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EV Charging And Its Implications Across Transport, Power, Buildings And Planning: Insights From Stakeholder Workshops

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1. Summary

Electrifying the UK vehicle fleet is a key part of government policy to reduce carbon emissions associated with transport, with battery electric vehicles (EVs) making up 16% of new car sales in 2022.

The shift towards EVs, mandated by 2035 for all new passenger vehicles,[1] will require widespread access to charging infrastructure at homes, workplaces, and public areas.

This report outlines the issues related to the deployment of EV charging in new residential developments in England and Wales. It is based on expert discussion from four workshops held in March 2022 exploring the UK Government's statutory guidance on the provision of at-home EV Charging (Part S of the Building Regulations).

The report identifies a range of challenges associated with delivering Part S for sustainable transport, electricity, buildings and land use planning, and six crosscutting issues:

1. Making deployment affordable
2. Allocating costs of deployment
3. Ensuring equitable coverage
4. Developing innovative business models
5. Balancing between coordinated versus piecemeal deployment
6. Connecting land-use and grid planning.

2. Introduction

Electrifying the UK's vehicle fleet is widely seen as an important contributor to the reduction of carbon emissions derived from transport, alongside active travel and increased use of shared and public transport. In 2022 approximately 16% of new car sales in the UK were battery electric vehicles (EVs).[2] From 2035 all new passenger vehicles sold in the UK have to be EVs. For EVs to replace the existing fleet, access to charging facilities, at home, work or in public locations, will be of critical importance.

Deploying and scaling EV charging will subsequently link transport with the electricity sector, as well as housing. Linking these previously distinct sectors is expected to create various issues, particularly related to land-use planning, many of which are only becoming apparent as EV charging deployment progresses.

The statutory guidance document for 'Infrastructure for Charging Electric Vehicles'[3] (Approved Document S, AD S, or 'Part S') was published in December 2021. It covers all types of buildings and building works in England and Wales, including new buildings, major renovations of existing buildings, residential, non-residential and mixed-use buildings, and material changes of use (e.g. conversion of offices into flats). It came into force on 15 June 2022. In new housing developments of more than 10 dwellings, Part S states that EV charging infrastructure must be made available at the rate of at least one access point per residential unit. The design or layout of the charging points are not prescribed. The key measure of EV charging capacity is the number of car parking spaces with simultaneous access to EV charging.

This report summaries the issues arising in the deployment of at-home EV charging infrastructure in the UK. It is based on the thematic analysis of expert deliberation across four workshops held in March 2022, capturing the combined insights of 52 experts (see Appendix 1 for details of sectors represented). These workshops were convened to discuss the UK Government's statutory guidance on the provision of at-home EV Charging in all new residential buildings.

The workshops were held in March 2022 after guidance was issued but before it came into force. They were held under Chatham House rules and designed to explore emergent issues across transport, power, buildings and planning. Discussion focussed on the implications of Part S in new housing developments.

The following report summaries those discussions in two sections. Section 3 summarises issues for each area. Section 4 addresses emergent cross-cutting issues. Themes were identified though thematic coding of workshop transcripts to distil issues. Section 5 details implications for research and policy.

3. Sectoral Issues

Sustainable transport and Part S

The mandatory provision of EV charging infrastructure in all new housing developments in England & Wales was widely welcomed as necessary to meet a future in which transportation is electrified. It was viewed as unproblematic where on-plot provision (i.e. within the ownership boundaries of an individual dwelling) is concerned. However, it was also described as a 'knee jerk' reaction, easy to implement and monitor, but failing to recognise EVs as a necessary but insufficient part of a sustainable mobility future.

Cycling, walking and public transport all have a role to play, in addition to reducing unnecessary travel. This results in a potential trade-off between the promotion of EVs and support for a modal shift, with the latter being more desirable. It was recognised that more holistic developments, such as car clubs, might seek to limit the number of parking spaces whilst incorporating shared mobility solutions. Part S, predicated on dwelling unit numbers and off-street parking provision, has no mechanism for shared provision to reduce the need for parking and vehicle use. EVs need to be enabled, but not at the expense of wider sustainable transport ambitions. Presented in this light, Part S was seen to create the perception that there is "*a standard UK wide policy for one-for-one EV charging provision*". Concerns were also expressed over Part S presuming individual private ownership of dwellings and car parking spaces.

Implementing individual, on-plot chargers was viewed as unproblematic. Moving designated parking and charging infrastructure beyond property boundaries was seen as more challenging. Routing power cables and managing and allocating power supplied to charge points to household electricity bills is not clear cut. Further issues arise where communal or shared assets are provided.

Complications were widely seen to arise when there is less parking than households, for example in multi-tenure blocks or developments that are promoting reduced car dependency. Nonetheless, developing communal parking spaces and shared charge points was seen as important. One charger per private car was described as 'overkill' given the expected low charging frequencies.

"Individual properties are fine... the thing that we struggle with is the communal charging points... it's just a bit of a minefield"

Shared charge point infrastructure was thought to raise various additional implementation issues, mainly evolving around the management of shared infrastructure, accounts, bills and access. Responsibility for repair and maintenance is a further issue. At the same time, how shared infrastructure will be used remains unclear and has clear implications for system design, with new routines and cultures expected to emerge.

Shared charge point use may provide a stepping stone to shared vehicle use and potentially, mobility as a service, helping to break down embedded ownership structures and behaviours around individualised car use. Being able to access multiple chargers on an estate was viewed as key to encouraging adoption of more communal infrastructure. Promotion of car club bays was widely expressed as the next logical step in supporting sustainable transport solutions. However, increased shared parking is likely to create political resistance from publics and private financers concerned about reduced desirability of housing with shared parking.

While there is a shift away from on-plot parking towards more communal arrangements within new developments in general, how Part S enables shared infrastructure was deemed to require further exploration. New business models and service propositions may help, a variety of which are currently emerging.

Planning for a future based on reduced car travel and increased use of shared, active and public mobility solutions, while also meeting the needs and expectations of the present, presents an acute delivery challenge. The adoption of charge points was widely viewed as easier to achieve and monitor than a broader modal shift in sustainable mobility.

"It's too easy to fall back on the 'Oh well, we'll provide electric vehicle charging points, because it'd be easier'."

Electricity and Part S

Meeting increased energy demand and upgrading low voltage distribution networks are the primary issues for electricity systems arising from the increased deployment of EV charging infrastructure.

EV are expected to significantly expand demand for power in the future, alongside the electrification of heat. Flexible charging, to make the most of low-cost power, where demand is low or renewable supply is high, is required to mitigate and reduce total demand from electrification of transport. New business models, assisted by access to data, are expected to play an important role in enabling smart charging but require support.

At the same time, the low voltage electricity networks are increasingly congested, requiring capital intensive reinforcement before new generation or load can be connected. Distribution Network Operators (DNOs) need to plan around both where new EV charging infrastructure will likely be deployed, alongside understanding the capacity of existing infrastructure. DNOs are obliged to provide connection where requested – however, they are subsequently entitled to reclaim all costs associated with that connection and a proportion of costs associated with upstream reinforcement.

The lack of strategic infrastructure planning is leading to reports of areas where new housing developments are becoming financially unviable. Where private developers face prohibitive costs for connection, developments can become financially unviable. Some local authorities are having to find ways to finance grid upgrades to overcome this problem and avoid 'development blight' in their area. Ofgem changes to charging reforms will result in multiple financial reverberations for both private and social developers, and local

authorities. Having sufficient grid capacity was described as 'the elephant in the room', which unless tackled has the potential to hold back deployment of EV charging infrastructure. Grid constraints further justify attention to shared charging infrastructure and smart charging.

Various innovation projects are seeking to better understand aggregated EV charging practices and implications for energy demand. Further work is required to better understand peak electricity demand of multiple EV charge points after diversity of practices is accounted for. Changing user charging practices will also have unknown implications for electricity demand.

"If you are the customer that is looking to install a new piece of charging infrastructure, on a congested network, if you're the first developer, you could be the one that's triggering deeper reinforcement, and hence having a much higher connection charge than potentially people who will then come afterwards. There's a big question of how this is dealt with equitably if we know that such reinforcements are going to take place in the future."

Buildings and Part S

Ingrained practices and cultures of developers was the primary sectoral concern raised within the workshops, though it must be noted that no large housing developers attended. The cost of meeting new regulations and how various socially desirable outcomes are negotiated during the planning process were also raised as important.

Large developers dominate house building in England. As charge points present additional costs to developers, most were expected to fight 'tooth and nail' against their deployment, always opting for the lowest cost solution. Developers were thought to view Part S as placing an unfair burden on them, requiring them to finance additional public infrastructure that other stakeholders stand to financially benefit from. Workshop participants considered the pursuit of shareholder profits as the root cause of developers arguing against any additional costs. Meanwhile, there is a perception of the investment community viewing reduced or car-free developments negatively, because of the potential to reduce the value of properties.

Many participants saw the potential for a trade-off between the deployment of EV charging infrastructure against the provision of, for example, affordable housing unless Part S was made mandatory. Regulating for the deployment of infrastructure subsequently removes EV charging from the negotiation of social benefits from the planning process. Regulation was seen as a means to factor-in EV charging infrastructure into land values from the outset.

Land-use planning and Part S

Developers have a track record of resisting any additional costs of providing community benefits and local amenities, while local authorities seek to maximise them. Under the planning acts, local authorities can use various planning tools (such as Section 106 Agreements) to capture some of the land value rise to pay for the provisions of various community benefits. Given the chronic shortage and high cost of housing, this typically takes the form of a number of 'affordable' dwellings that a local authority asks developers to provide in a given housing development. Because 'affordable' is defined as being at 80% of market prices, developers see it as an erosion of profitability. However, the calculation of reasonable profit effectively enshrines a developer's right to expect a 20% return on investment.

In practice, extra requests to increase developers' costs (e.g. EV charging provision) is likely to be traded off against the number of 'affordable' housing units included in the development. EV charging infrastructure can therefore become in direct competition with the amount of 'affordable' housing being built by the developers. Part S can then be seen as regressive in the way that it prioritises EV charging (mandatory within certain cost thresholds) over affordable housing (not mandatory; open to negotiation under Section 106 Agreements). That was not the intent behind Part S but, nonetheless, that is how workshop participants anticipated it would work.

4. Crosscutting Issues

Affordability

Costs were the most widely shared concern to arise across the four workshops. Part S adds costs to new build developments but should not come at the expense of affordable housing. Reinforcing low voltage distribution networks can prove costly within the current cost allocation method, where those who go beyond current capacity pay for grid upgrades. High grid reinforcement costs can deter more sustainable housing developments and potentially halt developments altogether. Sufficient planning of grid upgrades can reduce the need for further upgrades and so reduce future costs. Shared charging infrastructure is likely to increase cost to households because of added layers of management.

Such additional costs are more likely to affect social and affordable housing developments. Overall costs are likely to increase with piecemeal deployment compared to strategic, coordinated delivery. There is potential to significantly reduce total costs through the utilisation of smart data systems. How to reduce total associated costs and make sure they are equally shared is a central cross cutting issue.

"...And if that isn't properly planned for, then you end up with a sort of a cliff edge, you know, the last person gets in at one price. And then suddenly, you've got this massive, massive cost that's going to come down the line for supply connection for the next developer, and then you end up in planning blight."

Who pays? Who benefits?

"There is an... unwritten assumption that there is a lot of money to be made here in setting up charging infrastructure, and the private sector can handle it."

To whom costs are allocated is a political decision. Different mechanisms to cover costs associated with EV charging deployment and grid upgrades are likely to be required. A variety of options were debated within workshops, with discussion of those likely to gain from increased EV deployment being a central concern.

Questions of cost are also linked to who benefits, including households through access to new EV charging, and grid operators and energy suppliers, as increased revenues. Benefits to stakeholders will vary depend on how charging is implemented. EV charging is likely to create commercial opportunities for new market entrants under supportive conditions but for whom and how remains unclear, further complicating equitable cost allocation. Much depends on how charging is implemented. According to participants, most developers have little interest in providing an ongoing service.

Different ways of allocating costs were discussed with no clear solution. Placing costs on developers means additional socially desirable outcomes get added to land value cost, but will be viewed negatively by developers for reducing profit margins. Energy retailers stand to gain from increased demand but market arrangements disincentivise and make retail investment by them risky because of customers' ability to switch before investments are recouped. Local authorities are exploring how to finance grid upgrades but have few, if any, reserves to draw on.

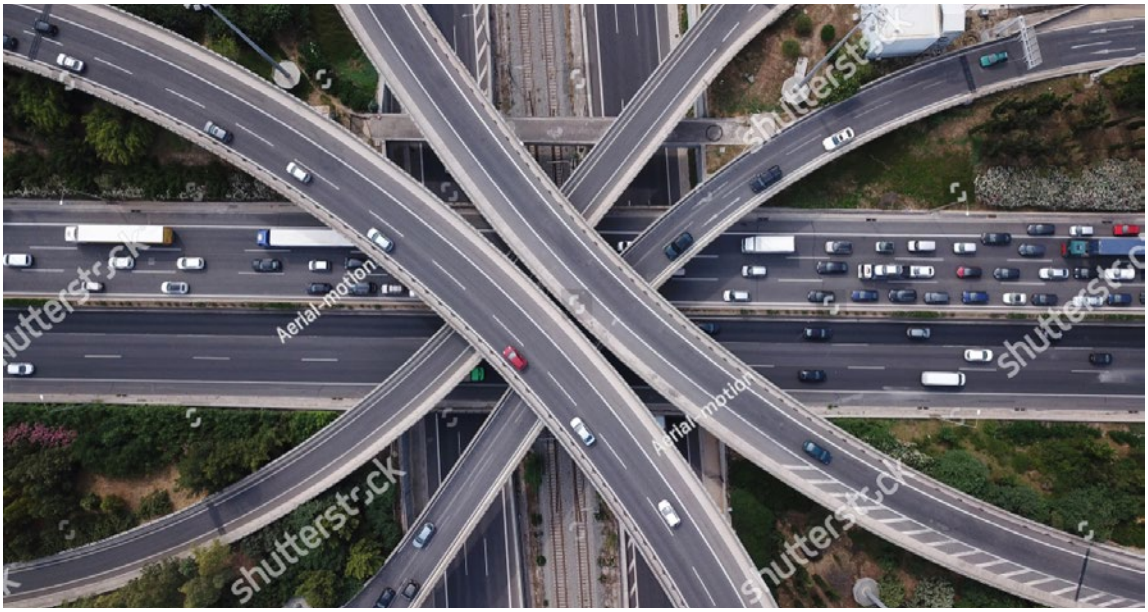
A related issue concerns the point at which network upgrade costs are socialised (the connection charging boundary). Reducing the cost to those requesting connections, such as developers, may avoid planning blight but is socially regressive as less affluent households pay a higher proportion of their household income on electricity bills than more affluent households. They are also less likely to benefit from access to EVs and be more in need of affordable housing schemes than richer sections of society who already own property.

Ensuring equitable coverage

Difference in land values, between northern and southern England, within localities and between urban and rural areas, have the potential to create a large disparity in access to EV charging. The increase in land value when a site is given planning permission is critical to the economics of development, and to the negotiations on community benefits between local authorities and developers.

In areas where new housing (and other types of development) commands high sale prices, the increase in land value is high; but the value is lower where sale prices are lower, for example on brown-field sites. In areas with relatively low property prices, the financial viability of new developments will decrease, and the impact of Part S is likely to be felt more acutely, because the cost of EV charging is a larger proportion of total development costs. In such areas, there is less value to be shared around between community benefits once developer profits have been considered. For shared infrastructure this issue is magnified due to increased costs associated with its management.

Further inequities will arise from access to private or shared charging infrastructure. Access to private charging infrastructure will allow users to benefit from EV-specific or dynamic time-of-use electricity tariffs. Smart utilisation of these tariffs is expected to significantly lower the cost of charging. Access to private charging will also open up opportunities for households to provide grid services. By contrast, shared or public charging tariffs are currently significantly higher. New business models must be integrated with wider electricity reforms to provide access to dynamic tariffs through shared use charging infrastructure.



Innovation

Deploying EV charging infrastructure was thought to create opportunities to capture financial value from the arrangements though the development of new business models.

Innovative metering and billing arrangements are emerging for at-home private EV charging. Further business model innovations are required where private charging infrastructure sits beyond property boundaries and where charging infrastructure is shared. Access to cheap EV charging will be important to drive user adoption. How costs associated with managing shared assets are covered, particularly when assets are relatively new, and utilisation rates are low, remain an area of concern. For instance, if shared assets are deployed in social or affordable housing, recovering costs through ground rent will be punitive. Meanwhile, if costs fall on social housing providers or local authorities, their ability to provide social value in other areas will diminish.

Utilisation rates will be key to making viable business models – balancing the need to create infrastructure ahead of demand, but not so far ahead that the new assets lie idle for long periods. It is unclear if there will be sufficient market incentives for private actors to engage in managing shared infrastructure. Social enterprises underpinned by communities of place may have an important role to play with households incentivised to maintain infrastructure and ensure provision. Alternatively, costs associated with shared infrastructure may need to be socialised, in the first instance.

The development of new EV charging infrastructure creates opportunities to capture financial value from the new arrangements. Operating car clubs is one such opportunity, the provision of grid balancing services utilising parked EVs and their batteries, another. New market actors are emerging in both spaces, but the latter generally gets more attention. Value derived from the provision of grid services can be passed to EV owners. It may also be used to help pay for shared infrastructure. Such 'aggregator' business models could operate on a commercial basis, or they could incorporate elements of social value, for example by using the payments for system balancing to subsidise EV car clubs in areas of poverty and social deprivation.

Coordinated versus piecemeal deployment

"You've got multiple problems here, that actually need someone to stand back from the picture and look at how they can solve them at a local level, as well as at the grid at the very top."

When a local authority creates a Local Plan or issues strategic guidance, it is signalling to potential developers where the local priorities are for different kinds of development. Any such development has implications for infrastructure (including the provision of energy, roads, water and waste). At the same time, Distribution Network Operators (DNOs) make forward plans for reinforcement of local electricity networks, based on projections of future demand. These two forward planning systems (spatial planning and infrastructure planning) are largely uncoordinated, leading to changes that are often reactive to events (rather than planned) and piecemeal in implementation. The lack of coordinated planning has two major negative effects:

- Costs increase: one strategic upgrade is always cheaper than piecemeal smaller ones, largely because enabling works (e.g. digging up roads) are repeated instead of being done once.
- Costs are unevenly distributed: when a capacity threshold is met, a large and disproportionate share of system upgrade costs are passed on to the next developer rather than being shared across multiple stakeholders or society more generally.

A piecemeal approach is likely to add extra costs, delay deployment and potentially, result in missed targets for EV charging in particular, and increase carbon emissions more generally. Sequencing grid upgrades to coincide with future changes in demand is also likely to be important but is hard to forecast.

Connecting land-use and grid planning

Land-use/spatial planning and forward strategic planning for electricity networks are not currently coordinated. Local authorities produce Local Plans outlining their strategic goals in terms of what kind of development should go where. Developers then promote development schemes, which may be more or less aligned with the Local Plan. However, only when a formal planning application is submitted to DNOs, as statutory consultees, find out about the details of proposed development and the possible impact on grid and network capacity. DNOs have created initiatives, such as Skyline, to make the information available more quickly, but only within the constraints of the existing system. DNOs are reactive to individual proposals, rather than engaged in and contributing to the broader Local Plans' strategy. There is a risk that local authorities must find money for grid reinforcement. Better methods to coordinate between transport, housing and electricity systems are required.

"At the moment, there is simply not the necessary sophistication of joined up thinking between... the business planning processes of [grid] utility companies and the spatial planning system we are trying to plug into."

5. Implications for Research and Policy

There are multiple implications for research and policy of which the following are considered by the authors as most pertinent:

For research this work points towards three areas for further inquiry:

- Follow up research to explore how Part S is working in practice and the extent to which some of the unintended consequences that are highlighted in this report have been realised and whether new issues have emerged.
- How charging infrastructure is deployed will have far reaching consequences for equity and fairness. Understanding the implications of different approaches to deployment across different sectors of society are important to ensure informed decision-making for just transitions.
- Follow up research to map the number and location of installed EV charging in new housing developments across England and Wales and to explore the planning processes through which they have been realised.

For policy, the following central messages arise:

- Infrastructure for EV charging is important but electrifying vehicles is not a panacea for achieving sustainable mobility. Electrification of the fleet needs to work alongside reducing demand for individual mobility solutions as well as increased use of shared and/or public mobility options.
- Regulations aimed at providing EV infrastructure through the planning system has the potential to reduce the provision of community benefits such as affordable housing.
- Collective ownership and/or use of charging infrastructure offers the potential to significantly reduce the amount and cost of charging infrastructure and pave the way for the greater use of collective and public mobility solutions.
- As proposed Part S is likely to result in unequal access to charging infrastructure between different regions of England and Wales and between rural and urban areas. There is a need for additional policy measures focussed on more equitable coverage.
- Ensure that the proposed Regional Energy System Planners in Great Britain develop the necessary tools and approaches to coordinate between strategic spatial planning and strategic planning of electricity networks.

Appendix 1: Overview of workshop participants

	Workshop 1	Workshop 2	Workshop 3	Workshop 4
Academic	1	0	1	2
Consultant	1	1	1	1
Industry	2	6	5	6
Local government	8	7	3	3
National government	0	1	0	1
Third Sector	1	0	0	0
Not defined	0	0	0	1
Total	**13**	**15**	**10**	**14**

Endnotes

1 HM Government, 2024. Pathway for zero emission vehicle transition by 2035 becomes law. Access here.

2 CCC, 2024. Progress in reducing emissions: 2024 Report to Parliament. Committee on Climate Change. Access here.

3 Infrastructure for charging electric vehicles: Approved Document S. 2023. Access here.

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