InsightReport 2021

Cox Automotive Grant Thornton

DRIVING OPPORTUNITY: DEPLOYING GROWTH MINDSET ON THE JOURNEY TO 2030

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ELECTRIC AND BEYOND

Meeting the demand for cleaner and safer vehicles

"More needs to be done to manage EV anxieties if we are to reach the ambitious targets set by governments worldwide."

Chris Ashton-Green - Founder and CCO, Regit.cars (formerly Motoring.co.uk)

International legislation is mandating the demise of the internal combustion engine (ICE). Technology is enabling vehicles that keep us safer. Consumers are increasingly choosing vehicles that are cleaner to run and safer to be in. Implications for manufacturers, fleets, mobility providers, and dealers are huge – from developing new drivetrains and models to managing ever more complex vehicles to their second and subsequent lives. And the timetable is tight.

By 2040, Bloomberg suggests there will be an anticipated 323 million electric vehicles on roads worldwide. This is a significant shift in under two decades, making up just under two-thirds of total vehicle numbers. The International Energy Agency (IEA) suggests 230m EVs will be needed on the world's roads by 2030, up from 10m at the end of 2020.

More needs to be done to meet 2030 targets

Philip Nothard, Insight and Strategy Director, Cox Automotive: "While the EV segment is undoubtedly growing fast, this is against an overall reduction in new vehicle sales. Some major barriers still stand in the way of mass EV purchasing, including range anxieties and concerns around the high cost of new EVs. Many motorists still need more convincing to go electric - along with better financial incentives and information – if we are going to be ready for the switch to electric new vehicles by 2030. As well as nudging drivers towards electric vehicles, we also need to see disincentives on ICE to encourage the transition."

A varied approach

It is important to recognise that while some governments are focusing on specific technologies, the reality is a worldwide approach embracing various powertrains, from pure electric to plug-in hybrid, fuel cell, natural gas, and more. Many commentators believe battery-powered vehicles will dominate the industry, but these will come in many shapes and sizes. As the automotive sector takes an increasingly global view, strategies will need to incorporate all of these elements.

Wherever you complete your research, vehicle cost, range, and charging infrastructure (and its reliability) continue to be seen as barriers to entry for electrified vehicles. To ensure widespread adoption, legislators will need to consider policies which support driver and fleet

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education; encourage better integration between those providing the vehicles and delivering the infrastructure; accelerate technology developments; and create prices and markets which are acceptable to all.

Most global vehicle manufacturers have indicated they will stop making or selling ICE vehicles between now and 2050. However, according to the IEA, of the world's top 20 manufacturers by volume (representing around 90% of new car registrations in 2020), 18 have already started plans to widen their battery-powered offer. Globally, there are already around 370 electric car models available, a significant increase from pre-pandemic. The widest availability is in China, but Europe has dramatically increased its offer. More than half of electrified models worldwide will be SUVs and pick-ups.

Hybrid and fuel cell technology is part of the journey for some, while others have focused on pure EV. Significant consolidation and vertical integration are producing economies of scale on production lines, as well as collaborative technology development around the raw materials, powertrain and charging infrastructure. There are reductions in model derivatives with some of the larger players, while luxury brands are making the switch to increased customisation.

A Canadian perspective

Brian Murphy, Managing Director, Kelley Blue Book & Data Solutions, Cox Automotive Canada & Brazil: "The vehicles already being developed today are most likely the last generation of ICE vehicles for North America, and perhaps the world. The electric future has arrived, the next generation of vehicles that follow will be zero emissions. I expect to see a significant disruption in the depreciation curve of ICE vehicles at the end of their production lifespan, with consumers who do not want to be forced to switch to electric pushing prices up. It is simple supply and demand economics, and this will be driven by resistance to change on the part of some consumers."

The manufacturer story

In July 2021, Carlos Tavares, CEO of Stellantis, launched the company's electrification strategy. With annual pre-pandemic production of around eight million vehicles worldwide and sales of just over six million in 2020, Stellantis is one of the world's largest vehicle manufacturers. The moves it makes over the coming years will influence supply chains worldwide, with more than €30bn committed up to 2025 for electrification and software development, equity investments in joint ventures, and direct R&D spend.

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Tavares confirmed the business expects more than 70% of European sales and 40% in the US to be from low emission vehicles by 2040. Stellantis aims to source more than 260GWh of battery capacity by 2030 through supporting five gigafactories in Europe and North America, as well as agreeing partnerships. In addition, the business has committed to achieving total cost of ownership parity between electric and ICE vehicles by 2026, although each of its 14 brands will approach that differently.

The Stellantis announcements echo those made by other manufacturers in recent months. Ford is investing $22bn between now and 2025, including the electrification of the Mustang, F-150 and Transit. A key part of the Ford strategy is to target the electric commercial van and pick-up market. The company has North America's largest manufacturer-owned public charging network, as well as thousands of EV-certified dealers across all 50 US states. Toyota, which introduced the first hybrid-electric production car in 1997, plans to launch 40 new or updated electric vehicles by 2025, up from the 13 available today.

From new to used… and beyond

As more battery-powered vehicles make it into the used market, there are also concerns around battery reconditioning, battery health and remaining life declarations at the point of sale. The European Battery Directive, which previously focused on the likes of smartphones and laptops is being updated to account for the whole life of vehicle batteries, making it easier to collect, dismantle, and recycle EV battery cells back into the supply chain. In California, Assembly Bill 2832 promoted the foundation of the Lithium-ion Car Battery Recycling Advisory Group in 2019 with a remit to submit policy recommendations to support 100% recycling of electric vehicle batteries by 2022.

Organisations such as Spiers New Technologies, a Cox Automotive Mobility brand, offer key services to support whole life battery economics. This includes repair, remanufacturing, refurbishing, and repurposing for the advanced battery packs used in hybrid and electric vehicles. Electric vehicle storage requires tweaks to existing processes, while more technicians need to be trained to work safely on these vehicles. There are also questions about what happens to the battery once it is no longer needed in a vehicle; there are several organisations exploring third-life use cases for former EV batteries across global markets.

Read more about the Cox Automotive perspective on cleaner and safer vehicles in the Cox Automotive trend definition document: Legislative and consumer demand for cleaner and safer vehicles.

ELECTRIC AND BEYOND

Infrastructure and legislation

Investing in the technology to keep vehicles moving

Global infrastructure requirements

With ambitious targets to increase EV adoption globally, significant investment will be required in charging infrastructure (in both numbers and reliability). In the US, there are currently around 110,000 public charging devices, with strong charge point to EV ratios in states such as Vermont, California, Massachusetts and Utah. In Europe, the figure is almost double, at nearly 200,000, while China leads the way with more than 800,000 devices. Countries such as Malaysia are playing catch-up in Southeast Asia, while Thailand, Indonesia and Singapore are pushing ahead for EV investment.

Although there was still an oversupply situation in Europe in 2019, with around five to seven electric vehicles per public charge point across Europe, the rapid acceleration in EV adoption means the recommended ten cars per device is imminent. The European Federation for Transport and Environment created a Public Charging Supply metric, advising more than 1.3m public charge points would be required EU-wide in 2025 and 2.9m in 2030. An estimated €20bn investment is needed, rising to €80bn when private charging infrastructure is also included.

For the US, the International Council on Clean Transportation has suggested there will need to be approximately 2.4m chargers by 2030, including 1.3m workplace, 900,000 public and 180,000 fast chargers. About a million chargers will be required at multi-unit dwellings, such as flats and apartments. The expected investment between 2021 and 2030 is around $28bn for both public and workplace chargers.

In some markets it is the vehicle manufacturers running the networks, such as Tesla and Volkswagen (Electrify America) in the US, and the Ionity joint venture in Europe. Energy companies such as BP and Royal Dutch Shell have made acquisitions to enter the charging market, while electric utilities and local authorities are also in on the action. Interestingly, much of the financial investment in the US is around buying or taking stakes in existing European charging companies.

Infrastructure and legislation

The right infrastructure in the right place?

Didier Van Bouwel, Chief Operating Officer of Modix International: "There is a clear challenge when it comes to ensuring the right infrastructure is in place to support the growth in electric vehicles. Not only do there need to be enough reliable connections, but the physical space needs to be found for vehicles to be parked up while drawing their charge. In some European cities, where space is already at a premium, this could prove a real barrier."

and install on-street chargers by resident request, but this would be slow. There are currently around 500 charging devices on the UK motorway network out of an estimated 2,300 required, and much of this is tied up in exclusivity agreements.

Companies are ramping up their activity. In September 2021, Royal Dutch Shell announced it would install 50,000 on-street charge posts by 2025 through its acquisition of ubitricity, up from the 3,600 chargers it currently operates in Britain. The UK government is also pushing forward, requiring charge points to be installed in all new build homes and offices, subject to legislation

How many charging points are there in the UK?

45,126	26,378	16,567	730
CONNECTORS	DEVICES	LOCATIONS	LAST 30 DAYS

Source: Zap-Stats 18 October 2021 Zap-Map.com

EV country focus: the United Kingdom

In October 2021, there were more than 45,000 public charge point connectors, 26,000 devices and 16,500 locations listed on the Zap-Map database. Between the end of 2016 and the end of 2020, there was a 220% increase in the number of public chargers in the UK. Almost a third of these are in Greater London, rising to half when you include the South East and East of England. Just 10% are found in the North East and North West. Around one-fifth of locations have a rapid or ultra-rapid public charge point, a figure which has grown substantially over the past decade.

A report from the Competition and Markets Authority suggests there could be a need for between 280,000 to 480,000 public charge points by 2030, which is more than ten times the current total number of devices. More than eight million households - a quarter of drivers - don't have a driveway or garage. There are only 1,000 on-street charge points outside of London. One solution could be to follow Amsterdam's lead

announced later this year. All points will be required to offer smart charging and load balancing options, building on the requirements from 2020 that public charging infrastructure should be pay on use, rather than membership.

The UK push for charge point reliability

The AA New Horizons Report 2021 highlighted that, while electric vehicles are accepted as the direction of travel, the reality of the adoption experience is mixed, with infrastructure reliability seen to play a big part in its success. Almost three quarters (74%) of the MPs surveyed for the report agreed having high quality, and reliable electric vehicle charge points is just as important as the quantity. In contrast, more than two thirds (69%) agreed EV drivers must be provided with better customer service.

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The report also underlined key areas of infrastructure development and investment, such as financing city centre and motorway locations, maintaining and upgrading legacy charge points, and reviewing better integrations of services and payments across charge point providers and vehicle manufacturers.

AA consumer research from earlier in the year found three quarters of drivers would feel more confident in owning an electric vehicle if they could access a charging point at home (75%), or if they could get charge from any point irrespective of who operates it or supplies the electricity (73%). In addition, a quarter of EV owners (26%) would use their vehicles more if public charging was easier.

Source: AA Yonder Driver Polls March 2021 and January 2021

How many breakdowns?

Dean Hedger, EV New Business Development Manager, the AA: "Research we shared on World EV Day 2021 shows most drivers overestimate the number of breakdowns caused by EV charging infrastructure and vehicle range, with an average guess of 65% for the main driving battering running out. However, in 2020, fewer than 4% of the EV breakdowns attended by the AA were due to running out of charge, a figure which has halved in the past few years.

"As more charge-points, especially rapid chargers, are installed across the country, the number of cars failing to reach one will further reduce, providing more confidence to drivers to help them make the switch. The reality is that the top two breakdowns for combustion engine vehicles and EVs are the same, with tyres and the smaller 12-volt battery being the main causes of faults.

"We provide back-end infrastructure for more charge-points across the UK than anyone else and expect to serve about 20% of the public infrastructure by the end of next year. Our customer service teams also support workplace and domestic charging units for several of our CPO (charge point operator) customers. In August 2021, our dedicated EV support team received over 9,000 calls, highlighting the growth in electric vehicles on UK roads and increasing need for reliable charging infrastructure."

The key to public charging economics is utilisation

Tom Callow, Head of Insight and External Affairs at bp pulse: "Electric charging infrastructure is an interesting market. There is a guaranteed growing demand driven by legislation. However, consumer expectations around service and reliability are also exceptionally high. The UK public charging strategy is focused on fast connections, offering convenience, and real-time

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visibility. But there is still a legacy network which needs to be upgraded and an education job to do around rapid charging speeds.

"Electric vehicle drivers who have home charging facilities may not need the public charging network, but they still use it on occasion. There is, however, a large proportion of residential properties which don't come with off-street parking. For those households, they need confidence they can charge while out and about. The reality is the UK's network has moved from 15% out of action in 2017 to fewer than 5% today. It is unlikely there will be 100% network reliability, but it will get close.

"The key to public charging economics is utilisation. We shouldn't be focused on the total number of charge points or connectors in the UK, but the utilisation of those points. The country could have many thousands of connectors, but they are of no use if they are in the wrong locations, offering the wrong charging speed for the local demographic, or if they are out of action. At a national level, the network is under capacity and very few charge points are fully utilised."

Alternatives to charge points

Alongside discussion around charge points, investment in wireless and inductive charging is also underway. Examples could include wireless electric roads, bordered by solar panel fences, which decentralise the power generation and eliminate any stress on the grid. With grid anxiety a concern in almost all global markets, this provides an alternative approach which can support all trucks, vans, and passenger vehicles using the road network.

There is still talk about replacing drained batteries with charged ones, rather than charging the car. Organisations in this space claim battery swapping is a faster and more convenient solution, particularly for those who don't have somewhere secure to plug in their car regularly. One such company, Ample, raised $160m in Summer 2021. This approach also has its sceptics, with concerns over driver and technician safety when removing and installing the batteries.

Looking beyond electric, investment in hydrogen is growing, but there are concerns about the number of hydrogen refuelling stations. The US has around 44 stations, with most located in California. Japan had 137 as of December 2020, and there are around 200 across Europe. In the UK, there are just 11 locations currently, serving a small number of registered vehicles (in the low hundreds) from manufacturers including Hyundai, Toyota, Honda, Mercedes-Benz and Renault/Symbio.

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The hydrogen story

In August 2021, the UK launched its Hydrogen Strategy, with an ambition for 5GW of low carbon hydrogen production capacity by 2030, focused on homes and buildings. Announcements include a £240m government co-investment in production capacity through the Net Zero Hydrogen Fund (NZHF), as well as support for hydrogen in the £1bn Net Zero Innovation Portfolio; £315m Industrial Energy Transformation Fund; and £20m Industrial Fuel Switching Competition.

Currently, hydrogen is focused in the chemical and refinery sector. There will soon be a small trial to supply 650 homes in the north-east with blended hydrogen, while there are 11 hydrogen refuelling stations in the UK, of which five are located within the M25 and others in the South East. There are also two stations in Scotland. The geographic deployment is similar to the electric charging network, but on a much smaller scale. There are plans for further investment, but there have also been recent closures of sites in England and Wales.

Existing operators include ITM Power, BOC, Air Products, and Aberdeen City Council. However, private companies like Element 2 have ambitious targets of more than 800 hydrogen refuelling stations in the UK by 2027, and 2,000 by 2030. ITM Motive, part of ITM Power, is investing in its hydrogen network from Birmingham to Leeds. The UK is one of several test cases for hydrogen in Europe, with initiatives also underway in Germany, France, The Netherlands, and the Nordic region.

Some commentators have suggested more than 8,000 UK refuelling locations would be needed (similar to the current petrol and diesel network) for hydrogen to be viable. However, a report from Hydrogen Europe proposed just 1,700 locations across mainland Europe to support an anticipated 2m FCEVs (Fuel Cell Electric Vehicle) in 2030. This indicates the jump from 11 to 8,000 hydrogen refuelling stations would not happen overnight. There is a tipping point, however, before fleets become confident in the network.

In contrast to the £1-2m expenditure on a fixed hydrogen refuelling station, companies like NanoSUN are looking at alternative mobile solutions, such as the Pioneer HRS, while UK business Adelan has been pioneering small portable units and mobile power solutions for the past 25 years. Its founders, Dr Michaela Kendall and Professor Kevin Kendall FRS, invented the core microtubular solid oxide fuel cell (mSOFC) technology in 1992.

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Opportunities for the hydrogen economy

Dr Michaela Kendall, CEO of Adelan and UK Hydrogen Champion for Mission Innovation at BEIS (Department for Business, Energy & Industrial Strategy): "We're putting fuel cells into the Commonwealth Games, the UK's HS2 rail project, and we're leading on hydrogen within COP-26 discussions. We've seen a massive market growth over the past 25 years due to climate change, air quality and energy security concerns. Hydrogen today is a global megatrend. Around 30 countries have hydrogen-specific strategies and more than 50GW of green hydrogen electrolysis projects were announced globally in 2020.

"The EU has committed around €470bn in public and private investment, but the US, China, Korea, Australia, Chile and more are also investing in hydrogen. There is a difference by geography in terms of the technology and applications, but this is a massive global opportunity with a strong market need to decarbonise. While there have been several hydrogen waves in the past three decades, the time is now to focus on an internationally co-ordinated programme.

"We are particularly interested in the transport sector and one of the biggest opportunities for hydrogen right now is in heavy-duty trucks. Medium trucks, taxi fleets, large passenger vehicles, coaches, and buses will also be strongly competitive by 2030. Hydrogen is driving forward in logistics, with forklift trucks, as well as in the rail, marine, and aviation sectors. Ultimately, we are seeing a shift away from centralised power to distributed networks which will enable further innovation."

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Consumer demand

From sideshow to mainstream

In the past decade, electric cars have gone from single figures to more than 10m units worldwide. Much of this has taken place in the past four years. Looking back to the first Cox Automotive and Grant Thornton Insight Report in 2018, global new car sales share for EV was below 2% and the market was in relative infancy. Today, China, Europe and the US are all showing significant growth, with around 3m new electric cars registered in 2020. India is also ramping up, led by investment from Tata Motors, Mahindra & Mahindra, and Suzuki.

Notwithstanding pandemic-induced global contraction in new car registrations in 2020, EV market share now sits at almost 5%. There are various reasons. Model ranges have increased to support manufacturers in managing their total emissions. Governments have provided or extended financial incentives to switch to low emission vehicles. Total cost of ownership is becoming more competitive. Infrastructure roll-out is increasing at pace. The world is creeping ever closer to 2030 and 2050 environmental milestones, while the automotive sector is certainly playing its part in supporting the transition.

With more EVs on the roads and on our screens, consumer exposure is also growing. The most recent World EV Day 2021 saw consumers and businesses representing more than 150 countries participate in online discussion, while it was also spoken about in the UK's House of Commons and by the White House National Climate Advisor. More than 150m cumulative viewers watched the opening races of the 2021 Formula E season, while the first Extreme E race reached a global audience of 18.7m. Electric vehicles have broken out of the side-lines and joined the mainstream.

If not now, then when?

Philip Nothard, Insight and Strategy Director, Cox Automotive: "Market share for EV is still comparatively low, but the percentage increases in the past few years have been significant. There are just a few short years until 2030, when the UK and many other global markets will no longer allow the sale of new petrol and diesel vehicles. If governments, manufacturers, and dealers want consumers to engage with the power of electric, then significant investment in education, infrastructure, and connectivity needs to be made today."

Consumer demand

What UK drivers want

Plenty of research has taken place into consumer demand for electric vehicles, much of it showing positive sentiment. In several surveys this year, around a third to a half of respondents expected their next car to be a battery electric vehicle or hybrid. The figure was 44% for eBay Motors Group and 52% for Regit.cars, while research by the AA and Electrifying.com found one in three drivers (34%) thought an electric car would suit their lifestyle right now, with a third (32%) stating going to a petrol station is a chore.

On the Auto Trader marketplace in the UK, one in seven new car advert views (14.3%) in August 2021 was for an electric vehicle, up from 3.8% the previous year. Auto Trader also shared that nearly one in five (17.7%) people are now considering an EV as part of their new car research, up from 8.8% at the start of the year. Incidentally, these figures are similar in the US, where the Kelley Blue Book Brand Watch Report found one in five shoppers researched an electrified vehicle in Q2 2021.

Research from the AA shows consumers want car dealers to do more to support buyers, with half wanting advice on range and how to ensure you never run out of charge (49%); a similar number looking for advice on the charging kit needed at home (44%); and around two fifths seeking explanations about how to claim government financial incentives (37%). This is echoed by Regit.cars data stating almost four fifths (77%) of car owners feel manufacturers and dealers are not doing enough to educate them about electric vehicles.

Regit.cars research also says almost three quarters (72%) of drivers may delay changing their vehicle due to uncertainty around electric vehicles. Only one in 10 (9%) surveyed currently have a charge point at home, and the number who know they have access at work is only slightly higher (12%). Almost three quarters of car owners (71%) felt they were in a position where a domestic charge point could be installed. But nine in ten (92%) believe the UK charging infrastructure isn't enough to support today's EV demand.

Perception issues continue around range anxiety and charging reliability. Only a quarter (25%) of drivers in the Regit.cars survey would be prepared to wait more than 30 minutes to receive an 80% charge at a public charging point. Around four fifths (79%) of those surveyed would want an electric vehicle to be able to

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do more than 200 miles on a full battery for it to be a viable replacement to an ICE model, despite the average length of a car trip in the UK remaining below 10 miles.

AA research also suggests drivers would feel more confident in owning an electric vehicle if they could access a charging point at home (75%); or if they could get charge from any charging point irrespective of who operates it or supplies the electricity (73%). A separate AA poll found a quarter of EV owners (26%) would use their vehicle more if public charging was easier.

Sources: Auto Trader EV Search Trends August 2021; eBay Motors Group Survey August 2021; AA and Electrifying.com Poll April 2021; Regit Electric Vehicle Consumer Survey April 2021; AA Yonder Driver Poll May 2021; Kelly Blue Book Brand Watch Report Q2 2021; AA Yonder Driver Poll March 2021; AA Yonder Driver Poll January 2021

Two sides of the Euro

Didier Van Bouwel, Chief Operating Officer of Modix International: "It is important to recognise that, while data tends to treat Europe as one homogenous market, there are significant nuances between countries. The Nordics and Northern Europe, for example, are currently running ahead of southern states when it comes to electric vehicle adoption. Larger countries, like Germany, may see a preference for moving to hybrid rather than full EV due to longer commutes and higher business mileage."

Overcoming the consumer challenges remaining for EV

As noted in a recent journal article in Transportation Research Interdisciplinary Perspectives, much of the existing consumer research looks at perceptions and purchase intent from non-EV owners rather than satisfaction, loyalty, and repurchase intent from existing owners. While economic and environmental benefits are strong determinants of positive attitude towards electric vehicles, the study echoed previous research which suggests personal considerations around vehicle usage (range and recharge) and the views of peers tend to influence purchase decisions.

Whichever survey or research you read, several key consumer concerns – or functional barriers – remain across global markets. Alongside the cost of the vehicle, these include the reliability of the charging network, where and when to charge, the complexity of paying for charge, and how far vehicles will be able to travel on a single charge. As an example, to respond to these concerns, bp ventures has recently invested €10m in European in-car digital payments provider, ryd, to support the likes of fuel purchases, EV charging, and car washing.

In the UK, work is being done around Vehicle to Grid (V2G) to make it possible for drivers to sell electricity stored in car batteries when demand is at peak levels. Germany is extending existing EV subsidies through to 2025 rather than closing off this year as originally planned. France is offering consumer subsidies, reduced taxes on EVs in cities, and a scrappage scheme for older polluting vehicles. Spain is doing the same. Indeed, much of Western Europe is incentivising EV adoption with financial support packages for consumers, and reduced costs for motoring.

Keeping a hold on ICE vehicles in Canada

Brian Murphy, Managing Director, Kelley Blue Book & Data Solutions, Cox Automotive Canada and Brazil: "If EVs remain at a significant price premium, you can expect people to want to cling onto the gas-powered wheels as long as possible, further tightening the supply of used ICE vehicles. As the industry transitions, I do think it is reasonable to expect that many vehicles that may have been scrapped in years past will be kept alive by larger investments in repairs. This will create a service shop boom. Look at the example of Cuba; many 1950s cars, from before the revolution, remain in service today with extensive repairs over the past 60 years."

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Financing the electric revolution

Tom Callow, Head of Insight and External Affairs, bp pulse: "There can be mutual benefits of charging companies providing subscription packages which ensure customer retention and can offer better tariffs. However, for many drivers, especially those who are less frequent travellers, the Pay-As-You-Go option is still more financially viable. In any case, the oft-cited challenge of multiple networks and apps has been mitigated by virtually all new rapid charge points offering contactless payment options.

"In the business market, there is demand for a more integrated solution, similar to the fuel card model but with additional functionality. Some organisations are looking for a single solution which encompasses workplace charging, home charging, public charging and also the more traditional fuel options when required. An all-in-one financed charging solution would also be expected to come with smart data and analytics to allow businesses to make decisions about effective vehicle deployment."

"There will be an estimated 12-14 million electric vehicles on UK roads by 2030, but at least half the vehicle parc will still be traditional ICE. This does, however, present a challenge to government finances. It isn't viable to add much higher taxes to electricity because of the impact on so many business sectors. It wouldn't be feasible to just tax EV charging as this would drive people away from the safe charging options to the 'dumb' 3-pin socket approach.

"In the same way, taxing public charging would drive people to home options, which would push demand into peak times and penalise those without off-street parking. There will need to be a different tax regime introduced around vehicle usage, which could be based on the growing ANPR camera network or mileage reports at the annual MOT or insurance renewal period. A rebalancing of motoring taxation will be required to close the gap that electric vehicles will create with the loss of fuel duty."

ELECTRIC AND BEYOND

The dealer and fleet viewpoint

Getting ready for an electrified future

In September 2021, Ipsos Automotive revealed the results of a mystery shopper study which took place in May and June across 12 of the largest EV markets in the US. Mystery shoppers documented their experience with 201 EV dealerships across 22 brands, compiling a scorecard around knowledge, availability, and dealer readiness. The results showed many dealer websites lacked EV-specific content, dealership staff required more specific knowledge to have in-depth conversations, and a lack of stock was hindering test drive opportunities.

Things are seemingly not much better on the service side of things. In the UK, the Institute of the Motor Industry (IMI) said in December 2020 that just one in 20 technicians working in garages and dealerships was certified to safely maintain and service battery-powered cars. While certifications were on track to meet 2030 requirements, if sufficient technicians remained in the industry, restrictions from COVID-19 have derailed progress. In July 2021, the IMI said just 6.5% of the automotive sector was 'EV-ready'.

Philip Nothard, Insight and Strategy Director, Cox Automotive: "There is a misnomer in various global markets that dealers don't want to go electric; that they are resisting change. However, the reality is that change costs money. To support education, training, infrastructure, and more, there will need to be a concerted effort and investment from governments, manufacturers, and the wider supply chain."

Preparing the service centres

EVs are likely to require less maintenance as they have fewer moving parts. However, there is a need to ensure technicians are trained to safely deal with the high-voltage components. As manufacturers increase the electrified models in their line-up, there is a growing requirement for their training schools to include EV and hybrid knowledge in accredited courses. There is a shift from it being a mechanical to technology-based role, which requires different skillsets.

With manufacturers instructing dealerships to invest hundreds of thousands of dollars, pounds, and euros in preparing for EV sales, some groups are pulling out. Around 200 of 880 Cadillac dealers in the US decided to close rather than investing at least $200,000 in each site to retail EVs. Ford has also asked all dealerships to invest in a $35,000 EV certification to retail new vehicles, while Volkswagen of America offered low-interest loans of up to $100,000 for facility upgrades.

The dealer viewpoint

For dealers and workshops looking to work on more EVs, there is a need to check cabling and infrastructure capacity. Upgrades may be required from the local distribution network operators if there is insufficient power supply to install the charging infrastructure. It is recommended for each servicing bay to have its own charge point as well as customer charging infrastructure in the car park.

Service centre managers will also need to invest in insulated tools, rubber PPE, a non-conductive barge pole, and security equipment to restrict access to EV space. It is also important to consider whether existing lifting equipment can lift heavier EVs, while also thinking about the changed centre of gravity depending on where the battery is positioned and whether it is in situ or has been removed to work on the vehicle. Ventilation is also important.

The direct-to-consumer sales approach for EVs will be explored in chapter 4.0. However, it is clear there is a significant cost barrier to dealerships and service centres making the switch to EV. As well as the potential of losing larger dealership and workshop brands, another concern is that independent dealers and technicians will choose to retire or change careers rather than upskill and invest in expensive new equipment. This could impact choice for consumers in the future.

Additional revenue streams

As dealerships invest in charging infrastructure, there are several revenue streams which may open up to support customers. Examples include creating VIP charging experiences for drivers through loyalty and membership schemes. If the dealership is in a convenient location, it might be possible to open up charging facilities to prospective customers as well. Dealers may also want to explore home charger deployment, providing a smooth customer experience and ensuring opportunities to retain relationships with drivers long after they have left the showroom.

The dealer viewpoint

Education rather than sales

The UK's first multi-brand electric vehicle showroom, the Milton Keynes Electric Vehicle Experience Centre (MKEVEC), opened in 2017 following a £9m investment in the city as part of the Go Ultra Low Cities Programme. Offering 20-minute test drives as well as flexible vehicle experiences from two to eight days, the goal is to provide consumers with advice and information. The site, which is open seven days a week, does not sell vehicles but has manufacturer partnerships with the likes of Audi, Skoda, Vauxhall, Volkswagen, MINI, BMW, Renault, Kia, and Nissan.

In a similar approach, Arnold Clark launched an £5m Alternative Fuel Vehicle Innovation Centre in Glasgow in August 2021. The site has been developed in partnership with Transport Scotland, OLEV, Scottish Power, Energy Saving Trust, Go Ultra Low, Strathclyde University, and The NVT Group. Around 100 members of the public visit the centre every week to discuss their options for switching to alternative fuels with 'product genies' whose remit is to educate and inform rather than sell.

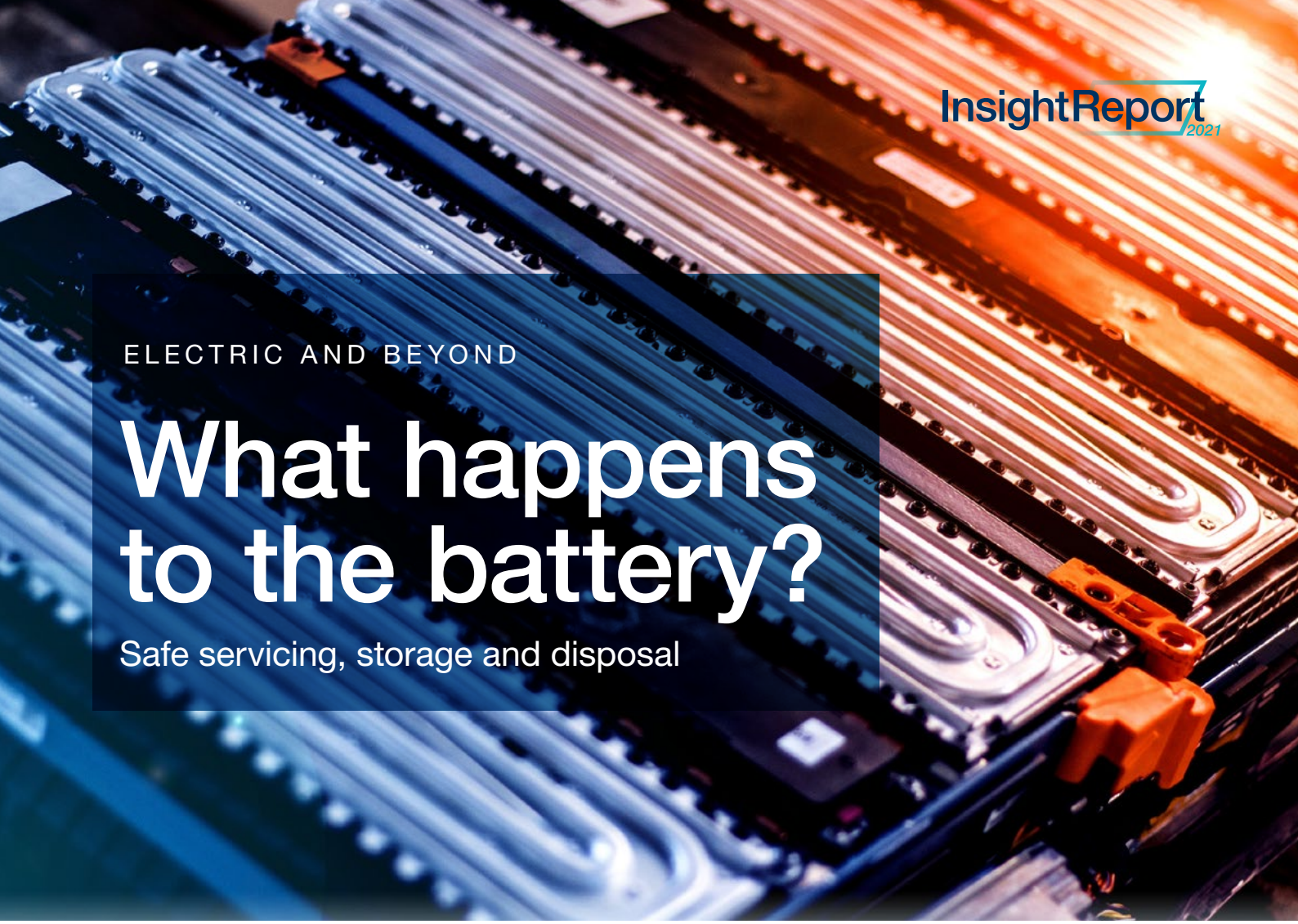
With direct-to-consumer models on the horizon for many manufacturers, there is an opportunity for dealers to keep their relationship with drivers through education and information centres. How these evolve to generate both footfall and also drive sales opportunities, even if those are via the manufacturer website, will be interesting to see. There is a large number of consumers who will still want to 'kick the tyres', experience test drives, and benefit from relationships with their local dealership. The importance of the dealer in helping consumers with the transition to electric should not be underestimated.

EVs and the fleet sector

Ian Richardson, Managing Director of 360 Media Group: "Several of the UK's largest fleets had already made commitments on sustainability grounds to electrify their vehicles by 2030, if not earlier. But now every fleet decision maker knows that the switch to plug-in cars is no more than two replacement cycles away. The pace of transition is set to increase exponentially, with significantly higher EV sales in 2021 than 2020, and then rising sharply again in 2022.

"Faith in the whole life cost of electric cars remains an issue for fleets, but the new generation of battery-powered makes and models is swiftly overcoming range anxiety. The dramatic pace of change is presenting new opportunities for car makers that previously accounted for modest fleet sales, and challenging the traditional fleet heavyweights.

"It is also placing demands on leasing companies to be flexible in contract lengths; to work with fleet customers to identify the drivers and vehicles best suited to be in the vanguard of the new EV wave; and to consult on the best recharging strategy. Fleets are also raising their expectations of their leasing suppliers. Driver profiling tools to identify which employees could switch first to electric cars, and the option to bundle the cost of installing a home charger into a lease are both key areas where fleets are seeking assistance."



ELECTRIC AND BEYOND

What happens to the battery?

Safe servicing, storage and disposal

Decarbonising battery production

While battery powered vehicles offer a clear route to low and zero emission motoring, there remains a challenge to overcome in the production of the vehicle. As it stands, making an EV can generate around +80% more CO2 emissions than an equivalent ICE car. In large part, this is due to the raw materials in the battery and increased metals content in the vehicles. It may take more than 20,000 miles driven before the GHG emissions from producing and driving an EV are comparable with an ICE vehicle.

Factors like metal extraction techniques and recycling will play a part in bringing this down, as well as access to clean energy. For example, over time, it will be possible to introduce more recycled rather than virgin materials into the production chain. However, at the moment, supply of recycled content which is suitable for automotive production is challenged. There is also a pathway to decarbonising the raw materials production methods, for example the introduction of hydroelectricity into the aluminium smelting and steel processing activities.

Philip Nothard, Insight and Strategy Director, Cox Automotive: “Increased renewables in the electricity grids worldwide will support decarbonising the automotive manufacturing sector. However, the investment required to transform global automotive manufacturing into a low or zero emission industry is significant. As some countries push forward, others are lagging behind. This could cause a shift in where vehicle manufacturers choose to locate future plants.”

The Cox Automotive vision for electric vehicles

We believe battery-powered vehicles will be the dominant form of transportation in the future for people and goods. We are strategically steering our business to support the global transition to battery power and, ultimately, continue to be one of the top automotive services providers in the world.

We believe EVs are an important part of reducing greenhouse gas emissions and meeting the goals on climate change. Cox is committed to driving positive environmental change though our efforts to achieve

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carbon and water neutrality by 2034 and achieve zero waste to landfill by 2024.

We believe in a closed loop ecosystem for EV batteries to reduce the environmental impact of metals mining. We support practices that enable the extension of EV battery first lives and end of life reuse and recovery treatments.

To support the above, Cox Automotive Mobility acquired EV battery provider Spiers New Technologies (SNT). The acquisition will allow Cox Automotive to have greater control over the lifecycle of its EV vehicles and their individual parts.

Battery servicing, repair, and maintenance

During a discussion in the UK House of Lords in early 2020, concern was raised about the potential hazard electric vehicles could cause if they breakdown on the smart motorway network. Many manufacturers advise against towing the vehicles because the car's motor is always mechanically connected to the wheels and there is no true 'neutral' gear. This potentially adds time and complexity, as vehicles need to be recovered on a low loader.

Several breakdown providers are now exploring options to ensure vehicles and their occupants can quickly reach a place of safety in case of any issues. These include onboard emergency charging facilities and the All-Wheels-Up recovery system in some patrol vans for the RAC, as well as the new free-wheeling hub technology and Multi-Fit wheel from the AA.

Some manufacturers are also looking to support EV drivers through Vehicle to Load technology (V2L) which allows one EV to donate charge to another. While this may not be fully appropriate at the roadside, due to slow charging times, it could prove of benefit in fixed locations such as car parks and campsites. US manufacturer Rivian is also working on an emergency tow-charging mode, using regenerative braking technology to refill the battery while the vehicle is being towed.

Roadside support for EV

Dean Hedger, EV New Business Development Manager, the AA: "All our patrols are equipped with unique free-wheeling hub technology that helps us to rescue EV drivers quickly and safely. It means fewer breakdown worries and shorter waiting times for drivers. Previously it was not possible to tow EVs, as many manufacturers recommended against it. The free-wheeling hub can be fixed to the rear wheels of stricken vehicles, using the AA's Multi-Fit wheel, so that it turns independently from the car.

"All of our patrols are also trained in electric vehicles to IMI Level 1 equivalent, with many also completing the Level 2 standard. With all of this investment, it is important to recognise that EVs make up a very small, although rapidly growing, proportion of current workload at just over 1%. As the EV transition takes place, we will continue to support ICE vehicles as long as they are still running."

Batteries and the fire risk?

In August 2021, General Motors confirmed it will recall all Chevrolet Bolt electric vehicles sold worldwide since launch in 2017 to fix a battery problem that could cause fires. In the meantime, owners are being advised to park outdoors and not exceed 90% charge on the battery. Ford, BMW, Volvo, and Hyundai have also issued battery recalls in recent months, while Tesla is dealing with several court cases in the US and Norway around battery health and over-the-air updates.

Vehicle fires happen in ICE vehicles, albeit rarely. However, battery cells in EVs can be particularly sensitive to heat and sparks, causing potentially higher risk of damage to the vehicle and the people around it. A Freedom of Information (FoI) request in the UK found the London Fire Brigade dealt with 54 electric vehicle fires in 2019, compared with 1,898 petrol and diesel fires. This suggests an incident rate of 0.04% for ICE car fires and more than double that for plug-in vehicles at 0.1%.

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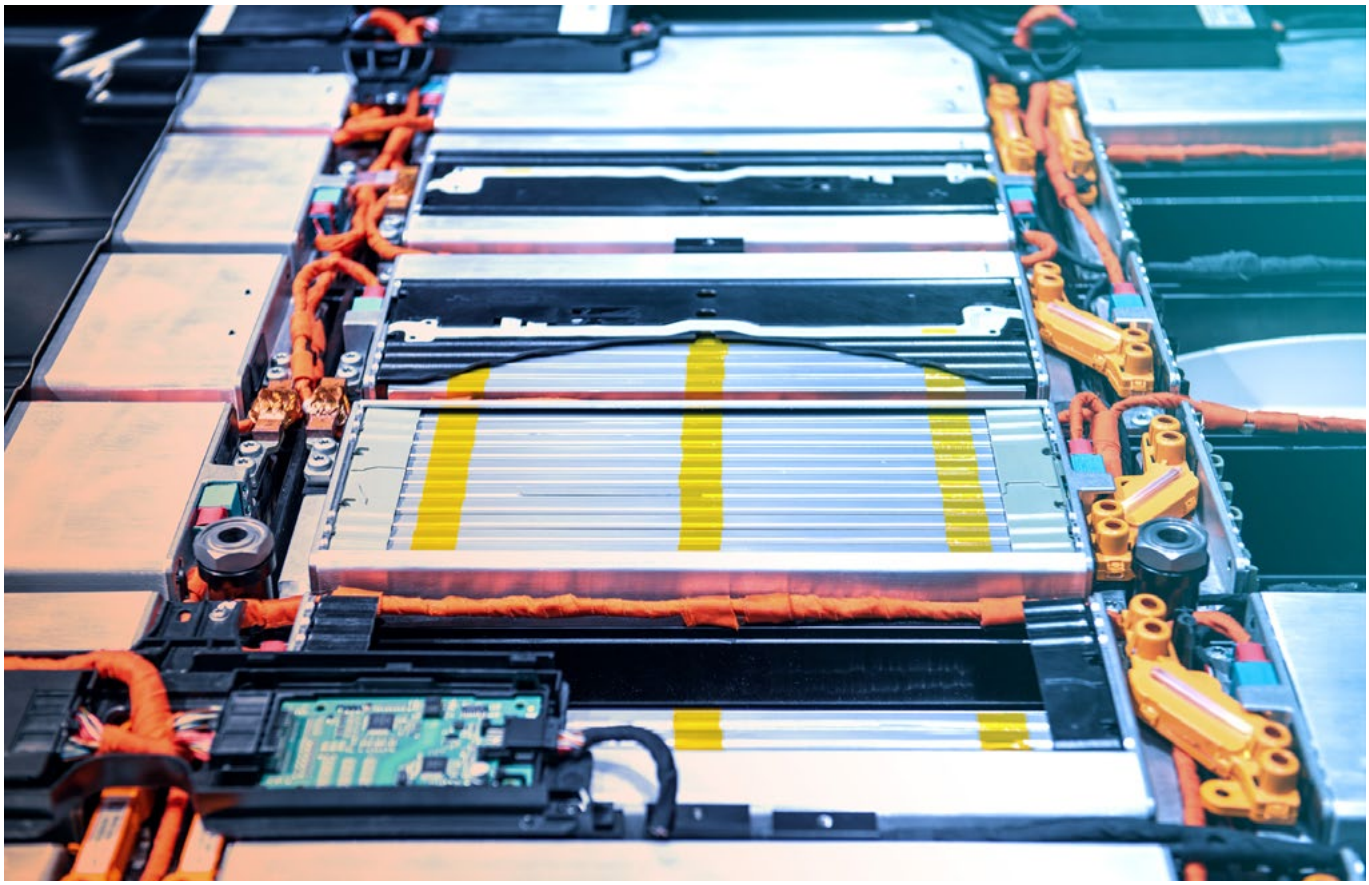

The challenge of EV fires

Peter Wilkinson, Technical Director at the Institution of Fire Engineers (IFE): "Lithium-ion batteries are a popular technology for electric vehicles because they store a huge amount of energy in a very small space. However, if the battery is

exposed to excessive heat, or there is a penetration in the battery case, then an internal short circuit causes heat that triggers a chemical reaction and a process called thermal runway, which can lead to ignition, or in some cases even explosion.

"Although these fires remain rare, when they do occur, they can be extremely dangerous. During an electric vehicle fire, over 100 organic chemicals are generated, including some incredibly toxic gases such as Carbon Monoxide and Hydrogen Cyanide – both of which are fatal to humans.

"Once the fire has been extinguished, the problem remains that electric vehicle fires can reignite hours, days or even weeks after the initial event, and they can do so many times, making disposal and storage of a fire-damaged vehicle a challenge."

Electric vehicle storage and transport

As more electric vehicles enter the second hand and resale markets, it is important they are transported and stored correctly between drivers. Some manufacturers recommend leaving them plugged in while not in use; others have a 'deep sleep' mode when not in operation. In either case, it is beneficial to keep them at 10% to 80% charge, if at all possible, to maintain the high voltage battery health.

There are also differences in the 12-volt battery, with options to either disconnect it while the vehicle is in storage or attach it to a trickle charger. Much of this depends whether the vehicle will be out of operation for more than 30-days. Energy-draining features which might need to be turned off include automatic map updates, temperature controls, and predictive battery reconditioning.

As with any vehicle, tyres will need to be rotated to prevent flat spots. Alternatively, the vehicle can be driven every few weeks or raised off the ground so there is no pressure on the tyres. The advice is to keep vehicles in a weatherproof location; however, some

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commentators suggest caution should be exercised if there are hundreds of electric vehicles being stored in the same enclosed environment.

Battery-as-a-Service (BaaS)

While most passenger and commercial vehicles will spend more than 15 years on the roads through various owners, the majority of batteries at the moment have an estimated lifetime of around five to eight years (or 100,000 miles). Manufacturers are extending battery warranties and in many cases they are double that of the mechanical warranty. Battery-as-a-Service (BaaS) seeks to address this through a leasing model which offers pricing per kWh, per km driven, or on a monthly basis. This is an emerging market and there is limited evidence to date as to how successful and profitable this will be for providers and operators.

For consumers, a lack of knowledge and transparency around battery health is influencing anxiety around how to ensure you are getting a good deal if you buy a used EV. The market is still forming for values in second and third life, and this further complicates financing of vehicles and decisions about how the replacement battery market will operate.

Replacement batteries in the UK market could cost anything from £5,000 used or refurbished to £15,000 new, which is a significant investment for a driver who picked up their second-hand EV at a comparatively low price. It is possible to replace single cells rather than the whole battery, which could bring the prices down to the hundreds rather than thousands of pounds.

Battery degradation

One study by Which? in the UK found an -8% reduction in usable range over six years due to battery degradation, which may not be an issue for buyers of new vehicles but will perhaps have an impact on the used market. Indeed, a Cox Automotive consumer study in the US found four in five (83%) consumers are sceptical about used EV batteries.

Battery degradation can be accelerated by extremes of temperature, particularly warmer climates, as well as the regular use of fast charging networks which tend to cause the battery to run hotter during the charging process. If vehicles often go through a 0 to 100% charge cycle, this can also speed up battery depletion. However, such intensive charge cycles are unlikely in most EV use case scenarios, with EV drivers recommended to keep their battery charge between 20% and 80%.

Recyclers, transporters, and services will require access to a standard set of data to effectively repurpose end of first life batteries. Cox Automotive is supporting calls for a standard battery health score (state of health / SoH) to enable smart end-of-life decisions and vehicle valuations. This aligns with the recent acquisition of Spiers New Technologies, which offers ALFRED; a PHP / MySQL web application that collects, manages, and processes battery and battery related information.

A new life for batteries

By 2030, Cox Automotive estimates 100 GWh of battery capacity worldwide will be retired annually from electric vehicles, from nearly 2,000 GWh of capacity demand. Just 1 GWh could power around 725,000 homes, suggesting significant opportunity for second and third life batteries in a decentralised and distributed energy sector. Greenpeace East Asia believes lithium-ion batteries decommissioned from EVs and repurposed for energy needs could meet the world's needs by 2030; suggesting repurposed batteries could support China's 5G telecoms infrastructure and data centres as a start point.

While some end-of-life options currently include export and disposal through landfill, the direction of travel is towards reuse and recycling. Both options are potentially challenging at the moment, but significant investment is taking place. Greenpeace East Asia suggests repurposing batteries could save 63m tonnes of carbon emissions from new battery manufacturing. The incentive to develop new streams for EV batteries once their in-car life is finished is significant. Repurposing is likely to be more effective than disassembling batteries and extracting materials.

In September 2021, Cox Automotive acquired Spiers New Technologies (SNT), a business that provides repair, remanufacturing, refurbishing, and repurposing services for battery packs. This follows collaboration between the two businesses which saw a battery health diagnostic tool built using Spiers' software platform, ALFRED. Spiers is one of a few companies that specialises in giving EV batteries a 'second life' after they are no longer fit for use in a vehicle. Around 80% to 90% of the batteries SNT receives are from manufacturers, with the rest from auto dismantlers.

Cox Automotive Grant Thornton

Insight Report 2021

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