

# MOTORPRO

ACCELERATE  
YOUR CAREER  
IN AUTOMOTIVE  
NOV/DEC 2020



## A SHOCK TO THE SYSTEM

THE ELECTRIC SPECIAL

How to... Catch up on MOT CPD \_ Stand out in the job market \_ Get set for ADAS





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**13**   
**YEARS No.1**

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## A GLIMPSE OF THE FUTURE



In case you hadn't noticed, the world is changing. Internal combustion has achieved incredible things over the past century, but political, environmental and social pressures now mean that new technologies are destined to replace it. Specifically, electrification.

It can be difficult to imagine what an EV future might look like when so much of the UK's vehicle parc consists of petrol and

diesel vehicles. That will be true for some time to come, but if we look at one of our near neighbours, we can see what the future holds.

Norway has long been the epicentre of EV adoption. More than 75% of all new cars sold in Norway are plug-ins (either full-electric or hybrid). That has changed every part of the country's automotive industry, from refuelling infrastructure to sales,

repairs and maintenance. It took some time for the culture to change, but the momentum has since become unstoppable.

The same process has started here too. Plug-in hybrids and full EVs account for just 8.2% of new cars right now, but that figure will grow. We should all be looking at how the industry needs to adapt. Norway could hold many of the answers.



**INSTITUTE OF THE  
MOTOR INDUSTRY**  
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**38**  
MILLION  
LICENSED  
VEHICLES

**1.3**  
MILLION  
CARS

**£33**  
BILLION  
GVA (2.5%)  
UK ECONOMY



**98,200**  
ESTABLISHMENTS  
**831,170**  
JOBS



**211**  
OCCUPATIONS  
IN THE SECTOR

**78,270**  
COMMERCIAL  
VEHICLES



**18% INCREASE**  
IN PAST 10 YEARS =  
**128,452**  
**JOBS**



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# WELCOME

The world remains in a state of flux, with significant challenges still to face, but the IMI exists to support our members – and that will continue. We've been working hard to minimise the impact of the pandemic on your lives. Here are just some of the areas we've been delivering on...

**01 SUPPORTING LEVY-PAYING EMPLOYERS**  
We have presented the views of Levy-paying employers directly to ministers, seeking a two-year moratorium on Levy clawback to enable businesses to concentrate on recovery, while retaining funds for later investment. There is no guarantee that the government will follow this course, but we have certainly emphasised the need for greater support for apprenticeships.

**02 USE IT OR LOSE IT**  
In the meantime, our "Use it or lose it" campaign is helping employers use their Levy contributions and leverage the extra funding announced by the Chancellor. There are in excess of 20 apprenticeship routes, both technical and non-technical, that automotive employers can now access through the

IMI, enabling Levy funds to be applied to training that is currently being financed separately by employers in most cases.

**03 ACCREDITATION EXTENSION**  
The pandemic has created significant challenges for those looking to maintain their IMI accreditation because of the closure of training facilities during lockdown and the limited capacity ever since. To assist those affected, we have announced a further six-month extension of the reaccreditation window, which follows on from the extension we had previously announced during the initial lockdown period. We will continue to monitor the situation and ensure that we do all we can to support those who wish to retain their accredited status.



**04 SUPPORT FOR APPRENTICES**  
It's a sad fact that the economic impact of the pandemic has resulted in redundancies across our industry. Among those affected are a number of apprentices who had all but completed their studies but were yet to undertake the final exams or end-point assessments. I'm delighted that we have been able to leverage support from the government's Redundancy Support Service for Apprentices to help these individuals complete their programmes and achieve the qualified status they've worked so hard for.



**05 SUPPORT FOR STUDENTS**  
There was much controversy surrounding this year's exam results at GCSE and A Level, as well as BTECs. Despite last-minute changes to the assessment

methods, not all students received the results they were expecting or hoped for. I'm pleased that we've been able to help a great many of them via the excellent resources on the IMI Autocity site, which includes information for parents who may not understand the career opportunities that automotive can provide.



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## The IMI

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INSTITUTE  
OF THE MOTOR  
INDUSTRY

# MAKE THE MOST OF YOUR IMI MEMBERSHIP

As an IMI member, you're part of a vibrant community of automotive professionals and benefit from access to an exclusive package of career support, CPD and networking opportunities

## DIGITAL EVENTS TO KEEP YOU UP TO DATE

### BUSINESS SUPPORT

#### POST-LOCKDOWN CHALLENGES: Q&A WITH STEVE NASH AND GUESTS

This Q&A answers the most important questions on how businesses need to adapt to this ever-changing situation. The IMI's CEO, Steve Nash, is joined by Tom Denton and Avia Sports Cars' Hayley Pells.

#### SUPPORTING AUTOMOTIVE THROUGH LOCKDOWN AND BEYOND

We review the support and resources available to the sector. The IMI's Steve Nash and Head of Membership Products and Services Mark Armitage are joined by Kelly Gibson, Head of Employment Law at Taylor & Emmet – an IMI partner which is offering members 45 minutes of free legal advice.

#### THE CASHFLOW CLINIC: TIPS AND TECHNIQUES FROM KPMG AND THE IMI

Get answers to your finance and cashflow questions from KPMG's Andrew Burn and Lee Swinerd, and Simon James, CFO at the IMI. This is the perfect watch for independent business owners, covering the essentials of cashflow forecasting, managing costs when cash is tight, and legislative changes affecting the sector.

#### PREPARING YOUR BUSINESS FOR THE "NEW NORMAL"

Insights into how best-in-class workplaces are adapting post-lockdown, with a focus on dealerships, manufacturers and independents. Steve Nash is joined by Steve Scofield and Gordon Grant, Global Sales Director at CitNOW.

#### YOUR BUSINESS SURVIVAL GUIDE

Steve Nash is joined by the IMI's Head of Business Development Steve Scofield, The Garage Inspector Andy Savva and Thatcham Research's Dean Lander to share the latest advice for independent garages, bodyshops and MOT centres.

#### MOTIVATION, MENTAL HEALTH AND THE MOTOR INDUSTRY

Mental resilience coach James Elliott and talent management consultant Carl Williams offer techniques for looking after your mental health and staying motivated in these tough times.

#### QUALIFICATIONS AND TRAINING

#### DELIVERING VOCATIONAL QUALIFICATIONS 2020-21

Mark Armitage is joined by IMI Product Manager Lindsey Mitchell and External Quality Manager (South) Adrian Marshall to recap the

Extraordinary Regulated Framework, introduce the Extended Extraordinary Regulated Framework and discuss tips for delivery.

#### LOCKDOWN AND BEYOND FOR IMI END-POINT ASSESSMENTS (EPAs)

Mark Armitage and a panel of experts take an in-depth look at EPA registrations, agreed adaptations for assessments, and success stories from lockdown.

#### IMI CENTRES DELIVERING QUALIFICATIONS WITH ADAPTED ASSESSMENTS

An overview of the submissions process for adapted assessments on IMI qualifications under the Ofqual Extraordinary Regulatory Framework, including the alternative assessment methods.

#### REGULATORY FRAMEWORK

We sift through the detail to give you an overview of the impact of the regulatory framework on IMI qualifications. Speakers include the IMI's Mark Armitage, Lindsey Mitchell, Adrian Stevenson and Adrian Marshall.

—  
**All the webinars can be accessed at [theimi.org.uk/landing/covid-19/webinars.php](https://theimi.org.uk/landing/covid-19/webinars.php)**



## THE IMI: EVERYTHING WE DO, WE DO IT FOR YOU

- \_We develop people and careers
- \_We run a nationwide membership community
- \_We assess and accredit individuals operating in the sector
- \_We campaign and build public confidence



To find out more about taking advantage of your IMI membership, visit [theimi.org.uk/membership](http://theimi.org.uk/membership)

Have questions about webinars, want to set up your own or have suggestions for topics you'd like to see covered? Contact our Community Manager, Georgia Murnane, at [georgiam@theimi.org.uk](mailto:georgiam@theimi.org.uk) or on 01992 511521

## MOVE YOUR CPD AND TRAINING UP A GEAR

The IMI offers a range of courses – both via eLearning and in person – to help keep your career on track and to give you the skills you need to take the next step. Many are free to members. The courses include:

### Electric vehicles

This package is a multi-module eLearning course designed for individuals wanting basic knowledge of EVs, including aspiring technicians hoping to upskill when it comes to repairing EVs. The package



is divided into eight modules, with each focusing on different elements and learning levels.

### The motor trade

This course covers the motor trade in general, which is much broader than many people realise. It outlines some of the diverse job roles in the industry and covers the different types of business and how they operate. Learners will gain an understanding of the different functions within an automotive business and how these work together.

### Using equipment for best results

In addition to hand tools and test equipment, most workshops will also have a range of equipment for lifting and supporting, as well as electrical or

air-operated tools. This course shows how to use these safely and properly in order to achieve the best results.

### Advanced driver assistance systems (ADAS)

Plenty of vehicles now feature ADAS technology, and this course allows you to develop an understanding of the different systems that are in use, plus their various advantages and disadvantages. This course also explores why calibration is so important and how it's carried out.

### On-board diagnostics (OBD)

This course is all about OBD monitors, scanners and diagnostics. Most OBD systems are now aligned with the current

OBD2 standard, which applies to all cars sold in the US from 1996. EOBD2 is the European equivalent of the US standard and applies to petrol cars sold in Europe from 2001 (and diesel cars three years later).

### Health and safety

Health and safety law is designed to protect you, and in the UK the Health & Safety Executive is the regulatory body charged with enforcing that law. This course is about the subject of health and safety in general but also includes an outline of some important regulations and laws.

To find the right course for you, head to [tide.theimi.org.uk/learn/courses](http://tide.theimi.org.uk/learn/courses)

## MAKING AUTOMOTIVE SAFER



Given the rapid growth in electrification, the automotive industry has a duty of care to employees working with high-voltage systems. To address public concerns, there must also be minimum standards across the industry.

With these issues in mind, the IMI has launched the TechSafe™ initiative to help set baseline standards for the automotive industry and, over time, address the skills gap for those working with electric and hybrid vehicles.

You'll hear a lot more about TechSafe™ in the future as it becomes a core part of the IMI's drive to improve professional standards across the industry and get us all ready for the electric revolution.

Keep an eye on *MotorPro*, the IMI website and our social media channels for the latest updates and information. In the meantime, if you'd like to learn more, head to YouTube and search for "TechSafe".

The automotive industry is changing. Combustion engines are giving way to electric power, and the government is determined to accelerate that shift by banning the sale of new petrol and diesel cars. *MotorPro* finds out what it all means for you...

# ELECTRIC REVOLUTION

## 01 VEHICLE TECHNOLOGY

Just what goes into an electric vehicle, and are you ready to work on them?

## 02 DEALERSHIPS

How will EVs change dealerships' approach to interacting with customers and selling cars?





**03 COMMERCIAL VEHICLES**

Batteries are gaining traction in light-commercial roles, but they'll need to get the range and the cost right if they hope to replace diesel

**04 APPRENTICESHIPS**

All these changes mean the skills gap could get even bigger over the next few years. Businesses need to start looking for a solution

**05 MOTs**

Cars are changing fast. The MOT test surely won't be the same in 2040, will it?

**06 TOOLS AND EQUIPMENT**

Time to throw out those old diagnostic tools and reinvest. Or maybe not...

**07 RECRUITMENT**

With so much change in the air, what kind of person should you be hiring to futureproof your business?

**08 OWNERSHIP**

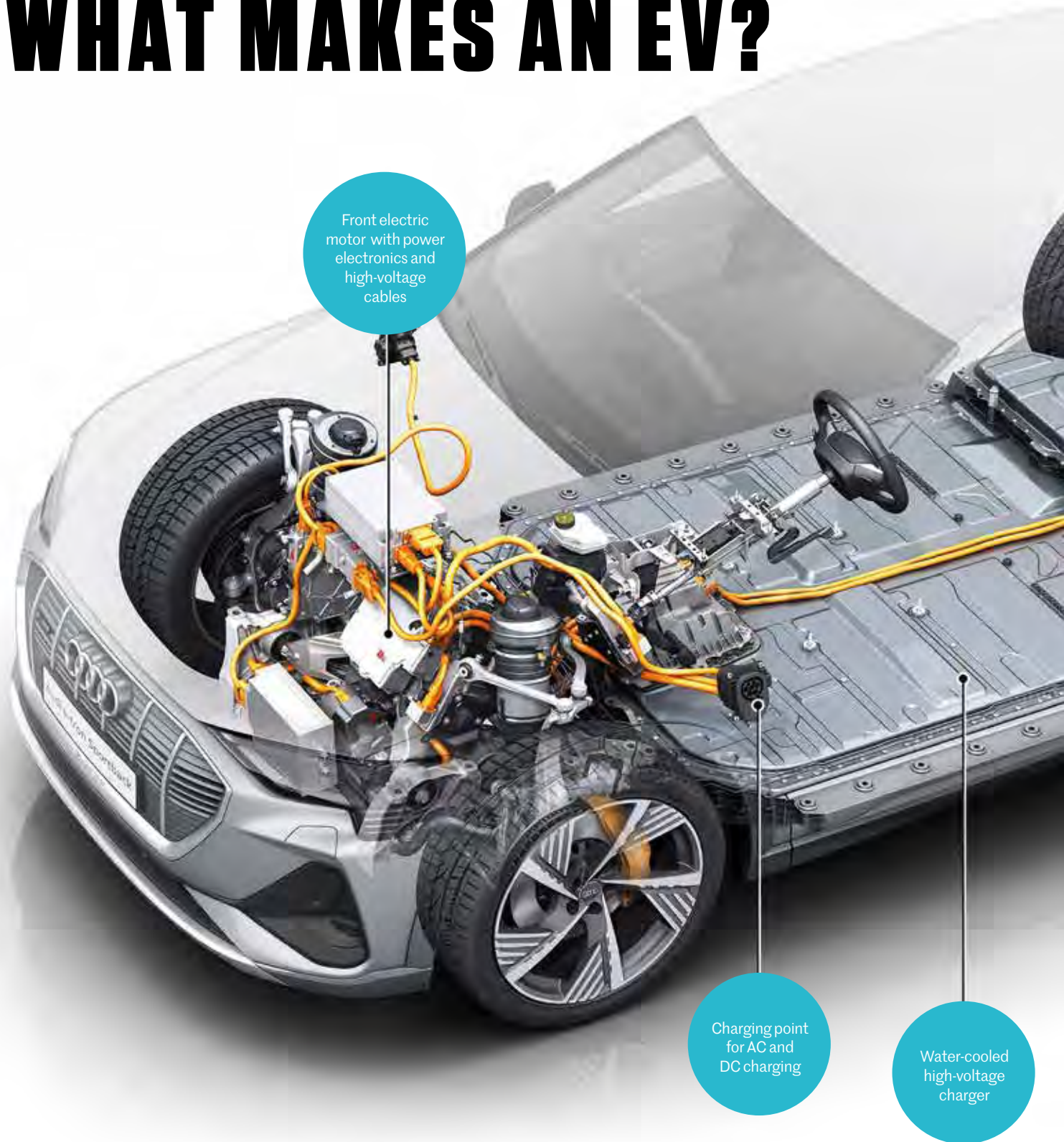
When there's no petrol tank to refill, do you even need to own your own car?

**09 THE SCANDINAVIAN MODEL**

So, we're going electric. What next? Well, let's look to Norway, the world's top market for EVs...



# WHAT MAKES AN EV?





Oil changes, spark plugs and timing belts are out, replaced by high-voltage cables, intricate cooling systems and power control units. Are you ready for just how different EVs will look – and for vehicles like the Audi e-tron Sportback to roll into your workshop?



Rear electric motor with power electronics

Battery junction box

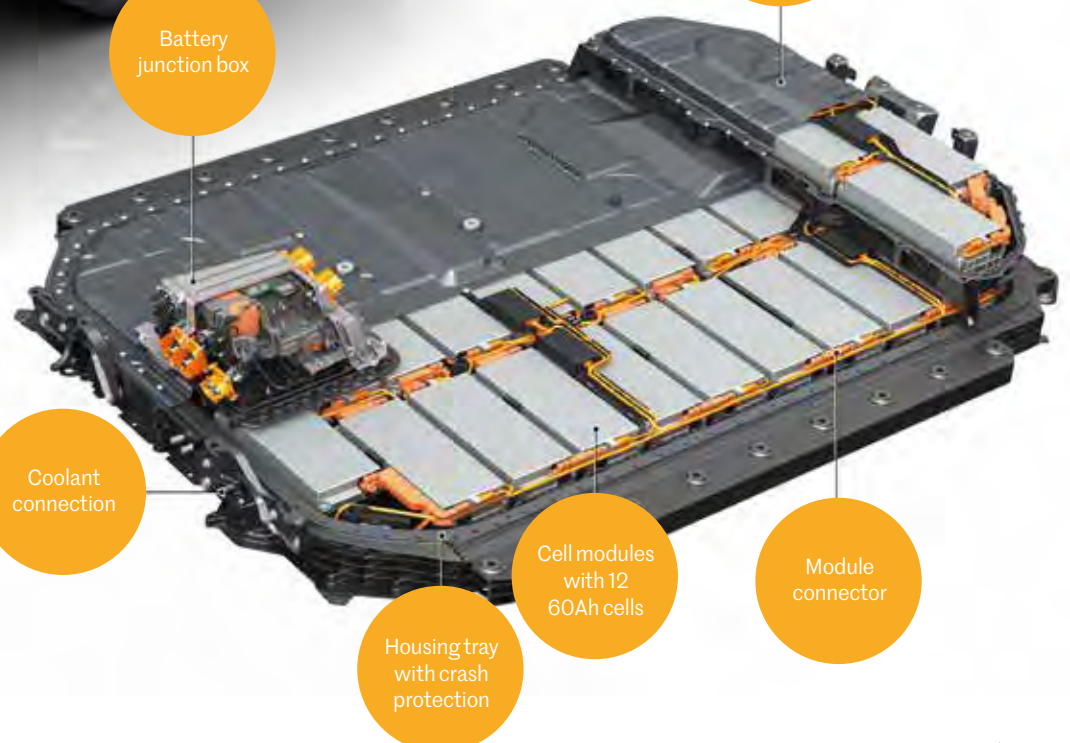
Housing cover

Coolant connection

Cell modules with 12 60Ah cells

Module connector

Housing tray with crash protection



02\_DEALERSHIPS

# RETAILING IN THE EV AGE

What impact will EVs have on dealerships? Will the electric revolution change sales and aftersales forever, or are the tried and tested methods still applicable? *MotorPro* asked three experts for their thoughts...



EXPERT VIEW

**ANDY GOSS**

CHAIRMAN, VERTU MOTORS

"Online sales and home delivery, which were accelerated by lockdown, have meant that a significant number of carmakers are now noticing that digital trend and seeing that agency agreements are the only way to operate going forward. The German brands are likely to move on this before the Asian brands because of the way their relationships work with their retailers.

"The online sales trend and the 24/7 retailing mentality will fuel that change. However,

there's a whole bunch of marketeers at the big brands who still don't understand operational marketing, so it could take some time for that to sink in.

"While I don't think it's just EVs that will bring about the switch to agency agreements, there's lots of research out there showing that consumers dwell much longer on websites for battery-electric vehicles and plug-in hybrids, so that will help the transition. I read recently that people buying alternative-fuel vehicles

spend on average 43% longer researching online than people buying vehicles with combustion engines.

"In a world where most car-buyers go onto monthly payment plans, the new-car sales side of the switch to EVs won't have much of an impact because the prices are dictated by the finance houses, so that's a done deal.

"In terms of moving to an agency agreement, VW Group is clearly at the forefront of this. For the retailer, it means getting new-car stock off their





## EXPERT VIEW

## MARK LAVERY

CEO, CAMBRIA AUTOMOBILES

"We're seeing an increase in servicing work on EVs at the moment due to the new, complex technology, but that servicing work will reduce. Work will then increase in other areas. There won't be much impact in the short term, but in the longer term it gives the person in control of the in-car systems more control over the customer.

"If the manufacturer controls which dealership the car is serviced at, that's anti-competitive behaviour. How is that situation good for the customer? And if that happens, it's breaching competition law. The current system [between retailers and manufacturers] has been evolving for a very long time and works well.

"Battery-electric vehicles aren't necessarily the green panacea that the government

makes out because of the environmental impact of battery production. Hybrids are a better proposition for larger vehicles, particularly if you start to look at synthetic fuels. But currently the plan is that even hybrids would disappear from sale by 2035.

"For me, taking little Johnny to school in a zero-emission car has to be weighed against the fact that a child may have mined the raw materials for

the car's battery. Are we sure a pure EV route is right?

"Overall, I'd say there's a need for a blended approach to propulsion types, including EVs, hybrids, hydrogen and a range of synthetic fuels. More co-ordination between the NFDA, the SMMT and the FIA would certainly help. We can get to net-zero emissions, but we're most likely to manage it with a mixed approach, not just through pure EVs."

## EXPERT VIEW

## RUPERT PONTIN

INSIGHT DIRECTOR, CAZANA



"Unless a new punitive tax is introduced, diesel values will hold up well over the next few years. That's because new-car supply has dropped, but there's still demand for these cars.

"Values of pure-electric cars will come down a bit due to an increase in new-car volumes, but they will still carry a premium over petrol and diesel cars. As more EVs enter the market, there will be an adjustment to values, but it won't be scary.

"It's possible that there will be a steeper drop-off in the values of older EVs due to newer cars offering greater range and better technology. This will eventually settle down when all EVs are offering ranges of 300 miles or more."

The Mercedes-Benz EQC Edition 1886 comes with a six-year "maintenance, pick-up and delivery" package, for when driving to the dealership is too much of a chore

books, which has got to be a good thing (assuming the handling fee is right).

"In terms of servicing, you've got to look at the whole vehicle parc and how long it will take for battery-electric vehicles to become a significant part of the mix. In the longer term, it will have a big impact, but in the short term it's not necessarily a major concern. Also, from an aftersales point of view, it's battery-electric cars that'll have the impact, because hybrids still have combustion engines.

"What you have to remember is the margin pressure that electrification will have on the entire industry. If the engine in an combustion-engine car typically costs the manufacturer £2,000 to £2,500, and the battery in an EV costs £8,000 or £9,000, then there's going to be pressure. That trickles down to everyone in the industry including retailers.

"Ultimately, the need for profitability is the most important thing. Cost has to be taken into account."



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 CLARIOS



## 03\_COMMERCIAL VEHICLES

# DELIVERING ON TIME FOR 2030

Light-commercial vehicles are well placed to go electric, and the market is growing – fast

WORDS STEVE BANNER

BRITISH GAS is acquiring 1,000 Vauxhall Vivaro-e vans. BT's Openreach division is committing to 270. Amazon has ordered 1,800 electric Mercedes-Benz Vitos and Sprinters for its European operations, 500 of which will be deployed in the UK.

But those orders are dwarfed by the gargantuan deal that Amazon has signed with US startup Rivian for 100,000 electric vans, to be supplied between now and 2030. UK-based manufacturer Arrival has also inked a contract with UPS for 10,000 of its Generation 2 electric vans, which should be in operation in Europe and North America by 2024. Battery-electric light-commercials certainly seem to be hot property.

## WHY THE LOVE-IN?

The appeal of battery-electric light-commercials is increasing as their range improves. Renault's new Zoe Van, for example, can travel up to 245 miles before its 52kWh lithium-ion battery requires recharging, and ranges are still going up.

"We could see electric vehicle ranges increase by 20% over the next two to three years," says Alex Johns, Business Development Manager at lithium-ion battery information specialist Altium.

But range isn't the be-all and end-all for many operators. Not every vehicle needs a 300-mile range, so why pay for a battery pack with a capacity that'll never be fully utilised? And why burden your vehicle with the extra weight of a tail lift if that reduces the weight of the goods you can carry?

Manufacturers are increasingly answering these questions by offering customers a choice. The Vivaro-e, for example, comes with either a 50kWh battery – said to be good for 144 miles – or a 75kWh battery, which should manage up to 205 miles.

Charging times are falling too. A 100kW DC charging system allows the smaller of the Vivaro-e's batteries to be recharged from zero to 80% in just 32



The Vivaro-e uses the same powertrain as the Corsa-e (sharing is caring, right?)

minutes. Its larger stablemate can hit the same target in just under 50 minutes.

Meanwhile, fast-charging could be particularly important for businesses that do want to use their vans on long intercity runs, assuming sufficient charging points are available. A combination of sufficient range and faster battery replenishment means that a driver should in theory be able to leave London in a Zoe Van in the morning and head for Glasgow with confidence, recharging the vehicle to 80% of its capacity over lunch at the halfway mark (assuming the optional 50kW DC onboard charger has been fitted).



**"WE COULD SEE ELECTRIC VEHICLE  
RANGES INCREASE BY 20% OVER  
THE NEXT TWO TO THREE YEARS"**

ALEX JOHNS, ALTILUM

## ARE BATTERIES THE ONLY SOLUTION?

Hydrogen fuel cells could represent a viable alternative for both light- and heavy-duty commercials on long-haul work. Renault has developed a hydrogen-powered Kangoo van, and IVECO has joined forces with US startup Nikola to develop heavy trucks with a claimed range of up to 500 miles.

But that's not enough to hold up the rollout of EVs. Battery-electric trucks are already being deployed in the UK on local work. In Manchester, 27 electric bin lorries have now entered service.

Concerns that battery packs will not prove durable and will cost a fortune to replace are rapidly evaporating. For example, the Vivaro-e's battery is protected by an eight-year/100,000-mile warranty. Altium is aiming to offer customers an extended warranty that will provide battery cover for 200,000 miles.

Lithium-ion will be the automotive industry's battery of choice for the next ten years, believes Isobel Sheldon, Strategy Director at battery manufacturer Britishvolt, but a switch to solid-state batteries is a possibility in the longer term. "They can give you the same capacity as a lithium-ion battery in a smaller, lighter pack, or more capacity in a pack of the same size," she says. Altium's Johns is equally optimistic about solid-state batteries. "We should see them in small volumes in five years' time, and in big volumes in ten years' time," he says.

In the meantime, lithium-ion batteries have been getting cheaper. "Over the past ten years or so, they've fallen from \$300 to \$100 per kWh and could decline further, to nearer \$80 or \$90," Sheldon notes.

That has to be good news for operators put off by the fact that electric vans are currently almost twice as expensive as their diesel equivalents. And it'll be good news for the rest of us too if the savings trickle through to passenger cars.

#### 04\_APPRENTICESHIPS

# RETHINKING THE SKILLS MIX

Businesses and new talent alike need to be EV-ready. So what might the apprenticeships of the future look like?

**WORDS**\_SEB MURRAY

WITH THE UK government now set to bring forward a ban on the sale of new petrol and diesel cars from 2040 to as early as 2030, automotive apprenticeships look likely to change dramatically as the industry goes through a period of rapid transformation.

For Dean Lander, Head of Repair Sector Services at Thatcham Research, that means we can expect to see more apprenticeships at Level 4 and above over the next decade. "These will be defined by the specialist needs that will arise as a result of the connectivity and electrification of motor vehicles," he says.

"The new skills required, such as having electrical engineers capable of working on high-voltage systems and specifically inside the battery of full-electric vehicles, will drive this forward. The battery cannot be seen as a disposable item when the replacement costs run into tens of thousands of pounds."

Lander adds that the technological revolution in today's automotive industry is far more significant than anything the sector has experienced over the past 50 years. In addition to high-voltage systems, communications capabilities are enabling cars to "talk" to each other, while features like emergency braking and lane assist are making motor vehicles more autonomous than ever.

"These all require new thinking and new skills," says Lander. "Apprenticeship standards will need to evolve rapidly, or the industry runs the risk of training new entrants in out-of-date skills. If employers lose faith in apprenticeships as a result, then a skills crisis is inevitable."

Mark Armitage, Head of Membership Products and Services at the IMI, foresees a steadier transition in apprenticeship content

in the decades ahead. That's because even though sales of new petrol and diesel vehicles will come to an end, a used vehicle park will still be in circulation for many years to come.

However, there is an immediate need for the latest technology to be included in technical apprenticeship standards. Sales of new electric cars doubled in August alone, even though the overall sales market fell by 5%. "As the fuelling and engine technologies found on combustion engines will start to become less relevant, this content will need to be replaced with all of the latest information for EVs and hybrid power technologies," says Armitage.

#### A CHANGE OF FOCUS

Meanwhile, other big shifts in training will relate to the scaling up of EV charging infrastructure, which will be crucial to efforts to achieve the government's tough emissions targets. "For apprentices in vehicle sales and customer service roles, there will be a need to have greater knowledge and the ability to support drivers in the transition to a different way of fuelling a vehicle," Armitage says.

"This may also spread to knowledge on home charging stations and the costs associated with these, or even being able to sell these solutions to drivers," he adds.

Yet for all the focus on technology in apprenticeships, Frank Harvey, Head of Member Services at the Independent Garage Association, warns that the apprentices of the future will still need uniquely human skills such as communication, which is crucial to maintaining excellent customer service. "We need people who can talk to the customer and understand their problems," he explains.

Harvey believes that the motor industry should be looking to get into schools and recruit the technicians of tomorrow there. "We need technician apprentices, but we're not good at pushing the career opportunities that are out there," he says. "I started on the shop floor as an apprentice and have been fortunate to progress in my career. The opportunities in this sector are endless."



**"APPRENTICESHIP STANDARDS WILL NEED TO EVOLVE RAPIDLY, OR THE INDUSTRY RUNS THE RISK OF TRAINING NEW ENTRANTS IN OUT-OF-DATE SKILLS"**

DEAN LANDER,  
THATCHAM RESEARCH





MOTs have always had to respond to technological changes, so get set for EVs and the next generation of smart vehicles to shake things up again

05\_MOTs

# SIX CHANGES TO TESTING BY

WORDS\_HAYLEY PELLIS

## 01\_HIGH-VOLTAGE CONCERNS

Cars' jacking points will be more closely scrutinised as vehicles become more technologically complex. Vehicles with missing jacking points are a frustration now, but the risk of a EV slipping during inspection could be more profound if a high-voltage cable happens to be exposed. Tesla already provides manufacturer-specific guidance on safely jacking up its vehicles for just this reason. In the future, missing jacking points could be grounds for a refusal to inspect, in the same way that you would refuse to inspect a car where the bonnet will not open.

## 02\_CHANGING EMISSIONS RULES

There will still be petrol- and diesel-powered vehicles on our roads in 2040, but you can't overlook the fact that the Euro 7 standards for emissions are going to create huge change. A clear definition of on-board emissions monitoring is desperately required, as this will allow testers to monitor live emissions or to download historic data at the point of inspection. The values would be for the year – not just the day of the test – and would be in the form of real driving emissions (with figures gathered through on-board fuel consumption monitoring). The big question is this: would that data need to go through the testing station, and could it be a criminal offence to ignore a polluting vehicle?

## 03\_GOING DIGITAL

By 2025, we're likely to see the end of analogue phone lines. This is something that the testing service is future-proofed against, but testing stations may need to be updated. With an ageing workforce, this costly upgrade may be enough to bring retirement plans forward for those already in the business. So, our 2040 test may be run by a much younger workforce than we're used to.

# 2040

## 04\_GARDEN-SHED ENGINEERS

Advancements in 3D printing technology may enable small-scale component production, potentially even creating the perfect climate for low-volume producers once more. This will firstly cause a headache for the Individual Vehicle Approval (IVA) scheme, but it will also present an administrative burden if the IVA is not able to handle the technology that budding car-builders are using.

## 05\_SHARING ENERGY

Vehicle-to-grid (V2G) technology was first developed in the 1990s, but the 2011 Fukushima nuclear disaster inspired the development of the CHAdeMO protocol, which showcased the benefits of storing energy in cars, to be drawn upon in other places. In the UK, Western Power is one company rolling out bi-directional charging, which could help to flatten out demand spikes in energy consumption by using machine learning to anticipate usage. This kind of interaction between the charging point and the vehicle may require periodic inspections.

## 06\_ OLDER CARS

More technologically complex vehicles may not be an easy upgrade for people to finance, so the UK car parc could end up getting a little older than we're used to. Self-driving technology and changes in work habits may decrease the number of vehicles requiring inspection, but inspections will either become more involved (and therefore more expensive), or will be carried out continuously using ongoing monitoring. We might even return to the three-triangle model: perhaps tyres, calibration and vehicle communication.



WORDS TOM DENTON

**Is electrification very different to previous technological changes?**

No, but new skills will be needed, and new safe working practices need to be put in place. Even though the number of EVs is increasing, the change will not happen overnight. Suitable safety equipment will be necessary, plus a good range of normal testing and diagnostic equipment, but it shouldn't involve much that most workshops don't already have.

**Will service and repair work increase or decrease?**

Overall, the amount of work will remain at about the same level, if we adapt. However, there are fewer parts to go wrong on an EV and fewer things to change during a service, so parts sales may be affected. Repair costs should be adjusted as necessary. We will need to attract customers in different ways – maybe by having charge points fitted, for example. “Free full charge with every service!” could be the new sales line.

**Will workshop equipment change, and do we need to invest (again)?**

It depends on what you already use, but most existing testing and diagnostic equipment will work just as well on EVs as it does on combustion-powered vehicles. You will need a good multimeter, with leads that are at least CAT III or IV, but you probably already have these if you do any form of diagnostic work.

An insulation tester is essential for, well, insulation testing. This is used to check for leaks between the high-voltage system and the vehicle chassis, for example.

**06 TOOLS AND EQUIPMENT**

# REALLY? I NEED ANOTHER DIAGNOSTIC TOOL?

Electrification changes the technology powering vehicles. Thankfully, it doesn't mean you need to throw out all your equipment and start from scratch

A diagnostic tool is essential too, even for simple tasks such as resetting service interval warnings. A system such as the Mega Macs 77 from Hella Gutmann (other brands are available) is very useful because it comes with built-in test data and procedures. The same equipment that you use for diagnostics on combustion-powered vehicles will also work for EVs and hybrids.

If you really want to invest in something different, a device called ChargeCheck has been designed to carry out a comprehensive and accurate test of any single-phase Mode 3 Type 1 and Type 2 EV charging station in the UK. The ChargeCheck acts as a car simulator when a car is not present. It's not essential equipment, but it's something workshops may want to consider as an extra service to offer customers in the future.

**Is it just electrification that will make a difference to our work?**

There are lots of technologies out there making us change the way we work. Take advanced driver-assistance systems (ADAS). Calibrating sensors and cameras is now essential and can provide an additional revenue stream if you see it as an opportunity rather than a threat.

The number of ADAS functions fitted on vehicles will increase in the coming years, and that will have a significant



influence on day-to-day work. Even after minor repairs, maintenance and servicing, post-accident crash repairs or windscreen replacement, the radar, ultrasonic sensors and cameras that feed into ADAS will need to be recalibrated.

**What's the most important thing to invest in?**

There can only be one answer to this question: training.

In the past, it was possible to learn about new technologies bit by bit as you encountered them. But now, with high voltages, incredibly strong magnets and even more complex interconnected

systems at play – not to mention the Electricity at Work Regulations – training before working on an EV is essential. It really is an investment, not a cost.

The IMI's network of registered centres is a great place to start, and IMI members benefit from some amazing offers on eLearning courses.

— **Ready to start your EV training? Find out more about the IMI's eLearning courses, many of which are free to members, by heading to [theimi.org.uk/landing/ev](https://theimi.org.uk/landing/ev)**

**And finally...**

If you choose not to get the EV training, there's one more piece of recommended equipment: a defibrillator

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07\_RECRUITMENT

# FUTURE- PROOFING RECRUITING

The shift to EVs could mean some big changes in the workshop. It's time to prepare for a new approach to vehicle maintenance by rethinking how the industry does recruitment

**WORDS**\_GAVIN WHITE CEO, AUTOTECH RECRUIT

THE PACE OF CHANGE in the automotive industry has never been faster. Huge strides are being made, and electric and autonomous vehicles are set to dominate the roads over the next two decades. The car mechanic of yesterday has been superseded by the vehicle technician of today, but the industry still has a long way to go to overcome its current challenges and prepare itself for the road ahead.

More than two million new cars are registered in the UK every year. This isn't going to change. What will change over the next two decades, however, is how these vehicles work.

The rapid progression towards hybrid and fully electric cars is very much a reality, and the technological advancements built into these increasingly smart cars continues unabated. What's more, it's anticipated that 14% of all new cars will be self-driving by 2040, with one in four vehicles being powered by batteries.

Consequently, the garage – and the vehicle technician – of the future will need to look rather different. It's up to the people doing the recruiting to make that change possible.

## NO PLACE FOR PHIL MITCHELLS

Just ten years ago, garages were still largely thought of as oily, dirty places to work. Over the course of the next two decades though, they will change almost beyond recognition. The garage of the future will be more akin to a laboratory than a workshop: an ultra-clean environment full of incredibly advanced, high-tech diagnostic tools. There are even reports that augmented reality interfaces, robotic assistants, on-site 3D printers and high-power



laser welding systems could all be required to service cars in the future.

To put this level of change into context, the latest Mercedes-Benz S-Class has 72 computers and 240 micro-processing systems, all linked to make everything work together. It's massively technical, and vehicle technicians will need not only a huge amount of mechanical skill, but also a giant reserve of in-depth technical knowledge.

Garages will need to ensure that their workforces have the necessary technical know-how, as well as the excellent customer engagement skills required to be able to explain what repairs are needed on any given vehicle.

Of course, this is uncharted territory. Confidence needs to be instilled within the motoring public that vehicle technicians can service their cars adeptly and safely. This is particularly true with EVs given the new and potentially fatal risks associated with high-voltage systems. Over the next 20 years, these vehicles will potentially overtake the traditional car, and it is imperative that employers train their workforce to service them safely. Otherwise, garages could find themselves liable.







### UPSKILL NOW, SUCCEED LATER

It's also worth considering the fact that manufacturers will largely control the connected car of the future. They will have the ability to monitor the health of a vehicle remotely and predict any maintenance and repair work in advance by simply sending an electronic message to the customer. This will ultimately lead to more mergers and strategic collaborations between manufacturers.

The aftermarket will need to fall into line behind this shift, ensuring that they make their assets sweat in the process. Training will be vital in shaping the modern vehicle technician to suit the garage of the future.

Currently, the cost of hiring a skilled vehicle technician is high because the supply is low. This pool needs to be full to deal with the challenges ahead, and a strong pipeline of talent needs to be found – ideally with a greater emphasis being placed on the next generation. Much work needs to be done now to demonstrate the latest advancements in the sector in order to make it an attractive, viable career option. Only that will sustain the aftermarket of the future.

## Five IMI courses to get you ahead of the EV game

### 01\_Electric Vehicles Introduction

This course will give you a general understanding of EVs. It'll provide you with an overview of the different types, as well as their history, costs and operation.

### 02\_Electrical and Electronic Principles

Find out about some of the key electrical principles, including electron flow and conventional current, fundamental quantities, electrical circuits, conductors, insulators and semiconductors, resistors and circuit networks, magnetism and electromagnetism, electromagnetic induction, mutual induction, electronic components, and integrated circuits.

### 03\_Motors and Control Systems

Learn about the function and construction of the main types of electric motors, including the basic principles of AC, DC, synchronous, electronically commutated and switched reluctance motors, plus motor efficiency, control systems, power control, sensors, and batteries.

### 04\_Safe Working, Tools and Hazard Management

This course introduces general safety precautions and guidance for high-voltage vehicles, as well as further detail on personal protective equipment, high-energy cables and components, the risks of working with EVs,

safe working processes, protection devices, work categories, initial hazard assessments, hazard management techniques, high-voltage tools and test equipment.

### 05\_Charging

This course includes information on charging standards and infrastructure, charging time and costs, charging modes, charging plugs, vehicle-to-grid technology, wireless power transfer (WPT), stationary WPT, dynamic WPT and solar charging.

—  
To find out about more about the IMI's EV eLearning courses and to get started, head to [theimi.org.uk/landing/ev](https://theimi.org.uk/landing/ev)

# WHO OWNS ALL THE CARS NOW?

The government is determined to get EVs on the road in the next decade, but what does that mean for vehicle ownership models?

**WORDS\_DANIEL PUDDICOMBE**

THANKS TO RAPID advancements in green technologies – from batteries and hydrogen fuel cells to the cleaning up of traditional fuels – the landscape for new car buyers is changing like never before.

And on top of these new and different ways to power cars, there are now a number of ways to “own” a vehicle too. Gone are days of walking into a showroom and writing a cheque for a new car. Instead, consumers are far more likely to lease a car by paying a set amount each month, and other arrangements such as car clubs and subscription services are on the rise too.

But that’s just the here and now. Over the next ten or 20 years – by which stage the roads are expected to be full of zero-emission vehicles – individuals and companies are likely to be procuring vehicles in a whole range of new ways.

According to consulting giant Deloitte, in a decade’s time, people will use vehicles in the same way that they use public transport today. “A shift from ‘ownership’ to ‘usership’ will see more consumers

using platforms that allow access to vehicles for use on specific journeys,” says Nathan Thompson, Automotive Director at Deloitte.

It’s a view that’s shared by Peter Eldridge, a Director at the Association of Fleet Professionals. “It seems fair to suggest that the established, siloed approach of long-term lease and short-term hire will be replaced by much less rigid provision,” he says. “We are already seeing medium-term rental and even hourly rental in urban environments stretch the traditional model, and these might lead to all kinds of forms of flexible leasing.”

With technological advancements opening up new ways to get behind the wheel, Eldridge adds that data will also help fleets and their platforms understand the needs of drivers better than at present.

“The business transport needs of the future are likely to be driven by a much better understanding of the journeys required and a broader range of options to satisfy them,” he explains. “All of this will come from the data we will see from ever more connected cars, which we presume will almost certainly all be EVs by that point [2030], as well as from a much more structured approach to journey planning.”

However, not everyone agrees that the end is nigh for traditional lease agreements. “We believe that there will still be a high degree of personal ownership of vehicles,” says Ian Fletcher, Principal Automotive Analyst at IHS Markit. “While the levels won’t be as high as today, we will still see high levels.”



**“A SHIFT FROM ‘OWNERSHIP’ TO ‘USERSHIP’ WILL SEE MORE CONSUMERS USING PLATFORMS THAT ALLOW ACCESS TO VEHICLES FOR USE ON SPECIFIC JOURNEYS”**

NATHAN THOMPSON, DELOITTE



Hopefully, in ten or 20 years’ time, the coronavirus pandemic will be consigned to the history books, but Fletcher says its impact may still be felt in the future, as people may be slower to move to shared ownership models than previously expected. “COVID-19 throws a spanner in the works. Consumers are currently concerned about public transport usage and Uber, so things have shifted. That will change as we adapt to the new normal, but the transition from personal transportation is likely to be slower because of it. In ten or 15 years, though, we will be in a different world,” he says.

As well as EVs, Eldridge is keen to consider the place that self-driving cars will occupy in the vehicle parc of the 2030s. “We may even be looking at a universal pay-to-use provision, where a vehicle turns up on your doorstep when you need it to take you to your destination,” he says. “However, it is difficult to say now whether this kind of vision will arrive in our lifetimes.”



## 09\_THE SCANDINAVIAN MODEL

# HOW THE NORWEGIANS WENT ELECTRIC

In the world of EVs, Norway is often held up as an example of how to get the transition right. What we can learn from our friends across the North Sea?

**WORDS** TRISTAN YOUNG

MORE THAN 75% of all new cars sold in Norway are plug-ins, whether hybrids or full-electric. The UK's figure? A whopping 8.2%. Hmm. So, just what can automotive retailers in the UK learn from Norway about the reality of going electric?

Stig Saeveland is the CEO of Hedin Automotive, one of Norway's largest dealer groups, boasting 4,000 staff, an annual turnover of nearly €3bn and new- and used-car sales of 80,000 units a year. He admits that the switch to electric has not been easy for the firm, but different parts of the business have felt the impact to varying degrees. For example, new- and used-car sales were the divisions least affected, while aftersales experienced the most significant financial hit.

There have been some positives too though. In the new car market, Saeveland reports that the shift to EVs has brought new customer groups into the showroom. "The customers were often younger and more knowledgeable about the alternative products in the market. So we adjusted

to meet that. We needed to be more knowledgeable too, and we needed to offer a better service. To grow and thrive in the market today, the customer has to be put at the centre of every experience. EVs have led the way in that respect."

However, this change in buying habits has also led to a drop in brand loyalty. "Green products and technologies have taken the front seat, and customers are less attached to the brand," Saeveland says. "That means customer retention is harder because people are more focused on the product."

In used cars, the group essentially traded through any difficulties. "The EV effect on used-car pricing was slower than anticipated. It also took a while for our stock to reflect what the market was demanding. In 2016-17, this created some headaches, but the adjustment happened naturally. Prices for used diesel cars have remained broadly steady, however, as the reduction in stock is balanced by market demand," says Saeveland.

## THE AFTERSALES IMPACT

In terms of servicing, because EVs have far fewer moving parts than diesel and petrol cars, the revenue per service is "a fraction of that for a diesel or petrol", Saeveland explains.

"On average, an electric BMW i3 uses 72% fewer parts during servicing versus a diesel 3 Series. To counteract the lost revenue there, we needed a strong focus by management on business efficiency. We concentrated on that and on increasing the throughput of service customers.

"To deliver that efficiency, we use lean processes and delegate responsibility out to all staff. This means technicians can make improvements if they see an area they could improve. It has given us, as an organisation, much better efficiency and better staff wellbeing because they know they're an active part of the business."

## ADAPT OR DIE

To help the business cope with the changes, the management had to get everyone on board for a cultural shift, Saeveland recalls. "We had to completely rebuild our aftersales operation, but that's now having a positive impact on our sales. You get the staff to do this with transparency, openness and humility.

"We were very open about the threats we were facing, so everyone knew they were involved. Our Lean Director and his team asked the technicians to be as open as possible without fear of repercussions. This built trust, so we didn't need to use financial incentives.

"Everyone understands that throughput is vital and that service contracts are vital to keep customers coming back. We also have to be direct about any unhelpful behaviour. If it's not putting the customer first, then we need to tackle that issue with the person concerned, not just introduce a new rule for everyone." ■





Leaning in...  
Matt Cleevely is  
hoping for first  
mover's advantage  
in the world of  
EV maintenance

WORDS\_REBECCA CHAPLIN IMAGES\_WILL AMLOT

Matt Cleevely explains how  
going electric has helped keep  
his family business motoring

# CHARGING UP THE COTSWOLDS

TUCKED AWAY ON AN industrial estate in Cheltenham, with the Cotswolds on one side and the Malvern Hills on the other, is Cleevely Electric Vehicles. The business was initially set up to bolster the family garage, which has been around since 1962, but it has since become a local powerhouse in the EV revolution.

Director Matt Cleevely is the third generation to work here and has totted up 20 years with the garage. It was his fascination with new technologies that prompted the firm to make the switch to EVs in 2018. And it all started when he got behind the wheel of a Nissan LEAF.

Fast forward to today and Cleevely and his team are pushing the EV agenda. They offer a Tesla Model S rental to help people sample the EV lifestyle, and they have an education centre as part of the showroom to explain the new world of EV ownership.

It has been a huge success too – so much so that they have to limit the number of EVs coming into the garage at any one time. With customers travelling from all over the UK to be seen by the Cleevely team, this garage is fast developing a reputation for repairing EVs and is now setting its sights on expansion. >





Left: Andy Herridge offers (a) service with a smile

### MotorPro: Why did you decide to set up Cleevly Electric Vehicles?

I was interested in how we could adapt, as I'd read a lot in the trade press about needing to specialise to keep your independent garage going. I didn't want to alienate my existing customers though, and I didn't know which brand, fuel type or whatever else to specialise in.

My wife had a petrol Ford Fiesta at the time. It wasn't really going anywhere, and I ended up feeling quite sorry for it, so I started looking into vehicles powered by alternative fuels. Electric was the most affordable option and also allowed me to progress professionally by learning about this new technology.

As soon as I drove an EV, a Nissan LEAF, I absolutely loved it. It's such an incredible driving experience. I've been a petrolhead all my life, and I've spent 25 years racing in Autograss. The last car I built and raced, which I still have, is a 400kg single-seater powered by a Suzuki Hayabusa motor. Suffice to say I didn't think EVs would win me over that quickly!

Unfortunately, our experience of buying an EV left something to be desired, so we decided to specialise in selling EVs ourselves. If major dealerships aren't prepared to handle them, then we will.

### What did you have to do to set up as an EV garage?

On the workshop side of things, I did my Level 3 and 4 qualifications in electric and hybrid vehicle technology.

Next, I set about looking on some of the owners' forums, trying to find out what EV owners wanted out of an independent garage. The answer was a bit of knowledge and someone who understands their vehicle, so that's exactly what we offer.

We didn't really have to make any changes to the actual workshop. There's a limited number of insulated tools that you need, but awareness of high-voltage safety is a must, so there's an initial investment to be made in kit and qualifications.

Other than that, it's the same as other workshops. You wouldn't look at it and think it's specifically set up for EVs. We don't have rubber mats on the floor because we don't actually come into contact with high-voltage problems all that often. Those kinds of jobs can be months apart.

### What jobs do you get the most?

Day to day, we see a lot of people travelling from all over the country to have their cars serviced by us because we can do it a lot cheaper than the main dealerships. We're doing servicing, suspension repairs and brakes, particularly around the regenerative braking systems.

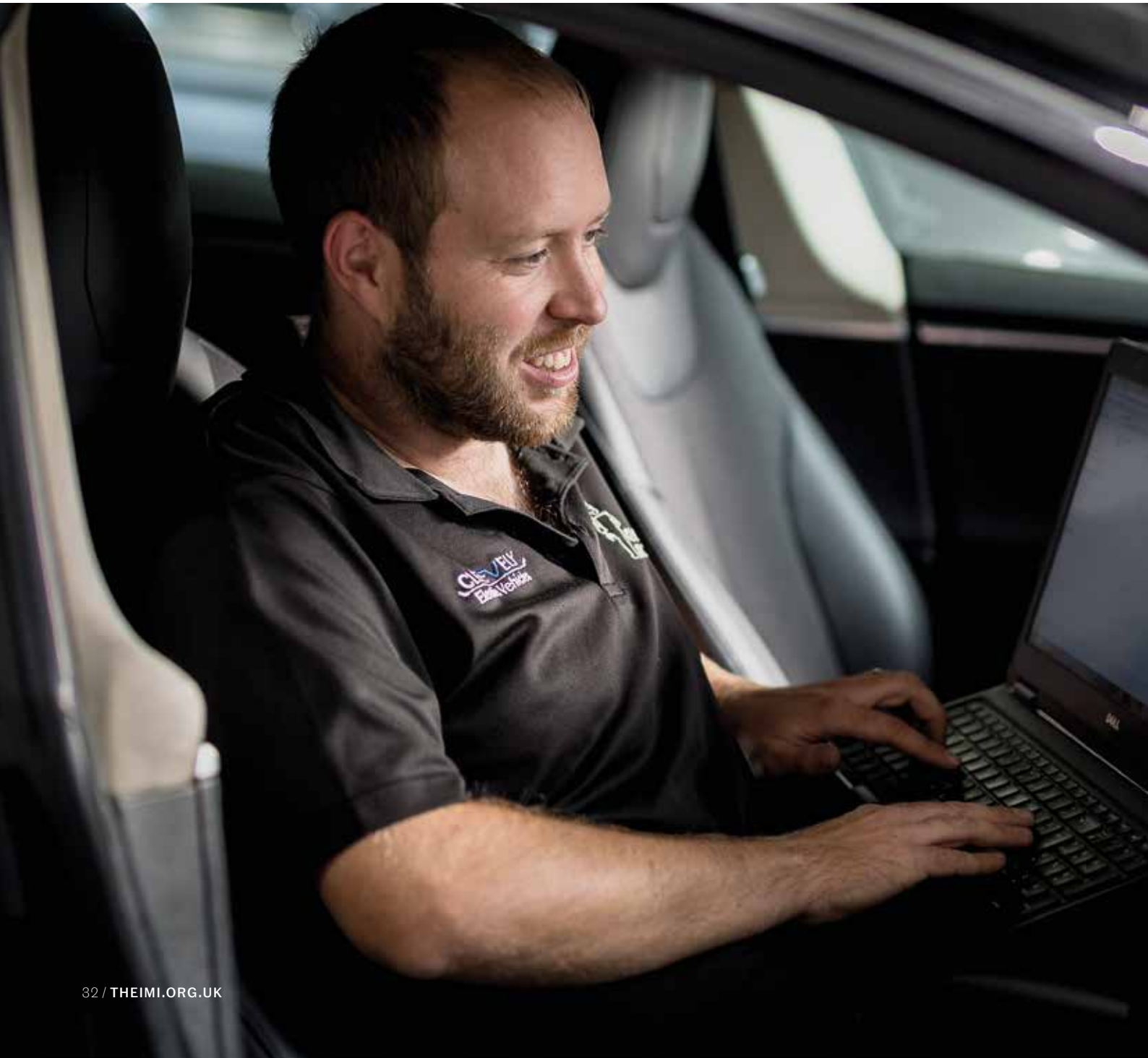
Then there are things such as tyres, the kind of maintenance jobs that other independent places or tyre-fitters seem to shy away from. No one wants to get involved with EVs.

We're seeing huge numbers through our doors. It started with a couple of jobs a week, but now we're having to limit the numbers to three, four or five a day.

### Was there a point when that changed?

We worked really hard on our relationship with EV owners via forums, owners' groups, our social media presence and things such as Robert Llewellyn's *Fully Charged Show*. We've appeared on there doing talks on maintenance.







Left to right:  
Just another day  
in the office for  
Ryan Ferguson,  
David Smith and  
Dean Raynsford

Left: Let's hope  
Peter Melville  
knows you can't  
drive a Tesla  
with a laptop...

It has been a bit of a snowball effect. As with the traditional business, we always work really hard on our customer service. That was my grandfather's ethos back when he started the garage in the '60s, and we carry that through to today.

#### Are you glad you made the change?

Like anything in the motor trade, it has its challenges, but it's fulfilling my dream of keeping the family business going beyond the third generation.

I started the EV side of things as a separate business because I wasn't sure which way it was going to go. I've got a business partner who looks after the sales and rentals, while my focus is the workshop itself.

I'm glad we did it, but it does lead to us having to do a lot of reverse engineering. Some of the repairs can be quite time-consuming, and we handle some things that a traditional garage would never get involved with.

We get there in the end though, with the assistance of HEVRA [the Hybrid and Electric Vehicle Repair Alliance]. We're a contributor to its network, and we share specific components and replacement parts that we've created while working on Teslas.

#### Is it true that EVs are easier to service than conventional vehicles?

Yes, and we don't try to pull the wool over anyone's eyes. Generally, when it comes to the servicing side of things, there's no need to have anything to do with the high-voltage system. It's really all about the car itself, the mechanics of the car and its roadworthiness.

That means there's less work involved, but it also means you'll need to hit higher volumes to reach the same profitability. There's no oil or filter to change at a service, so you've got to think of other ways of generating income. That was part of my reason for making the change two years ago; I wanted to be the first on the block and build up a reputation for being the EV specialists.

#### What advice and information do you give to customers who visit the education centre?

We try to keep it informal and informative. The aim is to help prospective owners understand the best way to benefit from making the switch to an EV.

That includes all the practical things that people might want to know, such as how to use the existing charging infrastructure out there, vehicle ranges and what the charge speeds are like.

#### What's your plan for developing the business?

The ultimate plan is to turn it into a fast-fit operation, but it's not just about routine servicing. We see all sorts of different faults – inverters and batteries, for example. We don't tend to get your clutches and your cambelt changes, but there are other faults that can be profitable if you're willing to look into them.

We're just in the process of expanding the workshop too, as it's now too small for us to operate from. Currently, we've got four lifts and a Class 4 MOT bay, but we're now working on adding a fifth lift and a second MOT bay next door to our 4,000ft<sup>2</sup> EV showroom and education centre. ■

—  
**Matt Cleevly was speaking to  
Rebecca Chaplin**

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Based on the Shelby Cobra Daytona, the all-electric Renovo Coupé hits 60mph in 3.4 seconds (just ignore the £400k price tag)



# SWITCHING OVER

As the UK attempts to slash its carbon emissions, *MotorPro* looks at an emerging career option for technicians: converting old petrol and diesel vehicles into EVs

**WORDS\_**CRAIG THOMAS

THE ROAD TO THE UK's target of net zero greenhouse gas emissions by 2050 is looking a little congested right now. At present, there are around 38 million petrol- and diesel-powered vehicles on UK roads, versus just 136,000 EVs. That's a big gap to bridge.

The government is now planning to end the sale of new petrol and diesel cars by 2035 (and possibly even 2032). So what will become of all the old internal combustion engine vehicles out there? They can't just be scrapped, so we need to find a more sustainable solution.

How's this for an idea then? Just convert them into EVs... A number of conversion companies are already on the scene. The likes of Lunaz, ionic cars and Electric Classic Cars are taking much-loved older cars and transforming them into zero-emission vehicles. This could be a promising opportunity for any technicians considering a career move. Here are three factors to bear in mind:

### 01\_UP YOUR SKILLS GAME

Jon Peck is responsible for client liaison at Electric Classic Cars, based in Newtown, mid-Wales. He explains that the company's work is split into three main areas: fabricating parts such as battery boxes and motor mounts; mechanical work such as connecting a motor to the original gearbox; and the electrical side, fitting and connecting batteries. Technicians hoping to work on any one of these areas will need to upskill in order to work with EVs.

"There are now specific EV courses that many colleges are running for electric vehicles," says Peck. "All of our guys here have either have done one or are in the process of going through and getting their EV qualifications. In our workshop, we have three fabricators, three electricians and two mechanics. There's very little crossover, but they've all got a basic understanding of what they're doing around the vehicle and what the end result is going to be."



**"THESE TECHNOLOGIES ARE GREAT, BUT YOU HAVE TO THINK OF THEM FROM A CLEAN SHEET OF PAPER TO MAKE THE MOST EFFICIENT USE OF THEM"**

ANDY TURBEFIELD, HEAD OF QUALITY AT HALFORDS AUTOCENTRES



### 02\_STAY SAFE AND UP TO DATE

In the new all-electric world, safety will be paramount for any technician working on high-voltage vehicles.

Steve Scofield, Head of Business Development at the IMI, emphasises the importance of safety awareness. "The key thing, from a technician's perspective, is absolute safety first," he says. "High-voltage systems take no prisoners, so the first step is to retrain and requalify with a mindset of 'safety first'. You start with the basic qualification so that you're safe and able to work in environments where you can make the vehicle safe."

Scofield explains that after technicians have attained this initial qualification, there are two important further stages. The first is continuous professional development (CPD), which helps technicians "stay abreast of the rapidly moving technology".

The other area to consider is your career trajectory. "Today you might be a maintenance and repair technician, but







**“HOPEFULLY, THIS NEW EV NICHE WILL ENCOURAGE SOME TO DIVERSIFY THEIR CURRENT SKILLS”**

ANDY SAVVA, THE  
GARAGE INSPECTOR



perhaps you have aspirations to become a master technician. So how do you requalify and move up the qualification levels so that you can progress your career and become a master technician, or move into management?” Or even set up a specialist garage, converting older cars into EVs?

Scofield notes that technicians with more training behind them will be better placed to take advantage of the opportunities in EV conversions. “These technicians will definitely need to be more like engineers, from an electrics perspective,” he says. “They’ll really need to understand that you can’t just pick up a battery pack and marry it to a motor and the rest of the system. It all has to work together. It’s back to fundamental electrics really, from an engineering perspective.”

Will EV conversions go mainstream? “Perhaps... perhaps not,” says Scofield, “just because of the economics of low-value vehicle work. But I can see it

certainly expanding and offering some business opportunities for new startups in that kind of high-end, high-value vehicle space.

“Transition periods like this always bring opportunities. It’ll be a challenge, but for a technician who might be wanting to start up on their own, or for a business that’s looking to transition because they know the older-style work will gradually dry up, it could be a viable option.”

### 03 **DON’T EXPECT TO HIT THE BIG TIME**

Andy Turbefeild, Head of Quality at Halfords Autocentres, sees these types of conversions as very much a niche area, viable only for the classic car market, where owners are more likely to have the requisite deep pockets to pay for the process. “These technologies are great, but you have to think of them from a clean sheet of paper, I think, to make the most efficient use of them,” he says.

Even so, he adds: “Technology is moving at such a rate that staying up to date is

Lunaz’s converted Jaguar XK120 is billed as “indisputably the most beautiful electric car in the world”. OK, so modesty might not be their strong suit...

vital for vehicle technicians. You can very easily get left behind. That suggests to all of us in the motor trade that we need to speed up our upskilling and increase our knowledge of what these vehicles have.”

Andy Savva, The Garage Inspector, agrees that this emerging market is likely to remain fairly small, but he does see opportunities for qualified technicians. “Hopefully, this new EV niche will encourage some to diversify their current skills, or maybe it will allow young technicians to come into this market, which is much needed.

“It’s a niche market at the moment, but you have to upskill properly. You have to be aware of safety, because safety is paramount,” he explains.

“But when you’re going into a new market, you have to go into it with a lot of research. Invest a lot of time in making sure that if you’re going to go into this, you have a market.”

The UK historic car market is worth an estimated £6bn a year. What’s more, a study a few years ago by the Federation of British Historic Vehicle Clubs found that there are more than one million historic vehicles registered in Britain, with a total value of £17.8bn. If EV conversion specialists can successfully tap into that market, young technicians may be able to carve out promising careers in this emerging space. ■

**If EV conversions seem like a tempting career challenge, contact a training provider and get qualified for the electric revolution.**

–  
**Check out the courses the IMI offers at [tide.theimi.org.uk/learn/qualifications/electric-vehicle-qualifications](https://tide.theimi.org.uk/learn/qualifications/electric-vehicle-qualifications)**



# WE WANT TO HEAR FROM YOU!

The IMI is reviewing the National Occupational Standards that feed directly into your qualifications. To make sure they're as relevant as possible in an electrified world, we need your input

The IMI recently announced that it is carrying out a review of the National Occupational Standards (NOS) for Electric and Hybrid Vehicles. Our expert working groups have already met online, and we are ready to reveal their suggested amendments. But we want to hear from you too...



## HERE ARE THE MAIN DEVELOPMENTS THAT WE NEED YOUR FEEDBACK ON:

1. Electric and hybrid vehicles should be referred to as **“electrically propelled vehicles”** in the NOS;
2. References to **“high-energy”** should be amended to **“high-voltage”** in the NOS;
3. Unit EV01 should be appropriate for more job roles, including MOT testers and drivers;
4. Unit EV03 should be renamed **“Remove and replace components in an electrically propelled vehicle’s high-voltage powertrain and ancillary systems”**;
5. A new unit should be developed: LV06, **“Diagnose and rectify faults in an electrically propelled vehicle’s powertrain and ancillary systems”**; and
6. A question: Do we need the NOS to deal with standards for the maintenance and repair of alternative energy fuel sources and systems?

–  
To view the amended NOS suites and draft documents in full, head to [tide.theimi.org.uk/about-imi/governance/national-occupational-standards-reviews](https://tide.theimi.org.uk/about-imi/governance/national-occupational-standards-reviews)

## BE PART OF THE DEBATE

–  
We’ve put together a short survey so you can have your say on the standards. To take part, head to [surveymonkey.co.uk/r/BDHK7GW](https://surveymonkey.co.uk/r/BDHK7GW)

We’d also welcome email feedback, and we’re happy to arrange telephone calls to discuss everything that’s taking place. Please contact Caroline Harris at [carolineh@theimi.org.uk](mailto:carolineh@theimi.org.uk) or on 07827 856564

–  
The IMI welcomes anyone who wants to participate. Thank you for helping us keep the standards up to date and relevant

Lockdown more than halved the traffic on our roads and resulted in a big reduction in emissions. As people gradually return to work, can electric scooters keep the air clean?

WORDS\_JON QUIRK

# CRANKING UP THE VOLTAGE



It may not be a hog, but the BMW C Evolution shouldn't do too much damage to your street cred





**A**DDRESSING THE CLIMATE emergency has been rising up politicians' to-do lists during the summer lockdown, what with changes to our working patterns and lifestyles delivering a significant (if temporary) boost to air quality through reduced carbon emissions. OK, so 2020 has been extreme, but at least it has proved that change is possible.

Transport currently accounts for 28% of the UK's greenhouse gas emissions, so the sustainability issue isn't going anywhere as we think about the future of transport. That means giving serious consideration to ideas such as zero-emission vehicles and carbon-neutral manufacturing.

At the Low-Carbon Vehicle Partnership Conference this summer, the Secretary of State

for Transport, Grant Shapps, pointed out just how thoroughly COVID-19 has changed our world. "This gives us a unique opportunity within transport to rethink the way that we travel, to speed up the development of clean technologies and to put the green recovery at the heart of our plans for the future," he said.

It's all very worthy stuff, but commuters need solutions for the new normal – now. With transport patterns starting to return to pre-coronavirus levels, the priorities for the urban commuter are to find an alternative that's cheap to buy and run, that doesn't possess a suicidal fuel gauge and that prevents you from having to wedge your face into someone's armpit every morning. Saving the planet may be a happy offshoot, but social distancing remains critical, after all.

Yes, that colour is called Electric Green, just in case you hadn't quite got the message

## TRUSTING TWO WHEELS

With more and more people looking for alternatives to public transport, motorcycles will need to be part of the mix. In July, the Motorcycle Industry Association reported a 56.6% increase in scooter registrations compared with last year, equating to a total of 3,576 units.

It's easy to see why: twist-and-go scooters are easy to ride and park, practical, inexpensive and good fun. And who doesn't fancy an extra serving of serotonin at the moment? Scooters also provide a genuine alternative to public transport, offering completely isolated travel and reducing anxiety levels should you need to start negotiating the office commute again.

Yet just as we have seen both taxis and last-mile delivery services becoming



electrified, the humble scooter is also ripe for reinvention. For urban settings, electrification is a no-brainer, as all forms of internal combustion engine are prone to creating a less-than-attractive combination of emissions, toxic organic compounds and particulate matter. PM2.5s are the most harmful particulates, mainly because they find it easiest to get into your bloodstream when you breathe them in. They can also stay in the atmosphere for weeks, depending on the weather.

It's fair to say that some motorcycle manufacturers are further along this road than others. BMW must take a bow for its pioneering electrification strategy in both cars and bikes. Its all-electric C Evolution maxi scooter first appeared back in 2012 at the London Olympics and went on sale in 2014. Today, the updated C Evolution has an electronically limited top speed of 75mph and boasts a 100-mile range, benefiting from the same battery technology featured in the BMW i3 city car. Its high price, an eye-watering £14,330, may have made it a low-volume product, but it has paved the way for a whole portfolio of electric models. BMW recently trademarked the names CE 02 and CE 04, so watch this space...

BMW and other incumbent manufacturers haven't quite cornered the market yet though, and there are a number of upstart companies vying for position. Things are definitely starting to get interesting in the EV scooter space.

## CHARGING INTO THE MARKET

One of the most dynamic entrants to the two-wheeled market is NIU. This Chinese company launched in 2015 after carrying out one of the most successful crowdfunding campaigns ever. Since September 2018, NIU has been listed on the NASDAQ stock exchange and has

sold more than 1.1 million units across 42 countries. Its stylish and affordable all-electric models – not to mention its on-trend brand stores appearing in Berlin, Rome and London – are helping to bring about the extinction of the petrol-powered scooter, and sooner rather than later.

In the UK, the NIU NQi GT/S (catchy, right?) has quickly established itself as one of the best-selling electric scooters on the market, and for good reason. It offers a brisk, benign and user-friendly introduction to two wheels and, with the help of the Government's Plug-In Vehicle Grant (which pays for 20% of the purchase price of the vehicle, up to a maximum of £1,500), it costs less than £3,000. On a finance plan, that's the price of a posh coffee per day and comparable to a petrol-powered scooter.

Like many other all-electric vehicles, NIU's models can now take advantage of the rapidly expanding charging infrastructure. And unlike the BMW C Evolution, the NQi GT/S features two lithium-ion battery packs that can be removed and charged overnight in your home. It's perfect if you live in the urban jungle on the 17th floor and don't have access to off-street parking or dedicated private charging facilities.

NIU's forward-thinking approach to both modular battery assembly and 4G connectivity has inspired a raft of other tech-minded startups to enter the fray. From established carmakers like SEAT to newcomers such as Super SOCO and Indian-owned Dutch startup Etergo, they're competing for a slice of a global market that is expected to sell an estimated 500 million two-wheelers between now and 2030.

That means it's time for the big bikemakers to step up – and they are. Honda, Yamaha, Kawasaki and Suzuki have recently put aside their rivalries to work together on developing a standardised set of specifications for electric bike batteries.

And there's a role in this for policymakers too. Collectively, the rising popularity of electric scooters is worth encouraging, as these vehicles could play a significant part in the efforts to meet the UK government's ambitious Road to Zero targets. Exciting times certainly lie ahead. ■



**INSTITUTE OF THE  
MOTOR INDUSTRY**  
Driving the industry since 1920

# Coaching your team through change

Managing a team can prove challenging at the best of times but throw in a situation that none of us are accustomed to like COVID-19 and it becomes a very different experience.

To help you, we have created a COVID-19 IMI Hub where you can access:

- A range of supportive materials to aide coaching, managing and leading from afar
- Free online courses to help the continuation of learning
- Resources that will help you manage stress, motivation and home-working
- Industry updates

Seek the support you need to take you, your teams and business through COVID-19 at [www.theimi.org.uk/covid](http://www.theimi.org.uk/covid)





## MEET THE ELECTRIC GENERATION

From the big names you know to the newcomers you don't, get set for the next wave of electric scooters hitting the streets

### 01 BMW C EVOLUTION

BMW's offering was the pioneering maxi scooter that made the electric two-wheeler credible. Unfortunately, it's too expensive to be anything other than a niche interest.

### 02 VESPA ELETTRICA

The Elettrica is the first electric scooter in the Vespa family, with traditional chic styling and a recently upgraded battery pack. It's still slower and less practical than the startup offerings though, so the heritage factor clearly comes at a price.

### 03 NIU NQi GT/S

From a startup founded by an ex-Microsoft employee, this model uses batteries from Panasonic and electric motors from Bosch. The NQi GT/S is the flagship of a six-model range and delivers 100 miles on a single charge. *Forbes* has tipped the brand as "very likely to become the new Vespa".

### 04 SUPER SOCO CPx

The UK's best-selling electric motorcycle brand is definitely going places. The CPx uses a 4 kWh motor, promises 80 miles of range and can be ridden on UK roads with just the compulsory basic training and L plates.

### 05 ETERGO APPSCOOTER

A third of the Netherlands sits below sea level, so perhaps it's no surprise that the Dutch have become rather gifted problem-solvers. Newly acquired by Indian-owned Ola Electric Mobility, Etergo is justifiably proud of its patented removable battery pack with a maximum range of 150 miles.





# CITY

Honda was late to the EV party, but its first battery-electric car – the e – is finally here. *MotorPro* takes a tour of this small but perfectly formed city car to find out how it's recharging the market

WORDS\_JAMES SCOLTOCK

# SLICKER





"So where does  
the petrol go?"

IN CASE YOU HADN'T NOTICED, the world is changing. Electric vehicles are here – and they're here to stay. By now, if you haven't seen a Tesla Model S, a Nissan LEAF or a Renault Zoe on the road, then you've probably been walking around with your eyes closed. And if you take a look now, you'll see a new addition to the EV crew: the Honda e.

Honda is a late entrant to the EV game, but it has big plans to expand its electrified offering, adding another battery-electric car and introducing hybrid technology to other vehicles in its line-up (remember the CR-V hybrid we walked around in Issue 3?)

The Japanese giant has a long history with electrification – it introduced the original Honda Insight way back in 1999 – so it

shouldn't be a shock to see it applying its know-how to the current range.

The Honda e is different though. This isn't a case of crowbarring electric technology into an old design. No, the e has been developed from the ground up, with a new platform to accommodate the electric components, from the motor to the cooling system, the DC-DC converter and the battery – without any compromises.

The same is true of the interior. The cabin offers an ultra-modern, minimalist design, but it's dominated by the huge, high-definition displays that make up the instrument cluster and infotainment system. It's the perfect look for a generation of drivers that has grown up with smartphones. And to keep the older petrolheads on side, the e is rear-wheel drive.



### Hitting the streets

There's no escaping the fact that the Honda e is a city car. It's on the small side, at just 3.9m long and 1.75m wide, making it perfect for shooting around urban streets. And with the instant power delivery of an electric motor, it's swift when the traffic lights turn green too. It hits 62mph in around eight seconds, so 30mph city limits take the blink of an eye.

The 35.5kWh battery stores enough energy to give the Honda e an official range of 125 miles from a single charge. That's not quite enough for long-distance touring, but it's more than sufficient for day-to-day life. With a Type 2 charging port, the e can be recharged in as little as 3.5 hours, or it can hit 80% in just 30 minutes using a fast charger.

And that's not the only way to get power. The e uses regenerative braking, and its one-pedal driving system means that as soon as you take your foot off the accelerator, the car begins to come to a stop, feeding energy back into the system. It's a strange idea to begin with, but once you get used to it, approaching and stopping at junctions becomes second nature. It also means you get less wear on the brakes.

Navigating the urban jungle should be a little less stressful thanks to the range of advanced driver-assistance systems (ADAS) on board. The e has them all: pedestrian detection, collision warning, adaptive cruise control, lane assist and traffic sign recognition.

If it wasn't already, these systems make the Honda e an incredibly complex vehicle.

Warning: do not drive the Honda e into a fish tank



## **“FEW OWNERS WILL NEED TO LOOK UNDER THE BONNET, BUT TECHNICIANS WILL NEED TO KNOW THE SPECIFIC PROCEDURES REQUIRED TO BLEED AND REFILL THE COOLANT SYSTEMS”**

Workshops will really have to be ready for when one rolls in for its first service.

### **Under the hood**

If you look at an X-ray image of the Honda e, it almost looks as though there are two motors: one at the front and one at the rear. Thankfully, Jason Ryder, Press Fleet Technician at Honda, assures me there aren't.

“When you look at the front, it almost looks like there's a small engine there, but there definitely isn't. There's a DC quick charger, an AC charger, the 175-amp DC-DC converter, the brake booster unit, the electric A/C compressor, the fuse box, the cabin heater pump and the front junction board,” he says.

But that's not all. “There are also three independent cooling systems too – quite a rare thing. There's one for the DC-DC converter, one for the motor and then a normal heating system for the car too,” says Ryder.

Few owners will need to look under the bonnet (except to check washer fluid levels every so often), but technicians will need to know the specific procedures required to bleed and refill the coolant systems. And then they'll need to make sure they're qualified to inspect and work on the high-voltage components too.

The rear of the vehicle, which houses the electric motor and the power control unit, is even more complex. These components are, for the most part, accessed from beneath the vehicle; thankfully, they're unlikely to need much maintenance.

Getting under the e reveals just how big its battery pack is. It forms almost the entire underfloor of the vehicle and a considerable part of the Honda e's 1,525kg unladen weight. That has the effect of lowering the car's centre of gravity, and even though you're never going to hit warp speed, it does help to make this a fun car to drive.

### **Diagnosing problems**

The Honda e is still factory-fresh, so there's no track record to indicate what problems might arise. But as with any car, when issues do occur, it'll be important to diagnose them quickly and get these cars back on the road as efficiently as possible.

That's what the on-board diagnostics port is for, allowing you to monitor the current and



“And this here is the windscreen...”

voltage going through the system and get data on individual cells in the battery pack.

And it isn't just information on the powertrain that you'll need to access. With so much ADAS technology on board, sensor recalibration will be essential should the vehicle need repairing. “If you're replacing the windscreen, for example, it's imperative that the cameras are set back up correctly,” says Ryder.

That certainly applies to the Honda e's side-mounted cameras, which have replaced traditional wing mirrors. The images are fed into the rear-view screens in the interior, so correct calibration will be paramount to make sure there are no dangerous blind spots.

Honda may have taken its time with the e, but this is clearly a forward-looking vehicle that's well placed to meet the rising demand for EVs. The onus is now on technicians to get up to speed and make sure these cars stay ready for whatever the urban jungle can throw at them. ■



IMAGES\_WILL\_AMLOT



## HOW TO KEEP THE HONDA E READY TO ROCK

Honda Press Fleet Technician Jason Ryder explains what to look out for should a Honda e roll into your workshop

**01 Keep your cool**  
"Refilling any of the cooling systems requires a specific bleeding procedure, so make sure you check that out properly."

**02 Check it over carefully**  
"The high-voltage battery cover should be inspected, especially after an accident or airbag deployment, and the batteries will require a leak test."

**03 Keep everything lubricated**  
"The transmission uses automatic transmission fluid to lubricate it and keep it cool. That requires changing at 100,000km under normal conditions. Brake fluid also has to be changed at the indicated service intervals."

**04 Stay safe**  
"Unless you've completed the training, you can't go near the high-voltage systems, so it pays to get yourself certified. There are three golden rules you need to follow when dealing with high-voltage components: disconnect, secure against reconnection and determine the absence of high-voltage charge."

**05 Use the right equipment**  
"The minimum requirement would be to use the fully insulated toolkit, where everything is insulated, from the ratchets to the screwdrivers."



# DIAL A FOR ASSISTANCE

It's not all about EVs... we're also locked into an ADAS future. Here's how industry giant Thatcham Research is getting ready, as it outlines a standardised approach to ADAS repairs

**WORDS**\_CHRIS PICKERING

MORE THAN FOUR MILLION vehicles on the UK's roads already have some sort of advanced driver-assistance system (ADAS) installed. That's around 10% of the total vehicle parc.

That number looks set to soar over the next few years, with new EU legislation coming into force in 2022 to make a number of ADAS functions compulsory on new vehicles, including autonomous emergency braking (AEB) and intelligent speed assist. It's highly likely that the UK will adhere to this legislation irrespective of Brexit, so there's no escaping it.

With this in mind, Thatcham Research released a new set of ADAS-specific UK Insurance Industry Requirements (IIRs) this summer, in an effort to help vehicle repairers and insurers get ready for the change.

"For several years now, we've been collaborating with stakeholders in the industry to develop a standardised approach to ADAS repair," says Dean Lander, Head of Repair Sector Services at Thatcham Research. "This was formalised in an IIR to give insurers a set of standards that would ensure vehicles come back onto the road in their pre-accident condition."

Thatcham has also issued a set of practical guidelines to help technicians devise a repair plan for ADAS-equipped vehicles. This then feeds directly into the cost estimate to be given to the customer or the insurer.

"The route to standardisation starts with ensuring that the individual repairing the car has the right level of knowledge to manage the process.

That extends beyond using a piece of equipment. It involves being able to assess what's actually on the vehicle and then acquire the appropriate methodology to treat that vehicle," says Lander. "The IIR establishes a process that ensures that can happen, while the guidelines enable the technician to decide on the best course of action."

## HIDDEN IN PLAIN SIGHT

The first hurdle is identifying what kind of ADAS is fitted and whether recalibration is needed. This has often been overlooked in the past.

Unlike traction control systems, cars don't generally feature a physical button to disable ADAS functions such as AEB. If there is an option to do so, it's often hidden in one of the sub-menus. The





### In a nutshell: Thatcham's IIR

A repairer shall in all cases:

- Identify the presence, or not, of ADAS on the vehicle and ensure that this is recorded.
- Where ADAS is present, ensure that repair procedures clearly identify whether inspection, realignment and calibration are required and why.
- Complete all relevant inspection, realignment and calibration activities as detailed within the repair procedures.
- Ensure that inspection, calibration, realignment and road tests are carried out by a currently competent person.
- Check that the calibration results confirm that the sensors are functioning in line with the manufacturer's technical specification.
- Produce fully verifiable and auditable records and provide a copy to the vehicle owner and/or insurer.

## **"THE ROUTE TO STANDARDISATION STARTS WITH ENSURING THAT THE INDIVIDUAL REPAIRING THE CAR HAS THE RIGHT LEVEL OF KNOWLEDGE TO MANAGE THE PROCESS"**

DEAN LANDER, THATCHAM RESEARCH



sensor hardware can be similarly tricky to find. Radar sensors for blind-spot monitoring systems are often integrated into the wing mirrors, along with the cameras for 360° parking displays. What's more, manufacturers are increasingly turning to "sensor fusion", where multiple different types of sensor (such as radar plus a camera) are combined. Repairers need to be mindful of all the possibilities.

Let's not forget that repairs to other parts of the vehicle can sometimes have a secondary impact on ADAS too. "The vehicle could come into the repair shop with damaged suspension. Repairing or replacing the suspension could affect the geometry of the vehicle, so consideration should be given to whether the ADAS will now require recalibration as a result," Lander says.

This could become an incredibly important part of the repair process, as even a small change to the sensor alignment can have a significant effect. A one-degree variation in the angle of a long-range sensor used for adaptive cruise control could result in a 2.6m error over a distance of 150m.

As such, the new IIR applies whenever inspection, realignment or recalibration of the ADAS is considered. That includes damage to an ADAS sensor itself or parts likely to affect its functionality, as well as instances where the vehicle's geometry is likely to have been affected.

### THE CALIBRATION CHALLENGE

Calibration is not covered by Thatcham's practical guidance because there are so many variations on the process. Broadly speaking though, calibration falls into one of three categories: static (where the car is stationary and the calibration equipment is brought towards it), dynamic (where the car is driven in a dedicated calibration mode) or self-calibrating (where the vehicle carries out its own calibration under normal driving conditions).

To make things harder, the data that's required to diagnose faults and recalibrate the system is often only shared with franchised dealers and their approved partners. However, Thatcham has been pushing for more manufacturers to make this data available to independent repairers. Thatcham now also offers a range of training courses, from basic awareness courses through to an IMI-accredited qualification on the new IIR.

Whatever innovations the future may bring, you can be sure that ADAS will play an increasingly significant role in vehicle repairs. It's time to get ready. ■

### Get ready for change

Thatcham Research has called for an implementation phase to be added before the IIR is mandated by insurers in March 2021. This would provide time for those engaged in the claims supply chain to adapt their processes.

Looking further ahead, the IIR and the accompanying guidelines have been written to allow for any changes that might take place in the rapidly evolving world of ADAS.





# FINDING THE STARS OF TOMORROW

The Skill Auto competition was an unfortunate victim of the pandemic, but the IMI Skills Competition 2020 is stepping into the breach to recognise the talent coming into the industry

**WORDS** JAMES SCOLTOCK

COVID-19 may have curtailed this year's Skill Auto competition, but the IMI isn't about to let that stop the next generation of talent showcasing their skills.

The 54 competitors who were due to take part in the Skill Auto event – across the Light and Heavy Vehicles, Refinishing and Body Repair categories – will now go head to head in the IMI Skills Competition 2020.

With social distancing restrictions in place, the competition has headed online, but it will still cover all of the skills needed to succeed in each category.

At the end of September, the competitors (right) completed virtual tests to determine the winners of the 2020 cycle of the competition. The victors will be announced on 29th October in a live online event hosted by the IMI's CEO Steve Nash.

Each category's top six competitors will receive IMI membership, which includes free EV eLearning to help them prepare for whatever the future holds, as well as ongoing support throughout the rest of the year. ■

**LIGHT VEHICLES**

Oliver Brown	Farnborough College of Technology
Nathan Crook	Jaguar Land Rover
Matthew Downey	South West College – Dungannon Campus
Samuel Holden	Volvo TDC
Matthew Houghton	Volvo TDC
Murray Inglis	Edinburgh College – Sighthill Campus
James Kennedy-Pratt	Edinburgh College – Sighthill Campus
Daniel Mayman	Volvo TDC
Sam McCausland	Volvo TDC
Alex Mills	BMW Group Academy
James Penny	Edinburgh College – Sighthill Campus
Gareth Rea	South Eastern Regional College – Downpatrick Campus
Joshua Reid	Transport Training Services
Luke Sterritt	BMW Group Academy
Iwan Twigg	Pembrokeshire College
Daniel Ward	Jaguar Land Rover Academy

**HEAVY VEHICLES**

Mason Bannister	Ford & Slater Ltd
Jacob Bell	Ford & Slater Ltd
Daniel Bird	Stephenson College
David Bodie	Stephenson College
Ryan Bowles	Coleg Gwent – Newport Campus
Kristian Eiersland	Cardiff and Vale College
Ben Gray	Ford & Slater Ltd
Daniel Johnson	Ford & Slater Ltd
Luke Maylin	Stephenson College
Mark McAdams	Fife College – Glenrothes Campus
Daniel Rayfield	Harris DAF Grays
Joshua Roberts	Cardiff and Vale College
Darren Watson	Fife College – Glenrothes Campus
Marc Winchester	South Eastern Regional College – Lisburn Campus

**REFINISHING**

Jack Birchall	Cheshire College South and West – Crewe Campus
Steven Craig	New College Lanarkshire – Motherwell Campus
Stephen Halsall	Blackpool and the Fylde College
Ryan Lowrey	Blackpool and the Fylde College
Ethan McGrory	West College Scotland – Greenock Campus
Joshua Millar	Transport Training Services
Bradley Monroe	Bentley Motors
Scott Neilson	New College Lanarkshire – Motherwell Campus
Nathan Palfrey	BMW Group Academy
Owen Sims	Cardiff & Vale College
Andrew Swain	3M
Marc Wolfenden	Gateshead College

**BODY REPAIR**

Owen Bird	NPTC Group – Pontardawe College
Ryan Docker	Cardiff and Vale College
Robert Gray	Riverpark Training
Dale Jones	Bridgend Ford
Craig Kernohan	Riverpark Training
Ben Martin	Volvo TDC
Tiler Moorcroft-Jones	Grŵp Llandrillo Menai – Rhyl Campus
Harry Owens	Blackpool and the Fylde College
Brandon Taylor	Grŵp Llandrillo Menai – Rhyl Campus
Liam Thomas	NPTC Group – Pontardawe College
Ryan Wainwright	Volvo TDC
James Williams	Cardiff and Vale College





ACCELERATION

SPORT

INSANE

TRACTION CONTROL

SLIP START

...to help free ver...  
...sand, or m...



THE DAY I...

# DROVE A TESLA FOR THREE(-ISH) SECONDS

WORDS\_JONATHAN MUSK

IT'S 7AM ON SUNDAY 5TH JULY 2015 AND I'm in Amsterdam. As I approach the pearl-white Tesla Model S P85D, the door handles extend automatically to greet me. My passenger and I hop in and get ourselves comfortable; we've got a long journey of some 360 miles ahead of us. Pressing the brake turns the car on, and I select the "Insane" acceleration mode on the imposing 17-inch display. "Ready?" I ask my passenger.

It's worth pointing out that I could have chosen any number of different motoring experiences as the drive of my life, each deserving of a feature of their own. To put things in perspective, over the past seven years, I've been privileged enough to drive some of the world's most desirable new cars, and I've seen rather a lot of the world through a windscreen.

For instance, I once drove a Nissan LEAF from London to Paris, before there was a charging network. I've pushed a Jaguar I-PACE to its limits on the racetrack, and I've romped about Henley-on-Thames in a Honda e. But despite these experiences (and many more), all it took was three seconds for the Tesla

Model S to win its place as the true drive of my life.

In case you're wondering: no, I'm not yet another blinkered Tesla fanatic. Nor am I related to Elon. In fact, I fully admit that there's a lot to criticise the company for, from its curiously brazen implementation of the Autopilot system to the dubious build quality. Equally, though, there's just as much to praise.

When I was growing up in the 1980s and '90s, I would have been lucky to find a supercar that could hit 60mph in five seconds. Those that managed to get there were stupidly impractical, requiring both athletic expertise to climb into them with any dignity and Schwarzeneggerian leg muscles to operate the pedals. And that's without even mentioning their highly complex and usually frail engines, with fuel consumptions bad enough to make Koch Industries worry. Bear in mind, too, that petrol cars already had 100 years of research and development behind them.

By contrast, electric cars hadn't really been touched since their disappearance from showrooms in the 1910s. And then, just 12 years ago, Tesla Motors was born.



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Its first car was the Roadster – a battery-electric car based on the Lotus Elise. It was startlingly rapid, setting its rear tyres alight in a torque-frenzied spin at the slightest whiff of a right foot on the accelerator pedal. It embarrassed elite supercars the world over and caught the attention of the motoring press and public alike. However, it was yet another flawed and very expensive sports car that the everyman was unable to enjoy. Plus, its relatively impressive 200-mile range was limited by a lack of any supporting charging infrastructure.

To say that it was a shock when a second Tesla, the Model S, appeared just four years later is an enormous understatement. Unlike the Roadster, it was a large saloon capable of seating up to seven people thanks to two optional rear-facing seats in the boot. It had acres of luggage space too, a space-age 17-inch centre console and enough refinement (thanks to its electric drive) to rival the best the industry had to offer. Alongside the car's launch came Tesla's aggressive installation of a new global "Supercharger" network. Crucially, that meant no more sitting idly by for hours while your car charged. Development was rapid too, and in 2015 the company introduced the first all-wheel drive model, the P85D, with a claimed 0-60 time of just 3.1 seconds. That was the sort of acceleration reserved for fighter jets, bullets and a human sneeze – not some lardy saloon.

And so, there I was in Amsterdam. I had no difficulty getting into the car, and there was no dramatic engine crackling in the background. Even with the windows open, the only sound was the faint hum of the air conditioning.

We pushed ourselves hard into the seatbacks, as though preparing to be launched into orbit, and I took a deep breath. In the moment, it was as though everything around us went into slow motion, allowing us to take note of the minutiae of our surroundings. As the traffic lights turned green, a glance in the mirrors confirmed that the road was clear. I stamped on the accelerator.

In an instant, torque at all four wheels rocketed us forwards, with only the tyre wall's modicum of elasticity offering any respite from the neck-snapping forces. Our pulses raced, and our organs felt as though they'd been crushed in a vice. Our retinas



You know what they say about big centre consoles...



struggled to keep up with the immediately blurred surroundings, turning the wide street into a narrow tunnel.

In less than a second, we were travelling at more than 10 metres per second. The speedometer's digital numbers danced like a rolling dice to keep up with the car's relentless acceleration. Two seconds in and we were already travelling twice the speed we'd been doing just one second earlier.

Wide-eyed, pale and clinging to the seat, my passenger screamed at me to slow down. Just over three seconds had elapsed and we'd already exceeded 100km/h.

I eased the throttle back to a steady cruise. Our bodies caught up with the shock of the horizontal free fall and our lungs gasped to breathe again. The car had just propelled us with the equivalent force of the planet's gravity. It was brutal, uncomfortable and a total revelation.

Even so, this wasn't what made it such a special moment. I was in Amsterdam to

celebrate Tesla's billionth electric mile. I'd even driven there from the UK using the Supercharger network. Tesla, a total upstart, had managed what long-established brands had failed to do. It had created the full package: an electric car with the space, practicality, refinement, range, charging support and outrageous million-pound supercar performance, all for a price similar to that of a conventional petrol-powered luxury motor.

Electric cars were no longer just an alternative to petrol. Suddenly, they were a plausible replacement. ■

**Jonathan Musk is the founder of specialist EV magazine *AutoVolt* and Content Editor at *Fleet World***

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### OK, Computer...

Tom Denton takes us inside the mind of a self-driving car and explores the ethical headaches involved

**P65**

# THE HOW TO SECTION

Everything you need to know to do your job brilliantly, by the IMI's expert contributors



### **P60\_STAY ON TRACK WITH MOT CPD**

Don't leave it all to the last minute! Here's what you need to know to nail this year's CPD requirements for testers



### **P61\_GET AHEAD IN THE JOB MARKET**

If you find yourself looking for a new role right now, remember this: standing out from the crowd has never been more important



### **P63\_GET READY TO CALIBRATE ADAS**

Electrification isn't the only new tech out there. Here's how you should be preparing to work on the latest driver-assistance tools-



### **P70\_DIG INTO A CAN BUS NETWORK**

The CAN bus is a vehicle's central nervous system. That means it's your job to understand precisely what it's telling you

## HOW TO...

# Keep your MOT CPD motoring

The annual training for MOT testers often gets left to the last minute. What do this year's requirements include?

WORDS: PAUL CHARLWOOD MIMI CAE

Continuing professional development (CPD) is one of those areas that tends to get neglected, but it's incredibly important – not only to make sure your knowledge stays up to date, but also to make you a better tester.

This year's CPD modules cover three specific areas:

- Issuing MOT certificates, failure certificates and other documents;
- The disciplinary points system; and
- The vehicle categories that fall under the group of vehicles you test (eg, motorcycles or cars and light goods vehicles).

Here's my advice to make sure your skills are up to scratch and to ensure you get the most from your CPD.

### Documents

We tend to think we know all about documentation, but it's surprising how many garages get it wrong. For instance, I regularly find MOT centres with out-of-date Contingency Testing documentation and the now-redundant CT32 advisory document.

The trouble is that when we hand over shabby bits of paper to the DVSA examiner and they are found to be out-of-date, then it's obvious that something has gone wrong with the garage's management practices.

**Top tip:** Don't just do the CPD, take the time to check what documents you have on file.

### Disciplinary points

A lack of knowledge here can cause real problems. Recently, I spoke to a tester who had received advice from a visiting DVSA examiner. The examiner had advised

### Vehicle categories

If testing is carried out on a vehicle that the centre is not authorised to test, you can get into deep trouble very quickly. This normally falls into two types of shortcoming:

- **Where the tester knows, or should know, that the vehicle is not of the right class.** The DVSA has noted

of 3,000kg, but a few weigh in at 3,200kg. Usually, the DVSA will accept that this is a genuine error and only issue 50 points. (I say only 50 points, but dependent on your disciplinary history, that could well result in a formal warning.)

**Top tip:** If a customer asks you whether you can you test a certain category, refer to the notice board and take a look at your VT9A. This valuable source of information is often overlooked by garage staff but usually answers the question.

### The Guide and the exam

Most of the information for this year's CPD can be found in the MOT Testing Guide. Managers often think it's for testers, and testers think it's for managers. It's a massive source of information, and familiarising yourself with it will improve the quality of your testing and your knowledge of the MOT scheme.

The sooner you get on with the CPD training, the better. I suggest you do it with the IMI, and I recommend you take the training as well as the assessment. The pass mark this year is higher than in previous years, at 80%, so it's easy to fail if you haven't had the training. You'll need to do it by 31st March 2021.

—  
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the tester about a particular shortcoming and had issued a VT59 advisory document. The tester told me that they weren't bothered by this; if the issue had been serious, they'd have received points.

Unfortunately, that's not true. The examiner had issued the VT59 and had the tester's signature to prove it. That's a ticking time bomb. If the DVSA revisits the site and finds the same shortcoming again, points could be issued. And they will ramp up.

previous instances of vehicles being issued with test certificates where they couldn't possibly have fitted through the workshop doors. That's a 500-point penalty, and the tester and authorised examiner could be for the high jump.

- **Where a vehicle might, at first glance, appear to be of a class that you can test.** A typical example would be the threshold between Class 4 and Class 7. One popular van has a model where most have a design gross weight



## HOW TO...

# Make yourself more marketable

In a year like no other, the job market has become highly competitive. Give yourself an edge with these five tips

WORDS\_ SALLY-ANNE HODDER FIMI

The COVID-19 pandemic has undoubtedly shifted the job market, making it more more competitive than normal. Many businesses with large overheads and fewer customers are now looking to cut back on the number of staff on the books and have stopped taking on apprentices and interns. That means competition for positions is fierce and only likely to become more so – in the short term at least.

But that isn't the only shift in the market. As things change, many people are rethinking their careers and taking the opportunity to follow their passions. It's an evolving landscape where only one thing is certain: that competition is growing.

So, if you're looking to take your next step in the job market, you'll need to stand out from the crowd. Gone are the days of sending off your CV and expecting an interview and then a job offer. These days, you need to demonstrate why you're better than the rest. Here are five ways to do that.

**“AS THINGS CHANGE, MANY PEOPLE ARE RETHINKING THEIR CAREERS AND TAKING THE OPPORTUNITY TO FOLLOW THEIR PASSIONS”**



### 01\_Demonstrate smart working practices

Times have changed, so as a potential employee you need to prove that you have all the skills needed to do the job in a changing world. That's everything from having the ability to work from home effectively if necessary through to good communication, time management and the ability to work independently.

### 02\_Get social

More roles now require at least a basic understanding of social media, and an ever-growing number of roles also look for knowledge of digital marketing. So get yourself up-to-date and prove that you can do these things.

### 03\_Big yourself up

Half the battle is convincing a potential employer that you're capable, but it's worth thinking about what you could also bring to the organisation moving forward. Don't just focus on what you've done in the past.

### 04\_Show off your skills

Candidates who can demonstrate attributes such as resilience, flexibility and adaptability will hold an advantage over those who can't, so when you're speaking to an employer, go in prepared with examples of when you've shown those skills.

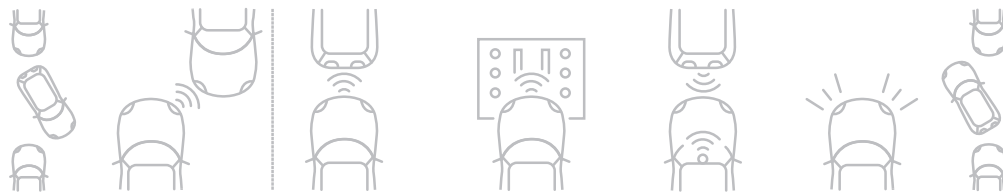
### 05\_Understand where you're applying

So you've fired off your CV and applied for lots of jobs

without really considering much else. (That's OK, we've all been there.) But if you really want to get ahead, you'll need to understand your potential employer's philosophy and culture – and, importantly, why you might want to work with them. If you can show a genuine passion for the company, its mission and its core values, you'll have a clear edge over the other candidates.

—  
**Sally-Anne Hodder is Head of Human Resources at the IMI**

—  
For the latest information, advice and career support, visit the IMI's dedicated COVID-19 pages at [theimi.org.uk/landing/covid-19](https://theimi.org.uk/landing/covid-19)



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## HOW TO...

# Reset your business for ADAS

It's time to get ready for the intelligent cars that'll soon be rolling into workshops. Here's how...

WORDS: NEIL HILTON AMIMI CAE

Advanced driver-assistance systems (ADAS) are now fitted on hundreds of thousands of vehicles on our roads. It's therefore imperative that the cameras and radars used by these complex systems are precisely calibrated to ensure their correct operation.

Ultrasonic sensors, medium- and long-range radar, cameras and lidar are now used (often in unison) to control key safety features such as lane departure warnings, adaptive cruise control, emergency braking and steering assist. These days, there's very little of a vehicle's surroundings that goes unmonitored.

These features are all based on the relationship between a mechanical setting – the car's axis, for example – and an electronic input. If the sensors are not calibrated correctly, then whatever systems the electronic control units (ECUs) adjust could respond with an incorrect action. That could prove incredibly dangerous.

### Don't skimp, start calibrating

As a result, ADAS calibration must be carried out following any accident repair or windscreen replacement. But that's not all. Everyday servicing and repair work such as replacing a steering or suspension component, as well as any adjustment made to the vehicle's geometry, should also be followed by a careful recalibration. This

was recently confirmed by Thatcham Research's latest Insurance Industry Requirements (see page 50 for more on that).

Failure to recalibrate the ADAS could result in incorrect information being fed to the vehicle's ECUs, potentially causing these vital safety features to operate inaccurately. That would pose an unacceptable risk to drivers and other road users.

After all, vehicle owners will need to have confidence that these systems are being recalibrated correctly and that the technician appreciates how critical this is.

### Get up to speed

The question here isn't whether or not ADAS checks and recalibration should be carried out. (In short, they must.) Rather, it's about having the right knowledge and equipment to do it. Here's a simple piece of advice for businesses and technicians: get your training up to date.

Once that's done, you then have to understand that the original manufacturer's calibration standards are final. Diagnostic tools need to follow the same calibration processes used by the manufacturer's servicing network. At Hella Gutmann Solutions, that's something all our equipment delivers.

Over the years, we've worked hard to position



ourselves as a leader in ADAS calibration, and the likes of Thatcham Research, National Windscreens, Nationwide Windscreen Services and Autoglass now use our Camera and Sensor Calibration Tool. That's helping to establish the ADAS calibration standards that the whole sector should be meeting.

### Spend money to make money

Calibration equipment is undoubtedly an investment, but it's a good way for workshop owners to future-proof their businesses. It'll help them stay competitive, and it

also means they can rest easy knowing that every vehicle will be leaving the premises in a safe condition.

Of course, you don't need to invest in every piece of calibration equipment at the outset. Perhaps consider starting with basic tools that will cater for popular vehicles in your area. That will provide an immediate revenue stream and enable you to expand your offering later.

ADAS technology is constantly evolving, so like other companies in this sector, we're continually expanding our range with additional hardware and software upgrades to cover both existing systems and the new tools being introduced to the market. For example, we were the first firm to develop equipment enabling independent garages to calibrate Audi's laser sensor and rear blind-spot unit.

ADAS is undoubtedly here to stay, so preparing now is vital. It could even help you build a more successful business in the future.

—  
**Neil Hilton is Head of Business Development at Hella Gutmann Solutions**

—  
**Update your skills and get ADAS-ready with the IMI's Advanced Driver-Assistance Systems course. Head to [tide.theimi.org.uk/learn/courses/1575](https://tide.theimi.org.uk/learn/courses/1575) to find out more**



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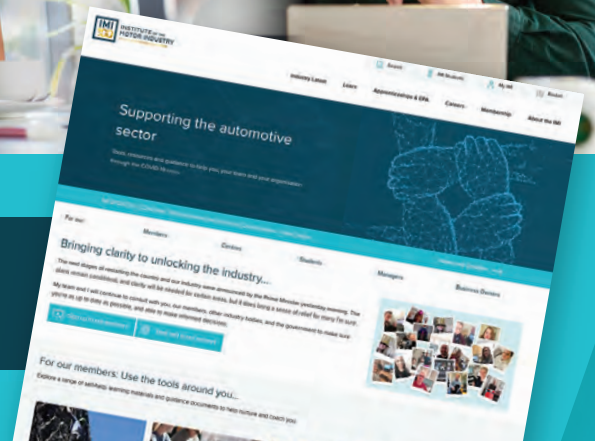


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## HOW TO...

# Think like a self-driving car

Fully autonomous vehicles won't be ready to hit the streets until they can understand and react to the world around them. To get there, they'll need lots of processing power and AI technology

WORDS TOM DENTON FIMI, AUTHOR OF *AUTOMATED DRIVING AND DRIVER ASSISTANCE SYSTEMS*



You see, Doctor,  
sometimes I think I'm  
a medium-sized SUV

For argument's sake, let's just accept the idea that vehicles are going to end up taking greater responsibility for handling certain driving scenarios in the future, and that at some point they'll be able to drive themselves from A to B without any input from a human driver. In short, that means they'll need to be able to think.

The autonomous vehicles (AVs) of the future will use a suite of onboard sensors – including radar, lidar, cameras and ultrasonic systems – to perceive their surroundings. The next logical step, then, is making sense of that information. In other words, it's a question of processing it all and acting on it. That's akin to thinking.

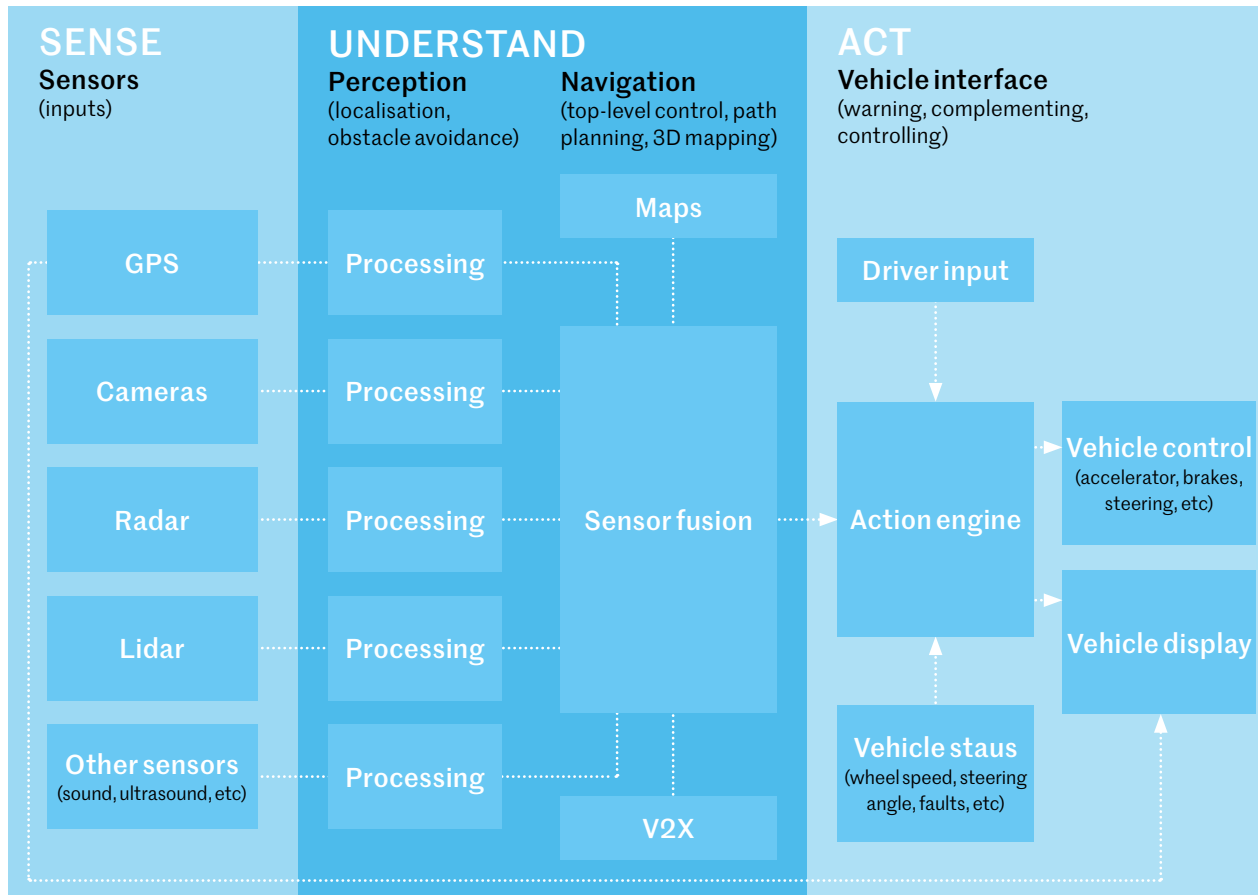
That'll require a huge amount of computing power, some of which will be housed on board, and some of which will be based in the cloud. Either way, decisions will need to be made.

Most will be technical: if the road is clear, move forwards; if not, stop. However, some decisions are moral or ethical: if a crash is inevitable, whose safety is the priority?

**"AT SOME POINT, THEY'LL BE ABLE TO DRIVE THEMSELVES FROM A TO B WITHOUT ANY INPUT FROM A HUMAN DRIVER"**

## HOW TO...

## Think like a self-driving car

**Blocking it out**

To keep things simple, think of an automated driving system as being rather like the diagram above, with three distinct blocks: sense, understand and act.

The sense block represents the combined input from the onboard sensors. These will be a combination of some or all of:

- A GPS receiver to give the vehicle's position and a compass for the direction of travel;
- Cameras to see the general surroundings (including stereo cameras to perceive depth);

- Radar to build a picture of the longer-range surroundings, even in poor light or bad weather;
- Lidar to build up a 3D image of the surroundings; and
- Other sensors appropriate to the particular design.

The understand block is where the serious processing takes place. Significant digital processing is needed because as well as the obvious need for safety, the quantity of data collected by the sensors is staggeringly huge. It's said that a driverless vehicle travelling along the road for a mile generates more data

than an aeroplane flying on autopilot from London to New York. That just goes to show how good humans are at processing information and acting on it, and how challenging it is to develop technology capable of replicating that.

Data from these sensors is processed individually and then combined or fused. Maps come from stored data just like on a normal navigation system, but the need for regular updates will be even greater. Updates can be downloaded from the cloud, and information from other connected cars

will be processed as part of the V2X system – shorthand for “vehicle to everything”, which covers the vehicle's communication with other road users and the area's transport infrastructure.

The act block is what actually controls the vehicle. The action engine combines information from the sensor fusion with any driver input and live vehicle status information such as speed and steering angle. It then outputs that to a visual display and the vehicle control actuators. The key outputs are linear movement (acceleration and braking) and direction control (steering).



## HOW TO...

## Think like a self-driving car

**Seeing into the future**

One key issue is not what the car sees, but what it knows beforehand about the area it's travelling through. High-definition 3D maps are, therefore, an essential element for the navigation and safety of these vehicles. Accuracy down to centimetres is key.

Storing this quantity of data is just one of the technical issues facing engineers. These maps are important not just for navigation, but also because they reduce the amount of work that the vehicle has to do to recognise the world. If an AV can compare its actual surroundings to what it already knows from a map, it can focus more of its processing power on the things that are different, such as identifying a pedestrian, an animal or a bike.

Traditionally, the development of maps has required the deployment of dedicated fleets of vehicles equipped with professional-grade sensors to collect

location, raw imagery, lidar and other data, which is then processed and stored in data centres. Now that cars are more highly connected and equipped with a range of sensors, new approaches are possible.

For example, mapping company TomTom and chipmaker Qualcomm have announced a project to crowdsource high-definition map data. The platform collects and analyses data from different vehicle sensors, supporting smarter vehicles in determining their location, monitoring and learning driving patterns, perceiving their surroundings and sharing this perception data with the rest of the world. The concept is designed to allow massive numbers of connected cars to see and understand their environment, traffic levels and road conditions, while also supporting real-time input for map and road condition updates.

**BOTTOM-UP  
(MACHINE LEARNING)**

- Models are built from simple components connected in a network.
- Relies upon a relatively simple abstract programme consisting of learning cycles.
- The programme builds its own knowledge base and common-sense assumptions.
- Intelligence emerges from the interactions of large numbers of simple processing units.
- A built-in learning mechanism results in adaptivity and flexibility.
- The system is better placed to model low-level human functions, such as image recognition.

**TOP-DOWN  
(SYMBOLIC REASONING)**

- Relies upon a hierarchically organised (top-down) architecture.
- All the necessary knowledge is pre-programmed into the knowledge base.
- Analysis involves creating, manipulating and linking symbols.
- The programme performs better at relatively high-level tasks such as language processing.

**ETHICS IN ACTION**

The trolley problem is an ethical thought experiment developed by Philippa Foot in 1967. Imagine the following:

You see a runaway trolley (or tram) moving towards five people lying on the tracks. They are tied up, so they can't move. You are standing next to a lever that controls a switch. If you pull the lever, the trolley will be redirected onto another track, and the five people on the main track will be saved. However, there is a single person lying tied up on the other track.

You have two options:

1. Do nothing and allow the trolley to kill the five people on the main track; or
2. Pull the lever, diverting the trolley onto the other track, where it will kill one person.

Which is the more ethical option? It might seem that there's an obvious, logical answer, but when you add emotions into the equation, it gets a lot trickier. The dilemma can also be adjusted. For example, what happens if the single person on the track is your child?

These questions have a real-world application when it comes to AVs. If forced to choose, who should a self-driving car kill or injure in an unavoidable crash? Should the passengers in the vehicle be sacrificed to save pedestrians, or should a pedestrian be killed to save the family in the vehicle?

The actual scenarios could be more even complex, but this does illustrate how difficult it is to programme an AV with ethics.



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## HOW TO...

## Think like a self-driving car

## “ALTHOUGH WE ACCEPT THAT HUMANS MAKE MISTAKES, WE DEMAND MORE FROM AUTOMATED SYSTEMS”

### Who's a clever boy then?

The processing power (and complexity) required for an AV to distinguish another car from a pedestrian or a plastic bag floating in the breeze is absolutely massive.

Artificial intelligence (AI) is essential when it comes to processing this information from the sensors. AI systems can be described as either top-down or bottom-up, and while there are advantages and disadvantages to both of these approaches, they tend to be broadly complementary (see bullet points on page 67).

The sheer quantity of data handled by an AV is mind-blowing, and the system must be able to process it all incredibly quickly. Accuracy of detection needs to be extremely reliable, and the decisions made must be better than those made by a human, because although we accept that humans make mistakes, we demand more from automated systems.

There's a lot still to be done. There are plenty of SAE Level 2 vehicles on the roads at present, but no Level 3s (see right). Even though the technologies exist, the social and ethical issues are yet to be resolved. And fully autonomous vehicles at Levels 4 and 5 are even further away.

—  
To find out more about advanced driver-assistance systems, head to [theimi.org.uk/adas](http://theimi.org.uk/adas)



## DEFINING AUTOMATION: THE SAE LEVELS

### Level 0

No automation: the human driver is in control of all aspects of the driving tasks, even when enhanced warning and intervention systems, such as ABS, are integrated on the vehicle.

### Level 1

Driver assistance: the vehicle has integrated driver-assistance systems such as adaptive cruise control, which can perform some acceleration/braking events, and steering assist which can help to keep the vehicle centred in its lane. Even so, the driver is responsible for monitoring the environment and should have their hands on the wheel at all times.

### Level 2

Partial automation: this is where the most advanced production vehicles currently sit. The car's systems are beginning to monitor the driving environment, and the vehicle can control some acceleration, deceleration and steering inputs. The human driver remains the fallback though, and needs to be aware of their surroundings.

### Level 3

Conditional automation: at this level the vehicle can monitor its environment and take responsibility for dynamic driving tasks, allowing the occupants to relax a little. But while the vehicle will control the steering, acceleration and deceleration, the driver must always be alert to requests from the technology to intervene should the driving scenario become too complicated.

### Level 4

High automation: at this point the vehicle can control all aspects of driving, taking responsibility for steering, acceleration, braking and monitoring the environment. It can also provide its own fallback system, although this may mean that the vehicle will decide to pull off the road and come to a stop should the driving scenario become too complex.

### Levels 5

Full automation: this is the endgame. The full-time performance of the vehicle is controlled by the onboard systems, including all driving tasks, under all conditions.

## HOW IT WORKS...

## CAN bus

WORDS TOM DENTON FIMI

These days, all modern vehicles, from conventional combustion-powered cars to the latest EVs, feature a Controller Area Network (CAN) bus. It's the electronic communications system that allows different parts of the vehicle to talk to each other, including the engine, the transmission and the brakes. In effect, it's a car's central nervous system.

Invented by Bosch and first used on the Mercedes-Benz S-Class in 1991, the CAN bus initially linked five engine control units (ECUs) in an effort to improve performance and safety by enabling the faster flow of real-time data around the car.

The CAN bus network was designed to combine (or multiplex) those messages,

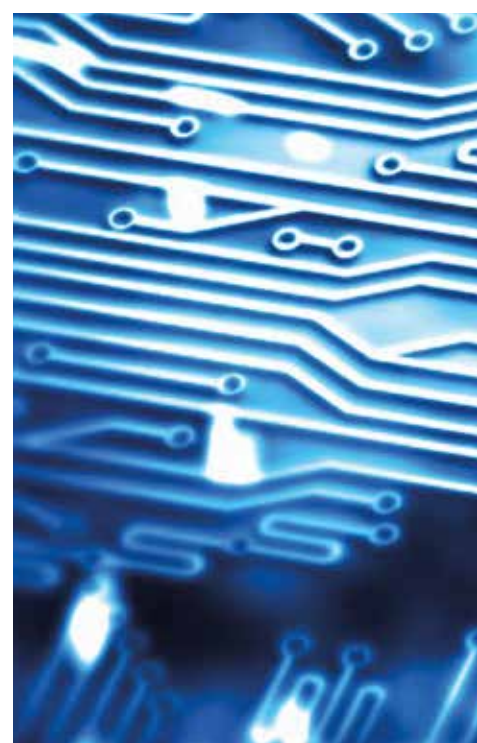
thereby reducing the amount of electrical wiring (and weight) required. It was a step up from what had come before, which had consisted of two-way receivers and transmitters which simply couldn't cope with several things communicating at once.

A CAN bus works by allowing any device in the network to create a "data frame", the standard message format, and transmit it sequentially. If more than one device transmits at the same time, the highest priority device continues while the others wait. Frames are received by all ECU nodes in the network and consist of an ID, a message and other items such as error correction bits.

The physical network on most cars is made up of a

twisted pair of thin wires known as CAN high (CAN-H) and CAN low (CAN-L). Coaxial cables and fibre optics can also be used.

Using a gateway to control data traffic, most vehicles now have several different networks – for the body, the powertrain and the infotainment system, for example. Unlike the 1991 S-Class, today's vehicles might have dozens of ECUs, including ones for the engine, the transmission control, the airbags, the ABS, the traction control and the stability control. The CAN bus allows these areas to communicate with each other in real time, prioritising the most important information and helping to improve vehicle safety and performance.

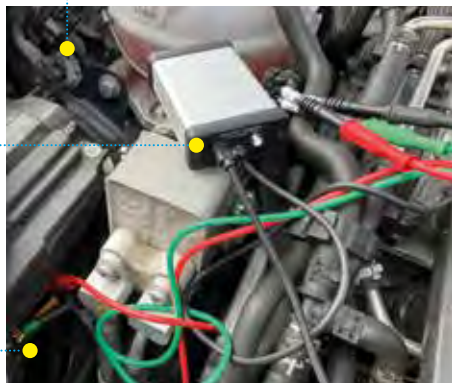


**01** THE CAN ANALYSIS TOOL FROM DEFINITIVE DIAGNOSIS CONNECTED TO THE CAN BUS ON THE BACK OF A LIGHTING UNIT

Chassis/earth connections

USB

CAN bus connections



### LOOKING INTO THE CAN BUS DATA

You can use a scope to look at a CAN signal. With a PicoScope, for example, you can decode these signals and look at the actual values.

A new tool developed by Glenn Norris CAE AMIMI from Definitive Diagnosis makes the process of looking at CAN data quick and easy. "The Definitive Diagnosis CAN Analysis Tool makes CAN data decoding more accessible for vehicle technicians," Norris explains. "It simplifies the process of tracing sporadic CAN errors and reduces time spent on diagnosis."

Testing the diagnosis tool on my car, I found that all the data on the CAN bus was shown instantly. I even simulated a fault by shorting the bus wires

together, and two errors were immediately listed.

A key feature of this new tool is that specific IDs can be sorted and filtered. This makes it easier to track down where errors may be coming from.

The value of the CAN identifier (CAN-ID) indicates the priority level. The lower the number, the higher the priority. The ID relates to specific items and activities, such as switching lights on or off, or a particular sensor.

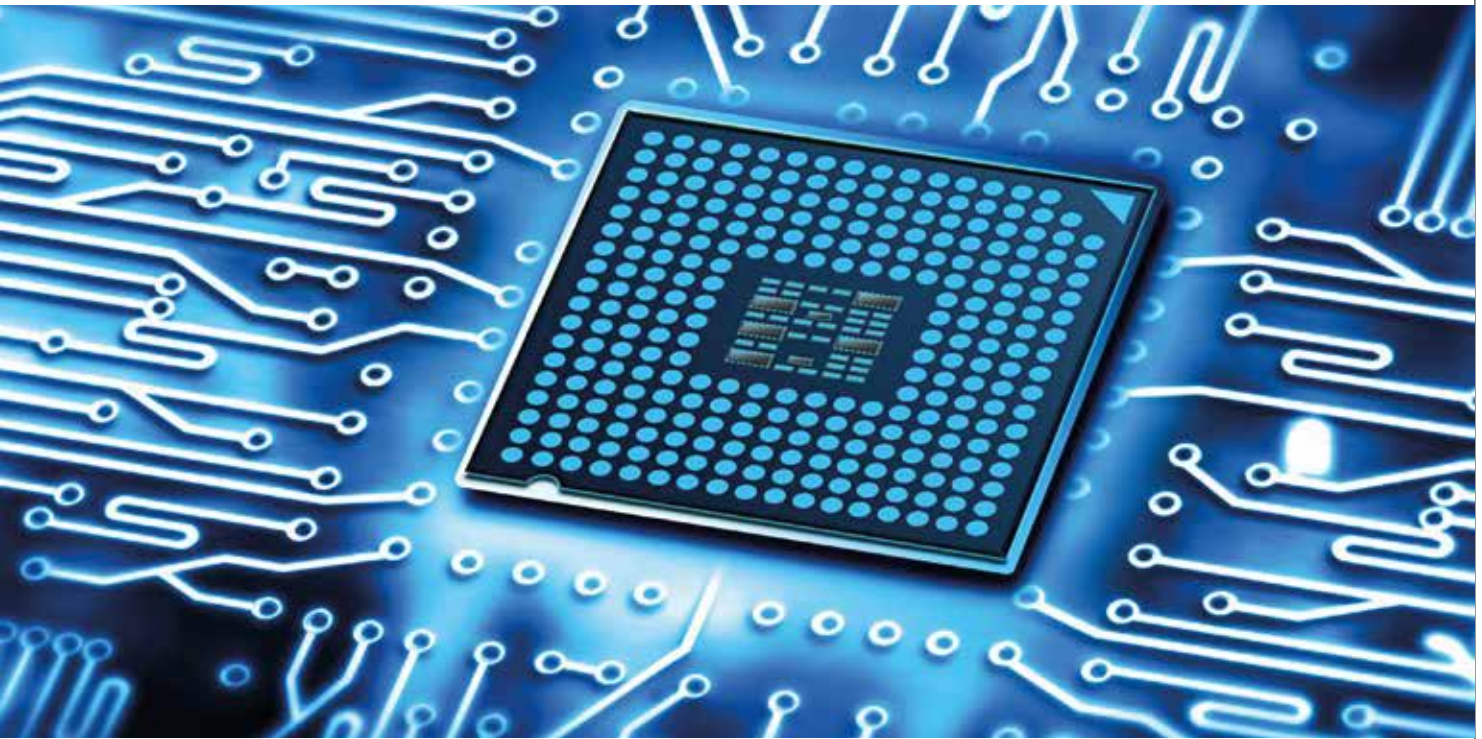
The CAN bus is a robust system, but errors will still occur. Thankfully, clever diagnostic tools can help to identify them quickly.



Industry expert Tom Denton has penned numerous automotive books, including *Electric and Hybrid Vehicles*. Visit [tomdenton.org](http://tomdenton.org) for more details



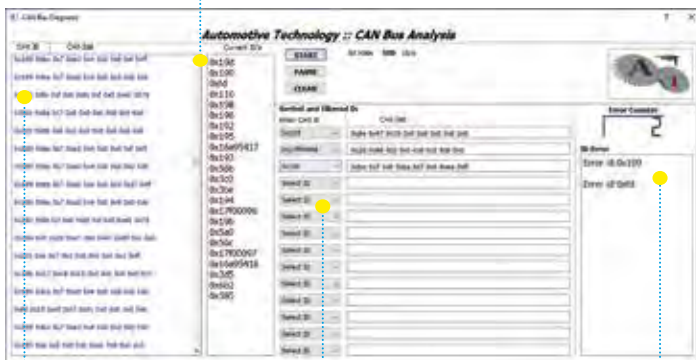
**"A CAN BUS WORKS BY ALLOWING ANY DEVICE IN THE NETWORK TO CREATE A 'DATA FRAME', THE STANDARD MESSAGE FORMAT, AND TRANSMIT IT SEQUENTIALLY"**



## 02 CAN BUS ANALYSIS SCREEN

"0x" tells us that the CAN IDs in this list are in hexadecimal (base 16). The first one has an actual value of "19d", which is 143 in decimal (base 10).

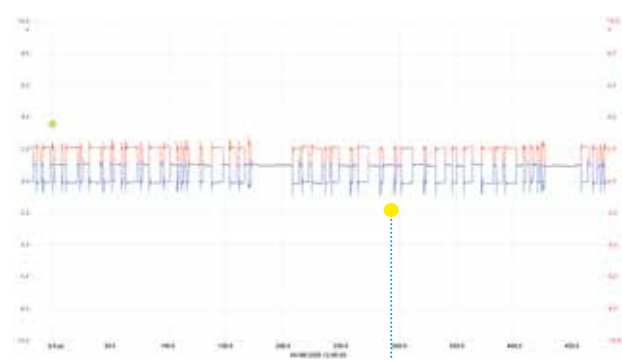
## 03 A CAN SIGNAL CAPTURED ON A PICOSCOPE. THE RED TRACE IS CAN-H AND THE BLUE IS CAN-L. USING SIGNALS THAT ARE THE OPPOSITE TO EACH OTHER HELPS TO ELIMINATE ANY INTERFERENCE



CAN messages

Specific IDs can be filtered

Error list



One CAN frame includes, among other things, an ID and a message





# WHAT'S HAPPENING AT YOUR IMI?

## ADAS accreditation goes international

WINDSCREEN REPAIR, replacement and recalibration provider Carglass France has invested in the IMI's ADAS certification for its trainers, who support more than 1,300 technicians across France. It's a significant milestone for the company, as well as a strong endorsement of the IMI's accreditation.

After a year of intense training, with support and guidance from the technical team at Belron, Carglass France achieved ADAS certification earlier this year, further strengthening its provision of safe repairs and a first-time-fix customer experience.

"It's a huge achievement," said Patricia Millet-Guizol, Training Director at Carglass France. "Previously, we had always asked Belron to assess the skills of our Technical Trainers, but with IMI certification and recognition, we will be able to work to improve the positioning of the Trainers within the automotive industry. And this will give us powerful differentiation versus our competitors.

"The accreditation reinforces our credibility in terms of professionalism and expertise and gives our partners and insurers confidence."

The process has not been without its challenges, she adds. "My team all wanted to pass with the maximum score of 100%, which they did! Now they want to go further by moving on to the IMI Master certification."

Eric Girard, Managing Director of Carglass France, said: "This is a great initiative and it confirms our leading position in ADAS technology. It makes me really proud to be recognised in such a way within the automotive industry."

The IMI certification is the only globally recognised industry standard and is awarded to individuals who have achieved the technical competence to operate and perform at the highest level. Working with multiple stakeholders – including leading vehicle manufacturers and suppliers at both the national and international level – the IMI ensures the highest standards and technical competence.



### All aboard!

There's good news for apprentices at LJM Compliance Solutions. The Staffordshire-based MOT and automotive training and consultancy centre is now approved to deliver the IMI's Level 2 and 3 Heavy Electric Vehicle qualifications.

And to take the announcement to the next level, LJM has also acquired an electric bus (pictured above), meaning it's ready to get started!



We're always available to talk if you have any questions or queries. Get in touch with the membership or centre support teams on 01992 511521 or email us at [imimembers@theimi.org.uk](mailto:imimembers@theimi.org.uk)





WE WISH TO EXPRESS OUR  
DEEPEST SYMPATHY TO THE  
FAMILY AND FRIENDS OF...

**Alistair Cheyne**

*FIMI, Hampshire, aged 76*

**David Dale**

*AMIMI, Leicestershire, aged 68*

**Leslie Hubbard**

*MIMI, Buckinghamshire, aged 73*

**Ashley Potter**

*AMIMI, Kent, aged 64*

**John Simpkins**

*FIMI, Hampshire, aged 82*

**NOTICE IS HEREBY GIVEN**

That an Ordinary General Meeting (being the 99th Annual General Meeting of the Institute) will be held digitally on Tuesday 27th October 2020 at 2.00pm.

**AGENDA**

1. Apologies for absence
2. Minutes of the Annual General Meeting of 30th October 2019
3. Installation of President – 2020/2021
4. Installation of Vice Presidents – 2020/2021
5. Installation of Honorary Treasurer – 2020/2021
6. Declaration of Directors
7. Revenue Account and Balance Sheet of the Institute for the year ended 31 March 2020, plus the Auditor's Report
8. Annual Report for the year ended 31 March 2020
9. Appointment of Auditors
10. Special Resolution to amend the Articles of Association
11. Any other business

By Order of the Board

Simon James Chief Financial Officer

The Institute's Article of Association 15.1 provides that: on a vote on a resolution at a General Meeting on a show of hands or on a poll, every Corporate Member present in person or by proxy has one vote.

Article of Association 16.1 provides that: a "proxy notice" (as defined in Model Article 31(1) of the Model Articles for Private Companies Limited by Guarantee) and any authentication of it demanded by the Board Members must be received at an address specified by the Institute in the proxy notice not less than 48 hours before the time for holding the meeting or adjourned meeting at which the proxy proposes to vote; and any proxy notice received at such address less than 48 hours before the time for holding the meeting or adjourned meeting shall be invalid.

Please confirm your interest in attending the webinar or request a proxy notice via: Simon James, Chief Financial Officer, c/o Georgia Murnane, IMI, Fanshaws, Brickendon, Hertford, SG13 8PQ, or email [ceooffice@theimi.org.uk](mailto:ceooffice@theimi.org.uk)

The Annual Report is now available at [tide.theimi.org.uk/about-imi/governance/annual-report-2020](http://tide.theimi.org.uk/about-imi/governance/annual-report-2020). Anyone requiring a hard copy should contact [ceooffice@theimi.org.uk](mailto:ceooffice@theimi.org.uk) or the address above.



# EURIG DRUCE

Citroën UK's Managing Director explains why he's fascinated by the rise of EVs – and why there's nothing like being in the right place at the right time

### What was your first job in the industry?

In my teenage years, I was interested in cars and all the latest models, but I was absolutely fascinated with electronics and physics. I ended up studying electronic engineering at university.

One summer, I took a job at a local Fiat dealership, delivering parts and collecting customers' cars. My intention was just to make a bit of money for the following term, but I soon found that I wanted to understand everything about how dealerships and the motor trade operate.

### Why did you stick with the automotive industry?

After completing a master's in electronic engineering, I worked for a while manufacturing computer motherboards. What I once thought would be a fulfilling career was no longer that interesting. My heart was set on a move into automotive.

The industry has such a fascinating mix of people, skills and exciting products. I was hooked! Now, thanks to the development of electric and hybrid vehicles, I get to indulge both of my lifelong interests at the same time.

### How did you decide which career path to take?

I secured a place on the Peugeot graduate scheme,



which was a fantastic starting point. I worked in aftersales and spent some time as a Customer Adviser. To this day, I think the Customer Adviser role is one of the toughest jobs in the industry, but I learned so much doing it.

As part of the training programme, we were asked to describe where we would like to be by the time we hit 40. I've always been ambitious, so my answer was to be in a senior, decision-making role.

### How did you make that happen?

My work ethic has really underpinned my progress and continues to do so, but luck has been important too. I've found myself in the right place at the right time, but crucially I've always fought to take full advantage of every opportunity.

### How has your career developed?

I'm now in my 20th year in the industry, having worked across sales and aftersales for the Peugeot, DS Automobiles and Citroën brands within Groupe PSA. For the majority of that time, I've been on the retail side of the business.

I became Sales Director for Citroën in September 2016, before taking the Managing Director role in February this year, just before COVID-19 hit. Did I mention luck?

### What are your goals for the future?

My short-term focus is on driving business performance here at Citroën UK. We're just completing the final elements of our three-year business plan, which is really exciting. EVs are about to go mainstream, and our mantra

"Electric for all, all for electric"? Well, it's certainly very French!

is "Electric for all". That means all uses – in towns and cities, short-haul and long-distance – all types of ownership (whether business or private), all budgets and all ages. For example, the new Citroën Ami can be driven from the age of 14 in France.

Beyond that? Who knows! I'm still relatively young and I have lots more I'd like to achieve. I would also like to give something back to society. I have had my fair share of good fortune, so I want to find ways of giving the less fortunate a leg up.

### What advice would you give to someone who wants to work in the automotive industry?

It's a great choice! Go for it. It's an industry that will give you some fantastic experiences and opportunities. To succeed, you'll need to work smart and hard, and take your chances. Learn from your mistakes and keep driving forwards.

**Eurig Druce is Citroën UK's Managing Director. He was speaking to Tristan Young**

**Who are your motoring heroes and inspirations? To feature in our next edition, email james.scoltock@thinkpublishing.co.uk**

STARTING FROM THE BACK?

REVERSING  
IN

THE ELECTRIC REVOLUTION\_P10  
EVERYTHING YOU NEED TO KNOW



INSIDE AN INDEPENDENT\_P28  
MEET CHELTENHAM'S ELECTRIC EXPERTS



SCOOTERS\_P39  
THE GREEN BIKES TAKING TO THE STREETS



THE DRIVE OF MY LIFE\_P54  
JONATHAN MUSK'S TESLA EPIPHANY



# “I couldn’t have got through this without the help from Ben.”

People across the automotive industry are facing new challenges. Coronavirus is affecting us all in different ways at work and at home. While these are unsettling times there is one thing you can rely on.

We are here for you. Now, more than ever.

[ben.org.uk/coronavirus](https://ben.org.uk/coronavirus)

Helpline: 08081 311 333



Find plenty of advice, online chat and self-help tools on our website, or talk to us on the helpline, free and in complete confidence, Monday-Friday 8am-8pm.

Ben - Motor and Allied Trades Benevolent Fund. Lynwood Court, Lynwood Village, Rise Road, Ascot, SL5 0FG. A charity registered in England and Wales (no.297877) and Scotland (no.SC039842).

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industry



Support for life

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