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EV Infrastructure in the UK – plugging the gaps

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Executive Summary

We have begun a period of change in the way we power our motor vehicles, a period which will provide hugely significant opportunities for the UK to grow its economy, and improve our environment. Crucial to its success, is ensuring the UK builds on and maintains a world-class chargepoint infrastructure network that meets the needs of existing electric vehicle (EVs) drivers, and that infrastructure is not a barrier preventing uptake in the UK. The paper explores what steps have been taken in the UK and identifies current priorities and existing challenges to ensure infrastructure is not a barrier to uptake of EVs.

1 Introduction

During January to March 2017, the number of ultra-low emission vehicle registrations passed 100,000 with over 13,800 new ultra low emission vehicles (ULEVs) registered in the United Kingdom. This is an increase of 17% on the same period in 2016[1].

[1] https://www.gov.uk/government/statistics/vehicle-licensing-statistics-january-to-march-2017

The UK has been one of the most advanced countries in supporting the introduction of electric vehicles (EVs) and the necessary recharging infrastructure, with a clear policy ambition to ensure almost all cars and vans are zero emission by 2050. To meet this stretching policy goal, in 2015 the UK government committed to invest more than £600m with an additional £270m in 2016 to support the early EV market to 2020.

The body tasked with achieving that goal in the UK is the Office for Low Emission Vehicles (OLEV)[2], a cross-departmental policy unit composed of staffing and funding from two Government departments; Transport[3] and Business, Energy, and Industrial Strategy[4]. Ensuring an appropriate electric vehicle charging infrastructure is a key pillar of this holistic package of support that is needed to meet EV ambitions.

2 Background

The UK has been a front-runner in EV demonstration, and the roll-out of supporting infrastructure since 2010. Along with Local Authority and private sector investment, Government funding of more than £80m between 2010 and 2015 has contributed to the UK having over 12,000 publicly accessible chargepoints, including more than 1000 rapid chargepoints (43kW AC / 50kW DC) chargepoints[5]. Early "phase 1" support from 2010-2014 delivered £19m to public bodies in eight regional projects in the UK – the "Plugged in Places" (Fig 1.0) that trialed early technology development, back office systems and data analysis[6].

Evaluation of these programmes and lessons learned contributed to "Phase 2"; the UK's National Infrastructure Grant Schemes operational between 2014-16, which delivered 250 rapid chargers and over 580 chargepoints in public sector workplaces and train stations. Anonymised usage data on these schemes is due to be made openly available later in in 2017.

This growth in the network was also supported in 2013, through the part-EU funded Rapid Charger Network[7], which saw four major EV manufacturers (Nissan, BMW, Renault and VW) come together for the first time to develop the EV marketplace, by studying the creation of a network of 74 multi-standard, interoperable rapid chargers along the 1,100km of TEN-T defined priority road routes, across the UK and into Ireland[8].

Figure 1 The UK's original 8 'Plugged-in Places'

In addition over 85,000 domestic chargepoints have been delivered to homes across the country through the Government's residential charging schemes. This residential offer has been well received by the automotive industry and has been influential in removing upfront barriers to the purchase of pure battery electric vehicles and ensuring that plug in hybrids are used to their full economic and environmental potential.

3 State of Play: current policy priorities

Public charging provision is seen to have two overlapping but different roles – meeting the needs of existing EV owners and addressing concerns of potential future EV owners about buying an EV.

[2] https://www.gov.uk/government/organisations/office-for-low-emission-vehicles
[3] https://www.gov.uk/government/organisations/department-for-transport
[4] https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy
[5] https://www.zap-map.com/statistics/
[6] https://www.gov.uk/government/publications/lessons-learnt-from-the-plugged-in-places-projects
[7] http://rapidchargenetwork.com/
[8] J.Wardle et al., *Rapid Charge Network: breaking down the barriers to longer distance electric driving*, European Battery, Hybrid and Fuel Cell Electric Vehicle Congress, December 2015.

Our approach is not to mandate ‘a chargepoint on every corner’ – this is not necessary to help the market grow and would be uneconomic. Rather, for plug-in vehicles to appeal to, and be a viable solution for, consumers, we want recharging infrastructure to be targeted, convenient and safe. We want to see the majority of recharging taking place at home, at night, after the peak in electricity demand. Home recharging should be supported by workplace recharging for commuters and fleets, with a targeted amount of public infrastructure where it will be most used, allowing people to make the journeys they want and ensuring that infrastructure can address the range of concerns of potential future EV owners, to increase EV uptake. This is initially foreseen to be big cities and densely populated areas, partly driven by air quality concerns, as well as ensuring key strategic transport routes and visible locations such as Motorway Service Areas have sufficient infrastructure, to provide consumer confidence.

The commitment demonstrated by the UK Government and the fast developing market is increasingly resulting in private investment into the UK network and the design of ambitious projects that look forward to much higher level of vehicle uptake, including the integration of battery storage and renewable energy. A number of innovative small and medium sized businesses have entered the UK market in recognition of the significant commercial opportunities that this market presents, and traditional utility and energy companies have shown an increased recognition of their potential role in this area. In addition, partnerships in the ‘destination’ market are becoming ever more common, with supermarkets[9], hotel chains, and other retailers have been undertaking investment in this area to increase their offering to consumers.

To target uptake in urban agglomerations, the Government has identified 8 UK cities to become flagship ULEV regions in the UK, providing £22.9m for EV infrastructure to 8 Local Authorities through OLEV’s successful ‘Go Ultra Low Cities’ scheme: Bristol, London, Milton Keynes, Nottingham, York, Dundee, Oxford and North East Combined Authority. Each of these cities will receive investment for pioneering initiatives to complement existing schemes and further incentivise purchase of EVs, and increase use and enhance charging infrastructure, assisting them in becoming internationally outstanding examples for the promotion EVs. This includes the introduction of rapid charging hubs and trialling on-street charging solutions to support and explore business model development.

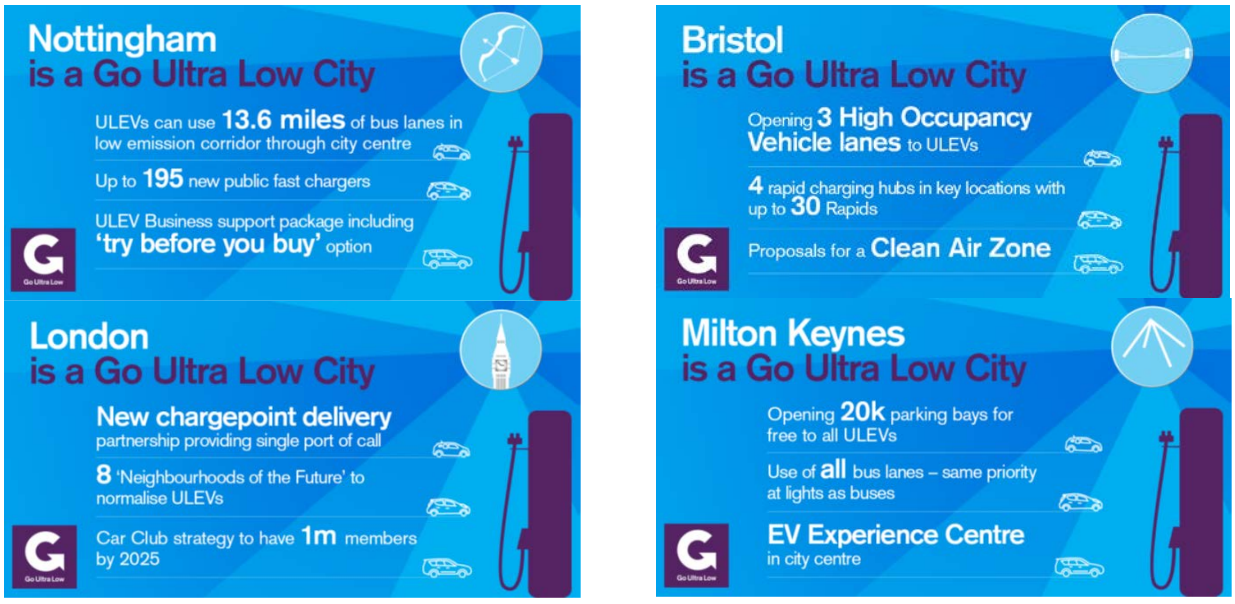

Figure 2 The UK’s four Go Ultra Low exemplar cities

In March 2017, OLEV also announced £14m of investment to deliver new dedicated chargepoints for electric taxis in 10 cities that bid for funding in its recent Taxi Infrastructure competition. These projects are expected to deliver around 400 rapid and 150 fast chargepoints which will enable the take-up of around 23,000 ULEV taxis nationally including supporting existing plug in private hire vehicles.

[9] https://www.zap-map.com/pod-point-and-lidl-offer-free-ev-rapid-charging-at-stores/

In addition, Highways England (HE) (responsible for maintaining and modernising England's highways) announced that no electric vehicle driver in the UK will be further than 20 miles from a chargepoint on the UK's strategic road network, earmarking £15m for this objective. Largely due to private sector funding, and EU Ten-T support through the Rapid Charger Network project, every UK Motorway Service Area already has at least one rapid charger.

The vast majority – more than 90% - of existing electric vehicle drivers are able and choose to charge their cars at home overnight when the demand on the grid is at its lowest. OLEV offers grants to those purchasing an eligible EV, of up to £500, to install a dedicated electric vehicle chargepoint through the Electric Vehicle Homecharge Scheme (EVHS), which has supported more than 85,000 chargepoints. Charging data from EVHS, plug in charging events is demonstrated at Figure 3.0 below, and shows current charging patterns peak at 18:30, overlapping with the existing evening peak period.

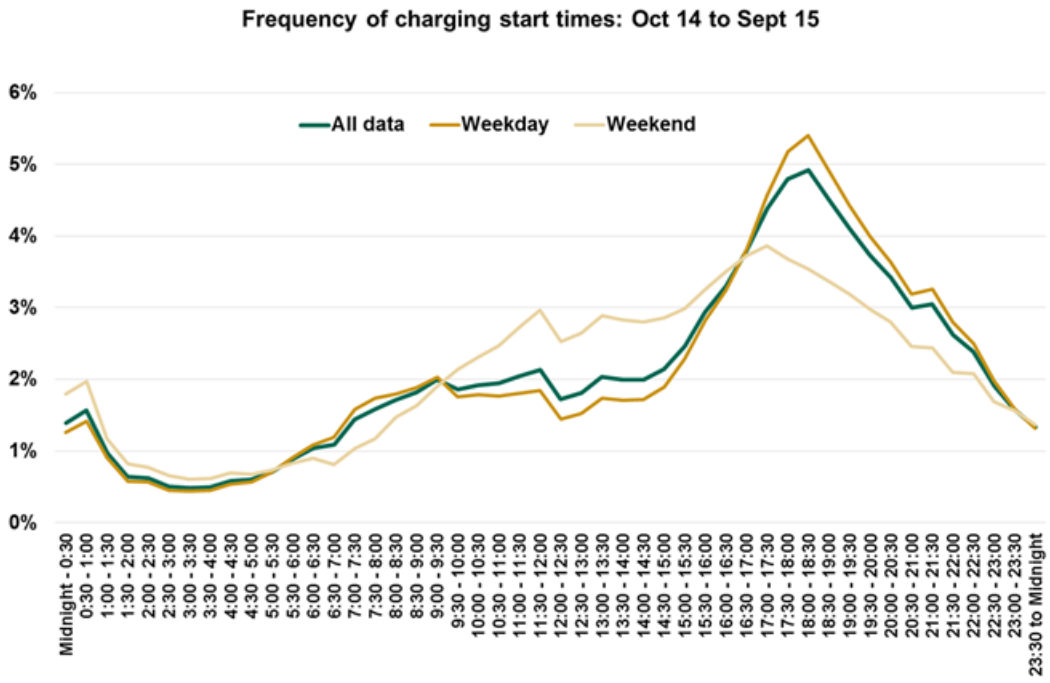

Figure 3 Charging data from the UK's domestic chargepoint grant fund scheme

However around 30% of domestic properties in the UK (up to around 66% in parts of London) have no access to off-street parking. More and more drivers will come to rely on being able to access infrastructure on the streets outside their homes to recharge. This remains a strategic barrier to the mass uptake of EVs in the UK, and is particularly true in cities where EVs could have the largest impact. Alongside the continued support for domestic charging through the Electric Vehicle Homecharge Scheme, at the end of 2016, OLEV announced an additional £2.5m for Local Authorities to install residential chargepoints in areas without access to off-street parking – an area that remains a key policy and technical challenge, where parking pressures remain and revenue issues remain politically significant.

In December 2016, £7.5m was also announced to support a new Workplace Charging Scheme (WCS) for companies, charities and public sector bodies to receive grant funding to support the installation of chargepoints for employee and fleet use – several hundred UK companies have already applied for support as part of this scheme, which has been a large mixture of public and private sector companies benefiting from up to £6000 towards the installation of a maximum of 20 sockets[10].

[10] https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles

Planning policy in the UK has also been a large and successful lever to require chargepoint installations, with some UK Local Authorities and bodies having already taken positive and ambitious approaches in terms of planning policies related to EV infrastructure. In the London Plan[11], for example, the Greater London Authority have required that car parks provide an electric charging point (or the cabling and energy capacity to install one in the future) at one in five car parking spaces in order to obtain planning permission for all new developments.

In autumn 2016, the Government also announced a move to define chargepoints as an "energy savings technology" under the Enhanced Capital Allowances (ECA) scheme[12]. The ECA scheme means that a business can invest in energy-saving equipment that may otherwise be too expensive. The first year allowances (FYA) allow businesses to set 100% of the cost of the assets against taxable profits in a single tax year, meaning a company will be able to write off the cost of the equipment (such as a chargepoint) against the business's taxable profits in the financial year the purchase was made.

The Government also provides for the UK's National Chargepoint Registry, an open source data set which lists all the publicly funded chargepoints as well as many of the privately funded ones. Third party organisations, such as sat nav developers have used this information to produce interactive maps of chargepoint locations and availability[13].

4 Challenges ahead and ambitions

Despite the strong start for the UK, further development of the network is needed to realise the vehicle uptake ambition that is foreseen in the coming years. In the most popular rapid charging locations chargepoints are already being heavily used and drivers are queueing for access, and consumers continue to state that a lack of public charging infrastructure is a barrier to purchasing an EV[14].

The key ambition remains to remove barriers that infrastructure can present to enable even more ambitious levels of uptake in the UK. Challenges remain in terms of how to ensure the UK has a world class network that is convenient, affordable, accessible and reliable; how to build a thriving and self-sustaining market around charging infrastructure and; how to ensure access to real estate and that different types of chargepoints are located in the best places; how to integrate the charging network with smart grid technology, energy storage and demand side response mechanisms to ensure that the electricity grid can accommodate and manage the demand from EVs.

The commercial market for public recharging is developing but remains challenging. There are significant barriers to a establishing a profitable business case including high up front electricity connection costs, which can make projects impracticable, balanced with finding suitable locations and sometimes a lack of understanding from chargepoint hosts. In the Innovator stage of EV ownership and current driver behaviour and vehicle ownership behaviours, assumptions about the future are challenging in a rapidly evolving and innovative market; what size of network is really required, how many +150 / +350kW chargers are needed to meet future needs; the impact of PHEV vs BEV drivers; what is the appropriate mix of slow, fast and rapid chargers. Business models have been constructed using actual capital expenditure, operating costs and usage date from Rapid Charging Network study (RCN), confirming that a financial business opportunity does exist for investment in rapid chargers in main highways and have identified the operating area in which a profit can be made, but the case is made for continued fiscal incentives, whilst UK EV adoption remains at the Innovators stage[15].

An aspect of this business case is the transition to charging for use of EV infrastructure. Until recently in the UK, a large majority of chargepoints had remained free to use. Whilst pricing is ultimately viewed as a

[11] https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan

12https://www.gov.uk/government/publications/capital-allowances-first-year-allowance-for-electric-charge-points

[13] https://data.gov.uk/dataset/national-charge-point-registry

[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/464763/uptake-of-ulev-uk.pdf

[15] J. Serradilla et al., *An evidence-based approach for investment in rapid-charging infrastructure,* Elsevier, Energy Policy 106 (2017) 414-524

commercial decision for chargepoint operators or host sites, and we expect competition to keep prices sustainable and affordable for consumers, it needs to be appropriately priced, to ensure EV driving remains an attractive option for consumers. Additionally, it is vital that consumers are clear about what they are paying for with a myriad of different pricing options, potentially confusing the end-user. A recent Government consultation[16] revealed widespread support for much greater clarity and consistency of pricing.

A fully seamless and interoperable charging network that is simple and easy to use for EV drivers remains a key ambition for the UK. Although there remains some diversity of connectors and sockets, industry has been moving towards standardised (or multi-standard) infrastructure, aided by Government grant support schemes which have required rapid charging infrastructure to be equipped with three tethered charging outlets to provide DC charging through CHAdeMO and Combo 2 plugs and AC charging through Type 2 plug. Minimum standardisation requirements have been solidified by the EU's Alternative Fuels Infrastructure Directive[17].

While there has been some consolidation in the UK market, currently there is a patchwork of chargepoint networks and each chargepoint network operator can prescribe its own method for accessing its services, whether that is by smart phone app, SMS text, card payment, smartcard membership or similar. The usual method is by smart card (RFID card) but customers are, in many cases, necessarily forced to become members of multiple networks in order to ensure sufficient access, or to adapt to multiple different payment and access methods to use different UK networks creating a lack of consumer confidence and we need to ensure the EV experience for drivers is as simple as it can be. In addition, consumers should be able to locate all chargepoints on their phone or sat nav, and have access to real-time information about their availability, ideally with the option to book a vacant chargepoint.

In June 2017, the Queen's Speech included measures intended to be brought forward under the Automated and Electric Vehicles Bill[18] to ensure that public charge points are consumer-friendly, convenient to access and work seamlessly right across the UK. The proposed Bill will seek to introduce enabling legislation to go some way to consider some of these issues, in particular around the consumer access to charging, and physical interoperability and accessibility of the electric vehicle charging network. It will also seek to include provisions to require the installation of sufficient chargepoints for EVs at Motorway Service Areas and large fuel retailers, to ensure that chargepoints are accessible for all drivers UK-wide.

Author

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Rosalind joined OLEV in 2014 having previously worked for the United Kingdom's Representation to the EU on Transport, Energy and Competitiveness issues. She graduated from the University of Newcastle in 2009, with a BA Hons in French and Politics.

[16] https://www.gov.uk/government/consultations/proposed-ulev-measures-for-inclusion-in-the-modern-transport-bill

[17] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0094

[18] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/620838/Queens_speech_2017_background_notes.pdf