



EV Report 2020

the road ahead

Partners

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newmotion

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Introduction

The momentum behind the transition to electric vehicles appears to be weathering covid disruption, for now.

While petrol and diesel sales are still reeling, in the UK new battery electric vehicle registrations more than tripled in June, up 262 per cent year on year.

Continued fallout may affect timings, but some 33 new battery electric vehicle models are expected from European carmakers in 2020, with more than 100 BEV models on the market by 2022.

There is work to do to ensure those vehicles arrive in the UK rather than elsewhere, and larger vans are conspicuous by their absence, but businesses certainly have appetite. Government policy, though imperfect, is heading in the right direction. Company car tax change is driving demand, while £500m of support for a rapid chargers complements the heavy lifting undertaken by the private sector - and comes at the right time.

But the investment required in the power system should not be underestimated. Existing infrastructure was designed for a different world. The power industry is working on ways to mitigate impacts, but the electrification of transport - and potentially heat - is a step change.

Most of the businesses surveyed for this

report state they plan to take a smart approach to charging. Most are considering integration of onsite generation into charging infrastructure to reduce grid demand, and just over a third are at least interested in providing vehicle-to-grid services.

But chargepoint operators suggest grid capacity is already a major barrier to deployment. While large fleet operators say they are prepared to pay for upgrades where necessary, they are unhappy at having to foot that bill for others. If wholesale upgrades are necessary, a rethink of charging allocation may be required.

The convergence of power and transport sectors also brings huge opportunity. Electric vehicles are possibly the most palpable and visible way to engage the public in decarbonisation, and their batteries provide an enabler to a renewables-driven power system. Digitisation of both power and transport, alongside modernisation of settlement and systems, is no mean feat. But done properly it will open up new applications, business models and competition to speed decarbonisation at lowest cost.

There are many unanswered questions and businesses currently face a perfect storm of uncertainty. But the views garnered for this report suggest they are preparing for the road ahead.

About the survey data presented in this report

The data presented in this report is based on a survey of 327 people conducted by The Energyst magazine between March and June 2020. Respondents represent a cross section of UK plc, from single site microbusinesses to multisite corporates. There were a number of public sector responses, largely local authorities and NHS trusts.

Around two thirds of respondents are considering installing charging infrastructure. Of those we split out questions for those planning workplace charging (124 complete responses), some for destination charging (20 complete responses) and others for fleet operators (33 complete responses). Each then rejoined the main survey. There were also 20 respondents considering public/on-street charging, but we did not break out separate questions for them. We have spread the survey responses alongside interviews across the report.

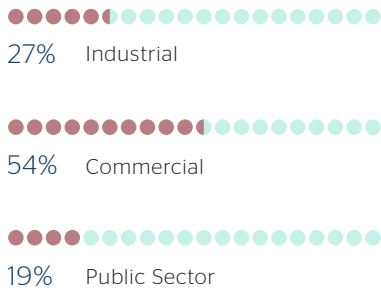
Thanks to all survey respondents, those that shared insight via interviews and to report sponsors Arup, EDF, Good Energy, NewMotion and Total Gas & Power.

Brendan Coyne | contributing editor | Energyst Media

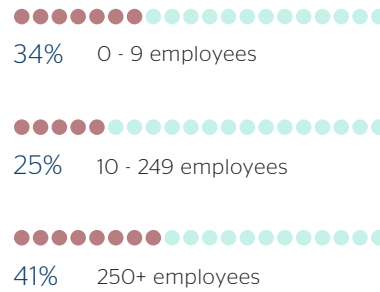
EV Survey 2020

Demographics

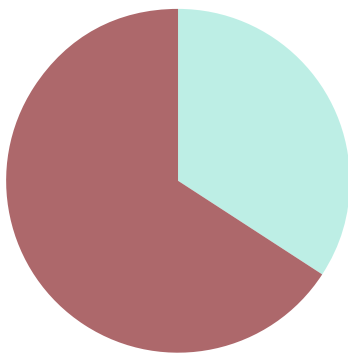
EV Survey question:
Which sector do you work in?



EV Survey question:
Number of employees in your organisation?

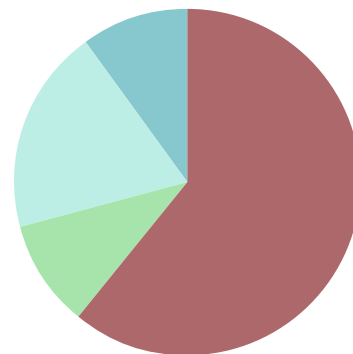


EV Survey question:
Is your organisation considering installing EV charging infrastructure?

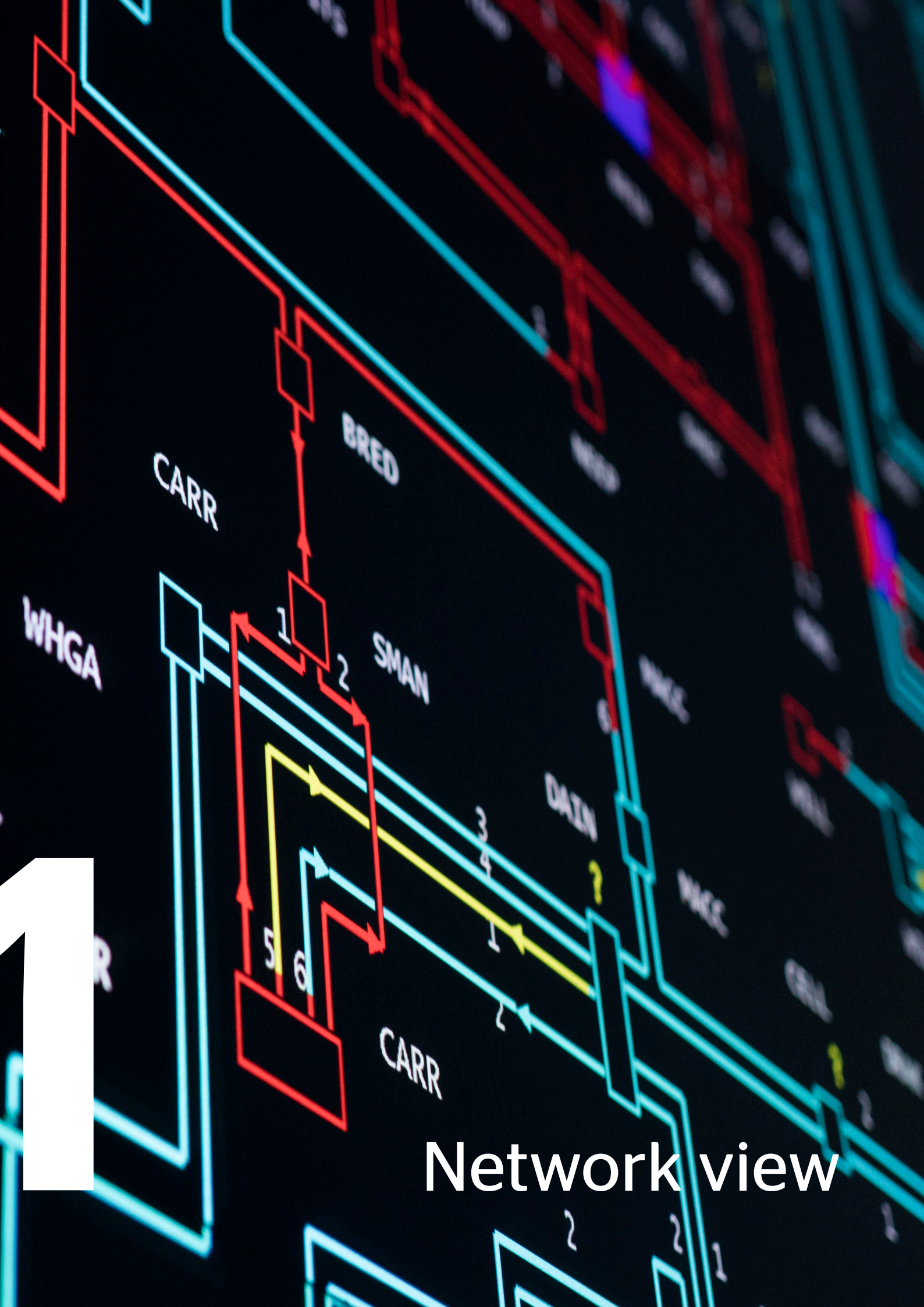


- Yes, considering installing EV charging infrastructure (66%)
- No, not considering installing EV charging infrastructure (34%)

EV Survey question:
What will be the chargers' primary purpose?



- Charging employees vehicles (61%)
- To enable visitors to charge (10%)
- Fleet charging (19%)
- Public/On street charging (10%)



1

Network view

Transport and power: The revolution will not be fossilised

Graeme Cooper, project director for transport decarbonisation at National Grid, says EVs and renewables are mutual enablers, while digitisation of energy and transport brings a smart, flexible and decarbonised system closer to reality



National Grid - Graeme Cooper

The decarbonisation of transport and energy are symbiotic, says Cooper. 30 million cars alone will need lots of power. A renewables-dominated power system needs vessels that can take excess generation when required, and adjust consumption when the system is tight.

Without those elements, price cannibalisation makes financing renewables projects increasingly difficult.

Digitisation is another cornerstone, says Cooper, providing visibility both up and downstream, enabling a smart system where demand and supply can be co-ordinated. Otherwise the UK's wiring system would inevitably become overloaded - and the required upgrades extremely costly.

"The switch to EVs allows you to have demand that is moveable in time," says Cooper. "Which means when there is spare electricity, you can dump it cheaply into cars. When it is expensive, you can say, 'do you mind not charging today'? That means transport gets cheaper and cleaner."

Service economy

Once those cornerstones are in place, he thinks innovation must follow - because charging networks will make relatively little money from retailing power.

"Electricity for transport is incredibly cheap," says Cooper. "Charging networks will need to make money from other aspects."

He sees parallels between the early days of the mobile phone industry.

"When the mobile networks were being built, everyone thought the competition was in the network. There were huge auctions for spectrum. But once the coverage was in place, the competition was not around the infrastructure, it was around the offering," says Cooper.

“Electricity for transport is incredibly cheap, charging networks will need to make money from other aspects”

"The car charging community has a chance to get to that point. It is not about who has the biggest network, but around the offering - seamless, quick, bundled, value adds. That is where I see great opportunity for business model innovation."

Timing issue

National Grid is working on plans to enable a high-powered motorway charging network that makes best use of transmission capacity.

The key challenge is one of timing, says Cooper.

"Most of the early EVs are not capable of high-powered charging. So for the moment, there is not a massive demand on motorways for EV charging. But you know it is going to be really important - nobody chooses to pay a big premium for motorway petrol, yet motorway services are always busy."

Moreover, people need certainty that they can charge when and where they need to before they decide to invest in an electric car over an ICE equivalent, says Cooper.

“It is not about who has the biggest network, but around the offering - seamless, quick, bundled, value adds. That is where I see great opportunity for business model innovation”

"People need continuity and consistency wherever they go. So high power en route charging could only be 8-10 per cent of energy retailed, but it becomes the most critical for those 'out of pattern' journeys."

Right now, six 150kW chargers is "probably fine" for motorway charging stations. "But typically, motorway service stations have 20-30 pumps, so how many chargers and at what rating will you ultimately need? The answer to that question will tell you the grid connection required. Do you build that incrementally? That is very inefficient. But at the same time, does it feel right to bring in 10MW of capacity today, knowing that it will be underutilised for the first few years?"

The government's £500m fund for rapid EV charging is therefore welcome, says Cooper.

"The interesting thing is how to deploy that - to get the right capacity in the right place at the right time," he says. "Is it short term, for today, or long term, knowing it won't be fully utilised? Then you have the conundrum of how to recover that cost. What is the price premium that may need to be levied?"



Business model pivot?

Cooper thinks that question, as well as falling service revenues for carmakers, leasing companies and dealers, will drive business model innovation from the automotive sector.

"If you are a captain of industry and want to pound the motorways in an electric Range Rover, why wouldn't you bundle 'Jaguar Land Rover Power' into the monthly lease?" says Cooper. "That is much neater - and then the charging networks have agreements with a handful of leasing companies, which is more financially robust."

Tesla already takes that kind of bundled approach, and Cooper thinks other OEMs, or those financing the cars, may need to adopt a similar model.

"If I was a leasing company, I'd be concerned about depreciation. Who in four years time will want a four-year old diesel? Nobody is giving volume discounts on EVs and then there is the loss of maintenance revenue, because EVs require a lot less servicing. So leasing companies have to consider where value is lost and gained and look at new revenue streams that are financeable in the long term," says Cooper.

"If they are not already thinking about this, they may not be in business much longer."

In the meantime, Cooper urges the energy and automotive industry - and its regulators and policymakers - to work as closely as possible.

"People will not thank us if we get this right. But they will blame us if we get it wrong, so we need to fight the status quo rather than each other. If we want to do this properly, collaboration is key."

Smart charging versus V2G

Cooper has consistently stated that the UK's power infrastructure can handle the huge increase in demand by swapping petrol and diesel for electricity - provided smart systems are in place.

"Flexibility is really important, but I think we can get a long way with smart charging - controlling when the power goes into the car."

While vehicle-to-grid is "an important principle", Cooper thinks a greater volume of two way flexibility from EV batteries may come from second-life car batteries in peoples' homes rather than "sitting on four rubber tyres."

But he says there may be some "killer applications" for V2G, especially where cars are parked for long periods of time.

"We have to explore these things, because that will lead to innovation, so V2G is important. Is it some magic bullet? No. Is flex critical? Yes."

Power games: networks plot route ahead

The UK's distribution networks face big challenges to deliver net zero. Western Power Distribution has outlined the number of EV chargers it can handle and measures to mitigate impacts



Western Power Distribution - Paul Jewell

Western Power Distribution is preparing for a 16-fold increase in electric vehicle chargers on its network by 2023.

The distribution network operator (DNO) says flexibility and managed charging will be key to ensure its power infrastructure can handle widespread adoption of electric vehicles, but underlines that there's no escaping the need for huge network investment.

"With EV adoption increasing at the current rate, it is expected some 217,000 chargers will be connected to the network by 2023," states WPD's updated EV strategy.

At the end of March 2020 there were around 13,760 EV chargers installed on the network, per the report, suggesting a 1,500 per cent increase over the next three years. WPD cites changes to company car tax rates (Benefit

“**With EV adoption increasing at the current rate, it is expected some 217,000 chargers will be connected to the network by 2023**”

in Kind), plus a significant ramp up from carmakers as driving factors.

One charge every five days

The document reiterates that WPD's transformers can accommodate a 35kWh charge for cars and vans every five days for each of the customers connected to its network.

WPD says that should be sufficient for most users, if charging is managed appropriately – and the document outlines a number of approaches.

These include timed connections, smart charging and potentially vehicle-to-grid initiatives. WPD said it has adapted its Flexible Power platform, which it is using to procure flexibility to manage network constraints, to enable domestic EV aggregation.

However, commercial flexibility through larger clusters of EV chargers may provide more immediately scalable solutions. For example, the flexibility available at park and ride sites or long stay car park locations is something

Rapid charging: Spend it wisely

Government has committed £500m to help enable a nationwide backbone of 6,000 rapid chargers along major routes. To deliver an enduring solution, it needs to be spent wisely, says Western Power DSO manager, Paul Jewell.

To that end, WPD is working with Moto service stations on new rapid charging technology that it believes could cut costs by around £500k per site and make installation quicker and easier. Under the £1m 'Take Charge' project, WPD will deploy a 'prefab' solution providing up to 20MVA of capacity – enough to charge multiple cars at peak times. The project also aims to develop 'plug and play' components that can quickly deliver capacity for up to 40 rapid chargers per site.

EV Survey question:

When do you plan to start installing charging infrastructure?



Car parks over on-street chargers?

Local authorities “appear to be looking at hubs and car parks rather than street-side charging”, says Western Power DSO manager, Paul Jewell.

That approach suits DNOs, because it is easier to provide a megawatt in one place via a new substation in a car park than lots of individual connections. Hubs also provide more straightforward opportunities for flexibility. Jewell thinks an increasing number of park and ride schemes could potentially play a balancing role as councils decarbonise city centres.

the whole industry must consider, said WPD.

It also expressed support for broader incentives for customers that can provide ‘whole system flexibility’.

“As vehicle to grid solutions and smart charging develop, WPD will have the opportunity to make use of these flexible solutions on the network. In fact, a customer who makes use of local generation, storage and EV charging could actually reduce their impact on the network and help avoid conventional reinforcement,” states the report.

However, where it must upgrade to manage clusters of EVs that overload the network, WPD said it developed technology to “throttle back the load” in hot spots.

That tool is now available to all of its teams, said WPD, but stated it will only be used while the networks are being upgraded – not on an ongoing basis.

Flexible approach

As well as the potential for depots and long stay car parks to participate in flexibility programmes within constraint zones, WPD also plans to offer timed connections.

For example, a depot that charges vehicles at night might be able to avoid paying for reinforcement by using adjacent capacity already present for daytime industrial use.

WPD said that approach can progress to a fuller active network management solution, where customers react dynamically to network signals to restrict charging at peak times.

To signpost where it may need flexibility, the

DNO has developed a heat map of capacity at each of its local transformers.

However, WPD said traditional reinforcement is required even to manage flexibility: “If flexibility is left unchecked then a bow-wave is produced which takes extensive expenditure to overcome,” states the report.

Spend to avoid capacity crunch

WPD’s strategy document points out that EV numbers could rise far more quickly – and must do so to hit the government’s 2035 target. DNOs must prepare for accelerated adoption and to enable the low carbon transition, says WPD DSO development manager, Paul Jewell. So Ofgem must factor that into the regulated five-year price controls that govern DNO spending and allowed earnings, he adds.

While emphasising the need for flexibility, Jewell underlines that lots of reinforcement is also required.

“It needs to be a price review that carries on setting the foundations for net zero,” he says.

The next spending period runs from 2023-28 – and many local authorities have committed to hit net zero by 2030. If they are serious about delivering those commitments, much of the enabling network investment must be carried out over the 2023-28 framework.

As such WPD is embarking on a major engagement push with local authorities to better understand where they are with those plans, and outline what is “physically achievable”, says Jewell. That engagement work will inform its submissions to Ofgem.

“**A customer who makes use of local generation, storage and EV charging could actually reduce their impact on the network and help avoid conventional reinforcement**”



2

Company cars
& workplace
charging

Free cars, free charging

UK electric vehicles appear to be entering the foothills of a boom, with new company car tax rules and other incentives beginning to drive exponential growth



Arval - David Watts

Prior to this year, UK electric car drivers tended to be early adopter private owners, with battery electric vehicles accounting for 1.6 per cent of new registrations in 2019, according to SMMT figures.

But as of April this year, changes to benefit in kind (BIK) rates effectively give company car drivers a free vehicle.

That has blown concerns around range anxiety out of the water, according to Arval consultant David Watts. As a result, the leasing company saw EVs nudging double digits in terms of total orders for the first quarter, and that trend has continued despite economic disruption.

However, that figure includes Arval's retail operation, where BIK has no bearing. Within its business leasing operation, the firm is seeing "significantly higher" growth rates, says Watts, with some channels approaching 20 per cent.

Watts puts the surge squarely down to BIK changes, which mean company car drivers pay 0 per cent this tax year, only 1 per cent for 2021-22 and 2 per cent for 2022-23.

"It is amazing how people can make things work when it is free," he said. "Overnight, those barriers around range and models have disappeared."

As a result, Watts believes electric vehicles will

"become the norm" for company car drivers over the next few years.

"Unless you have a horrific experience, you are not going back [to petrol or diesel]."

More models

As well as tax breaks, Watts says the ramp up from manufacturers is driving demand - with lead times less of an issue than some might believe.

Perceptions of lengthy waits were exacerbated when Hyundai launched its Kona and Kia its e-Niro. With limited numbers and high demand, both were effectively back off the market almost immediately.

That episode "tarnished EVs as a whole", suggests Watts. Most other models, he suggests, are close to conventional lead times of around 8-12 weeks. "Anything up to six months people are okay with," says Watts, "it is only when it gets longer that it becomes a problem."

Watts says as more EVs come to market, "you spread the pressure" on individual models, "so that position is only ever going to improve".

Pricing

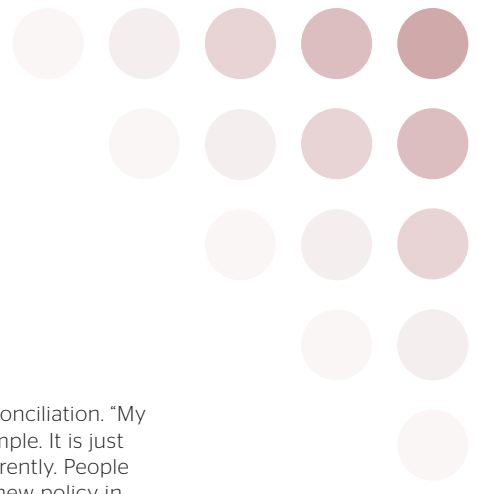
Manufacturers say they are not making any money from EVs - but that is due to high

“**My standard message is keep it simple. It is just a car that you fuel slightly differently. People think you have to put a raft of new policy in place, but I don't think that is the case**”

EV Survey question:

Do you think changes to Benefit in Kind rates will increase the number of EVs within your organisation?





investment and lack of scale. Watts points to Volkswagen, which last year started production of its ID.3 and next year aims to produce 330,000 EVs a year from its Zwickau plant.

“That’s the same ball park as the diesel models it was producing. Once you have that volume, the economies of scale start to kick in, and battery prices continue to fall,” says Watts. “So they ought to be making money.”

That means prices should improve. But for company car drivers, Watts believes “as long as companies are operating on a whole life, total cost of ownership basis, the cars will always fit within a grade somewhere.”

For the next couple of years, as OEMs ramp up and model range remains relatively limited, he thinks drivers “will be willing to compromise in order to access the technology due to extremely cheap tax”.

Keep it simple

Watts believes there is a tendency to overthink incorporating EVs into company

car policy, and dealing with reconciliation. “My standard message is keep it simple. It is just a car that you fuel slightly differently. People think you have to put a raft of new policy in place, but I don’t think that is the case,” says Watts.

“As long as the vehicle is in the right place in terms of grade structures and choice, there isn’t much else you have to do, other than mileage reimbursement at the government rate, 4p/mile, claimed through expenses.”

He says policies should just make clear to employees that if they are choosing an electric vehicle, they must accept and adjust to the differences that will entail.

“I don’t think that there should be any rule bar one: It is your choice, so you have to make it work. Drivers will need to behave differently, but as long as they are making an informed decision, they will be fine,” says Watts.

“You don’t need to profile them, or check if they have off street parking. That is just another can of worms. Keep it simple. It is all about the education.”

Company car tax breaks

Changes to Benefit in Kind (BIK) rates for electric vehicles make EVs an increasingly attractive option for both staff and employers.

The changes mean that the BIK for company car drivers is calculated by reference to a 0 per cent tax rate for this year, only 1 per cent for 2021-22 and 2 per cent for 2022-23

Previously, the BIK regime applied a benefit value of 16 per cent of the car’s list price. A £30,000 car would therefore be classed as generating a taxable benefit of £4,800.

So by taking an EV in the current tax year, employees effectively get a free car, which is still very cheap next year (taxable benefit of £300) and the following tax year (taxable benefit of £600) compared with a petrol or diesel equivalent.

“Government is using the tax regime to influence behaviour, and it is very favourable to EVs,” says Mark Braude, tax team legal director at law firm TLT.

Changes to the tax rules in 2019 enable employers to provide EV charging at work without generating a BIK, he adds, which means staff this year can get both a free car and free ‘fuel’.

Meanwhile employers can potentially claim capital allowances on the acquisition of an electric vehicle at a 100 per cent rate, says Braude

Businesses: Plot your journey now

With EV demand starting to grow exponentially, workplaces should start planning now – and think beyond the car park, says EDF EV solutions director, Vincent de Rul



EDF - Vincent de Rul

Interest in EVs and charging infrastructure had picked up markedly even before changes to Benefit in Kind tax rates came into effect in April, says EDF EV solutions director, Vincent de Rul.

So far it seems not even Covid-19 disruption can halt the shift now underway: June EV sales increased 262 per cent year on year, according to industry data. With generous tax breaks spurring demand, de Rul advises businesses planning to integrate EVs into company car fleets to begin mapping their journey now to secure full value from incentives and benefits.

“Start researching the technology options and support available, and which parts of your fleet are best suited to electrification to create a clear plan,” says de Rul.

“Starting slowly is not a problem. But do start, so that you can test and learn with a handful of chargepoints and vehicles to ensure a successful wider rollout.”

Stakeholder engagement should not be underestimated, he adds. “It affects all areas of the business. Ensure everybody is included so that it is a positive transition for all stakeholders.”

Crucially, he advises firms to strike partnerships.

“The EV ecosystem is developing quickly and there are many moving parts. It’s not something any business can successfully

do on its own. Having strong partnerships in place across that ecosystem is the way forward.”

Optimise everything

Mapping and overlaying requirements onto vehicle leasing or procurement cycles will inform charging infrastructure strategies, says de Rul, with both workplace and home charging factoring into the required number of chargers, charging speeds and also shaping energy contracts and capacity aspects.

Understanding on-site charging requirements informs whether or not businesses have sufficient electrical capacity or may need to consider workarounds. While some parts of the grid may require reinforcement, de Rul says there are lots of ways for businesses to minimise additional infrastructure investment.

While smart charging is a key consideration in managing grid capacity, he says firms should first look at maximising energy efficiency opportunities across their facilities – not just in the car park.

“Optimising energy consumption is the first thing to do. If you can generate renewable energy locally to support your own needs as well as the grid, you should do that,” says de Rul. “Then of course, load manage and prioritise your systems and processes smartly – not just across EV chargers, but across your entire estate.”

“Starting slowly is not a problem. But do start, so that you can test and learn with a handful of chargepoints and vehicles to ensure a successful wider rollout”

EV Survey question:

Have you considered the impact of EV infrastructure on your site’s network capacity?



Car parks as virtual power plants?

De Rul says smart charging “is an absolutely critical step to get to net zero” without overloading the grid.

Smart charging can also provide a significant opportunity for businesses in terms of minimising energy costs and reducing carbon footprints - while turning car parks into a potential source of revenue.

Even when cars are parked in different locations, there are ways that company fleets can become virtual power plants if aggregated and smartly controlled to charge only when it benefits the local or national grid, says de Rul.

He points to the challenges faced by National Grid ESO this summer in managing exceptionally low demand on the transmission system due to lockdowns

- which resulted in it offering to pay large energy users to consume more power.

“To me, smart charging is the most exciting aspect of the electrification of transport, because it combines all elements - the energy market, customer behaviour and the constraints of the network and the asset itself,” says de Rul. “If we can understand and manage those aspects in the right way, we can deliver smart solutions for the customer - and for the decarbonised economy.”

While smart charging can unlock revenue opportunities for businesses, he says bi-directional charging, which enables vehicle-to-grid services, should also be on the radar for businesses with large fleets as “the final stage of optimisation.” (See p55 for more on V2G.)

In the meantime, de Rul says business that bring together onsite generation and/or storage assets with EV charging solutions “can unlock a very strong proposition” across cost, revenue, constraint and carbon management.

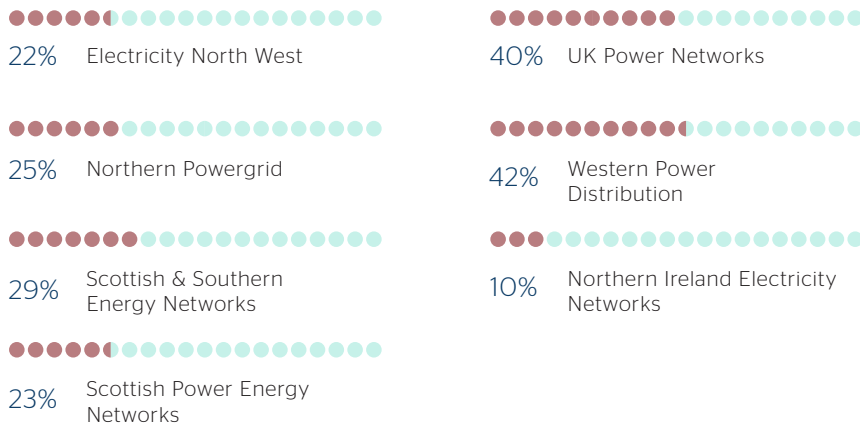
“**Optimising energy consumption is the first thing to do, prioritise your systems and processes smartly - not just across EV chargers, but across your entire estate**”

Putting the pieces together

This year EDF acquired charging network Pod Point, which counts companies such as Tesco, Lidl, John Lewis and Mitie as customers. It also acquired Pivot Power, which is developing a network of transmission-connected 50MW batteries in a bid to form a superfast EV charging network adjacent to main arterial routes. EDF has set out plans to be a European leader in electric vehicle charging. It believes a new nuclear fleet, storage and smart charging will be required to enable a net zero economy underpinned by electrification of heat, transport and industry.

EV Survey question:

Who is your local electricity distribution network operator (Multisite businesses have chosen all that apply)



Think smarter to speed transition

Smart charging and a considered rollout strategy are critical to maximise available grid capacity and minimise cost for businesses, says Alan McCleave, general manager at NewMotion UK



NewMotion UK - Alan McCleave

One of the few upsides from the Covid-19 lockdowns was cleaner air and significant CO2 reductions. Electric vehicles, says Alan McCleave, can make those environmental gains “the new normal”.

While economic disruption has impacted EV sales, they are still expected to more than double in 2020, according to SMMT, and McCleave thinks the UK is on the cusp of “hockey stick” growth.

“It has taken ten years to get to one per cent of vehicles being plug-in, but in the next four to five years, that will very likely reach ten per cent - a massive scale up,” says McCleave.

“Choice, availability and affordability is starting to come from carmakers - which indicates that mass market uptake is on its way,” he says, “After all, you can’t have growth without product.”

The flip side is charging infrastructure, where NewMotion is building relationships with car manufacturers, dealers and leasing companies to install chargers at their premises - and also at their customers’

premises and homes. A smart approach is key, says McCleave.

Think ahead

Given the growth curve, car dealerships must quickly get to grips with charging infrastructure. If they are considering AC chargers, McCleave advises them to go for higher capacity 22kW versions to future-proof their requirements.

“It’s additional investment, but if you are going to dig up a car park, it’s best to only do it once,” says McCleave. “A 22kW charger is only about 30 per cent more than a 7kW charger on install costs. It’s an uncertain world right now, but our advice is if you can afford it and have the power capacity on site, you should take that approach.”

“**Choice, availability and affordability is starting to come from carmakers - which indicates that mass market uptake is on its way**

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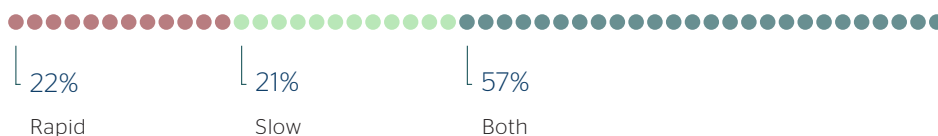
Aldi thinks ahead

NewMotion is installing 22kW charging stations across Aldi’s new UK stores as well as at the retailer’s Atherstone headquarters. McCleave says by opting for a higher power capacity than the standard 7kW chargers, the supermarket is future-proofing its operations as EVs with bigger batteries and faster charging capabilities start to hit the market.

While NewMotion provides account management and support for Aldi, McCleave says the supermarket can also remotely manage all aspects of its charging infrastructure via the NewMotion Business Hub.

EV Survey question:

Are you considering rapid or slow chargers?



Capacity crunch

For dealers – and any business with a large car park – electrical capacity will likely become an issue, if it is not already.

“Nobody ever built a dealership thinking they would become mini power stations. If you are building a new site, you can specify 20 chargers. But if you are retrofitting an old site, that is challenging – and if the power network requires upgrades, that can command a six figure sum without even putting in any chargers,” says McCleave. “So these are not insignificant decisions, especially where leases may only have a few years to run.”

Those tasked with implementing workplace and destination charging at scale must navigate similar challenges.



Smart approach

Smart charging is critical to maximise available grid capacity and minimise cost, says McCleave. Using connected technology to add smart services to the charge points helps balance on site energy use to keep within capacity allowances and allow the site’s Distribution Network Operator to approve the required infrastructure.

Meanwhile, company car drivers that can install chargers at home can take advantage

of time of use tariffs. That approach can lead to running costs as low as 1-2p/mile, he suggests, saving significant sums while helping to enable a cleaner power system and helping to balance local grids.

“Charging at home makes life easier and unlocks access to those kind of smart tariffs. But a lot of people don’t have off street parking, which is why workplace charging is such an important part of the puzzle,” adds McCleave.

Businesses appear to recognise the role they must play in enabling the transition. Covid-19 disruption notwithstanding, McCleave says demand for workplace charging has picked up markedly since last summer, with Benefit in Kind rates changes spurring “a lot more urgency”.

Interoperability

Achieving interoperability between charging networks as soon as possible would help enable a stronger, greener recovery as the economy attempts to shake off Covid-19.

Enabling drivers to charge anywhere with minimal fuss will speed uptake, McCleave believes, and will be especially important for destination and on-the-go charging, where operators are hoping to drive footfall and increase dwell time.

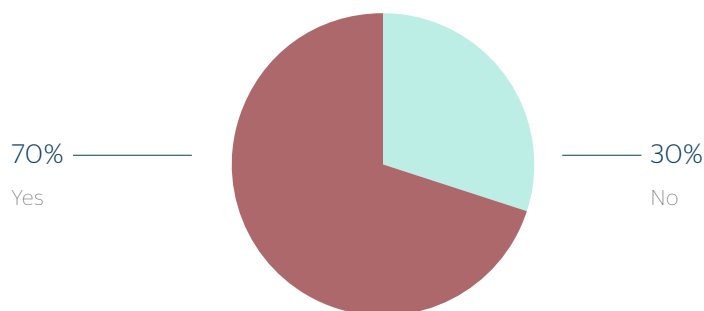
“The ability to charge anywhere with one means of payment or access is not possible today. But if we can break that interoperability barrier, it becomes interesting – not least because fleet operators are then less concerned about the range of the car nor have to worry about where the drivers can charge, or how they will pay,” says McCleave.

“Drivers will still need to plan their journeys – but that would make it a lot easier.”

“**A 22kW charger is only about 30 per cent more than a 7kW charger on install costs. It’s an uncertain world right now, but our advice is if you can afford it and have the power capacity on site, you should take that approach**”

EV Survey question:

Will your EV infrastructure be controlled to limit costs/grid constraints (e.g. smart charging)?



Preparing for the road ahead

Good Energy chief commercial officer, Randall Bowen, outlines how EVs can play a key enabling role in a cleaner economy, and what businesses should consider now



Randall Bowen - Good Energy

In the fight against climate change, electric vehicles “are the next battleground,” says Randall Bowen, chief commercial officer at Good Energy.

But, he says, EVs are also the enabler for whole-system decarbonisation, providing a network of distributed flexibility for an economy that will be powered primarily by renewables.

Electric vehicles, says Bowen, can not only take power when the wind is blowing and the sun is shining, but also give power back when the system is short.

While there are technical and commercial challenges to enable electric vehicles to become bi-directional power sources, Good Energy and others, including National Grid and a growing number of carmakers, are working towards a vehicle-to-grid future.

Demand picking up

Bowen says the first step is to collaborate with customers to help drive that shift through Good Energy’s EV charge point for businesses solution, One Point. As the name implies, One Point covers everything EV under one roof. While the business works to install charge

points with its partners RAW Charging and Swarco, he underlines that the approach is “technology agnostic, which means we can focus on providing businesses with the best EV chargepoint solution for them, in order to be ready for what is coming”.

“**Understanding energy consumption and reducing demand will help reduce the overall cost of decarbonisation**”

Because Good Energy customers “have already bought into the climate challenge and the urgent need to tackle it,” Bowen says it makes sense for the company to focus efforts on existing customers.

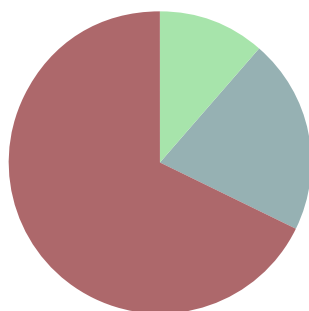
Destination charging

While some businesses within leisure and retail sectors will likely provide free EV charging as a way to attract customers, in the medium term it also presents a revenue stream as EV penetration increases. In that regard, Good Energy’s recent investment in Zap-Map, which can direct drivers to charging points along their route, will help drive footfall - literally putting businesses on the map.

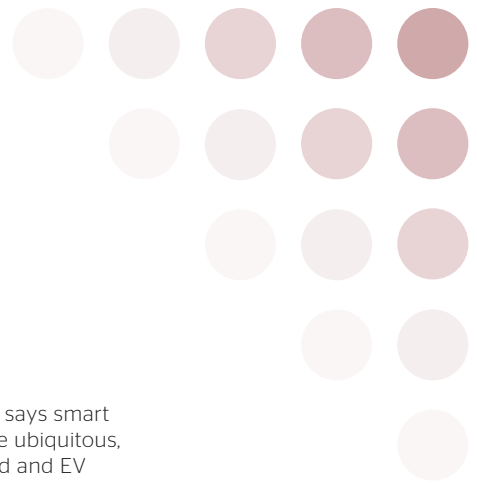
“So now is the time to consider and act,” suggests Bowen.

EV Survey question:

Have you considered the impact of EVs on your energy strategy/consumption/contract?



- Yes, we have discussed internally (68%)
- Yes, we have discussed with our supplier/consultant (11%)
- No (21%)



Smart charging: Shift happening

Smart charging delivers multiple benefits: lowering charging costs to owners, reducing stress on the local and national power networks and enabling people to charge when clean energy is most abundant.

“Smart charging will revolutionise many things,” suggests Bowen, especially when the smart meter rollout is complete. When that happens, and everyone is billed for their power on a half-hourly basis, there will be a strong incentive for people to react to larger price differentials, or time of use tariffs.

The cost of smart chargers is more than ‘dumb’ chargers, which Bowen says can

be a “pinch point”. However, he says smart chargers will ultimately become ubiquitous, so that grids are not overloaded and EV drivers are incentivised to help - rather than hinder - the power system.

If businesses do one thing...

The UK’s transition to electric vehicles is pointless without renewable power. As such, Bowen urges all businesses to switch to 100 per cent renewable power.

In tandem, he encourages people to “really understand energy consumption and examine all ways to reduce demand. That will help us reduce the overall cost of decarbonisation - and come out of the current situation in better shape”.

“**The UK’s transition to electric vehicles is pointless without renewable power**”

Where to start: Key considerations

For businesses considering EV charging infrastructure, Bowen outlines a checklist:

Numbers: how many chargers you will need?

Location: where will you put the chargers?

Dwell time: which determines the speed of chargers.

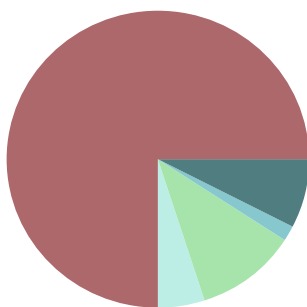
Grid capacity: are there constraints and cost implications?

Billing and metering: do you want to charge employees/visitors and if so, how much?

Control: choosing the right software package to optimise multiple car charging and flexibility.

EV Survey question:

Roughly how many staff at your organisation drive EVs?



- Under 10% (75%)
- 11-25% (7%)
- 26-50% (2%)
- 51%+ (11%)
- Don't know (5%)



3

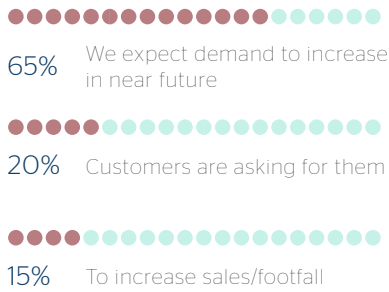
Public and
destination
charging

EV Survey 2020

Destination charging breakout

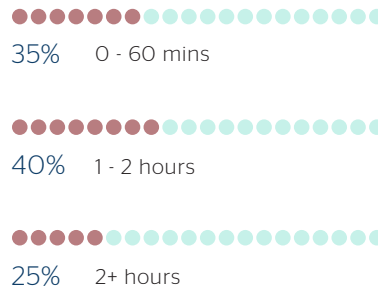
EV Survey question:

Why are you installing EV chargers?



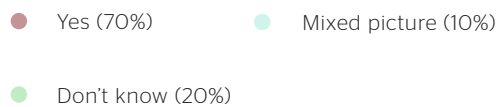
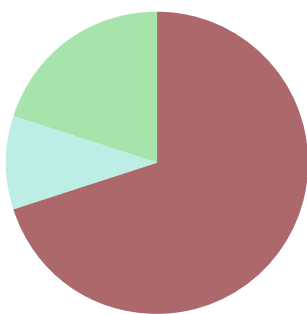
EV Survey question:

What is the average 'dwell time' customers spend at your sites?



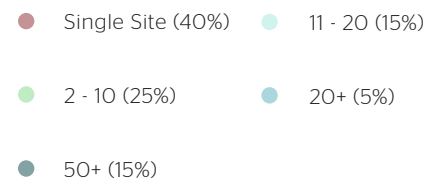
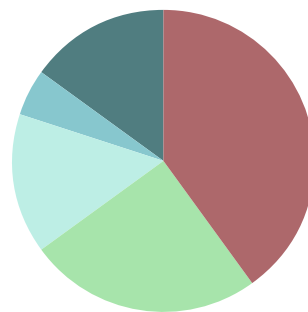
EV Survey question:

Has your landlord(s) agreed to allow charging infrastructure?



EV Survey question:

How many sites do you operate?



Public infrastructure 2.0: Joined-up thinking required

Arup's Filippo Gaddo says local authorities are getting to grips with infrastructure rollouts - but there is potentially a bigger collective prize



Arup - Filippo Gaddo

After an initial burst of activity, local authorities (LAs) are now taking a more strategic approach to EV charging infrastructure, says Filippo Gaddo, head of energy economics at Arup.

The consultancy has undertaken modelling work for LAs including Leeds and Sheffield. Specifically on rapid charging, it is currently working with Highways England as well as the Department for Transport on its Project Rapid programme to help inform the best strategic locations for public charge points.

Arup is involved in adjacent work with Transport for Wales and also for Greater Manchester around EVs and clean air strategies, some of which crosses into business model development as authorities look at how to price charging services that they initially provided free of charge.

Rationalisation

Authorities are at different stages of their journeys, says Gaddo, but most are now starting to take a more considered approach, he suggests, and are keen to rationalise supply chains that may have become unwieldy.

"Most are now working on data-driven strategies, determining where is demand,

where is existing infrastructure and where are the gaps, then creating dashboards to pull all that together and engage with the right stakeholders to determine the optimum approach," he says.

"They are increasingly keen to work with a single developer rather than multiple parties and to ultimately end up with a single tariff structure and programme that works across the city - so users don't have to deal with multiple interfaces."

Meanwhile, many are now taking a hub approach to try and maximise use cases for a single infrastructure point, e.g. taxis, private cars and light goods vehicles all able to charge in the same place.

Stick, carrot and concessions

Local authorities could also make more use of incentives and penalties in order to drive change from businesses without overburdening private citizens, which can be more politically challenging, suggests Gaddo.

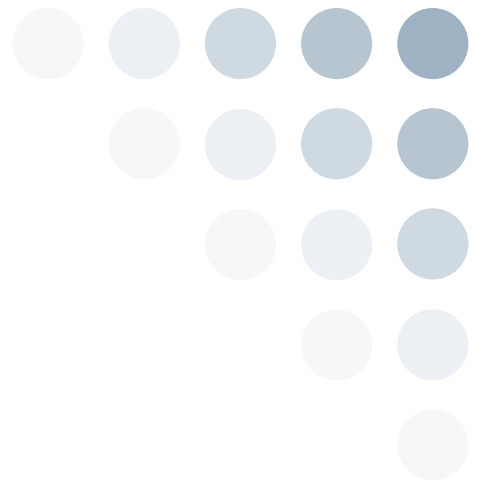
Commercial vehicle operators, for example, could be incentivised to drive EVs within clean air zones and penalised if they do not. "That provides both the incentive to develop charging infrastructure and is politically more palatable than a blanket congestion charge,

“**Local authorities have the power to effect change. They can say ‘we are going to go electric’ and make it happen. But they have not really harnessed their collective power to scale**”

EV Survey question:

How do you think you will fund the infrastructure?





“**The opportunity for a joined up approach is there at an individual authority level. But there is a bigger collective opportunity**”

which penalises everyone,” says Gaddo.

He also thinks concessions models, where a single firm is granted rights within a certain area, for example borough-wide or city-wide, could deliver a more cost efficient approach - provided interoperability is assured.

If LAs were to take that approach and aggregate their requirements, there may be significant opportunity to scale at reduced cost, Gaddo suggests.

“Local authorities have the power to effect change. They can say ‘we are going to go electric’ and make it happen. But they have not really harnessed their collective power to

scale. There is an opportunity to take a portfolio approach [via concessions models] that creates the opportunities to bring in infrastructure funds, which require an anchor tenant and that kind of scale

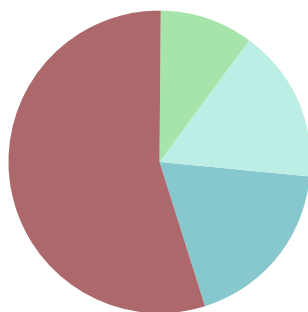
to invest,” says Gaddo.

He acknowledges that local authorities by nature are political organisations and that getting multiple parties to agree to a single strategy is no mean feat.

“However, unless you explore these kind of approaches, you don’t know what is possible. Because the two things investors require is certainty of demand and scale. Without that, it’s more difficult to attract the required capital,” he says.

“So the opportunity for a joined up approach is there at an individual authority level. But there is a bigger collective opportunity.”

EV Survey question:
How many charging points in total are you considering?



- 1 - 9 (55%)
- 10 - 19 (10%)
- 20+ (17%)
- 100+ (18%)

Plan your route carefully

The UK's public charging patchwork poses challenges for a car rental business and would-be customers, says Iain Macbeth, European director of strategy - Electric Vehicles at Enterprise.



Enterprise - Iain Macbeth

Enterprise has more than 100,000 vehicles in the UK and two million globally. It buys the vast majority of those vehicles outright before moving them on, usually within 6-12 months.

As such, it's effectively buying and selling around two million vehicles a year and the chances are that most of the nearly new cars on dealer forecourts have come from a rental operation.

Meanwhile, Enterprise also operates the UK's largest car club, where the majority of its EV operations currently take place, predominantly using second generation Nissan Leafs. It has around 80 on the books, says Macbeth, and these are one of the few exceptions to its retention rules, with residual values starting to rise. Car clubs are a great way for people to try out EVs, he adds, while grey fleet demand from local authorities and other public sector bodies is also starting to increase.



Fully charged?

Beyond that, Macbeth says the firm "Recognises that many of its customers still need educating on both using an EV and how to access public charging infrastructure, given that many will not have home charging options. The current state of public charging infrastructure, in terms of working coverage and interoperability, can cause challenges, particularly for those new to EVs.

"That side of things can cause frustration. It is only quite recently that the latest generation of chargepoints have started to provide contactless payment options," adds Macbeth. "People renting an EV might not know they need to have a dozen apps and umpteen RFID cards."

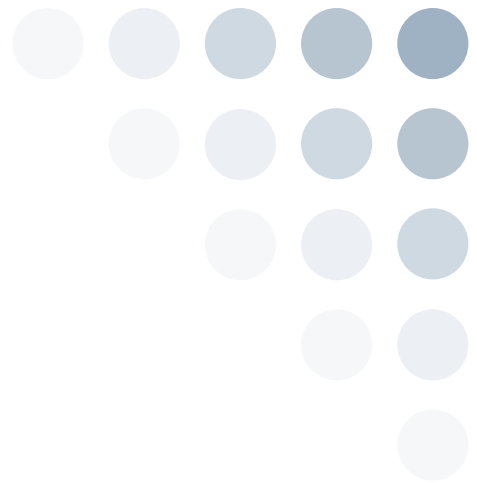
While EV registrations have increased substantially since changes to Benefit in Kind rules, Macbeth hopes business users with off street parking have had the foresight to install chargers at home. Heavy users, "sales reps doing 20-30,000 miles a year" will find themselves reliant on public infrastructure, he says. "At times it can seem barely adequate for early adopters. We recognise this is a short-term challenge and Government is taking steps to address this, but people remember the bad news stories, not the good ones."

Plan now, or pay later

Macbeth spent more than a decade working for Transport for London. As such, he offers succinct advice for anyone planning to integrate EVs into fleets or rollout charging infrastructure at reasonable scale: Plan now.

"Coming from a local authority background, planning can delay things massively, so plan the infrastructure in advance. Have the conversations with the DNOs early about where the power is available. The better the coordination and communication, the better the outcome."

Otherwise, he says, "you might find what you want to do is not possible without an eye watering bill."



App map

Macbeth says Enterprise would like datasets such as the charge point registry made more transparent and dynamic, so that people can see which charge points are working and how much they will be charged before they arrive. Equally, a public “league table” that ranks chargepoint operators by factors such as reliability would incentivise service improvements, he suggests.

“My remit covers Europe. As we increase our EV presence across the continent, we will need a platform that is available in multiple languages and currencies and across operators and energy suppliers.” The alternative is to strike relationships with different parties in each country - but that risks becoming unwieldy.

Positive outlook

Despite the challenges around charging, Macbeth says retail rental customers that try an electric vehicle tend to quickly become converts.

“At the moment, we’re receiving a lot of enquiries from local authorities and fleets to provide EVs. Our experience in helping customers to try an EV really helps in these circumstances - we’ve had instances where drivers have been reluctant to drive an automatic rather than a manual car, so guiding the customer in understanding how EVs work is a valuable asset,” he says. “But



attitudes will change - and when people have tried an EV, very few want to go back to conventional vehicles.”

Commercial rentals

Enterprise is seeing more EV interest within commercial channels, but for shorter-term contracts, fuel and maintenance savings don’t stack up, which can put business customers off, says Macbeth.

For electric vans, uptake post-Covid may depend on what happens with Ultra Low Emission Zones and whether these are now extended, Macbeth suggests. He thinks mass adoption within the van market will be closely linked to emissions policy.

If stringent rules are ultimately introduced, it may be that running costs are stretched to the extent that “electric van clubs” become viable for light users, says Macbeth. “It will be interesting to see whether or not that happens, but it could be a potential opportunity.”

“

Planning can delay things massively, so plan the infrastructure in advance. Have the conversations with the DNOs early about where the power is available

”

Public infrastructure: thinking inside the box

Liberty Charge CEO, Neil Isaacson, outlines its plan to enable a national network of on street chargers through telecoms infrastructure. Get this right, he says, and everybody wins.



Liberty Charge - Neil Isaacson

Liberty Charge is rolling out 1,200 on-street electric vehicle chargepoints leveraging telecoms capabilities. Virgin Media, a subsidiary of Liberty Global, operates some 40,000 of those powered cabinets across the UK. Its subsidiary, Liberty Charge, aims to deliver a scalable smart network using the connectivity they provide.

The 'VPACH' project, which has InnovateUK backing, brings together a consortium of partners, including: Vattenfall, SMS, Cenex, Ginger Town, Fully Charged, Connected Kerb, DETA and Loughborough University as well as local authorities in the West Midlands, Oxfordshire, Liverpool, Southend on Sea, Worcestershire, Wandsworth, Croydon, Northamptonshire, Hammersmith & Fulham and Belfast.

Save a packet

Liberty Charge, a joint venture with Zouk Capital, has been formed to deliver the network (Zouk runs the government's £400 million Charging Infrastructure Investment Fund). CEO Neil Isaacson says the aim is to provide "infrastructure as a service", essentially, providing a standardised baseplate that allows any chargepoint operator's kit to sit on top.

"Our view is that by leveraging Virgin Media's existing infrastructure, the cabinets and ducts, alongside its network expansion capabilities, we are able to deploy quicker and at lower cost," Isaacson explains.

"So it's not only cheaper, but deploying 'as a service' moves the operator away from having to sink all that capital on day one. That allows

them to better align costs with revenues." Meanwhile the operators get connectivity to boot. But Isaacson thinks the company can also leverage other kinds of connections.

"Virgin Media has existing relationships with local authorities. So where we do hit a roadblock, we can turn to people and get things moving," he says. "We have found that to be a very important aspect."

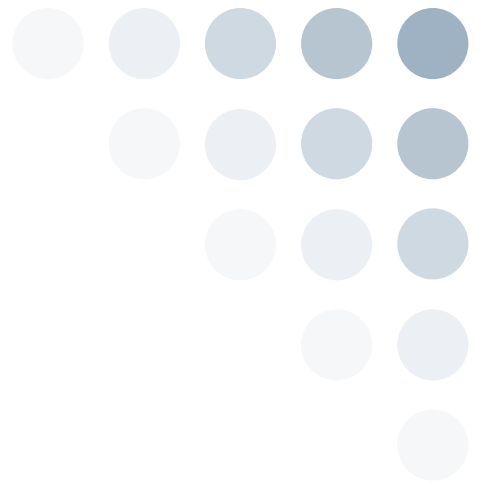
Power to the people

The original aim of the VPACH project, was to deploy double headed charging stations at 600 sites, though Isaacson indicates the plan is now for 300 sites. Liberty has been working with local authorities on the first batch of locations.

Isaacson says councils are at various stages of their EV infrastructure journeys, with the consortium "investing time to ensure partners are fully aligned in preparation for the rollout," he says. "The impact of Covid-19 puts further pressure on councils, so InnovateUK projects such as this one are key to helping make quicker progress."

Getting local authorities to sanction dedicated charging bays can be a political challenge, adds Isaacson, as residents do not always see eye to eye with that approach. There can also be a disconnect between those setting the political ambition and officers tasked with delivering on the ground.

"It's a challenge for local authorities, but if you wind forward a few years, residents will probably be asking why they haven't got more dedicated charging bays. So it's a difficult transitional phase to navigate."



Where to next?

Funding for the VPACH trial ends in March 2021, but Isaacson indicates this deadline may be extended due to Covid disruption. Either way, the end game is to be on the path to creating a sustainable business, he says.

“As far as possible, we want to be in a situation where local authorities can share learning with other local authorities in order to move more quickly. That has benefits for everyone.

“For Liberty, the aim is to create a long-term sustainable business providing infrastructure as a service to any chargepoint operator.”

In the coming years, Isaacson believes more chargepoint operators will come to market, while local authorities may be interested in adjacent data services enabled by its network, such as air quality and noise monitoring.

Crack this, go anywhere

Delivering an on-street public charging network is not easy. But Isaacson thinks

if Liberty Charge can succeed, significant opportunity knocks.

“It’s a challenge. National government is telling local authorities to rollout infrastructure. Local authorities have even less money in the current environment - and generally, as with any new field, they don’t have access to enough expertise,” says Isaacson.

“That’s why chargepoint operators generally aim for the low hanging fruit, which is domestic, destination and corporate charging. They tend to stop short of on-street charging, because it is very difficult.

“Our view is that not only can we provide a service that will be relied upon by 30-40 per cent of the population, but if we can crack this, who knows what the future holds?” says Isaacson.

“There are probably only a handful of players that have the national footprint and appetite to do this at a scale that makes sense. We believe we can make a fundamental difference to EV charging infrastructure across the UK.”



Pushing ahead: Nottingham plots shorter route

Nottingham aims to be the UK's first carbon neutral city. As such, it's pushing hard on electrification and tapping all available support to test and learn.



Nottingham City Council - Katie Greenhalgh

Nottingham City Council has committed the city to becoming carbon neutral by 2028. No mean feat, but it has now converted more than a fifth of the council fleet to EVs and has started to push beyond cars and vans, says energy projects manager, Katie Greenhalgh.

Alongside electric road sweepers and cage tippers, the council will have two electric bin lorries by the year-end after securing funding.

"We're fortunate to have Go Ultra Low support, because specialist vehicles are definitely a challenge," says Greenhalgh.

While switching to electric vehicles can unlock "dramatic" fuel cost, the capital cost is still prohibitive without some subsidy, she says.

"I don't think it would stack up without funding yet. Vans, probably yes, but there is still a funding gap on the more specialist vehicles, because the supply chain and the economies are just not yet there."

Electric car garage

The council is now opening an EV service centre - dubbed NEVS - which will maintain its own fleet and also provide services to other EV users.

"We have an existing MOT garage on the site and already do a lot of work with taxi drivers in the city - and the number of electric taxis is rising all the time," says Greenhalgh. "We have done a lot of work with Go Ultra Low to stimulate demand for electric taxis. So we think it's a growth market."

Meanwhile, Nottingham sees a gap in the broader commercial market - where service and maintenance centres have not yet caught up with the pace of change, especially as Benefit in Kind changes increase demand.

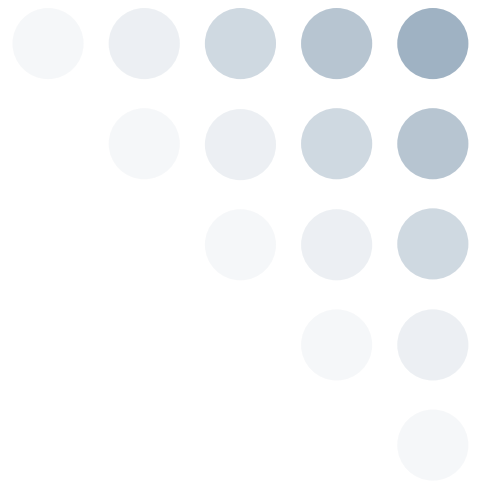
"We hope it will stimulate demand and create some diversity in the market while helping with skills development," says Greenhalgh. "We think we are the first council to take this approach."

Wireless taxi charging

Nottingham this year secured government funding to trial wireless taxi charging in a project involving Cenex, Sprint Power, Shell, Parking Energy, Transport for London and Coventry University. It aims to determine whether wireless technologies can speed up charging and help reduce congestion and clutter in city centres by enabling multiple vehicles to charge at once.

The plan is to install wireless chargers at taxi ranks so cabs can opportunity charge while they wait for fares. Ten taxis will be fitted with wireless charging hardware to trial the system.

Nottingham City Council will own the taxis and provide them to drivers rent-free. If the technology proves successful, it could ultimately be rolled out for public use.



Vehicle-to-grid

Nottingham is also working on a EU-funded vehicle-to-grid project at its Eastcroft Depot, home to a waste transfer station.

It will develop an integrated system that combines vehicles, battery storage and solar PV to work out how to use the assets to optimise charging and maximise use of renewable generation. The council also hopes to bid into grid balancing services as well as trade surplus power on energy markets.

However, the project has not been straightforward, as it has required a supply upgrade, necessitating additional funds, while Covid-related disruption hasn't helped.

"There was a slight pause while WPD weren't

delivering any non-essential works during lockdowns, but we now have a revised programme to release three tenders in August for the electricity supply upgrade works, the 40 V2G charging units and the stationary battery," says Greenhalgh, "hopefully to be completed this financial year".

Greenhalgh advises other local authorities planning hybrid EV-storage projects to plan for all eventualities.

"The supply upgrade has definitely posed a barrier, so having a really thorough understanding of site electricity supply, capacity, consumption, how close you get to peak demand, is really important," she says. "And factor in that funding capital requirement before you start - because that is key."



Birmingham Airport: Top down approach to charging

Birmingham Airport has installed high powered overhead chargers to keep its new fleet of electric shuttle buses running. Andy McDarmaid outlines its broader strategy.



Birmingham Airport - Andy McDarmaid

Birmingham Airport is working to decarbonise ground operations by 2033. Independent consultant Andy McDarmaid led the fleet strategy, which last year saw the firm take on six new electric buses - with overhead charging infrastructure that enables other bus operators to use it in future.

The Volvo buses, which take passengers from car parks to the terminal, are charged while en route via 'opportunity charges', essentially top-up charges, which take up to six minutes.

These are delivered by two overhead 'pantograph' charging systems which can provide 150kW and 300kW charging capability, while each bus houses four 50kW lithium ion batteries. There are also two 100kW plug in chargers in the coach park.

Shared infrastructure

The six buses could feasibly charge from one pantograph. But the airport opted for two "because we consider ourselves part of the West Midlands transport network rather than just a single destination," says McDarmaid.

"There are just over 400 bus movements a day into the airport, of which 200 are our own," he added (McDarmaid was interviewed prior to Covid lockdowns). "Infrastructure is a clear barrier to entry to other operators and

if we want to encourage more people to use public transport, being able to offer a pay-as-you-go charging service to other operators is strategically beneficial."

The potential to share infrastructure with other bus operators was one of the reasons Birmingham opted for pantographic chargers - which, alongside the buses, were supported by a £1.4m DfT grant.

The charging terminal adaptors and rails can be added to any bus, which means other operators planning to use the airport chargers is not locked in to any particular brand.

"A local authority might typically contract for a bus service for 5-7 years. An operator would not be able to get full payback on the bus and its own charging infrastructure over that timeframe," says McDarmaid. "So this potentially provides a solution."

The system can also charge double decker buses and HGVs - essentially any vehicle with the correct charging rails on its roof.

"It pairs like wifi and knows what type of vehicle is engaged. It also has inbuilt data collection, so we know how many kilowatts each vehicle has pulled from the system - it effectively has inbuilt billing functionality," he says.

“**A local authority might typically contract for a bus service for 5-7 years. An operator would not be able to get full payback on the bus and its own charging infrastructure over that timeframe**

”

While charging freight and fleet arriving at the airport is not currently under consideration, “the flexibility to do so is there,” adds McDarmid. “There is no reason why these type of chargers could not be used within the cargo airport for HGVs in the future.”

Cycle planning

Within its operational fleet, the airport has some Nissan Leafs, plus e-NV200 vans as well as some Mitsubishi plug-in hybrids.

“The eight year vehicle replacement strategy is that where possible, vehicles are switched to EVs upon replacement. If not, they are switched to a hybrid, and only replaced with an ICE vehicle if it is simply not feasible,” says McDarmid.

Niche vehicles

Some vehicles cannot be feasibly be swapped out for the foreseeable future. For example, large, 4x4 operational safety vehicles that perform runway and perimeter safety checks do 30,000 miles per year each and are in operation 24/7, says McDarmid.

“They have to respond to emergencies and sit out on the airfield for hours at a time to manage that situation. Electricity doesn’t work in that role and a hybrid would end up using range very quickly. So until we get to 400-600 mile range in a battery pack, we don’t have an electric solution. It has to be fit for purpose. We cannot compromise operational safety [within the net zero plan].”

“**Infrastructure is a clear barrier to entry to other operators and if we want to encourage more people to use public transport, being able to offer a pay-as-you-go charging service to other operators is strategically beneficial**”





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Protected Area

North-west Orkney Marine
Protected Area

Orkney Islands Marine
Protected Area

Marine Firth

Forth Firth

Firth of Forth Baited Marine
Protected Area

Clack Linn Marine
Protected Area

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Ireland

London

Cardiff

St George Channel

Scilly Isles

Guernsey
Saint-Pierre
Port

Jersey

Doggerbank

Kimmerland

Walter Tarn

Saint of Divers
Pari de Colas

Parc naturel
regional
Englois
parc naturel
regional
de la
mer d'Irlande

Barthelme

Legend



Public electric vehicle
chargepoints



Area within 30 miles
drive of a public
chargepoint

Location of public electric vehicle
charging infrastructure was sourced
from the National Chargepoint Registry.
www.national-charge-point-registry.uk

Drive distance from each public
chargepoint was calculated using Open
Route Service.
maps.openrouteservice.org

Basemap provided by Open Street Map.
www.openstreetmap.org

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Least regrets for local authorities

Local authority leaders have committed to net zero. Now they have to deliver. No mean feat, but there are some least regrets options, says Cenex electric vehicle infrastructure specialist, Jacob Roberts



Cenex - Jacob Roberts

Jacob Roberts spent two years as a local government officer. As such, he understands firsthand the challenges that declarations from the top, such as achieving net zero within a decade, can place on those tasked with delivery.

However, now electric vehicle infrastructure specialist at Cenex, he says there are least regrets options for local authorities when it comes to decarbonising transport via electric vehicles.

Mapping need

“Right now, the least regrets, lowest hanging fruit is to identify households with the means to buy an electric vehicle but who are being held back by a lack of charging infrastructure,” says Roberts.

To enable that, Cenex has developed a census-based mapping technique that helps to match areas in towns and cities without off street parking and where people are likely to be affluent enough to own one.

“For many households, not being able to charge at home, overnight is the single biggest barrier to them owning an EV,” he says, “and removing it can be as simple as putting one or two chargers on a street.”

Roberts says an equitable rollout is an admirable aim. “But if we are trying to be pragmatic and ensure money is spent as prudently as possible, it is important to focus on areas where EVs are likely to be – at least in the short term,” he suggests. “In the longer term, as the second hand market develops, you broaden the approach. But for me, that is later in the timeline of EV development.”

Raise awareness

Raising awareness of existing infrastructure is

also important – and low cost, says Roberts.

“In many areas, there is now a very good network of rapid chargers – but people do not always know about it, particularly where the network is operated by private suppliers,” he says. “Many of us in the UK EV industry – myself included – have made the mistake of assuming that everyone has heard of Zap-Map!”

“But engaging with residents and telling them that there are several rapid chargers in their area can reduce the need for one on their street. For some people, that would be enough to convince them to buy an EV, or at least shade the decision.”

By way of evidence, Roberts points to the Budget commitment to ensure that nobody is ever more than 30 miles from a rapid charger.

“But we have mapped the data, and pretty much everywhere in the UK is now already within 30 miles of a rapid charger,” says Roberts. “If anything, that is a sign of how far we have come – and we don’t even know it.”

Public engagement is key

“If you have a plan in place and are going to start moving forward, my number one recommendation is to bring residents along with you,” says Roberts.

“You can have immaculate plans, but if you don’t engage early and keep residents abreast, they can rebel about losing parking spaces or losing pavement space or perceived trip-hazards and it can be hard to turn that around.

“Local authorities have to engage effectively and address any issues before it becomes political.”

“**We have mapped the data, and pretty much everywhere in the UK is now already within 30 miles of a rapid charger**”

Rapid charging: Crunch time

Ian Johnston, CEO of rapid charging network Engenie says years of groundwork is paying off as retail and leisure sectors mobilise. Their success now hinges on grid capacity and customer experience



Engenie - Ian Johnston

The UK has around 2,500 rapid chargers in the ground. Engenie CEO Ian Johnston believes that will reach 4,000 next year as retailers start to put plans into action.

The market has matured rapidly over the last 12 months, he suggests, laying the ground for major growth.

"If you have four or five national retail chains agreeing frameworks, you are going to quickly double the number of chargers in the ground. Over the next 12-24 months, I think we are going to see a vast deployment increase," says Johnston.



"To deploy chargers, you need a willing and engaged landowner. A year ago, we had to do a lot of explaining and education. Now, every major landowner and retail business is taking time at board level to define an EV strategy. Many of them are now working on tenders or rollouts."

Do or die

The challenge for network operators, he says, is not to undo all the hard work by failing on service.

"The mass market will have significantly less patience than early adopters. Networks have to make charging as smooth as possible. If we do not get it right, we are dead."

As well as ease of use and interoperability, that means putting the right chargers in the right locations, matching dwell times appropriately. Johnston says the 50kW rapid chargers it is installing across 200 Marston's

£500m fund: Don't ignore rural blackspots

Government has set aside £500m to boost rapid charging infrastructure. The Rapid Charging Fund aims to have at least six high power chargers at every motorway service station by 2023. By 2035, the aim is to have part-funded 6,000 rapid and ultra-rapid power points up to 350kW beside motorways and major UK roads.

Engenie's Johnston thinks taxpayer support should also be used to address blackspots that are needed to ensure nationwide coverage.

"Chargepoint operators will normally dodge the issue of blackspots. But they are becoming more apparent now. Private money cannot fund chargers across all the blackspots, so that is where government funding should be directed."

sites work well because drivers can get an 70-80 per cent recharge by stopping for an hour – a lunch, coffee meeting or dinner.

Capacity crunch worsening

While confident of Grid challenges and securing sufficient site capacity “without a doubt are getting worse,” says Johnston.

At sites such as Marston’s the firm aims to install 2 x 50kW chargers at each pub – but cannot do so in a significant number of cases.

“If you apply for grid at 100 retail sites, at 30 sites it is not viable. At 15 per cent of sites, you can only install one 50kW charger. So you can only install two 50kW chargers at around 55 per cent of sites,” he says. “To install higher capacity is even more challenging – yet that is what people are looking at.”

A survey for another retailer found that neighbouring retailers had already installed rapid charging at 33 per cent of sites, says Johnston. “So that land grab has happened. It’s fantastic news that big retailers are taking action to install charging while they can. But the grid is now becoming very complicated.”

Where retail parks require more capacity, a new substation can provide a solution. “But to put that in, you need to find 15 square meters in the car park and a circa 100 year lease, which most retailers can’t offer,” says Johnston.

Consolidation all done?

EDF’s acquisition of Pod Point this year was the most recent illustration of industry consolidation. Johnston thinks Engenie is “probably one of only two large independent networks left”, and doesn’t anticipate consolidation of national networks.

“We are funded for the long term and focused on building a network of thousands of chargers,” he says. “At the moment, we are not looking to be taken out. If we can retain our independence, it means we can collaborate with a wider range of partners.”



On the flipside, Johnston thinks it may already be too late for new entrants to join the party.

“It takes quite a long time to do it properly,” he says, “and I can’t see a large landowner taking a risk on a new entrant.”

“**The mass market will have significantly less patience than early adopters. Networks have to make charging as smooth as possible. If we do not get it right, we are dead**”

McRapids: Covid not cooled rollout ... yet

Food and retail charging deals are still being announced, despite the sectors being battered by Covid-19. In the last week of June, alone, [McDonald’s inked a deal with Instavolt](#) to rollout chargers across its Drive Thrus; [Aldi signed with NewMotion for an initial 140 x 22kW charging units](#); and [Engenie said it would install 17 rapid chargepoints for retail group Brookhouse](#) by the year end.

An aerial photograph of a winding asphalt road through rolling green hills at dusk. The road is illuminated by long, glowing light trails from cars, creating a sense of motion. The hills are covered in lush green grass, and a wooden fence runs along the edge of the road. The overall atmosphere is serene and scenic.

4

Greener fleets

Greener fleets: the John Lewis Partnership's roadmap

The John Lewis Partnership is making major investments to eliminate fleet fossil fuels. General manager of fleet, Justin Laney, outlines the challenges and opportunities on the road ahead



John Lewis - Justin Laney

Last year the John Lewis Partnership committed to decarbonise its fleet by 2045, and that all its 600 heavy trucks would be running on biomethane by 2028. Recently, it announced an ambition to eliminate all fossil fuels from its fleet by 2030 and will achieve this by tackling the heaviest emitters first. The Partnership started planning a decade ago - and general manager of fleet Justin Laney says robust research and trials are key to success. However, he believes it is critical not to let perfection be the enemy of progress in cutting carbon today, rather than putting it off until tomorrow.

Biogas for HGVs

The John Lewis Partnership has been running biomethane trucks for eight years, says Laney. They are expected to clock up close to 20 million miles this year using the waste-derived gas.

Long distance and heavy trucks represent about 15 per cent of the Partnership's fleet, but account for 80 per cent of its overall fleet emissions, hence tackling them first.

"We arrived at biomethane as the best approach through a large study with Imperial College in 2010 that looked at 13 fuels in total," says Laney.

Biomethane is not zero carbon, so the long-term plan is to go electric - and Laney thinks overhead catenary systems may ultimately be required to fully decarbonise HGVs.

"But that is a long way off, hence opting for biomethane - because we can buy trucks now and impact emissions rather than wait for something as yet unproven."

Today the Partnership is running 85 biomethane trucks. It has another 143 on order this year with all 600 heavy goods trucks in the fleet set to run on biomethane by 2028. Compared to diesel, carbon dioxide emissions from each truck are reduced by around 80 per cent, he adds, which equates to a saving of about 100 tonnes of CO₂ per year, per vehicle.

Along with removing all fossil fuel from the entire transport fleet by 2030, the switch means the Partnership will save over 500,000 tonnes of CO₂ by then.

"Taking that out of the atmosphere now lessens the overall challenge of tackling climate change" says Laney.

"So while there is a view that biomethane diverts attention from the end game of electrification, we are probably ten years away from a solution for heavy trucks. It is key to recognise that there are technologies that can save carbon today - and consistently over the next 10 years."



“**While there is a view that biomethane diverts attention from the end game of electrification, we are probably ten years away from a solution for heavy trucks.**

”

Hydrogen no, overhead lines yes

While a number of big businesses want government to commit to a hydrogen strategy, Laney does not see it playing a role within the Partnership's fleet.

"Soon there will be heavy trucks with electric powertrains. That's interesting because it is then relatively easy to have a range that includes pure battery trucks for short distance, urban use, and ones with 'range extenders' to top up the battery en-route for longer distance routes. The range extender could be a diesel or gas engine, or hydrogen fuel cell. You could also have a device to collect power from an overhead line like a tram: a catenary system"

"The problem with hydrogen is it is very inefficient. It is much more efficient to use a battery or to take power from a line," he says.

"When you first look at catenary systems [overhead power lines], it seems crazy, and you think nobody is going to invest in them without the trucks out there. But it's not as



expensive as you might think to equip all the UK's strategic road network with a catenary system, it's about the same cost as building a nuclear power station. Once built, you end up with a technology where the energy cost is very low and the infrastructure owner can charge a margin on it," says Laney.

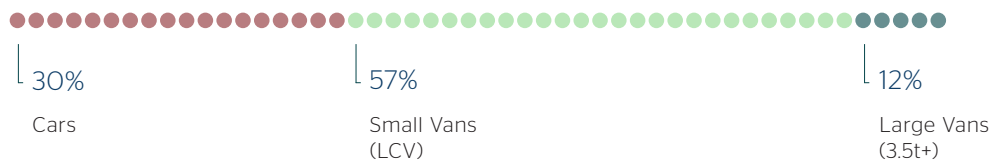
"Long-term, if you have a choice of two energy bills, expensive or cheap, it is likely that the lower cost version is going to win. The indications are that a catenary truck's fuel cost would be a half to a third of a hydrogen truck."

“**Upgrading a powertrain is an option we do not have with a diesel van. So we think there are a lot of aspects to Arrival's approach that will reduce overall costs and carbon emissions**”

While running overhead lines along Britain's motorway and A-road network would be a major undertaking, "it is something that could decarbonise a significant amount of road transport," says Laney.

EV Survey question:

Is your fleet predominantly...



"It is a big project, but we feel it is a better choice [than hydrogen] because of its efficiency. Extensive trials on live roads are happening in Germany and elsewhere, it would be great to get a trial going in the UK."

Larger vans: a smarter approach?

Electrifying its small van fleet is relatively straightforward, says Laney. Solutions for larger home delivery vans are also starting to emerge and the John Lewis Partnership is working with UK electric vehicle maker Arrival on a trial from January 2021.

Should it prove successful, the aim is to move by 2023/24 to a full-scale rollout so that all 1,750 of the Partnership's delivery vans and light trucks are electric by the end of their seven-year replacement cycle.

Alongside this, approximately 750 refrigerated trailers will also be converted from diesel to electric drive and the Partnership's 1,300 strong car fleet will become 100 per cent electric. Any remaining vehicles that cannot be converted to biomethane or electric will use hydrotreated vegetable oil (HVO) biodiesel.

The first four Partnership vehicles from Arrival are due in service next year.

Laney says Arrival's ground-up approach, incorporating aluminium chassis and composite bodies, boosts the business case.

"It means the kind of things that would cause you to sell a standard van, corrosion and engine wear, don't apply. A vehicle like that could last 20 years, and EVs are quite upgradeable - you can replace motors and batteries," says Laney. "Upgrading a powertrain is an option we do not have with a diesel van. So we think there are a lot of aspects to Arrival's approach that will reduce overall costs and carbon emissions."

Ultimately, an Arrival 4.25tonne van could replace the 7.5tonne diesels the John Lewis Partnership uses for two-man deliveries for goods such as sofas and fridges.

"Those 4.25 tonne vans have a derogation to operate at higher weights, so will do the same work as a 7.5t diesel," he explains. "There are several benefits to that. You don't need a truck licence for one thing, and you don't have restrictions on driver hours. So it provides greater flexibility and the vehicle can be more productive."

Capacity upgrades: Footing the bill

In preparation for a large-scale EV transition, the John Lewis Partnership has commenced work on mapping power capacity with delivery requirements at around 300 sites. These sites range from large depots with fleets of large trucks to smaller Waitrose stores with a handful of vans.

While there are ways to spread the load, Laney says there will be "quite a few sites where we have no option but to increase capacity going into site". He thinks the associated costs, and particularly the way they are allocated, "are a real barrier to electrifying fleets".

"Firstly, because the cost is an unknown. But it can be very expensive and you can actually end up paying for upgrades that can be used by others in the area. It is not right that you bear the cost," says Laney. "The principle that you pay for upgrades used by others is quite unique to power supply."

As such, he thinks some form of government support or regulatory intervention is required to remove that barrier for fleet operators.



The John Lewis Partnership is now embarking on a project with a UK University to design a technical solution that removes the need for tail lifts on those type of vans.

Should it prove successful, "it means a vehicle like an Arrival could replace that entire 7.5t category," Laney suggests. "There are a number of examples of where you can do things differently with EVs, and that is very much one of them."

Test, learn, act

Laney says it is critical to choose the right technology, given financial and environmental costs of getting it wrong. "You have to understand the technology, hence all the work we have done with academia," he says, "And then ensure you have really robust trials."

The two go hand in hand: "If you have a good view of what is on the horizon, you can pick

the things you want to trial early on and then have extensive, robust trials before you commit to any volume," says Laney.

"We do alpha and beta trials: one or two units in year one, 10 units in year two and maybe 30-40 units in year three. After that, if it goes well, you are ready for a full scale rollout."

But Laney reiterates the importance of understanding the science behind the technology - which he thinks lies squarely within the remit of the fleet manager. That is imperative, he suggests, because commercial fleet operators are facing the biggest modal shift since the transition from horse to car.

"It's a similar scenario, hence the importance of understanding the technology. Because if you back the wrong horse, the risks are that you move too slowly. Suddenly your competitors have better access, happier customers and their costs are lower... while you have lost competitive advantage."

“**If you back the wrong horse, the risks are that you move too slowly. Suddenly you have lost competitive advantage**”



First mover advantage: Making net zero pay

Mitie has committed to achieving net zero by 2025. A tall order, but the firm plans to harness its experiences to sell similar decarbonisation services to clients.



MITIE - Simon King

Mitie now has more than 500 EVs on its fleet, having committed to electrifying 20 per cent of its cars and light commercial vehicles by the end of 2020.

The rollout was paused during Covid-19 lockdowns, but has since restarted and Mitie remains on track to hit that goal, says director of sustainability, social value and fleet, Simon King.

As well as installing infrastructure across its own estate, the firm is rolling out charge points at client locations, which both parties can use.

Mitie is now ramping up 'decarbonisation as a service' to clients - and King says moving early on electric vehicles is providing valuable insight, as well as demonstrating to clients that it is walking the walk.

Public push required

Public infrastructure remains a key challenge, says King.

"We're lobbying for government and local authorities to step up commitment and get on street charging infrastructure in place, because it is not within the gift of business to do that," says King. "We are very happy to work with central and local governments to support that, but we can't just go ahead and do it ourselves."

Mitie is in talks with some of the on street charging companies, mapping where it requires public charging infrastructure to support its commitment to decarbonise by

2025, and working jointly to influence local authorities to tilt investment in that direction.

King accepts that Mitie is "asking for a lot of support from a lot of people" in order to decarbonise, but believes pushing for infrastructure investment will benefit UK plc more broadly and encourage others to commit to invest in EVs.

Given the pressure on public finances, would Mitie consider co-financing public charging infrastructure in strategic locations?

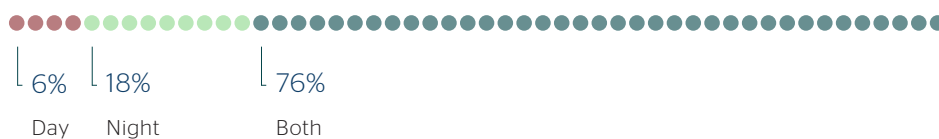
King does not rule it out. "It depends on the situation," he says, indicating that if Mitie were able to secure some sort of set aside, "we are open to sensible dialogue." However, he says the challenge is that people tend to want the chargers at the same time, which can make shared infrastructure something of a challenge.

However, where Mitie mostly needs to charge overnight, there could be merit in striking arrangements with car park operators, public or private, where the public is mostly charging during the day, says King.



EV Survey question:

When would you need to charge?





Vans still a challenge

Availability of larger vans remains a barrier, says King. While tax breaks such as Benefit in Kind and Enhanced Capital Allowances make a compelling business case for electric cars, “financial viability also remains a big challenge on vans”.

Although targeted government support would be “extremely welcome”, King is convinced the market will ultimately deliver. But for the immediate future, without concerted action,

he thinks much of the EV transition will be limited to smaller vans and cars due to costs and lack of volume.

“Over the next five years, we are confident [those larger vehicles will arrive at reasonable prices], just look at the speed of development in the car market in recent years,” says King.

“There are significant deals starting to happen and more and more OEMs are starting to talk about delivering the kind of vehicles we need.

“So we are confident that we can deliver on our net zero commitment by 2025. It’s the right thing to do and it means we can then help others on that journey as well.”

“**We’re lobbying for government and local authorities to step up commitment and get on street charging infrastructure in place**”

Net zero in four parts

Lee Stokes, head of sustainability solutions & innovation for Mitie Energy, is tasked with rolling out its decarbonisation services to clients. He says for company fleets, tax breaks such as ECAs and Benefit in Kind mean it is possible to switch the majority of cars and light commercials to EVs “at zero incremental cost”.

But Stokes says it makes more sense to take a business-wide approach to sustainability. He breaks it down to its simplest form:

1. Optimise everything on site first, so that whatever you buy is not over-specification.
2. Where possible, get rid of everything that burns gas.
3. Buy all power through power purchase agreements (PPAs), “which means you avoid accusations of greenwash and are genuinely contributing to renewables investment”.
4. Get rid of tailpipe carbon, i.e. switch to EVs.

“That is essentially a net zero strategy,” says Stokes. “It is important to frame it simply, but aim high in the organisation, because it is one of the few top down initiatives.

“But if you can achieve that at zero incremental cost, it is a no brainer,” he says. “It is financially rewarding, and socially rewarding – so it is crucial to look beyond the fleet.”

EV Survey question:

What in your opinion is the biggest barrier to EV fleet uptake? (rate 1-5, with 1 as most significant barrier, 5 least significant) (average)



3.10 Lack of UK charging infrastructure



2.43 Lack of vehicle volume



3.61 Insufficient range



2.93 Not enough larger vans



3.10 Expense

DPD: Flexible route planning is key

DPD aims to go all electric as fast as it can. But given the pace of change, a flexible strategy is critical



DPD Group - Olly Craughan

DPD is attempting to build the UK's largest electric delivery fleet. Despite disruption as a result of Covid-19, the parcel delivery firm is on target to reach 700 EVs on the road this year. Olly Craughan, CSR general manager, DPDgroup UK, says every depot within its network should be utilising at least 10 per cent EVs by that deadline.

The majority of DPD's drivers are franchisees, typically leasing through DPD or purchasing the vans independently, and so will take the vans home and charge at home, says Craughan.

That reduces the infrastructure requirement at DPD's depots, but it necessitates careful planning when allocating EV routes to drivers and ensuring they can fulfill a day's work.

“**Most of the EV routes will be those closest to the depot. As range improves, we will work our way out**”

“So most of the EV routes will be those closest to the depot. As range improves, we will work our way out,” says Craughan.

Alternative vehicles

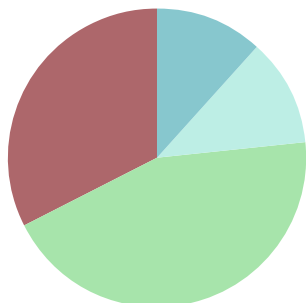
As well as Nissan E-NV200s and MAN 3.5t eTGE electric vans, DPD with EAV launched a purpose-built, e-cargo cycle last November. Olly Craughan thinks the e-bikes will play a role in the post covid era for parcel carriers, especially if central and regional governments support that strategy with policy that encourages people to think beyond cars, vans and lorries.

Meanwhile, Craughan says DPD is evaluating numerous other vehicles, including those made by new breed start-ups as well as firms retrofitting electric drive trains to existing trucks.

“Nothing is off the table,” he says. “Any strategy needs to be fluid at this moment, because the technology is moving so fast.”

EV Survey question:

How many vehicles in your fleet?



- 1 - 10 (12%)
- 11 - 100 (12%)
- 100 - 500 (44%)
- 500 + (32%)

Centrally driven vans?

DPD has started taking delivery of 100 3.5t vans from MAN. These have had to be converted from left hand drive to right hand drive - and to date there has been a distinct lack of larger vans ready made for the UK market. DPD CEO Dwain McDonald said earlier this year the company could "take far more" 3.5 tonners if they were available.

While much of the world operates on left hand drive systems, Olly Craughan thinks there is space for a centrally driven electric van, which would then have global application.

"Hopefully we will continue to see innovation from some of the start-ups," he says. In the meantime, the MAN 3.5t vans, able to deliver approximately 70 miles, will boost efficiency in terms of route density on its inner city drops.

"We want to be the leader in sustainable delivery," says Craughan. "Covid has not changed that strategy and we will be making more announcements soon."



Testing the water before diving in

SES Water has been trialling EVs ahead of a wholesale switch. Energy and carbon manager, Henrietta Stock, says there are potholes to navigate, but the experience has largely been positive



SES Water - Henrietta Stock

SES Water started trialling EVs last year, initially with 10 vehicles (around 8 per cent of the fleet). It has since added another handful, and has installed around 30 charge points. More vehicles and chargers will follow over the coming months.

"The trial has put us in a really good place," says energy and carbon manager, Henrietta Stock. "Fleet is a key aspect of decarbonisation and we're in a stronger position because we have started the process and gained some learning."

Stock says SES Water started with the "straightforward cases, drivers that don't cover a huge amount of distance or who might spend a reasonable amount of time at a particular site where they can charge the vehicle," she explains.

"Over time, we worked up to the more challenging profiles, which gave us a good view of the challenges posed for different types of drivers."

Charging speeds are an issue. "For us, that is a vehicle limitation rather than a charging limitation," says Stock. "The [Nissan] eNV-200s

are limited to 7kW charging speeds, whereas the chargepoints we have installed are 22kW. So for now, that is a bit of a limitation and a bit of a challenge. People have to adjust and schedule around that, which becomes increasingly complex as you roll out more vehicles."

Driver influence

Drivers, however, "really like the vehicles, even those initially sceptical are converts," says Stock. "There tends to be some uncertainty - but only until they have tried them."

Meanwhile, telematics and chargepoint data has underlined the impact of driving style on range. "Our least-efficient driver gets about 70 miles fewer than the most-efficient, which is significant given range is about 140 miles," says Stock. "So they are having to charge twice as often - they find that quite inconvenient and it starts to have a real operational impact."

As such, SES and its EV partner Haven Power, are working on driver education programmes in order to maximise range.

“**Our least-efficient driver gets about 70 miles fewer than the most-efficient, which is significant given range is about 140 miles, so they are having to charge twice as often - they find that quite inconvenient and it starts to have a real operational impact**”

Watts in a name...

Stock isn't kidding when she says the company has become attached to its vehicles, and vans in particular. Its 11 Nissan eNV-200s have been christened by staff. Despite in-depth interviews and a survey of more than 300 businesses, the following roll of honour is likely to be the most shared aspect of this report on social media. For the record, SES Water's vans are called:

Mo Farah Day | Emma Wattson | Usain Volt | Sherlock Ohms | Carmen Electron | Charge Simpson | Elecy Simmonds | Spark Zuckerberg | Joules Holland | Gillian Amperson and ... Dane Powers



EVs as a service

Haven Power's 'EVs as a service model' has been "great, we wouldn't change that," says Stock, "but we might change the contractual basis."

She explains: "Because we pay per vehicle, it gets recharged internally for each vehicle, whereas some elements actually sit at a cross company level, such as the chargepoints and the data. So we will try and smooth out those aspects as we move forward. But overall, the concept of EVs as a service is really great. It continues to make life a lot easier."

Emissions anxiety: Public charge points

As the trial broadened to drivers doing higher miles, SES found they needed to use public charging facilities more than it had anticipated.

"We're trying to address that. It can be very expensive. The payment methods are disparate and the drivers have to reclaim the charge," says Stock.

"We also have concerns around emissions, because our electricity source is 100 per cent renewables. Externally, we don't have that guarantee."

While SES has not yet installed home chargers for its EV drivers, doing so will ultimately pose similar questions.

In the meantime, Stock hopes smart fuel card solutions come to market.

"There are companies developing cards that can be used across networks and that report the greenhouse gas emissions associated with the electricity from different charge points. That is the kind of solution we need," she says. "We have reasonably good coverage at our sites and most of the time we can charge at our own locations. But that kind of solution would be really helpful."



Car policy challenge

Around a third of the SES fleet is made up of company cars and historically all vehicles have been purchased. While Benefit in Kind changes make EVs more attractive, to date there has been limited ability to bring in EVs - because staff allowances have not been adjusted to meet their higher price points.

"There are a number of things we are working through. What's great is that, because of the work we have done introducing EVs to the commercial vehicle fleet, drivers are more aware of the options and keen to make use of the charging infrastructure we now have in place," says Stock.

"The company car drivers themselves have really moved the debate forward and we've recently committed to making all new company cars EVs or PHEVs. This is in addition to our existing commitment that all new commercial fleet vehicles will be EVs or PHEVs where viable technology exists."

An incrementally smarter approach

Claire Thompson-Sage, sustainable development co-ordinator, at UPS, outlines the logistics firm's next steps towards decarbonising the fleet - from smart charging to cycles



UPS - Claire Thompson-Sage

UPS has been [using electric vehicles in London for more than a decade](#) and has had smart charging in place at its Camden depot since 2017. But it is now moving to the next stage with UKPN Services and energy platform Moixa via an innovation project dubbed 'electric fleet centred local energy systems', or EFLES. The aim is to optimise charging for cost and carbon, while using elements such as the battery storage system installed as part of the original 2017 project.

"The smart system looks at a whole range of factors - weather forecasting, power demand, energy prices, local generation and storage - and then determines what is the right thing to do," explains UPS sustainable development co-ordinator, Claire Thompson-Sage. "That might simply be charging the vehicles, or it might be using them to power our conveyors, or export power to the grid."

As it builds a nationwide EV strategy, UPS is now looking at how to best use the containerised battery storage unit originally deployed at Camden. It is also discussing plans internally about how any daytime spare capacity at its central London sites may be put to greater use.

Modal shift?

UPS initially had to retrofit diesel vehicles in order to pilot EVs at scale from the Camden depot. To address the lack of suitable electric vehicles, UPS last year made a strategic investment in specialist EV maker, Arrival, and has 10,000 vans on order, with delivery staggered between now and 2024.

While that should solve its volume challenges for larger vans, UPS is also exploring other forms of transport at the smaller end of the scale. Cycle logistics looks promising for urban last mile deliveries, says Thompson-Sage, with both central and local governments keen to reduce congestion and improve air quality.

UPS has undertaken numerous cycle logistics projects in Europe. Closest to home, it is deploying e-trikes, e-quads and e-walkers in Dublin. Thompson-Sage says those trials have been well received, though have presented some questions around security, as well as a requirement to base large volumes of cycles in city centres.

Despite those challenges, Thompson-Sage thinks it is likely UPS will ultimately invest in a large-scale cycle logistics fleet.

"People will still need mattresses and exhaust pipes, which can't be delivered on cycles. But a lot of things can be - and the cycles are relatively low cost and don't require much power," she says.

"While having somewhere to base them is a challenge, central government and local authorities are actively looking for spaces to house them - and maybe, post Covid, there will be spaces that find themselves under-utilised."



At the opposite end of the spectrum are large trucks, which Thompson-Sage says present "the next big challenge. While we can bridge the gap with biomethane and LNG, they are not zero emissions fuels. So we need a solution."

Meanwhile, UPS is also an airline, "and that is a challenge to which nobody has yet come up with a credible answer".



“

People will still need mattresses and exhaust pipes, which can't be delivered on cycles. But a lot of things can be - and e-cycles are relatively low cost and don't require much power

”

UK EV maker aims to shift gear

Arrival aims to shake things up, making modular vehicles out of composite materials via 'microfactories' that it claims will be no more expensive than fossil fuel equivalents. Big firms are buying in.



Arrival - Glenn Saint

UK firm Arrival started out in 2015 aiming to redesign electric vehicles. Since then it has attracted significant funding, most recently €100m from Hyundai and Kia. It plans to use the money to go far beyond electric vans and buses and is looking at "the whole vehicle ecosystem," according to chief of commercial vehicles, Glenn Saint. This will include charging infrastructure and potentially depots too.

Suffice to say Arrival is thinking big. It's also getting big. Across the group, it now employs around a 1,000 people, more than half of which are software engineers.

However, it must now transition from an R&D technology company to a production company to deliver its first vehicle, a four tonne modular van. Customer and investor, UPS, is expecting 10,000 units by 2024. Royal Mail has also tested its vans and John Lewis Partnership is a more recent trialist.

Of its equity partner, "the initial vehicles will be going to UPS early next year," says Saint, with Arrival building production facilities in Bicester and the US, while "looking at other facilities globally".

These will not be typical vehicle manufacturing plants. Instead of centralised production facilities producing units to ship globally, Arrival plans to build "microfactories" close to demand around the world.

"Each of them is about 10,000 square feet, a standard warehouse building. We can put our assembly facility inside those units and be up and running in three to six months," says Saint. "And each facility can produce up to 10,000 vans a year. So we are very scalable and can add these factories as market demand increases."

Larger trucks coming

While the first vehicles will be four tonners, the modular design system, or "lego-based tech" in layman's terms, means Arrival can quickly build larger vehicles.

Saint claims it plans to develop vehicles "up to 26 tonnes over the next four years" based on modules of its launch vehicle.



"Components can be easily scaled up, so over the next few years there will be more and more vehicles to market based on our modular architecture," says Saint.

“**Operating costs are lower, emissions are lower, there are no breathable emissions at point of use - and if the price is no more than a combustion engine, then there is a commercial benefit from having an EV**”

Range 'not necessarily an issue'

Nottingham this year secured government funding to trial wireless taxi charging in a Range can be an issue for some commercial vehicle operators, but Saint says Arrival's initial markets are less sensitive.

"Battery technology is such that our standard vehicle has a range of 250km (155 miles) and can be extended to 400km (249 miles) by adding batteries," he says.

"But the majority of our initial customers are able to use the lower range, because they are largely doing deliveries from depots. If you break down the market, a large proportion of vehicles actually do quite modest daily mileage."

Omnibus edition

Arrival in June unveiled the next product from its modular range, the Arrival Bus. It says the zero emissions vehicle will cost no more than a fossil-fuelled equivalent up front – and less to run over its lifetime. It has not yet confirmed a production timetable.

However, he says the biggest trucks will likely require different power sources. “Battery electric vehicles will not fit the entire market. We don’t see battery operated articulated lorries as the way to go. We can’t change physics; even with fantastic improvements in battery technology, we still have to deliver that power into a vehicle in a reasonable amount of time. So we are looking at alternatives,” says Saint, “one of which may very well be hydrogen.”

Transport as a service

As well as starting vehicle design and production from scratch, Arrival aims to reinvent the wheel when it comes to business models.

“Of course, we can just sell you a vehicle and get on with it. But we are also looking at other models,” said Saint. This could conceivably include infrastructure, even depots, he suggests.

Meanwhile, he says all Arrival vehicles will be “autonomous ready”. While the government is unlikely to sanction autonomous vehicles

on UK roads in the near future, Saint says they can be used in private, controlled environments today – such as depots. But for now, he says there is increasing demand for its core proposition: an electric commercial vehicle that costs no more than a diesel.



“That has been the goal since day one. Operating costs are lower, emissions are lower, there are no breathable emissions at point of use – and if the price is no more than a combustion engine, then there is a commercial benefit from having an EV,” says Saint.

“That is the game changer. To date, EVs have been more expensive. If you remove that barrier, the market will explode.”

Take the knocks, carry more

Whereas most OEMs are fitting electric drives to existing models, Saint says that approach increases cost and weight while reducing payload.

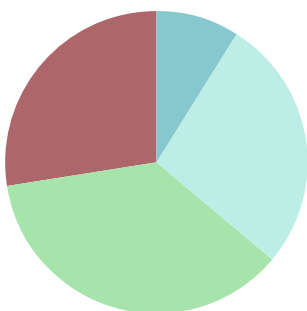
Designing the trucks around composite materials makes them both resilient and lighter, says Saint. “So you can carry more and the body panels are extremely tough, they will withstand all those bumps and knocks.”

He says it also means vans do not have to be ply lined and adds that Arrival is now working with vehicle converters on how to optimise layouts, for example, seating and shelving, “in a way that makes it easy for the next guy,” says Saint.

“We appreciate there are many variants of what a van is used for. Our aim is to make all of that simple to start with.”

EV Survey question:

What kind of daily mileage would you need from a battery per vehicle?



- Up to 50 miles (9%)
- 51-100 miles (27%)
- 101-150 miles (37%)
- 150+ miles (27%)



5

Smart charging
and vehicle
to grid

Smart charging: Starting to motor?

Rather than a part of the problem, electric vehicles are starting to become part of the solution to grid constraints, says ev.energy head of grid services, William Goldsmith



Ev.energy - William Goldsmith

In June, smart charging platform ev.energy had 14 bids accepted by UK Power Networks (UKPN) in its latest flexibility procurement round – and other firms are working on aggregating cars and vans to provide ‘flexibility on wheels’.

Ev.energy’s technology optimises EV charging times and loads. Its aim is to save drivers money, reduce congestion on grids and make best use of low carbon generation.

Head of grid services, William Goldsmith, says there is now some 25MW of EV load on its platform. He could not disclose how much of that would be used to provide flex for UKPN, as the commercial process is ongoing. But it seems likely that the 14 accepted bids, for multiple years, are each at the lower end of UKPN’s 50kW minimum threshold.

Ev.energy was a strategic partner with UK Power Networks on its smart charging innovation project, Shift, enabling it to prove to the distribution network operator that its technology and portfolio management is sufficiently robust to deliver when required. Later this year, it will take part in Western Power Distribution’s InterFlex project.

Goldsmith thinks smart charging can also provide flexibility for the national power system. To access the Balancing Mechanism, the main tool used by National Grid ESO to balance the supply and demand, it would need to aggregate 1MW of load – and be able to consistently deliver it.

Goldsmith is convinced ev.energy could confidently deliver that volume “in the near future”. However, he says suppliers would have to genuinely implement half hourly settlement. “Although some would like you to think they are doing it, the amount of half hourly settlement going on is negligible,” he says, “and half hourly settlement is crucial to unlock a lot of this value.”



“**Although some would like you to think they are doing it, the amount of half hourly settlement going on is negligible, and half hourly settlement is crucial to unlock a lot of this value**”



For the meantime, ev.energy will continue to focus on the primary objective. “The biggest thing for us is to get people smart charging in the first place,” says Golding. “To go mainstream, that requires incentivisation and education.” Making smart charging “simpler and smarter” is a guiding principle.

Smart charging versus vehicle-to-grid

Ev.energy's platform is designed to operate with full, bi-directional vehicle-to-grid capability, known as V2G.

"As a concept, V2G is great. The difficulty at the moment is one of cost. The hardware is expensive and at the moment it is essentially limited to Nissan vehicles," says Goldsmith.

Nissan uses the ChaDeMo charging protocol, which supports V2G. But most others use the CCS protocol, which does not, though should do from 2025. The EU is also mulling whether to mandate manufacturers include the V2G capability from that point.

Goldsmith says 'V1G' smart charging, i.e. one-directional control of when and how much power goes into the vehicle, delivers much of the system value.

"V2G definitely offers more upside, but we can reduce peak load by 80 per cent through smart charging. That is commercial reality now and if offers a huge amount of value," he says.

"I think V2G might offer some value in commercial applications, but it will be a while before becomes a mass market in the domestic space," he suggests, if at all.

"Either way we don't need to wait for that. V1G can deliver what we want today."

“**V2G definitely offers more upside, but we can reduce peak load by 80 per cent through smart charging. That is commercial reality now**”

Adoption curve

In two years, ev.energy has added 10,000 EV drivers to its platform.

"So we're not quite mass market yet, but we are certainly getting a diverse range of customers," says Goldsmith. "It is not just the early adopter energy geeks any more."

He says the average customer saves £125 a year through smart charging and typically only needs an hour of smart charging per night on a 7kW charger. Its system optimises for cost and carbon intensity. "Zero carbon charging is ultimately our mission," says Goldsmith.

The company has struck partnerships with utilities in the UK, Europe and US and is one of five start-ups working with Volkswagen as the world's biggest carmaker explores smart charging. Goldsmith says it is working on time of use tariffs that better suit EV owners with "several suppliers" and a type of use tariff with Igloo.

While its business is in the domestic market, it is looking at further B2B partnerships with car leasing companies, dealerships and chargepoint manufacturers.

"If they can help extend the charging experience away from home and offer value to customers," says Goldsmith, "we're happy to partner with them."

“**The biggest thing for us is to get people smart charging in the first place, to go mainstream, that requires incentivisation and education**”

Think smart, act now, save cost

EVs can become a major decentralised energy resource today, and businesses should act quickly to lock in least cost and highest value, argues Total Gas & Power's Justin Tarr



Total Gas & Power - Justin Tarr

"Smart charging can deliver significant cost savings to businesses today while providing a significant flexible, distributed resource that enables greater decarbonisation of the energy system," says Justin Tarr, business solutions sales specialist at Total Gas & Power.

He urges businesses to act now to lock in best value and reduce the chances of having to spend more on charging infrastructure costs in a few years' time.

"Firms should ensure their charging infrastructure is future-proofed and smart from the outset," says Tarr. This will lower their ongoing costs - and reduce the overall investment required to decarbonise the economy.

Smart investment

"One of the main challenges with increased EV adoption is utilities being able to accurately forecast demand," says Tarr.

"Millions of EVs on the road in a few years' time suggests utilities having to generate and deliver more power, however an equal challenge is represented by the massive change in load curves, especially during peak hours and within areas already experiencing

high demand. Smart charging will help grid operators smooth those curves, provided the right incentives are in place."

The ability to meet charging demand with renewable generation will also enable more green power onto the grid and help reduce system balancing costs, while allowing businesses and individuals to charge vehicles at least carbon intensity, reducing their carbon footprint.

While the ban on sales of petrol and diesel cars is currently 15 years away, that deadline could come forward - and Tarr says businesses need to act now to avoid being caught out.

"It's important for them to adopt quickly to lock in early benefits and to avoid huge capital outlay for grid reinforcement when demand is at its peak," says Tarr. "You don't want to be at the back of the queue for grid rights."

Meanwhile, grants and subsidies also favour early adopters. Tarr points out that the Workplace Charging Scheme grant has already decreased to £350 per port and suggests businesses take advantage of any support while it is available to reduce capex.

EV Survey question:

Would you use EV infrastructure in conjunction with onsite storage/generation?



18% Yes, we will integrate chargers with existing onsite generation



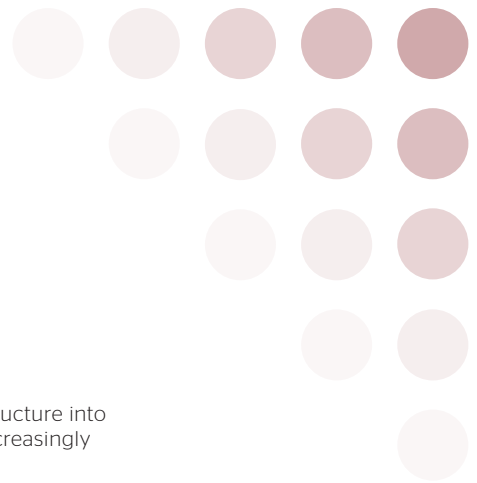
23% Yes, we're considering investing in onsite generation to integrate with charging



20% Yes, we are considering investing in onsite storage to integrate with charging



38% No, not yet considered it



Smoother operators

"Businesses that future proof with smart charging - especially those with large fleets - can manage their own site load curves and peak demand costs," says Tarr. He thinks that will prove increasingly valuable as the grid runs closer to its limits and price signals sharpen.

Tarr says Total Gas & Power's partnership with global charging network ChargePoint Inc. enables business customers to access its energy management functionality, providing greater visibility over site loads and what may be required to "avoid blowing capacity and incurring unnecessary cost".

Solar and storage too?

Larger businesses and fleets are increasingly interested in integrating onsite generation and storage with EV charging.

Tarr says Total's majority stake in solar firm SunPower Corp. enables it to bundle solar

canopies with charging infrastructure into car parks, "which clients are increasingly requesting".

For now, he says all but the largest businesses and fleets tend to perceive battery storage as "still too expensive". But those with capacity constraints may find a battery business case that wraps in cost of capacity or grid reinforcement, plus peak cost avoidance, arbitrage and grid services "can add up to a massive saving", says Tarr.

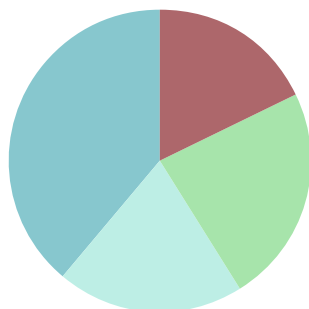
He thinks as battery costs fall and grid constraints increase, a bundled model "will become more feasible and the business case stronger". But Tarr reiterates that firms with large fleets - and councils planning major EV charging hubs - should consider all the options available to them.

"It's important to understand how mass groups of EVs charging at a single point can benefit the grid, and some of the revenue streams that can open up," he says. "It is shaping up to be quite a significant opportunity."

“
It's important to understand how mass groups of EVs charging at a single point can benefit the grid, and some of the revenue streams that can open up
”

EV Survey question:

Would you use EV infrastructure in conjunction with onsite storage/generation?



- Yes, we will integrate chargers with existing onsite generation (18%)
- Yes, we're considering investing in onsite generation to integrate with charging (23%)
- Yes, we are considering investing in onsite storage to integrate with charging (20%)
- No (39%)

Electrifying fleets without breaking the grid

Distribution network operators and fleet companies are working out how to enable the EV transition without simply resorting to grid upgrades. The Optimise Prime trial hopes to enable a smarter approach



Optimise Prime - Sung Pil Oe

Optimise Prime is the world's biggest trial of commercial EVs. The £34.7m project, funded via energy bills under Ofgem's innovation allowance, aims to understand – and minimise – the impact that the electrification of commercial vehicles will have on distribution networks.

Led by Hitachi Vantara and UK Power Networks, the four year project will involve up to 3,000 EVs from Royal Mail, British Gas and Uber, supported by Scottish and Southern Electricity Networks, Hitachi Europe and Hitachi Capital Vehicle Solutions.

Big shifts

The project is strategically important, because fleets are starting to drive EV adoption curves says Sung Pil Oe, innovation project lead at UK Power Networks.

“Some of the biggest fleets operate tens of thousands of vehicles, so they could be transitioning significant volumes in one go.”

That is evidenced by Centrica, owner of British Gas, in July placing an order for 1,000 EVs. The partners have agreed to bring forward their investment plans for EV as part



of the project with Royal Mail also procuring additional electric delivery vans as part of Optimise Prime.

“There is also a gap in understanding how commercial vehicles will be charged, their charging profiles – because most trials to date have focused on residential users,” says Oe. “So as a result of the trial, we will collect the largest dataset on the network impact posed by commercial vehicles – and it will be made publicly available.”

The trial looks at both return to home fleets and return to depots. The latter is likely to pose the greatest capacity challenges, given the concentration of charging in one place. However, the former aims to determine how distributed EVs could be used to provide flexibility services to meet network needs as well as examine how to automate the process for employees to claim back expenses for charging company EVs at home.

Disruption

Royal Mail, which has 48,000 vehicles on its fleet, is the return to depot partner. It told *The Energyst* it is currently waiting for its smart load management system to be deployed by Hitachi. Until that happens, it was unwilling to provide comment on its EV experience to date for this report.

Project delays, relating to vehicle availability and delivery of some of the technical solutions, have been exacerbated by Covid-19 disruption.

While now looking likely to complete up to a year behind schedule, the partners hope it will

“As a result of the trial, we will collect the largest dataset on the network impact posed by commercial vehicles – and it will be made publicly available”

“
The ability to understand the value of flex for different types of EV fleets is an important aspect of the trial
”

ultimately deliver planning tools that assist fleet managers in transitioning to EVs.

Base loads

Oe says the Depot Charging workstream should enable fleet managers to better understand aspects such as the number of chargepoints required, their rating and background load demand already on site, and overlay that with operational schedules to optimise charging requirements.

“It will take into account any onsite generation or storage, and flexible assets such as EVs to optimise a site’s energy requirement and produce a profile which can then be used to apply for a profiled connection – which is another product that we are offering as part of the trial,” Oe explains.

A profiled connection is a type of flexible connection – which will allow DNOs to maximise utilisation of the existing network capacity. By matching a site’s profile and charging schedule with network constraints, the aim is to create a smart charging system that benefits both vehicle operator and network operator.

Power trades

The trial also aims to understand the flexibility services fleets such as Royal Mail could provide.

“If a depot takes a profiled connection, and has optimised as a result, is there residual flexibility that can be provided to the DNO on top of that? If so, it could be used to provide additional revenue streams for customers – and that’s something we want to explore as part of the project,” says Oe.

“The ability to understand the value of flex

for different types of EV fleets is an important aspect of the trial. If the value is proven then it will increase liquidity in the flexibility service market by allowing commercial EV fleets to participate.”

Tech challenges

The capital hurdle of creating enough capacity to electrify depot-based fleets can be a challenge for operators. But it is not always the wider network that requires reinforcement, says Oe. “It could be the last mile cable feeding their site, which is classified as a sole use asset rather than a shared use one.” So while some fleet operators may think they can avoid associated costs by taking a smart or flexible solution, “that element should not be overlooked,” says Oe. “There may be some unavoidable costs.”

Equally, while smart control systems can be remotely managed, “there are elements where a fleet operator needs to understand their baseload, any flexible assets and the operational requirements of their vehicles to gauge the optimised connection required for that site,” he adds.

Asked to summarise advice to any fleet operators considering a switch to EVs, Oe is succinct: “Distribution network operators are happy to support people, we want to find smart solutions, but early engagement is key.”



EVs a service: Smarter packaging required

Partnering on Optimise Prime should provide sharper insight for a vehicle leasing firm keen to package EVs as a service, says Suzanne Phillips, head of mobility solutions at Hitachi Capital Vehicle Solutions



Hitachi Capital - Suzanne Phillips

Vehicles, chargers and total ownership costs are key discussion points in any fleet conversation. "But actually, the bigger discussion we are having with customers at the moment is around energy capacity and the network aspect," says Phillips.

“ I think people had underestimated the enormity of the challenge ”

"I think people have underestimated the enormity of the challenge. Which is one of the reasons we wanted to get involved with the Optimise Prime project, to be able to have that consultation with the DNOs, to understand the capacity requirements, and to do the clever bits - which is to work out the solutions.

"Does it have to be a network upgrade, or is there a smarter way of looking at it? Could you bring in local generation, or a profiled connection and flexible demand, or use onsite storage - or a combination," she explains.

"Those are the kind of conversations we need to be able to have with customers, because it feeds into total cost of ownership, which could make or break the business case."

Ultimately Hitachi's vehicle financing arm hopes to harness experience from the trial, and other work, to inform 'EVs as a service'. That is, "how to wrap all of that into one package to spread the cost of investment over the life of the solution," says Phillips.

"We are building these business cases with customers at the moment - we have lots of complex customers - so absolutely the demand is there," she adds.

"They have carbon reduction strategies and targets, and they are very interested to understand the business case of today versus the business case of tomorrow.

"And I think organisations are looking for someone to do that end-to-end and help them build their future strategy."

Gridserve partnership

Hitachi Capital Vehicle Solutions recently invested in Gridserve, which is building a network of dedicated high-powered EV charging stations, or 'Electric Forecourts' adjacent to main roads and motorways.

Hitachi plans to have retail outlets on the forecourts where customers can lease an EV.

But the other aspect of the partnership is that Gridserve, which is also a solar and storage developer, can provide onsite generation and storage solutions to corporate customers under a Hitachi banner, enabling the 'as a service' approach Phillips is working to develop.

EV Survey question:

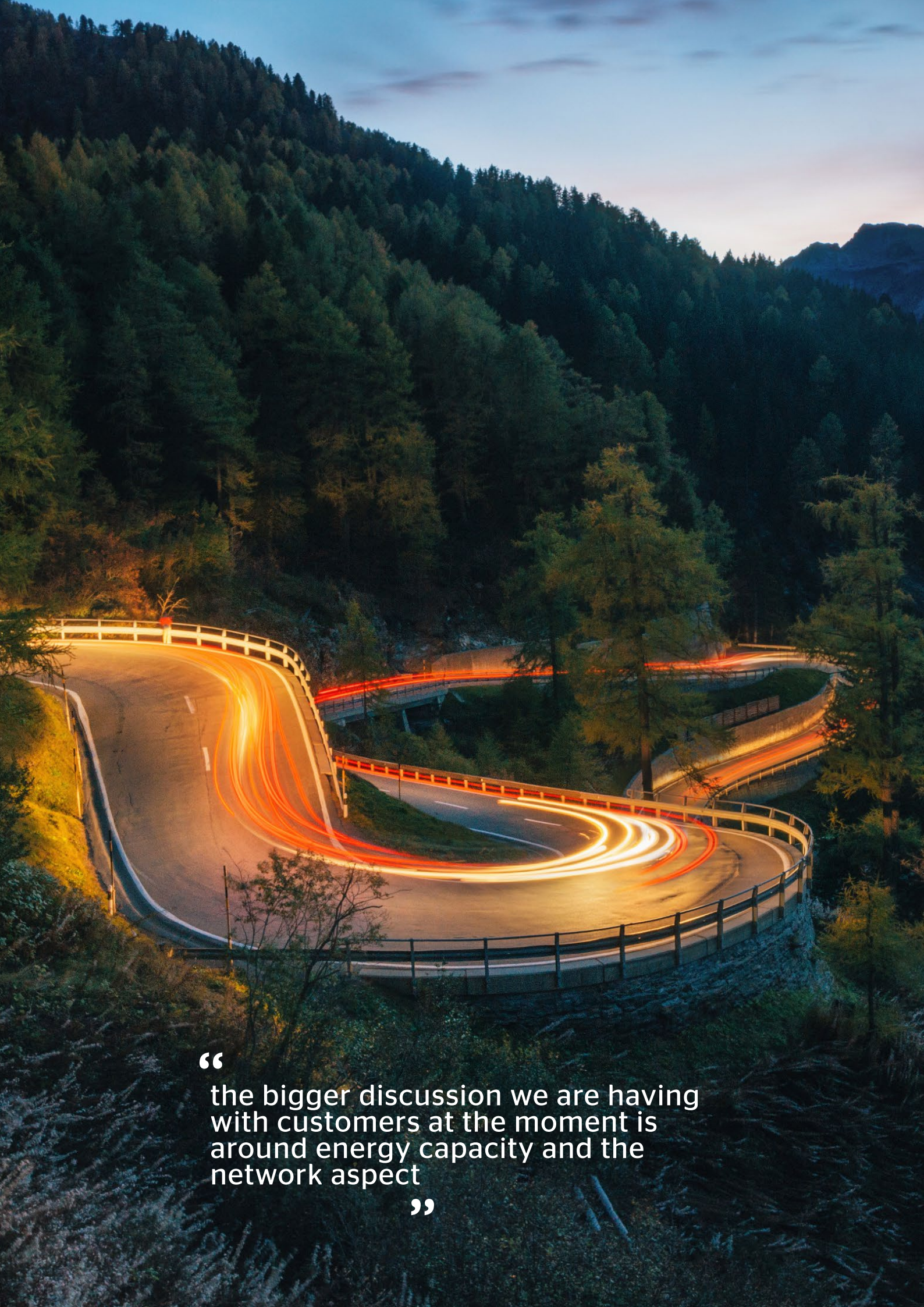
Are you considering integrating EVs into the fleet within the next 12-24 months?



100% Yes



0% No



“

the bigger discussion we are having with customers at the moment is around energy capacity and the network aspect

”

Vehicle-to-grid: Where's the smart money?

EDF and Nuvve's Dreev joint venture is trying to crack flexibility on wheels. Paige Mullen outlines the bumps on the road to commercialisation and where value might lie ahead



Nuvve - Paige Mullen

Last year Nuvve and EDF launched a joint venture called Dreev in a bid to scale flexibility from EVs.

Operating across UK, France, Germany, Belgium and Italy, its aim is to roll out vehicle-to-grid (V2G) commercially while enhancing smart charging, or VIG services.

Like any emerging technology, UK trials to date have shown V2G is hard work to get started. It requires multiple technical and commercial strands to come together.

Hardware availability and cost for bi-directional chargers has been a blocker in the industry, says Paige Mullen, from Dreev's



London office. To address it, Dreev recently tendered to procure thousands of units.

Another big challenge is around vehicles. While EDF has partnerships with PSA Group and Nissan, EVs from a range of manufacturers must become V2G compatible to achieve a truly mass market. A shift from DC-only to both AC- and DC-charging vehicles, will necessitate onboard V2G chargers, providing more options for customers to participate in V2G.

However, European OEMs seem to be coming around to the idea, with the likes of [BMW](#) conducting trials and VW chief strategist Michael Jost [stating earlier this year that the world's biggest carmaker wants 350GWh of storage](#) at its disposal by 2025.

Revenues: broader than FFR

A [2019 study by Cenex suggested £400 per vehicle may be the upper annual revenue](#).

“there are still some pretty huge barriers to entry into FFR, It's not really feasible to install these industrial grade meters at every single charging unit”

V2G: Why only Nissan?

Nissan uses the CHAdeMO charging protocol, whereas most European carmakers use the Combined Charging System (CCS), which does not currently enable V2G, though the body promoting CCS, CharIN, said last year that the standard will support V2G by 2025. Mitsubishi PHEVs also use CHAdeMO, but their smaller battery capacity limits their value.

[limit for providing V2G services](#), with the bulk coming from delivering firm frequency response (FFR), which National Grid ESO procures to help keep the grid stable at 50Hz.

For EVs, "there are still some barriers to entry into FFR," says Mullen. One is metering requirements. "They are quite expensive for aggregated assets," says Mullen. "It's not always feasible to install these industrial grade meters at every single charging unit, particularly when looking at V1G."

Meanwhile, many chargepoint operators cannot yet provide the required granularity to enable a 2 second response time, the minimum required for FFR in the UK.

Mullen thinks these could preclude V1G smart charging from frequency response if regulations do not evolve. She believes dedicated V2G chargers and operators could ultimately bid for those contracts, but says it's not the only game in town. That contrasts with the 86 per cent stated by Cenex's 2019 study (though Cenex more recently published

research to show V2G provided far wider non-cash benefits).

For now, before regulatory changes come into effect, much of the potential value is from behind-the-meter optimisation, says Mullen. For example, using vehicle batteries deliver energy back into buildings to avoid peak charges and charging cars when energy surplus is available or at cheaper tariff times.

The aim is to combine those revenues with wholesale power market arbitrage, though energy markets and regulations will need to adapt to aggregators with new technologies to maximise the value of V2G, says Mullen.



“**Any business that has vehicles parked for long periods at a time might benefit from V2G,” says Dreev’s Claire Weiller. “It’s important to consider V2G technology and benefits at an early stage**

”

eFlex: London fleet V2G trial

Nuvve is involved in E-Flex, an InnovateUK-funded V2G trial that includes the GLA, TfL, Cisco, Cenex, Imperial College London and E-Car Club.

Gnewt Cargo is the largest fleet involved. The Menzies Distribution-owned firm operates 70 modified electric vehicles and has deployed 10 bi-directional chargers alongside smart chargers at its East London depot.

It's still early days, "we're doing level one stuff, basic profiles, balancing with the other units," says Nuvve's Paige Mullen. But the Gnewt deployment is starting to provide real life data and insight about the balance between energy and fleet needs.

"Gnewt is a very good use case, because they have a long dwell time, so we can test the periods where we can make the most from V2G," says Mullen. "On the flip side, Gnewt relies on these vehicles every day, so the batteries have to be up to the required level."

Meanwhile, E-Flex is providing further insight into the co-ordination required between building, energy and fleet managers to find the optimal mix, which is bespoke to each site. "That is a good thing to start working on early, and not in silos," says Mullen.

Early engagement with DNOs is also key, she says, given V2G chargers will require signoff by an onsite witness. At Gnewt's site, that took five months.

"The grid connection and capacity issue needs to be streamlined - and I think DNOs are realising that," says Mullen. "Right now, it's not scaleable."

“
Larger business usually have variable tariffs that reflect peak prices, and vehicles can help to save them a lot of money
 ”

Balancing local grids

Mullen thinks the emergence of DSO flexibility markets - where distribution network operators pay third party distributed asset owners to keep their grids running smoothly instead of adding copper - are starting to become feasible opportunities and will reduce grid infrastructure investments.

DNO requirements are highly location-specific, making them advantageous for some customers, says Mullen, and some are already

starting to signpost flexibility requirements across their networks.

“DSO flex wouldn’t necessarily be a standalone business case [for V2G],” says Mullen. “But it is a complementary revenue stream, and the market is starting to develop in the UK.”

Most importantly, she says, the DNOs “have designed their markets with smaller-scale assets, such as EVs in mind, the metering and data requirements do not necessarily exclude them”

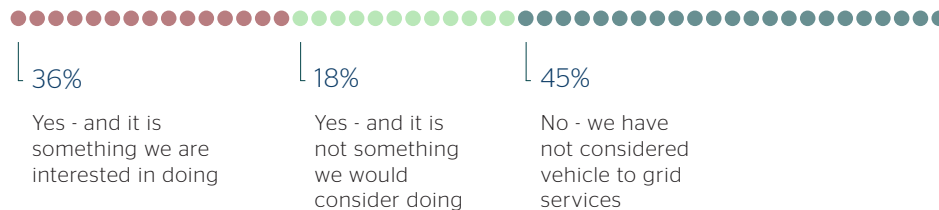
Tesla preparing for V2G?

Tesla Motors was granted a UK power generation licence in June. It plans to build a virtual power plant using its ‘autobidder’ platform. More in hope than expectation of a response, The Energyst asked Tesla if it planned to bring EVs into the platform, alongside its stationary battery storage units. But the carmaker has not ruled it out, and there are [reports that the Model 3’s onboard charger is V2G compatible](#).



EV Survey question:

Have you considered using EV infrastructure to provide grid balancing services (vehicle-to-grid services)?



V2G benefits 'bigger than cash'

A government-funded report published in June suggested non-cash benefits from V2G would exceed revenues from grid balancing and power trading.

Cenex said its report, 'A Fresh Look at V2G Value Propositions', is the biggest survey to date of V2G experience across Europe. It looked at UK trials involving Nissan, Ovo, Octopus and Eon, as well as international projects.

While there is money to be made from flex, analysts identified four main areas of wider benefit:

- Extended battery management - lowering the lifetime cost of home and EV power equipment, through added intelligence and control
- Adding network resilience, as a back-up power source and a shield against brown-outs (a main motivator in Japan, the study found)
- Personal Net Zero - linking with household renewable generation and energy efficiency
- Green engagement - V2G as a motivational step for drivers as part of broader environmental engagement.

Chris Cox, Cenex's head of energy infrastructure, said those touting V2G should push the broader benefits.

"V2G shows huge promise, but recently has been reduced to a tool for making money from trading," he says. "This study does a great job of re-considering its true potential"

Get paid to charge

Another potential V1/V2G revenue stream is 'demand turn up'; charging cars when there is too much power on the transmission or distribution system. National Grid ESO has faced challenges in recent years from low summer demand and high solar output, but this year's Covid-19 lockdowns presented exceptional circumstances.

Demand was 15-20 per cent lower than normal, and Grid had to work much harder to keep the system stable. It is paying distributed generators to stop exporting renewables on to the system and batteries and businesses to use more power - a service EVs could readily deliver.

National Grid ESO plans to run the system on zero carbon sources whenever possible by 2025. To do that, it will need much more flexibility.

Who should consider V2G?

"Any business that has vehicles parked for long periods at a time might benefit from V2G," says Mullen. "It's important to consider V2G technology and benefits at an early stage. Even if businesses do not do it now, they should set up charging infrastructure and car parks to be V2G ready," she says.

"Usually there is a significant economic benefit to adding at least some proportion of V2G [to the mix]," she adds.

"Having that flexibility allows you to better optimise connection capacity and means you can avoid reinforcements. Larger business usually have variable tariffs that reflect peak prices, and vehicles can help to save them a lot of money."

Free V2G kit: Nissan drivers needed

Western Power Distribution is attempting to drum up participants in a vehicle-to-grid trial by offering free bi-directional charging systems to participants.

The trial is part of its Electric Nation innovation project. WPD aims to recruit 100 drivers to commence trials by March 2021.

Applicants need to have a Nissan EV with at least 30kWh battery capacity and off road parking. They can expect to earn at least £120/year from providing grid services, and get to keep the £5,000 charging system.

Details at electricnation.org.uk



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