OZEV Use Case Report

Office for Zero Emission Vehicles: Electric vehicle on-street chargepoints Use Case

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Office for Zero Emission Vehicles

This use case report is part of the outputs from a partnership between Icebreaker One and the Office for Zero Emission Vehicles. The project aims to close the data gaps required to roll out thousands more electric vehicle charge points across the UK by working together with industry to identify the data infrastructure needed to roll out more charge points.

Use case summary: More than 30% of households in the UK cannot install at-home electric vehicle chargepoints, highlighting the importance of affordable and nearby on-street charging. But how can local authorities deliver this infrastructure in a timely, efficient, equitable and cost-effective way, ensuring 'location optimisation'? We explore how data can help the dilemmas that arise from the huge challenge of satisfying the coming demand for on-street charging.

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Background and context

The UK Government has committed to end the sale of new petrol and diesel cars/vans from 2030 and forecasts suggest that at least 280,000 to 480,000 public chargepoints will be needed by 2030[1] – more than 10 times the current number (around 25,000). The UK government's electric vehicle (EV) infrastructure strategy[2], published in March 2022, states that:

> *'…easy overnight charging is, and will remain, the default for those with driveways. But charging should be just as convenient and stress-free for those who currently park on-street [including those who drive vans and commercial vehicles].'*

More than 30% of households in the UK lack the ability to install at-home EV chargepoints.[3] Yet, while rapid chargepoints are getting a lot of media and business attention, on-street charging is not so much in the public eye. On-street chargepoints are the 'Cinderella' of the chargepoint sector, and public chargepoints are needed to satisfy this demand.

The CMA's report on building a comprehensive and competitive charging sector[4] notes that: 'roll-out [of on-street parking] is very slow and local monopolies could arise if the market is left unchecked. Local authorities (LAs) play a crucial role here in rolling-out chargepoints and actively

[1] https://www.gov.uk/government/publications/electric-vehicle-charging-market-study-final-report/final-report
[2] https://www.gov.uk/government/publications/uk-electric-vehicle-infrastructure-strategy
[3] https://www.gov.uk/government/publications/electric-vehicle-charging-market-study-final-report/final-report
[4] ibid

overseeing the market to maximise competition and protect local residents, but they are not all currently sufficiently equipped or incentivised to do this'.

The government's electric vehicle strategy also points out that delivering accessible charging for homes without private chargepoints will not be easy [excerpts from strategy below][5]:

> *'Local on-street charging can be particularly commercially challenging for developers and investors. Charging volumes are generally lower due to the slower speed of charge and the lower margins on the sale of each kWh…'*
>
> *'Generally, developers target a certain number of EV drivers in the surrounding area per chargepoint to provide certainty over demand. The viability of chargepoints therefore depends significantly on the EV uptake rates in the local area. At the same time, people are less likely to switch if they do not see chargepoints locally…'*
>
> *'There is a wide variation in local authority capacity, expertise and engagement in EV charging…[and] the regional disparities for on-street provision are stark. [Challenges] include a lack of clarity over their role, perceived insufficient funding, and constrained resource. Other concerns…include the complexity of engaging with the energy connections process, data gaps, and specialist skills/knowledge gaps in local authorities. In addition, local authorities must balance the parking needs of petrol and diesel vehicle drivers with increasing demand for parking with charging from EV drivers.'*

The use case prioritised for development as part of the Office of Zero Emission Vehicles and Icebreaker One project focuses on the need for data access and sharing to enable local authorities to better plan for public on-street charging.

Why does this use case matter?

If the UK is to meet its Net Zero targets, the adoption of EVs will need to increase rapidly.

One of the biggest barriers for EV take-up is the perceived lack of infrastructure, according to 57% of drivers[6]. Rapid chargepoints, typically installed and managed by commercial chargepoint operators - often in hubs in popular locations - can be very expensive. This is likely to put consumers off using them (and thus buying an EV in the first place). Increased use of rapid chargepoints also risks putting strain both on the electricity network and, over time, on EV batteries,[7] causing them to wear out faster.

Combined with stats showing that drivers with off-street parking opt for charging their vehicle at home more than 80% of the time[8], this shows that a key obstacle is persuading drivers without off-street parking to purchase an EV. Research from ES Catapult[9] backs this up, finding that

[5] https://www.gov.uk/government/publications/uk-electric-vehicle-infrastructure-strategy
[6] https://trade.autotrader.co.uk/assets/downloads/The-Auto-Trader-EV-update-2021.pdf
[7] https://www.kia.com/dm/discover-kia/ask/how-to-extend-ev-battery-life.html
[8] https://www.citizensadvice.org.uk/Global/CitizensAdvice/Energy/Take%20Charge%20-%20EV%20tariff%20report.pdf
[9] https://es.catapult.org.uk/report/on-street-parking-and-electric-vehicles

households that do not have access to off-street parking see electric vehicles as impractical until they have somewhere to charge.

Almost one third of UK homes lack the ability to install at-home chargepoints, and will rely on public chargepoints if they are to buy an EV. More than a quarter of drivers don't have a driveway or garage, equating to more than 8 million households.[10]

Local authorities play a lead role in driving the roll-out of affordable, on-street charging for those without access to off-street charging. They need to know where to put chargepoints which are:

- Most cost-effective for the public purse
- In locations of consumer demand (driven by data to back this up).

But local authorities are in a tricky position. They are responsible for supporting the uptake of EVs by those in their regions (including less affluent areas that are less likely to have access to at-home charging), but in many cases are not seeing the demand. They may therefore not prioritise chargepoint installation, due in part to a reluctance to spend public money on a potentially unused resource.

Yet, driver demand for EVs is unlikely to ramp up until drivers feel confident in their ability to charge near their home, and at a reasonable rate. One chargepoint operator said: *'Local authorities cannot afford to wait until the demand has built up before installing the infrastructure. Can we find data that proves the point of "if you build it, they will come"? This would make clear to local authorities that they should not wait until demand has built up before being interested in installing the infrastructure.'*

Benefits of enabling use case

- **Increased driver confidence.** A comprehensive on-street parking strategy would bring confidence to drivers without a garage or driveway that an EV purchase is worthwhile. Research has found that households that do not have access to off-street parking will see electric vehicles as impractical until they have somewhere to charge them. However such chargepoints need to be functional, accessible, available, usable, and in a safe location.
- **More convenient access to charging.** Drivers are unlikely to want to leave their vehicle far from where they live (or stay) for long periods of time. As one local authority representative states: '*What is needed are chargers at one minute's walk from home, not five minutes walk from home'.*
- **Levelling out of ability to own EVs.** EVs are currently purchased more by affluent drivers, who are homeowners, and tend to have off-street parking. A comprehensive on-street charging infrastructure will allow low income drivers to charge EVs at or near their home. It bridges the gap between the 'have-garages' and the 'have-not garages'. It will also support the used EV market. A contact at Autotrader told Icebreaker One that its forecasts show that EVs are likely to form more than 50% of the 0-5-year-old used car market by 2029.
- **Improved access to affordable charging for non-residents.** Including visitors to residents, those staying in an area on holiday, and fleet vehicle drivers.
- **Possible reduction in local traffic.** If drivers can charge close to their home, they are less likely to drive to another location in search of a charger, reducing traffic on the roads.

[10] https://www.gov.uk/government/publications/electric-vehicle-charging-market-study-final-report/final-report

- **Reduction in use of rapid chargers can lead to reduced pressure on electricity networks.** Rapid charging places a higher short-term demand on the network, which cannot easily be managed through smart charging. If more EVs can be charged using slower, overnight charging, this can even out demand, especially if demand management is applied.
- **Reduction in use of rapid chargers can lead to reduced strain on EV batteries.** On-street parking where drivers charge vehicles for long periods reduces the use of rapid charging hubs, which can strain a vehicle's battery life.[11]
- **Reduced cost to EV drivers.** A CMA consultation[12] found EV drivers could save £100 per year if they had access to on-street charging instead of using rapid charging.
- **Supports the UK's Net Zero targets.** Public chargepoints per 100,000 people currently range from 80 in London to 43 in Scotland, and 17 in Northern Ireland. West Midlands, Yorkshire and Humber and the NorthWest are also low[13]. Increasing numbers of EV cars among lower income households, renters and flat-owners is a necessity for the UK to reach its net zero targets.

Barriers to implementation (and possible solutions)

Barrier	**Potential solutions**
Local authority perspective	
Local authorities are hesitant to install chargepoints without clear evidence of demand, as they don't want to risk being seen to spend public money on chargepoints that are then not used[14]. Yet this evidence may not appear until/unless EV uptake increases (chicken and egg scenario). Councils need guidance on how to build an EV strategy and the data to support this.	Clear need for data to indicate current and future demand. May include: • Current EV ownership (by location) and vehicle use[15] • Anticipated future EV ownership • Location of where commercial vehicles are kept (private hire and fleet/vans) • Trends in sale of second-hand EVs[16]
Generally LAs do not have any plans in place, dedicated personnel, financial resources or in	

[11] https://www.kia.com/dm/discover-kia/ask/how-to-extend-ev-battery-life.html
[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1012617/EVC_MS_final_report_--.pdf
[13] https://www.gov.uk/government/publications/electric-vehicle-charging-market-study-final-report/final-report
[14] In NI and Newcastle for example, have an existing chargepoint infrastructure which is "not fit for purpose", and was hardly ever used.
[15] WPD has made a survey of 700 EV drivers here in XL sheets. Could OZEV do something at larger scale?: https://www.westernpower.co.uk/electric-nation-data
[16] Auto Trader (AT) has predicted sales in the EV market beyond 2030, working with industry bodies, and has calculated the impact of new car registrations on the wider UK car parc. Anticipated by 2029, >50% of used cars which are 0-5 years old will be EVs. AT is also able to record interest in electric cars – demand rather than sales - at a granular local level, and is working with Field Dynamics and ZapMap to build a detailed picture of households and locales using off-street parking and public chargepoint provision. This will help determine where demand fits with existing chargepoints and where there is on and off street parking, in order to help plan investment.

some cases the appetite to drive forward roll-out[17].	
Potential lack of clarity/joined up thinking about installation between local authorities, particularly at boundaries, risks under or over-installation of chargepoints and an incoherent network.	Communication and data sharing between local authorities is key. Having a named EV infrastructure lead per council would help. It would be useful to have a requirement (and funding?) for neighbouring local authorities to work together on rollout plans to provide a coherent network (especially for people near local authority boundary points).
Some local authorities may not know what useful, official datasets exist.	Package datasets together and share with local authorities (with some tools).
Even where local authorities are aware of official datasets, they may not have the skills to interrogate them and use them to build a strategy.	Develop easy-to-use tools to help local authorities interrogate and make use of publicly available data.
Different nations (and regions) in the UK are in different stages of their roll-outs. local authorities do not always hold responsibility for on-street EV infrastructure[18].	A representative from Derry City and Strabane District in Northern Ireland told Icebreaker One about a positive initiative whereby 10 of 11 local councils applied for levelling up money in a consortium to upgrade the infrastructure. This approach may help solve two problems: i) the issue of public chargepoints being close to each other at the border between councils ii) saving money by buying in bulk
Maintenance of chargepoints also needs to be built into plans (and the risk that chargepoints in less-used areas will be neglected).	Data could be needed on capital costs and maintenance costs of chargepoints.
Consumer behaviours	
Consumer fears that on-street charging will make 'parking wars' worse[19], potentially putting consumers off asking for this.	Nearby dedicated hub networks in local car parks

[17] Finding from CMA report. Also notes that LAs do not have a clearly defined role – EV charging is not one of their statutory duties and so it can be a lower priority, particularly given competing demands on their resources and the other services they must provide.
[18] Eg in Northern Ireland, roads and car parks are owned by the Department of Infrastructure. This is an "administrative issue" which can be dealt with, but worth noting.
[19] Findings from ES Catapult focus group research.

Local residents (especially non drivers) may object to the installation of chargepoints 'cluttering' their pavements, and causing a potential hazard/inconvenience for those with disabilities.	Minimise any increase in street furniture by making use of lamp post charging, rather than installing eg bollard chargers.
Strategies need to take into consideration seasonal peaks - eg holiday destinations with limited parking, but where population can multiply hugely during summer months. Yet if enough chargepoints are installed to meet this demand, they may only be active for a few months a year.	Data on tourism/drivers/destinations is required to understand this fluctuation. Potential for park and ride hubs for tourists.
Planning and modelling must take account not just car usage/the proportion of homes without access to EV chargers, but also a potential shift to public transport/car sharing (away from car ownership).	CoMoUK (shared transport charity) may have some insights.
The EV market is difficult to predict and rapidly changing. Current EV data (on ownership, journeys, chargepoint utilisation etc) is not necessarily representative of future trends and patterns. For example, much is based on early adoption in more affluent areas. This could result in early prioritisation in affluent areas, leading to a rich/poor divide.	A 'social clause' in each chargepoint deal with a CPO, where any CPO wanting to put in chargepoints to plum locations, also has to supply CPs in a low income/low volume area and/or rural area.
Planning of on-street chargepoint needs must take account of van/fleet vehicle/private hire vehicle ownership. Even if a household has a driveway (and an at-home chargepoint), this may not be suitable for a van.	Gather insights from leading private hire/fleet vehicles into the locations of their drivers (specifically where they keep the vehicles overnight). NB: gaining these insights could help identify likely earlier adopters of EVs, and thus where to prioritise installation.
There is currently a lack of insight into the second-hand EV market and what this will mean in relation to charging needs (inc charger types).	Data from Autotrader and other second hand car exchange platforms may help. Autotrader, for example, has existing and forecast data.
Chargepoint operators	
Some important (or essential) data is held by private companies, who may be reluctant to share it for commercial reasons. For example, utilisation data (which chargepoints are in use,	Mandation of the sharing of certain data by chargepoint operators, such as in France. **OR**

how many vehicles they service, and how long vehicles spend charging).	Gain voluntary agreement from chargepoint operators to share data with a trusted third party under clear licensing conditions.
Currently, there is a lack of incentive for commercial chargepoint operators to invest in lower-return on-street charging. Likely to mean fewer operators proactively bidding in this space.	Better incentivisation of operators (through government grants? Other options?)
There is no standardised procurement document for LAs to state chargepoint requirements; it is time-consuming for operators to complete multiple different forms	Create a standardised procurement form, similar to the Digital Marketplace[20] approach.
A lack of competition for on-street charging in a given area could risk local monopolies developing[21].	
Distribution Network Operators (DNOs)	
Electricity network constraints in certain locations may mean installing multiple chargepoints is expensive and/or challenging. Insights into capacity and costs are not always clear, easy to interpret into practice, or consistent across DNOs (potentially relevant where a local authority operates across two DNO regions).	Work with DNOs to help them develop a clear and consistent approach to supplying these insights to local authorities.
EV plans must also build in other future increased demands on the network (eg heat pumps).	Future plans for e.g. installing heat pumps in council homes should be considered in chargepoint strategies.
There may be logistical challenges where land is a mix of publicly and privately owned.	
In some areas, there may be a lack of (sufficient) space for on-street parking (e.g. high-density housing, old historic centres with no parking permitted, areas with narrow pavements), so alternative locations will need to be considered.	Making use of existing real estate with large parking areas (leisure centres, churches, schools etc). Risk: such places must be safe, such as single people and women at night. Creation of transport hubs could help (see CoMoUK).[22]
Streetlamps are seen as a cost-effective way of installing chargepoints in residential areas. There has been a high roll-out of these in Westminster/Wandsworth councils by Ubitricity,	A registry of lamp-posts on-kerb and off-kerb would be beneficial.

[20] https://www.applytosupply.digitalmarketplace.service.gov.uk/
[21] Finding from CMA report
[22] https://como.org.uk/

and this approach was cited by several stakeholders during the research process. But, if set back from the pavement, they need a connection to a satellite bollard, which doubles the cost (though still cheaper than a new chargepoint). Also, some lamp-posts are not owned by council, but through a Private Finance Initiative (PFI) and council has to pay a third party for them.	Install chargepoints when putting in new lamp-posts, around 5% are changed each year.
Other challenges	
Existing and accessible datasets that are of value may be incomplete, not granular enough, or not fully up to date, for example: • National Chargepoint Registry of chargepoint locations/types (it's believed that this may include chargepoints that are no longer operational). There is a perception among stakeholders interviewed that the NCP is not as good as ZapMap's data, but also that ZapMap's data is not 100% complete. • Open Street Map has data on the location of some car parks (which could provide hubs for affordable charging), but data is supplied on a purely voluntary basis and so has gaps. • DfT data on journey trip ends has not been updated since at least 2017. • There is a lack of granular data on on-street and off-street parking in the UK.	• Mandation of advising when a chargepoint goes out of service (as well as when new ones are installed). • Field Dynamics has researched and mapped at a constituency level on-street and off-street parking.[23] Other such datasets may also exist.
There may not be enough street lamps to deliver the required number of chargepoints (one chargepoint operator estimated one lamp post per 20 cars).	Comprehensive data on available lampposts required (including where on pavement they are situated).

What data is required?

More detailed list available here.

- **Current locations of Chargepoints:** incl. whether those chargepoints are operational (eg ideally building on National Chargepoint Registry)

[23] https://www.racfoundation.org/wp-content/uploads/standing-still-Nagler-June-2021.pdf

- **Nationwide Map of Households Without Off-Street Parking:** With data as granular as possible, which can be combined with local authorities local knowledge. The best example[24] so far is the Field Dynamics at constituency level.
- **Utilisation data of existing chargepoints**: How much energy is being used by existing chargepoints, how often, for how much time, by whom.
- **List of Designated Disabled Parking Spots:** If these are likely to switch in future to EV may need dedicated chargepoint at a parking spot.
- **Journey Data:** Statistics on journey times to key services including food stores, education, health care, town centres, employment centres and transport hubs. Latest from DoT 2019.[25]
- **Parking data:** National registry of where current on-street parking and potential private parking lots that could be used for chargepoints, e.g. churches, council-run car-parks, leisure centres
- **Road Traffic Statistics:** estimates of the vehicle miles travelled each year in Great Britain by vehicle type, road category and region. Latest from DoT 2020/21.[26]
- **Vehicle Licensing Statistics:** which are showing a massive upward trajectory for EVs.[27]
- **Ownership/use of commercial/private hire vehicles:** and the location of where vehicles are kept overnight. These may be early adopters, so knowing their location would be valuable.
- **Pavement Widths:** which can indicate whether a bollard or other form of street-based charger can be installed. Energeo has a tool for measuring footpath widths.[28]
- **Street Widths:** which can indicate whether parking is possible.
- **Predicted EV demand:** Auto Trader has made an assessment for used EVs (used car market by volume is almost 4x size of new market). It forecasts a 'tipping point' in 2029, when >50% of used cars which are 0-5 years old will be EVs.
- **Behavioural data of EV Drivers:** Early indications are that drivers need to charge as little as once a week based on Hyundai research[29] or every 2/3 days according to an Electric Nation Trial.[30] But this indicates very unlikely on-street parking will be needed daily [unless vehicle is the job, such as taxi drivers].

Data not yet available (we think):

- Whether people use EVs more or less than ICE cars
- Data on lamp-post estate in UK (if it exists at all, it is only at only at a local level)

[24] ibid
[25] https://www.gov.uk/government/statistics/journey-time-statistics-england-2019
[26] https://www.gov.uk/government/collections/road-traffic-statistics
[27] https://www.gov.uk/government/statistics/vehicle-licensing-statistics-july-to-september-2021
[28] https://www.energeo.co.uk/locate
[29] https://www.thisismoney.co.uk/money/cars/article-10013433/UK-drivers-need-charge-electric-car-20-times-year.html
[30] https://www.westernpower.co.uk/electric-nation-data

Assessment of the National Chargepoint Registry: strengths and weaknesses

To download and explore this dataset:
https://data.openenergy.org.uk/dataset/national-chargepoint-registry?q=national+chargepoint

Strengths

- Open data available to use by anyone under a UK Open Government Licence
- Well structured and useful data that could be used for multiple purposes
- Frequently updated
- Detailed data that includes: device owners, controllers, manufacturers and the network that they are on, as well as contact details
- Contains information about the physical connection - e.g. the power type (AC, DC, three phase AC, single phase AC)
- Has latitude and longitude information in addition to postal address - therefore the data can be combined with mapping information as well as be humanly readable
- Location type - e.g. on-street parking, park & ride, car park
- Easy to download and use by anyone with commonly used spreadsheet software
- It is well enough structured that it can be read by humans as well as be used by software
- The fields appear to contain the expected data for the column definition (i.e. you do not find longitude information in a postcode field)
- Easy to add to Open Energy Search.

Weaknesses

- The third most-used location type is 'Other', making up a sixth of the data – this indicates that either the existing list of types is insufficient, or the data entry process isn't rigorous enough to capture useful information
- The downloaded CSV file doesn't not load cleanly into Microsoft Excel – we have not investigated why, as the file does load cleanly into Google Sheets
- The "last updated" field has data going back to 2015, indicating that the registry may not be up to date, and therefore not necessarily reliable for finding a chargepoint
- Some values in "date updated" are nonsensical, such as "0000-00-00 00:00:00", which calls into question the reliability of the data in that field
- Having both 'last updated' and 'date updated' fields that often have quite different values also reduces confidence in the data
- Whilst the CSV is well structured it is not always clear the differences in some of the fields.

What actions could be taken

- Require annual confirmation of chargepoint locations and update of changes (including if the number of chargepoints has increased) - this could be done by reminding the contact listed to check and update entries
- Enable data users to notify the National Chargepoint Registry of changes and errors
- Add field definitions documentation.

Useful sources

- On-Street Residential Chargepoint Scheme guidance for local authorities - GOV.UK
- Taking charge: the electric vehicle infrastructure strategy
- Tools for merging capacity of power network and demand for EVs for use of LAs:

    1. Connectmore (SPEN): https://www.spenergynetworks.co.uk/pages/connectmore_interactive_map_terms.aspx
    2. AutoDesignTool (NPG): https://www.northernpowergrid.com/auto-design
    3. Energeo Locate: https://www.energeo.co.uk/locate
    4. Pilot in London for revealing demand/usage through Heat Maps
- OS hackathon ideas drive EV infrastructure improvements forward