



London electric vehicle infrastructure delivery plan

Executive summary
June 2019

Supported by

The Mayor's
Electric Vehicle
Infrastructure
Taskforce



Mayor's foreword

London's air is so dirty and polluted it amounts to nothing less than a serious public health crisis. It breaches legal limits and blights the lives of Londoners, resulting in thousands of premature deaths every year and causing a range of lethal and debilitating illnesses, including cancer, heart disease and dementia. As an adult I developed asthma, which doctors tell me is likely to be linked to air pollution.

But what makes me most angry is the impact London's filthy air is having on the health of our children. To our shame, in some parts of our city there are children growing-up with stunted lungs and chronic respiratory conditions because of exposure to poor air quality. This is simply unacceptable.

The task of finding solutions to this scourge is urgent. So, at City Hall,

we're taking action – not only in response to our dangerous air, but also to address the climate emergency that threatens the long-term security and wellbeing of every Londoner.

The action we've already taken includes: cleaning up our bus and taxi fleets, promoting walking, investing record sums in cycling, and encouraging more Londoners to use public transport by freezing fares and introducing more affordable bus tickets. We're working to a target of 80 per cent of trips to be walking, cycling or public transport by 2041.

We've also rolled out the world's first ever Ultra Low Emission Zone, which is the toughest emission standard in operation anywhere on earth. However, if we aspire to truly transform the quality of our air – and preside over a steep and meaningful reduction in our carbon emissions –

we must move away from petrol and diesel cars, and towards electric and hydrogen vehicles. Bringing about this sea change won't be easy, but with the right political will and ambition I'm confident we can pull it off.

I'm proud that London is one of the first major cities in the world to publish a detailed and independently-assessed climate action plan that outlines how we will comply with the Paris Agreement. A big part of this plan is aiming for all new cars and vans on our roads to be zero emission from 2030.

This is a radical, but necessary step. Car ownership continues to decline in London, but we must do more now to help unleash an electric vehicle revolution across our city. Through our Electric Vehicle Infrastructure Taskforce, the public and private sector have worked side-by-side to expand London's public charge points and to make sure they are well used, in the right locations and future-proofed for tomorrow's technology.

The past year has seen more than 1,000 new charge points installed at petrol stations, town centres and retrofitted into street lighting columns. Our world-famous cabbies now drive more than 1,700 electric taxis and Transport for London runs Europe's largest electric bus fleet. We've also created a new multi-million-pound fund to support small businesses, charities and low-income Londoners switch to cleaner vehicles including electric.

There's no shying away from the fact that expanding our public charge points will be challenging. London's land is always in high demand, our streets are often narrow and we have to work with 35 different planning authorities. But we know there is a real appetite to cut harmful emissions and propel London towards a greener future. Thanks to our taskforce's hard work, we have tapped into the energy, enthusiasm and expertise of more than 140 organisations to plan for the cutting-edge infrastructure London needs. It is a world-leading piece of work that will ensure that London can continue to lead from the front, blazing a trail for others to follow.

With so much at stake, we simply can't afford to slip into reverse gear. In fact, now is the time to really put our foot down and accelerate our city's transition to zero emission vehicles. This plan will enable us to do just that. This is crucial because ultimately our efforts will mean cleaner air, a greener city and healthier lives for all Londoners, not to mention a better and more sustainable future for our planet and generations to come.

Sadiq Khan
Mayor of London

EV infrastructure for London

We believe we can be confident there is a clear way to provide the right type and amount of charging infrastructure to serve London's needs.

Background

The Mayor's Transport and Environment Strategies set out a clear commitment to zero emission road transport, and to a zero carbon city by 2050. This is a priority given the significant impact London's toxic air has on health and social justice for Londoners. The Mayor has declared a climate emergency and his ambition is for every new car or van registered in London to be zero emission from 2030, meeting the ambition of the Committee on Climate Change and sooner than the national goal of 2040 as set out in the Government's Road to Zero.¹ To achieve this will require a significant shift in mindset, vehicles and infrastructure, supported by legislation.

London has a growing electric bus fleet, zero emission-capable taxis and other electric vehicles (EVs) such as private hire and vans already in use on London's roads, in greater numbers than any other UK city.

Numbers of EVs are increasing, with one in every 47 new cars registered in the UK now plug-in, and one in every 36 for London. However, barriers to more widespread uptake remain. Consumer awareness and perception, range, availability of vehicles and cost of vehicles are all factors, but the availability of charging infrastructure – real or perceived – is considered to be the most immediate barrier to tackle at the city level. The Committee on Climate Change has recently reported that the expansion of EV charging networks and grid capacity is key to facilitating growth of EVs.²

Private home (or workplace) charging is expected to be preferred for many car owners across the UK, as well as having some particular advantages as set out in Road to Zero. This is also the case in London, but there will also be an important role for public charging infrastructure, both because of car-owning homes without off-street parking, a rising gig economy, and

high-mileage vehicles such as taxis and private hire that will require charging throughout the course of a day. Owing to the rapidly changing technology of the vehicles and charging infrastructure, the behaviour of drivers is still evolving, making it challenging to plan for future infrastructure needs.

The London context

London is recognised as one of 25 EV capitals that together are home to around half of all EVs worldwide.³ Sales of EVs, both pure battery electric (BEV) and plug-in hybrid (PHEV), in London are growing year on year. In 2018, EVs accounted for 2.81 per cent of sales in London – higher than the UK average of 2.13 per cent.⁴

EVs in London are supported by a range of charging infrastructure, ranging from rapid DC chargers, to slow to fast AC chargers.⁵ The current mix of charging infrastructure helps to accommodate today's technology and to facilitate different uses. Rapid chargers are costly per unit but offer the fastest charge time, whereas slow

to fast AC chargers cost considerably less to purchase and install, but take much longer to charge a vehicle. In both cases, on-street provision needs to be carefully balanced against concerns about meeting accessibility needs, and the density of street furniture and traffic on London's roads, in line with the Mayor's Transport Strategy.

There has been significant public investment in charge points in London from the origins of London's first public charging network, Source London in 2011 to the lamppost and freestanding charge points being installed today via the Go Ultra Low City Scheme.⁶ Transport for London (TfL) has also committed to installing 300 rapid chargers by the end of 2020. The private sector is investing as well, and the commercial case is set to improve further, with growing zero emission fleets of taxis, private hire and other key user groups. However, initiatives to remove barriers and improve the conditions for accelerating investment are critical to facilitate and speed up growth in this sector.

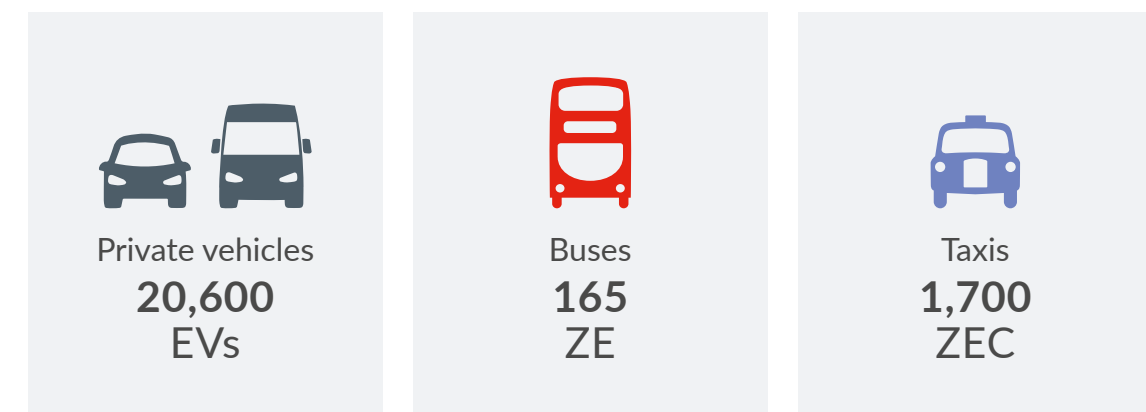


Figure 1
London's transition to zero emissions

1 The Road to Zero: Next steps towards cleaner road transport, HM Government, 2018 www.gov.uk/government/publications/reducing-emissions-from-road-transport-road-to-zero-strategy
2 www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf
3 www.theicct.org/publications/ev-capitals-of-the-world-2018

4 Plug-in EV = Battery electric (BEV) + Plug-in Hybrid (PHEV); vehicle segments include cars, motorcycles and LGVs, DfT Statistics, Datasets VEH0130, VEH0131, VEH0150, VEH0260, VEH0354, VEH0454
5 Rapid DC is defined here as DC50kW+ (CCS + CHAdeMO/Supercharger) or AC 43kW+. Slow to fast AC is defined here as a 3-22kW charger. See Glossary for further details
6 www.londoncouncils.gov.uk/our-key-themes/transport/roads/gulcs



Image 1
The Mayor addressing delegates at the launch of the EV Infrastructure Taskforce

The Mayor's EV Infrastructure Taskforce

In May 2018, the Mayor established a world-first EV Infrastructure Taskforce with experts from both the public and private sector who collectively have the knowledge to help unlock barriers to expanding charging infrastructure and accelerating the switch to EVs in the Capital. The taskforce consists of representatives from business, energy, infrastructure, Government and London boroughs and, over the past year, they have been supported by contributions from more than 350 stakeholders from in excess of 140 different organisations.

The taskforce has been informing and steering the development of a delivery plan, to identify and deliver the level and type of charging infrastructure that London will need to accelerate the switch to EVs up to 2025. The focus is on the medium rather than the long term, as taskforce members agree that, due to rapid change in this industry, to make firm plans now for the longer term is not advisable. The decisions we take now, and the level and type of provision installed in the medium term, will help to shape the way the switch to EVs grows across London, and therefore influence the long-term

requirements, progressing towards the Mayor's Transport Strategy goal of a zero emission transport network by 2050.

Since May 2018, we have held a series of taskforce workshops to inform the delivery plan, discussing user needs, land and energy issues, and financial models. We held further, more targeted, stakeholder meetings and round-table discussions to solidify our understanding of specific user needs and what stakeholder groups wanted the taskforce to deliver. These included:

- Individual meetings with groups of taxi stakeholders, private hire stakeholders, car manufacturers and EV infrastructure investors
- Round-table discussions with charge point manufacturers and operators, car and van sharing representatives, and a business leaders' round-table meeting organised by taskforce member, London First

The delivery plan

This report recognises that infrastructure is currently a barrier, be it real or perceived, to the switch to EVs, although it should be noted that there are other barriers that will have a large influence. Notably, EV supply in the UK is currently a constraint, and unless this issue is resolved, this will continue to be a limiting factor. It may mean that our low EV growth scenario, or even lower, is a real possibility.

The modelling for this plan gives us confidence the current delivery schedule in London by the private and public sector, consisting of over 300 rapid charge points and over 3,500 slow to fast chargers by the end of 2020, will be sufficient to deal with the expected uptake of electric vehicles. By 2020, using prudent EV uptake assumptions, we could need around 200 to 400 rapid charge points and 3,400 to 4,700 slow to fast charge points. By 2025, with EV uptake in line with the MTS and London's 1.5 degree plan, this could rise to between 2,300 to 4,100 rapid charge points and 33,700 to 47,500 slow to fast charge points. The expectation of the taskforce is that the numbers of points suggested in the report would be delivered primarily by the private sector but further support from the Government may be needed.

As it is likely there will be a mix of both types of chargers the numbers of chargers are likely to be somewhere in between these ranges. It is important to note that the wide range in the numbers of charge points is largely driven by commitments from the private hire sector to transform their fleets to be zero emission and other factors such as the cost and supply of vehicles improving. The total number of rapid charge points required would reduce further should charging speed capability of new vehicles increase to accommodate ultra-rapid charging (100-150kW+).

These estimates have been derived from a modelling exercise, which took into account uncertainties including the rate of the switch to EVs, charging behaviour and charger utilisation. Because of the uncertainties of these variables, and so to avoid the risk of 'predict and provide', the taskforce did not recommend a prescriptive, target-based approach to 2025. Instead, the focus is on addressing the barriers to scaling up existing infrastructure in a way that takes account of the need to ensure London's streets are 'Healthy Streets'⁷ and do not contribute to congestion.

A common concern is that EVs will put too much strain on the power supply and will cause the system to fail. However, evidence provided by the National Grid and local distribution networks suggests that this can be effectively overcome through better coordinated and 'smarter' use of our power networks.

⁷ The Healthy Streets Approach is the system of policies and strategies to help Londoners use cars less, and walk, cycle and use public transport more (see content.tfl.gov.uk/healthy-streets-for-london.pdf)



Image 2
Shirley Rodrigues, Deputy Mayor for Environment and Energy, addressing delegates at the launch of the EV Infrastructure Taskforce

Table 1: Six central challenges to delivering more EV infrastructure:

Category	Challenge
Land and energy	1. Ability to secure suitable charge point locations given competing demands and London's limited land availability
	2. Long lead times and complexity of installation
	3. Cost of energy grid upgrades
Operational/users	4. Lack of confidence in the availability of convenient charge points (ie, perception that all are already in use or broken down, or not in convenient locations)
	5. Unfamiliarity with the experience of charging – perception that it is confusing, complicated and inconvenient
Investment uncertainty	6. Uncertainty about what type of charger is needed, concerns about obsolescence – reluctance to invest until there is more confidence in the charging model

We have identified six central challenges to delivering more EV infrastructure (see Table 1).

This delivery plan for EV infrastructure in London seeks to address these challenges. We must provide clarity for the medium term (to 2025), and inspire confidence that infrastructure will no longer be cited as a barrier to transition to EVs for those vehicles that need to use London's roads. This plan sets out the framework, clarifying where we should focus our efforts. It includes actions to facilitate installation, tackling the known challenges around land and energy issues, and finally it sets out the scale and

type of likely infrastructure needed against a charter of commitments to roll out EV infrastructure and support for the industry.

A key aim of the taskforce is to consider what market conditions are needed to embolden a commercial market and maximise the value of public funding. London has already been subsidising EV infrastructure and the role of the public sector is now beginning to move towards providing strategic direction and facilitation. This is not about distorting business models, but rather unblocking a number of strategic barriers that have been identified.

The overall insights, findings and recommendations of the taskforce are:

- We are frontier planning, with many unknowns and rapidly changing technology. Our findings must be understood within this context. EV driver behaviour is evolving and we must be cautious to avoid stranded assets (out of date technology). This is the first time a city has undertaken such a comprehensive exercise to understand likely future EV infrastructure needs and it is hoped that others will also benefit from the work of the taskforce
 - Public charge points should be open to all, with a few exceptions, notably for taxis in central London and other specific, priority groups that need extra support due to mandatory requirements and operational needs. This increases public confidence in charging infrastructure and also boosts utilisation, and therefore financial viability
 - Different types of chargers currently suit different user needs, and a mix of rapid and slower chargers will continue to be needed to 2025. However, different approaches are suggested for rapid chargers and slower chargers:

For rapid chargers

 - The proposed focus is on the development of rapid charging hubs,⁸ which we see as serving primarily high-mileage/business users who need fast and available charging. Multiple charge points in known locations serve to increase consumer confidence that they will find a reliable and available charger
- To improve the spread of these across London, the next phase of delivery should focus on at least five flagship rapid hubs, one in each sub region of London, with the first by 2020, subject to funding and EV growth. These would be in off-street locations, easily accessible and with high throughput
 - To improve overall coverage of rapid chargers, additional rapid chargers should be prioritised to serve London's town centres.⁹ This could be in the form of hubs or single rapid chargers, to primarily serve commercial needs. As suitable sites along TfL's roads are increasingly difficult to find, we expect future sites to be on borough roads (or off-road)
 - The private sector should adopt these approaches going forward, and TfL will also be doing so for the remainder of the 300 rapid chargers it will install in London by the end of 2020

For slow to fast AC chargers

 - The focus is on a) uplifting volume, b) reducing the streetscape impact of chargers, and c) exploring new models around deployment off-street (eg, car parks in or around residential areas)
 - The future favoured deployment model is strategic and demand-led, (not desire-led) in order to improve commercial viability and enable the private sector to take over delivery

8 Defined as 'a minimum of six rapid chargers enabling simultaneous charging of six+ vehicles' – further definitions of types of rapid hubs can be found in Chapter 4

9 Town centres as defined in the London Plan (approx. 200)



Image 3
Q&A session at
the launch of the
EV Infrastructure
Taskforce

What can we do to make this happen?

The situation is complex, there are numerous stakeholders involved and the Mayor of London has limited powers and cannot impose infrastructure deployment. However, there are a number of ways we can help facilitate charge point installation and unblock the barriers

identified above. The following set of ‘enablers’ has been developed and are summarised in Table 2. More detail on how they will be taken forward is set out in Chapter 5.

These activities will facilitate EV infrastructure by tackling current

Table 2: Enablers to facilitate charge point delivery

Category	Enabler	Date
Facilitate smoother installation and match supply with demand	1. Deliver London's first rapid charging hub and support the roll-out of additional rapid charging hubs – in collaboration with the private sector	From 2020
	2. Support shared business charging infrastructure	Ongoing
	3. New pan-London Co-ordination Body to facilitate and oversee charge point installation	Initiate in 2019
Reduce energy barriers	4. New online tool/ ‘heat mapping’ to identify energy grid constraints and where new charging capacity will be cheaper and easier	June 2019
	5. Explore alternative and smart power supply options, such as battery storage, mobile charging and private wire networks	Ongoing
Share knowledge and maximise potential of legislation	6. Publish guidance on charge point installation for both public and private sector	2019/20
	7. Publish guidance on future-proofing EV infrastructure to encourage investors	2019/20
	8. Promote better standardisation of charge points and vehicles, interoperability of systems and data sharing	Ongoing

challenges to provision. However, if we are to meet the scale of infrastructure we might need in London – in any of the modelled scenarios – we also need investment and commitment from the private sector.

As part of this delivery plan, we set out a number of commitments from both the public and private sector, gathered in a charter. This demonstrates the ambition and commitment to support the delivery plan. However, more must be done, and the final purpose of this work is to initiate a call to action, requesting more private sector organisations based or working in London to come forward with their own commitments to be part of the EV revolution in London, making it the leading EV city both in the UK and globally.

We believe that this delivery plan, with the identified enablers, research and the charter of commitments, should provide confidence to fleets, businesses and London residents that there is a clear way forward to delivering the right type and amount of charging infrastructure to serve London’s needs, accelerating the switch to zero emission transport.

Taskforce members:



With thanks to:

- | | |
|-------------------------|--------------------|
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| Chris Brown | Anneka Lawson |
| Christina Calderato | Jane Lindsay-Green |
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