

# Automotive World MAGAZINE

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## Hydrogen ecosystem offers huge business opportunity



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# Hydrogen ecosystem offers huge business opportunity

Plug Power management believe the market conditions for hydrogen have never been so good. Megan Lampinen hears more

**T**he global market opportunity for hydrogen will be huge. Global Market Insights

anticipates a 5.5% CAGR over the ten-year period from 2022, putting its potential value at US\$317bn by 2032. For suppliers in this ecosystem, even a small slice of that pie could prove lucrative.

Green hydrogen company Plug Power's ambitions are anything but small. Based in the US, the company has a global reach and is building an end-to-end green



© Plug Power

**Andy Marsh**  
Chief Executive, Plug Power

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By ramping up hydrogen production for industrial applications, you're also significantly enabling the scale up of hydrogen production for mobility

hydrogen ecosystem that touches on everything from production, storage and delivery to energy generation. Customers include such big names as Amazon, BMW, Carrefour, Lidl and Walmart. “One of the things that makes Plug different is that we view this hydrogen industry as a community,” said Chief Executive Andy Marsh, speaking at a media event in October 2023. “We work and engage with people across a broad spectrum to make the hydrogen economy happen.”

*Bloomberg* has predicted that by 2050, 20% of world energy will come from hydrogen. “Even if that figure is overstated, it's still big,” Marsh told event attendees. By 2030, Europe anticipates it will be using 10 million tons of domestically produced hydrogen and another 10 million tons of imported hydrogen every year. The US also expects to generate about 10 million tons of hydrogen every year by this time. “That's a huge market opportunity,” he emphasises.



The Renault Master Van H2-TECH is available to order in France and the Netherlands at the moment

## A defining moment

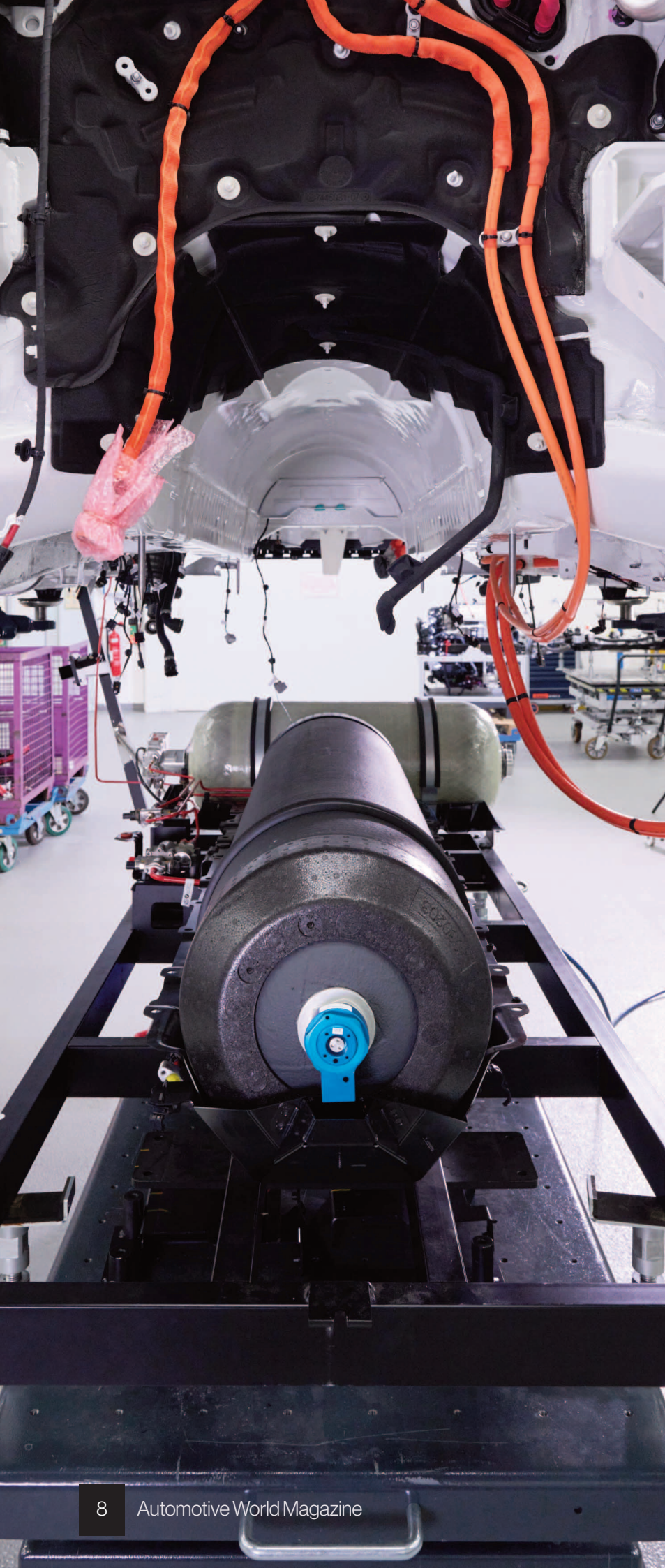
One of the key drivers is legislation. “I’ve never seen the conditions so good [for hydrogen] thanks to some of the new legislation coming up,” observed Jose Luis Crespo, General Manager of Applications at Plug Power.

The Renewable Energy Directive applies to all 27 Member States in the European Union and stipulates that 42% of the hydrogen consumed by industries must be green by 2030. While this legislation is not focussed specifically on mobility applications like trucks and buses, Marsh believes it will be a “tipping point” for the hydrogen generation market and in turn open the door for a hydrogen-powered transportation sector. His colleague

Benjamin Haycraft, Executive Vice President of the EMEA region at Plug Power, suggested this is in fact “a defining moment for hydrogen in Europe.”

The bulk of the hydrogen consumed in the world today goes to refineries for industrial and chemical processes, and most of this is grey hydrogen. The Renewable Energy Directive aims to clean that up, and simultaneously accelerate hydrogen production.

“To enable hydrogen mobility, you need two things,” Haycraft told *Automotive World*. “Industrial scale vehicles and hydrogen fuel to power them.” In 2021, Plug teamed up with Renault to form the Hyvia joint venture. Its first model, the Renault Master Van H2-TECH, is



powered by a 30kW fuel cell from Plug. By 2030, the venture is targeting a 30% share of Europe's hydrogen LCV market.

But that hinges on a reliable supply of clean fuel. "If you have the vehicles but not enough fuel to power them, then you have an issue," Haycraft cautioned. "By ramping up hydrogen production for industrial applications, you're also significantly enabling the scale up of hydrogen production for mobility. This regulation will make green hydrogen much more of a commodity in the market, and that aligns well with the timing of the scale up of fuel cell vehicles."

In Europe alone, 17% of new trucks sold in 2030 (or about 60,000 trucks) are expected to run on hydrogen. That's according to a 2020 study commissioned by the EU's public private partnership, the Fuel Cell and Hydrogen Joint Undertaking. "The hydrogen industry has moved into execution mode," Haycraft asserted. "The OEMs have developed their vehicles, like we've done with Hyvia. Now it's about scaling production and reducing price. It's just a matter of time."

## Business potential

While hydrogen production and use forecasts vary, they all point in the same direction. "Every objective analysis for the energy transition says we will use a lot of hydrogen," noted Jack Brouwer, Director of the





National Fuel Cell Research Center at the University California Irvine. “It’s going to be big.”

Consumer awareness about the benefits of hydrogen has been improving noticeably. “Importantly, a better understanding of hydrogen is making our customers feel more comfortable, making them feel it’s here to stay,” said Crespo. “Ten years ago it would take me three months to convince them about hydrogen. Now they come to me and tell me they need hydrogen...The past ten years was just the training. Now this is going through the roof.”

Demand is particularly promising in Western Europe, where the number of low- and zero-emission zones has doubled in the past few years, said Haycraft. He also flagged concerns around the electric grid as a pivotal driving force for hydrogen. “In the Netherlands, the electric grid is completely saturated to a point where you cannot inject additional

renewable capacity. We’ve heard from potential clients that they need to switch to fuel cell mobility because they just simply do not have access to the grid.”

For Plug, its initial mobility market focus is on large e-commerce and logistics players entering cities with last-mile deliveries. The next segment will be vans covering about 200-300 kilometres in a day, likely telecom fleets. Across all its business areas, the opportunity translates into billions of dollars of revenue. More specifically, it anticipates US\$1.2bn in revenue for 2023, rising to US\$6bn by 2027 and US\$20bn by 2030. By the end of the decade, it anticipates a 35% gross business margin.

While those figures are specific to Plug Power, the trend they represent is not. “We have had an incredible growth story, yet most of the growth is ahead of us,” concluded Haycraft.

# Mitsubishi's global ambitions have come to an end

The costs and management resources required to maintain a global manufacturing presence have proved too much for Mitsubishi, writes Ian Henry



© Mitsubishi Motors

**I**n 2008, Mitsubishi closed its Australian factory in Adelaide. This was partly due to the economic challenge of producing in Australia as tariff barriers came down there, but it remained in some of the key export markets it served. In 2012, Mitsubishi stopped production at Born, in the Netherlands passing the factory to Dutch owners, who tried to make it work as a contract manufacturer, for BMW. That plant has now run out of work and will finally close in 2024. In 2015, Mitsubishi shuttered its plant in Normal, Illinois. A few years later the site was taken over and refurbished by Rivian. And in September 2023, Mitsubishi confirmed it is pulling out of its joint venture with GAC in China. GAC will take over 100% ownership of the plant and build EVs there.

These cutbacks reflect Mitsubishi's inability to establish a long-term viable presence in these markets; it still sells a narrow range of imported models in the US and Australia and has decided to re-enter Europe with badge-engineered models from Renault. But these are markets where it is at best a marginal, niche player. Mitsubishi's niche player status was especially clear in China, from where it is pulling out entirely, in the light of a sustained fall in its sales volumes. These totalled just 38,550 in 2022, a fall of 60% on 2021's total. Moreover, in the largest EV market in the world, it sold just 515 Aitrek EVs last year.

Looking to the future, Mitsubishi has announced a series of new EVs and hybrids (and ICE models). But it is doing this while retrenching, in manufacturing terms, back into

Japan while retaining production capability in ASEAN markets, in Thailand, Indonesia, Vietnam, Taiwan and the Philippines.

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**Nine of the 16 new models planned by 2028 will be ICE powered**

In parallel with cutting its manufacturing network, Mitsubishi had to seek financial refuge within the arms of Nissan specifically and the Renault-Nissan Alliance more generally. Nissan took a 34% stake in Mitsubishi in 2016, instantly becoming the largest and controlling shareholder, ahead of the Mitsubishi Corporation itself, which holds 20%. This gave Nissan control over Mitsubishi without facing the full costs of acquisition. And through the Renault-Nissan Alliance, Renault's resources (ie European model line-up) could be deployed to help Mitsubishi's turnaround.

In March 2023, the company unveiled its new model plans through to 2028. These include two BEVs of its own, a pick-up and an SUV; it also announced it would source two BEVs through its connection to Nissan and



© GAC

The GAC Mitsubishi Motors Co joint venture oversaw production and sales of Mitsubishi Motors products in China

Renault. On top of the BEVs, there are also three new HEVs planned: an SUV, an MPV and a new version of the Xpander crossover for ASEAN markets.

But nine of the 16 new models planned by 2028 will be ICE powered. Given the broad powertrain trends at play in the market, this seems odd and indeed questionable. Mitsubishi says it will invest more than US\$10bn in electrified vehicles and battery production by 2030 (including investing about €200m in Renault's new Ampere BEV unit), although it will clearly rely on Nissan and Renault for this technology.

Mitsubishi wants to achieve 50% of its global sales through EVs by 2030 and reach 100% by 2035; how it can do this while introducing more ICE and hybrid models than EVs in the next few years is difficult to understand. Moreover, given its statement that it will rely on Nissan and Renault for electric or electrified models in the near term, it seems as

if its own manufacturing activities will remain largely focused on ICE and hybrid power, at least in the short term. It is also not clear where or how or whether it will invest in battery production of its own.

In market terms, Mitsubishi's new focus will be on Japan, south-east Asia, Oceania, Latin America, the Middle East, and Africa. US sales will remain marginal, and it will return to Europe by taking two Renault ICE models and rebadging them; the Captur is also made as the Mitsubishi ASX in Spain, and from next year, the Renault Clio factory in Turkey will turn out a Mitsubishi Colt which some early reviewers have already dubbed one of the worst-ever examples of badge engineering. Additional (hybrid and electric powered) models will be exported to Europe from Japan. Quite how quickly or easily Mitsubishi is going to re-establish itself in Europe having disbanded its dealership network and having to start afresh is a significant question.



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It would not be surprising to see Mitsubishi retrenching further within ASEAN and fully merge into Nissan for the brand to survive

Leaving aside the uncertainty regarding its return to Europe and its small remaining presence in the US, it is likely that Mitsubishi will essentially become a modest domestic and ASEAN player. The costs and management resources required to maintain a global manufacturing presence have

proved too much for Mitsubishi. However, whether it can maintain its ASEAN presence as the Chinese manufacturers, whose growth led to Mitsubishi's departure from China, themselves move into ASEAN markets, remains an open question.

It would not be surprising to see Mitsubishi retrenching further within ASEAN and fully merge into Nissan for the brand to survive. At some point moreover it may be that Mitsubishi as a car brand will no longer be viable; and when that happens, if not before, similar issues may also face the smaller Japanese brands, although Daihatsu, Mazda and Subaru already have “protection” through partial shareholdings by Toyota so their survival may be assured, for now at least. For Mitsubishi, the global goal has been missed; maintaining a regional Asian presence in the long term is the new reality for the brand.

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# **BMW's Gen6 battery demands an 'all hands on deck' approach**

**BMW is deploying an interdisciplinary approach to ensure that Neue Klasse vehicles have next-gen power under the hood. By Stewart Burnett**

**B**MW's legacy as a maker of high-performance luxury vehicles is inextricably connected to the term 'Neue Klasse'. In the 1960s, the vehicles under this brand rebooted the firm, saving it from financial turmoil and laying the foundation for its modern-day output. When the automaker revived the brand in May 2021, it was intended as a statement—to reboot itself once more and secure its place in tomorrow's all-electric luxury segment.

One of the developments BMW is touting most prominently for the new Neue Klasse is the integration of its upcoming batteries (which promise a range upwards of 600 miles) in all new vehicles. These batteries are being comprehensively developed and designed internally, and the OEM is promising they will deliver a "quantum leap" forward.

However, the competition for battery leadership is fierce. European OEMs face significant challenges both from Chinese battery makers and the US-based firm Tesla. Milan Nedeljković, Member of the Board of Management of BMW AG, Production, acknowledges that the automaker faces an uphill battle. To counter this, it is taking an 'all hands on deck' approach, with voices from across departments and the wider value chain contributing towards development.

## Strength in synergy

On 26 October 2023, Nedeljković opened BMW's Battery Cell Manufacturing Insights event in Parsdorf by pushing back against a prevailing narrative: "The political

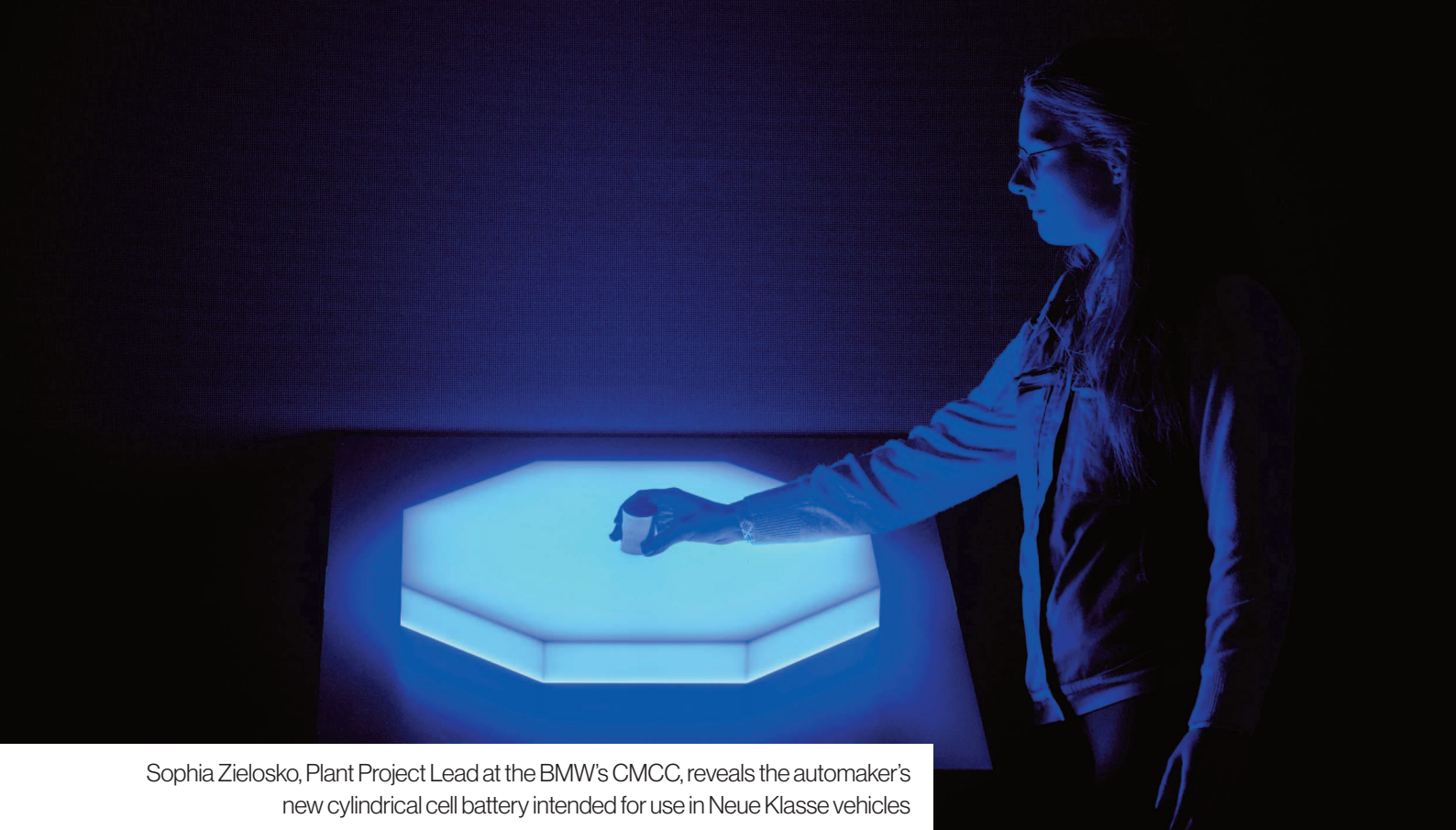
and media discourse of the last few months could make you think Germany and Europe have had their day in automotive." He conceded that the region is currently lagging behind internationally—indeed, China was responsible for 77% of overall global battery production capacity, according to 2023 BloombergNEF data.

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The political and media discourse of the last few months could make you think Germany and Europe have had their day in automotive

"The whole wealth of Europe is based on innovation and technology achievements," he continued. "But at the same time, we need to industrialise it." Because of this, he argued, Europe needs to work to ensure enough manufacturing facilities are in place. BMW plans to produce its Gen6 batteries primarily at its German and Hungarian plants.

The automaker is keen to showcase the synergistic approach it is taking towards battery development. In October 2023, it opened the Cell Manufacturing Competence Centre



Sophia Zielosko, Plant Project Lead at the BMW's CMCC, reveals the automaker's new cylindrical cell battery intended for use in Neue Klasse vehicles

(CMCC) in Parsdorf to bring all departments together to collaborate. “The speed of change and the product’s complexity are very high, that’s why we are bringing everyone under one roof,” said Nedeljković.

the cells and has an annual manufacturing capacity of one million units, CMCC has an annual capacity of 5,500 units, which are not intended for use in consumer products. The focus, instead, is on product development. “We take the best of what we have in Munich and scale and validate,” explained Markus Fallböhmer, Head of Battery Production.

## The canvas is wide

At present, the CMCC is working primarily to enhance the manufacturing process for Gen6 batteries, which will be produced with a variety of different chemistries. According to Gerd Schuster, Senior Vice President, Research, New Technologies and Innovations, there is no one-size-fits-all solution for the Neue Klasse. “The best chemistry for the specific usage wins out.”

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Everyone has their experts coming, and we need to align

CMCC is intended to serve as a sister facility to the OEM’s Battery Cell Competence Centre (BCCC) in Munich. While the BCCC designs



Nedeljković further suggested that there might be some give-and-take in terms of performance. “It’s the customer’s decision: if they want a long-range product, then they will get a cell with a different chemistry,” he stated. If the customer favours raw performance, they may need to choose another BMW product. In any case, the OEM promises that all Gen6 batteries will deliver 20% higher energy density and 30% faster charging compared to Gen5.

This will, in part, be achieved through a new small cylindrical form factor. According to Schuster, the energy demands of the Neue Klasse are not compatible with larger cells, and small batteries also help lower overall production costs. However, BMW is not the only OEM developing in this vein—or the most innovative. Tesla’s upcoming 4680 battery is also cylindrical and uses a dry electrode coating method that, it claims, can dramatically reduce energy consumption and production cycle time.

For the time being, Schuster does not view it as a feasible option: “This is not proven and mature at the moment.” While acknowledging that it could enhance sustainability by lowering energy costs, he posited that it would limit designs to graphite anodes only, ruling out silicon entirely. However, he conceded that the method has been considered as part of BMW’s attempt to gather as much knowledge on battery technology as possible.

This knowledge gathering process has seen the OEM heavily involve all its contracted suppliers and partners. For instance, solid state



battery firm Solid Power will also have a presence at CMCC, with plans to realise the technology in consumer products by 2030. “Everyone has their experts coming, and we need to align,” said Nedeljković.

According to BMW, this interdisciplinary approach is the best means at its disposal to secure a leadership position in battery production. “It’s not a top-down approach but an interdisciplinary team. That’s what makes our daily work so successful,” Schuster concluded. At the time of writing, Gen6 is on track to feature in the first Neue Klasse vehicles that hit roads in 2025.

# Tesla's Q3 earnings indicate maturing US EV market

Sandeep Rao takes a deep dive into Tesla's latest results and their reflection on the wider EV segment

© Tesla

**T**esla's Q3 earnings release has a number of encouraging trends: across nine months of the current financial year (FY), total production and deliveries are well near par to the entire previous FY. While FY 2021 was a stalwart year where the company's net income grew 555% over the past year, total revenue had grown by only 71%. In the past nine months of the current FY, net income is a little over half of what the company had over the entire past FY despite total revenue comfortably running above par.

Cost of revenue for the current FY to date is already on par with the past year while operating expenses aren't far behind. While total

vehicle deliveries are consistently rising, free cash flow has been in decline over the past four quarters—essentially a reversal of long-term trends. Over the past four quarters, net income has declined while the trend of consistently rising EBITDA lies broken. The company also indicated that its year-on-year (YoY) revenue growth is diving relative to that of the auto industry, which has been rising for six quarters now.

Rising costs could be attributed to two factors. Firstly, the battle to continue pushing up delivery volumes via aggressive discounting while input costs are rising is straining the company's bottom line: the automotive business has accounted for

nearly 95% of its revenue since 2020. The second factor could be the costs involved in the launch of the Cybertruck, with an annual production capacity planned to be north 125,000 vehicles annually in its pilot run.

The Cybertruck's pricing is proximate to the Model 3, which is likely a welcome development for the company: the "cheaper" Model 3/Y's are selling like hot cakes, with current production and delivery trends likely to close out the year at volumes well higher than the past FY. In contrast, the higher-priced (and estimably higher-margin) Model S/X is running at par with past year's production and below last year's



deliveries. This is largely due to Tesla's erosion of market share in the "premium EV" segment in recent years: as of Q3 this year, BMW, Mercedes and VW had witnessed over 265%, 145% and 338% growth in YoY sales. Tesla's market share is down from nearly 65% in 2022 to about 50% as of Q3 this year.

Tesla isn't unique; it's a challenge to have a "basic" and "premium" model under the same marque. Nearly every major carmaker has (or attempts to) build out a separate marque for the

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The battle to continue pushing up delivery volumes via aggressive discounting while input costs are rising is straining the company's bottom line

"premium" buyer segment. If Tesla does this too, this would mean the company's deepening commitment to being in the "premium" space. While net auto sales are declining in the YTD, EVs—which tend to be relatively higher-priced—have seen a net


increase YoY. Tesla's loss in momentum in the "premium" space is a harbinger of things to come in the "basic" space, with numerous brands poised to grow and give battle. Overall, it's a net positive for the American EV industry: electric cars are no longer the "future".

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# Will GPS spoofing slow autonomous driving?

Manuel del Castillo explains recent consumer views related to spoofing attacks and why they cause a significant threat for automakers

**A**utonomous vehicle technology is advancing quickly. Self-driving vehicles on the motorways have become common, promoted by Tesla, with variants of the technologies available in other makes and models. But many drivers and authorities remain unaware of the susceptibility of these systems to cyber attacks by criminals who can use low-cost equipment to spoof the GPS guidance systems.

Recent research into the views of 2,000 UK consumers and motorists conducted by FocalPoint in association with YouGov shows that

whilst consumer awareness of the threat is relatively low, concerns over cyber attacks could impact the rates of adoption for autonomous vehicles or vehicles with advanced driver assistance systems (ADAS).

## What is GPS spoofing?

The dangers of spoofing were reported back in 2019 when a Tesla Model 3 was experimentally spoofed successfully. Using off-the-shelf hardware and software, fake satellite signals were illegally broadcast by a spoofer, disrupting the behaviour of the vehicle. Of those surveyed, 82% believe that



spoofing will have a detrimental effect on road safety as assisted driving applications and autonomous vehicles become increasingly available.

One of the main threats proposed by targeted spoofing is forcing a vehicle to a halt, thus enabling the theft of the vehicle from the owner. During an attack on a vehicle, the spoofer can disrupt the computed location, speed and heading of the victim's receiver, causing vehicles to think they are in a different location and even potentially provide false information about road conditions, traffic, or obstacles. Autonomous vehicle systems rely on a complex

sensor set for collision avoidance and lane-keeping, but in certain circumstances, spoofing GNSS signals can cause the vehicle to miscalculate its position, causing it to change lanes or speed. This puts passengers, pedestrians, and other vehicles at risk.

With autonomous vehicles relying on accurate navigation, time synchronisation and coordination with other vehicles, spoofing also has the potential to disrupt multiple autonomous vehicles simultaneously.

As the tools required for spoofing become cheaper and easily

available online, eradicating the threat becomes very difficult. A traditional method to protect against spoofing is to encrypt the radio signal, but this is expensive, complicated and relies on the management of the encryption key. More importantly, is not viable because it requires changes to be made by the owners of the GNSS satellite constellations. An alternative technique is to use expensive and bulky arrays of antennas that can measure the arrival angle of the satellite signals and only use the ones coming from trusted directions. Such an approach is viable because it involves the receivers' end only, but it is not practical for mass market devices.

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Concerns over cyber attacks could impact the rates of adoption for autonomous vehicles or vehicles with ADAS

## Consumer adoption and awareness

The growth of availability and adoption of ADAS systems in new vehicle models suggest that consumers value autonomous

features. In addition, studies have suggested ADAS systems can reduce accidents and increase levels of safety on the road. However, the emerging spoofing threat could hamper the growth of the autonomous driving industry. In fact, 45% of the respondents in the UK survey stated the risks of cyber attacks as an influencing factor on the decision to purchase a car with autonomous capabilities, partially or fully automated.

67% of respondents were unaware of the impact of spoofing on autonomous vehicle systems. However, after learning of the potential impact, 86% of respondents rated the risk of an accident to autonomous vehicle users and the risk of harm to other road users and pedestrians as a top concern.

With consumers becoming increasingly security savvy, it is time critical for OEMs to consider their approach to increasing awareness and employ effective strategies to mitigate any potential impact across the sensing, communications, and control layers.

## Improving cyber security across the supply chain

From July 2024, all newly manufactured cars under ISO/SAE 21434 are responsible for providing a high level of cyber security across their supply chain. That means OEMs and their suppliers will need to adopt a rigorous approach towards cyber security. This includes protection against



Any GPS-enabled device entails a risk of hacking

spoofing cyber attacks to ADAS. Some effective strategies to help mitigate these risks might include employing multiple sensor technologies to help cross validate and ensure accurate positioning and navigation; employing robust anti-spoofing techniques that can help protect autonomous vehicles against GNSS spoofing attacks, encryption and authentication; and working with third parties to

consider innovative new technologies.

Looking ahead, OEMs need to ensure management procedures are in place to mitigate any potential security gaps, with well-defined priorities, as part of an integral part of the value chain/ecosystem. This is critical to protect the future growth of the entire autonomous driving industry.

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*Manuel del Castillo is an GNSS industry specialist at FocalPoint*

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# Schaeffler buys Vitesco: EV supply consolidation accelerates

The merger is a sensible move for the Schaeffler family as it brings a growing business under its control while it manages the declining revenue at its other business areas, writes Ian Henry

In September 2021, Continental spun off its burgeoning electric mobility parts business into a new company, Vitesco. The dominant shareholder in Vitesco is the German Schaeffler family (the controlling shareholders in the Schaeffler industrial group). The family, which owned 49.99% of Vitesco after the spin-off (and also retained a 46% stake in Continental), is the driving force behind the plan to merge Vitesco into Schaeffler. It is offering minority shareholders a 21% premium to the Vitesco share price at the time of the offer in October 2023, or around a 52% premium on the Vitesco share price when it was spun off. The family will also sell its directly-held Vitesco shares to

the Schaeffler company. The Schaeffler family's stake in Continental derives from its attempted full take-over of Continental in 2008 which was finally abandoned in 2014. At that point Schaeffler owned 49.99% of Continental.

The planned merger (which is expected to complete in January 2024) is designed to create a company with annual revenues of €25bn (US\$26.4bn) and a current pro-forma order book in e-mobility parts and systems alone of about €40bn. The merged group would employ 125,000 at more than 140 production and R&D units across the world.





The planned takeover of Vitesco is being positioned publicly as part of a plan to simplify the complex shareholding structure of the Schaeffler family's operations

At present the planned combined group achieves just 9% of its revenue from e-mobility but this is expected to rise to around 30% by 2030; at the same time ICE-related components sales are expected to fall from more than half to less than one-third of the combined group. The Schaeffler family believes the merger could generate €600m in sales and cost synergies by 2029.

The new Schaeffler-Vitesco operations would have a core e-mobility division and three other units: Powertrain & Chassis (essentially the Continental or legacy systems which were originally placed within Vitesco); Vehicle Lifetime Solutions (combining Vitesco's and

Schaeffler's aftermarket businesses); and Bearings & Industrial Solutions which will merge with the established automotive bearings business.

The merger of Vitesco into Schaeffler is a sensible move for the Schaeffler family as it brings a growing business under its control while it manages the declining revenue at its other business areas. The planned takeover of Vitesco is being positioned publicly as part of a plan to simplify the complex shareholding structure of the Schaeffler family's operations. This will involve the conversion of Schaeffler's nonvoting preference shares into common stock, ahead a



© Vitesco Technologies GmbH

planned listing of Schaeffler on the German MDAX market. This should see 30% of Schaeffler shares becoming free-floating stock. Press reports also suggest that the move to integrate Vitesco into Schaeffler

In this regard, the Continental Chief Executive Nikolai Setzer has told the German press that the company will consider selling parts of Continental if such moves would create value. For example, in August 2023 it was reported that Contitech, the belts and sealings unit, is up for sale but how quickly this reportedly loss-making unit could be sold is open to question, although insiders suggested this may be possible within two years. Continental would retain the profitable tyre and other non-automotive businesses.

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The Schaeffler family believes the merger could generate €600m in sales and cost synergies by 2029

could presage a further restructuring of the Schaeffler family's industrial holdings, notably the 46% stake held in the original Continental operation.

The guiding hands behind this restructuring are the Schaeffler family and the CEOs of the various business units operating under their direction, notably Klaus Rosenfeld, Schaeffler Chief Executive, and Vitesco's Chief Executive Siegfried Wolff. Having engineered one spin-off (of Vitesco) just over two years ago, they are now engineering a merger designed both to defend the core Schaeffler business and to benefit from the anticipated growth in the e-mobility Vitesco business.



The restructuring of the growing EV components business is unsurprising as established players seek to exploit this market while managing the decline of their established or legacy businesses. In the context of this specific deal it will be interesting to see if the Continental tyre business (which remains very profitable) is one day absorbed into the Schaeffler-Vitesco operation. After all, tyres will be required on EVs so retaining this business could well be seen as a logical move.

More widely, further M&A and consolidation in and around the manufacturing of e-mobility and autonomous systems will continue. Magna for example acquired the autonomous technology company

Optimus Ride in 2022, as well as Veoneer's active safety division, also in 2022. Similarly Bosch has recently acquired Atlatec, a mapping company involved in Level 4 autonomous systems, and also acquired the California based semiconductor manufacturer, TSI.

The Schaeffler acquisition of Vitesco involves some detailed financial engineering, but there is also a clear underlying industrial logic; the Magna and Bosch moves have less overt financial engineering, but they undoubtedly involve clear industrial logic in this rapidly evolving sector. Of one thing we may be sure: there will be more moves along these lines in the next few years.

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

# Where next for in-car marketing?

4screen shows how digital technology opens the door for businesses to interact directly with drivers on their terms. Megan Lampinen hears more

**A**dvances in connectivity and touchscreen technology could turn the vehicle into a lucrative marketing space with a captive audience. Location-based solutions specialist 4screen is working with automakers and businesses to monetise the in-vehicle opportunity in a way that brings real value to drivers and alternative revenue streams to everyone else.

Targeting both local shops and global brands, 4screen helps businesses increase visibility and customer engagement through integration with the in-car navigation or infotainment screen. Businesses that sign up to the platform are highlighted on the

screen map view at their specific location with an icon called a Branded Pin. Clicking on the pin will bring up additional information such as opening hours, services offered or money-saving vouchers. Popular business partners on the platform include fuelling and charging stations, parking facilities, fast-food restaurants and cafes, car washes, supermarkets, hotels, and lifestyle sales outlets. “We are receiving many requests and already have the largest global brands with us,” says Francis Higiroy, Head of Automotive Innovation at 4screen.

Importantly, all the information displayed about the businesses is recent and dynamic. “In the past,

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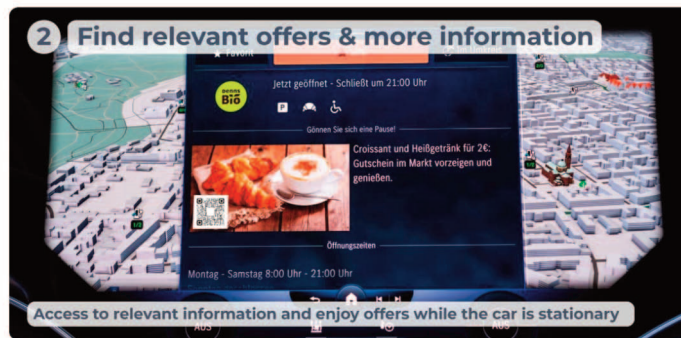
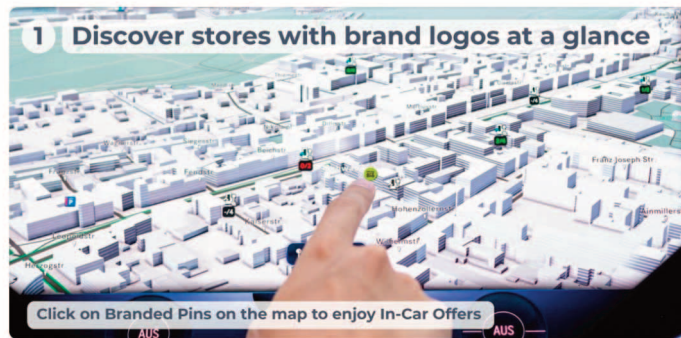
and with many brands today, all you get is static information that was originally compiled into the navigation system: the business address and, if you are lucky, a telephone number. But if that phone number changes, who knows when it will be updated? We're focussing on enriching the information available to give better insights to the driver," Higiroy emphasises.

4screen gathers this data from the businesses and provides it to the OEMs to share with drivers. The aim is to be seamless and subtle. "The information that 4screen provides is designed to enhance the overall user experience and provide guidance and value at the driver's

“

We're convinced that the digital experience will be a decisive and unique selling point for customers in the future

request," he clarifies. Additional details will only appear once an icon is selected. "The whole equation only works if it makes sense for all the parties. The drivers want to receive valuable information. The OEMs want to grow the relationship with their drivers, and the businesses want to reach relevant people."



© 4screen

The Mercedes-Benz and 4screen project emerged from Startup Autobahn powered by Plug and Play

## Automaker perspective

4screen is working with a number of big names including Mercedes-Benz, Audi and Skoda, and Higirom promises “major OEMs all over Europe coming just around the corner.” Mercedes-Benz has offered this digital interaction feature as standard in most of its vehicles with the first and second generation of MBUX, including the S-Class, the EQS and the EQE. Owners first need to activate it by giving their consent via the Mercedes me App or the Mercedes me portal website.

“Our goal is to provide our customers with seamless access to the latest features, services and content so they can make the most of their time in the car,” explains Tim Hettich, Business Developer for the In-Car Commerce Platform at Mercedes-Benz. “This is why

we’re constantly looking for innovative and digital use cases. When we first discovered 4screen, it quickly became clear that its product could be interesting for us, since it gives opportunity for a real-time interaction between driver and brand.”

Feedback from users has been positive, with more than 90% of Mercedes-Benz drivers stating that they preferred the branded logos on the navigation map over generic icons, as well as the enriched detail screen featuring in-car offers. For Hettich, features like this could help with brand differentiation. “We’re convinced that the digital experience will be a decisive and unique selling point for customers in the future,” he tells *Automotive World*. “So, offering beneficial digital services and features that provide an added value to our customers in their daily lives—such as the ‘Advanced Points of Interest’



© Mercedes-Benz

feature—is becoming increasingly important. The feedback we received on the introduction of the feature confirms this.”

Hettich hints at further iterations down the line: “We can’t reveal any details yet, but given the positive feedback we received from our customers, this feature could also find its way into other series models and might be developed further in the future.”

## Where next?

As it currently stands, 4screen’s platform is focussed primarily on raising awareness and actionable reactions. “We’re not reinventing the wheel,” concedes Higiroy. “In a sense we’re just playing with how you can interact.” But there is considerable scope for further development, possibly incorporating augmented reality

and heads-up display technology. “Imagine you are stopped at a traffic light and there’s a zoo around the corner. There might be an animated tiger walking over the street in front of you,” suggests Higiroy.

It could also one day incorporate in-vehicle payments. “Some OEMs are offering that already, like the option to fuel at the pump and then pay in the vehicle,” he says. “In the future there could be connections happening there.” Then there are the possibilities opened up with autonomous driving. Today, it’s already possible to experience a fully autonomous ride-hailing service in select cities. What if a supermarket or a restaurant paid for part of a consumer’s ride to their location? “We see interest here in connecting and combining this business with the mobility world, especially when you look into autonomous driving,” he concludes.



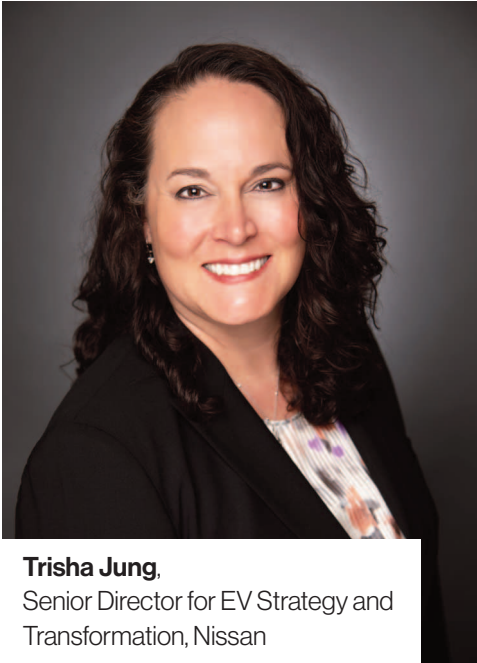
Images © Nissan

# Inside Nissan's EV playbook

**Nissan has ambitious e-mobility goals, but 2030 still won't see an all-electric line-up. By Megan Lampinen**

**N**issan is positioning itself as a sustainability champion, with the stated goals of achieving carbon neutrality and a zero-emission model line-up by 2050. Central to this is its commitment to make electric vehicles (EVs) “accessible to everyone, everywhere.” Helping to lead the e-mobility push is Trisha Jung, Senior Director for EV Strategy and Transformation. She’s held various positions at the automaker for more than two decades, and today her focus is on supporting the growth of electrification in the US and delivering upon Nissan’s electrification objectives.





**Trisha Jung,**  
Senior Director for EV Strategy and  
Transformation, Nissan

Jung concedes that “internal combustion engine (ICE) vehicles will continue to play a role” in the product line-up. However, she emphasises that consumers are “beginning to embrace electrification in key markets around the world.” The automaker aims to capitalise on this interest by introducing 27 electrified models globally, including 19 EVs, by fiscal year 2030.

## Experience and charging

The automaker wants EVs to account for 40% of its US sales by 2030, with even more to feature some other form of electrification. Globally, the electrification mix should pass 55% across both Nissan and Infiniti brands by the end of the decade.

So, while the automaker has ambitious e-mobility goals for 2030, it’s not an all-electric future, and

Consumer education and hands-on experience will be pivotal to realising Nissan’s electric vision. “We’ve learned that when a consumer drives an EV first hand, their purchase intent rises considerably,” Jung tells *Automotive World*. Given the importance of this aspect, Nissan has been exploring a number of experiential marketing strategies. For instance, it has been the exclusive automotive sponsor of National Drive Electric Week for



more than a decade. This event, held every autumn, draws thousands of people to local events across the US and offers the chance to drive an EV or a plug-in hybrid.

Long-term EV success also hinges on charging infrastructure, and Nissan has been partnering with governments and energy providers to build out charging networks. “Part of being an EV automaker is that your responsibility to the customer doesn’t end at the point of sale,” she explains. “Infrastructure must continue to expand to support wider adoption of EVs, not only in population centres but also in urban and rural areas as well.” In July 2023, Nissan announced that it would adopt Tesla’s North American Charging Standard (NACS) for the US and Canada beginning in 2025, making it the first Japanese automaker to do so. This should significantly increase the number of public fast-charging locations at which Nissan EVs can charge.

Improvements in battery technology could also make or break the segment’s future, and Nissan sees considerable potential in solid-state. Regarded by many as a potential game-changer, solid-state batteries offer roughly twice the energy density of conventional lithium-ion batteries, along with shorter charging times and lower cost. In 2022, Nissan unveiled a prototype production facility for laminated all-solid-state battery cells, located within the Nissan Research Centre in Kanagawa Prefecture. The aim is to launch an EV with in-house developed solid-state batteries by 2028.

## Energy management

Sustainability is about more than just selling and driving EVs, and Nissan is keen to develop infrastructure that will support a circular economy in the energy management ecosystem. It aims to fully commercialise its vehicle-to-everything and home-battery

Both home and public charging are central to long-term EV success





The Re-Leaf features weatherproof plug sockets mounted directly to the exterior of the vehicle, which enable 110-230v devices to be powered from the car's high capacity lithium-ion battery

systems in the mid-2020s. With the Nissan Energy Share solution, EVs act as mobile storage batteries to supply homes or other facilities with electricity. In 2019, it used a fleet of Leafs as moveable storage batteries at evacuation centres in Japan's Chiba prefecture following blackouts in the wake of a typhoon. The following year the company unveiled the Re-Leaf emergency response vehicle concept, designed to provide a mobile power supply following natural disasters or extreme weather events.

Second-life batteries are a key piece of this wider energy ecosystem. Months before the first Leafs even arrived on the market, Nissan had partnered with Sumitomo Corp. to set up 4R Energy Corp. Its focus is on developing the technology and infrastructure to refabricate, recycle, resell and reuse the

batteries in Nissan EVs. "[It is] not for their scrap value, but to power other things," emphasises Jung.

## Deep foundations

Nissan claims to trace its EV roots back to the 1940s, when a gasoline shortage prompted the development of the electric Tama two-seater truck. While technology has evolved considerably since then, Jung is keen to suggest that "Nissan's rich history as a global automaker and our achievements in electrification provide a deep foundation on which we can build."

As for the US market in particular, she suggests it has "reached a major transition point" in the move towards e-mobility, and the automaker is prepared to meet its needs. "Nissan is going in the right direction," she concludes, "and our future is electric and connected."



© Daimler Truck

# Daimler pursues geothermal as a green production option

**The truck giant joins a growing list of automakers looking to harness geothermal energy. By Lee Monks**



**T**he potential embargo on Russian gas due to the Russia/Ukraine conflict and a looming 2050 net zero target has pushed carmakers to find energy alternatives. Although more stable than weather-dependent fuel sources such as solar and wind, geothermal energy is a comparatively expensive option, with extensive permitting hurdles.

Yet in recent months, the likes of BMW, Stellantis and Renault have announced exploratory geothermal projects to pursue ways of cultivating sustainable production habits. Daimler Truck is the most recent name to join this list, and in October 2023 announced an exploratory partnership with

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It's clear that deep geothermal energy could play a big role in ensuring future energy supply

the German city of Worth am Rhein and German energy provider EnBW Energie Baden-Württemberg to build its own geothermal plant. As well as fuelling an adjacent car production facility, the plant would serve a proportion of the local community with clean energy.

## Geothermal

“Sustainable transport should make an important contribution to combating

global climate change,” suggests Thomas Neckenich, Head of Facility Management and Green Production at the Mercedes-Benz Trucks Plant in Worth. “The same applies to sustainable vehicle production.” Since Daimler accelerated its sustainable production efforts in 2022, it has “realised carbon-neutral production in Europe” through a combination of wind, solar and hydropower. The company also aims for carbon neutrality in the US, Japan, and India by 2025, and



**Thomas Neckenich,**  
Head of Facility Management and Green Production,  
Mercedes-Benz Trucks Plant, Worth

© Daimler Truck

at all other production facilities by 2039. “We are continuously self-generating energy at our production sites,” Neckenich continues. “By the end of 2022, we’d installed 7.2 MWp of solar panels worldwide, generating 7.9 GWh of electricity per year.”

Daimler’s collaboration with Worth am Rhein and EnBW Energie Baden-Württemberg marks the beginning of the company’s exploration of geothermal energy. “Our Green Production Initiative reduces CO<sub>2</sub> emissions, increases our use of renewable energies, improves our energy and water efficiency, and reduces waste at our production sites,” Neckenich says. “But we can decarbonise further, and we need to explore new energies. It’s clear that deep geothermal energy could play a big role in ensuring future energy supply.”

Geothermal energy offers an inexhaustible energy source. It harnesses pockets of heat created by the earth’s core and trapped underground, in this case collected via heavy-duty drilling. Daimler plans to use closed loop technology to deliver geothermal energy as heat and convert it into electricity to power its Worth am Rhein plant. A closed loop system involves no fracking, no greenhouse gas emissions, no earthquake risk, no water usage, no by-product brine or solids, and no aquifer contamination. According to Neckenich, “The plant could then supply whatever energy we need regardless of weather, time of day or season.”

As is so often the case with large projects pertaining to circularity and sustainability, collaboration is crucial. “Daimler’s core business is vehicles,” Neckenich adds. “It makes sense to leave the energy supply to the specialists. EnBW is committed to renewable energies and has plenty of experience building and running geothermal plants.”

Yet, before it can build a geothermal plant, Daimler must negotiate a few hurdles.

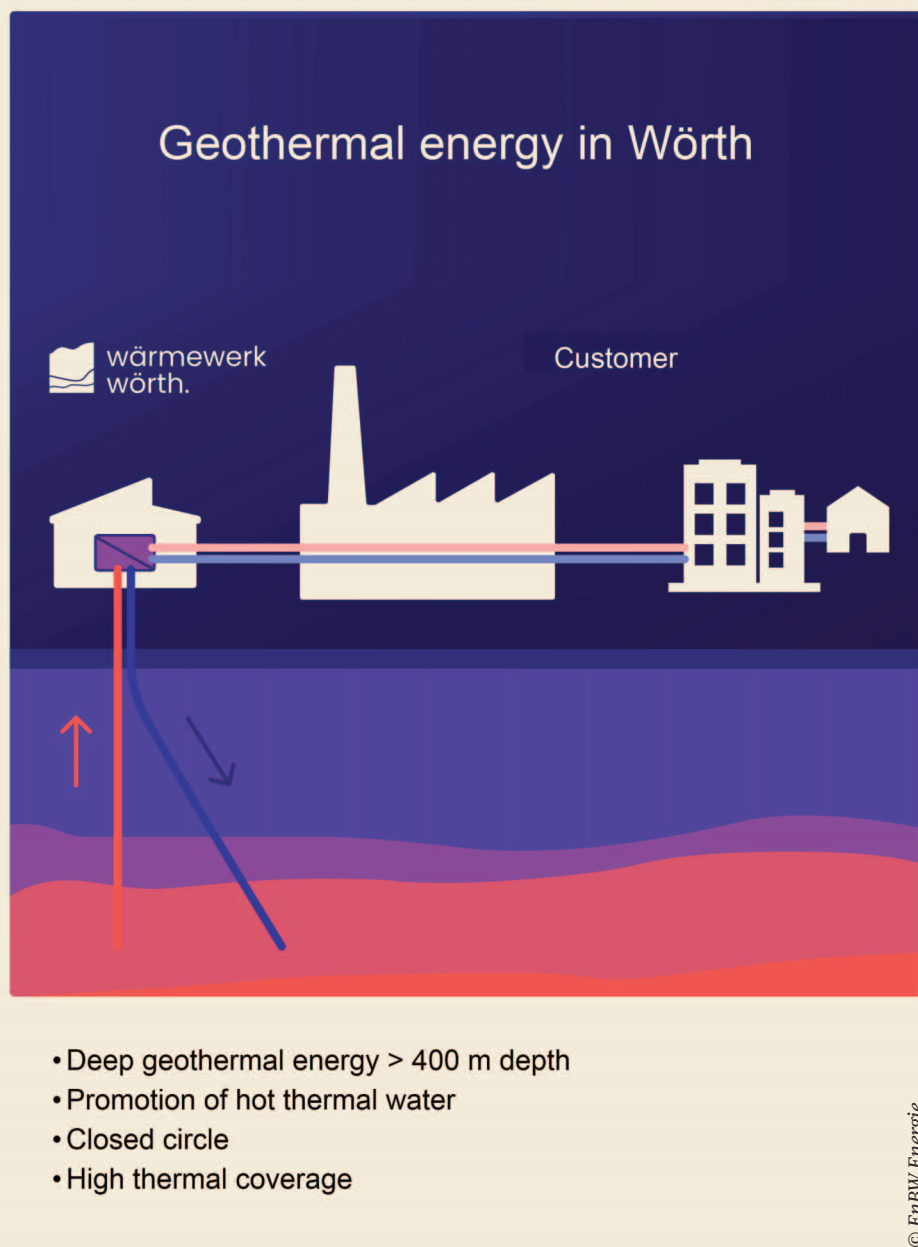
## Untapped potential

One is finding the right site. Worth am Rhein’s position in the Upper Rhine Plain makes it a highly feasible proposition. A 2021 report by German energy market research group AGEBA suggests that up to 186 TWh of geothermal energy could be claimed from the

region, which would cover 5% of Germany's annual energy demand. But first the energy must be sourced, rubber-stamped, and optimised.

"We still need to decide on an exact location, resolve permitting issues, and run tests on how best to exploit the geothermal energy before we build the plant and connect the heat network," Neckenich says. "One risk is that drilling will fail despite appropriate preliminary investigations." Many things can go awry during an exploratory geothermal drill due to the extreme nature of the work. Retaining a steady flow of energy can be problematic, as access lines can become blocked due to collapse or constriction, and equipment can easily break under acute duress. Yet of the geothermal projects undertaken in Germany—there were 42 geothermal plants in Germany as of November 2022, with four more in construction—around 90% have been successful.

Should everything go to plan, testing and development in Worth am Rhein will take place between 2025 and 2027. Once this is completed, the geothermal plant can then be built and connected to the local heating network. Daimler expects the plant to be up and running by 2028. As well as fuelling Daimler vehicle production, Neckenich suggests the project will provide local energy. "At least 10% of the excess geothermal energy will go to the people of Worth am Rhein. Local heating network expansion has already been ratified and plans are ready."

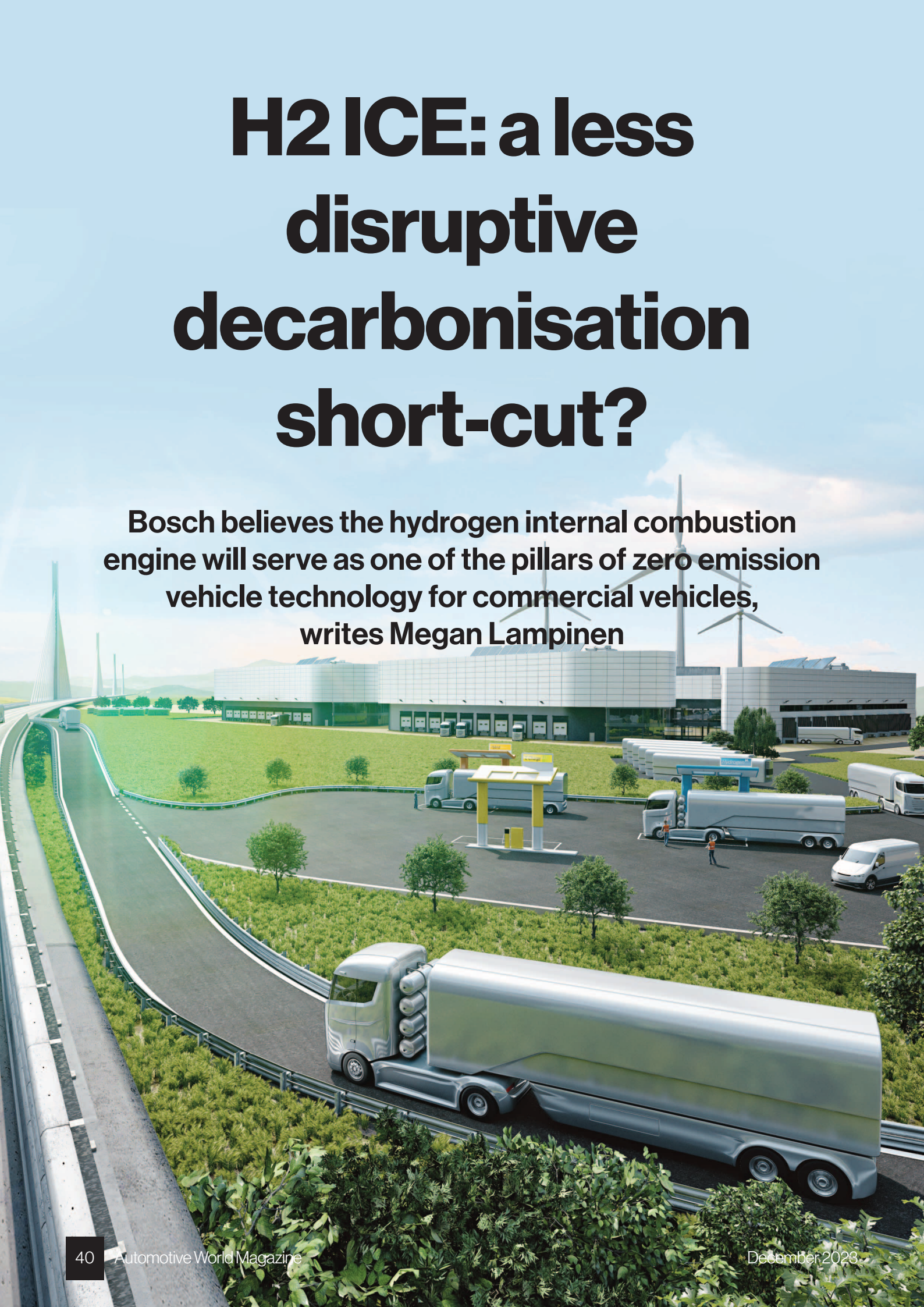


## Future significance

Neckenich concludes by suggesting that "the project could be hugely significant to the decarbonisation of both Daimler and Worth." The reality is much bigger: geothermal energy could revolutionise carmaker energy usage. As other prominent automakers follow Daimler in exploring similar projects, the potential for geothermal to augment automotive's net zero drive seems limitless.

# H2 ICE: a less disruptive decarbonisation short-cut?

**Bosch believes the hydrogen internal combustion engine will serve as one of the pillars of zero emission vehicle technology for commercial vehicles, writes Megan Lampinen**





**D**iesel has long served as an all-rounder for commercial vehicles, working well with anything from a light van to a heavy-duty truck. But that concept may not hold out in the shift to CO2-neutral mobility. When it comes to the choice of battery electric (BEV), hydrogen fuel cell (FCV) or hydrogen internal combustion engine (H2E), it all boils down to use case. “The requirements for commercial vehicles are highly heterogeneous,” says Andreas Kufferath, who is responsible for commercial vehicle engineering at Bosch. “Think of the varying conditions around load, power, range and temperature. There is no one-size-fits-all solution; we need all three complementary technologies to meet all use cases.”

## The case for the H2E

Like many industry players, Bosch expects the industry to embrace multiple technologies in the push to decarbonise. While BEV and FCV have attracted considerable headline space, many industry players are also pursuing H2E, and this includes Bosch.

“Technically, the H2E shows its advantages where we have to provide high engine power output over a long distance or for an extended period of time,” he tells *Automotive World*. Think of a heavy truck making a trans-Alpine crossing from Germany to Switzerland, running with a full load for an hour. “At high power rates, the H2E comes close to or even exceeds the overall system

efficiency of the fuel cell.” It’s also extremely robust under difficult ambient conditions, such as in dusty environments or extreme temperatures.

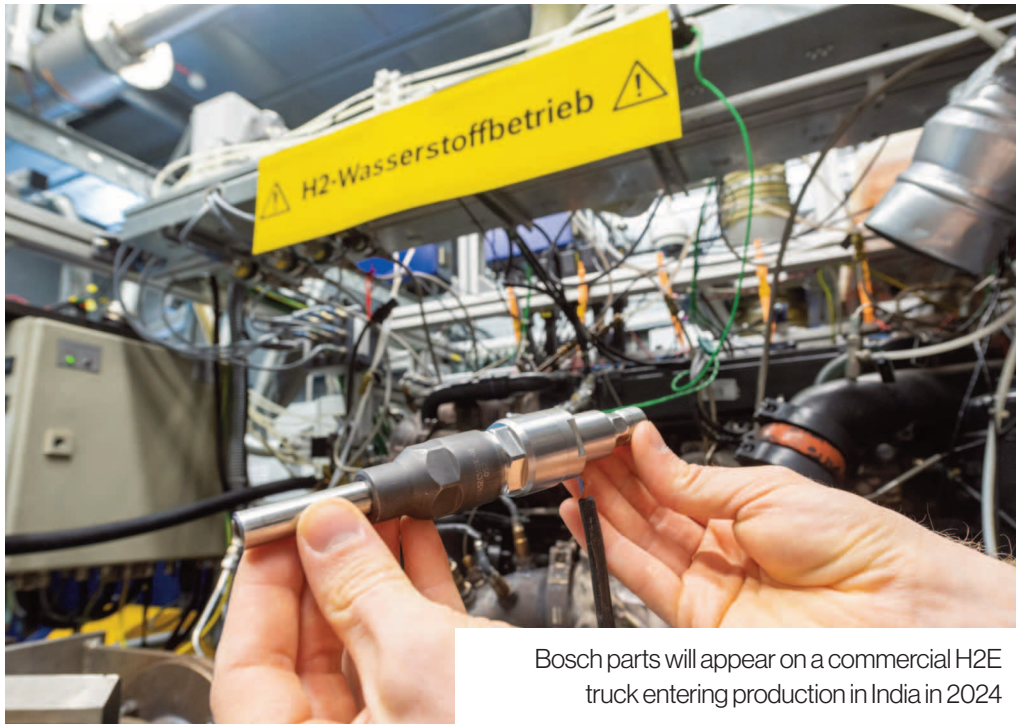
While both FCV and H2E can refuel in much less time than it takes to charge a BEV, H2E offers a faster time to market and less disruption in the supply chain. The H2E is very similar to a diesel engine—Bosch estimates a unit has about 80-90% of the same parts found in a diesel, so the vehicle architecture can stay the same. That’s a huge benefit in terms of development time and cost for automakers.

The similarity in engine design also makes it much easier to tap into the established production and service networks for diesel. “These factors enable a very fast market entry,” he emphasises. “That’s important because we really need speed for decarbonisation.”

There are also supply chain resiliency arguments for the H2E. Composed primarily of steel and aluminium, it avoids many of the rare earth materials needed for BEVs. It also avoids the need for high-end microchips—Bosch built its technology on classical microchip technology.

## Air quality debate

One of the biggest objections to H2E to date has centred on emissions. “Combustion is considered antiquated and is associated with critical emissions,” concedes Kufferath. “However, the emission topic needs a much more differentiated consideration.”



Bosch parts will appear on a commercial H2E truck entering production in India in 2024

To start with, he addresses CO<sub>2</sub> emissions. Compared to a current diesel application with an emission baseline of about 700 grams per kilowatt-hour (g/kWh) CO<sub>2</sub>, an H2E has below 5g/kWh— a reduction of more than 99%. “This is the reason why we will see the hydrogen engine and why we develop all these components,” he points out.

This was also recognised by the European Union in February 2023; a current proposal by the Commission classifies H2E as a zero-emission vehicle (ZEV). Speaking to media on the revision of CO<sub>2</sub> emission standards for heavy-duty vehicles, Frans Timmermans, then Executive Vice President of the European Commission for the European Green Deal, said: “90% (CO<sub>2</sub>-reduction) by 2040 means that the vast majority of new trucks and long-distance buses coming on the market will be zero emissions,

powered by batteries, fuel cells, or even hydrogen-powered internal combustion engines.”

Then there are emissions of nitrogen oxides (NO<sub>x</sub>) and particulate matter. Proponents of the H2E claim that an exhaust gas after-treatment system with a particle filter and an SCR system tackles the NO<sub>x</sub> issue. “In principle, small quantities of NO<sub>x</sub> are produced during the combustion process of the hydrogen engine, but on a lower level than a diesel,” Kufferath says. “With proven SCR technology we could reduce the emissions to a level that it is no longer relevant, even under urban conditions.”

With tailpipe emissions down to a negligible level, the focus turns to particulates. Research from the UK Department for Environment, Food and Rural Affairs found that small particulate (PM<sub>2.5</sub>) emissions in a BEV commercial vehicle were

in the same order of magnitude as a hydrogen engine or even a modern Euro 7 diesel under urban driving conditions. With exhaust emissions contributing just 1% or 2% of PM2.5 emissions, the bulk comes from tyres and road abrasion. In a BEV, there is no tailpipe emissions but the heavier weight of the battery results in slightly higher tyre emissions, putting it on par with the H2E in the overall total.

## Preparing for global uptake

Bosch is positioning itself as a player across the whole hydrogen ecosystem, with activities in many of the different stages of the value chain. For instance, its offering includes electrolyzers and the complete power module for hydrogen fuel cell vehicles and the hydrogen injection system, electronic control units, sensors, and other technology for the hydrogen engine. While in the H2 engine many of these components share similarities with diesel engine parts, in some cases high-tech modifications are needed. “The diesel injector for commercial applications opens and closes more than one billion times over the entire lifetime cycle,” he points out. “Diesel is extremely supportive on the lubrication side, whereas hydrogen has no lubricating properties so Bosch is developing an injector that does not require lubrication.”

Starting with a port-fuel injection approach, it aims to launch production in 2024. Direct injection

units should follow in 2026. By this time, global developments with the H2E should have started to materialise. “The H2E is not a European niche development,” Kufferath emphasises.

He also points to interest among automakers in China and India, noting how “the Indian Government has made a concerted effort to push this technology.” The first heavy-duty H2E commercial vehicles with Bosch products will enter production in India in 2024. Momentum is also building in the US. “Following the Inflation Reduction Act some customers started pushing the H2E technology very hard and there are a number of projects now running in the US,” he adds.

The Allianz Wasserstoffmotor (Hydrogen Engine Alliance) initiative was founded in 2022 and has since attracted 70 members, including automakers, suppliers and academic institutions. Its first big public event, Wasserstoff Motor Live, was held in Karlsruhe, Germany in June 2023 and shone a spotlight on the technology’s market readiness. “This was not a PowerPoint presentation—you could drive these vehicles,” said Kufferath.

Looking ahead, Bosch remains confident that the H2E will serve as one of the pillars of zero emission vehicle technology for commercial vehicles. While hesitant to pin down a specific forecast, Kufferath notes: “The technology will account for a relevant share of the market, otherwise we would not be making all this effort to develop the whole portfolio.”

# Could Kymco set the 2W battery swap standard?

**Kymco is offering an entire e-mobility ecosystem for electric scooters and motorcycles. Megan Lampinen hears more**

**E**lectric two-wheelers tackle many of today's urban mobility challenges around emissions and congestion and look set to play a starring role in future transport ecosystems. Unlike electric passenger cars and commercial vehicles, many motorcycles and scooters already offer battery swap technology. The Swappable Batteries Motorcycles Consortium (SBMC) has been promoting a common standard for L-category vehicle batteries for the past couple of years and today boasts 38 members, including Honda, Suzuki, Piaggio, Kawasaki, Niu and Kymco.

But the debate over which standard to use is far from settled. While SBMC members have largely adopted Honda's PCX batteries, Niu has developed its own range of electric scooter batteries, and Kymco is pushing hard on its in-house Ionex battery platform. In fact, Kymco is now spearheading a new business model for the industry by trying to bring everyone on board its Ionex Open Consortium. How this goes down with SBMC members remains to be seen, but management are exuding nothing but confidence.

"The automotive industry is at an inflection point as it moves from internal combustion

engines (ICE) to the electric vehicle (EV) era, especially for two-wheelers," Kymco Chairman Allen Ko told *Automotive World*. "The two-wheeler segment is different from four-wheelers, and it is very difficult to find a place to charge. Fortunately, we don't need a big battery, and this is where the swappable battery comes in to play. We have been developing EV technology for 25 years and have seen how technology and customer demands have evolved. This drove us to want to be the leader of electric motorcycle regulation."

## **A game-changer**

Underpinning Kymco's ecosystem is the removal of the battery from the two-wheeler purchase price. "Without the battery, e-motorcycles are more affordable than ever," Ko emphasised. The company is proposing a battery as a service (BaaS) solution to energy companies, featuring the Ionex Common Battery and Ionex Operating System (OS). The Common Battery is the removeable battery that Kymco has been using for years and which can be swapped, charged within the two-wheeler, or removed and charged at home. The Ionex Cloud system manages the entire BaaS solution for mobility service providers as well as the autonomous battery swap stations that Kymco is also offering.

These swap stations come in various sizes and configurations and work with any motorcycle equipped with an Ionex battery metring unit (BMU). Designed for OEMs, the BMU is a standardised electronic module that can be integrated into any EV design and enables a vehicle to work with the Ionex battery. “The BMU eliminates the main challenge EV makers face today: complex battery technology,” says Ko. “By taking care of their investment, the BMU is a game-changer for all EV manufacturers and the key to the era of affordable electric motorcycles.”

The Ionex BaaS, OS, BMU and swap stations make up the complete Ionex EV solution, and those players that opt in represent the Ionex Open Consortium. This platform, asserts Kymco, is the tool that’s needed to realise an electric future. “With this solution commuters bid farewell to upfront battery costs and concerns about battery life,” said Ko. “These technologies are the pinnacle of years of innovation, and with them we will fulfil our vision of an electric era for everyone.”

## From promise to reality

Battery swap simultaneously tackles the challenges of long charging times and range anxiety, and as such Kymco’s solution could indeed revolutionise the two-wheeler

segment. But it requires buy-in from the industry and some sort of widespread agreement that it is the standard of choice. While that’s far from guaranteed, the company already has a number of significant partners, including Harley-Davidson, Grab and Thailand’s state-owned energy company PTT.

It’s growing geographically as well, expanding from its base in Asia into new European markets. “Europe is pushing global sustainability, and the governments realise just how important it is,” said Ko. “Certain countries already operate green zones where ICE vehicles cannot enter. Step by step we will see more limits around ICE vehicles and more support of green alternatives. It’s a good time for us.”

The company is clearly determined to play a formative role in the emerging electric two-wheeler market around the world and has poured investment into reinventing itself from a simple scooter manufacturer to an energy ecosystem coordinator. “The EV era does not just require good solid vehicle manufacturing technology,” Ko stated. “You also need a lot of software, the cloud, and new smart technologies. Today’s Kymco is not just a pure vehicle manufacturing company.”

While he hesitated to suggest a new definition, the Chairman doubled down on the company’s pioneering role in



Battery swap stations are popular with two-wheelers

realising cleaner two-wheelers: “We are heading towards a world where electric motorcycles are everywhere, energy companies provide battery services for e-

“

We are shaping the future where e-mobility is not just a promise but a reality

motorcycles, and riders receive batteries with guaranteed performance and only pay for actual usage. In this world, we see manufacturers introduce e-motorcycles with integrated onboard battery metring. This is a change that Kymco leads... We are shaping the future where e-mobility is not just a promise but a reality.”

# UK autonomous vehicles deployment takes a step forward

The King's Speech promise of an Automated Vehicles Bill could be an industry landmark, writes Sarah Riding



© Nissan

**A**utonomous vehicle (AV) developments came under the spotlight in the UK during the King's Speech on 7 November. The speech traditionally marks the state opening of parliament and outlines the legislative agenda. This year it entailed the promise of an Automated Vehicles Bill to ensure the safe deployment of self-driving vehicles. This is potentially a great landmark for the automotive industry in terms of industry, employment and consumer needs.

However, the ambitions outlined that are intended to facilitate this—penned as unlocking a transport revolution—should be carefully digested where the realities of delivering against this by 2030 are concerned. The elements of driving connected to the automotive industry—such as road maintenance for example—will surely need to be better maintained where things like potholes and cracks, which are not programmed within autonomous vehicles to recognise, are concerned.

Of course, we are yet to see how the legislation is fully

outlined, except for the clear statements about ensuring there is transparent legal liability over who or which organisation is responsible during crashes involving self-driving cars—thereby removing the liability for crashes from drivers themselves in unfair scenarios. However, while there are concerns that this may discourage manufacturers from investing in the UK automotive market it's actually more likely to encourage them to focus more heavily on safety than ever before, and protect consumers further in the long run. Of course, drivers retain the responsibility for non-



Autonomous vehicles have been running road trials in London

driving aspects such as insurance and roadworthiness. Furthermore, there is the possibility that the legislation or the thinking that's gone into it will be the subject of a consultation that allows any key issues not addressed to be ironed out ahead of its official launch.

Aside from this, it is an exciting and long overdue development that will allow the UK to step up to the level that other

countries have in terms of a full deployment of autonomous vehicles that facilitate the industry to develop more commercially here—with safety being the key priority of course, something which the government has been focused on prioritising up until now where delivering these long-awaited measures are concerned.

The employment and business development opportunities

this bill is likely to trigger will also boost private and public sector economies and lessen the impact of increasing operating costs and cost-of-living crisis—indeed, the R&D opportunities where technological development around accessibility and safety are concerned are likely to encourage both investment and engagement, elements that could help the UK economy further flourish.

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

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# Scania's pay-per-use model could ease EV truck transition

A new distribution channel could facilitate affordable long-term electric freight uptake. By Lee Monks





**F**or ambitious transport emissions targets to be met—in Europe, a 45% reduction by 2030, zero emissions by 2050—the freight transition from the internal combustion engine to electric vehicles (EVs) is essential. And yet making the switch is far more problematic for some freight carriers than others. Smaller carriers already running within tight profit margins can ill-afford the additional outlay an entirely new EV fleet represents.

Scania and digital freight forwarders sennder have teamed up to form Juna, a pay-per-use EV truck leasing service that will offer freight companies an affordable transitional solution. Johan Kjellner, Juna's Managing Director and Chief Operating Officer, sees the project as much more than a stopgap: "This is a long-term solution. Scania expects Juna to become an important distribution channel."

## Managing risk

Kjellner's conviction stems from a couple factors, particularly the industry-wide commitment to environmental goals and the implicit financial risk to fleet owners. "There's a pull from big shippers in electric transportation due to CO2 reduction targets," he says. "Land transport is a huge part of their operations, but they don't always own the trucks. They often lease trucks, in which cases shipping responsibility is assumed by a small to medium-sized carrier."



Scania and sennder JV Juna should encourage small- to medium-freight shipper EV truck uptake

According to Kjellner, the average number of trucks in a European fleet carrier is seven, and 70% of carriers have less than ten trucks in their fleet. "Small- and medium-sized carriers face huge financial barriers if they want to enter the electric market," he suggests. According to the July 2023 Electric Truck Guide report, an electric heavy goods vehicle costs between €184,000 (US\$200,000) and €230,000 (roughly twice the price of a diesel equivalent). "This is a huge portion of the potential EV market, and very important to Scania," Kjellner adds. "Juna was created to address this."

Working alongside Scania in the Juna JV is sender, a digital freight network platform. It offers what Kjellner terms “commercial predictability”. This means that, alongside the rental agreement, a carrier will enjoy some operational guarantees. “You will receive an assignment from sender that pinpoints exact utilisation, so you will know your exact route and where the chargers are,” he adds. “From there it’s simple math, you can work out costs and profit margins.”

## Pay-per-use

Juna’s pay-per-use lease offer—along with the provision of baked-in shipping consignment guarantees—also means that diminishing truck value, as well as initial outlay, doesn’t burden the shipper. “A



finance company may not want to bet on a truck and may feel it’ll be effectively worthless in eight years,” Kjellner says. “Plus, you need to own the truck for a long time to earn back the outlay. With Juna, we can assume that value risk because we know this project will still exist in eight years.”

According to Kjellner, the Juna project will go live at an unspecified date in 2024 with 350 kilometre-range Scania EV trucks. “We hope to deploy around 100 trucks next year, and we’re starting from the top down, securing utilisation from big-name shippers,” he says. “Once we have their interest, it’ll be very easy to sell the product. 100 might sound a lot but it’s a small fraction of what’s happening in Europe.”

Kjellner also hopes that, once the project begins to flourish, growing success will embolden doubtful smaller carriers. “We need to build

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This is a huge portion of the potential EV market, and very important to Scania



carrier trust and help them understand how best to transition to successfully run their operations,” he says. “Regional freight operations can usually do most things they need to, but they may need to change. We want to facilitate that change.”

## Changing model

Kjellner expects Juna to evolve to accommodate the market, once enough shippers are on board. “Scania is very eager to explore the pay-per-use model.” He suggests that initial rental agreements will involve short-term commitments for shippers, with even shorter leases once Juna has grown its fleet. “Eventually, we’re also planning to offer pay-per-kilometre and pay-per-kilowatt. For now, it’s all about offering the most flexible lease we can.”

Juna, as Kjellner readily admits, offers nothing revolutionary. But he sees pay-per-use as a potentially perfect opportunity to accelerate the EV transition. “Many have tried pay-as-you-go subscriptions. But we believe that it’s the model that will work best for electric trucks.” And Scania has its own emissions targets to pursue—a feature that Juna can help fulfil. “Of course, Scania is really serious about reducing its carbon footprint, but we know we need to do more in electric.”

If Juna works as well as Scania expects, the project will expand. More importantly, such success could establish the pay-per-use freight model and enable daunted small- to middle-sized shippers to join and accelerate an enormous EV transition. For the 2050 zero emissions target to be met, projects such as Juna could make all the difference.



Images © Toyota

# Toyota project lays a data foundation for fuel cell LCVs

A consortium project to create a hydrogen version of the Toyota Hilux could help validate the use of fuel cells in light commercial fleets. By Will Girling

**D**ecarbonisation has become a high priority for commercial fleets, with two powertrain options offering a zero-emission alternative to diesel: battery electric (BEV) and hydrogen fuel cells (FCEVs). While batteries are arguably [winning the debate](#) in heavy-duty vehicles, light commercial vehicles (LCVs) present a compelling opportunity for hydrogen.

In September 2023, fleet management company Rivus published a report on its [trial deployment](#) of 3.5 tonne FCEVs from First Hydrogen. During testing as parcel delivery vehicles, the vans were found to be “much more robust” in carrying out operations than BEV models. Noted improvements included higher payload, longer range (up to 1,000km), and faster refuelling (ten minutes). These qualities are proving that the hydrogen fuel cell powertrain can be an efficient and practical solution well suited for the diversity of global LCV applications, which go beyond standard logistics operations.

However, at this early stage of development, more information is needed on the performance, practicality, and applicability of FCEVs across a range of LCV use cases. It is for this reason that consulting firm Ricardo has been working with Toyota since December 2022 to build a first-of-its-kind hydrogen-powered version of the OEM’s Hilux pick-up for the UK market.

## Prototyping the future

Through the Advanced Propulsion Centre (APC), a UK-based non-profit organisation that forms the third major partner of the consortium, the project received funding from

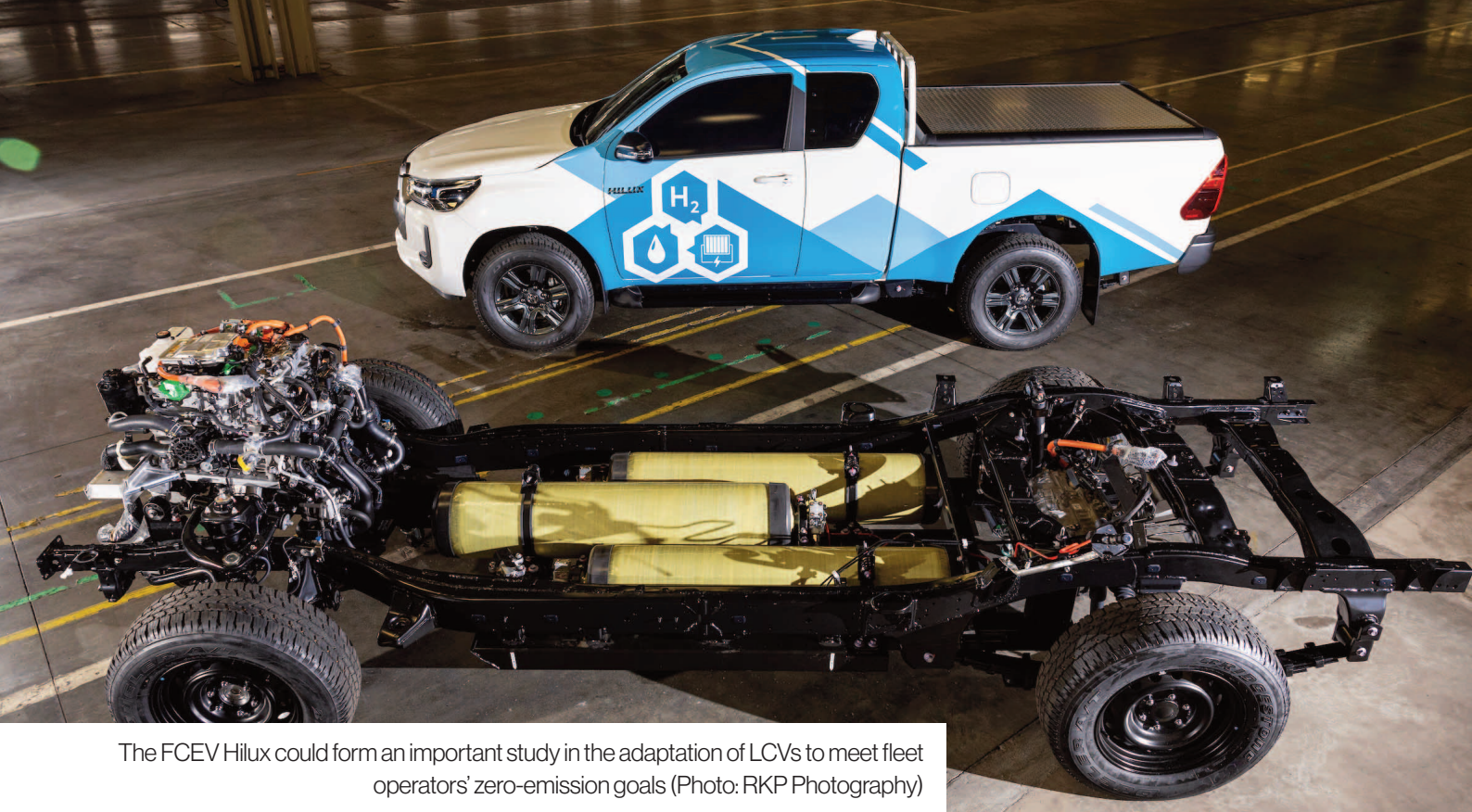


Part of Ricardo's role in the project consortium is integrating the Toyota Mirai's subsystems coherently with the Hilux (Photo: RKP Photography)

the UK Government. The partners hope to produce a FCEV to which operators already utilising internal combustion engine (ICE) Hilux fleets could easily switch.

Phil Crowther, Head of Vehicle Integration at Ricardo, tells *Automotive World* that the project’s vision is to “use the investments Toyota made in the Mirai and apply those subsystems to the Hilux” in a low volume manufacturing framework. The mid-size Mirai’s powertrain features a 128kW fuel cell capable of producing 182hp and a 402 mile (647km) range from 141 litres of hydrogen.

At the time of writing, Crowther explains, “We’re currently in the prototype phase: seven vehicles have been produced, with another three to come.” Through assessment, these models will then provide the data and confidence required to put the FCEV Hilux into production. Although a UK-based project, the envisioned customer base for the final vehicle is global, with a



The FCEV Hilux could form an important study in the adaptation of LCVs to meet fleet operators' zero-emission goals (Photo: RKP Photography)

particular emphasis on fleet operators in the energy, mining, utilities, and construction sectors, which often require pick-up sized models as support vehicles.

These industries, he continues, have challenging decarbonisation targets and are looking for “tangible steps” towards meeting them. For example, a September 2021 study published by *ScienceDirect* from Linköping University (conducted by Ahmet Anil Sezer and Anna Fredriksson) found that transport accounted for up to 10% of CO<sub>2</sub> emissions in the construction industry. As such, hydrogen LCVs are well-placed offer a zero-carbon solution to diesel fleets that doesn't compromise use case performance.

## Designed for the real world

Due to its experience in applying propulsion technology in automotive, aerospace, and marine,

a major part of Ricardo's role in the project includes the integration of drive axles, fuel cells, and fuel storage and distribution system applications for the Hilux. The company is responsible for installing them into the prototypes' chassis, integrating the Mirai's subsystems, and leading a procurement campaign in the UK, Europe, and Japan to source the required components.

Although a FCEV Hilux will inevitably be more technologically complex than the original, Crowther emphasises that Toyota wants to capture the same brand attributes customers have come to expect. After distilling these ideas in consultation with the automaker, Ricardo's initial concept study focused on safety, range, and durability as core design principles. “We're changing Toyota's core systems as little as possible, but there's a lot of application engineering required to transfer them from the Mirai

to the Hilux,” he explains. Important differences between the two include radically different vehicle dimensions and crash protection designs. These needed to be reconciled to match the OEM’s brief.

After successfully completing the concept study in 16 weeks, the consortium produced its first prototypes in September 2023. Ricardo’s ongoing role in the project will focus on testing and analysing the hydrogen-powered prototypes. In addition to the core metrics already specified, the consultancy will measure handling, braking, HVAC, noise, and more. “The performance of these Mirai subsystems is understood, but the real-world application challenges that a Hilux might face are not,” says Crowther.

## A data-driven transition

By 2035, countries like the UK and US, as well as blocs like the EU, intend to ban the sale of new light ICE vehicles, including vans up to 3.5 tonnes. Although examples of hydrogen LCVs are already starting to appear in a limited capacity, the global automotive hydrogen ecosystem must still be scaled up substantially. This requires significant funding from both public—such as the [comprehensive tax credits](#) provided by the US Inflation Reduction Act—and private sources. In most cases, securing this capital will require companies to provide data on three things: vehicle performance, carbon reduction impact, and investment ROI potential.

The Hilux project consortium aims to compile the information that will determine the true value FCEVs could bring to LCV use cases, which could then help contextualise their environmental benefits for fleet operators. Since the Mirai was originally designed as a hydrogen-powered passenger vehicle, Ricardo’s testing will also provide an invaluable data foundation for the ease of transferring existing systems to LCV use cases. Crowther states that this will be conducted at a granular level to maximise safety: minutiae such as the wear and tear on fixings, wiring, and fasteners in the fuel cell system will all be recorded.

Richard Kenworthy, Managing Director at Toyota Manufacturing UK, praised the project team for its fast delivery of prototypes and areas for assessment. While Crowther informs *Automotive World* that it is too early to release the data compiled so far, he confirms that the testing will encompass a FCEV Hilux’s “cradle to the grave” journey.

With other manufacturers like Hyundai expanding on and deploying its own passenger vehicle fuel cell system (from the Nexa) in [heavy commercial applications](#), the validity of hydrogen as a replacement for diesel in fleet operations is accelerating. If current projects conclude that the performance of FCEVs matches their eco-friendly credentials, a flood of investment from a large cross-section of industries could make scaling hydrogen LCVs an affordable and attractive option.



# Partial consensus on global LCA standards remains feasible

While fully harmonised global LCA standards may not be achievable, a partial consensus could still prove transformative. By Stewart Burnett



**L**ife cycle assessment (LCA) standards are gaining momentum in the auto industry. Intended to serve as a comprehensive framework for assessing the environmental impact of various stages of a vehicle's life, beginning with raw material extraction through to end-of-life disposal, they provide valuable information to customers about their purchasing options.

Many automakers already conduct LCAs, but there remains no universally mandated standard for doing so. In some regions efforts are being made to develop harmonised LCAs. In Europe, for instance, the TranSensus LCA Consortium has commenced work on realising a common framework.

However, in an increasingly globalised industry, a universal standard is crucial. According to Nikolas Hill, Head of Vehicle Technologies and Fuels in Ricardo's Sustainable Transport team, this will not be an easy or perfect process despite its importance. In some cases, a lack of harmonisation in some areas may even be preferable.

## Cause for agreement

The efforts to establish regulations for globalised LCA standards are being organised by the United Nations Economic Commission for Europe Informal Working Group (UNECE IWG) on Automotive LCA and Chaired by Japan and South Korea. The US, China, the EU, and the UK are also Contracting Parties of the IWG. Ricardo is an active participant in the working group, joining from the second meeting

which took place in December 2022. Ricardo actively contribute to the main IWG, as well as two sub-groups focusing on the use-phase and fuel/energy production aspects.

From an OEM's perspective, greater levels of harmonisation on a global basis would streamline the LCA process. "Automakers don't really want to have six or seven different sets of rules to adhere to in the future," Hill explains to *Automotive World*. "A more harmonised approach would be beneficial." In practice, this means repeating the same types of calculations in areas like manufacturing emissions and end-of-life and applying them as similarly as possible for any externally-facing reporting in different regions.

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Automakers don't really want to have six or seven different sets of rules to adhere to

Higher levels of harmonisation would lower the amount of work required to conduct LCA on a per-region basis, creating more overhead for OEMs to refine the process and make it more specific



Global LCA standards will create a universal framework for assessing a vehicle's lifetime emissions, including raw material sourcing and manufacture

to individual vehicle models and variants. As a consequence, customer trust and information quality will improve.

Harmonisation also helps ensure that regions reach consensus on what hotspots should be targeted and where to prioritise action across the supply chain and throughout product development. “This will be helpful in providing a clear and agreed link between LCA and corporate decarbonisation, as well as wider decarbonisation targets,” Hill states.

The emergent approach works out aspects of the general structure that can be globally harmonised and differentiates them from what will

need to be determined in terms of regional data sets. In addition, by providing an overall framework, policymakers are given complementary regulatory support at a local level to stimulate further improvements that could lower a vehicle's life cycle emissions.

While this may not necessarily mean absolute uniformity, Hill asserts, it offers a net improvement in communicating with customers—particularly when browsing products manufactured across several regions. “Different approaches can create confused messaging and undermine confidence and trust, but harmonised approaches will help customers achieve a better balance

in their wider decision-making regarding the environmental impact of their choices.”

## Some differences are necessary

While consensus may be reached on many aspects of LCA, there will invariably be areas where flexibility is required. Hill distinguishes two ways this can manifest. In the first, it is simply difficult to make harmonisation work. This could be because of local regulations and policies that lead to variations in how datasets and default parameters are approached.

In the second, it may be preferable in terms of accuracy for harmonisation not to occur. According to Hill, this could be because a vehicle’s manufacturing conditions, use-phase, or end-of-life differ on a local basis. He further highlights that highly important considerations for the usage phase, such as lifetime mileage and average energy consumption based on a duty cycle are examples of this. “Using the same assumptions internationally will not accurately represent the local real-world conditions, which can vary considerably” he states.

Furthermore, some methodological disagreements cannot be easily distinguished as being either ‘right’ or ‘wrong’ but can nevertheless lead to significantly different results. One example Hill cites is in determining the end-of-life allocation methodology, which affects how the use of recycled materials in production and recovered materials in end-of-life recycling are treated in the LCA accounting.

Ultimately, however, Hill argues that disagreements over the methodology for specific aspects are “minutiae” compared to the outputs the working group seeks to help address. “Climate change is such a huge challenge, and we are still behind the curve for where we need to be in terms of progress and policy commitments.” The UNECE’s target date for adoption of the developed methodological is 2025.

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Climate change is such a huge challenge, and we are still behind the curve for where we need to be in terms of progress and policy commitments

A universal framework for LCA standards, he concludes, will be vital in providing consistent information to ensure that progress continues and is not undermined by a failure to accurately capture real-world conditions, or a lack of consumer confidence in the reality of such progress.