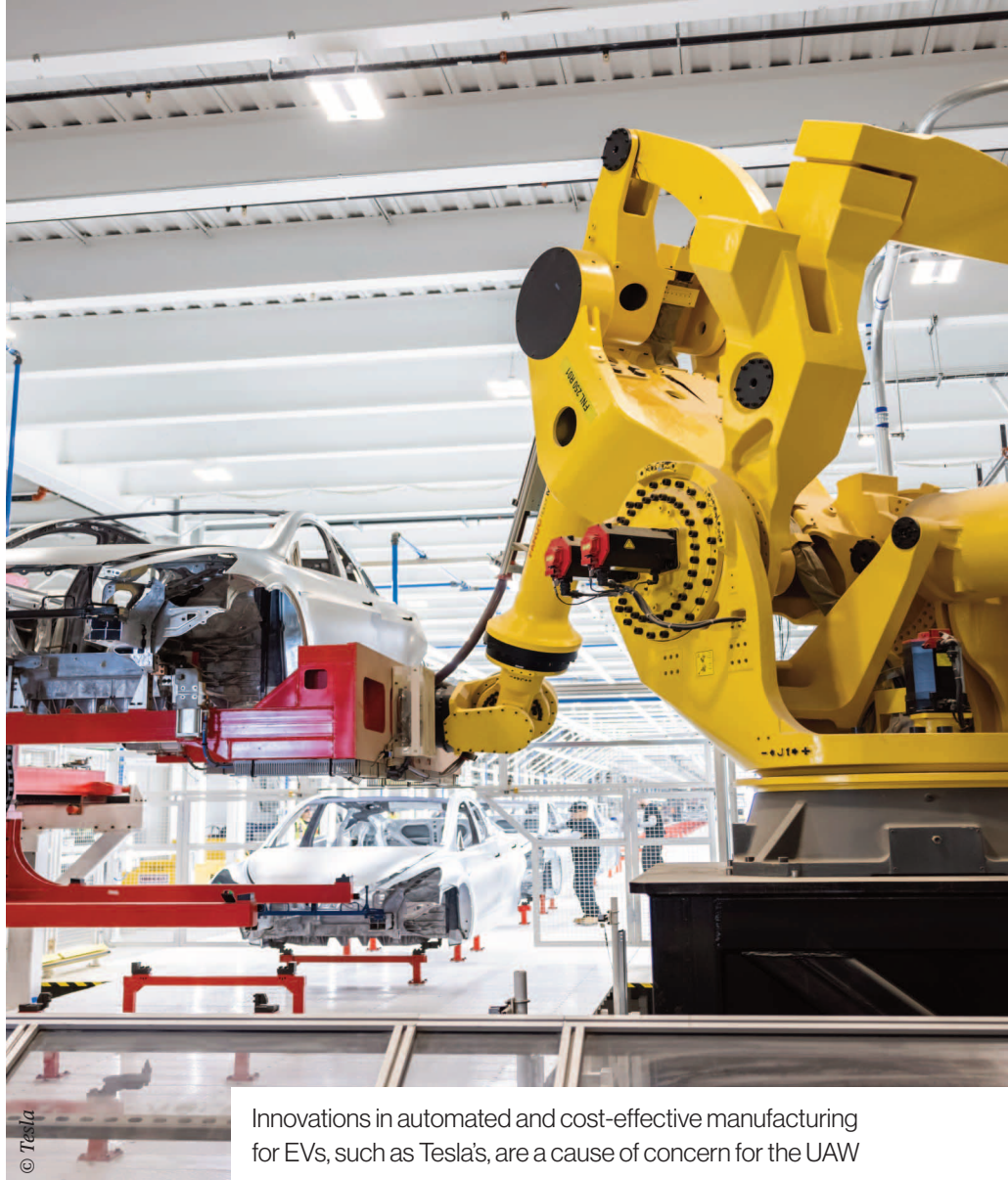
and questions why they can't be redistributed. The OEMs' counterargument is that more capital is needed for facilities and plants to maintain and grow the electric industry." With EV transaction rates already high, it is unlikely that suppliers' already stretched financials can be covered by consumers. In fact, as enduring issues such as the semiconductor shortage taper off, he suggests that automakers will shift to cheaper electric models and shrink suppliers' margins even further.

## Deciding the future

With no indication that either party will concede to the other in the debate, Barrott proposes that strike action is more likely than not.

"Suppliers are currently banking parts in order to maintain business. It's possible that consumers wouldn't notice any disruption for a month or two." A longer strike would deplete this stock and potentially lead to a more favourable negotiating position for the UAW. The question will be how long the union's "war chest" of resources can sustain prolonged action against three major automakers.

It is notable that strike action in the US is becoming a prospect while it is simultaneously seeking to onshore manufacturing from markets like China. The material origin rules and associated tax credit benefits of the US\$400bn



Innovations in automated and cost-effective manufacturing for EVs, such as Tesla's, are a cause of concern for the UAW

Inflation Reduction Act have produced a regulatory environment that could create new labour markets. Indeed, it has already proved successful enough to spur the EU to [prevent a manufacturer exodus](#) across the Atlantic. In the long-term, Barrott believes a UAW strike would prove to be a "blip on the horizon" that will not disrupt the US' desire to shorten e-mobility supply chains and enhance domestic production.

The US currently accounts for US\$210bn of the total global electrification investments made to date, which are

forecast to reach US\$1tr by 2030, according to market data provider Atlas EV Hub. Due to these market forces, he concludes that a UAW strike might create short-term difficulty but is unlikely to affect the US industry's course. "The train has left the station—even if the strike lasted longer than expected, it won't create a fork in the road for the industry." As negotiations between the UAW and the Big Three continue, both parties must consider how electrification is changing manufacturing and decide a mutually beneficial future for the US' automotive industry.

# Cupra DarkRebel battles dragons— and status quo

Megan Lampinen reports back from the launch of Cupra's potentially disruptive EV concept at IAA Mobility





Maps of old would often indicate unexplored lands with the label, “here be dragons”, warning travellers of mysterious, potentially dangerous regions. For Cupra, that’s more of an invitation than a deterrent. The self-proclaimed rebel brand is tapping into this spirit of adventure and self-determination with its latest concept, the all-electric sports car, DarkRebel.

“While some people are afraid of the unknown and leave the unexplored, unexplored, that is not how we do things at Cupra,” Chief Executive Wayne Griffiths told media at a recent press event at IAA Mobility. “We believe in discovering what’s hidden in the dark.” Teased as a virtual image in April 2023, fleshed out in the following months with online feedback from the Cupra Tribe (the fanbase), this vision took physical form at IAA. The event marketing material played heavily on the ‘here be dragons’ and exploration theme.

Cupra is clear—this is not your average sports car. That category belongs to the likes of sister Volkswagen Group brands Porsche, Lamborghini and even Audi. As Griffiths asserted, “Traditional sports cars don’t make sense for us.” This design, should it eventually find its way into a production car, will never be a volume player. What it is, said Griffiths, is “our guiding light, our icon, an expression of what we want to do with the Cupra brand in future.”

Technically, this icon takes the form of an all-electric two-seater based on shooting-brake architecture and an interior wholly devoted to the driver and the driving experience. “This is



The DarkRebel pushes the boundaries of what is possible



for drivers that like to drive, not to be driven,” Chief Operating Officer Sven Schuwirth told *Automotive World*. The design team is particularly proud of the interior illumination and the mercurial exterior body colour, which changes



depending on the environment and the angle. Everything about it deliberately pushes the boundaries

technically illegal. This is a study in the possible and challenges the way vehicles are imagined and created.

“

We are looking for a revolution every time we take the pen in our hand

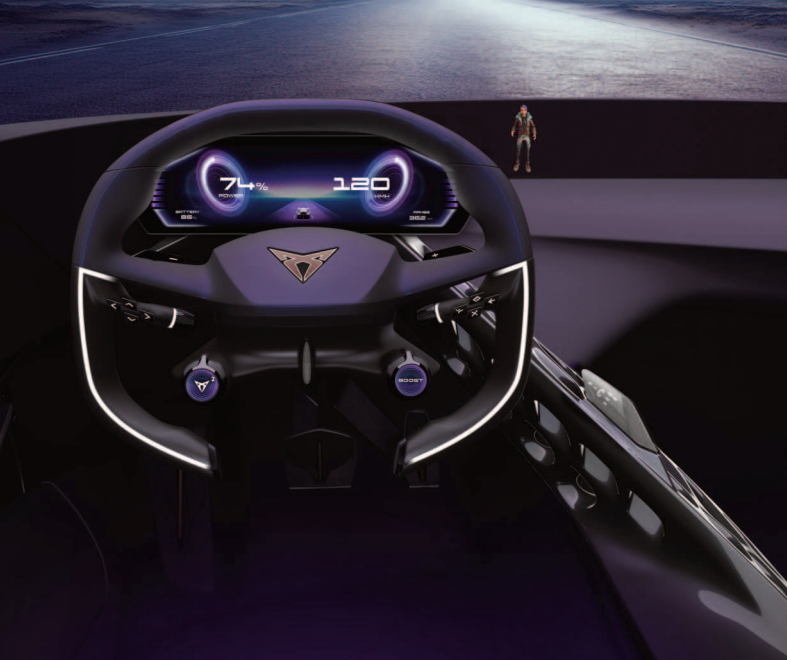
of design and performance—to such an extent that not all the windows are functional and the floating illumination in the exterior is

Notably, DarkRebel marks the first model to be created directly from fan feedback—specifically 270,000 consumer configurations in Metahype, Cupra’s virtual space. Each of these 270,000 fans spent between six and ten minutes configuring their vision of the ideal sports car of the future in Cupra style, within certain limits set by the configurator. The design team, led by Jorge Diez, translated these submissions into a physical product of sheet metal and software. And they didn’t hold back. “We are looking for a revolution every time we take the pen in our hand,” said Diez. The result is an assertion that electric cars in the future can be sporty, sexy, emotional—and profitable.

Jorge Diez and Wayne Griffiths with the DarkRebel concept at its Munich unveiling







Cupra is driving parent company SEAT's growth, with total SEAT group sales up 20% this year. Cupra alone sold 150,000 vehicles in the first six months (23,000 in June), propelling SEAT to a record first half with profit of €370m (US\$399m) and turnover of €7.4bn. Cupra models carry a higher margin than SEAT's and have thus been prioritised during the semiconductor shortage. Griffiths is "obsessed" with carrying that momentum forward with ground-breaking design.

"Obsession" is a controversial word choice, but one he stands by. "Obsession means an idea or thought that continually intrudes on a person's mind, often to an irrational degree. We are always driven to be a little irrational in what we do, always surprising, always provoking. We are crazy enough to take necessary risks, even if they give us sleepless nights. If we are not

obsessed with what we do, perhaps those things are not worth doing."

The pay off with show cars like the DarkRebel comes primarily from their impact on brand image. "This show car is a provocation," said Griffiths. "We still have to see if we can afford it along the way, but our series production cars are pretty close to show cars. If we want to become an iconic brand, we need to produce icons. This car could become an icon."

It's a bold assertion. Cupra's move into electric vehicles is a pricey one and faces increasing competition from Chinese brands, many of which have set their sights on Europe. Can such a bold, deliberately polarising design vision ensure the viability of this upstart European in an increasingly competitive, margin-squeezed segment? Here be dragons, indeed.



Images © Autocraft EV Solutions

# Prioritising recycling could be a barrier to true EV circularity

Sara Ridley argues that remanufacturing can help extract every last bit of value from EVs



**T**he automotive industry is on a fast track to clean up its act. Electric vehicles (EVs) are viewed by many as the future of automotive and while the elimination of tailpipe emissions is undoubtedly a major step forward, important questions remain. To become truly circular, automakers will need to develop a plan to prevent EV batteries from going to landfill. How exactly they should go about achieving this remains the subject of considerable debate.

While much of the discussion around circularity revolves around the business of how to recycle EV batteries, there are, arguably, more immediate questions to be addressed, such as how to maximise the longevity of EV batteries and the value that can be yielded from them over their lifetime. By investing all its time and attention into solving the recycling question, the industry risks ignoring or neglecting other avenues that could prove more impactful towards its sustainability goals.

## **The current state of EV battery recycling**

Data shows that the global EV battery recycling market surpassed US\$2.1bn in 2022, with this figure expected to reach as high as US\$19bn by 2030. The environmental impact of sourcing the materials used to create EV batteries is substantial, therefore one might logically assume that recycling is the optimal way to recoup maximum value from the materials used. At a minimum, if the industry recycles the materials within EV batteries, then surely the aforementioned environmental cost of sourcing them, combined with the additional cost of producing the

batteries themselves will not have been in vain? Most people would tend to agree with this position and yet, this viewpoint speaks to the prevailing view that recycling holds the key to achieving circularity goals.

“

**While much of the discussion around circularity revolves around the business of how to recycle EV batteries, there are, arguably, more immediate questions to be addressed**

Although recycling does indeed play an important part within this journey, its importance should not be overstated at the expense of other demonstrably more effective measures which should take precedence. As things currently stand, there is a very real danger that bias towards recycling is causing large quantities of EV batteries to be prematurely recycled when in fact they have much more to offer.



Does remanufacturing represent the best available route to unlocking the environmental and performance benefits of EVs?

## The hidden cost of recycling

Data from Autocraft EV Solutions highlights the inefficiency of current recycling processes. If the environmental cost of producing EV batteries is high, recycling is only somewhat better, generating approximately 53% of the electricity, consuming 14% of the water and emitting 59% of the CO<sub>2</sub> required to produce a new battery. These figures put the true impact of recycling into perspective.

According to the waste management hierarchy framework, preventing waste in the first instance is the best way to yield the maximum environmental benefit. As things currently stand, the automotive industry could be accused of overlooking this important step or at the very least, not giving it the investment it deserves. This begs the question, why is this the case?

## Remanufacturing and its role in waste reduction

Supply chain constraints, combined with the well-publicised environmental impact of producing new EV batteries, should prompt a serious rethink about how the automotive industry positions itself to truly unlock the environmental and performance impact of EVs. Remanufacturing offers a solution to this challenge, with major advancements in EV battery testing and repair providing a potentially ground-breaking avenue to achieve its goals. Awareness levels about what can be achieved through remanufacturing, nonetheless, remain low. Misconceptions around remanufacturing also continue to hamper progress on this front.

For instance, it is now possible to identify battery faults at a cellular level, meaning that the affected area



can be targeted. This represents a far superior alternative to replacing the battery altogether and data illustrates the value of such an approach. Repairing a single battery module uses a tiny fraction of the electricity and water (3.2% and 2.8%, respectively) required to produce a virgin pack, while emitting a mere 2.9% of the amount of carbon.

Interventions of this kind can be undertaken at regular intervals throughout the life of each battery to proactively address causes of battery faults, even before they have occurred. The value here is that premature decline can be halted by reversing the effects of cyclical ageing, which ensures that batteries perform at the optimum level for where they are at within their lifecycle. Only when all avenues to maximise battery life through repair and remanufacture have been exhausted should the possibility of recycling be considered.

## **Giving EV batteries a second chance.**

Even when EV batteries no longer meet the required standards for use within automotive, it is still vital to explore ways to derive further value before recycling them. Power-walls, static storage, and marine conversions are just a few of the opportunities to transition remanufactured packs and modules once they have been deemed unsuitable for their original purpose. This way, the packs are still operational in some form or another, and the longer they remain

in use, the greater the value they provide to offset the environmental cost of producing them.

## **The road to circularity**

There is no perfect solution when it comes to achieving optimal sustainability outcomes within the EV sector. That said, remanufacturing and repair represents arguably the best available route to unlocking the environmental and performance benefits of EVs. A multi-faceted approach is required to achieve true circularity and if the industry remains on its current trajectory, it stands to miss out on the untapped environmental and financial potential that can be achieved from maximising the life of its EV batteries

EV battery recycling is an important issue for the automotive industry and efforts to streamline processes to become more efficient and less wasteful are a good thing. That said, this should not distract from the wider aim to extract every last bit of value from EVs by restoring performance and maximising longevity through repair and remanufacture. An integrated approach to circularity is needed and perhaps it is time that the industry embraced a remanufacturing-first mindset instead of defaulting to recycling because it is the more familiar option. The future success of EVs, and their position as an environmentally-friendly alternative to internal combustion engines, may depend on it.

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*About the author: Sara Ridley is Engineering and Quality Director at Autocraft EV Solutions*

# EV uptake requires nuanced sales nudges

Dealers and OEMs can stimulate EV demand by providing the appropriate nudges to the differing ‘personas’ of customers at each stage of their journey.  
By Randy Miller



**E**lectric vehicle (EV) demand is growing rapidly, registering 55% year-over-year growth, with record sales of 10 million globally in 2022. Forecasts suggest it will race ahead by a further 35% to reach 14 million this year. But for all the hype around the EV revolution, EVs still only represent a modest percentage of the total number of vehicles purchased in many major markets worldwide. After government and OEM efforts to boost the EV market, the

industry’s fundamental question is one of consumer behaviour: “If you build more EVs, will consumers buy them?”

If OEMs want to tackle consumer reservations about purchasing an EV, they need to focus on three main areas: combating a lack of awareness of the benefits of EVs, increasing access to EVs and charging infrastructures, and supplying more information about what to expect from life with an EV.

## Unpicking the ‘personas’

To better understand how consumers feel and think about EVs, the 2023 edition of EY Mobility Consumer Index (MCI) analysed consumer mindsets around EVs in 2023, allocating respondents an index score from one to 100 for their “EV mindedness.” From this, five distinct consumer segments were identified based on respondents’ attitudes toward EVs and sustainability, cost-consciousness, and mobility





© Volvo Cars

preferences. These comprise a spectrum of attitudes and traits ranging from EV Sceptics, EV Reluctants and EV Persuadables to EV Considerers and EV Enthusiasts.

EV Sceptics present ‘eco-doubters’, naturally conservative and risk-averse, seeking affordability. EV Enthusiasts, by contrast, are committed to sustainability and are risk seekers, prioritising performance over cost. The most significant segments—the EV Persuadables and EV

Considerers—lie between these extremes and represent approximately 60% of consumers surveyed. Their views are generally more nuanced—they value sustainability but are budget-conscious.

By charting the trends in the evolution of these two consumer segments, OEMs and dealers have cause for both optimism and concern. Optimism, because they suggest a natural tendency for Persuadables and Considerers

to become more EV-minded over time, developing into Enthusiasts. If that tendency can be harnessed, more consumers will develop an EV-positive mindset more quickly. The results do, however, also cause for concern, suggesting a core group of conservative and risk-averse consumers—the EV Sceptics and Reluctants—whose attitudes toward EVs remain tied to their more expansive views of society and are thus likely to prove harder to shift.

## Convincing consumers

While the middle ground of EV Persuadables and Considerers is likely to be most fertile in the efforts of OEMs to increase EV sales, it is essential not to neglect the more extreme consumer mindsets in these efforts to ‘woo’ potential car buyers towards purchasing an EV. EV Reluctants and Sceptics may have more entrenched views on EVs and climate change, tending to be more cost-focused and more reluctant to pay a premium for an EV. However, they still represent a substantial potential market in the longer term. Likewise, at the other end of the spectrum, many EV Enthusiasts may already have made the jump, but they have a valuable role to play as evangelists and customer advocates.

There are three critical areas where “no regret” moves can be made to encourage

consumers to trade up to a more EV-positive mindset.

The first is awareness. Low awareness of the day-to-day practicality of EVs—such as concerns over usability, reliability, and comfort—hold back many consumers, particularly those whose awareness or experience of current vehicle performance and infrastructure improvements is limited or out of date. Worries about inadequate battery performance and range are also vital negative influences for Considerers.

The range of EVs is a significant worry, reflecting an innate preference for what they are used to and a lack of real-world experience of EV use. 44% of Sceptics prefer an extreme 400-mile (640-km) range from an EV, a mark few models reach and one largely incompatible with Sceptics’ cost-driven preference for budget and mid-market models. However, this concern tends to diminish once consumers have owned or used

an EV, meaning OEMs must work harder to de-stigmatise EVs regarding their battery performance and range.

Raising awareness by providing clear, accurate and impartial information about life with an EV and how battery performance can be optimised through good driving and charging practices should help these consumers to understand that they would be more satisfied with the performance of the latest EV models than they realise.

Access is another key area. Sceptics, Reluctants and Persuadables, in particular, believe that access to EVs is limited to those happy to shoulder a more significant cost burden. Perceptions of high up-front purchase costs and potentially significant ongoing liabilities such as battery replacement make an EV look like a high-risk choice these budget-conscious consumers can’t afford to make.

37% of Persuadables and 27% of Considerers say they put affordability first. While both segments are attracted by the lower total cost of ownership associated with EVs, they also have concerns over costs. For budget-conscious Persuadables, the primary problem is the high up-front cost. At the same time, for more value-minded Considerers, the risk of expensive battery replacements is a sticking point. OEMs and dealers can help address these concerns by offering alternative ownership models and “smart



The Electric Vehicle Experience Centre is the UK's first brand neutral centre for electric vehicles





Range and charging are key consumer concerns

financing,” such as rental and lease to own, to provide greater certainty over the cost, affordability, and low financial risk of joining the EV club. Many OEMs are also exploring offering subscriptions on EVs and even batteries to encourage the EV-curious to test the ownership experience with minimal financial commitment. OEMs can alleviate cost-of-access concerns by providing a wider choice of mid-market and budget EVs with “good enough” rather than market-leading performance.

The third critical area is around expectations. All five segments of consumers are—to a greater

or lesser extent—uncertain as to what to expect from life with an EV. Even consumers already among the more EV-minded have lingering concerns over charging performance, range, and cost. OEMs and dealers can help manage these expectations by providing transparent, realistic, and granular information on the performance of all their models. What ranges and charging times can owners expect to achieve, and under what conditions?

The use of digital tools to help estimate range and plan longer trips can also help establish more explicit expectations and

manage range anxiety. In contrast, consistent communications around the lower total cost of ownership of EVs in the long term can help alleviate cost worries among Persuadables and Reluctants.

The EV sales victory will go to those who can stimulate demand across all segments by providing the appropriate nudges at each stage of the customer journey and encouraging consumers to trade up a segment—so that an EV Reluctant becomes an EV Persuadable, an EV Persuadable becomes an EV Considerer, and an EV Considerer becomes an EV Enthusiast.

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*About the author: Randy Miller is Global Advanced Manufacturing & Mobility Leader at EY*



# Geely signals a new development path for diversified auto groups

Platforms can be shared and synergies found and exploited without one company owning 100% of all of its brands, writes Ian Henry





Chinese company Zhejiang Geely has become one of the major global auto companies in recent years, partly through in-house development of new businesses and brands, and partly through acquisition, or stake-building in established brands. Unlike the Volkswagen Group which has grown partly on the back of acquiring numerous brands in which it has retained 100% or near 100% stakes in its acquisitions, Geely has chosen to acquire and/or retain only sufficient stakes to give it effective control. In a number of cases it has raised funds for further in-house expansion or launching acquisitions through a series of IPOs which have allowed it to realise value in these operations and aid further investment.

Zhejiang Geely is a holding company, managing a plethora of brands, in which its core passenger car business is divided into four groups. The Geely group includes Geely itself, plus Smart (in a joint venture with Daimler), Proton (with ownership shared with Malaysian company, DRB-HICOM), and Lynk & Co (an in-house developed brand). Then there are Volvo and Polestar, which are grouped together in the Volvo group. Lotus Cars and Lotus Engineering form a third group. The fourth group is based around a new brand, Zeekr. Zeekr Intelligent Technology is described as an “electric mobility technology and solutions” brand which will make EVs and batteries.

Alongside these car brands there is a CV group which includes a number of Chinese CV brands and also the UK-based LEVC which makes the London taxi. Zhejiang Geely also includes five other industry groupings: Geely Technology (which embraces a diverse range of business from energy



LEVC has operated under Geely ownership since 2013

through to helicopters); a motorsport group; a mobility group; a financial services group; and an education and talent development group.

While the original Geely brand was developed in China, it moved internationally when Volvo was acquired from Ford for US\$1.8bn in 2010. Very quickly Volvo was allowed to develop its own models, moving away from the historic reliance on Ford platforms. The first new model under Geely ownership was the second generation XC90 in 2014, using the SPA platform which also spawned the current (but soon-to-end) S60/V60/XC60 and S90/V90 models as the Volvo brand accelerates into an all-electric future. In parallel, Volvo and Geely worked together to develop the CMA platform which produced the C40 and XC40, as well as a number of Geely models. Three years after the launch of the SPA platform, Polestar—which had



Lotus Emeya

been a low volume performance brand of Volvo—was hived off in to a separate business in 2017.

Volvo was launched on public stock markets via its own IPO in October 2021, raising about US\$2.3bn but at a reduced share price as Zhejiang Geely held onto 82% of the voting rights in the newly separated company. Previously, Geely had planned to merge Volvo and Polestar but this plan was cancelled in early 2021; instead Polestar has been given more independence. Volvo and the Geely Auto group plan to co-operate in powertrains, EV development, joint purchasing and collaboration in autonomous vehicles. They will also share the new SEA and SPA2 platforms (and the SEA platform will be used by Polestar on the new Polestar 4).

Polestar's IPO and launch on the New York Nasdaq took place in June 2022, and soon after that news emerged that ahead of its all-new electric crossover factory coming on stream in China, Zhejiang Geely planned to list Lotus on the New York Stock Exchange by the end of 2023; this is due to be achieved through an IPO via a merger with an SPAC investment entity backed by luxury groups company, LVMH. Zhejiang Geely had taken a 51% stake in Lotus in 2017 and has since developed the company from a low volume UK sports car player into what will soon be an EV-only brand; production is due to be of a different order of volume with a new Chinese factory planned to make up to 150,000 electric SUVs—way more than the 3,000 or so historically made in the UK.

Zhejiang Geely is also not averse to tapping financial markets to fund the development of its in-house brands; Zeekr is its in-house developed premium brand which has emerged quickly in the post-COVID world, having been announced in April 2021. It is currently the subject of an investor tour to raise US\$1bn in an IPO by the end of 2023. Geely is hoping for a valuation of US\$1.3bn—a remarkable valuation for a company which sold just 72,000 vehicles in 2022 and expects to sell 140,000 in 2023, with international sales planned for the Netherlands, Sweden, Israel and Kazakhstan. Meanwhile, indicating the co-operation potential across the man independent yet interlinked brands, Zeekr is providing the basis for a new Volvo, an MPV to be called EM90. This will be Volvo's first MPV, targeted at the luxury hotel and related markets. At present this will be a China-market only model but it would not be surprising to see this appear outside China in due course.





Volvo EX30

Zhejiang Geely's investments have continued with a stake-building process at the financially troubled UK sports car maker Aston Martin. It first acquired a 7.6% stake in the struggling UK company in September 2022 and is expected to increase this to 20% by the end of 2023. In fact, Zhejiang Geely is now the third largest shareholder in Aston Martin, after its chairman Lawrence Stroll and Saudi Arabia's Public Investment Fund. Reinforcing the links with the wider group, Geely Auto itself will supply seats and HVAC systems to Aston Martin, which will also continue to source V8 engines from Mercedes and electric powertrains and batteries from new EV US company, Lucid.

Zhejiang Geely is a new style conglomerate; it may start by acquiring 100% companies but is clearly willing to sell some share—while retaining control—to reduce overall acquisition costs and generate a return. Established systems or practices of owning 100% of acquisitions have been superseded by Zhejiang Geely's strategy and signal a new way for diversified auto groups to develop. Platforms can be shared and synergies found and exploited without one company owning 100% if all of its brands; legacy auto companies need to rethink their strictures and organisations.

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*The opinions expressed here are those of the author and do not necessarily reflect the positions of Automotive World Ltd. Ian Henry is Director of AutoAnalysis, an independent automotive research and consulting company based in London. The AutomotiveWorld.com Comment column is open to automotive industry decision makers and influencers. If you would like to contribute a Comment article, please contact [editorial@automotiveworld.com](mailto:editorial@automotiveworld.com).*





# How long before Ford turns a profit in EVs?

The move to EVs is well under way at Ford, but this is far from trouble-free, writes Ian Henry





**F**ord lost around US\$2.1bn on its electric vehicle (EV) business in 2022, more than double the US\$900m loss incurred by the new business area in 2021. It expects its EV losses to worsen again in 2023, to US\$3bn. Fortunately its internal combustion engine (ICE) vehicle business remains in a rude state of financial health, especially in North America, generating around US\$10bn in profits. Although Ford is taking every opportunity to benefit from US or European government loans or grants to fund its EV transition, its existing businesses' profitability clearly underpins this transition.

Reflecting the move away from ICE vehicles and highlighting each business area's contribution, Ford has restructured itself, with new business unit names, ie: "Ford Blue," its traditional ICE business; the "Ford Model e" EV unit; "Ford Pro," containing its commercial and government fleet business; "Ford Next," which includes non-automotive mobility solutions and other future tech; and its existing Ford Credit financial services subsidiary. This change has been accompanied by Ford selling off the majority of its stake in the EV start-up Rivian and writing off US\$7.3bn of the book value of its Rivian stake. Ford had reportedly planned to use the Rivian skateboard design for a range of Ford EVs but—having bought into the company—decided to go it alone and develop its own EV platforms.

In the US, major investments in EV production are taking plant at the Rouge plant in Detroit, as well as at the Michigan Assembly plant in Flint and at Flat Rock, also in Michigan; battery plants in Kentucky and Tennessee are being built in a JV with

SK On of Korea, funded by a loan from the US government; and in Canada, the Oakville plant in Ontario will also become an EV and battery assembly facility, with CA\$1.8bn invested there. Ford's total investment in EVs is expected to reach US\$50bn by 2026. However, Ford is expecting North American EV sales to be no more than 40% by 2030, so continued investment in ICE powertrains continues.

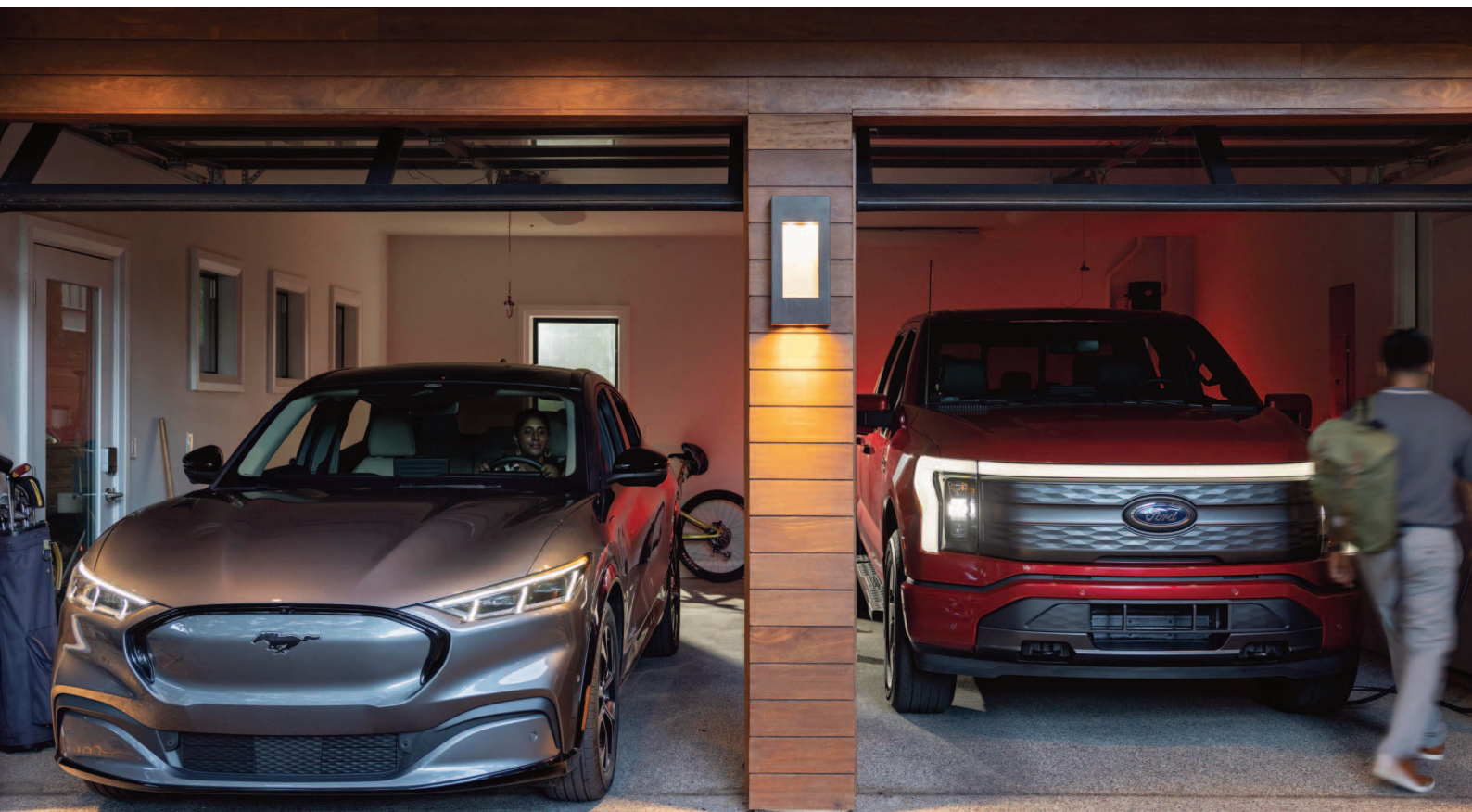
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Ford's total investment in EVs is expected to reach US\$50bn by 2026

In mid-2022 it announced a US\$3.7bn investment programme in Michigan, Ohio and Missouri for both EV and ICE vehicles, adding 6,200 jobs; just over half of this investment will be in Michigan, to support production of the ICE Bronco and Ranger vehicles. But US\$1.5bn will be spent on electric CV production at Avon Lake, Ohio, along with a modest US\$100m at the existing Lima Engine and Sharonville Transmission factories in Ohio; another US\$95m will be spent at the Kansas City Assembly Plant in Missouri to boost production of the Transit van in ICE and electric formats.

Meanwhile in Europe, Ford is moving into EVs largely independently of Ford's US operations. Lacking a small and compact EV platform of its own, Ford of Europe turned to Volkswagen and licensed the MEB platform. Two models using Volkswagen technology will be produced at the revamped Ford Cologne factory; US\$2bn has been invested to transform the factory from the ICE era to EV production, making it the first carbon-neutral plant within Ford. Interestingly, having been set up to make 400,000+ Fiestas, the reconfigured Cologne plant will only make 250,000 EVs, the first of which—named Explorer—will come off the assembly line by the end of 2023. This will be a much smaller vehicle than the ICE Explorer SUV produced by Ford in the US. A second EV, probably to be called Explorer Sport, will appear in 2024.

In Turkey, Ford is also investing in electric Transit production, battery cell production and pack assembly, in association with its local partner, the Koc group, and LG of Korea which currently supplies battery cells for the Transit from its plant in Poland. The new Turkish battery plant (which will be Ford's first in-house plant in Europe, compared to four in-house battery plants planned for the US) comes on stream in 2026. The Ford Turkey plant is run by Otosan, a Koc subsidiary, which also has operational responsibility for the Ford Romania plant in Craiova, which makes the Puma crossover; this will add an electric version and take on the Transit Courier small van with production transferred from Turkey. Transferring small van production from Turkey to Romania will enable Ford Turkey to concentrate on Transit production and also make the new Volkswagen Transporter as part of the Ford-Volkswagen alliance in Europe.







In June 2023, Ford opened the Cologne Electric Vehicle Center, a hi-tech production facility in Germany that will build its new generation of electric passenger vehicles

Also, in 2022 Ford announced plans to produce EVs in Valencia, although it gave little information on volumes, models and timing; and in 2023 the company announced it would delay this investment, and as a consequence of this delay it has withdrawn its application for support funding for the EV investment from the Spanish government. Ford reportedly still plans to make EVs in Spain but has not made any definitive commitment as to when and at what scale.

The move to EVs is well under way at Ford, but this is far from trouble-free; its costs are clear from the company's admission of at least three years of EV-specific losses, already amounting to over US\$6bn (taking 2023's expected losses into account). With US\$50bn being invested in EVs across its operations,

Ford needs its EV operations to move into profit sooner rather than later. But with plans for EVs in Spain in abeyance, and the admission that it expects ICE vehicles still to represent 60% of North American sales in 2030 (with supporting investment required here too), the transition to EVs will clearly not be quick. How far behind its competitors Ford ends up because it has to invest in both ICE technology in the US for the foreseeable future while increasing its investment in EVs will be interesting to observe. The difficulties of transforming legacy automotive manufacturers into full EV companies are very clear at Ford. It's an experience which others will also likely face, creating more space for the Chinese manufacturers in Europe in particular and quite probably more widely across the world.

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# What's shaping commercial transport concerns and priorities?

Shippers and carriers provide feedback on the future mobility outlook for US trucking. By Megan Lampinen





**C**ommercial transport operators are juggling a complex mix of priorities. Along with the usual pressure to cut costs and navigate volatile fuel prices, they are also scrambling to meet new sustainability requirements and position themselves for an increasingly automated future. These trends are prompting many decision-makers to reprioritise both mid- and long-term business strategies.

## **Pessimism on emissions reduction**

In Breakthrough's 2023 State of Transportation report, 94% of respondents agree that consumer demand for more sustainable products makes reducing emissions a bigger priority in the next 12 months. Breakthrough is a transportation data analytics firm, and its findings are based on a survey conducted in March 2023 of 500 transportation companies (350 shippers and 150 carriers) in the US.

Notably, the impetus to prioritise emissions reduction comes from corporate leadership, with 42% of transportation professionals saying pressure to improve transportation sustainability most often comes from the C-Suite. However, progress on emission reduction goals may be slower than expected. 61% of respondents expect that ongoing macroeconomic forces will make it nearly impossible to meet emissions reduction goals over the next 12 months. 33% believe it will be somewhat difficult, with only 4% believing current economic conditions will have no impact on their company's ability to meet targets.

"Pessimism around emissions reduction opportunities today is a function of procrastination and the belief of a few that are waiting for a silver bullet solution for zero-emission vehicles (ZEVs)," says Matt Muenster, Breakthrough's Chief Economist. He advocates an approach that incorporates multiple different fuels, which gels with various industry predictions. Bloomberg New Energy Finance, for example, forecasts a steady decline for US diesel and gasoline heavy commercial vehicle sales, with an increase of battery electric, natural gas, and fuel cell vehicles through 2040.

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**Nearly 97% of carriers see value in adding electric vehicles to their fleet**

"A portfolio approach can help organisations achieve emissions reduction goals by considering the alternative energies available by geography," adds Muenster. "The more shippers lean into the multi-fuel opportunities that exist today, the more optimistic they become... Shippers are overwhelmed by the concept of incorporating sustainability considerations in the



Kenworth has been working with Toyota to deploy fuel cell technology in its trucks

day-to-day operations of running their transportation networks. Since most transportation operations are contracted to third parties, they must rely on carrier partners to successively execute. This adds to more uncertainty and can lead to pessimism.”

In the years ahead, as players gain experience moving freight in a more sustainable way, he expects to see that pessimism lift. The vast majority of respondents on the shipper side (99%) said they would take advantage of electric or alternative energy vehicles if carriers in their networks offered them. Nearly 97% of carriers see value in adding electric vehicles (EVs) to their fleets and 59% plan to do so by the end of 2023. Interest is there, but progress remains slow, with most carriers still in the pilot phase of adoption.

“While heavy-duty ZEVs are available today, we know that widescale deployment of these technologies

requires considerable upgrades to the technology and particularly the infrastructure across North America,” explains Muenster. “This is a great long-term solution for emissions reduction, but shippers also need a more realistic, short-term strategy.”

## Autonomous driving

Automated driving also promises to make its mark on the industry in the long term, but again that impact could take its time materialising. Breakthrough’s study found that 94% of respondents were interested in autonomous driving pilots. Not only could autonomous vehicles (AVs) provide relief in the event of driver shortages but they could also improve the safety and efficiency of goods movement. “AVs work as a ‘perfect driver’, which means they can run around the clock providing better service—no hours-of-service rules—and drive with optimal fuel efficiency, saving on fuel costs,” he notes. “They are likely safer than a human driver, entailing lower insurance expenses. All these reasons can result in reduced costs for the carrier and shipper.”

But as with the ZEV transition, most of the activity today is limited to pilots. Uber Freight is one to watch on this front, as it recently partnered with Volvo Autonomous Solutions to offer autonomous freight capacity to shippers on select routes, starting in Texas. Visions for how automation will play out in the freight industry vary, but in this case both Uber and Volvo see it taking hold in a hub-to-hub model. Here, autonomous trucks operate on long-haul segments of a journey while human drivers complete drayage operations.





Volvo Autonomous Services is forming strategic partnerships to pilot and eventually commercialise autonomous transport solutions


In Muenster's view, there will likely be a role for a human driver in some form for a long time yet. "In the journey towards Level 5 autonomy, a driver will have to be present," he tells *Automotive World*. "However, the driver role could adjust by monitoring multiple trucks at once, or there could be multiple drivers in a cab to allow the truck to operate 24/7 while complying with hours-of-service rules."

## Attracting investment

Macroeconomic trends like inflation, the economic growth rate, the employment growth rate, government policies and regulations, trade, and industrial production continue to pose challenges for transportation leaders and will inevitably impact the evolution of

future mobility technology in this space. "The current macroeconomic environment creates near-term headwinds and long-term tailwinds for an autonomous, electrified future," predicts Muenster.

As he explains, high materials and labour costs, and an elevated cost of capital create near-term headwinds for the growth of these industries because these dynamics increase production costs. However, subsidies and incentives coming from policymakers are providing some relief to these near-term headwinds. "In the meantime, longer-term trends such as labour-constrained economies and the potential for sustained high energy prices for conventional energy—and ultimately carbon cost—make these industries attractive for investment."



# End-of-life battery solutions require greater OEM control

Most automakers agree that end-of-life batteries will be important, but can they access enough of them to increase EV adoption? By Will Girling



**T**he International Energy Agency (IEA) forecasts that 14 million electric vehicles (EVs) will be sold worldwide in 2023, accounting for 18% of the total passenger car market. This is fast growth for a segment that held only 4% three years earlier, but what happens when the batteries powering this growth can no longer hold enough charge?

Estimates for the life expectancy of a standard lithium-ion (Li-ion) battery range from ten to 20 years. With batteries representing approximately 30% of each EV's total production expenditure—according to BloombergNEF—simply discarding them when critical mineral supply chains are already [strained](#) is not cost efficient. Subsequently, automakers such as Renault, BMW, and Mercedes have announced investments in [circular sourcing methods](#).

Supporters claim that implementing end-of-life (EoL) battery management strategies such as reuse and recycling could [bolster OEMs' global electrification efforts](#) and help them secure vital battery supply chains. But how realistically can present market conditions allow these approaches to close the loop?

## A marginal difference?

Hans Eric Melin, Managing Director of Li-ion battery recycling consultancy Circular Energy Storage (CES), is ambivalent about current EoL processing efforts. “We are going from a technology that burns unrecyclable fuel (gasoline) to batteries, which have the potential for recycling and reuse. This is obviously a great thing,” he states. “But it's untrue that these EoL

options can immediately support adoption: there simply aren't enough EVs available right now.”

A March 2023 report from CES estimates that 2,648 GWh of batteries will enter the market in 2030, yet only 137.6 GWh of EoL capacity will be available that same year. Of this figure, approximately 43.4 GWh will be suitable for recycling purposes—meaning only 1.7% of battery demand in 2030 could be satisfied through this channel. As EV penetration approaches 100%, Melin adds, the reuse industry's ability to stabilise battery material supplies and close the loop will increase with it. However, because the electrification shift is still relatively new, he believes that EoL processing can only make a “marginal” difference during the early transition period.

“Li-ion batteries in cars also last longer than equivalents in phones or laptops—up to 20 years. This means the waste sector will have to wait a long time for feedstock.” This makes EoL planning difficult for automakers, as decisions made today might not take effect until decades in the future. “As a consequence, basically no OEMs are laying the proper groundwork for closing the loop,” claims Melin. The current phase of automotive electrification may simply be too premature for EoL strategies to work as planned.

## A question of value

There are two important parameters for commercialising EoL propositions: the cost of a process and the value of its end product. The simplest way to lower costs and increase process efficiency, says Melin, is through higher feedstock



If current forecasts prove accurate, EoL batteries may only be able to satisfy 1.7% of demand by 2030

volume. The more batteries there are, the more profitably they can be recycled. Combined with advances in extraction technology, this reality might not be far away, at least for lithium nickel-manganese-cobalt (NMC) chemistries, which represent around 60% of the total market. McKinsey & Co's analysis in March 2023 estimated that battery material value minus extraction costs could yield a US\$600 margin per ton recycled by 2025. However, this is only one EoL opportunity.

Semiconductor conductor specialist Analog Devices advocates for battery reuse before recycling. When cells have lost 70-80% of their charge capacity, and can therefore no longer power an EV, the company suggests energy storage systems, power tools, and e-scooters as useful second-life opportunities. Others, such as Li-ion recycler Redwood Materials, argue that taking a battery out of circulation is less preferable than keeping it within mobility. As such, Redwood considers repair and refurbishment more effective in propelling greater EV adoption.

“Whoever dismantles the battery will have one goal: get as much value from it as possible,” says Melin. “The market will decide which EoL option is preferable.” He suggests that reuse might have more immediate value, but the quality, design, and functionality of the batteries in supply will ultimately facilitate or rule-out this approach. “EoL plug-in hybrid batteries generally have less repurposing value because they are made specifically as mobility components and not energy storage.” Therefore, reuse is not so much an alternative EoL channel to recycling as it is a practical and financial consideration for whichever company is processing the battery feedstock.

## OEMs: the ‘best buyers’

So, in the interests of growing and maintaining the EV market, who should be leading the conversation on EoL batteries? Melin opines that OEMs themselves are in the best position to do so, but current sales models restrict progress. “By



releasing control of the battery upon sale, they are losing that opportunity.” A handful of counterexamples do exist.

Renault introduced ‘battery leasing’ for its Zoe model in 2014, which enabled cheaper overall entry costs and free battery replacements for customers, as well as greater overall battery stock control for the company. The automaker discontinued the option five years later, citing “significantly improved residual values” that resulted in a “more competitive full purchase price.” In 2022, Volkswagen publicly outlined strategies to offer customers incentives for returning their used EVs. VW would then lease these models instead of reselling them. Clearly, there is some recognition among automakers that retaining control of EoL batteries can help keep them in circulation.

Indeed, Melin considers OEMs to be the “best buyers” for EoL batteries. Since they would be intimately familiar with their own vehicle’s cell design, they should also be able to extract maximum value from second-life applications like reuse or refurbishment. “However, automakers have to also make material loops as short as possible to keep EoL feedstock flowing.” He proposes that this could be achieved by producing smaller packs—the average battery size is around 40kWh, although examples like the GMC Hummer EV’s 212kWh are much larger. Melin considers the latter counterproductive for achieving greater circularity. “A large battery, particularly if it’s used infrequently, will take longer to be recycled or reused. Comparatively, smaller batteries will die faster and can help form the closed loops OEMs require.”



Battery stock control—between 2014 and 2019, Renault enabled customers to lease the battery on its Zoe model instead of purchasing outright

This design reconfiguration would reinforce EoL battery supplies but could also be perceived as ‘planned obsolescence’. Despite this, Melin doesn’t think it would prove controversial with consumers. In fact, since people are already accustomed to replacing the battery in their gasoline-powered car approximately every five years, there is arguably a precedent of acceptance already in place. However, to make this affordable for the end customer, automakers must first keep a high volume of feedstock within the industry, which will in turn manage EoL solution profitability. Only then, Melin concludes, will EoL batteries contribute to the e-mobility market’s growth and sustainability.



# **Simpler payment could increase public transport use**

**A survey by Visa reveals simpler travel payment options could mean wider use of public transport. By Lee Monks**



**T**he global drive to reach net zero emissions by 2050 (with China aiming for 2060) is dependent on numerous factors, including mass electric vehicle adoption and curtailing sales of new internal combustion engine vehicles. However, the utilisation of public transit as opposed to private car travel is also important.

According to the Centre for Climate and Energy Solutions, communities with strong public transportation can save the US 37 million metric tons of carbon dioxide annually. Furthermore, clean energy solutions company Energy Saving Trust found that one full bus can mitigate the need for 75 private cars, thus significantly reducing congestion and improving air quality.

In May 2023, Visa carried out a worldwide 'Future of Urban Mobility Survey' among 11,500 respondents from 12 countries across Europe, Asia and the Americas. The survey suggests that payment complexity and fragmentation contribute to reduced use of public transport. To increase its usage, Visa believes the ability to better plan journeys and more easily purchase tickets will be essential features.

## Fragmented

Visa's solution is an all-in-one service adhering to mobility-as-a-service (MaaS) principles, designed to unify all public travel elements. MaaS encapsulates buses, trains, trams, and scooters as unified, all-in-one mobility options. Nick Mackie, Vice President of Urban Mobility & Government at Visa, tells *Automotive World* that public transport payment

options currently lag behind other marketplace equivalents.

"There's no comparison between most travel purchasing systems and the sophistication and user-friendliness of the retail marketplace," he suggests. "A traveller may have a ticket or app for one part of the trip, then another ticket or app for the next part. It's incredibly fragmented. One simple trip can involve numerous ways of paying." Visa's data found that more than half (51%) of those surveyed use four or more payment methods each month while using public transport. Globally, fewer than one in five (19%) use a single payment method.

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Visa's goal is to make public transport simpler and more seamless, and in turn facilitate its growth

"Visa's goal is to make public transport simpler and more seamless, and in turn facilitate its growth," Mackie adds. He feels that, by making it easier to plan and pay for services, public transport will become a more attractive way to get from A to B than using a car.



The company's survey corroborates this conclusion. Regarding the potential opportunity to use a single payment option to cover all parts of a public transport journey, 45% of surveyed users said they would be more open to trying different forms of public transit. Additionally, 42% suggested they would use public transport more often, and 64% would use a digital service to plan, book, and pay in advance on a single platform for all legs of their trip.

## MaaS

Mackie sees Visa's MaaS option—a prospective service featuring contactless pay-as-you-go combined

with an all-encompassing app—as a potential means of facilitating such requirements. “The app will offer different travel options, such as the ability to pay for an entire journey with one click,” he says. “A user could then cost and track the trip and easily negotiate disruptions.”

Existing systems provide something similar. US cities like New York, Chicago and Miami offer contactless ‘tap to ride’ subway and bus travel and a sister app. “Visa's MaaS option will take this one step further,” Mackie suggests. “It will allow the user to map out a more complex journey involving different modes of transport.” In contrast, many current travel payment examples only offer





According to Visa survey data, simplified payment options could significantly increase public transport usage

single-provider operating services. Customers can't yet book an Uber and a tube ride through a single app, yet this is exactly what Mackie claims Visa's option will allow them to do.

## Unification

To simplify payments in a way that Visa's survey suggests consumers want will involve a complex unification of different multiple elements and services. To achieve this, service providers will need to come onboard with the idea. Mackie is confident that this won't be an issue and that a MaaS option is only a matter of time. "Public policy will quickly evolve. Look at how important public transport systems are to cities, and how those systems have evolved in line with MaaS principles."

"Each different service will still require some kind of ticket," states Mackie. Visa is currently developing

plans for such a system. Since more than a third of canvassed public transport users (37%) would take more trips in a day were they able to cover all transport payments with a single payment method, public transport operators could potentially be losing revenue until the technology has been introduced. Price-capping is another issue: 47% of public transport travellers would use services more often if rides were fare-capped.

However, solving these issues is much more than a matter of revenue: more public transport customers also means higher levels of sustainability in urban spaces. This, concludes Mackie, is the direction that public transport must follow. "It's about making it as simple and intuitive as possible. If it means a sharp uptake in passengers, then simplicity clearly attracts riders."



# ADAS and EVs put car audio in the spotlight

As cars become entertainment centres, reliable acoustics has never been more important. By Megan Lampinen



**T**he vehicle cabin is one of the most challenging acoustic environments. Not only does the sound system have to contend with propulsion and tyre noise but there are limited placement options for car speakers. Simply adding more speakers isn't a complete solution, as this only increases the chance of impulse response interference. Acoustics are also impacted by the shape of the cabin and the variety of materials reflecting and absorbing sound waves in different ways.

“Car cabins have always been a challenging acoustic environment with large glass surfaces, variable seating options, and various upholstery variants driving the complexity,” observes Hendrik Hermann, Automotive Sales Manager at Swedish digital audio specialist Dirac.

At the same time, audio performance has never been more significant, with automated driving and long charging times for electric vehicles (EVs) allowing drivers and occupants to devote more attention to the entertainment system. “Reliable audio performance is more important than ever as cars increasingly become entertainment spaces,” says Dirac’s Rüdiger Fleischer, Automotive Product Manager.

Dirac is reshaping the in-cabin audio experience and has worked with such big names as Volvo Cars, Polestar, Hyundai and Nio. “We help system engineers remove the awkward impact of the car cabin and give them a clean canvas so they can arrange their sound systems just as they intended,” Fleischer tells *Automotive World*. “They can focus on the musicality of the audio system, rather than wasting time

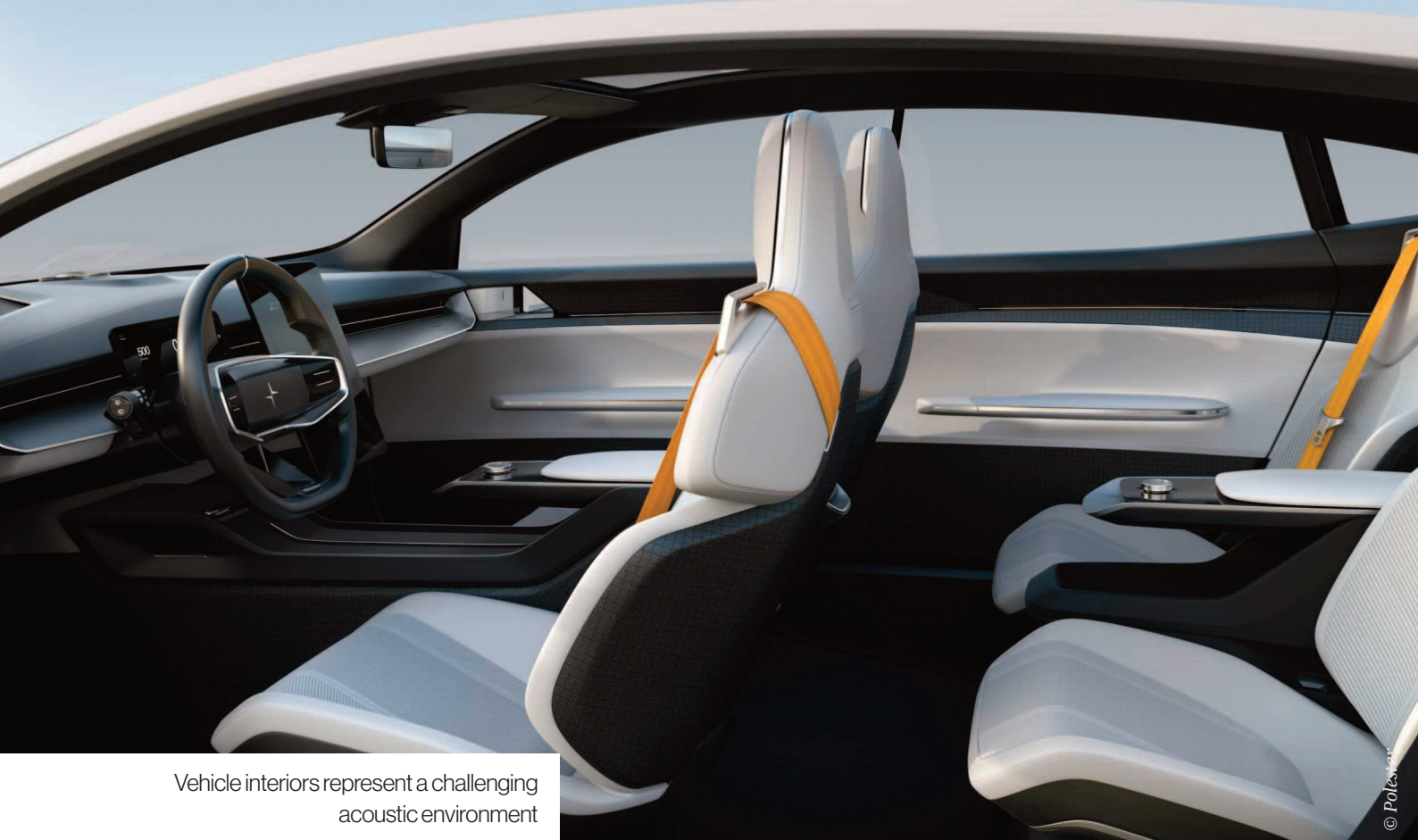
dealing with speaker interference or car cabin resonances. They can leave that to us.”

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Reliable audio performance is more important than ever as cars increasingly become entertainment spaces

## Impulse response

Dirac’s digital software solutions can improve the audio experience for many types of sound systems, but automotive is an increasingly pivotal industry. Here, its signature automotive sound optimisation solution, Opteo Professional, can make a big impact. The system uses multiple-input multiple-output (MIMO) mixed phase impulse response correction technology to allow the vehicle’s speakers to work intelligently together, regardless of how many there are. An impulse response represents a speaker’s reaction when it receives an instantaneous, short burst of energy (an impulse). When the impulse is applied to the speaker, it excites the speaker’s diaphragm, causing it to move and generate sound waves. The resulting sound is the impulse response.



Vehicle interiors represent a challenging acoustic environment

“The solution also addresses the common sound reflections and resonances that result from the car cabin itself. That’s why we sometimes say that the car cabin is virtually erased,” Fleischer elaborates.

The development of the system required a thorough understanding of the acoustic properties in a vehicle, how sound propagates, and how the sound field of the many loudspeakers in the cabin can influence each other. “Such behaviour can be described using mathematical models,” he explains. “It then required several powerful digital signal processors, which allow audio signals to be digitised and then mathematically manipulated with the right algorithms.”

The algorithmic input represents the acoustic fingerprint of the car audio system. Dirac determines this fingerprint by measuring the impulse

responses on 16 points per seat and per channel. For a four-seater car with 20 channels, this will lead to 1,280 impulse responses, which serve as the input for its advanced audio algorithms.

## Measuring a subjective experience

Opteo Professional launched in 2014 in Volvo’s XC90 for both the Bowers & Wilkins and Harman/Kardon systems at the time. It followed in numerous Volvo models since and has been onboard Polestar’s line-up since the brand’s first model, the Polestar 1, arrived on the market in 2019. Most recently it was used on the Polestar 3. “With Polestar 3, we wanted to deliver a high-end audio experience that allows passengers to feel the depth and breadth of the soundstage, experiencing every subtlety, no matter where they’re sitting in the car,”



observes Roger Hjelm, Head of Connected Car at Polestar. “To accomplish our goal, we collaborated with Bowers & Wilkins to provide class-leading in-car audio, then relied on Dirac to ensure the speakers sound their best.”

When it comes to measuring the impact of the sound, Dirac’s software can record the impulse response using the method described above, but something like the ‘depth’ and ‘breadth’ that Hjelm mentions are very subjective. “This cannot be objectively measured, but some measurable elements help produce those sensations and are measured as part of the tuning exercise,” says Fleischer. “For example, individual gain and channel delay are measured to ensure sound generated by the various speakers in the cabin reaches the listener’s ears at predetermined times.” The combination and superposition of all these individual source signals is what creates the sensations of depth and breadth.

“The perception of both the soundstage and an audio system’s subtlety is admittedly a highly subjective matter,” adds Hermann. In this case, feeling “the depth and breadth of the soundstage” served as the guiding principle for everything Polestar and Bowers & Wilkins did, including speaker positioning, grill design, speaker grade/materials, and capable amplifier hardware. “That philosophy extended to tuning the system, which included numerous audio engineers and trained critical listeners to build the best possible acoustic environment,” he points out.

## Market demand

The acoustic requirements of vehicles will vary depending on their use cases and the technology that underpins them. For instance, fully autonomous driving and shared mobility could prompt OEMs to alter typical speaker positioning. “As autonomous driving scenarios expand the possible listening positions thanks to moving and folding seats, we are exploring various options of dynamically adapting the listening space, including altering the sound experience based on head positioning,” says Hermann. “Our measurement-driven approach for tuning already easily accounts for numerous different seat modes. At the same time, autonomous driving will make cars an even more preferable space for listening to music without distractions.”

Looking forward, Dirac plans to expand its software solutions for automotive to further elevate immersive audio performance. As automakers increasingly seek to differentiate their offerings through the user experience and digital technologies, this segment will only grow in importance. “The goal is to provide more seamless software integration for maximised scalability across all vehicle levels,” says Fleischer. “In the future, we see a strong trend toward OEMs doing their own independent cabin sound optimisation. We can cater to that by providing these software tools for them to use, if they have the right skill set.”

# Cheap EV charging may not cancel out high entry cost barrier

Disparities in the price of home charging throughout Europe reveal that low running costs alone do not ensure high EV uptake. By Stewart Burnett

One of the biggest selling points of purchasing an electric vehicle (EV) is that it is cheaper to run than an equivalent internal combustion engine (ICE) vehicle. A 2020 study by consumer advocacy nonprofit Consumer Reports found that EV drivers in the US tend to spend around 60% less on recharging/refuelling than their ICE-driving counterparts. This helps to offset the higher upfront costs—the average RRP for an EV is US\$10,000 higher than an ICE vehicle, according to automotive services provider Cox Automotive.

For EU drivers, however, the affordability of EVs fluctuates greatly from country to

country. An August 2023 study by price comparison website Switcher.ie found that, in 2022, EU countries with the highest EV adoption were often those for which home charging is the most expensive. Conversely, the cheapest tended to be those with the lowest adoption, suggesting that other factors are preventing widespread adoption.

## Disparities in Western Europe

Denmark was the most expensive country in which to charge as of H2 2022, costing €0.58 (US\$0.62) per kWh. This is notably higher than the

second most expensive country, Belgium, which comes in at €0.45/kWh. Eoin Clarke, Director of Switcher.ie, explains to *Automotive World* that the costs “depend on things like the price of electricity in a given country, mixed with government taxes and levies.” Wealthier countries, he adds, tend to pay more for energy and were also hit the hardest by the energy crisis of 2022.

Denmark is the sixth wealthiest country in Europe, with a GDP per capita of US\$66,390 in 2023, according to International Monetary Fund data. It also has one of the strongest EV market shares, registering 2,202 new EVs in January 2023—21% of all





vehicles during this period. Clarke notes that in wealthier countries, EV motorists often receive less government support, but this is not the case in Denmark. The government offers to refund 1DKK/kWh (US\$0.14) for home charging, making it cheaper overall to charge there than in Belgium, which does not offer an equivalent rebate.

Despite the energy crisis, governments are capable of exerting significant control over the cost of home charging. The Netherlands is the cheapest place in Western Europe to charge an EV at home, largely due to extensive subsidisation. It comes in at €0.135/kWh—77% cheaper than in Denmark.

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We’ve seen energy costs rise across the globe, and if it continues, the value equation for EVs will weaken just as regulators require increased sales

### Low adoption countries

The ten cheapest countries for home charging are all in Eastern Europe, with a particular concentration in the southeast. Kosovo is cheapest overall: €0.064/kWh. EV

adoption is also low in Kosovo—even with tax incentives, its government only projects a 5% market share for the segment by 2030. Charging prices in Serbia are similarly low at €0.087/kWh. Of a total 28,845 new vehicle sales in Serbia in 2022, only 287 (1%) were EVs.





The entry prices for EVs in Serbia and Kosovo are the same as a typical country in Western Europe, despite a comparative lack of wealth.

According to World Bank data, Serbia's GDP per capita was US\$9,393 in 2022, and Kosovo's was US\$5,391. Although the Serbian government is taking action to stimulate EV uptake, subsidising the cost of new EV sales by €5,000, this may not be enough to surmount high entry costs. No efforts to subsidise the cost of home charging exist in either country.

“These countries generally tend to be less affluent, and EVs are still prohibitively expensive,” states Clarke. “People simply need more money in their pockets to afford them.” A leaked EU memo from 2022 seen by Reuters revealed that several EU member states situated in the east are requesting a five-year delay of the 2035 deadline for banning sales of

new ICE vehicles. The reason cited is “significant differences in purchasing power” between respective member states. Indeed, the low cost of home charging would appear to only be an incentive for individuals with sufficient liquidity to make the upfront investment.

## Zero-emission mandates

If the EU's 2035 deadline is to remain, then more needs to be done. Low home charging costs alone cannot surmount the high entry costs of Western-made EVs in southeastern European countries. Exported Chinese EVs, however, could be more affordable. BYD's Seagull, unveiled in June 2023, is set to retail for €10,350—for contrast, a Fiat 500 Electric can cost upwards of €30,000 in some European markets.





A poll of UK drivers by the AA revealed that 54% consider the cost of charging at home a major selling point of EVs

For countries with higher GDP per capita, cheap refuelling remains core to the EV value proposition. A 2022 survey by insurance firm AA found that 54% of UK EV drivers considered the cost of home charging a major selling point. Karl Brauer, Executive Analyst at CarExpert.com, tells *Automotive World* that, in any country, charging must remain significantly cheaper than refuelling an ICE vehicle. “We’ve seen energy costs rise across the globe, and if it continues, the value equation for EVs will weaken just as regulators require increased sales.”

While it is true that the war in Ukraine led to spiralling energy costs throughout much of Europe, the measures taken in the Netherlands to reduce charging costs show that governments can still do much to manage the

situation. Clarke proposes that governments mandate energy companies to provide electricity plans that cater to the specific needs of EV drivers. “There could be a rush to supply home charging solutions with cheaper EV charging tariffs and ‘smarter’ options like vehicle-to-grid (V2G) technology.” V2G allows for the two-way distribution of electricity to and from the grid when charging an EV, giving the owner the option to sell electricity stored in the battery back to their provider.

Brauer emphasises that more needs to be done to reduce price volatility in terms of vehicle and energy costs. Both, he concludes, present a serious challenge to automakers and consumers alike, as well as a potential existential threat to the EU’s zero-emission mandate.



# With software-defined cars, UX and IxD shape brand DNA

User experience and interaction design take on greater importance in the digital age. By Megan Lampinen





**W**ith the industry focus turning from sheet metal to software, automotive manufacturers are rapidly repositioning themselves as technology and mobility companies. The digital revolution and the growing convergence of the consumer technology and automotive industries are rewriting the rulebook for vehicle design. Mastering that rapidly evolving relationship between human and machine requires a delicate touch.

It's one that Tim Smith has cultivated over the past 20 years and is currently using to help automotive companies prepare for future mobility. Founder and Director of design start-up UXIXD, he has spent more than two decades helping brands across numerous industries grow closer to their customers through impactful design. During this time, he has seen a dramatic evolution within the automotive space. "Ten years ago, the automotive industry and the technology industry were worlds apart but now they are colliding, and these century-old players are trying to reinvent themselves as technology companies," Smith observes. "If automotive brands want to get closer to consumers through technology, then user experience (UX) and interaction design (IxD) are absolutely key."

He describes the science of design behind technology interaction as a 'handshake': "You have to make sure the handshake is not painful or sweaty. It has to be very comfortable and on brand. With UX and IxD, the aim is to shepherd, maintain, and guard. Skills in these disciplines are increasingly necessary, especially in the disrupted industries where technology is now a mandatory part of brand DNA."

## Multisensory and accessibility

The journey towards new mobility will draw on numerous technologies, especially screens. These are used to display an expanding range of information and entertainment features for drivers and passengers, but Smith sees a decided move beyond just audio and visual. Human senses also include touch, taste and smell, and there is considerable potential to incorporate a more multisensory framework. "There is a missed opportunity here, not only in terms of how other senses can improve the UX but also around accessibility," he tells *Automotive World*.

Many automotive players are keen to explore the potential of a metaverse experience in the vehicle, but applications to date have been limited to audio and visual. As Smith points out: "What is a metaverse experience to a blind or deaf



Technology has become a key part of automotive brand DNA

© UXIXD

person?” He advocates for accessibility standards in the design community, something that requires all innovation to be accessible to a more diverse group of users.

The smartphone is a good example of where it was done correctly, with offerings for the blind like text to speech and haptic feedback. Smith notes that if the smartphone were not adapted for blind people, their quality of life would significantly suffer. This lack of accessibility could exclude them from securing jobs, restrict their mobility, etc. “I like to consider development on a multisensory level,” he says. “Anything that is designed should degrade gracefully. The majority of people will have vision and hearing, and so on, but how does the experience degrade and continue to work for those without vision?”

## Functional and emotional

There is both functional and emotional accessibility to consider. A wheelchair user can functionally access a bus in London, but what about emotionally?

To start with, they have to hope that the driver sees them at the bus stop, then wait for the driver to lower the suspension. A loud warning sound accompanies the wheelchair ramp extension from the rear of the vehicle, and then they can board. While the functional accessibility box has been ticked, the emotional one has not. “Able-bodied people enter at the front of the bus, they walk past the driver, they might wave,” observes Smith. “But the wheelchair user has to enter at the back. There’s this segregation. It’s indiscreet, somewhat discriminate, and they’re treated differently. Emotionally speaking, it is inaccessible.”

Future design should ensure that any piece of technology has both this functional and emotional accessibility, and this is where multisensory UX and IxD come in. Smith has worked on previous projects with Volkswagen on making driverless taxis accessible for blind people and wheelchair users. Another piece of research explored the impact of eliminating wing mirrors on driverless vehicles. While many self-driving concept models replaced these with cameras, the change in design could pose problems to blind people. For those with limited or no sight, the placement of wing mirrors indicates the direction the vehicle is facing and where to enter. Removing these mirrors completely also removes a key coping mechanism for the blind.

Smith’s advice is to retain the useful tactile information of the mirror but in a dramatically diminished size—think a matchbox size wing mirror. “It would no longer function as a visual aid for drivers but could still function as that accessibility feature for blind people,” he explains.



Designing for accessibility also incorporates the needs of other vulnerable groups, such as those with post-traumatic stress disorder, autism, and Alzheimer's. It can also be situational: "Think of a woman travelling alone in a shared vehicle with four unknown drunk men. Emotionally, that's just not accessible," Smith says. "The industry is changing, and its people are more sympathetic but they're busy and unaware of different types of peoples' complex needs."

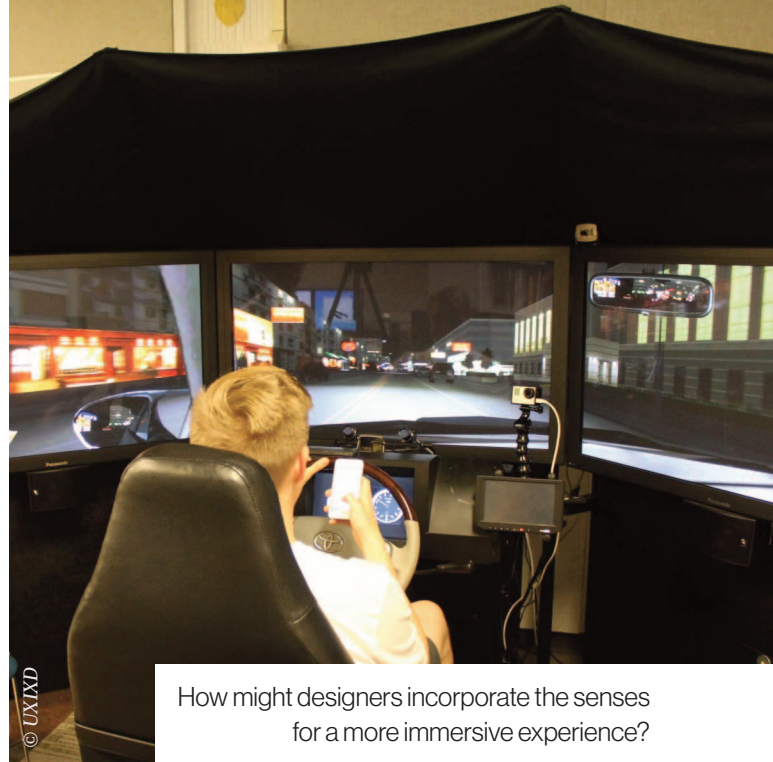
## Near- and long-term visions

In practical design terms, a multisensory UX offers exciting possibilities. For example, Smith suggests scent could be used to alert drivers either in place of or

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What is a metaverse experience to a blind or deaf person?

alongside audio and visual functions. "Smell is one of the most powerful triggers of memory," he points out. "What if we incorporate



How might designers incorporate the senses for a more immersive experience?

smell during driver training, coupling certain manoeuvres or information with a certain smell. When that manoeuvre presents itself in real world, the car then emits that smell. Instead of telling you to change lanes or turn left in 100 yards, it could 'smell' you that."

In the longer term, autonomous driving and shared fleets will open up even more potential. "In the future, you may not necessarily want a Volvo experience, for example, but rather a Netflix experience, or a Starbucks experience. You may want the environment to look like you are in a pool of coffee and it's nice and warm, and things smell and taste like coffee."

That's certainly not for everyone, but it points to the options available for immersive, accessible design. Overall, Smith sees "huge multisensory brand opportunities" around incorporating different senses, addressing functional and emotional accessibility, and turning vehicles into "immersive experiences on wheels."



# Protterra may not be a bellwether for e-bus failure in the US

**Protterra's bankruptcy took the automotive industry by surprise, but strong demand for e-bus technology could make it an isolated incident. By Will Girling**



**O**n 7 August 2023, California-based Proterra surprised the automotive industry by filing for bankruptcy. Launched in 2004, the heavy-duty battery system developer and electric bus (e-bus) manufacturer had previously raised more than US\$1.2bn in funding rounds and was backed by companies such as Daimler and BMW i Ventures. The deal that saw the company become publicly listed on the Nasdaq in 2021 was valued at US\$1.6bn.

In its Chapter 11 filing, Proterra claimed that complex fleet customisation made scaling operations difficult without “extensive” working capital. The company also stated that rising inflation in the US made contracts signed 12-18 months prior unworkable, as the agreed prices shrank margins considerably.

At the time of writing, Proterra remains operational. But what impact could the financial headwinds of a long-established player have on the wider US e-bus segment?

## Razor thin margins

The value of the US e-bus market is forecast to reach US\$2.1bn by 2028—up 388% from US\$437.8m in 2022, according to Mordor Intelligence. Anthony DeOrsey, Research Manager at sustainable innovation research firm Cleantech Group, tells *Automotive World* that current trends suggest these positive medium-term outcomes are still highly likely. “US net zero targets mean that demand is growing, with many vehicles being sold to municipalities. I think that demand is going to remain intact.”

However, this won’t be without difficulty.

DeOrsey states that “razor thin” margins between sales prices and production costs mean e-bus manufacturers must have “impeccable” unit economics. In contrast to Proterra’s difficulties, he highlights BYD’s scale as a distinct advantage. In 2020, the Chinese OEM secured a state-wide purchasing contract in California to gradually convert the state’s 14,000 bus fleet to battery electric models.



Proterra’s ZX5, an all electric 40ft bus model

“The company has deployed more than 60,000 e-buses around the world—its processes benefit from learning-based optimisation, so it can integrate local workforces and materials into a proven operations system,” he says. BYD’s models reportedly use 70% local content, exceeding the 60% threshold imposed by the Buy American Act standard. However, DeOrsey cannot offer insight as to whether BYD’s e-bus sales in the US are currently profitable.



BYD's Type D electric school bus

© BYD

## Unlocking e-bus value

The average cost of a new e-bus is in excess of US\$750,000, appreciably more expensive than US\$435,000 for an equivalent diesel engine vehicle. DeOrsey relates that manufacturing innovations that could reduce e-bus prices, such as nano structuring techniques for producing battery cathodes (“the most expensive part of the battery”) at a higher density for a lower cost, are gaining traction but still a few years away from widespread use. The US’ struggle to reconcile environmental targets with [battery production capacity](#) and new supply chains for critical materials also remains largely unresolved.

In the long-term, [lithium extraction techniques](#) and [circular economics](#) could help resolve supply/demand

issues. However, materials prices will largely be determined by macro-economic factors beyond OEMs’ direct control. In the meantime, e-bus manufacturers must emphasise the current cost advantages of their vehicles. For example, despite the higher sticker price, e-buses’ lower fuel and maintenance costs can accumulate over the course of a fleet’s lifetime. A February 2020 study (Quarles, Kockelman, et al) published by scientific journal MDPI found that e-buses trialled in Austin, Texas could generate per unit savings of US\$73,000-US\$173,000.

This is encouraging, although DeOrsey still considers it unlikely that purchaser “price tolerance” to the high entry cost will improve near-term. However, battery electric buses’ value for fleet-to-grid (F2G)



energy storage and bi-directional charging, wherein fleet owners would receive monetary compensation for delivering electricity back to the grid, could have a softening effect on operational capex. Combined with solar power for e-bus charging, fleets could become attractive assets for both clean mass transport and energy market arbitrage.

“The biggest opportunity here is with electric school buses,” adds Nicole Cerulli, Associate at Cleantech Group. “These have large batteries, and their routes often mean they’re parked for most of the day, which is helpful for reducing grid load.” BYD currently offers two such e-buses in the US: Type A and Type D. A July 2023 study by Cleantech estimated that—assuming 58% of municipal buses were electric—F2G could help contribute 30 GWh (20% of the US’ total capacity) by 2030.

## Sustaining demand

“Federal incentives, grants, and decarbonisation targets will also play a huge role in sustaining demand for e-buses,” continues Cerulli. The Inflation Reduction Act facilitates a tax credit of up to US\$40,000 on the purchase of an electric vehicle weighing more than 14,000lb through to 2032. US cities that have pledged to electrify their bus fleets include New York (by 2035), Boston (2030), Los Angeles (2030), and Seattle (2040). “Cleantech Group’s perspective is that interest will continue to grow, and the customer base is still out there.”

Whenever there is an industry bankruptcy, says DeOrsey, a certain degree of market hesitancy will inevitably follow. “The question is



whom will it impact: public market investors, investment banks, or venture capitalists?” Protterra received substantial backing from the latter, yet he notes that incurring losses is a generally accepted risk of such investment and unlikely to significantly sour future industry deals. “I don’t consider this particular event to be a ‘showstopper’ for e-buses; there’s enough happening at an ecosystem level with vehicle innovations, material access, F2G, and cathode manufacturing to maintain interest.”

While greater scrutiny of new players in early-stage investment rounds is almost inevitable, Protterra’s failure to secure strong unit economics offers an important lesson from which others can learn. “I think we’re past the tipping point,” concludes DeOrsey. “We’re witnessing a natural state of economics play out in the e-bus market; it’s not the manifestation of damning consequences for the technology itself.”

# Quiet e-trucks merit new noise standards

Recent research confirms MAN's eTruck produces about half as much noise as comparable diesels, but it's just the start of what's needed. By Megan Lampinen





**E**lectric vehicles (EVs) produce much less noise during operation than their gasoline and diesel counterparts, and this difference plays out most clearly in the heavy vehicle segment.

The significant noise reduction offered by electric fleets could radically revamp delivery operations in urban and residential areas, extending the hours they can operate and thereby slashing road congestion and improving operational efficiency for fleets. But just how big of a difference can battery propulsion make, and what's the best way to measure and certify it?

## Study on low-noise logistics

Recent research from Germany suggests that electric models could produce just half as much noise as diesels. The 'Mobility Study on Low-Noise Logistics' was conducted by the Fraunhofer Institute for Material Flow and Logistics IML and sponsored by the Ministry for the Environment, Nature Conservation and Transport of the State of North Rhine-Westphalia.

The project saw a team from Peutz Consult pit one fully laden 40-tonne MAN eTruck against a diesel MAN TGX 18.510 of the same weight. Hand-held sound meters positioned 7.5 metres on either side of the Munich test track were used along with a SoundCam to record noise levels from the vehicles. Measurements were taken at various speeds, when reversing and with the Acoustic Vehicle Alerting System

(AVAS) switched on and then again with the system switched off. The AVAS produces artificial driving noises because the rolling noise of the tyres can only be clearly heard at speeds above 20kph.

"The results of the study confirm that battery electric trucks are significantly quieter than diesel trucks, both subjectively perceived and objectively proven with measured values," says Benedikt Berchtenbreiter, Development Engineer for Noise Vibration Harshness (NVH) at MAN Truck & Bus.

For steady passing at 20kph, noise emissions from the MAN eTruck were about 6dB lower than the diesel, but there's more to it. This was a particularly quiet diesel truck to start with. In published scientific literature on noise emissions, a certain noise level is assumed for a diesel truck. The diesel truck measured for comparison in the project was 5dB below this standard noise level at low speed of 20kph. The difference between the eTruck and the diesel truck in the actual measurement was 6dB but combined with the 5dB reduction, the total difference was 11dB. "The eTruck is thus about half as loud as a classic diesel truck in terms of auditory impression," summarises Michael Wirtz, Project Manager in charge of measurements at Peutz Consult.

For the accelerated approach, there was an even more significant level difference between the two trucks of 12dB. When compared to a conventionally powered passenger car, the eTruck is just 1dB louder.



MAN participated in the 'Mobility Study on Low-Noise Logistics'

## Further research

“These results are good news, but we are still carrying out further tests to support development,” Berchtenbreiter tells *Automotive World*. As part of the development and validation department for the acoustics of MAN’s trucks, he and the team aim to “help solve the challenges in the field of low-noise logistics and make a constructive contribution.”

As well as measuring noise levels they are also focusing on noise quality. “Due to the absence of the previously dominant combustion engine, completely new possibilities arise,” Berchtenbreiter explains. “Depending on the

driving condition, the noise now comes from the tyres and the drive and auxiliary units. These are analysed source by source, optimised, and harmonised with each other to create a convincing overall picture.”

While there have been some concerns that electric vehicles may be too quiet, posing a safety risk for vulnerable users such as the blind and partially sighted, Berchtenbreiter does not see this as an issue: “Although battery electric trucks are significantly quieter, in our view this danger does not exist. The legally required AVAS ensures the perceptibility of the vehicle, especially at low speeds of up to 20kph.”

## Standards

The Munich test offers reliable and independent values that confirm the suitability for electric truck operation in residential areas during off-peak hours, but more work is needed to fully open the door to this opportunity. While most markets require special permission for fleets to run at night and during off-peak hours, administrators lack any sort of standardised data as a basis of judgement.

In MAN’s home market of Germany, noise emissions are assessed according to the TA Lärm (Technical Instructions on Noise Protection), but other countries take a different





The SoundCam makes noise sources on the truck visible

approach. The Netherlands has emerged as a pioneer in this space. Its Piek noise protection standard requires trucks and transport equipment to undergo acoustic testing, and in order to operate during off-peak hours they must not exceed a specified decibel limit.

“There are approaches to possibly adopt additional requirements from Piek into EU or ECE legislation,” notes Berchtenbreiter. “During the last revision of the Piek regulation, it was adapted to [noise regulation] ECE R51.03.”

“There is currently no market overview or standardised information on noise emissions from alternatively powered commercial vehicles used in logistics in Germany,” says Daniela Kirsch, Project Manager at Fraunhofer IML. “That’s why we need a solution like the Piek certificate that companies can use for orientation.”

## The business case

Opening the door for electric delivery in additional time windows could have a big impact on the roadways. Christoph Jeßberger, Product Strategy Manager at MAN,

suggests the use of these trucks could “open up a very wide range of uses and a high degree of flexibility for our customers. This means use up to 24 hours a day, seven days a week—provided the legal framework is in place.”

While MAN offers electrified vans and buses, deliveries of its first electric truck will not begin until 2024. “In the following years, we will further expand the range in the truck sector so that almost all applications can be powered electrically,” Berchtenbreiter says. The company also plans to expand the in-house production of battery packs from small series to large series production from 2025.

Moving forward, widespread industry agreement on measuring noise emissions from these vehicles could prove good for business. “We are in favour of uniform standards for as many markets as possible,” adds Berchtenbreiter. “Different standards lead to increased development efforts and thus higher vehicle costs.” Full details of the Fraunhofer IML study on low-noise logistics will be published in early 2024.



# UK's net zero delay could stymie investment in EVs

UK PM Rishi Sunak's net zero U-turn is likely to see EV investment fall as investors look to more stable and consistent automotive markets. By Lee Monks





**D**uring a press conference on 20 September 2023, UK Prime Minister Rishi Sunak announced that he would delay the UK ban on the sale of new gasoline and diesel cars from 2030 to 2035. The delay means the UK now falls into step with EU automotive net zero timelines. The prime minister said he was “absolutely unequivocal” about meeting net zero carbon emission objectives by 2050 but had opted for a “more pragmatic, proportionate and realistic approach.”

The decision, broadly lamented by the UK automotive industry, comes just two months on from news of the UK’s first gigafactory, currently under construction by Tata in Somerset. With the electric vehicle (EV) roll-out well underway, the delay could prove disruptive to the country’s ongoing e-mobility momentum and fuel doubt over future investment in UK EV and battery supply chains.

## Self-sabotage

EV sales are on the rise. Global spending on EVs exceeded US\$425bn in 2022, up 50% on the previous year, according to the International Energy Agency, which expects to see 14 million EVs sold during 2023, a 35% year-on-year increase. According to an August 2023 study by e-mobility service provider Zap-Map, the UK is broadly reflective of global trends. EV sales doubled from 200,000 in 2020 to 400,000 in 2021, rose to 630,000 in 2022, and are expected to hit 850,000 by the end of 2023.

Yet much of the UK’s success is down to outside investment from India, the US and Europe. Alok Dubey, Regional Director for Western

Europe at Monta, an EV ecosystem software provider, suggests that Sunak’s net zero policy change has sent a “shockwave” through a growing EV industry “currently subject to billions of pounds of investment.” Patrick Reich, Chief Executive and Co-Founder of EV charging app Bonnet, feels the move will inevitably discourage investment and lessen the number of potential EV buyers: “It’s disappointing to see such low ambition just as businesses are investing huge sums and consumers are switching in great numbers to EVs.”

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Investors will understandably feel cheated by this sudden change in direction

Ben Nelmes, Chief Executive at New AutoMotive, a non-profit EV transition advisory, believes Sunak’s decision represents a counter-intuitive and costly act of self-sabotage. “EV prices are dropping and charging infrastructure is improving,” he says. “This is due to the investment of billions of pounds



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heavily in Britain “specifically because of the 2030 deadline.” He adds: “Investors will understandably feel cheated by this sudden change in direction.”

## Investment worries

Notable investments in UK electrification to date include BP’s £1bn commitment to charging infrastructure, Nissan’s and AESC’s £1bn EV manufacturing hub in Sunderland, and Stellantis’ £100m in electric drive units in Ellesmere Port.

These investments were contiguous with the UK’s early commitment to EVs. The initial 2030 target—ratified by then UK Prime Minister Boris Johnson—put the country five years ahead of EU timelines. Lauren Pamma, Director of Transport Programmes at the Green Finance Institute, believes that stability regarding the 2030 target “resulted in billions of public and private capital being mobilised for the EV transition.” However, in the wake of the U-turn, European automotive stocks saw substantial gains on 20 September across the Stoxx 600 index, rising approximately 2%.

towards the 2030 target. Pushing the date back will raise costs for motorists by deterring future investment in the UK EV industry and supply chain.” Andy Palmer, previously Chief Operating Officer at Nissan and Chief Executive at Aston Martin Lagonda, now running electric car charging firm Pod Point, points out that companies have invested

Pamma suggests that rowing back on this commitment “risks damaging the UK’s international investment credibility.” Ford UK head Lisa Brankin says the company had invested £430m (US\$525.5m) to build EVs in Britain. “Our business needs three things from the UK government: ambition, commitment, and consistency. A relaxation of 2030 undermines all three.”





Future investments, like Nissan's and AESC's £1bn into Sunderland's EV manufacturing hub, are now at risk

## Future markets

According to EY's September 2023 'EV Country Readiness Index', the UK is currently ranked fifth. One of the determining metrics is "regulatory". The report, published weeks before Sunak's announcement, suggested that a key factor in the UK's relatively high standing was "the impending 2030 ban on the sale of new internal combustion engine vehicles" that encouraged "an increasing number of consumers and businesses to go electric." With that ban now delayed, the country's EV standing could

suffer, and competitors such as the US, the Netherlands and Germany could start to benefit from investment previously earmarked for the UK.

"The UK government is no longer leading Britain's net zero transition," Asif Ghafoor, Chief Executive and Co-Founder of Northern EV charging network Be.EV suggests. "The public will now drive the changes they want to see, and the market will respond to that demand." He adds that the EV industry "must push on with business as usual. The global EV transition is happening—that horse has well and truly bolted."