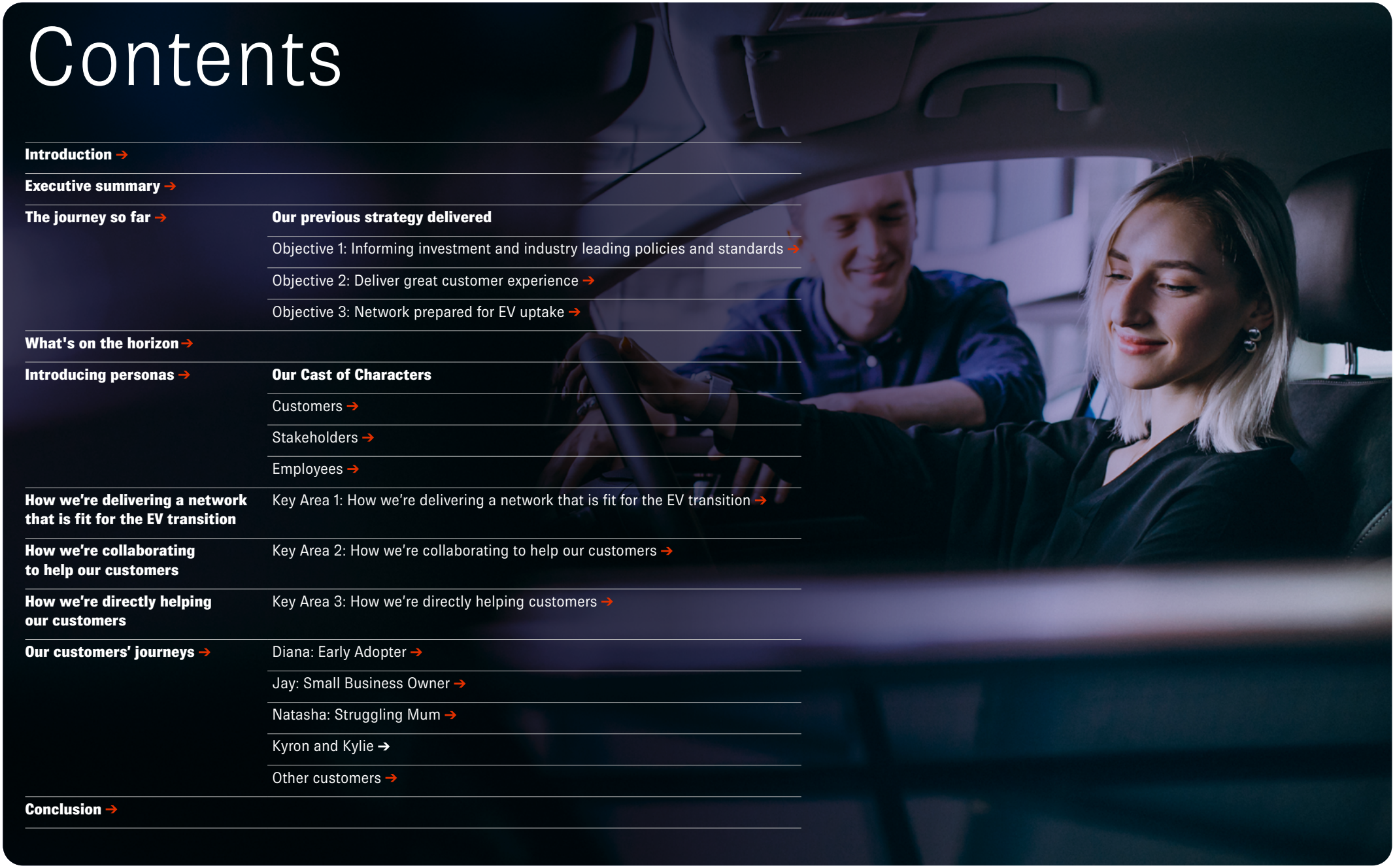
UK Power Networks Electric Vehicle Strategy 2023

Contents



The UK has committed in law to achieving net zero carbon emissions by 2050 and to banning the sale of new petrol and diesel cars and vans from 2030.

Ian Cameron
Director of Customer Service & Innovation

Road transport accounts for around 30% of the UK's carbon emissions[1], and so the switch to electric vehicles (EVs) is a key part of the puzzle in achieving Net Zero. There are clear signs that industry and customers agree: many car manufacturers, including Ford, Volvo and Mini are now committed to selling an all-electric fleet by the 2030s[2], and the sale of EVs has seen a huge increase in the past few years, with over one in five new cars sold in the UK in 2022 being an EV. Alongside heating, it is one of the most concrete ways our customers can address their own personal carbon footprint.

Currently, a typical EV produces just a third[3] of the emissions of an equivalent petrol vehicle, and this will continue to fall as technologies mature and the carbon intensity of electricity generation falls further. Alongside largescale investment in EV infrastructure, this means that we're going to see an exponential growth in the number of EVs on our roads and connecting to our electricity grid.

We predict there will be over five million EVs by 2030 in London, the East and the South East of England alone. The government also expects there to be around 300,000 public chargepoints across the UK by that time.

But to make these predictions a reality, we all need to act. There are clear barriers to adoption at the moment: relatively expensive vehicles, supply chain issues, a cost of living crisis and a lack of appropriate charging infrastructure.

However for us, as a distribution network operator (DNO), we are clear on our fundamental goal for EVs: connecting as many chargepoints as our customers require, as quickly and cheaply as possible, and maintaining the smart, robust electricity distribution network they need to operate efficiently.

EVs are still a relatively young technology, and innovation abounds in the sector. We want to harness that innovation and collaborate with as many likeminded people as possible to find the best solutions to these new challenges. But we also want to make sure that no one is left behind in this transition.

This means making sure that there are enough public chargepoints for those without access to off-street parking, that charging is accessible to all drivers regardless of their needs and that smart solutions can be used to save drivers and our customers money where possible. Underpinning this is a constant commitment to maintain a safe and reliable network.

This strategy document sets out how we want to work with you, our customers and our wider stakeholders, so that everyone is informed and has an opportunity to influence and participate in our plans. It lays out what we have achieved so far, what initiatives we have in progress and what we have planned for the future to achieve our goals while serving our diverse range of customers throughout their EV journeys.

We want to make it easier for the UK to achieve – and over-achieve – on uptake projections. We are a small but vital part of the EV landscape, and we cannot work alone to achieve this. We invite you to engage with us on these plans: please get in touch with us with your feedback or new ideas to take forward together.

CONTACT US

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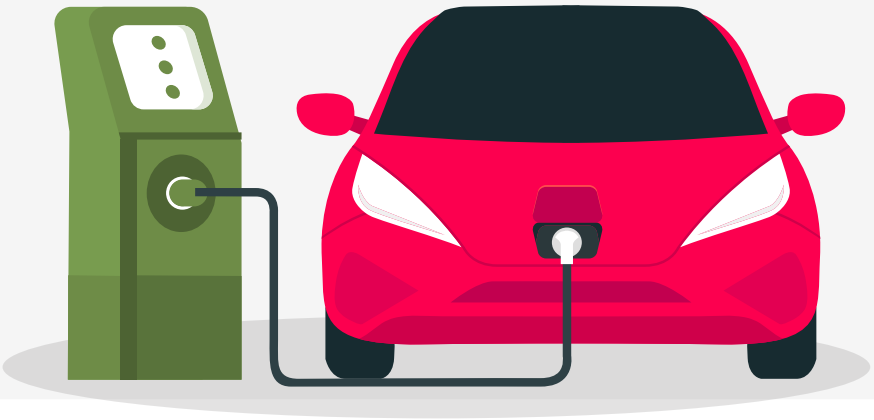
[1] 2021 UK greenhouse gas emissions, provisional figures (publishing.service.gov.uk)
[2] Trends and developments in electric vehicle markets – Global EV Outlook 2021 – Analysis – IEA.
[2] The electrification race between OEMs is locked on 2030 | Fleet Europe
[3] Ricardo-AEA for DfT (2021). Lifecycle Analysis of UK Road Vehicles.

Executive summary

Since we last updated our EV strategy three years ago, the number of EVs on the road across the UK has increased five-fold, from 223,000 to 1.1 million. As the scale of the EV transition has increased, we have worked hard to ensure that we can provide the network infrastructure to support this growth.

We have successfully delivered against our previous strategy: EVs are connecting to our network without issues. Now, as we see a step change in the number of EVs on our roads, we think it is the right time to update this strategy to keep pace with the transition and ensure all our customers can participate in it.

This document sets out our strategy for the next three years, so that we can facilitate and achieve the EV growth needed to get to Net Zero.



We have engaged with our customers, stakeholders, and staff to:

- Identify the key barriers to EV growth and the best approaches across energy systems to overcome them
- Understand the factors that influence this growth and how to best and most efficiently manage the resulting uncertainty.

Here, we lay out how we will deliver our plans to provide the best outcomes for our customers on their EV journeys.

We have categorised these plans into three key areas:

1: Delivering a network that is fit for the EV transition
2: Collaborating to help our customers
3: Directly helping our customers

Underpinning each of these are the following objectives:

Key area 1: Delivering a network that is fit for the EV transition

Objective A: To have enough people with the right skills in our workforce to deliver our plans to facilitate the EV transition

Objective B: To invest smartly and be cost efficient by using a data driven approach. By forecasting need and monitoring our network, we will ensure that we are providing the right upgrades, at the right time, at the lowest possible cost to our customers

Objective C: To walk the walk: we will transition our own fleets when vehicles reach end of life and suitable EVs are available

Key area 2: Collaborating to help our customers

Objective A: To facilitate a fair and equal EV transition. We will achieve this by working with local authorities on local and regional planning, working with those delivering public services (such as emergency services) and championing accessible charging

Objective B: To maintain high quality customer service while delivering high volumes of new connections

Objective C: To not be a blocker to EV take-up. We will achieve this through innovative collaboration with suppliers and chargepoint operators, and by removing ourselves from the critical path of chargepoint installation

Key area 3: Directly helping our customers

Objective A: To be a source of trusted, impartial information to help customers make informed decisions on their EV journey

Objective B: To be at the forefront of digital innovation that makes our customers' lives easier and speeds up the EV transition

Objective C: To maintain a safe, reliable network through this period of change and adoption, including enhanced services for vulnerable customers

While we are determined to meet every one of these objectives, we know there are still further challenges to overcome. Some barriers will remain and new barriers will emerge. But we are committed to driving forward on the path to Net Zero, continuously engaging, learning, and collaborating with our customers and stakeholders to do whatever we can to make EVs available, accessible, and affordable to all.

We hope that this document will provide you with information on our plans and what these mean for you, but also spark ideas and start conversations. Please get in touch with us so we can move forward on the EV transition, together.

CONTACT US

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The journey so far

We last updated our EV strategy back in 2019, when there were just 223,000 EVs on the road across the UK. In the past three years, that number has increased five-fold and there are now over a million EVs across the UK, with over 400,000 in UK Power Networks' licence areas alone.

Our previous strategy had **three main objectives**, with clear activities underpinning them. We have successfully delivered against these objectives and related activities, which has enabled all of the EVs in our area to connect to date, without causing network issues.

Our previous strategy delivered

Objective 1: Informing investment and industry leading policies and standards

ACTIVITY

Achieve the best forecasting tools to support planning

DELIVERED

- We produce and update our Distributed Future Energy Scenarios (DFES) annually, which show predicted uptake of EVs and other low carbon technologies (LCTs) at a very granular level. Alongside the updates, we conduct regional engagement with local government and planning organisations to help them get the most from these forecasts.
- We have developed our Strategic Forecasting System, a sophisticated and dynamic load forecasting model that allows us to better plan future network interventions to meet the uptake of EVs and other LCTs predicted by our DFES.
- Our LV visibility strategy combines physical monitoring with predictive analytics to provide high quality load data on our network assets to help us make more informed decisions around network planning and operation.

ACTIVITY

Clear and accessible policies and standards

DELIVERED

- Our open access G81 technical library provides engineering standards and information to help customers with their works on the network and is continuously updated.
- As part of our innovation project Emerge, we have launched a new engineering operation standard to enable third party meter operators to safely work on domestic fuses in the course of fuse upgrades. This allows for instantaneous approval for third party meter operators to carry out these upgrades, reducing time-based barriers to EV adoption. This earlier, proactive engagement removes us from the critical path.
- Joining other key stakeholders, we were recently on the steering group for the development of the British Standards Institute's PAS 1899[4], a voluntary standard for accessible EV charging.

OUTCOMES

100% visibility of our low voltage network through monitored or modeled data

Seven eligible fuse upgrades performed by third party meter operators in Emerge trials

[4] British Standards Institute's PAS 1899

Our previous strategy delivered

Objective 2: Deliver great customer experience

ACTIVITY

Most choice available and customer convenience

DELIVERED

- Our Smart Connect portal is a free service for installers to more efficiently request low carbon technology connections for an existing premise. It is fully digital and over three quarters of requests are automatically fast track approved.
- We also have Smart Enquiries, which accepts a proportion of customer enquiries without the need for human intervention. This reduces the lead time for applications from ten days to a matter of minutes, improving customer convenience and allowing us to process a huge increase in applications as we set ourselves up for the even higher volumes to come.
- We offer timed or profiled connections for customers to provide cost-effective connection solutions when capacity is not required 24 hours a day, for example in fleet depots.
- Our Connections Gateway and Ask the Expert surgeries offer pre-application support for customers, providing enhanced support and information to help guide customers through the connections process for new chargepoints free of charge.
- We are delivering on average over 95% customer satisfaction scores for domestic low carbon technology connections.

ACTIVITY

Continue to engage and provide transparency of required data

DELIVERED

- Our industry-leading Open Data Portal features one of the UK's biggest data sets about the electricity network, and we are adding to it all the time. Recently, we added data sets specifically targeted towards local authorities planning public charging infrastructure rollouts. This open access and self-serve portal helps customers of all sizes to plan their chargepoint installations.
- We have engaged with chargepoint operators to share our planned outage data, so that charger availability can be displayed accurately on their systems, avoiding customers travelling to offline chargers. We are expanding this approach to include data on unplanned outages.
- We regularly hold connections forums specifically for LCT customers, as well as flexibility forums for people and businesses, where we share news and updates and receive feedback about our services.
- We engaged on transport with hundreds of customers and consulted our Whole Systems and Net Zero councils as part of our RIIO-ED2 business planning process, to make sure that our plan for the next five years is fully reflective of customers' needs and wants.

OUTCOMES

Over 95% customer satisfaction scores on average for domestic LCT connections

In 2022, Smart Connect processed over 9,000 connection requests every month, a 300% increase in volumes in less than a year, and 80% were automatically approved

Our previous strategy delivered

Objective 3: Network prepared for EV uptake

ACTIVITY

Smart toolbox

DELIVERED

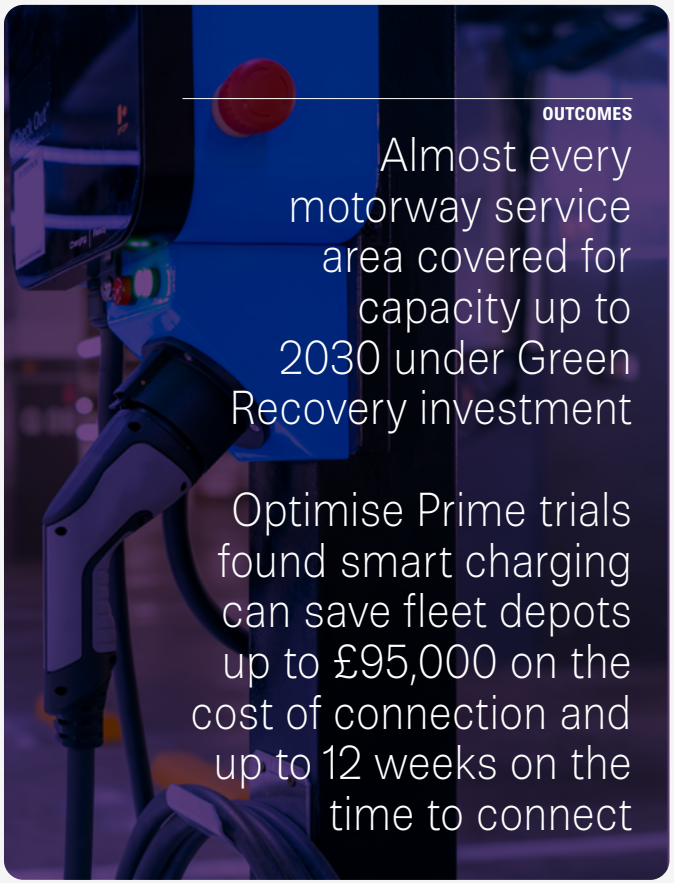
- Our Site Planning Tool, developed as part of flagship innovation project Optimise Prime, is a self-serve tool that helps customers planning to install multiple chargepoints to evaluate their energy needs for transitioning their fleet to EVs and see if timed or profiled connections are suitable for them.
- Other self-serve tools for customers include Smart Connect, the Open Data Portal and our DFES, all discussed under objective 2.
- Internally, we use all of this data as part of our own smart toolbox to invest strategically, efficiently and effectively in the network to facilitate EV uptake.
- Our Active Response software will make it possible for over 500 EV chargers to be connected around a single substation using automation that re-configures itself in real-time, moving spare capacity to where the demand is.

ACTIVITY

Deploy efficient investment: right sized and timed

DELIVERED

- Through our Green Recovery programme we are delivering £66m of strategic investments in the electricity network to create new capacity to significantly lower the cost of connecting high-powered charging hubs to our network. We have also combined this programme with our innovation project, Charge Collective, to deliver strategic investment in urban centres for on-street charging.
- Energy flexibility is an integral part of the establishment of our Distribution System Operator (DSO), allowing us to manage the network, build a more resilient grid and save money for customers. We buy flexibility from a range of organisations that can alter their energy generation or consumption as a service. Most recently, we launched our largest tender yet for 500MW of flexibility. In our previous tender, nearly 80% of the flexibility we secured came from EVs.
- Our timed and profiled connection offers also allow for efficient investment through a flexibility first approach, giving customers choice on their connections and only upgrading the network when necessary.



OUTCOMES

Almost every motorway service area covered for capacity up to 2030 under Green Recovery investment

Optimise Prime trials found smart charging can save fleet depots up to £95,000 on the cost of connection and up to 12 weeks on the time to connect

What's on the horizon

All of these activities and more have got us where we are today, with 21,000 public chargepoints (35% of GB total) and over 400,000 EVs (36% of GB total) across our network areas. However, this is just the start, and the strain on public charging infrastructure is beginning to show, with customers finding it harder to find available public chargers while out and about[5].

[5] Charging infrastructure 'woefully behind where it needs to be' | News | Forecourt Trader

What's on the horizon

Currently, across the UK there are 18 EVs per chargepoint, and this ratio has been steadily worsening over the past couple of years, as supply of EVs has outpaced installations of chargepoints.

The uptake in EVs is rising quickly: compared to the 2022 Future Energy Scenario forecasts by National Grid[6], there are 20% more EVs on the road than what was forecasted previously.

While customers have told us that in the short term, high electricity prices and the cost of living crisis is likely to delay their switch to EVs, in the medium to longer term we still expect to see a rapidly increasing number of EVs on GB roads.

These patterns are reflected in our data. Before the end of the government's Electric Vehicle Homecharge Scheme grant for most domestic chargepoints, we saw a peak of nearly 4,000 chargepoints connected to our network in a single month, in March 2022.

However, the removal of the grant, coupled with supply chain issues causing delivery delays for a number of EVs and the cost of living crisis has seen volumes reduce, coming in below forecast for the last three months of 2022.

EV connections were averaging around 1,500 per month, while customers' focus seemed to shift to solar PV, as customers looked at ways to save money on their bills in the longer term. We expect EV volumes to pick up again throughout 2023.

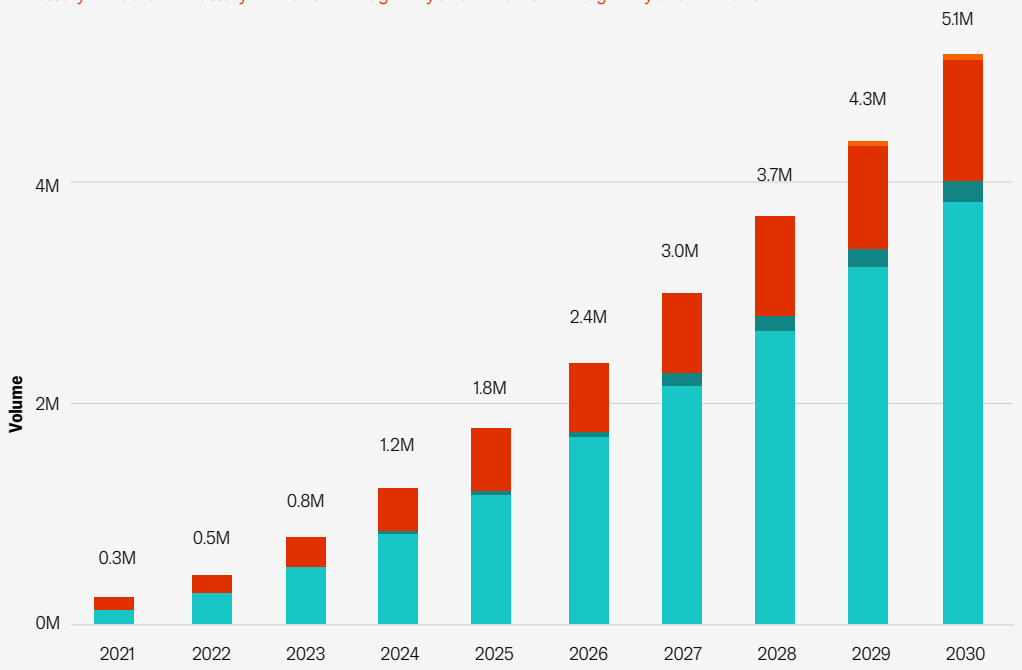
We are adapting to this uncertainty and updating our forecasts, to ensure we are ready and prepared for any new scenario which plays out. As of February 2023, there were 403,000 EVs registered in UK Power Networks' licence areas.

This is higher than the amount predicted by both National Grid's Future Energy Scenarios and UK Power Networks' DFES for 2022, perhaps due to these scenarios overestimating the impact of supply chain issues on uptake.

In our most recent update to our DFES for 2023, released in December 2022, we have included updated battery price projections, with costs expected to increase before falling from the end of 2023. This leads to a steeper uptake from 2023 onwards.

Figure 1

2023 DFES projections to 2030 for UK Power Networks licence areas (Consumer Transformation scenario)



We publish quarterly market intelligence reports which take an analytical and strategic view of industry trends and topics. These can be found here

[6] National Grid Future Energy Scenarios

What's on the horizon

These new EVs will need to charge somewhere.

Figure 2 shows our updated charging 'segments': where charging across our customer base is forecast to occur.

What is clear from these charts is that the majority of charging happens at home, and will continue to do so, whether that is on street or off street locations. It is therefore important for us to make sure we have the capacity for third parties to connect chargers in these locations, and our plans are targeted towards these segments to ensure we are not a blocker there.

However, each of the segments is an important part of the overall charging ecosystem and we have to make sure we provide the required capacity where and when customers need it, keeping up with the pace of fastest movers, while also ensuring that no-one is left behind.

Part of the uncertainty on exactly when and where EV uptake will occur comes from wider issues: inflationary pressures, policy changes and evolving markets all affect customers' spending decisions and businesses' investment decisions.

As our forecasts sit at the heart of everything we do to facilitate EVs, we will continue to engage with customers, stakeholders and industry to identify any emerging trends so that we can update them to be as accurate as possible.

This continuous feedback loop helps us to increase the accuracy of our DFES over time. Ongoing engagement also helps up to achieve our task to understand our customers and their evolving needs.

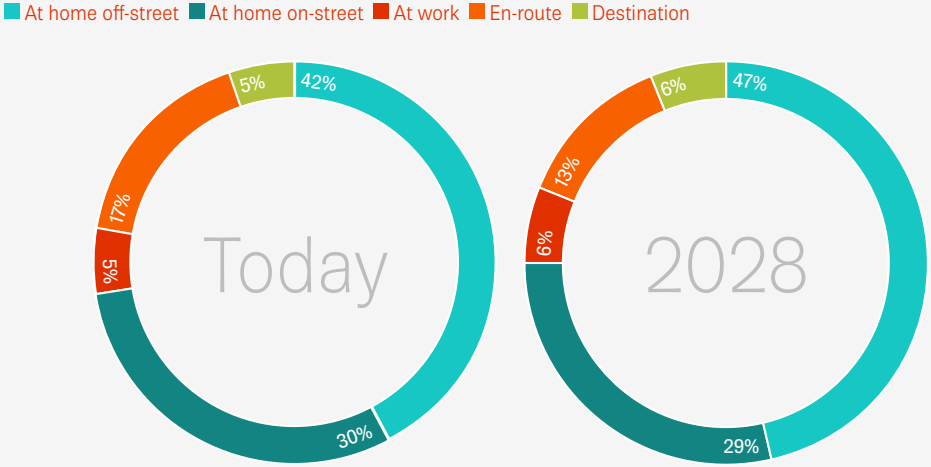
By knowing what the current blockers to adoption are, we can focus our efforts in the right places at the right time. We need to work with customers to help them on their EV journey, understand how these uncertainties affect EV take up and plan the network and our services accordingly.

We use charging segments to understand what is happening in our environment, identify and prioritise things we need to change, and figure out what we need to do to meet the network infrastructure requirements of each segment. We also use them as a basis for innovation, continuous improvement, research, communication, and learning.

While they have stood the test of time and continue to serve us well, we have found that as the transport sector evolves and the complexity increases, additional perspectives are necessary. For example, a commercial fleet manager or a driver with disabilities will require solutions that span several of these segments.

In addition, we are seeing the development of V2X (vehicle to everything) technology as an increasingly viable solution. ISO 15118-20:2022[7] has been published as a stanadard for communication between EVs and supply equipment, and the government continues to show commitment through innovation funding in this space[8]. As the cost of V2G chargers continues to fall, we expect to see and facilitate more V2X on our network.

Figure 2
Charging segments



[7] ISO
[8] Innovation funding

Introducing personas

Since customers sit at the heart of everything we do, we have chosen to introduce personas to our EV strategy to better serve our customers.

By putting ourselves in the shoes of our customers when considering how and when they use our services, we can make more informed decisions on how we best support them; identify and solve their problems; tailor the information we provide; and improve how we communicate with them.

Introducing personas

Customer Personas
We deliver electricity to over 8.4 million homes and businesses across London, the East and the South East of England. Our customer base is broad and diverse, and this makes the persona approach interesting but also challenging. Each customer is at a different stage in their transport decarbonisation journey. Each customer has different motivations and faces different barriers. Those who have made the switch still have hurdles to overcome and those who haven't can feel like the initial hurdle is insurmountable.

Therefore, our customer personas are only representative of our customer base. They are informed by our data, research, and engagement. They are not real people, but they have been tested extensively with real customers to ensure that they are reflective of their aspirations, their needs, and the challenges they face.

Stakeholder Personas
We have taken the same persona-based approach with our stakeholders. However, our customers have told us that they do not understand the term stakeholder and we acknowledge that it is a difficult distinction to make.

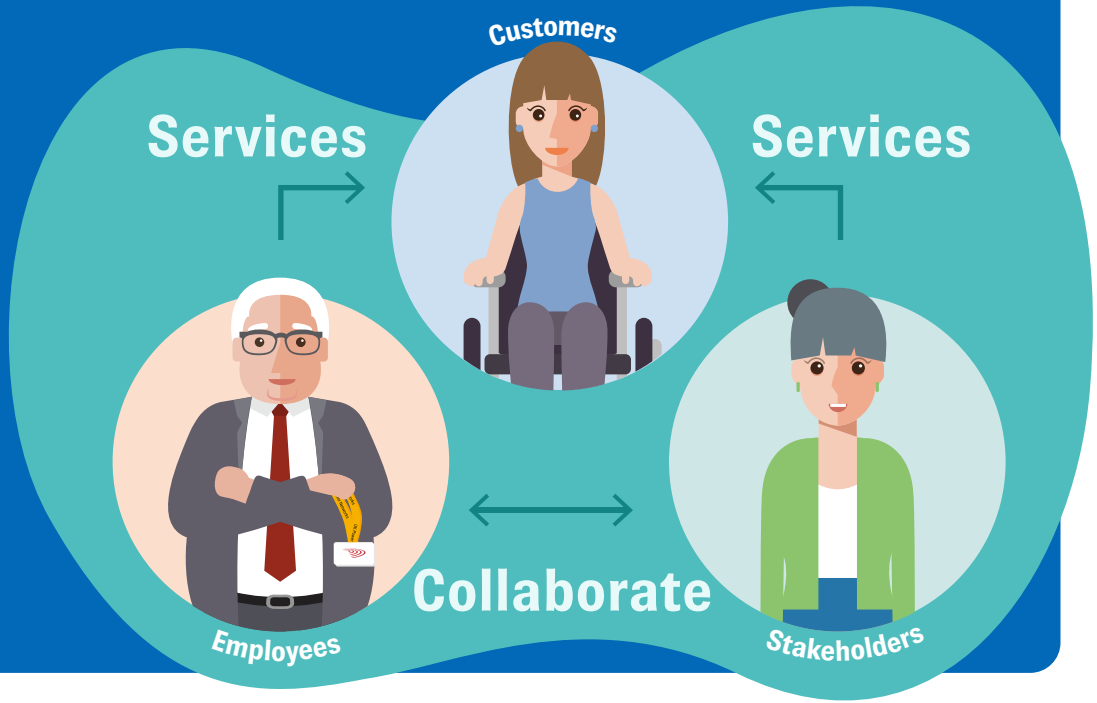
For this strategy, we define a customer as anyone who occupies one of the homes and businesses we serve, while a stakeholder is anyone that is not a customer or an employee of UK Power Networks, and serves the same customers that we do.

A public chargepoint operator connects to our network and uses the electricity that we deliver. In this situation, we typically consider them a customer. At the same time, we serve the same customers, and we collaborate with them to make sure our shared customers receive a great experience. This is just one example, similar logic applies to the many other stakeholders supporting the switch to EVs, such as local authorities, energy suppliers and fleet managers.

Employee Personas
A key tenet of our corporate vision is to be an employer of choice and so we cannot forget about our own staff. We have considered representative employees that our customers and stakeholders might come into regular contact with at each stage of their journey. We have developed personas that reflect the challenges that our employees face because of the growth in LCTs and what they're doing to support our customers plan, connect and charge their EVs. The relationship between customers, stakeholders and UK Power Networks is depicted in the diagram.

Keeping Personas Relevant
This is the first time we have used personas in our EV strategy to better represent our customers and stakeholders. Our thinking on this approach will mature and we will review and test the personas regularly to ensure that they are still relevant and continue to reflect our customers' desires and problems.

By doing so, we will undoubtedly uncover new challenges as well as potential service enhancements. We have purposely generalised them for this strategy, but in some instances, we will elaborate further. We are already doing so with our local authority stakeholder persona as we build our services and tools to support local area energy planning.



Our Cast of Characters

Customers

Our five customers below are meant to represent a cross-section of the customers we serve. While the list is not exhaustive, we hope most people will be able to identify with some of the key parts of their EV journeys.

Diana

Early Adopter

Diana lives rurally, owns an EV but wants a second and is keen on all LCTs. She wants to do her bit for Net Zero and try out the latest tech.

Natasha

Struggling Mum

Natasha is a single mum who is just about managing. While she likes the idea of an EV, it's out of reach at the moment. Urban air quality is very important to her.

Jay

Small Business Owner

Jay runs a scaffolding business across London. He has a small fleet of trucks and vans, based in a yard, and he is thinking about transitioning his business fleet to EVs, as well as his personal car.

Kyron

LCT Installer

Kyron is an electrician who parks on-street. He's installing a lot of chargepoints for people, and his employer is hinting that they'll electrify his work van too. Kyron is married to Kylie.

Kylie

Disabled Driver

Kylie is disabled and drives a Motability vehicle, so knows she'll be getting an EV within the next 10 years either way, but her kids are campaigning for one sooner. She parks on-street in a Blue Badge bay. Kylie is married to Kyron.

Our Cast of Characters

Stakeholders

These stakeholders represent a range of people who we provide services to, but also work with to serve our mutual customers. They're integral to the collaboration and innovation needed to deliver our EV strategy.

Sally

Council Officer

Sally is a council officer, responsible for her council's Local Area Energy Plan (LAEP), including transport and decarbonisation. She doesn't know where to start and is feeling pressure from government and constituents. She doesn't want to leave anyone behind.

Nina

Housing Developer

Nina is the electricity grid connection lead for a nationwide housing developer. She has multiple developments in the pipeline with large power demands. She's under pressure to deliver as quickly and as affordably as possible and has targets for numbers of chargepoints for each new development.

Michael

Chargepoint Operator

Michael is a project manager for a rapid charging hub chargepoint operator. He has multiple sites to connect, with growing loads. He's found some connections very expensive and time-consuming and wants to grow his charging network as quickly as possible to keep up with demand.

Olivia

Energy Supplier

Olivia works for a retail energy supplier. She's organising chargepoint installations and also acts as an aggregator, offering flexibility services to customers. She needs to understand how, when, and where to provide flexibility to DNOs.

Vineeta

Fleet Manager

Vineeta is a fleet manager for the large firm of electricians that Kyron works for. She's looking at electrifying her fleet and needs to consider home and workplace charging.

Craig

Emergency Services

Craig is the project manager tasked with electrification of the fire service fleet in his region. He is particularly worried about charging in emergency response situations while maintaining safe operation of the service

Our Cast of Characters

Employees

Here are just a few of our hard working staff who work across the different stages of our customers' journeys. They're always seeking opportunities to improve our services and continuously engage and collaborate with customers and stakeholders to understand their challenges.

Georgia
Customer Service Advisor

Georgia gets lots of calls from customers who want to know the process to install a home chargepoint and she is having to do lots of coordinating to schedule home supply upgrades. She's concerned things are getting lost due to increasing call volumes and manual processes.

Linda
Net Zero Associate

Linda works with local authorities (LAs) to plan their public charging infrastructure roll outs and fleet transitions, alongside other decarbonisation aims. She wants to help LAs achieve their goals, but also wants to use data effectively to plan the network and identify where flexibility can provide capacity.

Tony
Connections Manager

Tony and his team are facing huge volumes of connection requests that are getting increasingly complex due to the increasing variety of technologies. He's worried about his staff's workload and wants to automate the repetitive part of quotes so he can add value through customer engagement.

Ophelia
Innovation Engineer

Ophelia works in our innovation team. Ophelia works with representatives across all charging segments and at every stage of the customer journey but she's currently focussing her attention on the connections stage. She's always seeking opportunities to collaborate with others to address some of the challenges her colleagues and our customers face.

Frank
Field Engineer

As a field engineer, Frank is on the front line. When he's not responding to power cuts, he's working on a lot of public chargepoint connections. He's seeing difficulties in installing and upgrading in urban areas in particular and wants to coordinate works so they're done quickly with minimal disruption.

Jing
Flex Services Advisor

Jing works in our flexibility services team, trying to find ways to increase capacity on our network quickly and cheaply. He wants customers and stakeholders to be aware of the opportunities to save money and generate revenue. He's always trying to find ways to incentivise customers to provide flexibility.

Key Area 1: How we're delivering a network that is fit for the EV transition

We know we need to work hard to deliver a network that is fit for the future. This section outlines our plans to invest in our people, our systems and and our assets to achieve this.

OBJECTIVE A:

To have enough people with the right skills in our workforce to deliver our plans to facilitate the EV transition

OBJECTIVE B:

To invest smartly and be cost efficient by using a data driven approach

OBJECTIVE C:

To walk the walk: we will transition our own fleets when vehicles reach end of life and suitable EVs are available

CUSTOMER QUOTE:

"There's a greater need for UK Power Networks to stay on top of current information, to have more staff dedicated to EVs"

How we're delivering a network that is fit for the EV transition

Our vision

To date, our vision has been made up of three pillars: to be an employer of choice, a respected and trusted corporate citizen and to be sustainably cost efficient. For RIIO-ED2, we have added a fourth pillar: to enable the Net Zero transition for all. This demonstrates our recognition of the importance of achieving Net Zero and our commitment to do so. There are a number of activities underway to achieve this vision, addressing our staff, our operations and how we run the network.

Our workforce

We need to develop the right workforce to deliver on our EV strategy. We are committed to building the skills required for the DNO of the future, and this includes the creation of our Digital Skills Academy. This will support the technical skills needed for the essential forecasting, monitoring and modelling that we will do.

For on-the-ground work, we will deliver a flexible resourcing model that supports the scaling up of delivery as and when demanded by EVs and other LCTs. This will also ensure that we have the capacity and skills to continue to deliver for our customers as demand for LCTs grow.

Investing smart: forecasting, monitoring and dealing with uncertainty

To deliver the efficient and strategic network improvements needed to support all of the new EVs on our network, we must first have confidence in our forecasting and monitoring.

Our focus in RIIO-ED2 will be on increasing visibility of the low voltage (LV) network in particular, where EVs and LCTs primarily connect. Our LV visibility strategy is comprised of two key elements:

1. Adopting a data-first approach

a. Maximise the benefits through better use of data to achieve enhanced network visibility faster and cheaper. Leveraging data collected from smart meters, third party data and monitoring data we are already collecting on the network

b. Capitalise on the data available by creating and using modelling and predictive analytics methods and Artificial Intelligence (AI) to gain LV network insights faster and cheaper compared to traditional methods of physical monitoring.

2. Deploying physical monitoring economically and efficiently

a. Utilise real time physical monitoring where we forecast distribution constraints, or where we are actively managing the network through flexibility services and flexible connections (e.g. time profiled connections).

b. Optimise network visibility and monitoring capabilities by making sure all new equipment is LV monitoring enabled and deploy LV monitoring when carrying out other site works, where this proves to be value for money for our customers.

Acting on the findings from this forecasting and monitoring must be done at least cost to our customers. We will first exhaust non-traditional methods of finding capacity through flexibility procurement or using innovative technology solutions.

Then, rather than commit upfront to large, expensive network upgrades for EV predictions that may not materialise as and when expected, we will use regulatory defined uncertainty mechanisms to fund this work.

This means that when it becomes clear that the demand is materialising, we will speak to our regulator, Ofgem, to gain the funding needed.

Our fleet

We are also committed to walking the walk when it comes to EVs. Currently, our road vehicle fleet accounts for 42% of our direct carbon emissions (excluding losses). Where technically available, we have committed to replacing all vehicles in our fleet with an EV alternative, to a minimum of 60% of the fleet by the end of RIIO-ED2.

This action will reduce our transport emissions by 49%, which is a 21% contribution to reaching our total carbon reduction target.

Distribution System Operator and Flexibility Services

What we've done so far

How EVs can benefit from flexibility
Customers with EVs participate in flexibility services through an aggregator or through their energy supplier.

There are two main ways they can do this:

1. Smart charging
This is when EV charging is intelligently managed and optimised by communicating with the aggregator or supplier, who receives signals from the grid on whether to start or stop charging. This means that charging can be delayed or limited if there is too much demand. Often, this communication involves price signals, meaning that customers benefit from smart charging by getting cheaper charging at off-peak times.

2. Vehicle to Grid
Vehicle to Grid (V2G) charging is when an EV charger not only controls how much power it takes from the grid but can also export power to the grid and the owner can be paid for doing so. This again can be useful in times of too much demand. Customers can use their EVs as a battery, charging up when grid demand and prices are low and exporting power when grid demand and prices are high. Currently, only some EVs and chargepoints offer V2G technology.

Flexibility can also be used 'behind the meter': this means that the car's battery can be used to meet the household's power demand, reducing overall demand on the grid and therefore costs. This is called Vehicle to Building (V2B).

Our work on EV flexibility
Our innovation project Shift worked with Octopus, Kaluza and ev.energy to trial market led flexibility solutions for smart charging. We found that customers were willing and able to shift their charging times when charging at home off street. The success of these trials led to the implementation of our low voltage flexibility procurement (i.e. buying flexibility from EV drivers' smart charging through their aggregators and suppliers).

We are now extending this work, through Shift 2.0, to see how direct price signals could complement this further and address some potential issues with smart charging such as the creation of secondary peaks, when all charging is shifted to the same overnight period.

Our most recent flexibility procurement event is tendering for low voltage flexibility at nearly 1,000 locations.

The requirement will largely be for reduction in demand during the evening peak (between 5 and 7pm), for a fixed fee of £26.32 per kW per year. We anticipate that domestic EVs will provide a lot of this flexibility.

We're keen to make sure there is equality of access to flexibility services like smart charging for those who park on as well as off street, and so we want to facilitate public smart charging.

Our On street smart charging report produced by our Charge Collective innovation project found that there were both network and customer benefits to on-street smart charging.

We also participated in SmartSTEP[9], a government-funded trial for public smart charging, which demonstrated its technical feasibility. We are keen to do more work in this area to find ways to make smart charging mainstream for at home on-street charging.

[9] SmartSTEP

Distribution System Operator and Flexibility Services

Our future strategy for the DSO

We are establishing the UK's first ever independent Distribution System Operator (DSO), turning our whole systems strategy into action. This team will be crucial to facilitating the transition to Net Zero and supporting clean economic growth at lowest cost.

Our vision is of a dynamic distribution system, with electricity demand and supply flexing in response to distribution-level conditions and market signals. We will see market-based solutions which influence consumer behaviours, supplemented with traditional network investment that results in the lowest costs for consumers. This will lead to a smarter and more highly utilised distribution network, with faster and cheaper access for the LCTs we will need to achieve Net Zero.

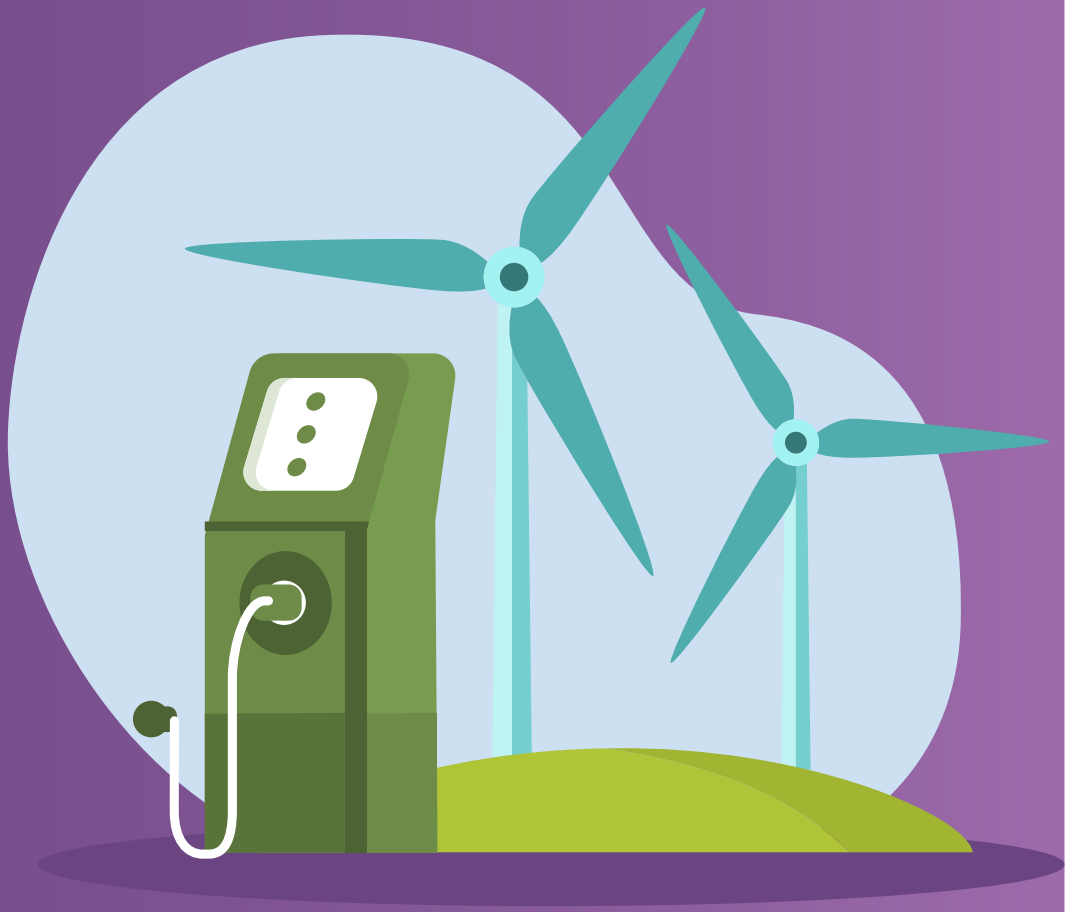
Our DSO strategy is based on four strategic pillars[10]:

1. **Building trust and confidence in independent distribution system operation**
2. **Reducing customer bills through sector leading DSO operations**
3. **Providing timely and affordable access to our network by accelerating the connection process**
4. **Helping our customers play their part in Net Zero and support innovation in energy services**

We were the first UK DNO to contract flexibility from EV service providers, including flexibility from domestic customers. We already run flexibility tenders every six months, but our vision is for a digital, independent, coordinated-access platform on which all participants can buy and sell flexibility services.

Our vision is that the Distribution Market Platform will be integrated with the wider energy and balancing services markets via an open application programming interface (API), providing market 'inter-operability' and coordination. The Distribution Market Platform will be provided and operated by a third-party and will coordinate with initiatives such as the ESO Single Markets platform.

We do not believe that DSOs should have "closed" digital monopoly platforms. All of this will mean working closely with flexibility providers and aggregators to ensure that our EV customers can benefit from the flexibility services we provide, both by participating through smart charging and through overall lower costs to customers. We estimate that benefits from deferred reinforcement on our networks due to the use of flexibility will be up to £410m.



[10] See appendix 18 for our full DSO strategy

Key Area 2: How we're collaborating to help our customers

We are constantly working with a wide range of stakeholders to serve our customers. This section summarises some of the innovative work we've collaborated on to date to help facilitate EV uptake, which will continue to deliver benefits to customers, as well as detailing our future plans.

OBJECTIVE A:
To facilitate a fair and equal EV transition

OBJECTIVE B:
To maintain high quality customer service while delivering high volumes of new connections

OBJECTIVE C:
To not be a blocker to EV take-up

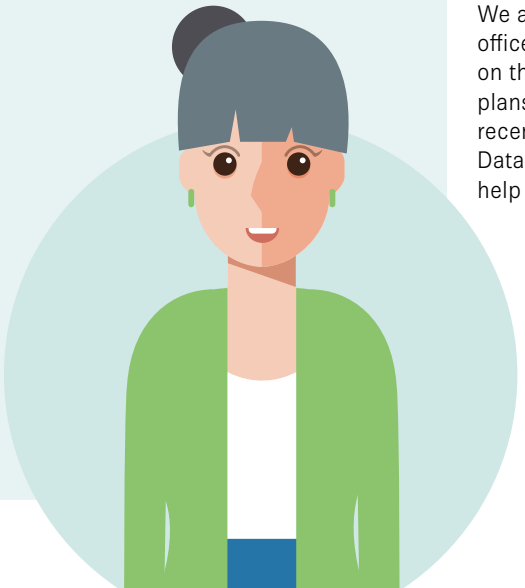
How we're collaborating to help our customers

Local and regional planning

Sally

Stakeholder - Council Officer

Sally is our council officer. She is responsible for the Local Area Energy Plan (LAEP) for her area, but she doesn't know where to start. She is starting to feel pressure from government and constituents to do more on electrifying transport, and she doesn't want to leave anyone behind. Her constituents are starting to ask for public charging now too.



Currently, some local authorities lack the expertise and experience to identify, assess or consider the energy and technology impact of their development plans. An effective LAEP requires the integration of various data sources and balancing various dependencies and constraints to achieve Net Zero goals.

Local authorities also face difficulties in assessing the impact that the energy plans have on social equality and the capacity to engage effectively with other local, regional, and national energy system stakeholders. We are working in partnership with local authorities to overcome these barriers to decarbonisation.

We are already engaging with council officers like Sally every day to help them on their path to Net Zero, and we have big plans to scale this up in RIIO-ED2. We've recently launched a LAEP page on our Open Data Portal, with many useful data sets to help plan public charging infrastructure.

We are building a team that will assist local authorities with their climate plans each year of RIIO-ED2, offering a three-tiered support service utilising a framework to assess, develop action plans and deliver investments where a prescribed level of certainty is achieved.

This team and the local authorities they serve will require tools and data to perform this activity and collaborate effectively.

Through the Collaborative Local Energy Optimisation (CLEO) project, we are developing a tool to assist these activities. This will enable local authorities to make the best choices for their communities in developing their LAEP.

We've spent a lot of time engaging with local authorities to make sure we know what they want and need from us to help them achieve their LAEPs. The solution will be flexible, easy to use, open, collaborative and data-driven.

Innovative collaboration with local authorities

We have recently completed two innovation projects that worked closely with local authorities to facilitate the rollout of public on-street EV charging. Charge Collective aimed to encourage investment in public EV chargepoints in areas that were otherwise at risk of being left behind.

We worked closely with councils in Cambridge and Norwich to identify socially beneficial chargepoint locations and strategically upgrade the network to support these chargepoints, at lower cost to chargepoint operators. Over 20 chargepoints are now live in Cambridge and over 40 will be installed in Norwich this year as a result.

In Enable, we looked in detail at provision of public charging for disabled drivers without access to off-street parking. Working in collaboration with Motability, we estimated that there will be around 400,000 Blue Badge holders dependent on public charging in our licence areas by 2030. We have published information and data on location of Blue Badge bays available to local authorities to help them ensure these are included in charging infrastructure plans.

We also sat on the steering group for the development of British Standards Institute's PAS 1899[11], a voluntary standard for accessible public charging sponsored by OZEV and Motability. We will continue to advocate for accessible public charging when working with local authorities.

[11] https://www.bsigroup.com/en-GB/standards/pas-1899/ https://accessibleevcharging.designability.org.uk/

How we're collaborating to help our customers

New connections

Nina

Stakeholder - Housing Developer

Nina is the grid connection lead for a nationwide housing developer. She has multiple developments in the pipeline with large power demands and is under pressure to deliver as quickly and as cheaply as possible.

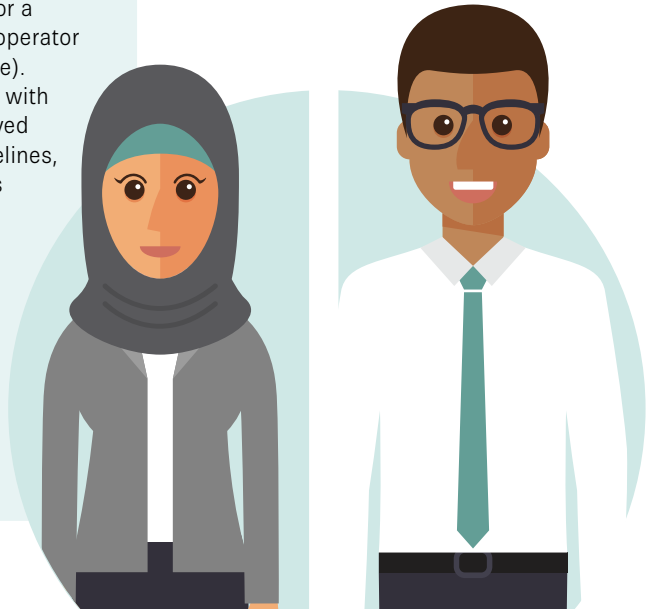
Michael

Stakeholder - Chargepoint Operator

Michael is the project manager for a rapid charging hub chargepoint operator (chargepoints of 50kW and above). He has multiple sites to connect, with growing loads. He's getting delayed by issues with consents and timelines, and has found some connections very expensive.

Together, Nina and Michael represent a large portion of our stakeholders in the connections space, and these stakeholders are providing vital charging infrastructure for our communities. They have told us that they can struggle with long lead times and expensive connection quotes, as well as issues around planning and consents delaying some installations.

We are working hard to continue to improve the ease and speed with which these customers gain connection offers and budget estimates, and we're committed to delivering a minimum of 9/10 customer satisfaction on this work.



We are also innovating in what we can offer customers to align with their own EV strategies: for example, offering "tipping point" connection quotes which provide quotes with and without upgrade work to help with optioneering and beginning to offer scaling connections for those who are ramping up their charging provision over time.

For our innovation project Voyage, we worked with Gridserve to demonstrate a new substation design that fits in the size of a car parking space, to help with the roll out of charging hubs where there is limited space.

Alongside our Green Recovery scheme and working with the government on the Rapid Charging Fund[12], we are strategically investing in and reinforcing the network as and when needed, at lowest cost, to ensure the timely connection of charging hubs in major locations. This will ensure a maximum of 30 miles between charging sites. These locations will be key to addressing customer concerns around range and charging anxiety.

Communication is key to effective collaboration. That's why we're launching our LCT forum, so that we can hear directly from connecting customers on what's working and what else they want to see from us.

This is in addition to the forums we already hold such as our Connections Customer Forum, Distributed Energy Resource (DER) Forum, and the Competition in Connections Forum. We also offer Ask the Expert surgeries to customers who need help or advice while applying for a new or altered electricity connection and we continuously work with other industry participants to reform the process of managing the queue to connect to the grid[13].

For issues with planning and consents, we know these can cause significant delays to projects. We have developed a new, faster approach for leases for motorway service areas, based on our learnings in the largescale solar generation market. This has shortened the asset lease arrangement process from over three months to five days.

We know we still need to do more work in this area, for example looking at practical options for a compact low voltage substation. We want to work with stakeholders to find solutions to these issues, and welcome ideas to take forward.

[12] Rapid Charging Fund
[13] CMP376: Inclusion of Queue Management process within the CUSC

How we're collaborating to help our customers

Supply and installation

Olivia

Stakeholder - Energy Supplier

Olivia works for a retail energy supplier, who organises chargepoint installations. She's been having issues with long waits for fuse upgrades, which can be frustrating for customers. She also acts as an aggregator, with a customer flexibility proposition.

Kyron

Customer - LCT Installer

Kyron is an electrician, installing EV chargepoints and other LCTs for customers at their homes and on business premises. Installations are becoming increasingly complex as his customers are installing more and more LCTs. He wants an easy process for applying to connect.

Olivia and Kyron work on different parts of the supplier and installation journey for customers, so we're making sure to work with them to understand each stage, ensuring our customers are well looked after from beginning to end.

For Olivia, through innovation project Emerge we have developed an engineering standard so that qualified third party meter operators can perform fuse upgrades independently. This means she can send out one engineer to make a customer's property suitable for a chargepoint, improving and expediating the customer experience and removing us from the critical path.

For Kyron, we have developed an installer guide on How you can connect electric vehicle chargepoints and we are working with the Electrical Contractors' Association (ECA) on their public information campaign, Leading the Charge[14]. This raises awareness on the advent of EVs and LCTs, shares best practice and safety guidance for installers and facilitates the exchanging of ideas to accelerate progress.

Together, this means that installations can be performed knowledgeably, to the latest standards and safely.

We are working closely with aggregators like Olivia to develop flexibility markets and introduce new products that deliver value to our network and customers.

Through innovation project Shift we worked with Octopus, Kaluza and ev.energy to trial market-led flexibility solutions (see Project Shift Final Report). The success of these trials led to the implementation of our low voltage flexibility procurement (i.e. buying flexibility from EV drivers' smart charging through their aggregators and suppliers).

We are now extending this work, through Shift 2.0, to see what the impact of secondary peaks caused by EV charging could look like, and how direct price signals could complement our flexibility procurement further.

[14] Leading the Charge

How we're collaborating to help our customers

Fleet electrification

Vineeta

Stakeholder - Fleet Manager

Vineeta is the fleet manager for a large firm of electricians. She is feeling pressure to electrify and needs to consider both home and workplace charging.

Craig

Stakeholder - Emergency Services

Craig is the project manager for fire service electrification. He is also feeling pressure to electrify his fleet but is worried about charging in response situations.

We know that fleets are going to be some of the largest drivers of EVs over the next few years, with many companies setting ambitious electrification targets ahead of the 2030 phase out.

Through our flagship innovation project Optimise Prime, we've conducted the largest fleet EV trial in the world, which has given us a wealth of information on fleet requirements and charging patterns that will help us to serve fleet customers effectively.

As part of this, we've launched our Site Planning Tool available for any customer planning to install multiple chargepoints at a site.

Acting on feedback received from our customers and stakeholders, we have supplemented this with a simple Site Electrification Planner to help customers assess their needs at high level before using the full tool. For those at the very beginning of their journey, we have a Fleet Electrification Guide, for any fleet who doesn't know where to start with going electric. This is based on our real life experience of helping the Royal Mail and British Gas fleets go electric.

For emergency services in particular, we are launching a new innovation project, Blue Light, to consider their specific electrification needs.

Through a combination of modelling and engagement, we will look to understand fleet charging requirements and assess the network impact. We'll also look into the prospect of fleet charging hubs, accessible for all emergency services.

Key findings from Optimise Prime

Optimise Prime undertook trials to investigate smart charging and profiled connections for fleets. We also did behavioural surveys to understand fleet drivers sentiments towards EVs. Some key findings include:

- Using smart charging to manage load in line with a profiled connection was shown to save some depots up to £95,000 on the cost of connection and up to 12 weeks in the time to connect
- Profiled connections can be successfully implemented, but EV load must be the dominant load in the depot for its control to reliably ensure compliance.
- On average, 84% of all drivers surveyed at least somewhat supported the expansion of EVs in their organisation, and once drivers had tried an EV they felt more positive about the technology.

More findings can be found at the world's largest EV dataset available here.

Peer learning with Addison Lee

After learning from their press release that Addison Lee had ambitions to electrify their fleet, our account management team proactively reached out to them to discuss their charging needs. We explained who we are, why a planned approach to charging is critical and suggested using the same data mapping and modelling techniques used by Uber during our Optimise Prime trials to identify optimal charging locations and help Addison Lee drivers to go electric.

Key Area 3: How we're directly helping customers

We have engaged with and listened to our customers on what they really want and need to make the switch to EVs. This section summarises the actions we have and will take to make that switch as easy as possible, informed by ongoing engagement at every step.

OBJECTIVE A:

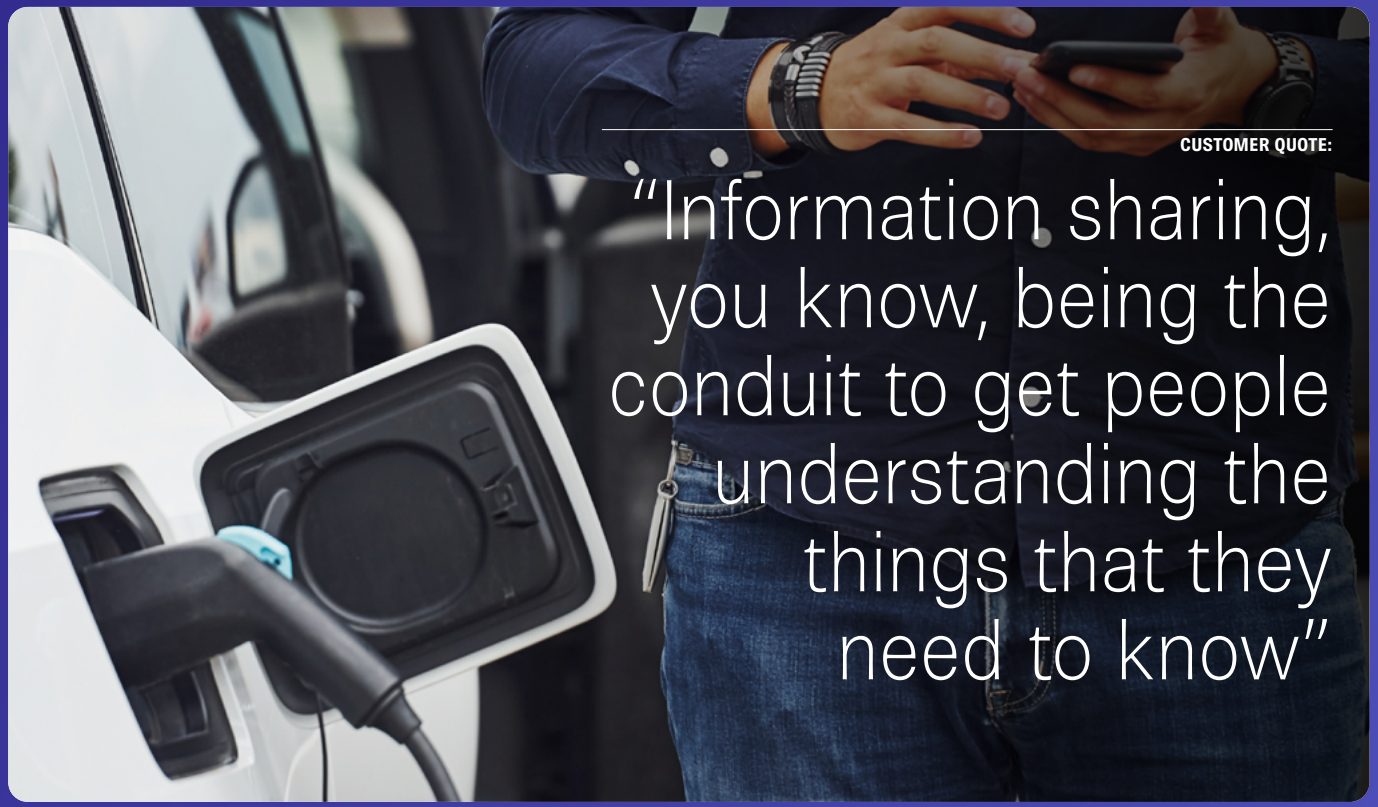
To be a source of trusted, impartial information to help customers make informed decisions on their EV journey

OBJECTIVE B:

To be at the forefront of digital innovation that makes our customers lives easier and speeds up the EV transition

OBJECTIVE C:

To maintain a safe, reliable network through this period of change and adoption, including enhanced services for vulnerable customers



How we're directly helping customers

Our customers' journey

When looking at what our customers' EV journeys look like, we have split this into three stages:

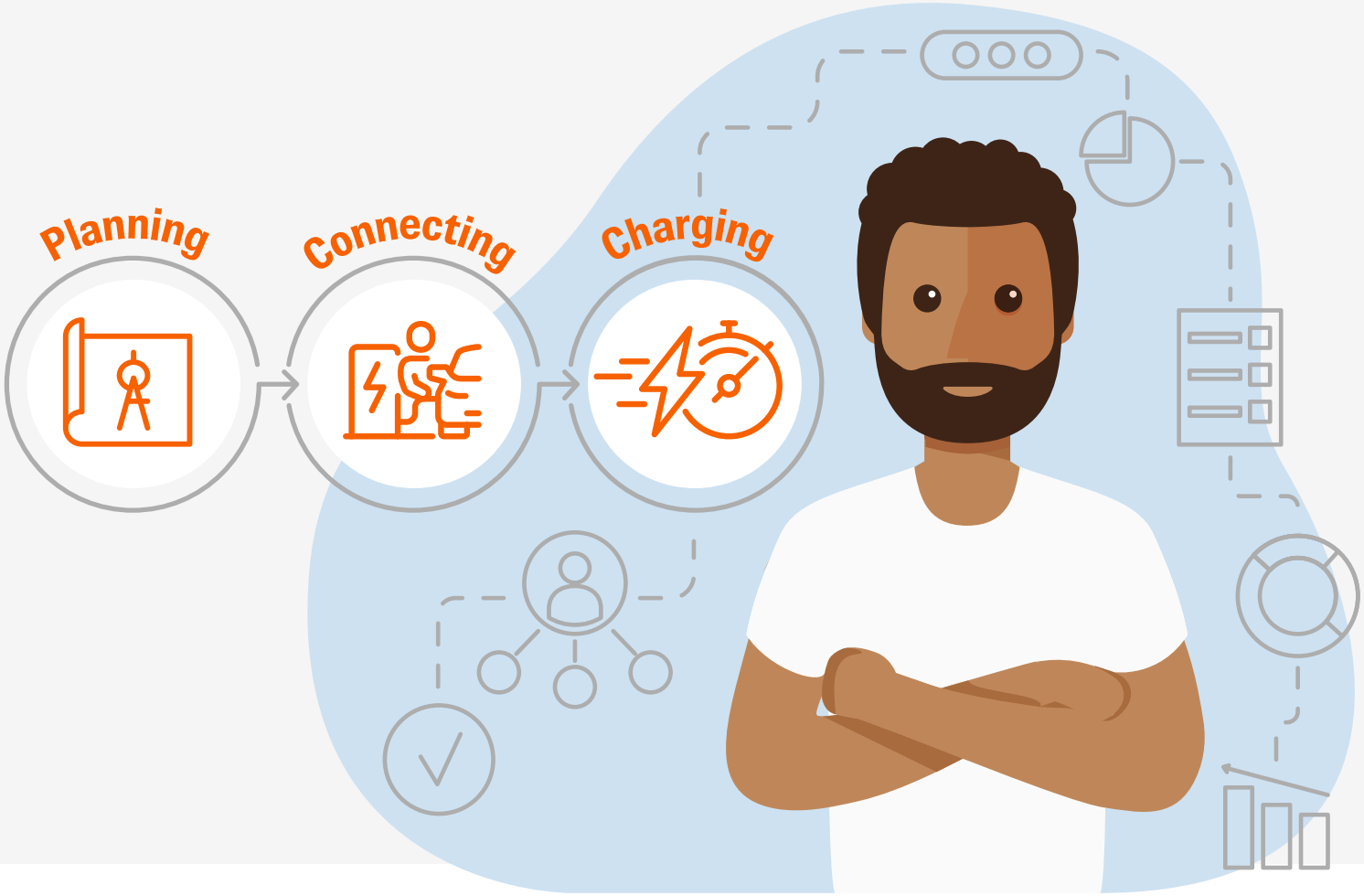
Planning:
Making the decision on whether or not to switch to an EV, how to charge it, and what needs to be in place before making the switch.

Connecting:
Connecting charging points and related infrastructure to our network to make the switch to an EV a reality.

Charging:
Day-to-day life with an EV: charging, smart charging and reliability of the grid.

While each stage will look a bit different for everyone, we think this aligns most closely with how and when we interact with our customers, and it has helped structure and prioritise our strategy.

In this section are some leading initiatives we're undertaking against each stage. While each has wider applicability than the electrification of transport, EV drivers will benefit from them all.



How we're directly helping customers

Net Zero Advice Line

Whenever we speak to our customers, they repeatedly tell us that they see us as a trusted source of impartial information about EVs and other LCTs. They ask us to provide advice on things like:

- Grants and other financial support that is available
- Who the key parties involved in the EV journey are and what their role is
- What our role is and the services we provide at each stage in the EV journey
- Where else to go for further information and advice

We already provide a lot of information on our website from What type of Electric Vehicle Charging Point are you installing? to Power cut help & advice to our Accessible Transport Information Hub, but we know we can do more.

That's why we are establishing a Net Zero Advice Line, as an easy and accessible way for customers to get this information from us. The service will be advertised through normal online channels, but we will seek alternative and novel ways to ensure that our customers are aware it exists and how to access it.

We will work with our customers and our stakeholders to achieve this.

How we're directly helping customers

LCT Readiness

Providing a connection to the electricity network is one of our core services and service efficiency is increasingly important as we transition to a low carbon economy. Both our customers and our stakeholders tell us they want to connect more quickly and easily.

By 2028, the number of connections requests is expected to grow by 40%. Our goal is not to be a blocker to Net Zero while maintaining great customer service and doing this efficiently and consistently. We will drive service improvements through digitalisation, process change, and measurement of our performance using surveys and data.

In August 2021 we launched Smart Connect which is targeted primarily at our domestic customers and installers, particularly those that operate within our At Home Off Street charging segment. We launched Smart Enquiries in January 2022, which accepts a proportion of customer enquiries without the need for human intervention.

We are not stopping here. We continue to improve our Smart Connect service and we are developing new digital products and services that will support other charging segments.

Smart Gateway is a single portal we are developing for all connections enquiries. This will reduce application processing time by directing applications to the correct teams from the enquiry stage.

Customers will reduce their administrative overheads by retrieving information from previously submitted applications and will be able to track progress of their connection applications.

In addition, we are also building on solutions developed by other network operators to provide online self-service connection offers. The innovative High Voltage Auto Quote project will allow any customers seeking to connect any high voltage asset between 300 kVA and 1 MVA to assess and optimise their asset size and locations and generate a connection offer that they can then accept.

> "We want to connect more quickly and easily."

We also aim to provide budget estimates for connections between 1 MVA and 2.5 MVA.

These products and services will be fully integrated to ensure that there is a seamless and consistent customer experience.

How we're directly helping customers

LCT Readiness

Smart Connect

Smart Connect is an online connections portal we have developed to provide installers and customers with a more efficient way to connect their device to our electricity network.

It is a free service that can currently be used when connecting one or multiple new low carbon technologies at an existing single dwelling/premises (domestic or non-domestic) with an existing electricity connection of up to 100amps per phase.

The portal offers a range of benefits, primarily providing an automated assessment to reduce processing times and issue instant approval when criteria are met.

It gives a simple dashboard with a view of all connection requests and their status and allows installers and customers to add images and supporting documents to their request.

Within six months of going live we made savings of £300,000 purely from reduced manual assessment and validation of LCT connection applications.

Smart Connect is a great example of successful innovation. It stemmed from our Transpower project that supported five Innovate UK funded Vehicle to Grid (V2G) projects.

We concluded that our processes for V2G connections applications were time-consuming and complex.

Smart Connect was born. In a short time, we expanded it to cover multiple technology types and since we launched it in August 2021 we have continued to improve the product and our processes that underpin it.

It now processes over 9,000 domestic LCT connection requests every month, a 300% increase in volumes in less than one year. In 2022, 85% of applications were processes autonomously by Smart Connect, with 80% automatically approved.

How we're directly helping customers

Reliability and Support

Our customers expect the power to be there when they need it. On top of that, under new laws proposed by the Government, public chargepoints will need to meet a minimum 99% availability standard as an average[15].

We are committed to maintaining the reliability of the distribution network to support this level of availability for charging infrastructure. We are proud to have maintained a 96% customer satisfaction rating for LCT customers to date and have a target to maintain this to at least 94% through 2023, alongside very high levels of network reliability targets as set by our regulator, Ofgem.

For when a rare power cut does occur, we have our Priorities Services Register (PSR), to make sure our customers with vulnerabilities are well looked after. Those who are signed up receive extra support and additional care in the case of a power cut, such as a priority number to call 24 hours a day, home visits and hot meals.

We are working with other utilities in our area such as Cadent Gas, Thames Water and South East Water to make sure that everyone who is eligible is signed up and gets the support they need[16].

With ev.energy, we are also developing a notification system called Powercast, an open-source API that will provide unplanned and planned power cut information as well as alternative places for customers to charge their EVs, such as the nearest public chargepoint that has power. Third party providers and suppliers will then be able to incorporate this into their software solutions, so that customers can see this information through their usual apps and platforms.

"We want a reliable electricity supply so that our car is charged when we need it"

[15] The consumer experience at public chargepoints - GOV.UK (www.gov.uk)
[16] Your utility lifelines - YouTube

Our customers' journeys

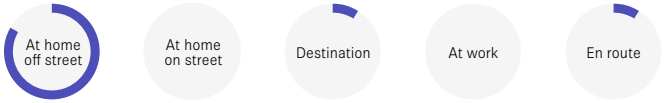
We have looked at our customers' EV journeys to ensure this strategy is achievable, actionable and ambitious. We have reflected our customers' journeys through the lens of our different personas. At each of stage of the planning, connecting, and charging journey we have considered their motivations and their needs and demonstrated how we are helping or how we plan to help.

Despite all these exciting plans, we know there is still more work to be done and so we have highlighted some of the barriers our customers have told us need more focus. We want to hear from others in this space if you have ideas in these or other areas, so that we can work together to address these barriers.

Our customers' journeys

Diana – Early Adopter

Expected charging locations:



Bio

Diana works in finance. She lives in rural Kent and commutes to work. She has solar and leases an EV, she wants a second hand EV for her son. Diana isn't on the gas network so has an oil boiler. She is an early adopter of LCTs and wants a heat pump and battery storage system. She uses an electric bike to and from the station when commuting.

Motivation

Diana is knowledgeable about climate change and LCTs. She wants to reduce her emissions, but also try out new technologies and reduce her bills. She also gets a tax break by leasing her EV through work.

Where she is and where she wants to be

Diana has some solar panels, has insulated her home, and is now ready to invest to fully electrify with a second EV charger, heat pump and domestic battery system. She's talking to electricians but hitting roadblocks.

She wants all her installations completed quickly and easily, and through one company. She would like to be able to take advantage of smart tariffs to save more. She doesn't want to be stuck in an admin loop, chasing lots of people and filling in endless forms.

Diana calls **Kyron** (LCT Installer) about getting a second chargepoint installed and explains her LCT aspirations.

Diana then calls **Olivia** (Energy Supplier) and gets different advice.

Diana is left wondering who to trust.

What Diana needs

Diana wants to fully electrify her home, but her rural location could make this difficult. She needs to know what her limitations are, if and how she can cost effectively overcome them and what the process is to make her home ready for full electrification.

What we are doing to help

We want to work closely with suppliers and installers to help provide the most up-to-date information for new connections and flexibility options.

Diana can speak to someone like Georgia in our customer services team and soon will be able to speak to our Net Zero Advice Line to see what her options are.

Our helpers will provide advice on any electricity supply upgrade needed and signpost her to the right people to progress her installation journey.

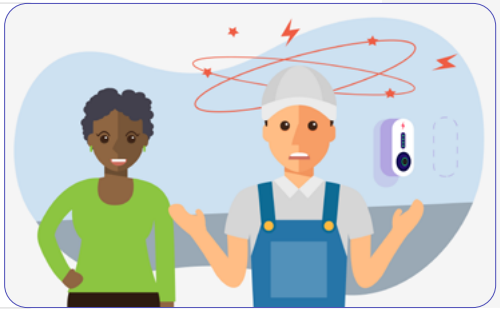
Our customers' journeys

Diana – Early Adopter

Kyron (LCT) Installer) arrives at **Diana's** home to install a second charge point.

Kyron inspects the solar panels and the cut out. The solar installation is not documented and the installer has gone out of business.

Kyron explains that the installation is too complicated for him.



Connecting

What Diana needs

Diana's installation is complicated and challenging to current installers and systems: it's confusing to get them all connected and talking to each other. She wants a quick, seamless journey where we all get it right first time.

What we are doing to help

We are working with installers to upskill them to be able to carry out more complicated installations without having to call us out. Through Smart Connect, Diana's energy supplier Olivia can submit Diana's application to connect LCTs for approval digitally.

If Diana's property is not auto-approved due to her trickier location and older property, we are forming a flexible workforce that can perform any necessary supply upgrades within days. Through innovation project Emerge we have developed training materials, accreditation and an engineering standard which means that qualified third party meter operators can perform fuse upgrades quickly and independently and will reduce the number of home visits required.

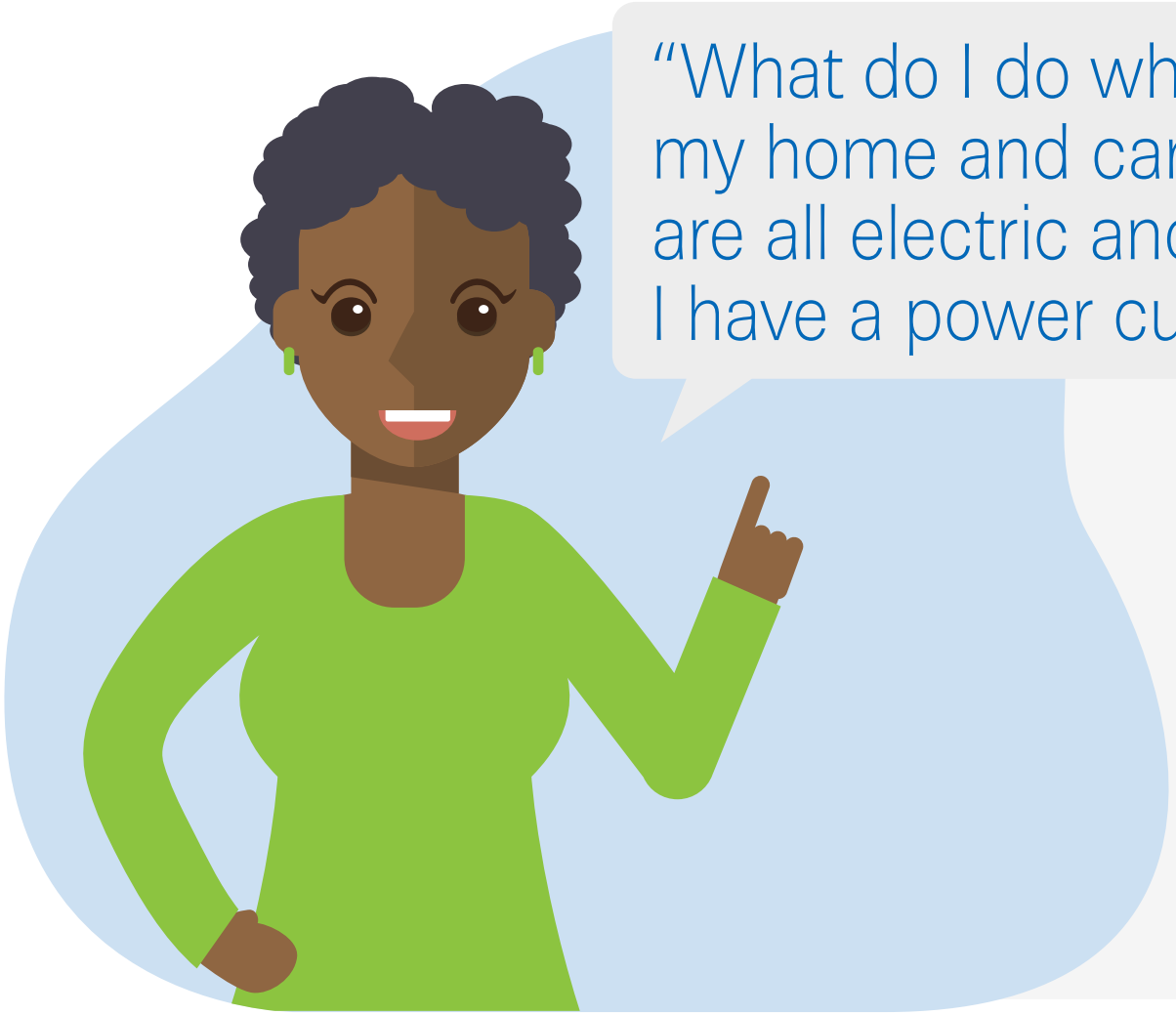
Our goal is to enable suppliers like Olivia to send out one engineer to make Diana's property suitable for her chargepoint and sort out her whole installation in one visit.

Working with Octopus Electric Vehicles, we have developed, tested and approved a power limiting device and produced an associated engineering recommendation[17]. This device allows V2G technology to work alongside domestic solar or batteries, allowing more renewable energy to be connected to the grid. It sits between the charger, energy asset and smart meter, and is designed to ensure the network capacity is maximised.

[17] ENA EREC G100 (energynetworks.org)

Our customers' journeys

Diana – Early Adopter



Charging

What Diana needs

Once connected, Diana needs fast and reliable restoration and support in the case of a power cut, due to her rural location.

What we are doing to help

Our most important job is to provide Diana with a reliable power supply. We are proud to have maintained a 96% customer satisfaction rating for LCT customers to date and have a target to maintain this to at least 94% through 2023 and beyond.

If her energy supplier or aggregator offers it, Diana will be able to access unplanned and planned power cut information as well as find an alternative location to charge her EV through their apps. This feature will be facilitated by our notification system called Powercast that provides this data and information via a publicly available programming interface.

Our customers' journeys

Diana – Early Adopter

Diana calls **Olivia** (Energy Supplier) to ask about different tariffs and any other incentives.

Olivia describes the different tariffs and incentives available to her now and in the future depending on her LCT plans.

"How can we better understand and serve the needs of micro mobility providers and customers?"

Ophelia
Innovation Engineer

Charging

What Diana needs

She'd also like access to smart charging opportunities to reduce her costs.

What we are doing to help

Diana has been offered an EV tariff by her energy supplier, Olivia. This tariff makes it cheaper for her to charge her car overnight when demand is lower.

We are working with suppliers and aggregators like Olivia to increase the opportunities for customers to benefit from flexibility like this – for example, through LV flexibility procurement and paying for power she could supply from her domestic battery.

As we continue to establish our DSO and expand our flexibility offerings these opportunities should become more localised and targeted.

What Diana needs

Diana also likes to use smaller electric vehicles like e-bikes and scooters to get from the train station to the office and back again when she commutes into London for work.

What we are doing to help

Micromobility is an exciting and evolving sector, and an important part of a move towards active travel. While the power demand for charging these vehicles is expected to be low, the volume of connections for charging hubs or similar could be high. We are going to undertake some research through a new project to look into this in more detail and engage with others in this area, to make sure we are prepared for all types of electric vehicles.

Remaining barriers

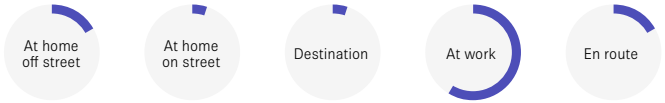
Diana still has a number of barriers that we are still working out how to address:

- **Delays caused by slow and/or costly network upgrades, if these are needed due to her remote location**
- **How we can help Diana avoid the need for such network upgrades through smart home solutions that we can trust**
- **As an early adopter she may be negatively impacted due to rapid technology advancements and ongoing lessons learnt, leaving her with out of date technology**
- **Targeted flexibility products and services for her due to her rural location**

Our customers' journeys

Jay – Small Business Owner

Expected charging locations:



Bio

Jay runs a scaffolding business across London and lives in the suburbs. He has a small fleet of trucks and vans that are based in a yard, and he is fed up with paying Ultra Low Emission Zone charges and dealing with admin. Jay is vaguely aware that sales of new petrol and diesel cars, vans and heavy goods vehicles will be phased out in the future.

Motivation

Jay thinks an EV could be right for his personal car, as he could charge at home. He also wants to know if transitioning his fleet to EVs could cut on-going costs for his business and avoid ULEZ charges.

Where he is and where he wants to be

He is at the beginning of his EV journey, figuring out the costs and benefits. He wants to know how he would charge his fleet and how much it would cost him.

He wants to know how to install chargepoints at home and at his yard, how much that would cost, how to use public ones, and if smart charging could reduce costs. He plans to buy a plug-in hybrid and install a home charger for his personal car that his parents could also use, although they aren't convinced by EVs.

What Jay needs

Jay needs to know whether investing in transitioning his fleet is worth it for his business yet. He needs to know if he should electrify his yard or if he could rely on public charging.

What we are doing to help

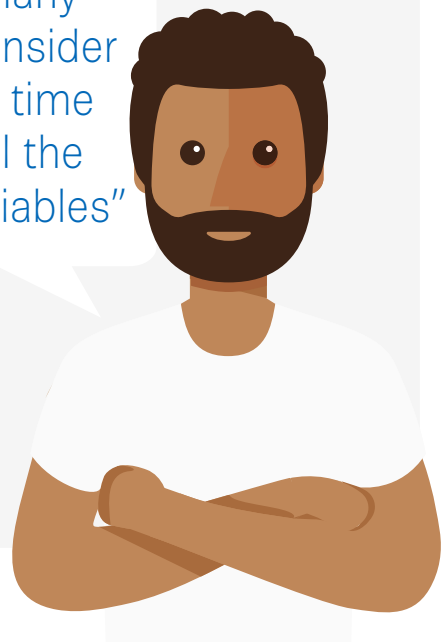
From our White Van Plan project and wider engagement, we know Jay struggles to find time to assess whether it's worthwhile for him to transition his fleet. He needs to know what his options are for his electrifying his yard and when best to do so.

We provide a number of tools and services that can help him with this. Our Business EV Hub has lots of information to help small businesses like Jay learn more about EVs. Our simple Site Electrification Planner can help Jay to assess his needs at a high level.

If he wants more detail, our Site Planning Tool, which was developed through our fleet electrification project Optimise Prime, is an online tool that can appropriately size the electrical connection he would need based on the requirements of his fleet. This can provide him with a number of scenarios, so he can see whether smart charging would help reduce his connection and charging costs.

At the same time, our Open Data Portal among other sites can provide him with a view on where public charging infrastructure already exists that he could use.

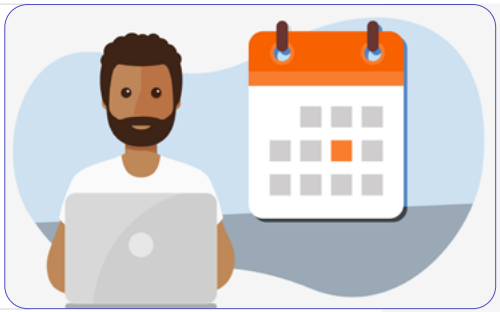
"I have so many things to consider and so little time to assess all the different variables"



Our customers' journeys

Jay – Small Business Owner

Jay requests an 'Ask the Expert' appointment to talk through his his questions and concerns about switching to EVs



Tony (Connections Manager) walks **Jay** through the Site Planning Tool and confirms when petrol and diesel sales will be phased out.

Tony also explains the different flexible connections options and will provide **Jay** a time and cost to upgrade the supply to his yard.

Connecting

What Jay needs

Jay needs to know how much it's going to cost him to electrify his yard and how long it will take. He also needs to know if his house can support a home charger.

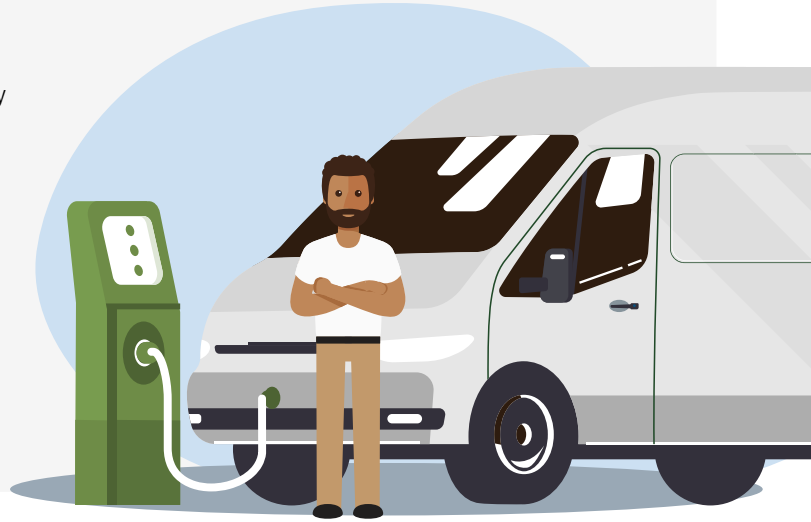
What we are doing to help

Once Jay has an idea of his high level needs from the Site Electrification Planner, he can call upon pre-application support provided by our 'Ask the Expert' team who can walk him through the Site Planning Tool, explore connections options and provide indicative costs before a full quote is provided.

We already offer timed connections that control or limit electricity demand 2-3 times per day when network utilisation is high. They can be a cost-effective and quick way for EV fleets to connect to our electricity network when their electricity demand varies throughout the day.

We continue to innovate our flexible connection offerings. We have been developing and trialling profiled connections that are like timed connections but rather than 2-3 periods per day, they manage electricity demand over 48 half hour periods.

We are working to improve the ease and speed with which customers receive connection offers. In the future, Jay will be able to use our online Auto Quote service to generate his own connection quotation in minutes. For Jay's home and those of his employees that take their vans home and park off street, his installer can use Smart Connect to easily submit connection applications in bulk. We will also look at ways for his installer to assess the suitability of their home supply without having to visit each one.



Our customers' journeys

Jay – Small Business Owner

Charging

What Jay needs

Jay needs to know that charging will be reliable, otherwise his business could suffer. The majority of his business is in London and so his vehicles travel short distances in urban areas but carry heavy loads. He is at a loss as to his specific vehicle or charging requirements.

What we are doing to help

We are committed to maintaining the reliability of the distribution network to support the minimum 99% availability standard for public chargepoints that are being proposed under new laws[18]. We have very high levels of network reliability targets set by our regulator, Ofgem, and we strive to exceed these.

We acknowledge that we need to do more to support the HGV transition, particularly for short haul distances in metropolitan areas. We are engaging with the likes of Volvo and Daimler who are leading on the Megawatt Charging Standard (MCS).

By doing so, we are seeking to understand customers' operational constraints and the different types of charging that are best suited for different operations such as Jay's.

We have joined the Zemo Partnership[19] and attend their Energy Infrastructure Working Group. We are committed to working with other network operators to ensure any infrastructure solutions are aligned both locally and nationally.

Remaining barriers

For Jay, we have identified four key remaining barriers to his EV journey:

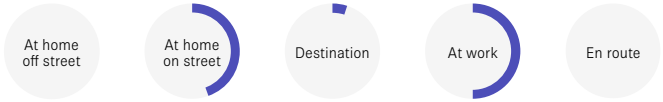
- The cost and risk to him of transitioning his fleet, and how he can know when to have the confidence to commit to the change
- He's unclear of what grants and funding are available to help him transition his fleet and what are the optimal locations of where to charge his fleet in terms of cost
- The administrative burden of managing the expenses relating to his fleet charging at multiple locations such as his yard, his employees' homes and at their destination
- For his personal vehicle, his parents are sceptical about EVs and don't want him to switch. How can he win them round?

[18] The consumer experience at public chargepoints - GOV.UK (www.gov.uk)
[19] Zemo Partnership

Our customers' journeys

Natasha – Struggling Mum

Expected charging locations when she buys an EV:



Bio

Natasha is a single parent to two children. One is medically dependent on electricity (they use equipment that needs electricity to operate). Natasha works part time, and she struggles to pay her bills and pay for basics. She rents her home and drives an old second hand car.

Motivation

Natasha can barely afford to run her car at the moment, but she needs it and needs to replace it. She would love an EV because of the air quality benefits and free charging at work, but she thinks it's out of reach for her. If she gets rid of her car, she will be reliant on public transport which is relatively frequent where she lives but expensive.

Where she is and where she wants to be

She lives in a block of flats, and parks on street or in her building's car park. Her family is very reliant on her car, so if she gets rid of it, getting public transport will be a pain (they have lots of things to lug around).

She's conscious of the poor air quality near where she lives from the traffic and wants her council to invest in electric buses. At some point, she wants to get an EV but she thinks its too expensive right now and is waiting for a better second hand market and better public charging options near her home.

She wants to know if either her landlord or council will provide public charging, and how much it would cost to use. It's not a priority for her right now, but she is interested because of free workplace charging.

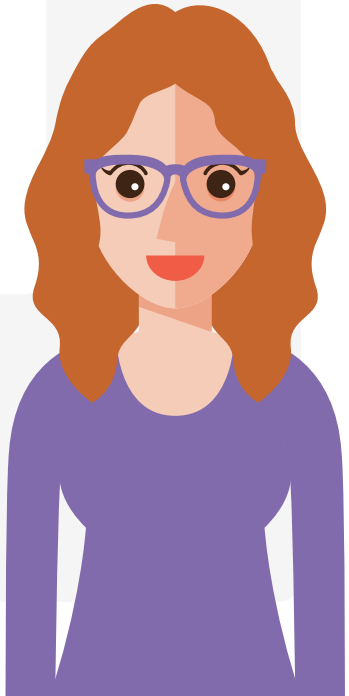
What Natasha needs

Natasha likes the idea of an EV, but she doesn't have the time or the money to think about everything involved in the switch right now. She's not yet at the planning stage, but easy-to-access information will help her to get there when the time is right.

What we are doing to help

Soon, Natasha will be able to speak to our Net Zero Advice Line to get relevant advice and information from us. Natasha will be able to use this line when she's ready, and in the meantime, we will continue to update the advice and guidance we have on our website around switching to an EV, and make sure that information is tailored to a range of audiences, including domestic customers.

"My children's school is next to a main road and I'm worried for their health. Especially for my son who has respiratory troubles."



Our customers' journeys

Natasha – Struggling Mum

Sally (Council Officer) calls **Linda** (Net Zero Associate) to ask about what support we can offer to help her with public charging and electrifying public transport in Natasha's area.

Linda assesses what LAEP stage **Sally** has reached and describes the services we offer including the LAEP page on the Open Data Portal and CLEO plans.

Planning

What Natasha needs

Natasha lives in a densely populated urban area, and poor air quality is affecting her children's health, so she would like to know what her local council is doing about that.

What we are doing to help

Sally is the council officer at Natasha's local authority who has been tasked with looking at EVs. Sally is in the early stages, and so she is still developing the roadmap for deploying public charging infrastructure and electrified transport in her area, but she knows that tackling air pollution is a big benefit of doing so.

We will support Sally through our newly established Local Authority Net Zero team to help plan this roll out, supported by data, analysis, and expertise. Through our project CLEO we are developing a self-service digital tool that enables local authorities to make the best choices for their communities when developing their local area energy plans and will allow Sally to build a public charging investment plan to meet her electrification and decarbonisation targets.

Our Charge Collective project demonstrated how we can work together with local authorities to plan local, public charging networks in areas at risk of getting left behind in the transition to Net Zero and ensure that on street charging provision is distributed fairly and evenly.

At the same time, Sally is exploring zero emission buses in Natasha's area, aided by government funding and our Local Authority Net Zero team's advice on how best to connect for their charging needs.

London's Green Bus Revolution

We have been working with Transport for London (TfL) to electrify London's iconic red bus fleet, helping the transition to a low carbon future.

Jointly we have developed a cost-effective model to deliver the project in line with TfLs expectations, ensuring a controlled transition over a number of years. There are now 805 zero-emissions buses in the capital, with a commitment to deliver 100% zero-emission bus fleet by 2034.

As transport makes up 20% of all London's emissions, the work we are doing is helping to ensure that London is a zero carbon city by 2050.

Our customers' journeys

Natasha – Struggling Mum

Connecting

What Natasha needs

Natasha isn't connecting right now. But in the future, she would want easy to use, safe and accessible charging near her home or work.

What we are doing to help

Nina works for the housing developer who built the block Natasha lives in. She's working on a new development elsewhere in the neighbourhood and is aware that she has to meet certain targets for EV charging.

To make sure that the charging that goes in is futureproofed and accessible to all, she is working with our Connections team to get the right connection for the site.

She's looking into ramping up the capacity supplied to the site as demand increases with more EVs, a new service we are beginning to offer to connecting customers.

Charging

What Natasha needs

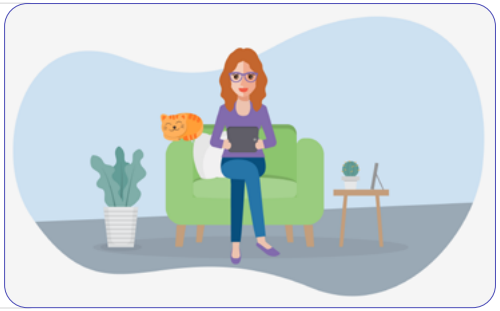
While not currently charging, Natasha needs extra support from us if there's a power cut, to make sure that her family is safe and her child's equipment can still run – regardless of if she has an EV or not.

What we are doing to help

Natasha is signed up to our Priorities Services Register (PSR). This means she'll receive extra support and additional care in the case of a power cut, such as a priority number to call 24 hours a day, home visits and hot meals. We can also put Natasha in touch with an expert who can offer advice on her energy bills and energy saving tips.

We are committed to providing extra help to all our customers in vulnerable situations, whether or not they have an EV. For example, we have committed to offering increased support for our medically dependent PSR customers by dispatching battery banks if they are at risk of being without power for more than four hours, so that they still have electricity to meet their medical needs while power is restored.

Natasha signs up to the PSR through her water company because she has a child dependent on medical equipment that needs electricity to run.



Natasha experiences a power cut and calls us on 105.

As she's on our PSR from effective data sharing, we're able to offer her extra support and make sure her child's equipment stays functional.

Our customers' journeys

Natasha – Struggling Mum

Charging

What Natasha needs

When she does buy an EV, Natasha would like to find cheaper ways to charge it, but she has not heard of smart charging.

What we are doing to help

We're keen to make sure there is equality of access to flexibility services like smart charging for those who park on as well as off street, and so we want to facilitate public smart charging.

Our on street smart charging report produced by our Charge Collective innovation project found that there were both network and customer benefits to on-street smart charging.

"If I do buy an EV how can I find cheaper ways to charge it?"

We also participated in SmartSTEP, a government-funded trial for public smart charging, which demonstrated its technical feasibility. We are keen to do more work in this area to find ways to make smart charging mainstream for at home on-street charging, which is sometimes referred to as tertiary public charging.

Remaining barriers

Natasha's remaining barriers are:

- The cost of EVs. This is her main barrier; they are still far out of reach for her. A developing second hand market here will help, but more needs to be done to make EVs affordable This may be driven forward faster as fleets transition to EVs.
- The running costs of an EV should be lower than those of her current vehicle, but she may feel less certain about this with the current energy crisis
- The lack of control regarding at-home charging: she does not know when her block of flats will get chargepoints, how many there will be or how much it will cost.
- While she could currently make use of free charging at work, she doesn't know how long this will stay free, or how long she will stay in her current job.

Our customers' journeys

Kyron and Kylie

Common bio and motivations

Kyron and Kylie live in an urban area in London with their two children. They live in a terraced house, without access to off-street parking, on a street that's often hard to park on. Nevertheless, they are both motivated to reduce their emissions and are interested in making the transition to an EV. Their kids have learnt about them in school and are keen for the latest technology.

Bio

Kyron parks his work van on the street. He is an electrician serving the South East of England. His kids want an electric car. His wife, Kylie, is worried about long journeys. Kyron's work is hinting they will electrify.

Additional motivations

Kyron is also driven by his work electrifying their fleet.

Where he is and where he wants to be

Kyron is relatively well informed as an installer of EV chargers, but feels less informed as a customer who parks on street. He's seen the developments in EVs over the past few years and can see the appeal. He knows that we have an automatic system for domestic chargepoint installations (Smart Connect), but hasn't used it yet. His local area only has a couple of public chargepoints. He wants accessible, cheap chargepoints near his home and when he is travelling long distances on jobs. His kids have learnt about EVs at school and are encouraging him to make the switch.

Bio

Kylie is disabled, and drives a Motability vehicle with adaptations for her needs. She parks this on a Blue Badge bay outside her house.

Additional motivations

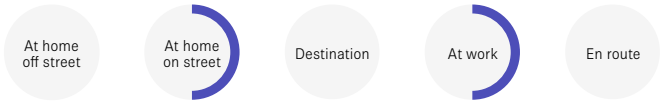
Kylie gets her vehicle through the Motability scheme. This means she gets a new car every three years, so she will be switching to an EV sooner rather than later.

Where she is and where she wants to be

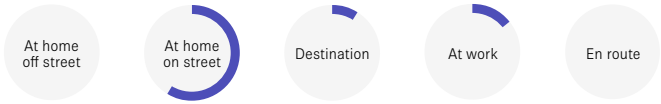
Kylie knows that she will be due a new Motability vehicle soon and that there are EVs available, but she doesn't know if there are any that suit her accessibility needs yet, or how she would charge one.

Her local area only has a couple of public chargepoints. She doesn't drive that often, but she likes the idea of going electric. She wants accessible, cheap chargepoints near her home. She has a Blue Badge bay near her home, but she doesn't know if it will get a chargepoint.

Kyron's expected charging locations:



Kylie's expected charging locations:



Our customers' journeys

Kyron and Kylie

Vineeta (Fleet Manager) calls **Kyron** (LCT Installer) to inform him of the company's fleet electrification plans and that he will get an electric work van when they do.

Kyron tells **Vineeta** the he's worried about where he will charge his van because he parks on the street.

Vineeta collects information on how many of her drivers take their vans home and park on street so she can use this in her planning with us and the local authority.

Planning

What Kyron needs

Kyron feels a lack of control in the process – work will decide when they electrify his van, and the council will decide when they install public chargepoints. Parking is already difficult in his area. He wants to feel prepared for the change and know what's coming.

What we are doing to help

Vineeta is the fleet manager for Kyron's company. We are helping her plan the electrification of her fleet, using the learnings form our Optimise Prime project. She's read our Fleet Electrification Guide and now she's using our Site Planning Tool to see what her needs are.

Kyron can also look at our Business EV Hub, to find out more information about what it will look like when his work van electrifies and help to feed into Vineeta's plans, so that they work for him.

Our customers' journeys

Kyron and Kylie

Kylie calls **Sally** (Council Officer) to tell her she is getting an EV and would like a chargepoint on her nearest Blue Badge bay.

Kylie also tells **Sally** that her husband, **Kyron**, is getting an electric work van and wants to understand their plans to improve public charging.

Sally explains that there is nothing to share right now, but she is working with us and others to produce a plan.

What Kylie needs

Kylie also feels a little lost. She needs to know when and where accessible public charging will be available.

What we are doing to help

Like Natasha, Kyron and Kylie will benefit from the support we offer to local authorities through our newly established Local Authority Net Zero team. One of the requirements for our digital tool, being developed through project CLEO, that was gathered through our engagement with local authorities is the ability to share their plans and the underpinning data with their constituents to allow comment and ensure buy-in for their plans. Providing accessible public charging for Kylie will be an important part of this energy planning process.

To make sure that public charging is accessible to all and give local authorities the tools to plan for accessible public charging, we were recently part of the steering group for developing British Standard Institute's accessibility standard for public charging infrastructure, PAS 1899[20] and the associated design guidance[21].

We will continue to promote this standard for essential specifications on how to provide accessible public chargepoints for EVs. An output from our Enable project that was run with Motability the charity is granular data on estimated Blue Badge driver numbers and Blue Badge bays for all local authorities to use in their planning.

This has been published on the Local Area Energy Plan page on our Open Data Portal. Coupled with the BSI PAS 1899 accessibility standard, this should help to give local authorities tools to plan for accessible public charging.

[20] PAS-1899 | BSI (bsigroup.com)
[21] Designability | Design Guidance | Accessible EV charging

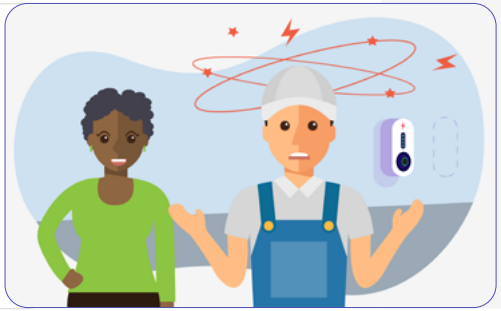
Our customers' journeys

Kyron and Kylie

Kyron arrives at **Diana's** home (Early Adopter) to install a second charge point.

Kyron inspects the solar panels and the cut out. The solar installation is not documented and the installer has gone out of business.

Kyron explains that the installation is too complicated for him.



Connecting

What Kyron needs

Kyron's installations are getting increasingly complex and he's not sure who to ask to know the best way to do things.

What we are doing to help

We are working with the Electrical Contractors' Association (ECA) on their public information campaign, Leading the Charge[22].

This raises awareness on the advent of EVs and LCTs, shares best practice and safety guidance for installers and facilitates the exchanging of ideas to accelerate progress. Kyron can use this resource to find the most up to date advice and talk to other installers who have encountered similar issues to him.

Kyron can also use our Smart Connect portal to keep track of and speed up his more straightforward installations, allowing him to get more customers connected faster.

[22] Leading the Charge

Our customers' journeys
Kyron and Kylie

Charging

What Kyron and Kylie need
Once they've gone electric, Kyron and Kylie need good, reliable access to accessible public charging near their home.

What we are doing to help
Our Local Authority Net Zero team will work with Sally to help ensure well planned, reliable and easy to use public charging is delivered for Kyron and Kylie to use.

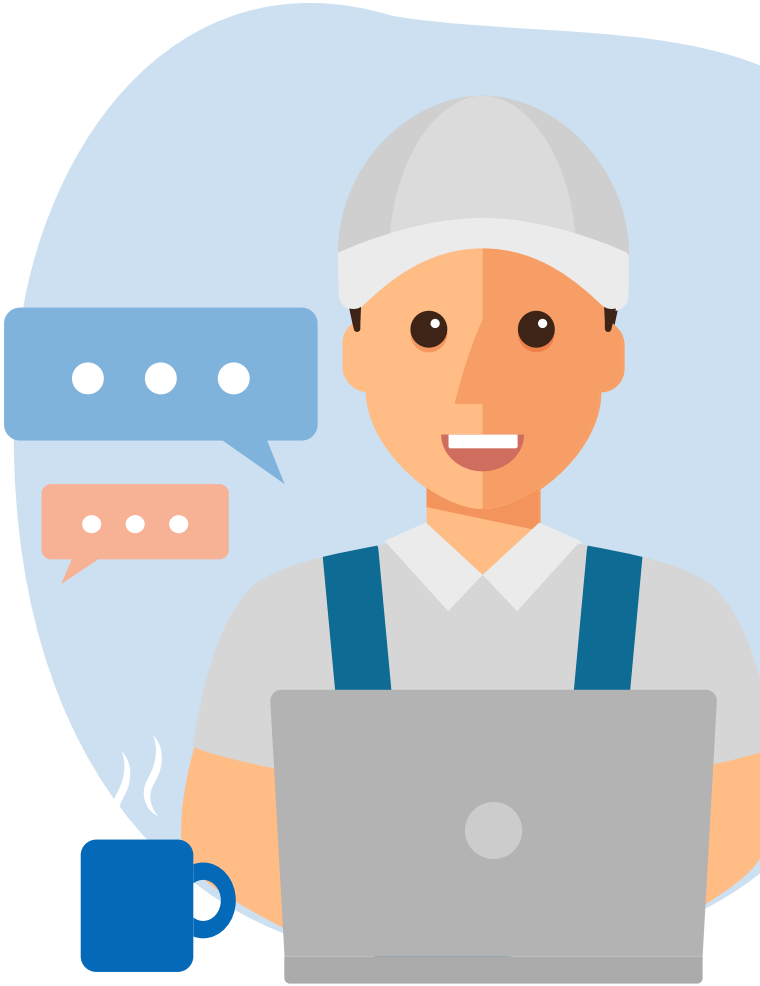
What Kyron needs
Kyron can drive long distances over long days and needs access to rapid and reliable charging en-route when he's out and about with work.

What we are doing to help
Through our Green Recovery Fund and the Government's Rapid Charging Fund[23], we are working with chargepoint operators such as Michael to deliver the network upgrades necessary for largescale rollout of rapid charging across the strategic road network. This means that Kyron will be able to find rapid charging facilities on his long journeys in convenient locations. To support this work, we are looking at innovative compact substation designs that can be deployed rapidly and with minimum disruption to motorway and other trunk road service station operations.

These include solutions designed, deployed and tested by our Voyage project as well as those developed by other network operators such as the larger capacity substation developed by National Grid Electricity Distribution under their Take Charge project[24].

Remaining barriers
For Kyron, he is likely still to struggle with trickier installs, such as those that aren't auto-approved by Smart Connect, and we need to work with industry to help him through these. For their personal EV journey, Kyron and Kylie's main remaining barriers are:

- Parking stress on their street: Kyron sometimes finds it difficult to find a space close to his home, and so he assumes demand for any public charging near him will be very high
- The timing of installation of public charging close to them: will this happen soon enough for them, especially if Kyron's work electrifies very soon?
- The accessibility of on-street and public chargers for Kylie to use
- Higher cost of on-street charging relative to off-street charging and lower availability of cost-saving measures such as smart charging and V2G technology.



[23] Rapid Charging Fund
[24] National Grid - Take Charge

Our customers' journeys

Other customers

While our personas cover a broad spectrum of our customers, they cannot cover every aspect of the EV transition.

There are further areas that we know we need to look at in more detail in the coming years. These include:

- Ports and waterways and the electrification of water transport
- Other types of vehicles that are at earlier stages in their electrification journey, such as aviation, HGVs and coaches
- Organisations with large and complex estates that are looking at transport electrification alongside wider decarbonisation
- Buildings with multiple occupants electrifying at different times

Conclusion

EVs are a fundamental shift in the way we move around.

Our customers are adjusting to a new reality, where charging needs to be planned and considered. Part of that shift is also a change in the way people interact with us as a DNO, and our role in society. While previously the electricity network was stable and mostly invisible infrastructure, we are now growing rapidly and at the forefront of technological and digital innovation. This role is important, to facilitate and accelerate the transition to Net Zero and to make sure that all of our customers are involved in that journey.

We have set out in this EV strategy how we hope to fulfil this role. There are actions we need to do to transform how we run our business, work we need to do in collaboration with other stakeholders in this area and initiatives we need to deliver to directly help our customers electrify their transport. A lot of this work has already begun, and the EV revolution is well underway. But to reach the numbers of EVs that we predict, and that are needed to reach Net Zero, there is more work to be done.

We hope that by using our customer personas in this strategy we have brought to life how our actions will improve our customers' EV journey, whoever they are. It s going to be a team effort to get there, and we hope our plans will resonate with our stakeholders too.

Our EV strategy is live and evolving, as the world around us changes and develops. We want to hear from you if you would like to get involved in any of these plans, or if you think we could be doing more. Working together, we can deliver the infrastructure and services needed to facilitate an affordable, just, and innovative transition to EVs.