EXECUTIVE SUMMARY

The switch from fossil-fuelled to zero-emission vehicles forms a core part of the UK government's Net Zero strategy, with the sale of new petrol and diesel (internal combustion engine, or ICE) cars to be banned by 2030. The reason for this is clear; transport produced 27% of the UK's total emissions in 2019. The ban on the sale of new ICE cars, combined with lower running costs for EVs and an anticipated drop in up-front EV prices, means it is expected that there will be an explosion in EVs (consumer and commercial) on the road over the coming years.

The UK's EV-charging infrastructure is currently inadequate to support this. In itself, the need for a rapid increase in chargepoint installation is a massive logistical challenge. But an even greater challenge is the capacity of the UK's electricity network to cope with the rising demands that EVs will place on it.

The need for access to data to support the increased uptake of EVs, and the rollout of a charging infrastructure to enable this, is clear. Every stakeholder involved in delivering an EV infrastructure that is fit for the future requires data to support their plans, and none more so than the distribution network operators (DNOs) that are responsible for managing the electricity networks to which EV chargepoints connect.

UK Power Networks' Head of Enterprise Data Management, Matt Webb, told Icebreaker One: 'The likely future demand on the electricity network that will be created through the accelerating uptake of EVs poses a significant challenge for network operators. We are faced with the need to meet customer and stakeholder expectations through the facilitation of timely connection of all forms of EV charging infrastructure while maintaining continuity and quality of electricity supply at lowest possible cost to the customer.

'To ensure we are ready to service increasing numbers of fuse upgrades and potential network reinforcement where aggregate demand from EVs has the potential to exceed local network capacity, we require insight into potential and actual chargepoint installation and utilisation. The provision of data from a variety of stakeholders is key in this respect and the Open Energy programme has the potential to streamline processes to help meet this need and the challenge of delivering an electricity infrastructure that is fit for the future.'

Icebreaker One's EV use case therefore focuses on how the Open Energy programme can support DNOs' requirements by facilitating and streamlining access to essential data, and how this in turn will allow DNOs to improve the insights and services they offer, as an active player in helping to optimise where chargepoints can and should be installed. In this document, we outline the data sets required and potential data suppliers, the challenges of implementation, and the benefits and opportunities this use case presents to stakeholders throughout the value chain.

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OVERVIEW

As part of the Modernising Energy Data Access (MEDA) competition in 2020, a core use case was developed to demonstrate the benefits of an Open Energy Search and Access Control. This focused around a local authority looking to understand the impact of retrofitting buildings with low carbon technologies and, potentially, electric vehicle (EV) charging points across a large estate.

As part of our user needs-based approach, Icebreaker One is developing two further use cases. These will broaden exploration of the value of better data access: making energy data more robust, shareable, and easily accessible, and outlining the benefits of the Open Energy approach to stakeholders across the market.

The use cases will be used in several key ways, including to:

- enable the development of Open Energy's products and services
- identify key datasets to prioritise for making available via the Open Energy service
- illustrate the benefits of becoming members of Open Energy through real-life examples.

Goals of Icebreaker One's use cases

1. Outline the benefits to potential Data Consumers and Data Providers of accessing data/making data available via the Open Energy service.
2. Identify and acknowledge barriers to implementation, such that methods for overcoming these barriers can be considered at an early stage.
3. Demonstrate, through example, how the Open Energy service can enable a secure, trusted environment to facilitate the sharing, access and control of energy data according to an Open Energy Standard.
4. Demonstrate the status of the relevant data sets identified:
    a. Are the data sets open?
    b. Are the data sets shared using an existing licensing agreement?
    c. Are the data sets subject to data sharing restrictions, as per Open Energy's sensitivity classes for trusted data sharing, such as access being restricted to specific Data Consumers and/or requiring payment for accessing the data.
5. Demonstrate the ability for an authorised participant to access the Shared Data where all Open Energy's conditions relevant to the data set have been met.

Use case prioritisation process

Step 1: Members of the Open Energy Steering and Advisory Groups, including representatives from government, regulators, consumer bodies, trade associations and industry, identified potential areas of focus for new use cases. Broad areas considered during this process included electricity supply flexibility, electric vehicles (EVs), fuel poverty, heat pumps, smart meter adoption rates, and the transition away from domestic gas boilers/heating.

Step 2: Following input from Advisory and Steering Group members, Icebreaker One prioritised EVs, and specifically the EV charging infrastructure, as a key area of focus for the development of our second use case.

Step 3: Members of the Steering and Advisory Groups put forward specific problem statements in relation to EV charging infrastructure that better access to energy data could help address.

Step 4: Following an internal prioritisation process and in consultation with our Advisory Group, Icebreaker One confirmed the problem statement for development into an Open Energy use case (see below).

Step 5: During December 2021 and January 2022, the Open Energy programme worked with stakeholders in this priority area to develop and refine the use case, gathering insights on benefits, barriers and the data required. Organisations consulted included Distribution Network Operators (DNOs), chargepoint operators and manufacturers, local authorities /BEIS-backed Energy Hubs working with local authorities, consultants, innovators, the Office of Zero Emission Vehicles (OZEV), and code manager Elexon.

Confirmed problem statement

'The connection department of a Distribution Network Operator (DNO) needs to know when and where chargepoints are likely to appear across their network, corresponding usage/consumption patterns for each chargepoint/type of chargepoint, and aggregate demand (domestic, commercial, industrial etc), in order to enable better management of electricity distribution now and in the future, at a time when supply and demand are becoming increasingly challenging to assess and predict.'

EV USE CASE: BACKGROUND AND CONTEXT

There is a clear need for access to data to support the increased uptake of EVs in the run up to and beyond 2030 and the rollout of a charging infrastructure to enable this. Without access to robust and reliable data to support EV chargepoint installation and use, there is a risk that chargepoints will be installed ineffectively and/or too slowly to meet rising demand, that placements do not take into account needs across society (for example, in locations where there are high densities of shared occupancy buildings, street parking or in rural areas) and in a way that does not take into account electrical network capacity.

How to build an EV infrastructure that's fit for the future is a hot topic in the energy industry. DNO SP Energy Networks told Icebreaker One that the vast majority of requests for insight that it receives relate to EV chargepoint planning, and increasing numbers of startups and existing industry players are looking for opportunities around EV charging.

DNOs: 'at the coal face' of building the UK's EV infrastructure

The UK's Distribution Network Operators (DNOs) are central to the task of ensuring that demands placed on the grid by the rising uptake of EVs are met. Their connection departments are responsible for processing and managing requests to the grid for electricity in the here and now, as well as forecasting future capacity requirements so that they can prioritise where to invest in greater capacity.

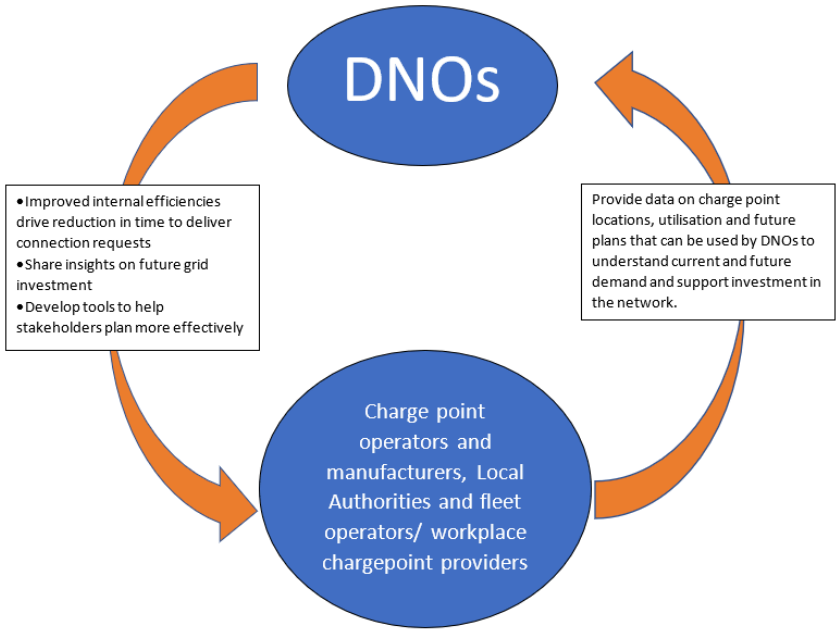
They need to know when and where chargepoints will be installed (domestic, public, commercial and industrial), the nature of these chargepoints (slow, rapid, ultrarapid, for example), and how they are used. But there is currently no mandatory registration of installations, with data having to be pulled from multiple sources. Data on use of different types of chargepoint and plans for future installations is even more patchy and problematic to access. Concerns from those that hold the data may include reservations about who will have access to the data (reinforcing the need for the robust access controls that Open Energy has in place), and whether their data is in a format that is suitable for sharing.

These challenges with data access make it inefficient, time-consuming (and therefore costly) and challenging for DNOs to plan for likely capacity requirements. This is only going to become more difficult as EV uptake accelerates, potentially resulting in a too-slow rollout of chargepoints and in doing so, creating a knock-on effect of slowing EV sales.

EV use case vision: a virtuous circle of insight

While this use case is focused around DNOs' need for data, it is envisioned that implementation of this use case will have benefits for multiple stakeholders. DNOs have a responsibility to provide data to their customers about the availability of and constraints on their networks.

By gaining better access to data as outlined in this use case, DNOs will in turn be able to supply better and more useful data and insights to organisations that are looking to install chargepoints. For example, SP Energy Networks has an ambition to evolve its ConnectMore Interactive Map to a point that it can be a 'self-service' tool for customers to try out different scenarios in terms of location and size of installations, to see how it affects



network capacity and price. Thus, if implemented, this use case has the potential to deliver a virtuous circle of insight.

DATA REQUIRED TO DELIVER USE CASE

Please note: these are the datasets that have been identified during the use case research process as being required to implement the use case in practice. It is not designed to be a comprehensive list of all possible data sets. A more detailed list is available here.

Icebreaker One would welcome feedback on this list, including any gaps. Please email openenergy@icebreakerone.org.

Data sets	Potential Data Providers	Access mechanism definition	Rationale for definition	Current access mechanism	Purpose of data set
Public chargepoint locations and type - current	ZapMap	Shared	Commercially valuable data	API for EV data under licence	Baseline of state of play for public chargepoints to identify areas of potential stress
	DfT (National Chargepoint Registry)	Open	Available here under Open Government licence	Available in CSV, JSON or XML formats as a download or by using an API	
	OZEV (NB dataset in development - timelines uncertain)	Likely open	Government mandate to make this data available	TBC	
	Chargepoint operators and manufacturers (multiple)	Likely open in the future, but work needs to be done to make this happen	Government mandate to make this data available	Likely via OCPI 2.1.1 protocol for data sharing; used by EV parties across Europe	
Domestic chargepoint locations (aggregated/anonymised to non-personal level) and type - current	Chargepoint manufacturers (multiple)	Likely shared	Commercially valuable data	TBC - not currently directly accessible	Baseline of state of play for domestic chargepoints to identify areas of potential stress
	OZEV - chargepoint incentive scheme data	Likely shared	Not currently open; subject to discussions with OZEV	TBC - not currently directly accessible	
Workplace/fleet /i industrial vehicle/public transport chargepoint locations and type	Will include chargepoint manufacturers and operators of vehicle fleets (eg Amazon, Post Office) and public transport (eg TFL)	Likely open in the future, but work needs to be done to make this happen	Government mandate to make this data available	TBC - not currently directly accessible	Baseline of state of play for these types of chargepoint to identify areas of potential

					stress
Public chargepoint use data - current	Chargepoint operators and manufacturers (multiple)	Shared	Commercially valuable data	TBC - not currently directly accessible	To understand the pull on the grid of public chargepoints, including usage curves (time of day, seasonal etc).
	Chargepoint payment providers (e.g. Paua)	Shared	Commercially valuable data	TBC - not currently directly accessible	
Aggregated data on domestic EV chargepoint use	Centre for Net Zero (founded by Octopus Energy) - dataset due to be launched March 2022	Likely open (TBC)	Whether data will be open or subject to restrictions is subject to internal discussions	TBC - not currently directly accessible	To understand, at aggregate level, the pull on the grid of domestic chargepoints, including usage curves.
Aggregated data on domestic EV chargepoint use	Third-party Data Providers with access to smart meter data and the ability to aggregate and anonymise - possibilities Electralink or n3rgy	Likely shared, but TBC	Whether data will be open or subject to restrictions is subject to future discussions	TBC - not currently directly accessible	
Workplace/fleet /i industrial vehicle/public transport chargepoint use data	Will include chargepoint manufacturers and operators of vehicle fleets (eg Amazon, Post Office) and public transport (eg TFL)	May be shared or open, depending on supplier	Whether data will be open or subject to restrictions is subject to future discussions	TBC - not currently directly accessible	To understand the pull on the grid of this type of chargepoint, including usage curves.
Planned EV chargepoint locations - public	Chargepoint operators and manufacturers (multiple)	Shared	Commercially sensitive data	TBC - not currently directly accessible	To understand the likely future pull on the grid of public chargepoints
	Local authorities	Top-level data likely to be open; more granular data may be shared	Whether data will be open or subject to restrictions is subject to future discussions	TBC	
Planned EV chargepoint locations - workplace/fleet/ public transport/indus trial vehicles	Will include chargepoint manufacturers and operators of vehicle fleets (eg Amazon, Post Office) and public transport (eg TFL)	Shared	Whether data will be open or subject to restrictions is subject to future discussions	TBC - not currently directly accessible	To understand the likely future pull on the grid of these types of chargepoint
Future scenario modelling	National Grid ESO Future Energy	Open	Available here:	Currently available on	To understand

	Scenarios (FES)*		https://www.nationalgrideso.com/future-energy/future-energy-scenarios/fes-2021/documents	National Grid ESO website and via Icebreaker One service	likely adoption of EVs over time and therefore the likely demand for chargepoints, including domestic chargepoints
	DNO Distribution Future Energy Scenarios (DFES)	Open	Each DNO produces 'DFES' using similar assumptions to FES, but at a more granular level, often taking into account local ambitions which may not be reflected in FES.	Underlying data published on most DNO websites.	
Predicted EV charging demand vs electrical network capacity	SP Energy Networks - ConnectMore interactive map	TBC but hopefully open	DNOs are required to make data available to customers on grid availability and constraints	Map (but not underlying data) available here: https://www.spenergynetworks.co.uk/pages/connectmore_interactive_map.aspx	SP Energy Network's tool is aimed at customers, but the underlying data could be of use to other DNOs.
Vehicle traffic and journey data	Possibilities include Open Transport Map, OpenTraffic (service under development) and the Department for Transport's Road Traffic Counts. [NB - Google data is also a possibility but likely to have high costs attached)	Open	Datasets designed to be open	DfT database via Open Government licence; Open Transport Map via GUI and API	To support modeling of patterns of likely demand/future demand for chargepoints based on locations (eg start and end point), time and date, and length of journeys.
Ultra-low emissions vehicles registered in UK	DfT datasets - eg ultra low emission vehicles by propulsion or fuel type	Open	Open government data supplied in ODS format	Open government data supplied in ODS format	Speed of growth in EV uptake likely to be indicative of speed of domestic chargepoint installation

** Main modelling insights currently used to anticipate and plan for future growth. However, individual consultancy firms may have their own, bespoke models based around specific user needs and/or could develop these in the future using data available through Open Energy service.*

SERVICES REQUIRED TO DELIVER USE CASE

In the challenges of implementation, data alone will not solve the problem of how to deliver an EV infrastructure that's fit for the future without overloading network capacity. New services will therefore be required using energy data to inform decision making and management. It is envisaged that these services may be enabled by third party Data Providers such as existing energy consultancies, community energy groups and innovative new entrants. These organisations can plan a key role in analysing the data available through the Open Energy service and feeding back insights to individual stakeholders and/or via Open Energy. However, in the same way that Open Banking demonstrated the ability of traditional banks to become Data Providers in their own right, it is also envisaged that DNOs themselves may innovate and provide these new services.

BENEFITS OF USE CASE

As highlighted in the overview, if this use case is implemented to its full potential, it has the potential to benefit a wide range of individual industry stakeholders as well as having wider systemic benefits for the energy industry, the environment and society as a whole.

This is due to the synergistic, holistic nature of this use case. If DNOs have better access to data to support their planning and investment, this in turn enables them to act more effectively and efficiently to support the roll out of the EV charging infrastructure.

Individual beneficiaries

- **DNOs**
    - Will move from a time-consuming, very manual and inefficient process whereby each DNO must independently identify Data Providers and implement individual data-sharing contracts with each, to a streamlined process that gives all DNOs a single point of entry to the data they need via the Open Energy service. This will result in significant time savings.
    - Will be able to optimise their network investment decisions by gaining a better understanding of where investment will most be needed to support the rollout of EV chargepoints, and how much investment is needed. For example, chargepoint use data (actual or expected) will help DNOs understand how to optimise connections for essential chargepoints; for example, a bank of four chargepoints where all four are are constantly in use will place different demands on the network than a bank where only half are actively charging a vehicle at any one time.
    - Better enables DNOs to meet their Net Zero commitments by enabling the electrification of the transport network.

'Icebreaker One has the potential to be a single point of entry for where chargepoints exist, how they're used, and where they may be in the future, rather than each DNO having to seek out this information individually. These insights have the potential to give our ConnectMore

tool extra oomph, and the ability to turn it into a useful, self-service platform to help customers plan installations.' SP Energy Networks

'When it comes to facilitating the rollout of EV chargepoints, DNOs have a clear responsibility for providing data about their networks. However, we also need access to others' data – with greater visibility of prevailing demand, new chargepoint installations and how they're used, we can be better placed to ensure we invest in the right place at the right time to meet this growing need.' UKPN

'There's currently a huge amount of effort and duplication that goes on for each DNO to individually get hold of the data they need. It's time consuming, costly, and simply bonkers.' Scottish and Southern Electricity Networks

- **Chargepoint operators, manufacturers and installers**
    - If DNOs are better able to plan grid investments and, in turn, share this insight with chargepoint operators, this will help with identification of potential chargepoint sites.
    - If DNOs have better sight of future plans for installation by chargepoint operators, this could help reduce the timelines for chargepoint operator connection requests by ensuring that reinforcement exists in advance of actual need.
    - Potentially lower connection costs through improved visibility of existing and future network headroom.
    - A faster, more streamlined approach to improving network capacity will in turn speed up the UK's chargepoint rollout, opening up the market for chargepoint installers and manufacturers to sell their products and services.

'As a company, our success depends on the Net Zero transition. The work of Icebreaker One will help accelerate this.' Zaptec

'If supplying data to DNOs means we get better insights about reinforcement plans and timelines in return, it's certainly something we're open to.' Shell Connect

'This is an incredibly valuable use case, and it's right to focus on the DNO perspective. It offers the potential to speed up time from a connection request to chargepoints being installed and operational.' Chargepoint

- **Local authorities**
    - Local authorities have a key role to play in planning EV infrastructure in the areas they administrate, including ensuring that appropriate infrastructure exists in locations less likely to attract commercial investment and/or where the nature of properties prohibits the installation of domestic (off-road) chargepoints. Alongside chargepoint operators, local authorities will benefit from DNOs understanding the need for investment in the network in such areas.
- **Fleet and industrial vehicle operators/business owners**
    - Businesses are increasingly looking to encourage and facilitate electrification of vehicles used for work purposes, whether those are business-owned

vehicles or the vehicles of staff that drive to work. As with chargepoint operators, if DNOs are able to reduce the time between a request for connection at a workplace and chargepoints being in place, this will have a positive impact.
    - The same applies for the operators of fuel stations and motorway services looking to diversify their business away from fossil fuels. A better understanding of the costs of connection under different scenarios also has the potential to reduce business costs.
- **Innovators**
    - While DNOs are the primary actors in this use case, subject to access and licensing agreements the Open Energy service will open up access to data for innovators in this space, whether that's consultancy firms or companies looking to develop new, added-value products and services.

'Electralink has an ambition to support the industry through widening access to meter data insights, including supporting DNOs by enabling better insights around EVs.' Electralink

- **Consumers**
    - A speedier roll-out of the EV charging infrastructure and better access to data for innovators will help drive competition and consumer choice, potentially enabling access to more competitive rates as well as improved chargepoint access.
    - An increase in the availability of chargepoints in low-income/deprived areas can be achieved, if local authorities are able to better identify and prioritise locations that are less likely to attract commercial chargepoint investment.

Systemic benefits

As outlined above, this use case has the potential to streamline and accelerate the UK's EV charging infrastructure rollout. This in turn will have a number of systemic benefits, as outlined in the table below:

Environmental	Societal	Innovation	Public spending
Facilitates the rollout of zero-emission vehicles in line with Net Zero goals.	Economies of scale improvements to charging infrastructure can speed up EV adoption, leading to more competitiveness, a strong second-hand EV market and shared ownership models, which all increase the range of options for EV ownership/access, including in less affluent areas.	Value-added services could include, for example, • Car-sharing / rental schemes that improve EV access to those who cannot or do not want to own a car (e.g. particularly in cities). • Vehicle-to-grid (V2G) which enables EVs to act as flexibility assets for the grid, supporting the transition to Net Zero.	A reduction in overall cost of the Net-Zero transition and thus on the taxpayer burden due to quicker transition and improved commercial drivers, reducing spending from government.
Reduction in pollution from a swifter move to EVs.	Increased speed of EV rollout has positive impacts on public health through		A reduction in spending on health due to the public

	reduced air and noise pollution.		health benefits of reduced pollution.
	Strengthens the ability to support government requirements for new property developments to have EV chargepoints.		

CHALLENGES OF IMPLEMENTATION

While the benefits of unlocking the full potential of this use case are clear, Icebreaker One's use case research also identified a number of challenges that will need to be overcome. These include the following:

- **Resources will be required to analyse and interpret the data:** Making data available and accessible via the Open Energy service is an essential first step, but DNOs also need the resources and support to analyse the data and turn it into useful insights. Improvements in internal processing and digitalisation within DNOs will be key; there may also be a significant role here for third-party consultancy and data insight firms to analyse the data and share their insights via the Open Energy service.
- **Data sets needed for multiple purposes are distributed across a large number of organisations with no unified view or understanding of what exists.** Simply identifying and gaining access to all of the relevant datasets is a significant endeavour. Whilst this problem could be solved through individual organisations licensing their data to other individual organisations via bespoke bilateral contracts, this is not a practical or scaleable solution. This problem is not dissimilar to that faced by the banking sector for which Open Banking was designed and for which Open Energy has also been developed.
- **Data sets are held in varying formats that will not be interoperable.** This is normal, and is what metadata (the description of a data set, which Open Energy will index) is used to clarify. This allows Data Consumers to know how to parse and interpret data sets according to their needs, while allowing Data Providers to publish them in formats that they find most convenient.
- **Chargepoints may be classified differently by different manufacturers and operators.** This may make aggregation of use data challenging, unless an accurate, universal standard is agreed and applied.
- **Current use patterns are unlikely to be indicative of future demand.** While many organisations have chargepoint use data, and would be open to making it available under the right terms, our research highlighted that changing market conditions and increased EV uptake among broader and less affluent demographics mean use patterns will look very different going forward. This means that existing use data will need to be interpreted carefully, rather than lacking any value.
- **Standardised access and licence conditions for sharing are needed.** These, combined with openly-available listings of what datasets are available, will allow data to be more quickly and easily consumed. Access conditions may include, for example, terms around payment or security compliance. Licence conditions may include, for example, terms governing how the data can be used, adapted or redistributed.

- **Local authorities have multiple roles to play in the rollout of EV infrastructure and are at different stages of their EV rollout planning.** As well as planning the location of on-street and free EV chargepoints, local authorities also oversee planning permission for chargepoints by commercial providers. This means they are potentially Data Providers and Data Consumers - these are similar challenges to that laid out in the original MEDA use case, for which Open Energy was identified as a part of the solution.
- **Some potential Data Providers expressed concerns about making their data publicly available.** For example, several chargepoint operators expressed concerns about competitors gaining access to commercially-sensitive insights on future installation plans, or their most heavily used chargepoint locations. Meanwhile some local authorities might be reluctant to make data on low use of free public chargepoints available due to concerns it might be used to criticise how taxpayers' money had been spent without an adequate understanding of the need for this investment. Clear and proportional access control agreements that balance the needs of different stakeholders in the ecosystem, such as those proposed by Open Energy, are key to managing such concerns.
- **Reservations exist over how data will be used.** For example, some charge point operators expressed a desire to understand exactly how DNOs plan to use the data they could supply before they'd be willing to commit. Others expressed concern around unintended consequences, for example that the data could be used to deny, rather than enable, grid connections.
- **A government mandate around data provision would support delivery of this use case.** One chargepoint manufacturer expressed a view that the chargepoint data required for this use case should be made openly and universally available by all chargepoint operators/manufacturers, but that to make that happen across all Data Providers might require a government mandate. In the absence of this, the only option is a voluntary sharing model that risks pitting companies against each other rather than incentivising collaboration and finding a way to fairly apportion opportunity.

FUTURE DEVELOPMENT

- If implemented, this use case offers the potential for greater collaboration between DNOs, chargepoint operators and local authorities. If any Open Energy participant subsequently makes findings from their data analysis available via the Open Energy service, this has the potential to benefit other participants involved in EV and EV chargepoint rollout.
- While focused on the EV chargepoint infrastructure, the principles of this use case have the potential to be applied more widely to other areas of the energy industry – such as the electrification of heating systems.
- Ofgem's plans for market-wide reform of how energy settlement works, moving from a system where customers must estimate likely energy demand to a system based on actual half-hourly consumption and export, have the potential to significantly improve the granularity of data available.

Appendix: Useful links

- Energy Data User Needs (collated by the Energy Systems Catapult as part of the Modernising Energy Data Access competition)
- The UK's transition to electric vehicles - briefing document (Climate Change Committee)
- The consumer experience at public electric vehicle chargepoints (government consultation documents)
- Future of transport regulatory review consultation Zero emission vehicles (Department for Transport)
- Scoping the role of local authorities in the provision of electric vehicle charging infrastructure (Local Government Association)
- Visa calls for standardised seamless, interoperable payments in electric vehicle charging (Visa press office)
- Will by-mile road pricing be needed to replace car tax as we move to EVs? (Guardian)