

Automotive World MAGAZINE

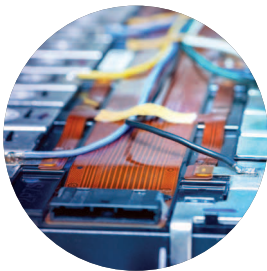
Issue 44 | August 2023

Software just the
start of a UX-defined
vehicle, says Nio



Volvo Trucks CTO outlines carbon neutral roadmap | **Hyperloop TT** to unlock new paradigm for urban mobility |
Ree promises disruptive EV platform | **Electreon** trial advances dynamic wireless charging |
Nio showcases brand building in the digital era

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06

Software just the start of a UX-defined vehicle, says Nio



12



12

New vehicle makers find the going getting tougher

16

Has dynamic wireless charging solved EV range anxiety?

20

Inside Volvo Truck's ZEV technology strategy

20



Xpeng's R&D philosophy emphasises customer needs and agility

24

What are the new security threats of the connected car era?

28

New modular platform promises to shake up commercial EVs

32

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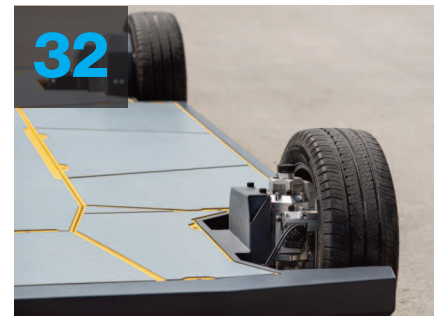
Anmol Mothy

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24



32



36



48



60



64

36

What are the game-changers in ZF's tech roadmap?

40

Do smart EVs spell the end of the traditional supply chain?

44

Metaverse impact hinges on security

48

Hyperloops could unlock a new paradigm for urban living

52

Micro EVs meet the real mobility needs of city drivers

56

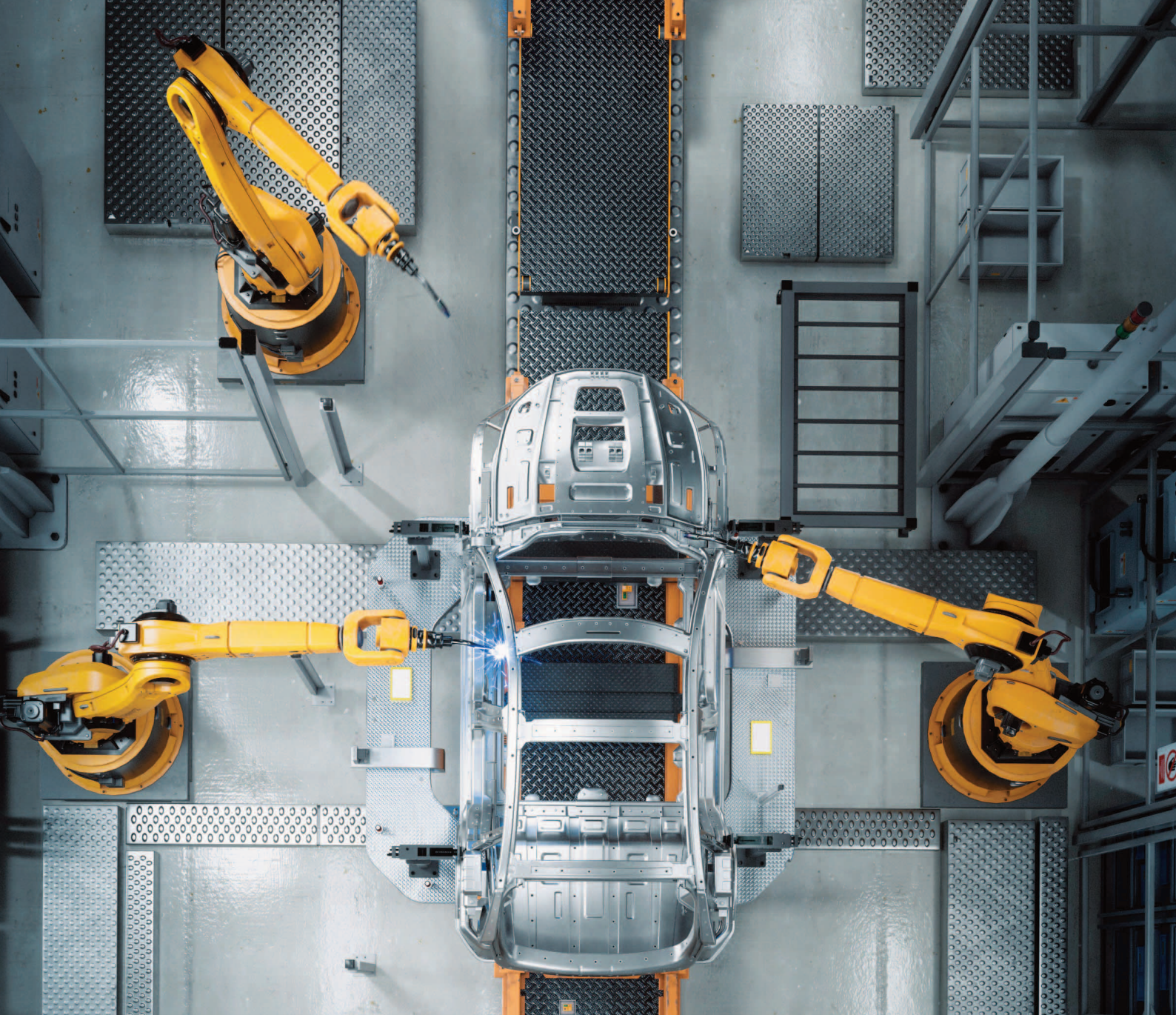
What's the final destination for urban mobility?

60

Will driverless EVs mean fewer cars on the road?

64

Telematics and IoT can guide the CV electrification journey



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Software just the start of a UX-defined vehicle, says Nio

Nio offers a useful case study of brand building in the digital mobility era. By Megan Lampinen

As automakers become mobility providers, charging takes the place of fuelling, and product makes way for service, traditional brand strategies will be turned on their head. China-headquartered Nio is currently in the midst of a European push and establishing itself as a global player in the electric vehicle (EV) space. The company has taken the soft-touch sales approach so far that it's almost a caress. But could it prove the ticket to success in this increasingly competitive and rapidly evolving space?

User experience defined vehicles

While most of the industry is talking about software-defined vehicles, Nio prefers the phrase 'user-experience defined vehicles'. And by users it means customers. "Nio's user-experience defined vehicles are much more than software-defined vehicles," explained Mark Zhou, Nio's Executive Vice President and Chairman of Product Committee. It all hinges on the company's digital architecture, which has been specifically designed to rapidly apply new technologies linked to safety, security, AI, sensors, chipsets, etc. "This digital architecture—the foundation on top of which we build different technologies—is our game-changer," Zhou told *Automotive World*.

Zhou's comments came at the July 2023 inauguration ceremony of the company's Berlin Innovation Centre, the latest addition to its expanding global R&D network, dedicated to understanding and anticipating user requirements. Much of that understanding comes from frequent engagements at numerous and varied touchpoints.



Nio Houses are intended to serve as "a space for users and community to express, share and experience memorable moments together"





Launch ceremony for the Nio Innovation Centre in Berlin

Bricks and mortar

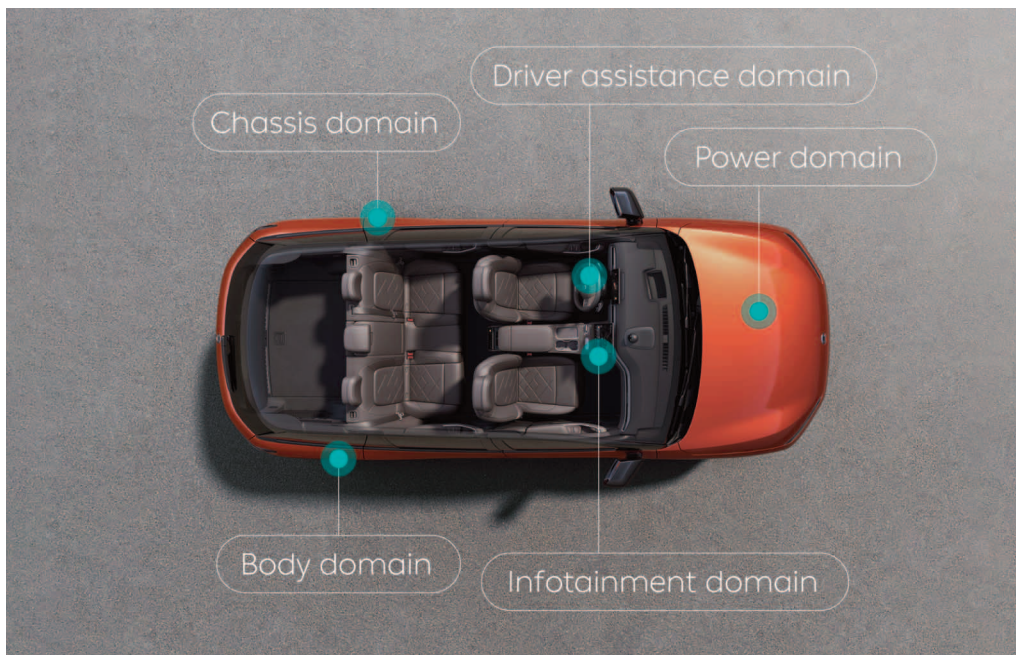
In terms of bricks and mortar, there is a network of Nio Houses, Nio Hubs and Nio Spaces. These all refer to physical spaces where members of the community can connect and—if they wish—interact with the cars. The difference between each of these is the size and scope of what’s on offer. Houses are the largest, Spaces the smallest.

For example, the Nio House in Berlin includes a vehicle showroom on the main floor, with side rooms for users to configure their models. The building also features rooms for community events like yoga, a soft-play area for toddlers, a podcast room, lifestyle products like

handbags and jackets for sale, a café, various workstations and even an ‘analogue room’ with ping pong, Fussball, and board games for when the digital life becomes a bit much.

Anyone can simply pop round and experience the Nio brand or ignore it and do yoga with their neighbours. More than one House in China has even witnessed a proposal of marriage. It very much supports Nio’s definition of itself as a “technology enabled lifestyle company.”

While Nio isn’t willing to share the financial investment that went into these locations, they clearly do not come cheap. And it’s not as if the brand will make that investment back in latte sales. It’s aiming for something



much more valuable: relationships. “We want to create a business for human beings, not just a car business,” emphasised Zhou. “We want users to like and trust us. It’s the root of the Nio business.”

User feedback

These brand experience locations are just the start of its customer relationship management strategy. The company also regards its software and firmware over-the-air (OTA) updates as pivotal user touchpoints, delivering new functions and occasionally fixing problems over the course of the vehicle’s life. In fact, the company has just put in place a new target of pushing firmware OTA (FOTA) updates every quarter. Over the last five years, Nio has issued 83 FOTA updates, enabling 454 new features and 623 features upgrades. Unlike some competitors, these all come at no charge to its users.

Software is central to success in today’s mobility ecosystem. Of the 10,000 people working in R&D at Nio

at the moment, 6,000 are devoted to software development for digital and smart technology. That number will grow, and the hope is that the Berlin Innovation Centre will attract a new wave of software engineering talent. The location will also be instrumental in evaluating user feedback and determining which features to roll out to European users. “Our user-centric approach is the biggest differentiator for us on the market,” asserted Nio’s Benjamin Steinmetz, Head of Product Development in Europe.

Some OTA updates and future model features are derived from direct user feedback gathered from multiple sources including the Nio app, in-person user events and the AI digital assistant Nomi. In China, the company hears from about 300 users every day. In Europe, where the user pool is understandably much smaller, it’s more like 200 per month. All of the feedback is aggregated by AI and passed on to the user-experience teams, which translate it into clear product definitions.



Nomi is Nio's AI digital assistant



A user benefit assessment helps clarify the wider impact of any new feature introduction. The system allocates a letter to each proposed feature, with 'A' marking the highest impact across the user base. "An 'A' feature would be one that benefits all users," explained Sebastian Salera, Senior Product Experience Manager. "That would generally refer to something that is not about taste or preference, but more about driving in general, like a navigation system feature." Ideas deemed worthwhile are then passed on to the R&D team for development. Following more testing and a final green light, the feature can then be released. Nio's Matrix headlights, Charging Lock feature and numerous Nomi functionalities are the direct result of user feedback.

Connection

Nomi personifies Nio's use of digital technologies to create tailored services and an emotional connection between users, the brand and the vehicles. Described as an in-vehicle AI companion, its functionality improves the more it is used. The assistant responds to voice commands to adjust cabin settings but also learns user habits and can put forward suggestions. In China, many users name their Nomi after a beloved pet or a child and dress them up with accessories. "We are far beyond the sort of 'open the window' stage with Nomi," observes Dominique Massonie, Head of Software Internationalisation, referring to the close bonds drivers form with the digital helper.

The Berlin location will help to adapt Nomi and other driving and design elements to the localised

requirements of Europeans. Nio knows the uphill battle it faces in bringing a new challenger brand to the heart of Europe, especially Germany. But the combination of eco-friendly technology and more jobs—by 2025 the Innovation Centre should employ 125 people—has secured it government support. State Secretary Michael Biel, Senate Department for Economic Affairs, Energy and Business Affairs, was in attendance at the Berlin launch and spoke of the importance of eco-friendly innovators like Nio to the region: "We need companies like Nio to show new ways and ensure that e-mobility finds new acceptance and implementation...The future is not only electric but electrifying."

“

Our user-centric approach is the biggest differentiator for us on the market

That doesn't mean loyalty can be rushed. As demonstrated clearly with its brand and marketing strategy, the company is playing the long game. "The German market is a very complicated one, with a strong respect for other players," Hui Zhang, Nio's Group Vice President, told media. "But we are patient. We know it takes time to build brand reputation and our own local competence. This innovation centre is another big step in that journey."

New vehicle makers find the going getting tougher

Ian Henry argues that it is hard to see any new EV players outside China establishing a major presence in the market

Tesla has changed the face of automotive manufacturing and led the move in the US and Europe to electric vehicles (EVs). The company now makes EVs in the US, China and Germany and is reportedly considering plants in Mexico, Spain and a number of other locations across the world. It is synonymous with the shift to EVs and its success, while far from an overnight phenomenon, has been the inspiration for several others to enter the burgeoning EV market. However, no other new entrants have yet had anything like the success of Tesla, although Polestar (which the financial backing of Geely and the engineering support of Volvo) will likely succeed; for many of the other new entrants the challenges are substantial and some are now facing financial oblivion.

Lordstown Motors, for example, took over the former GM factory in Lordstown, Ohio with ambitious plans in the electric pick-up market; with GM taking a small stake in the company for an investment for US\$75m, Lordstown was valued at an astonishing US\$5bn in September 2020. This valuation was reached despite no vehicles having been produced and was arrived at by investors who believed the undoubted hype. Nearly four years later, in July 2023, the company was placed in US bankruptcy protection, with a notional value of just US\$30m. Only one vehicle had been produced, despite the claims of 100,000 customer orders. Lordstown is reportedly planning to sue Foxconn which had been one of its major backers and had reportedly promised to buy the Lordstown operations.



Lordstown Motors had planned to build the Endurance pick-up

Whether anyone will see value in the Lordstown Endurance's pick-up design and take on the intellectual property remains to be seen; with a starting price of at least US\$63,500, the Endurance is far from cheap, and with Ford's F-series Lightning dominating the electric US pick-up market with a starting price lower than the Endurance, it is difficult to see why or how anyone would want to take on such a powerful incumbent.

Evidence for the challenge facing new entrants also comes also from Rivian, which is building some electric SUVs and pick-ups in the former Mitsubishi factory in Normal, Illinois. However its build volumes are hardly going to make much of a dent in the market—just over 2,300 were built in Q2 2023,

with deliveries amounting to slightly more than 1,400. With a starting price of about US\$75,000, it is unsurprising that Rivian has found it difficult to make major inroads in the market, its manufacturing challenges notwithstanding.

Nikola, a large truck manufacturer, focused on hydrogen powertrains, is also finding it difficult to make inroads in the new energy vehicle market. Faraday Futures, another new entrant, is still raising funds and has yet to produce road-going vehicles; maybe it will, or maybe it will go the way of Lordstown.

Why has this series of events come about? Arguably it is actually very simple: the automotive industry has



R1S SUVs near completion on the trim line at Rivian's manufacturing plant in Normal

© Rivian

significant financial resources of his own which the people behind Lordstown and Rivian did not have). The support of Panasonic in batteries also helped greatly in the early days. Add these factors to the relative slowness of the established vehicle companies to get on the EV bandwagon and it becomes easier to understand how Tesla has managed to carve out a strong and sustainable position in the EV market. Polestar—backed by Geely's financial power and drawing on Volvo engineering expertise—is likely to succeed in EVs; whether it will have been able to achieve what it has done so far on its own is open to debate.

always been one in which scale is paramount and substantial funds are required. Tesla has managed to succeed because it had real first mover advantage, led by a somewhat controversial and highly driven individual who managed to keep investors on board (he also had

By the time the inevitability of the switch to EVs was recognised by the major established vehicle companies, Tesla had built a strong position and developed strong customer loyalty to support this. The Chinese were not far behind Tesla, but their collective prowess was arguably not noticed in the US and Europe at first; once the threat of the Chinese was accepted,

Nikola aims to become a leading player in battery electric and fuel cell trucks



© Nikola



Faraday Future had pushed back the delivery timeline for the FF 91

and driven by regulatory change, the likes for Ford, GM and VW belatedly entered the EV market; and they did so with far greater financial heft than the new entrants, and this has made it much more difficult for more recent new entrants to stake a claim in the EV market.

Tesla has undoubtedly revolutionised the automotive market and will be a major player for the foreseeable future. So have the Chinese; but the established, so-called legacy players have not rolled over and will not allow these new players to have the market to themselves. Sure, the legacy companies will end up having ceded some share in the long term, but they will, by and large, remain in place. More new entrants will undoubtedly appear from time to time but the contours of the EV supply side mean it is difficult to see anyone new—especially outside China—establishing a major presence in the market. The scale of financial

and manufacturing resources required, allied to the need for an existing market presence and

“

The automotive industry has always been one in which scale is paramount and substantial funds are required

customer base to transition from ICE to EVs, will mean that future Lordstowns and Rivians will likely fail or be consigned to marginal places on the sidelines.

The opinions expressed here are those of the author and do not necessarily reflect the positions of Automotive World Ltd.

Ian Henry is Director at industry consultancy AutoAnalysis

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Has dynamic wireless charging solved EV range anxiety?

Electreon's May 2023 trial of its dynamic wireless charging technology presents an exciting vision where EV range is no longer an issue. By Will Girling



The broad accessibility of charging infrastructure is generally recognised as a prerequisite to greater electric vehicle (EV) adoption. In the US, the state of Texas alone will need 1,462.5% and 615% more Level 2 and Level 3 chargers respectively by 2027, according to S&P Global Mobility. The most obvious short-term solution is a massive roll-out of charge points nationwide, such as [Enel X Way's 2030 plan](#). But what if the automotive industry's entire approach to charging could be transformed?

This is the perspective of Oren Ezer, Chief Executive and Co-founder of Electreon, who told *Automotive World* in December 2022 that wireless

charging could gain [prevalence by the end of the decade](#). From 21 to 25 May 2023, an impression of how that future could look was demonstrated in a trial that saw Electreon set out to drive an EV for 100 hours non-stop over a distance of 1,500 km. "This was our opportunity to show the world what wireless charging is all about," he states.

The trial

The company's Electric Road technology is based on three components. Copper coils are installed beneath the surface of a road and then covered in asphalt. When an authorised EV drives over the coils, Electreon's system



management unit transfers energy from the grid to a receiver installed in the car. Cloud-based software then facilitates live monitoring services and data insights.

The chosen vehicle for the May trial, an all-electric Toyota RAV4, had an 18 kWh battery—substantially smaller than other examples, such as the Tesla Model Y’s 75 kWh. “[Batteries are one of the greatest challenges](#) for the industry today, and we wanted to demonstrate that big, expensive, unsustainable cells aren’t necessary with dynamic wireless charging (DWC),” says Ezer. Battery sizes have grown in an effort to allay consumer range anxiety, yet Electreon’s solution could allow this trend to reverse. The team’s confidence was

such that the entire event was also livestreamed.

To highlight the efficacy of its technology, only 25% of the company’s 200m demo track used for the 21-25 May trial featured wireless charging. “Initially, we were actually providing the car with too much energy; the battery was holding 99% charge all the time,” he relays. This meant accelerating beyond an initial test speed of 30 kph (19 mph) in effort to drain the battery faster. By the end of the 100-hour trial, the RAV4 had travelled 1,942 km without stopping—29% further than anticipated and 26-times more than its official range spec. “The bottom line is that it was a huge success,” enthuses Ezer.



Electreon's Toyota RAV4 mid-trial—this screenshot was taken from the company's livestream of the event

Becoming a reality

In his view, wireless charging presents a more practical solution than current efforts to create larger batteries and scale-up charge point infrastructure. It should be noted that the [economics of charger-supported electrification](#) are still poorly defined in some areas. If the world's approximately 1.4 billion internal combustion engine vehicles were replaced with EVs, he argues that a shared charging infrastructure with no waiting times and easy accessibility for all vehicle segments is the most elegant solution. "In this way, wireless charging can act as an accelerator for EV adoption."

Electreon is currently developing its third-generation technology, which Ezer notes will boost the power from 20 kWh to more than 70 kWh and facilitate faster charging for heavy-duty vehicles. For one-third of all roads to become Electric Roads and all vehicles to be sufficiently charged while travelling at 100 kph, Electreon's energy equation is 600 watts per kilometre travelled.

"However, the point isn't to make batteries irrelevant; we just want to make them smaller," he emphasises. Since the environmental sustainability of EVs is a key driver of the market, making DWC as green as possible is also a priority. "The next step is to connect renewable energy to the road, such as solar panels and wind turbines." The company's technology is designed in such a way that this could be achieved without a power inverter.

Although he concedes that the popularity and investment in conventional charging stations could present an initial hurdle to the wider adoption of a more novel solution, Ezer is confident that the May trial will help convince the industry. "We need to educate the market to show everyone that wireless charging isn't a dream; it's a reality." As such, he anticipates that specific use cases like bus routes, airports, and fixed logistics routes will provide the early evidence of DWC's full commercial potential. "The ultimate vision is to roll it out for all passenger cars, and particularly

autonomous vehicles,” Ezer adds. Combined with [advanced SAE Level 4 self-driving capabilities](#), the result could be 24-hour robotaxi services that do not need to periodically return to a depot to charge.

Changing the conversation

The infrastructural changes required to implement DWC will inevitably require close collaboration with regional government authorities. However, Electreon is not starting from zero. Early adopter countries like Israel and Sweden have been interested in the company’s wireless charging technology for almost a decade. From this initial interest have come projects in Germany and Italy, which Ezer believes will create a cascade of influence that could soon extend to the entirety of Europe. “In the US, Michigan was the first to launch a tender for DWC, and we’re also developing it in Utah. Meanwhile, our partnership with Toyota for the trial could open doors in Japan, too.”

Regarding a timeline for when DWC could become a wider part of the e-mobility ecosystem, Ezer suggests that progress will be mixed and dependant on the territory. In Europe, particularly in Sweden, static wireless charging—where EVs are parked and charged in a more conventional manner—might become common within three to four years, whereas DWC—as in the May trial—could take five to seven. This is also contingent on establishing a customer subscription model for using Electreon’s services. “It’s still under consideration, but there are two main options: an in-vehicle billing device that charges an amount



The copper coils for Electreon’s dynamic wireless charging system prior to being covered with asphalt

based on energy consumed, or a fixed monthly fee regardless of usage,” he reveals. This would be equivalent to a phone contract that offers unlimited calls, texts, and data.

Teasing that 2024 will contain a “big surprise” for the industry, Ezer concludes that the results of Electreon’s May trial will help generate greater global enthusiasm for DWC’s potential at a crucial time in electrification. With many in the automotive industry focused on [next-gen battery technology](#) and gigafactories’ capacity to mass produce it, Electreon’s approach could change the conversation on what is and isn’t important in mobility’s new era.

Inside Volvo Truck's ZEV technology strategy

Volvo Group's Chief Technology Officer shares the roadmap for his carbon neutral vision. Megan Lampinen



Images © Volvo Group



Future-proofing for looming emissions regulations will play out in different ways for different players, but at Volvo Trucks it's all about electrification. The truck maker already has six battery electric truck models in series production and has sold nearly 5,000 electric trucks across 40 countries.

But electric also encompasses hydrogen fuel cell electric setups, and this is a newer space for Volvo. The company has teamed up with Daimler to develop fuel cell technology through the cellcentric joint venture. Volvo unveiled its first hydrogen fuel cell heavy truck in 2022, and testing on public roads kicked off earlier in 2023. Hydrogen is thought to be a particularly good fit for heavy trucks running longer distances in regions where battery power alone would struggle, such as rural areas lacking charging infrastructure. If all goes to plan, the first fuel cell electric trucks should hit the market in the second half of this decade.

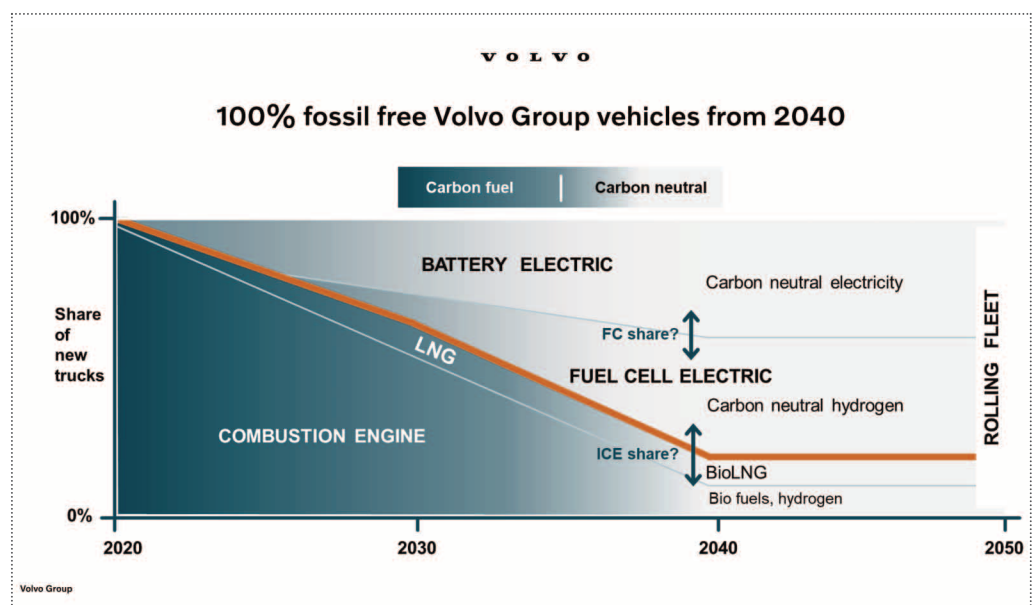
Both hydrogen fuel cell and battery electric will play key roles within the wider Volvo Group carbon neutral

vision. Overseeing the technology roadmap to realising this future is Lars Stenqvist, Volvo Group Chief Technology Officer.

“We have never had so many technologies in parallel—battery, fuel cell, internal combustion with renewable fuels, and on top of all that a huge development within software,” he tells *Automotive World*. “We have to figure out how to do this in the smartest way. That means combining technologies between the fuel cell electric trucks and the battery electric trucks to avoid duplication and wasting developing efforts.” Volvo has long made it a priority to reuse solutions across the wider Group businesses, including buses and construction equipment. “That’s my main challenge.”

Uncertainty

Another key issue is thermal management. “When a fuel cell converts hydrogen into electricity, it creates a lot of heat,” observes Stenqvist. “That means that thermal





Lars Stenqvist,
Chief Technology Officer, Volvo Group

management suddenly becomes a critical technology.” Thermal management has also become a top priority area for battery electric trucks in order to keep the battery operating at an optimal temperature. “If five years ago you asked what the hot technologies would be in 2023, everyone would have told you batteries and fuel cells. Very few would have said thermal management. Today, that’s super sexy.”

The move towards a hydrogen-powered line-up is also facing development hurdles around the form the fuel takes and how it is conveyed into the vehicle. “Neither Europe nor the US has a standard regarding how to get the hydrogen onboard these trucks. If it’s gas, will it be 700 or 350 bar? Then again, will it be liquified hydrogen? From a vehicle layout perspective, I would love to have hydrogen as liquid because then I can use a smaller tank.” Larger tanks, as would be required for a gas form, pose installation challenges for designers.

Stenqvist suggests that the design team is currently able to work around this uncertainty, but not forever: “We still have flexibility, but sooner or later we need to make some really key decisions.”

One major decision has already been made around involvement in the supporting infrastructure for zero emission vehicles. Some OEMs are taking a direct and active role, such as Nikola. The automaker is not only developing fuel cell and battery electric trucks but also energy products for producing, distributing and dispensing hydrogen to fuel its trucks. On the battery electric side, Volvo Group has set up a joint venture to establish a public charging network across Europe. However, it will not be duplicating these efforts around hydrogen. “As long as the market is working and hydrogen is available, I’m convinced that we do not need to step in,” asserts Stenqvist.

He believes that demand for hydrogen will skyrocket from numerous global industries such as steel and chemical in the coming years, stimulating more production and distribution. Heavy



Volvo has been testing in harsh winter conditions on public roads in northern Sweden

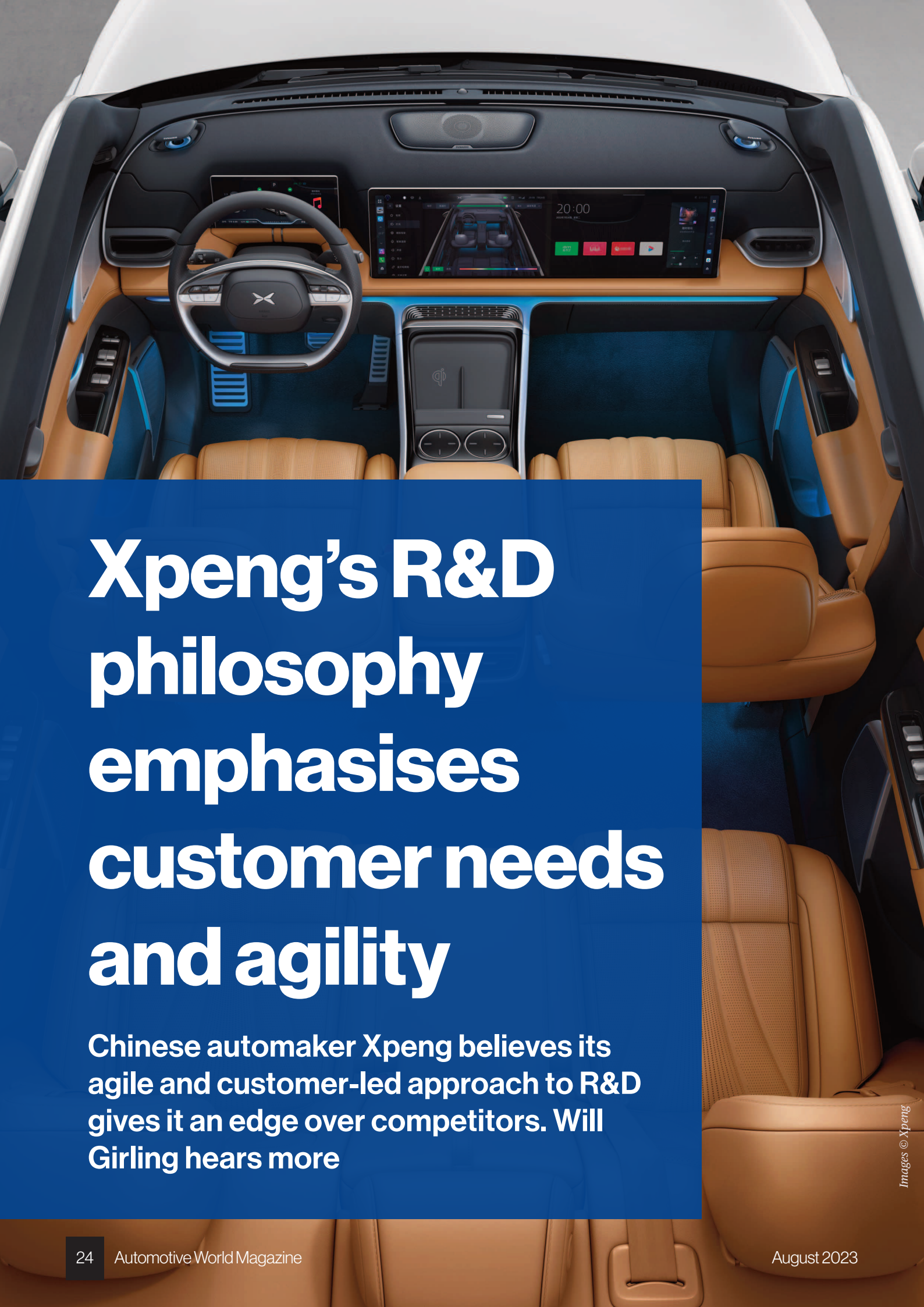
transport, he suggests, will “piggyback” off this demand. That applies to not just any hydrogen, but specifically green hydrogen, generated from renewable sources. “Transport looks likely to consume less than 10% of the total green hydrogen production, so I’m not scared about availability. But I do foresee differences in the various regions of the world, and that’s why I’m so glad that we have both battery electric and hydrogen technologies in the portfolio.”

Outlook

Volvo can build the best electric and fuel cell trucks in the world, but vehicles alone are not sufficient to ensure the success of a zero-emission fleet. Other ecosystem partners need

to fulfil their responsibilities, whether that is producing and supplying the energy these vehicles need or providing the financial incentives to secure a speedy shift to cleaner fleets.

“If society wants to accelerate [towards net zero], different incentive schemes will be very important,” Stenqvist warns. “Already we see a big difference on this front between the US and Europe, and even differences among countries within Europe. Such financial support is necessary in this starting phase of the market before true volumes are up and running.” How long this initial market phase lasts is uncertain, but Stenqvist suggests it will partly depend on the type of incentives offered. “We are talking years at least,” he adds.



Xpeng's R&D philosophy emphasises customer needs and agility

Chinese automaker Xpeng believes its agile and customer-led approach to R&D gives it an edge over competitors. Will Girling hears more

For some automotive industry stakeholders, the future of R&D depends on [new manufacturing technology](#) or [data analysis and machine learning](#). However, Chinese automaker Xpeng favours an approach that combines customer-centricity, premium product design, and resource management.

Speaking at an online press roundtable on 8 June 2023, Xpeng Product Planning Director Meng Wu offered the company's G9 as a paradigmatic example of its R&D process. Launched in China at the end of 2022 and [introduced to select European markets](#) in February 2023, he states that the luxury SUV's mid-sized dimensions take account of customers' modern desire for functionality, spaciousness, and comfort.

Focus on customer needs

The SUV segment's capacity to enable new customer experience has been [noted by automakers like Aehra](#). This is an area that Xpeng is proactively developing, although the company considers its approach to R&D to be fundamentally different from its competitors. "Many European, Chinese, and Japanese OEMs start from benchmarking," Wu claims, using models such as the Audi A5 or BMW 4 Series as a starting point. "Instead, what we do is gather insights to understand who our customers are and what they need."

He believes that electric vehicles (EVs) are becoming more private and less communal than internal combustion engine (ICE) products. This is placing a greater emphasis on

providing a distinct experience from a premium vehicle, but one that is not necessarily linked to ostentatious designs or features. "The market is very educated in what it wants. Most of our customers in Europe and China have already had a premium EV experience, and they want to feel that quality and innovation." As such, while developing the G9, Xpeng focused on vehicle proportions and a clean design within a framework that emphasised convenience, comfort, and "the pleasure of driving". The latter consideration extends from acoustic isolation for a quieter ride to customer range anxiety, which the automaker is tackling in two ways.

First, the G9 incorporates Xpeng's 800V high voltage silicon carbide (SiC) platform, which it claims can double the charging speed of its previous generation vehicles. "Larger batteries are expensive and heavy," says Wu. "An efficient design is much smarter, so our R&D team developed a lightweight body design, with aluminium making up more than 30%." Second, the company is continuing to build up its public charging network in both China and Europe. By the end of 2023, it expects to have 500 new 480kW DC superfast chargers in the former market—powerful enough to provide a G9 with 200 km of range in just five minutes.

The importance of agility

Some analysts expect the Chinese industry to [dominate the luxury EV space](#), with McKinsey & Co singling out its innovations in the US\$80,000-US\$149,000 price group as evidence. The G9's "lounge-style" interior makes a clear premium



An exterior shot of the Xpeng G9

statement—even small details like seat quilting are modelled on the Canton Tower in Guangzhou and designed according to “Fibonacci principles” (a mathematical ratio designed to create aesthetic harmony). However, its current price in Europe—€71,990 (US\$79,199)—places it just below the lowest bracket for what would generally be considered a luxury product. Despite this, Xpeng is determined that it won’t be an obstacle.

Jack Xu, Vice President of Automotive R&D, tells *Automotive World* that an affordable approach to premium that doesn’t compromise on quality is an important part of its strategy in a highly competitive market. “We’re competing with global players, not just Chinese OEMs,” he emphasises. Fundamentally, Xpeng’s R&D philosophy focuses on pruning

inessentials and non-value-added functions and components. However, this is not the automaker’s only avenue for cost reductions.

Through the second generation of its Smart Electric Platform Architecture (SEPA 2.0), for which he was directly responsible, Xu states that Xpeng seeks to communise the components across its product range to boost volume and lower overall cost. At the time of writing, approximately 80% of components are expected to be compatible with next-gen models, which the company believes will shorten its future R&D cycles by 20%.

Wu informs *Automotive World* that Xpeng’s R&D is primarily geared for agility, providing the company with what he considers a strong engineering advantage before a vehicle programme has even begun. The highly adaptable SEPA 2.0 architecture supports vehicle platforms with a wheelbase from 1,800mm to 3,200mm and can be scaled across a variety of model types, including sedans, coupes, hatchbacks, SUVs, and pick-ups. Xu makes it clear that this engineering flexibility has a clear competitive advantage. “The evolution of the smart EV sector is so much faster than ICE; it’s a race to see who can bring new technology to the market first,” he says. “Customers always remember which company was the first to introduce something new.”

A key player

With automakers in Europe already [preparing strategies](#) for an anticipated influx of Chinese-made EVs in 2025, time is clearly of the essence for Xpeng. As electrification provides opportunities for new



The Xpeng G9's interior—the seat quilting is modelled on the Canton Tower in Guangzhou and designed according to “Fibonacci principles”

entrants to disrupt more established players through innovation, the automaker's R&D philosophy demonstrates how customer-centricity, a focus on premium products, and cost savings can be rationalised in a single product line.

Xpeng's agility and willingness to diversify could also see it capture a broader global market than its competitors. Although Tesla announced in May 2023 that it would no longer produce right-hand-drive versions of the Model S and Model X, Xu confirms that his company sees an ongoing opportunity in the 75 countries with left-hand traffic. He suggests that developments in steer-by-wire (SBW) technology—which dispenses with a mechanical steering column in favour of electronic motor controls—could offer an elegant

solution. “If you have SBW, changing from left to right is pretty easy. The market will see our right-hand-drive car in a couple of years.”

“Comparing the pricing of EVs and associated supply chains in China and Europe, I think China is much more prepared to deliver affordable vehicles,” says Wu. Indeed, the country remains significantly ahead of all others in terms of EV sales and currently houses six of the ten largest battery manufacturers in the world, constituting around 56% of total market output, according to SNE Research. Subsequently, he concludes that the conditions are right for China to become a homeland for affordable, high-quality EV innovation, and that Xpeng's R&D philosophy will enable it to be a key player.



What are the new security threats of the connected car era?

All automotive industry stakeholders must be cognizant of their role in reducing the impact of cyber attacks in the connected vehicle era.
By Will Girling



The increasing connectivity of modern cars is challenging the automotive industry on two fronts. Poor communication with customers on the realities of data sharing are creating angst and mistrust, particularly among those unaware of its [capacity to create better products](#). However, more fundamentally, enhanced connectivity is resulting in a larger surface area for cyber attacks.

By the end of the 2010s, the importance of cyber security was understood by some but generally underdeveloped. Software firm Synopsys' report *Securing the Modern Vehicle* found that 30% of OEMs did not have an established cyber security programme or team and 63% did not thoroughly test soft/hardware for vulnerabilities. Substantial progress is expected in the 2020s and early 2030s—the automotive cyber security market is poised to grow

from US\$3.1bn in 2022 to US\$16.4bn in 2032, according to Precedence Research.

But what are the new security threats of the connected car era, and how can they be addressed?

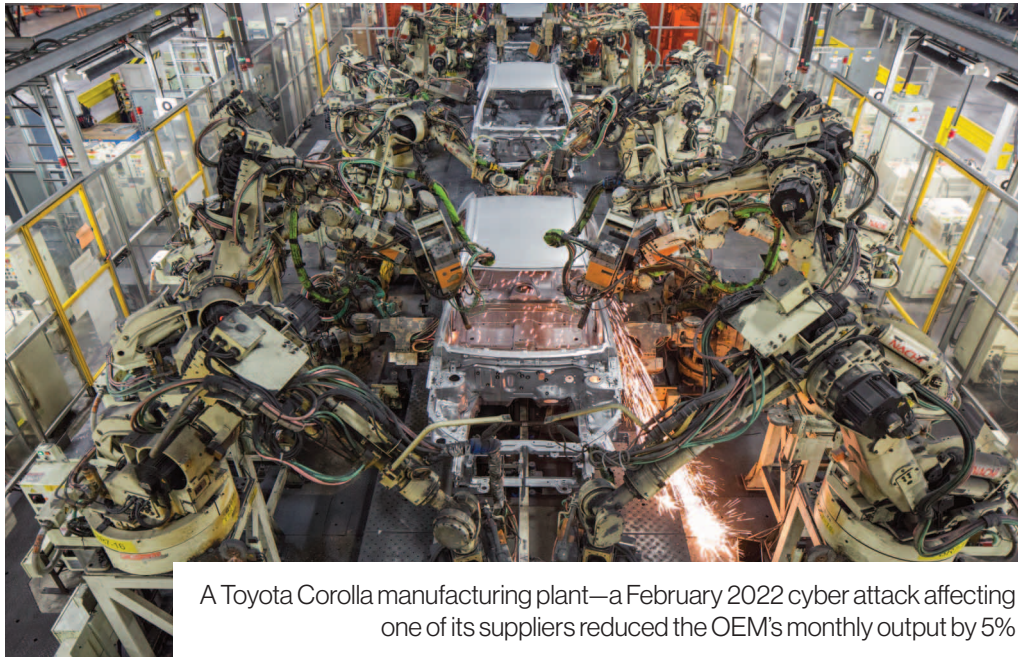
A growing concern

Vikash Chaudhary, Chief Executive and Founder of HackersEra, tells *Automotive World* that cyber security has become a growing concern for automakers, suppliers, and consumers alike. “Weaknesses in a single supplier’s systems can result in an entire supply chain being compromised,” he suggests. Recognising that the automotive industry was lagging behind other sectors, he started the company in 2015 in a bid to fill the gap. HackersEra currently provides security services to more than 15 OEMs.

Chaudhary identifies connected car security,

malware and ransomware attacks, supply chain security, data privacy, compliance with regulations, and human error as some of the most prevalent challenges facing automotive today. “Modern cars collect and transmit vast amounts of data, including personal information about drivers and passengers,” he adds. Indeed, analysis from McKinsey & Co and NTT Data suggests that a vehicle transmits 2,777% more data per hour than a smartphone. “Ensuring that this data is kept secure and protected is essential to maintaining customer trust.”

What’s clear is that the automotive industry cannot rely on traditional security methods in the digital era, and vehicles themselves are not the only targets. In February 2021, Kia’s US operations experienced a large system outage and were allegedly the subject of a ransomware attack that blackmailed the company for US\$20m in exchange for



© Toyota

A Toyota Corolla manufacturing plant—a February 2022 cyber attack affecting one of its suppliers reduced the OEM's monthly output by 5%

decrypting hacked data. The attack was claimed by notorious hacker group DoppelPaymer, although Kia contended that the cause was merely a technical issue. The following year, Toyota suspended production at 14 Japanese plants following a cyber attack that affected one of its suppliers, resulting in a 5% drop in monthly output. This highlights a notable disadvantage of the [increasingly prevalent partner ecosystems](#) necessary to manufacture connected, electric, and autonomous vehicles.

Unprecedented threats

As more complex connected car concepts materialise—such as Aiden Automotive Technologies' vision for [bi-directional communication](#) between OEMs, vehicles, and third-party service providers—HackersEra's research makes it clear that cyber security should be less of a siloed concern and more of an encompassing product R&D philosophy.

Digital features emerging on the market must be thoroughly examined as potential exploitable gateways that can be used to gain access to a vehicle and its data. For example, in January 2023, engineers at HackersEra found an attack vector on passive keyless entry and start systems. Through a coordinated 'relay attack'—wherein two thieves use hacking tools in tandem—a vehicle's system could be tricked into thinking the owner was present, grant the thieves admission, and then start the engine. This would result in no apparent external damage, which could subsequently complicate the substantiation of police and insurer reports that an incident had occurred.

In a contemporaneous article published by the Indian *Free Press Journal*, Chaudhary suggested that the difficulty of executing this method means it is unlikely to occur very often. However, it is still an indication of the novel and unprecedented threats awaiting an increasingly digital industry.

VSOC

Staying ahead of cyber criminals will require new tools and techniques. In April 2023, HackersEra announced that it is developing a new, centralised, artificial intelligence-enhanced vehicle security operations centre (VSOC) platform. A release date has not yet been announced.

The company's automotive cyber security approach follows a nine-step methodology. In the early stages, HackersEra undertakes 'pre-engagement' to gather basic company requirements, a code review for potential exploit routes, and a vulnerability assessment. Next, a 'fuzzing test' is conducted by flooding a system with irregular inputs to examine its overall robustness. This is then followed by a functional security test to validate defence mechanisms, 'side-channel attacks' that seek to disrupt data processing, and penetration testing that targets specific vehicle systems in the same manner as a hacker. Finally, a report is submitted and HackersEra will offer ongoing support to the client company.

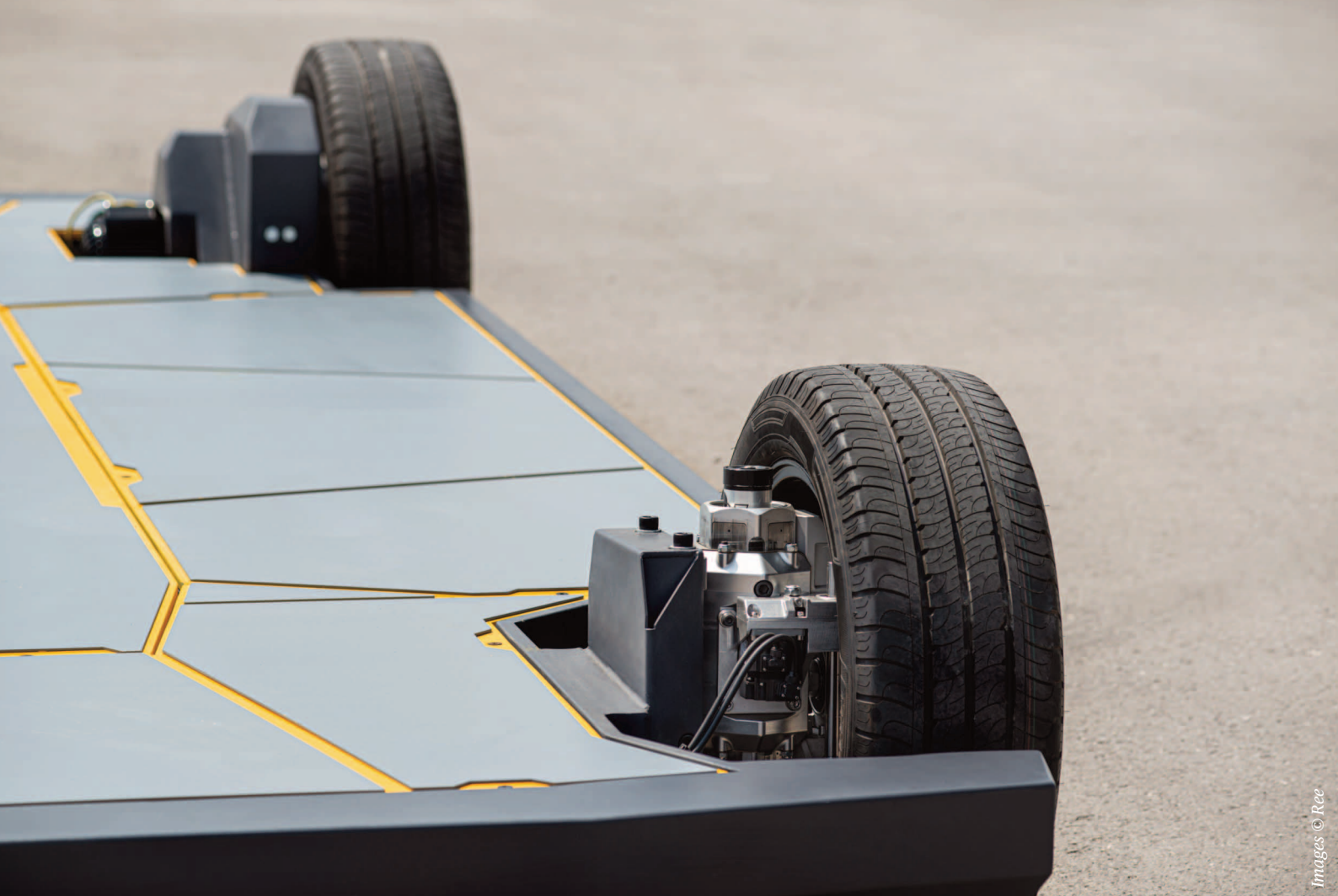
"The VSOC will provide real-time monitoring and remediation of cyber threats to vehicles," Chaudhary explains. "It will offer a comprehensive range of security services, including incident response and threat intelligence." The platform will be staffed by "a team of experienced security professionals" providing round-the-clock monitoring and remediation services. Advanced analytics and machine learning algorithms will enable companies utilising the VSOC to identify and prioritise cyber threats as they occur.

Most importantly, Chaudhary emphasises that having a centralised management point for security operations will enable manufacturers to better understand threat monitoring and remediation. "Automakers will be able to leverage the VSOC's threat intelligence and analysis capabilities to gain a better understanding of the threat landscape and develop more effective security strategies." For those still coming to grips with new attack vectors, including [factories incorporating digital twin processes](#), he claims that the platform will be flexible enough to produce custom strategies for each company's unique requirements.

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Modern cars collect and transmit vast amounts of data, including personal information about drivers and passengers

With Statista anticipating more than 400 million connected cars on public roads by 2025, time is running out to secure the future of mobility. The broader value of tools like HackersEra's VSOC and [cyber exploit challenge events like Pwn2Own](#) could be their ability to help the automotive industry understand the complex security role that each stakeholder must inevitably play.



Images © Ree

New modular platform promises to shake up commercial EVs

**Tel Aviv-based firm Ree Automotive promises a platform
that will deliver the “next generation” for fleet EVs.
By Stewart Burnett**

The market for fleet vehicles has seen numerous disruptions in recent years. As legacy fleet OEMs display a hesitance to adapt and meet the changing needs of operators, startups have moved in to provide new solutions and meet the demand. Rivian, for instance, benefitted from several billion dollars in funding from e-commerce giant Amazon to custom-build vehicles to its precise needs.

Another company, Ree Automotive, plans to shake things up by delivering what it describes as the “next-generation electric vehicle (EV) platform”. This platform is a chassis that is completely flat, ultra-thin, scalable and modular. In each wheel corner are the company’s prize innovation, the Ree Corner. This unit packs all critical vehicle components—such as steering, braking, suspension and the powertrain—into a single module based around the wheel itself. Each corner has an electronic control unit (ECU)—all of which are, in turn, controlled by a central ECU.

A closer look

Although it may seem as though the company is trying to pack a lot into a small space, the Ree Corner is quite compact. Economy of space proved to be a central consideration during the product’s design, as it enables the chassis to be thin and reduce the number of components. This, in turn, means more space to work with: the company promises 35% more interior volume for passengers and cargo.

All major functions are handled by-wire—the braking and steering activators are electronically handled. Peter Dow, Vice President of Engineering at Ree emphasises that

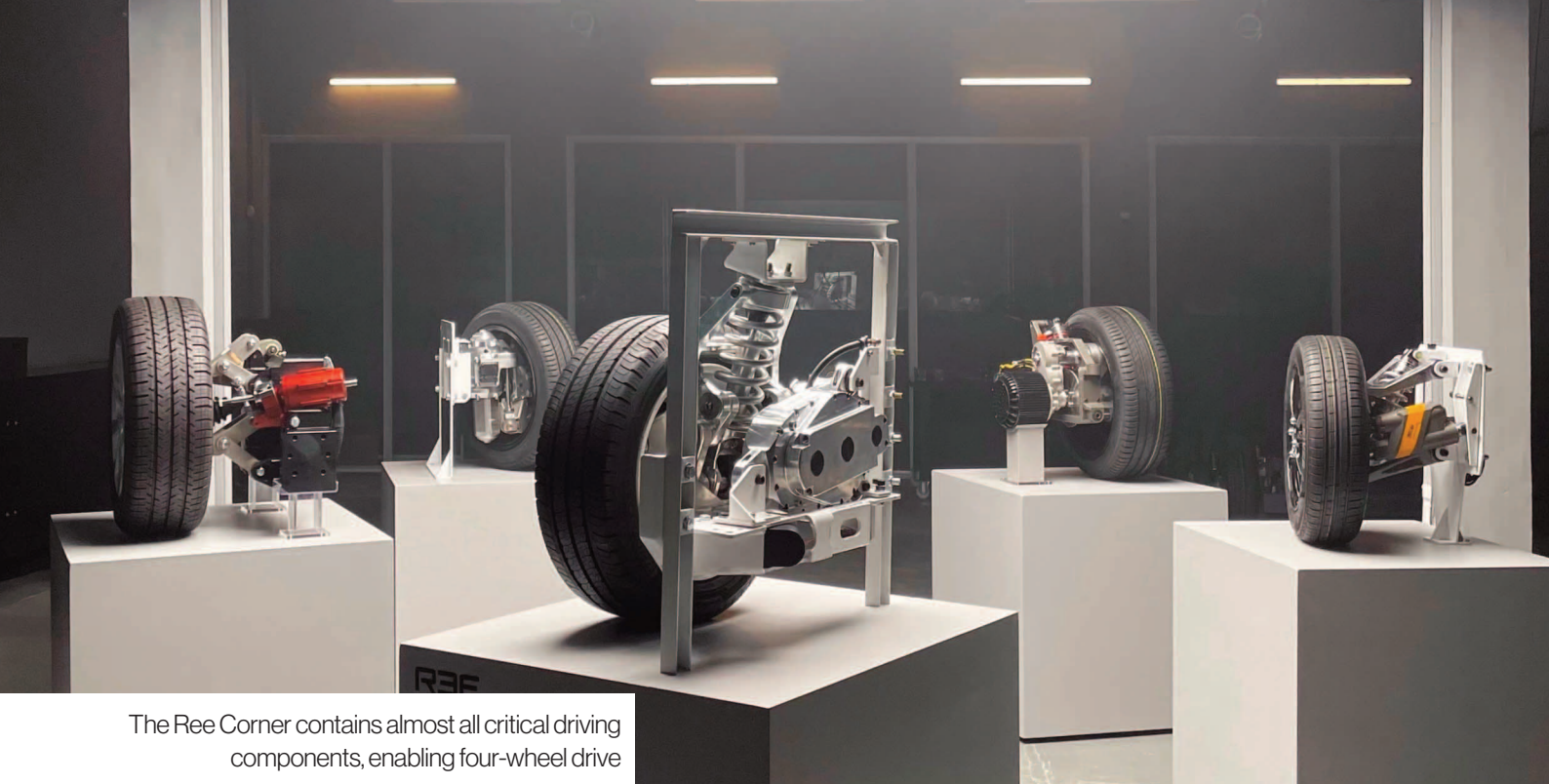
each wheel is independently steered, braked, and driven. In practice, this means four-wheel drive, which, Dow claims, enhances vehicle manoeuvrability and “allows a lot of flexibility when building a platform.”

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Finding drivers is the biggest bottleneck for fleet companies today

Relocating most core components into the wheel spaces doesn’t just allow the chassis to be flat, it also allows it to be uniquely low. Ree Chief Executive Daniel Barel claims that “this has been the holy grail for fleet vehicles” for some time now, as in most instances, the floor actually sits above the wheels. A low floor brings down the centre of gravity (fleet vehicles often struggle in this regard), making them more aerodynamically efficient and easier to drive. Barel claims that “Ree is the only one able to achieve this,” on account of its corner unit technology.

A low floor also means an easy step-in for drivers, reducing the strain of a repetitive physical activity that may need to be repeated many dozens of times per day and could lead to long-term health issues. Thus, the company hopes it can give operators a recruitment advantage by helping them improve overall driver health and wellbeing. “Finding drivers is the biggest bottleneck for fleet companies today,” Barel asserts.



The Ree Corner contains almost all critical driving components, enabling four-wheel drive

A platform for possibility

Ree has designed its platform to be highly modular in order to facilitate as broad a range of client needs as possible. This approach can be found in the chassis, which can be adapted in size to fit as many as three batteries or fuel cells. The corners—which the company considers its chief expertise and primary innovation—can also be adapted. For instance, if a larger spring is required to support a higher vehicle mass, it can be switched in.

The company also promises that its platform is “autonomous-ready”: while an in-house autonomous driving system (ADS) is not being developed, external solutions have been tested. Barel explains that the Ree Corner represents the “limbs” of a successful ADS—not the brains. “The only way to drive an autonomous vehicle safely is by wire,” he explains, pointing towards the maximal reliability and responsiveness of the approach. Furthermore, because the company’s hardware and software were designed

in tandem and use only five ECUs (compared with upwards of 100 in other vehicles), response times can drop below a millisecond.

As of July 2023, the company lists three vehicles on its website: the Chassis Cab (the standard chassis with a cabin configuration); a medium-duty box truck capable of supporting a payload of 4,400lbs; and Proxima, a last-mile delivery vehicle developed in collaboration with US walk-in van firm Morgan Olson. All of these solutions are intended to exemplify the company’s innovative approach—each provides an industry-lowest step-in height, four-wheel drive, low centre-of-gravity, and manoeuvrability.

However, the company is taking a decidedly hands-off approach towards applications. Rather, it considers itself as a pure platform provider. Ree welcomes clients and partners to come to it with their needs—which could range from long-haul delivery to landscaping or even public transport—so that precise, custom solutions can be developed.



Durable and reliable

No matter the application or vehicle, what becomes apparent on closer inspection is the extent to which redundancy has been implemented on both a software and mechanical level. If the in-corner ECU fails, it will be backed up by the units in the other wheels. There are two motor activators and two brake activators—a primary and a back-up. The six-phase motor is also supported by two independent power supplies—“if one fails, you can still continue to steer,” Dow asserts. Likewise, redundancy is built into the by-wire communication system to prevent latency issues if back-up systems need to be put into use.

Barel cites the example of a Boeing 747 that can still fly even if one of its engines stops working, emphasising that every component within the Ree Corner system has been developed to match this standard. “Our customers want durability, so our products can’t break; they need to work day after day,” he states. To this end, the company also uses steel in its manufacturing, eschewing more modern materials such as

carbon fibre, which, while lightweight, can prove brittle on heavy impact.

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We complete,
we do not
compete

Creating a safe and reliable platform is essential to earning the trust of clients, Barel maintains—something Ree will need to do to match the market share it is aiming for. As the company aims to enter mass production towards the end of 2024, it is targeting 40,000 Ree Corner units per year at its Coventry facility alone. Despite these ambitions, the company is not too worried—it does not perceive itself as having any real competitors in the space. “We complete, we do not compete,” Barel states.

What are the game-changers in ZF's tech roadmap?

ZF's CEO and his team offer a deep dive on their EV and chassis innovations at the Global Tech Day.
By Megan Lampinen

Images © ZF

The journey towards zero-emission, connected vehicles has dramatically changed the demands placed on suppliers and automakers. As the pace of innovation across the mobility industry rockets, so have the risk factors. With companies pouring huge sums of money into R&D, backing the wrong technology could prove fatal. For some, diversification has become central to future-proofing success.

Technology specialist ZF was keen to show off its diverse portfolio as well as its technology leadership at the Global Technology Day 2023 in Friedrichshafen, Germany, where the focus was on e-

mobility and chassis. "For us, those two segments are defining the future of mobility," Chief Executive Holger Klein told media. ZF plays an active role in other megatrends, notably autonomous driving, safety and the software-defined vehicle, but those segments were previously given the spotlight at CES in January 2023. For all areas of technology, though, there has been a step change in the speed of development.

"Typically, we would talk of development cycles of two years or more. Now we can have an eight-month timeframe," he observed. Eight months was how long it recently took the development

team to bring a new steering concept into production. With that sort of pace no longer unusual, modular concepts are becoming increasingly important, as is an agile corporate structure. "We want to take the hierarchy out of our organisation," Klein added. "This is what tech players do. It makes them more agile and prevents them from thinking in siloes."

Bouquet of solutions

The Tech Day displays demonstrated exactly how agile and innovative ZF could be. The EVbeat concept vehicle, meant to reflect "the heartbeat



of innovation,” was one of the main attractions. “A few months ago, the ideas for EVbeat were just a PowerPoint presentation,” said Klein. “Today you can drive it. The speed with which our engineers brought this innovation to life is remarkable but it’s what is needed in today’s landscape.”

Based on the Porsche Taycan, this showcase for compact design, low weight and high efficiency bundles together several new technologies. A prototype modular 800-volt electric drive system known as EVsys800 boasts a power density of 70 Newton metres per kilogram of drive weight. Separate cooling systems are used for the e-motor and power

electronics, with the former deploying an innovative slot cooling approach where oil flows directly around the copper rods at the point where most heat is generated.

The EVbeat also introduces a central thermal management system (TherMaS) that could extend range by up to one-third in cold weather. “Range is key for e-mobility,” said Otmar Scharrer, ZF’s Vice president of R&D for e-mobility. The supplier aims to increase range without increasing battery size, using instead what Scharrer refers to as a “bouquet of technologies.” And here the thermal management system is particularly important. “It’s a real game-changer, a

spectacular step forward,” he told *Automotive World*. Although it remains under development, Scharrer is bullish on its transformative potential, adding: “With EVs it is all about increasing range and this could solve that problem.”

The concept car also deploys driveline software that networks all drive systems and creates a connection to the cloud for additional services. It can anticipate the optimum thermal operating points of the electric motors based on individual driving profiles and then prepare the system accordingly. It also uses these profiles to offer driving tips. Overall, this one system alone could increase efficiency by 6%.



Holger Klein addresses media at the Global Technology Day 2023

“The development of EVbeat demonstrates how ZF is mastering the industry transformation and at the same time laying the foundation for a successful future,” emphasised Klein. Ten years ago, the company was heavily tied to internal combustion engine (ICE) technology, which accounted for 60% of its revenues. Today that has dropped to 27%, largely due to the growth of e-mobility.

Beyond the EVbeat, the supplier was also showing off its commercial vehicle e-mobility offering, with solutions for both near and long term. The spotlight was on the AxTrax 2, currently under development. This is a modular, integrated, axle-based e-powertrain system designed to replace the engine, transmission, drive shaft, differential and conventional axle to electrify trucks and buses. For Christian Brenneke, Head of global R&D for ZF Commercial Vehicle

Solutions, this could be an industry game-changer—eventually. It’s not a drop-in replacement for an ICE setup and will require new design strategies. “For this you need to rethink the chassis set-up,” Brenneke explains. “There will be a lot of transformation ahead for legacy customers. For new ones starting from scratch, it’s an easier decision but for the traditional players the transition will be a challenge.”

Production of the AxTrax 2 should begin in Europe in late 2024, followed by the US in 2025. For more near-term use there is the CeTrax 2 dual. Described as a “one-box solution,” it features a three-speed transmission with two e-actuators and can easily fit within the space of the transmission in an ICE vehicle.

Challenges and uncertainties

The e-mobility products above are just a tiny snapshot of what was on display at the Tech Day, which also featured advanced networked chassis technology and the announcement of a new Chassis Solutions Division. The unit brings together all the hardware components needed to control a vehicle’s dynamics and the associated networking. It’s an area of big business, currently reporting an annual turnover of more than €14bn (US\$15.2bn), but it’s rapidly becoming more complicated. “The biggest challenge for the team at the moment is the clear separation of software and hardware,” said ZF’s Andre Engelke, Head of Vehicle Motion Control.

It’s not just Engelke’s team that faces challenges; the entire industry is engaged in a high-stakes gamble on



The EVbeat bundles together a bouquet of technologies

technology. The CV division alone is developing technologies across diesel ICE, hydrogen ICE, hydrogen fuel cell, battery electric and e-fuels. “ZF is preparing for all different powertrain paths,” confirms Brenneke. He notes that this decision stems from a combination of regulation, economic and geopolitical developments and customer demand—all of which remain major uncertainties.

In fact, Klein flags regulation as one of the biggest variables facing the supplier today. “Regulation is driving a lot of development,” he tells *Automotive World*, particularly around safety and emissions. But it’s not the main driver. In fact, he suggests that it’s the enthusiasm and

vision of its employees that drives innovation at ZF.

Rescue Connect is a case in point. This suite of digital services for emergency responders was the idea of a low-level engineer who participated in an innovation competition. He then went on to develop it with a small budget in the innovation lab, and in January 2022, the company secured the first order from firefighting vehicle manufacturer Albert Ziegler. Klein flags several other innovations that also stemmed from its in-house team, concluding: “Our limitation is we have more ideas than money. Now we need to focus and figure out what we can afford when. But it’s certainly not a bad problem to have.”

Do smart EVs spell the end of the traditional supply chain?

The complexity of new vehicles and continual shortages are sparking a move into the new era of automotive supply chains, writes Mike Hitmar

The complexity of automotive supply chains is unrivalled. Digitalisation, sustainability, and rapid urbanisation have pushed the industry toward electric vehicles (EVs), autonomous vehicles, and a more tech-focused mindset. Now, vehicles are producing up to 5,100 terabytes of data each year thanks to a rapid increase in connected sensors and devices, whilst EVs require a new set of materials and

suppliers, in-built tech, and charging infrastructure.

The boom in EVs has changed the automotive industry for good. With global EV sales expected to leap 35% this year, manufacturers are under unprecedented pressure to produce vehicles at speed—with big players like Jaguar Land Rover even devoting entire sites to building EVs. And when it comes to smart vehicles, different bill of materials configurations,

remote fixes, and specialist parts have turned vehicles into some of the most technologically advanced and intricate products to manufacture, subject to ever-increasing regulations and customer expectations.

Previously, a lack of integration, poor data, siloed decisions, and a reactive stance created disconnected and misaligned automotive supply chains. Now, manufacturers are squeezed



Images © Xpeng

further by the complexity of new vehicles and continual shortages, sparking a move into the new era of automotive supply chains.

The new wave of complexity

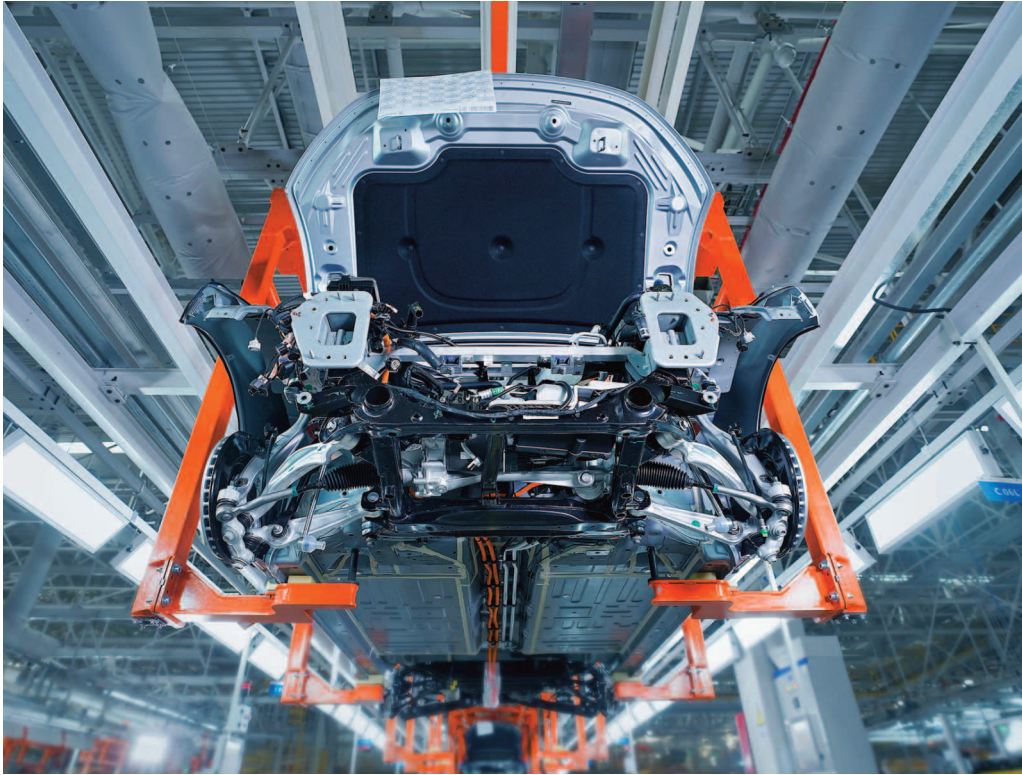
Unprecedented demand shifts and uncertainty extend from the manufacturing stage, to charging stations, to software and firmware updates. Chaotic swings in automotive supply

and demand can risk customer loyalty. If vehicles aren't readily available, customers will head elsewhere, so manufacturers need to ensure a consistent supply.

Poor visibility of inventory across suppliers means poor visibility of supply risk. A single issue among thousands of suppliers over multiple tiers can make even the most efficient production lines grind to a halt. Due to the complexity of new vehicles and the myriad

of component parts they require, manufacturers and suppliers often turn to overstocking as a solution. This not only exacerbates shortages but also ties up capital that can be put to better use elsewhere.

With a proliferation of configuration options, a shift from make-to-stock to make-to-order, and the surge in new suppliers for novel technologies, the complexity only grows. With disruptions spanning demand and supply,



manufacturers must monitor every stakeholder from systems, components, and materials, right through to dealers, customers, and recyclers. Organisations must build new supplier relationships and have the visibility to ensure that this new complexity doesn't equate to delays.

Shortages throw a spanner in the works

Shortages of semiconductors and metals for EV batteries continue to plague the automotive industry. In 2021 alone, it lost US\$210bn in revenue due to chip shortages slowing down or stopping vehicle production altogether. And when the industry only uses 5-10% of semiconductors, with most going to consumer electronics, automotive manufacturers often find themselves at the back of the queue. Some are even having to pick and choose which features to include on vehicles to try to keep up with demand, leading to

costly retrofits to give customers the functionality they want. With no end in sight for shortages, leaders are having to find creative ways to bolster their supply chains and meet demand.

Shortages aren't fully solved by simply finding new suppliers and creating an even more complex, extended supply chain. More suppliers equal more risk of weather disruptions, port bottlenecks, and labour shortages, and every link of the chain must be closely monitored to proactively handle issues. Some have turned to nearshoring or reshoring to produce parts locally and alleviate these risks, but a lack of raw materials can mean that manufacturers must still source components from further afield—and the complexity continues. Short-term fixes need to be combined with longer-term planning, allowing automotive leaders to effectively balance suppliers and strengthen their supply chain.

The evolution to a connected automotive supply chain

Connecting this plethora of suppliers and stakeholders may seem daunting, but moving to modern, collaborative supply chains is building resilience for manufacturers. It's no longer about individual suppliers, but their entire ecosystem. A multi-tiered, connected supply chain and supporting technology that brings data together in one platform will help businesses to understand the impact of delays or disruptions and take proactive, corrective action.

Integrating suppliers and trading partners across thousands of organisations, every tier, and various ecosystems builds resilience through secure connected data, real-time information exchange, and collaborative working. This develops trust, confidence, and agility, with accurate, harmonised data enabling decision-grade insights and streamlined regulatory compliance. Connected decisions ensure that the impact of any supply chain disruptions or delays is minimised and proactive steps are taken ahead of time to improve productivity, enhance supply assurance, and reduce lead times.

This visibility feeds into inventory optimisation, where leaders can create aligned plans across horizons that reflect material and capacity

availability and make the best decision to adjust. Collaborative planning and enhanced visibility give leaders the data to reduce safety stock and rebalance inventory levels, saving time and money whilst improving forecast accuracy.

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As cars get smarter, supply chains must follow suit

As cars get smarter, supply chains must follow suit, and the traditional automotive supply chain no longer drives success. Decades of cost-optimisation, outsourcing, and globalisation made automotive supply chains more cost-efficient but fragile. What worked before no longer stands, and automotive manufacturers need to evolve their supply chains now to be a success in the shift to EVs and smarter vehicles—or risk being left in their competitors' dust.

The opinions expressed here are those of the author and do not necessarily reflect the positions of Automotive World Ltd.

Mike Hitmar is Director at e2open

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Metaverse impact hinges on security

With valuable IP and customer data being transferred, it's crucial that the automotive metaverse is built to be secure, writes Bertrand Boisseau

The metaverse is poised to change every part of the automotive industry, from how engineers design, test and develop new products to a consumer's path to purchase. While the metaverse itself is still in its infancy, its foundational technology is already being adopted in the form of virtual reality (VR) and augmented reality (AR). Digital twins, which are a key part of the metaverse in automotive, are also now being widely adopted in car design, providing engineers with a virtual twin of a physical car to simulate each step of the design and construction process.

The companies openly embracing the metaverse could see a huge uptick in profits. According to MarketsandMarkets research,



the automotive metaverse is predicted to rise in value from US\$1.9bn worldwide in 2022 to US\$16.5bn by 2030. But with highly valuable intellectual property and customer data being transferred and therefore potentially at stake, it's crucial that the automotive metaverse is built to be secure from the very start.

The potential for the automotive metaverse

Within this virtual world, car manufacturers and engineers will be able to move beyond traditional 2D and 3D sketches, which are still the starting points for today's car design. OEMs will be empowered to experiment and test new models and services in a computer-generated environment, without physical

commitments. BMW is leading the charge when it comes to design and production in the metaverse, recently unveiling the world's first virtual factory. Based on Nvidia's Omniverse platform, the digital twin factory will enable manufacturers to plan, design and optimise the layout of new cars years before the start of production, speeding up the production processes and improving time to market and sustainability.

Once a car has been designed, produced and is ready to be sold, consumers can also use the metaverse to try before they buy. Through VR showrooms, consumers can get a feel of the car in terms of its look, size and features in a much more immersive way when compared to pictures or videos. They can also customise their car in real-time, enhancing their shopping experience and

enabling car dealerships to increase personalisation and, in-turn, sell more vehicles. Manufacturers from Audi to Jaguar Land Rover are experimenting with VR, with consumers even able to take a virtual test drives of the vehicles without leaving the physical showroom. A key part of these virtual test drives will be the capacity to generate data which can be analysed, improving the future of car designs and potentially the development of autonomous vehicles.

In the virtual world, different designers, engineers and technicians working on separate details of a car can work from anywhere in the world simultaneously, hence saving time, and offering opportunities for shared inspiration. In a market where individuality and customisation are essential, metaverse technologies hold the



The BMW Group and Nvidia are generating a completely new approach to planning highly complex manufacturing systems with the Omniverse platform

potential to energise the creativity of designers, while also significantly cutting prototyping costs.

Security from the beginning

Despite the potential the metaverse can bring to the automotive industry, there are risks. Increasingly, the sector is being built on software and data. At every touchpoint, from the initial stages of design, through the point of sale, or even during maintenance, data is collected. This data could face the threat of unauthorised access, data breaches or even remote exploitation in the metaverse. Unless cyber security is a priority from the conception phase, there is a major risk of vulnerabilities.

It's down to the platform owners to work together to enforce security rules for all businesses to adhere to. Not only will this put the spotlight on the cyber security challenges that lie ahead, it will ultimately help drive platform adoption. Automotive companies need to ensure they educate themselves on cyber security

best practices related to the virtual world on which they are hosted, examine the services they are building and using on the platform, and take steps to ensure the security of those services.

Securing every touchpoint

On top of defining who is responsible for securing what data within the metaverse, OEMs will also need to focus on the vehicles themselves. Manufacturers need to ensure that the myriad of software tools that are involved in the development of new cars are constantly up-to-date in order to guarantee top performance and access to the latest security patches. In addition, by automating these processes, they can quickly address and get ahead of any potential software, operating system or application vulnerability.

The cars of the future will be connected, so manufacturers also need to consider the systems within the cars once they are on the road, as well as the external systems to which

they are connected. This requires cyber security measures in the vehicle itself and beyond, ensuring that the vehicle backend, the infrastructure and the mobile network are secure. Carmakers also need to guarantee the security of their embedded software and hardware. All of this requires specific skills and expertise, across several different domains, working together.

The flexibility of open source approaches will be key here, allowing car manufacturers to share identified vulnerabilities and fixes in a transparent fashion. A culture of collaboration will enable all OEMs and Tier1s involved to work together to deal with the challenges of automotive cyber security.

The cars of the future

The metaverse is only going to grow in importance as the car market evolves. With autonomous driving in particular, progress will increasingly rely on metaverse technologies. For autonomous driving software to truly take shape, it needs to be tested over thousands or even millions of miles. The metaverse will be a game-changer here. Digital twins, 3D simulations and realistic environments will be the building blocks to create road-ready autonomous driving software, allowing manufacturers to test and experiment safely. Data sourced from real cars and fed back into their digital twins, will help enrich these simulations, and artificial intelligence will help monitor these simulated environments.

Metaverse technologies might also find applications within the cars of the future, with AR information such

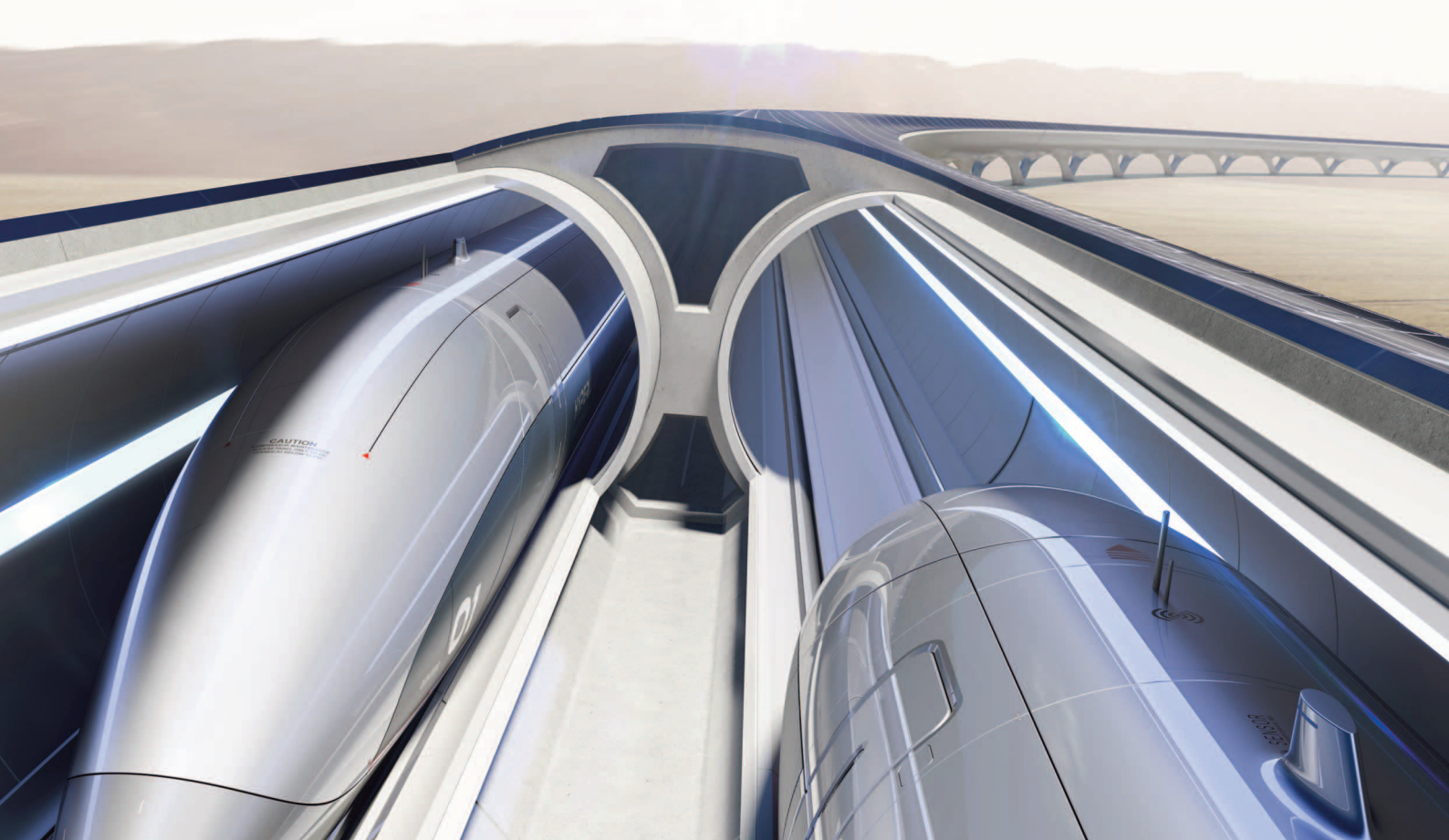
as navigation or feedback from autonomous driving systems projected onto the windscreen. This will mean that passengers can see the vehicles and lanes that the car's autonomous systems identify. In fully autonomous cars, VR and AR entertainment systems could also be used, so that passengers can fully "switch off", and perhaps zoom down the motorway while flying over a beautiful forest in VR.

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The car of the future will live in the metaverse, and cyber security will be the key to keeping the door safely locked

The automotive industry is moving towards a period of enormous and profitable change. By embracing the metaverse, it can streamline and boost every aspect of the sector, from car design and production to marketing. To ensure the automotive metaverse is secure from the beginning, both the solution providers and automotive companies themselves have a role to play. This will not only increase metaverse adoption but also drive a more personalised and immersive experience for consumers. The car of the future will live in the metaverse, and cyber security will be the key to keeping the door safely locked.

Bertrand Boisseau is Automotive Sector Lead at Canonical



Images © Hyperloop™

Hyperloops could unlock a new paradigm for urban living

New inter-city hyperloop projects in Europe and China have the potential to markedly change urban mobility and city layouts.

By Will Girling

The realisation of hyperloops as a popular form of urban transport—wherein magnetically elevated capsules travel inside networks of vacuum-sealed tubes—has been [progressing gradually](#). However, it has been difficult for the technology to move beyond the initial hype invigorated by Tesla Chief Executive Elon Musk in 2013.

Nonetheless, Andrés de León, Chief Executive of Hyperloop Transportation Technologies (HyperloopTT), informs *Automotive World* that his company is closer to realising a commercially viable service than ever before. In May 2023, it secured a €800m (US\$875m) three-phase tender to build a high-speed hyperloop service between the Italian cities of Venice and Padua—a distance of 25 miles (37km).

If successful at the conclusion of a €4m feasibility study, HyperloopTT will progress to a design phase and finally a prototype/field test. The project is set to commence later in 2023, and, if all goes well, the first 10km of infrastructure could be in place by 2028.

A better passenger experience

In León's view, urban transport should be a relatively prosaic matter of getting 'from A to B' as efficiently as possible. Fitting this mentality within a hyperloop context has been HyperloopTT's focus for almost ten years, but it hasn't been the only concern. "We've also prioritised sustainable operability using renewable energy sources and financial viability," he says. The company claims that hyperloops have

the potential to be the first land-based mass transit systems that pay for themselves within 20-25 years, around six times faster than high-speed rail.

However, a focus on efficiency has not diminished HyperloopTT's mission to also deliver a better passenger experience than other forms of urban transport. León's vision for hyperloop travel is a frictionless journey that requires little direct input from the customer or their smart devices—ticketing is performed digitally at home, and biometrics are used for check-in upon arrival at the station. "The idea is that the passenger could be naked and still technically access the service," he jokes.

Convenience and comfort will be important, as hyperloops built in cities will naturally compete with road-based mobility and high-capacity metro services—the London Underground alone facilitates approximately five million passenger journeys per day, according to Transport for London. What HyperloopTT's enclosed system can offer is high speeds (up to 760mph) and flexible and comparatively cheap infrastructure that can suit local geography, including overground and underground sections. These capabilities also open exciting opportunities for rapid inter-city travel, of which the Venice-Padua project could be the first indication. "This could be the start of fast cross-continent travel that doesn't use airplanes," suggests León. Instead of travelling outside a city to an airport, parking, and then negotiating airport logistics at both departure and arrival, hyperloops would allow passengers to consolidate the journey into a single easy step.



A virtual rendering of what the HyperloopTT capsule ride experience will look like

Market developments

It should be noted that Europe is not the only region exploring the capabilities of hyperloop technology. In April 2023, the South China Morning Post reported that a 160km service connecting Shanghai and Hangzhou was under consideration following a commissioned study by the Chinese Academy of Engineering. Using capsules with a maximum speed of 621mph, passengers could travel between cities in around 15 minutes—by comparison, driving the shortest route in a car would take more than two hours. “The Chinese government is taking hyperloops seriously and investing in them,”

adds León. The service is currently anticipated to be in operation by 2035.

In the US, ambitions for utilising hyperloops as a form of urban passenger transport have scaled back. Hyperloop One abandoned its plans in this sphere in February 2022, opting to focus on freight applications instead. León highlights that HyperloopTT published a feasibility study examining a potential “Great Lakes hyperloop corridor” running between the cities of Chicago, Cleveland, and Pittsburgh in 2019. However, at the time of writing, construction plans for such a service have not materialised.

This could be indicative of US customers' continued preference for individual mobility: "Public opinion is certainly more in favour of cars." León concedes that the perpetuation of this attitude could delay the introduction of passenger hyperloops. However, because of the technology's fast route to profitability, he believes US customers could be convinced in the medium term. With the electrification of passenger vehicles complicated by [regulations](#) and [affordability](#), León proposes that the door is open for a new urban mobility solution that can offer speed and convenience without the economic downsides of other public transport options. "We don't want to rely on public subsidies, and that's an important point. Unlike high-speed rail, hyperloops won't need to be paid for with taxes."

Causes for optimism

By the time the first 10km of the Venice-Padua service are in place, León believes progress will be made quickly on a global scale: hyperloops could become part of many cities' urban mobility mix as early as 2030 or as late as 2035.

This, he says, should be a cause for great optimism for city commuters. "High-speed rail has a line distance limit of 600km, yet some cities are much larger than this." Indeed, London is approximately 1,569sq km, Tokyo 2,194sq km, and Beijing 4,567sq km. "Hyperloops don't have that restriction, so travel can be far better connected." This encompassing connectivity could gradually have a marked effect on city dwellers' entire way of life: commuters could move far outside the centre and beyond the 50km boundary typically considered

suburbia. "You could live 300km away and still get to work quickly and easily in the morning," says León. This could subsequently also change the layout of city real estate: "Instead of needing to have everything built in the centre, you could place things further away and use hyperloops to close the gap."

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Two years ago, the future of hyperloops was less certain...Now, with our project in Italy and what's happening in China, I'm more optimistic than ever

León concludes that the paradigm for urban living unlocked by hyperloops is almost unimaginable today. "Think about travelling from Los Angeles to San Francisco for dinner and then back again." This 767-mile round trip would take 12 hours by car or about two hours by airplane. His vision is to achieve the journey time of a flight but without the associated inconvenience, costs, and complicated logistics. It's an ambitious vision, but one that companies in the burgeoning global hyperloop industry could realise within the next decade. "Two years ago, the future of hyperloops was less certain," states León. "Now, with our project in Italy and what's happening in China, I'm more optimistic than ever."

Micro EVs meet the real mobility needs of city drivers

Micro electric vehicles offer a cheap, safe, and flexible alternative form of city transport that could help people reclaim urban spaces. By Will Girling



Even if the long-term costs of owning an electric vehicle (EV) are less expensive, the higher entry price compared with internal combustion engine (ICE) models is making some customers examine the [cost to value ratio](#). With cars generally remaining idle for 95% of the day, shared mobility is emerging as a cheaper and more convenient alternative that can also [improve urban spaces](#).

One solution for maintaining long-term private ownership in cities could be micro EVs (MEVs). Defined by Fortune Business Insights as a one- or two-seat quadricycle powered by a small battery, the researcher valued the global market at US\$9.6bn in 2022 and expects it to grow 130% by 2029.

Meeting city needs

Håkan Lutz, Chief Executive and Founder of Swedish MEV manufacturer Luvly, believes that smaller vehicles can provide a holistic mobility option for city dwellers. Most importantly, he views them as a solution to the inefficiency of owning a passenger car in a city. “In Stockholm, for example, people drive big SUVs capable of accelerating 100kph in two seconds and maximum ranges of 500km. The problem is that most only drive 35-70km a day, and there is usually only one person in the car at a time.” This results in a much larger consumption of resources—energy, money, and space—than is necessary. “City mobility today is just incredibly wasteful,” he tells *Automotive World*.

The solution is not to eliminate private transport entirely but rather tailor it to what urban customers actually need. The Luvly O—Luvly’s first MEV—is

designed to match the requirements of the city with little superfluity: it has a maximum speed of 90kph (55mph), a range of approximately 100km (62 miles), and dimensions (2.70m x 1.53m x 1.44m) large enough to fit up to two people. Lutz states that the vehicle consumes 80% fewer resources overall than a standard passenger car.

This focus on meeting the requirements of city drivers also results in greater affordability at a time when an average EV costs US\$66,000. MEVs currently available rarely exceed 20% of this price. Customers can currently register their interest for the Luvly O, which will be sold for around €10,000 (US\$10,892), while segment competitor City Transformer’s [forthcoming CT-2](#) has a full retail price of €16,000. The company’s Chief Executive and Co-founder Asaf Formoza identifies the CT-2’s small 16kWh battery—79% smaller than the Tesla Model Y’s—as crucial for creating a cheaper overall product. “The battery is the most expensive single component in an EV. If a car is light and small, we can make significant cost savings.” It also presents a solution to the lack of battery production capacity complicating the electrification shift in [countries like the US](#).

Space, safety and growth

However, the usefulness of MEVs extends beyond more cost-efficient ownership. Their greater agility and compact size allow them to maximise the space allocated for parking, as well as reduce congestion by filtering through traffic like a two-wheeler. Formoza claims that heavy traffic costs Tokyo €52bn per year in lost revenue. Udi Merido, Chief Operating Officer



© Luvly

An exterior shot of the Luvly O

and Co-founder of City Transformer, also views light electric urban vehicles as a much safer form of eco-friendly transport during commuting hours, both for road users and pedestrians.

A MEV's enclosed cabin offers more protection for drivers than an exposed two-wheeler or scooter, and the total vehicle is substantially lighter than a standard car. The Environmental Protection Agency estimates that the average car weighs 1,860kg. By comparison, the CT-2 weighs just 590kg and Luvly's MEV is even lighter at 400kg. This is significant at a time when EV uptake is rising and micromobility solutions are vexed in [cities like Paris](#). Furthermore, a standard EV can weigh substantially more than an equivalent ICE because of the heavy battery packs required—sometimes thousands of pounds heavier, according to Kelley Blue Book. This makes them more dangerous in the event of a road collision, of which there were more than 23,000 in London in 2021 alone. “It would be much safer if the roads were dominated by smaller, lighter vehicles,” states Merido.

Both Luvly's and City Transformer's vehicles are yet to be released (late

2023 and 2024 respectively), making their reception uncertain. The desire to eliminate cars' influence on city layouts has resulted in the implementation of car-free zones in Barcelona and Ghent. As such, Formoza identifies Europe as a likely early adopter region, followed by dense cities in Japan, China, and eventually the US. Meanwhile, Merido suggests that MEVs are a “great solution” for capitalising on countries experiencing a post-COVID-19 e-commerce boom. This occurrence has already spurred on growth in the [three-wheeler market in India](#). MEVs' ability to carry heavier payloads while still offering the driver comfort and manoeuvrability in congested streets could make them ideal for last mile logistics in cities.

Reclaiming cities

“There's going to be fierce competition in this space,” predicts Lutz, citing McKinsey & Co's estimate that the European, Chinese, and North American minimobility markets (three- and four-wheelers) could be collectively worth US\$100bn by 2030. “That is going to



A CT-1 (City Transformer's first homologated vehicle) parked between two standard-sized cars to demonstrate its compact size

© City Transformer

attract a lot of players.” The consultancy also forecasts that the global micromobility ecosystem (two-wheelers, scooters, etc.) will reach US\$300-500bn by the same year.

Formoza contends that building customer acceptance and brand familiarity will shape how fast MEVs can start to make a positive impact on urban mobility. “When commuters in regular cars are losing time in traffic and then see a MEV passing them by, change will start to happen.” However, despite MEVs offering a broadly effective solution to many urban mobility issues, neither Lutz nor Formoza anticipates an easy ride for manufacturers.

Bolivian start-up Quantum Motors demonstrates the difficulty of establishing the early MEV market. The company began production of its E5 in 2022, hoping to capitalise on the country’s rich lithium resources. Despite this advantage, an article published in May 2023 by *Voice of America* reported that only 350 vehicles had been sold so far. It attributed this apathetic response to the Bolivian government’s decision to subsidise imported gasoline and

retail it cheaply at the pump.

However, these subsidies are not expected to last indefinitely, and achieving greater penetration could eventually translate to a wider Latin American market that’s receptive to MEVs. The continent contains two of the ten most congested cities in the world (Lima, Peru, and Bogotá, Colombia) according to TomTom’s 2022 Traffic Index.

Incorporating MEVs as a major part of urban mobility’s future, says Lutz, will depend on broadening cities’ definition of sustainability. “It has a societal component as much as anything else. Cities need to be built for people, not cars.” This means city planners implementing a large-scale reduction of the space dedicated to cars, and Formoza presents MEVs as a catalyst for achieving that aim. “Cars occupy 50% of a city’s landscape. If you removed 10,000 standard cars and replaced them with 10,000 CT-2s, you would create 75% more room for green zones, sidewalks, and social spaces.” The ultimate prize, he concludes, will be for people to “reclaim” the cities in which they live from the transport that helps them get around.



What's the final destination for urban mobility?

A combination of new technology, government policy and behavioural change is needed to optimise city transportation. By Megan Lampinen

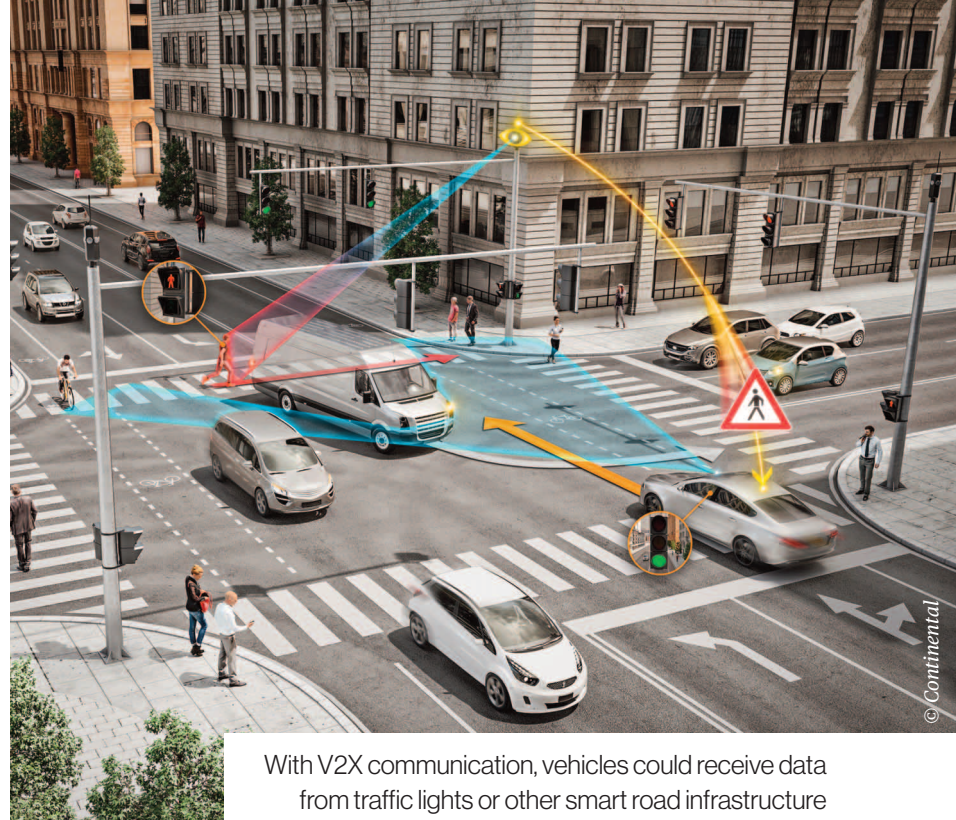
Cities around the world are bringing their transportation systems into the modern era. At the heart of this effort is the question of how to move a growing number of people in the most efficient, affordable, and convenient manner. Add in the numerous commitments to CO2 neutrality by 2030, and that challenge becomes even harder.

Opinions vary widely in terms of the roadmap for urban mobility and even what the final destination looks like. More than a decade ago, former mayor of Bogota, Enrique Peñalosa, was quoted as stating, “An advanced city is not one where the poor can get around by car, but one where even the rich use public transportation.” This idea has attracted a considerable following and proven a springboard for transportation innovation.

For Kersten Heineke, who Leads the McKinsey Center for Future Mobility in Europe, improving the public transport experience will be pivotal in any efficient urban mobility ecosystem, but it will need to work in tandem with many other factors. The key, he suggests, could entail a combination of advanced technology, bold policy making, and behavioural change among travellers.

What technologies could help cities achieve their mobility goals?

That list certainly includes electric vehicles (EVs), but also smart traffic management. A smoother flow of traffic improves emissions. Moving people out of their individual vehicles and having them use micromobility and minimobility has a massive impact. So too could autonomous driving with shuttles, subways and trains to complement existing public



With V2X communication, vehicles could receive data from traffic lights or other smart road infrastructure

transport. The combination of those things will be needed to make this mobility transition happen, meet climate change goals, and keep mobility affordable and convenient.

Among this mix, what would you classify as low-hanging fruit?

That would be micromobility and changing the routes and rules in cities so that more people feel comfortable using their bike for a significant share of their trips. Hand in hand with this is the integration of public transit with micromobility services for first and last mile. If you can deliver people to or from the train station more easily or with an integrated ticket, and with a guarantee of a vehicle waiting for them, it would increase transit ridership and take people out of their cars.

What sort of infrastructure investment could that require?

For micromobility it could mean introducing speed limits, amending the parking policy and putting in



Bike travel has proven particularly popular in certain cities

more bike lanes. Admittedly that takes time. A series of bike lanes could take half a year, but building more public transit could take ten years.

Can you highlight any regions that have had particular success with a micromobility scheme?

Germany has been quite successful in the idea of employee bicycle leasing. Here, employees receive a tax benefit when they lease a bicycle through their employers. This market has gone through the roof, and people are using the bicycles for commuting as well as a range of other purposes. It shows that the solutions are there, but we need to trigger a behavioural change in people.

How important will public transport be within the wider multi-modal ecosystem?

That differs by city, but overall, I see it as the backbone of transportation, even in an age of robotaxis and autonomous shuttles. That's down to the capacity that these systems have.

What scope do you see for further improvement of public buses?

I see significant optimisation potential. Fixed route buses are probably not the best approach because the vehicles are stuck with a certain schedule and entail certain inconveniences. There is scope to complement the bus system with on-demand vehicles that take users from the one destination to another without having to switch. Cities could also operate smaller buses during off-peak times.

Can you flag any particularly pioneering cities that are introducing new approaches towards mobility?

Paris is a good example of a city trying to do things differently, though we can debate the recent [e-scooter vote](#). In Amsterdam the share of people riding a bike is just incredible, as is how well the city has tailored the infrastructure to support bikes. London is also making a big push now and wants to significantly increase the bike lane miles. Oslo announced it is aiming for a sizeable penetration of robo-shuttles in order to reduce private vehicle miles.

Do you anticipate any policy changes that could impact urban mobility in the near term?

There is a multitude of approaches to making individual car use and ownership less convenient in cities. This could include passive-aggressive measures, like taking away parking spots or making it more difficult and more expensive to obtain a residential parking permit. Cities could also convert vehicle lanes into bike lanes or introduce congestion charging like in London. There are also policy changes around how many parking garages can be built or how many parking spots can be included when there is new construction, but this has a delayed effect.

There's a lot of talk about data usage in urban mobility. How do you see this playing out?

There are many questions around how to foster the integration of various mobility-as-a-service options. A city issuing a licence for a mobility provider could make it a requirement that the provider share its data with the public transit authority. Or maybe public transit has to share its data and booking mechanisms with other mobility providers. Maybe it becomes mandatory that users can book new services from the city app. Something like this would definitely make it easier for the city to integrate everything.

How might urban air mobility (UAM) fit in to the picture?

We are in the phase where it's getting real, with some operators aiming to fly by the end of 2023.

I think we will see real traction this year or next year, but it won't have a massive impact on the mobility mix for a long time. My expectation is UAM will fulfil certain use cases in the next couple of years, like a fast trip to the airport, and it will certainly help with congestion, but this is not going to be the silver bullet. If you want to solve the overall urban mobility challenge in terms of congestion, affordability and emissions, UAM is a very small piece of the puzzle.

How close to solving those urban mobility challenges do you think the world's major cities will be by the end of the decade?

Some will have partially solved it but to say we've solved it means we need to agree on what constitutes a solution. In my mind, a solution would be a combination of meeting the CO2 emissions targets and making sure that citizens have the same degree of mobility as today, with the same or improved affordability and maybe a slightly lower convenience. I think that is very much achievable in the early 2030s.

In realising this solution, what is the expected interplay of technology, regulation, and consumer behaviour?

There is an element of technology making things easier and solving the problem for us, but ultimately it may come down to how much regulators dare to make slightly uncomfortable decisions that force or encourage people to change their behaviour. That's the real question.

Will driverless EVs mean fewer cars on the road?

Las Vegas rental start-up Halo.Car aims to replace car ownership.
By Lee Monks

In June 2023, Halo.Car launched the world's first driverless delivery of rental electric vehicles (EVs) across Las Vegas. The company, which has quickly expanded from a low-key start covering a small portion of the city, ultimately plans to introduce its commercial offering to other US territories. Halo.Car's service consists of a remotely operated 20-vehicle fleet. The company remotely pilots the car to a chosen location, and the customer drives the vehicle to wherever they need to go. Halo.Car then resumes control and retrieves or redelivers the car.

Safety first

Getting to this point hasn't been easy, and there are still challenges ahead. One testing example perfectly illustrates the unforeseen difficulties with which the company must contend. All Halo.Car vehicles—it uses the Chevy Bolt and the Kia Niro—are equipped with an anomaly detection system, which spots problems and forces the car to take appropriate action, such as an emergency stop. "One notable issue was integrating our software with the vehicle," Halo.Car Chief Executive Anand Nandakumar says. "It took time to figure out every single



Halo.Car vehicles are remotely piloted to a chosen location—accompanied by a following chase car

layer and how the car is built.” In fact, it took Halo.Car nine months to find the right way to integrate the software to stop the car.

Until June 2023, Halo.Car vehicles featured a safety driver. The company, which launched its first driverless EV service in July 2022, was initially a free beta-test running three cars in the Las Vegas Arts District. Residents could call and request a car, which would then be remotely piloted to their location within a 1.25 square mile service area—albeit with the safety driver onboard. The initial launch, during which Halo.Car was billed as an environmentally friendly alternative to purchasing a prohibitively priced EV, was the first part of a long-term strategy.

During that first launch, Halo.Car’s Chief Strategy Officer Cass Mao announced plans to eventually

expand operations to 50 cars over a wider area. In November 2022, the company expanded its service to cover all of Las Vegas. That same month, the company announced it would eventually remove its safety driver, the last step before the service would become fully commercial.

From now on, Halo will deliver driverless cars within the same Las Vegas boundaries without a safety driver. The vehicles are remote piloted using T-Mobile 5G, with additional coverage from AT&T and Verizon for extra stability. Halo.Car has also created its own proprietary algorithms, which enable the car to switch between networks to maintain high-quality streaming and low latency. But it’s not yet a ‘guardrails off’ moment. Despite now being driverless, the service features a “chase car” tailing the rental vehicle just in case something goes wrong.

This is unlikely, according to Nandakumar. “We’ve never had a problem. We’re just extremely cautious about potential issues.” Further steps are needed before a completely unattended service is deemed feasible. “We’re not a software company. We’re putting US\$40,000 cars out there, and safety has to be our chief goal.”

Customer perception

Nandakumar presents the latest roll-out as part of a longer-term vision. He sees the importance of managing a gradual shift in the service to mitigate risk. “For Halo it’s crawl before you



Anand Nandakumar,
Chief Executive, Halo.Car

“

We’re putting
US\$40,000
cars out there,
and safety has
to be our chief
goal

walk, walk before you run. As we roll-out this time, the chase car is there to cover safety and reassure the passenger.” He considers this just an

intermediary step—allowing time for a change in public perception before Halo.Car eventually makes the next leap. Only then can the service begin to become a feasible alternative to car ownership.

“The customer experience doesn’t change drastically, but how they view the service is different. A car pulling up with nobody inside will take some getting used to.” An eventual service that doesn’t feature safety representatives will herald a drop in costs, which will allow Halo.Car to further expand its operations and fleet size. “Unmanned means the customer will pay less, and ultimately, the model is geared towards asking the question, ‘Do you actually need to own a car anymore?’”

This factor is central to Halo.Car’s aims. Further to Nandakumar’s commitment to sustainability and environmental objectives, the enterprise bullishly hopes to dent



Las Vegas EV sales, lowering its traffic congestion and carbon footprint. EVs are popular in the city—according to Green Car Reports, Nevada has the seventh-highest uptake of EVs in the US (with 10.38 registrations per 1,000 residents). Nandakumar sees driverless rentals as a significant part of the future market, at the expense of vehicle sales. “We want to make it so easy to get a car on demand that you no longer need to own a car.”

Negotiating challenges

Nandakumar is clear about Halo.Car’s steep learning curve: “We started with one car, looking at how a stack works, exploring the idea of remote pilots and what training staff might entail. Now, we have a team of remote pilots and a fleet of cars and regular customers.” In the short period since inception to this latest

milestone, Nandakumar says Halo.Car has built up enormous amounts of valuable data. “We were testing manually until last year. Now it’s much more detailed in terms of data, network conditions, technology progress, and improving remote driver capabilities by getting their live feedback, which we add to the training portfolio.”

Nandakumar knows what’s at stake for his company. “Driverless delivery is critical to making this vision of on-demand vehicles economically viable.” Yet Halo.Car is not yet a fully driverless service, and there are further obstacles to negotiate—and a chase car to jettison—before it arrives at that destination. The wider goal of replacing car ownership will depend on how companies like Halo.Car deals with challenges such as changing public perception, negotiating inevitable technical issues, and keeping its cars and passengers safe.

Telematics and IoT can guide the CV electrification journey

The importance of telematics-based monitoring using IoT devices cannot be overlooked as the commercial vehicle (CV) sector electrifies. By Will Girling



The pressure is on for commercial fleet operators to decarbonise their vehicles without sacrificing service levels, yet the specifics of how and when remain unclear. Connected vehicle technology and data analysis are valuable resources for answering these important questions.

Data has already been leveraged by Ford's FordLiive platform to reduce branded fleet downtime and educate customers on the importance of telematics and IoT-based monitoring devices. But what about operators with more diverse fleets starting at an early point in their electrification journey? Lithuanian telematics software provider Gurtam, which has a presence in more

than 150 countries, is helping to fulfil that need through its fleet management platform for GPS tracking and IoT, Wialon.

Aliaksandr Kuushynau, Head of Wialon, tells *Automotive World* about how this product can assist commercial fleet electrification and describes the evolving role of telematics and IoT in the automotive industry.



Which CASE (connected, autonomous, shared, and electric) trends show the most promise for telematics and IoT?

All of them are having an effect on the technology to some extent. Autonomous vehicles (AVs) are certainly an exciting trend, and there are some markets already trialling these vehicles. However, we consider commercial fleets to be the largest market for telematics and IoT, and AVs won't be truly relevant in that sector for another decade.

In contrast, electrification is already underway in many countries, including the US and the UK. Fleets now have to change all their vehicles and take new considerations into account, such as charging time, which takes much longer than traditional refuelling. This is what Gurtam is focusing on.

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These technologies don't just belong in a James Bond movie; they're real and ready to use

How can Gurtam's Wialon platform assist commercial fleet electrification?

The commercial vehicle industry is looking at a decades-long roadmap for transitioning its fleets. Individual fleets will likely contain vehicles from many OEMs, and operators will need a way to unite the data from all those disparate systems.

Wialon is essentially a set of tools for GPS tracking and IoT. It has a highly diverse application—it can be used in more than 80 commercial fleet adjacent industries, including logistics, taxis, and public

transport. We partner with 2,400 telematics service providers to track 3.6 million vehicles globally, 64% of which are heavy-duty and 24% light passenger.

With the help of our platform and software, fleets can generate reports on their operations, including driver behaviour and mileage. They can use that data when selecting electric vehicles that best suit specific use cases. The findings could also highlight the need to retain internal combustion engines in some instances for now, although perhaps using alternative fuels. This is a highly valuable



Aliaksandr Kuushynau,
Head of Wialon

© Wialon

application for telematics today: without that visibility, a coherent transition won't be possible.

What are some other valuable use cases for telematics and IoT?

It can also be used for anti-theft and stolen vehicle recovery. In that instance, instead of monitoring driver behaviour continuously, the software would only track the vehicle under specific conditions, meaning once it had been reported stolen. Wialon software makes it possible for service providers to install multiple devices in a vehicle—if thieves disable one, a notification is sent to the platform, and a second device gets activated. We already have evidence that this is an effective recovery method.

How do you identify and develop solutions for unaddressed market needs?

Our telematics service provider partners are approaching fleets all the time. Those fleet operators discuss

their pain points—automation, the desire for greater fleet visibility, etc.—and then Wialon can combine with other third-party solutions to find a way to address those needs.

How do you think the global market for automotive telematics and IoT will evolve, and what is Gurtam doing to shape it?

There are several factors that can shape the adoption of telematics and IoT in various markets. Different regulations and laws governing its use are obviously an important consideration, as data sharing can be a very sensitive topic. Deregulation has been shown to have a positive impact on growth in countries like Poland, which quadrupled its number of connected vehicles within a year of amending its legislation in 2021. Similar situations have occurred in the US and Saudi Arabia, too.

At the same time, regulation can actually increase the application of this technology, particularly for commercial fleets, because some new stipulations make certain driver monitoring telematics devices essential for legally operating a service. Therefore, it's important that we educate the market. For example, Gurtam did that by launching a free-to-use personal tracking service, GPS-Trace. That increased interest in corporate level applications and subsequently led to the development of our paid service, Wialon. This is how we can shape the market: by demonstrating that these technologies don't just belong in a James Bond movie; they're real and ready to use.