Demystifying Utilisation

Green Finance Institute

Introduction

The UK's Electric Vehicle Charging Infrastructure (EVCI) sector is evolving, but there is still a lack of private investment flowing into the sector. The UK Government has estimated that around 300,000 public chargepoints will be needed by 2030, requiring at least £20bn[1] of investment. At the end of May 2023, there were 43,626 public chargepoints across the UK[2]. The UK Government to date has committed to deploying £1.6bn of capital in the form of grants, but as we reach the limits of government funding, the remaining investment will need to be funded by the private sector, and new investors and lenders will have to enter the market.

Investors and lenders consistently highlight a key barrier to investing in charging infrastructure is a lack of sufficient data around chargepoint usage, and uncertainty about what is considered "good" across the different chargepoint use cases. This document seeks to define the different ways utilisation is expressed, explain why this matters to investors, and provide a snapshot of current utilisation rates across the market by the different chargepoint use cases. Furthermore, this document encourages the reader to look beyond the number of chargepoints installed as a metric for success, and consider how we can ensure the right chargepoints are in the right place to enable a just and smooth transition to electric mobility.

Definition of utilisation

There is no industry standard definition or calculation for utilisation rates in EVCI, something which government bodies may need to consider in future if we are to secure a central understanding and acceptance of how this is measured.

A chargepoint's utilisation rate can simply be defined as the rate at which an Electric Vehicle (EV) chargepoint is used. It can be calculated in several ways; the two most common are:

Time-based utilisation

The amount of time a vehicle is plugged into a chargepoint.

*E.g. If a chargepoint has a vehicle plugged into it for 2 hours 24 minutes in a 24 hour period, utilisation over that 24 hour period can be calculated using the following: (2 hours 24 minutes / 24 hours) * 100 = 10% utilisation*

Energy-based utilisation

The energy supplied by a chargepoint (kW), relative to the potential maximum energy that could have been supplied in the same period.

*E.g. If a 7kW chargepoint has delivered 16.8kWh in a 24 hour period, utilisation over that 24 hour period can be calculated using the following: 16.8kWh / (7kW * 24 hours) = 10% utilisation*

The main difference between the two definitions is that time-based utilisation does not necessarily correlate to actual energy delivered during a charging event, or take into account times when a vehicle is plugged in and not actively charging. A vehicle might be plugged in and not actively charging due to a full battery or smart charging patterns. This difference is greater in slower charging solutions, where vehicles are left to charge for longer periods of time. For example, with a time-based calculation, a car which is plugged into a

[1] CDRT analysis

[2] How many electric charging points in the UK 2023 - Zap-Map

chargepoint for 8 hours, but only actively charging for 5 hours, has the remaining 3 hours still counting towards utilisation, despite not drawing power. As drivers are usually billed for electricity supplied, this additional 3 hour period may not be revenue generating, and may be preventing another driver using the chargepoint.

Furthermore, the rate at which a chargepoint can deliver electricity to the vehicle can vary. For example, a 22kW chargepoint will not always deliver 22kW of charge in one hour, instead it may only supply an average of 10kW over the same period.

Actual power delivered can be impacted by any of the following:

- Available electricity network capacity
- State of charge of the battery during charging
- Maximum charge rate of the battery
- Temperature of the battery
- Power rating of the onboard charger or charging cable, if lower than the chargepoint
- Any applied smart charging technology, adjusting the rate of charge over time to achieve a better price for users.

For more information refer to section 3.2 of Guide to Electric Vehicle Infrastructure

When comparing time-based and energy-based utilisation, the latter will almost always be a lower percentage. From an investor's perspective, energy-based utilisation is usually a more relevant and accurate way for calculating revenue and subsequently returns. Energy-based utilisation models can also be helpful to calculate other data insights such as carbon saved, as for the reasons set out above, time-based calculations do not provide accurate information on the actual energy used.

Time-based utilisation is still a valuable measure for investors, Chargepoint Operators (CPOs) and Local Authorities (LAs) as it can show insights into how drivers use the chargepoints. Such insights can be used to incentivise behaviour change amongst users, to improve the utilisation of assets in the network.

Both measures can be helpful in understanding the viability of EVCI, though neither alone explain the whole story. Knowing the context, which definition is being quoted and what this means for the future success of the business model, is what matters.

Why is utilisation important?

Utilisation is the key driver of revenue; the more energy supplied, the higher the revenue and therefore potential profitability of a chargepoint. While volumes matter, investors and lenders should start to look beyond the number of chargepoints in a business case as a metric of success: a higher number of chargepoints installed does not necessarily equal higher returns. However, there is evidence that installing multiple chargepoints close together gives drivers the confidence they need to transition, as seeing a higher number of chargepoints reduces charging anxiety. Sites with multiple chargepoints can provide drivers with confidence that at least one chargepoint might be available to use when they arrive, although, there has to be a balance, as too many chargepoints in a local area can cannibalise returns. A chargepoint can be installed anywhere, but if utilisation across its lifetime is low, it is unlikely to be profitable. A rigorous site selection process is crucial to ensure sufficient utilisation across a chargepoint's lifetime. Expected utilisation rates are therefore a critical metric when assessing forecast returns and payback period of an investment, and determining the viability of a business plan.

Solid understanding of utilisation can also unlock further future revenue models, for example, the ability for CPOs to contribute to energy flexibility contracts locally and work with the grid to help manage supply and demand.

Utilisation rates also vary by chargepoint use case and so it is important to understand the differences in these.

What are the different chargepoint use cases?

When it comes to EVCI, there is no one size fits all solution. Different chargepoints are better suited for certain locations. Below we outline the four main chargepoint use cases and the typical power ratings of chargepoints that can be found at these sites:

On-street residential charging

On-street residential charging is largely used by residents, or their visitors, who do not have access to private at-home charging solutions. These chargepoints are typically slower (normally 3 – 7kW) - residents will leave their cars charging either during the day whilst at work or overnight whilst sleeping. This is often longer than needed to receive a full charge.

Off-street destination charging

Destination charging also tends to be a longer and slower charge (typically 7 – 22kW) where the customer performs another activity whilst they leave their car charging (e.g. whilst at work, shopping centre or supermarket). It may not always be possible to return to the vehicle and unplug immediately once a full charge is achieved, so vehicles are also often left for longer than needed to receive a full charge.

Rapid or ultra-rapid hub charging

Rapid chargepoints (typically 50kW+) or ultra-rapid chargepoints (typically 150kW – 350kW) are higher powered chargepoints which are largely found in clusters on the strategic road network and in motorway service areas. These are designed for short, en-route charging events, where drivers can quickly top-up along their journeys, akin to refuelling a petrol car. Overstay time tends to be shorter here than at lower powered chargepoints, as drivers will typically stay with or near their vehicles.

Forecourt charging

A forecourt charging station will typically contain a large number of rapid and ultra-rapid chargepoints (typically 50 – 350kW). These chargepoints have an average charging time of around 30 minutes and visitors are offered retail experiences with coffee shops, convenience stores, lounge and meeting areas with Wi-Fi, to use whilst they wait for their vehicles to charge.

What are the utilisation rates for the different chargepoint use cases?

Time-based utilisation rates:

Below is time-based utilisation data, supplied by Zapmap, for their UK network coverage from 2020 – 2022[3].

Average time-based utilisation (%)					
	Q4 2020	**Q2 2021**	**Q4 2021**	**Q2 2022**	**Q4 2022**
Slow (3-6kW)	13.2%	13.4%	15.0%	13.7%	13.7%
Fast (7-22kW)	9.1%	12.8%	13.0%	15.0%	15.7%
Rapid (25-99kW)	4.0%	8.6%	14.6%	13.3%	14.8%
Ultra-Rapid (100kW+)	n.a.	n.a.	12.1%	12.9%	16.1%

Note: This data table uses Zapmap categorisations. Categorisation varies across other industry bodies, for example those attached to LEVI[4] and standardisation is a current goal of the Office for Zero Emission Vehicles (OZEV).

Energy-based utilisation rates:

To calculate energy-based utilisation, data on the energy supplied and the potential maximum energy that could have been supplied in the same period is required.

Using the above time-based utilisation data, and other inputs as explained below, the GFI, with support from industry stakeholders, have estimated what the energy-based utilisation of the UK's public charging network was across the same time period.

Zapmap provided analysis on the average energy transfer from the last 12 months of Zap-Pay sessions - for slow devices they transfer on average at a rate of 3kW, fast at 7kW, rapid at 35kW and ultra-rapid at 50kW.

The calculation that the GFI used for estimating energy-based utilisation is set out below:

- A slow charger's Q4 2020 time-based utilisation of 13.2% equates to 3.17 hours, 3 hours and 10 minutes of active charging in a 24 hour period
- A slow charger on average transfers energy at a rate of 3kW
- Total energy supplied across a 24 hour period equals 3kW * 3 hours and 10 minutes = 9.50kWh
- Using the weighted average power rating of all devices on Zapmap, circa 95% of UK devices, in each category band to calculate the potential maximum energy that could have been supplied in a 24 hour period, the final calculation is: 9.50kWh / (4kW * 24 hours) = 9.9%

[3] Circa 70% of all UK devices monitored

[4] LEVI Categorisations

Estimated energy-based utilisation (%)						
	Weighted kW	Q4 2020	Q2 2021	Q4 2021	Q2 2022	Q4 2022
Slow (3-6kW)	4	9.9%	10.1%	11.3%	10.3%	10.3%
Fast (7-22kW)	12	5.3%	7.5%	7.6%	8.8%	9.2%
Rapid (25-99kW)	49	2.9%	6.1%	10.4%	9.5%	10.6%
Ultra-Rapid (100kW+)	183	n.a.	n.a.	3.3%	3.5%	4.4%

Note: This data table uses Zapmap categorisations. Categorisation varies across other industry bodies, for example those attached to LEVI[5] and standardisation is a current goal of the Office for Zero Emission Vehicles (OZEV).

These figures show that the usage of the UK public charging network has increased across all chargepoint types since 2020. This is unsurprising given the increase in the number of EVs on the UK's roads (205,770 end of Q4 2020 to 663,700 end of Q4 2022[6]), and significant even after the increase in the number of chargepoints in the network (20,964 end of Q4 2020 to 37,261 end of Q4 2022[7]), with much of the early infrastructure built ahead of need. Of course, utilisation rates in 2020 will also have been impacted by covid lockdowns. Utilisation of an individual chargepoint is influenced by a number of factors; these include convenience, cost of charge, customer service and reliability of the network. However, the most significant factor is behavioural. Utilisation at an individual chargepoint will increase as more drivers see the newly installed site, and either existing EV drivers change their charging habits, or new EV drivers transition after developing more confidence in the infrastructure, the theory of 'build it and they will come'.

Experience of utilisation from CPOs

This theory of 'build it and they will come' is further evidenced by Gridserve's Braintree site. In 2021 Department for Transport data showed a 40% national rise in ultra-low emission vehicles, yet in the Braintree district there was an 82% increase - double the national average.

"There is certainly strong anecdotal evidence of the uptake in EVs around our sites. While we can't claim that all of the Braintree increase was due to our Electric Forecourt, it is a very strong coincidence that it had just completed its first year of operations" – *Mark Henderson, Chief Investment Officer, Gridserve.*

Connected Kerb measure utilisation in granular detail on each of their 7-22kw sockets. From this data, they have identified utilisation takes a period of time to build and then plateaus. There is an initial short gap between a chargepoint being installed and being visible on digital services such as vehicle navigation and roaming apps, followed by a slightly longer period (typically 8-12 weeks) for a new chargepoint to embed itself in local knowledge and to the local EV driver's consciousness.

What do these rates mean for industry?

It is normal for utilisation rates to vary between different chargepoint use cases and between calculations of utilisation.

From the data above, chargepoints under residential/ slow use cases have a larger difference between time-based and energy-based utilisation. This is expected, as these sites tend to experience the longest dwell times, where drivers will leave their cars overnight and energy will not be supplied during the entire duration of stay.

The difference is also wide for ultra-rapid chargepoints. This is because much of the existing car parc cannot accept a charge at a rate beyond 50kW (most new models will now take 100kW+, with some such as Porsche Taycan accepting 350kW) which limits the charge that can be delivered. As technology of both the cars and chargepoints develops over time, this difference will start to decrease.

[5] LEVI Categorisations

[6] Cumulative number of battery-electric vehicles only. How many electric vehicles are there in the UK - EV market statistics 2023 (zap-map.com)

[7] How many EV charging points are there in the UK - Zapmap (zap-map.com)

The utilisation rates presented above represent national averages. A number of CPOs and LAs generously provided GFI with supplementary data, on a more local basis; whilst some are aligned with the data above, others showed utilisation rates significantly below and above Zapmap's averages.

In order to ensure all drivers within the UK are able to switch to an EV eventually, there will be some areas where chargepoints have to be installed despite not being commercially viable for some time. Where such areas are tendered by LAs to serve their communities, CPOs must not be left to cherry pick the expected highest utilised sites, to avoid creating areas which are over / under served by chargepoints.

Achieving a "good" level of utilisation requires balance and utilisation of 100% should not be the target. As the utilisation of a chargepoint increases over time, there will be a level of utilisation that is too high, resulting in long wait times and queues for drivers looking to charge. These rates will differ depending on the chargepoint use case. For some rapid public chargepoints, rates of 25-30% are considered too high today and should not be exceeded as these indicate long queuing times at peak periods[8].

Opinions vary on where these thresholds for commercial viability are, however, anecdotally there currently appears to be a sweet spot for slower on-street charging of between 10-20%. This avoids queues for users, covers most commercial terms required to secure investment and delivers an accessible and reliable network for local residents.

With new functionality being delivered all the time such as booking systems, energy flexibility contracts and increased EV adoption, future utilisation rates are expected to grow. An investor will need to consider all these factors when developing a business plan, as well as allow for a level of downtime associated with routine maintenance or repair.

Conclusions & recommendations

Whichever definition is used, utilisation rates are a critical data point in our understanding of the state of the UK's charging infrastructure rollout. Both of the measures outlined above have their relevance to different business models, and like all numbers, both can be useful in the right context. As with any key performance indicator, being able to interrogate the data and understand the factors impacting performance is key.

Without knowing how and when chargepoints are used, investors will continue to lack the data they require to finance the roll out which underpins the UK's transition to electric transportation. If we continue to focus on the absolute number of chargepoints alone, without understanding how, where and when they are used by drivers, we risk building out infrastructure which is not fit for purpose in the long term, putting the transition to net zero at risk.

This document has begun to show what current utilisation rates are across the UK. However, to give investors the confidence to finance the roll out of the UK's charging infrastructure, **the GFI recommends the following:**

1

CPOs and OZEV should consider defining a standard terminology for EVCI (including utilisation rates) to enable chargepoints to be more easily compared. OZEV are aware that different charging speeds and thresholds are used and have been working on aligning the thresholds with industry to be used across regulations, funding schemes and consumer communications. Throughout 2023, OZEV and industry stakeholders have said they will be testing the terminology used for these different thresholds with consumers to ensure that they can identify the right chargepoints for their needs.

2

Greater transparency of utilisation data will enable investors to gain a better understanding of the sector and help all market participants access the right finance to continue their growth journey – In 2023 the Government will be introducing regulations from the Open Chargepoint Interface Protocol which will mandate the free sharing of utilisation data a year later. However to speed up the process and enable private capital to flow quicker, the GFI recommends industry explore options to widen access to data earlier.

[8] Evidence provided by a leading CPO

About the Green Finance Institute

The Green Finance Institute (GFI) was launched in 2019 to support the mainstreaming of green finance both in the UK and overseas. Uniquely positioned as an independent, commercially-focused organisation led by bankers and seed-funded by government, the GFI adopted a pioneering strategy of identifying the barriers to investment in real economy decarbonisation by sector, and committing to develop the solutions to demonstrate they could be overcome – a "think and do tank" of financial professionals, unencumbered by the short-term profit-making pressures of mainstream finance.

The GFI's programmes and partnerships are all thoughtfully constructed to expand our influence with the decision-makers who are key to transforming systems and our efforts are supported by an effective communications strategy.

The GFI's transport coalition was set up to unlock the financial barriers to the decarbonisation of road transport and enabling infrastructure, initially in the UK, to support the transition to a zero-carbon and climate resilient economy.

For more information, please visit www.greenfinanceinstitute.co.uk/programmes/cdrt/

About Zapmap

As a pioneer in the early days of electric cars, Zapmap was founded in 2014 with a mission to make the EV charging experience simple, wherever you go.

Zapmap currently has almost 600,000 registered users and over 95% of the UK's public points on its network, more than 70% of which show live availability data.

An integral part of supporting the wider EV industry, Zapmap Insights is the leading source of EV charging data and insights, providing unrivalled data and expert analysis into the shape and usage of EV charging infrastructure, as well as the attitudes and behaviours of EV drivers.

For more information, please visit: The UK's leading source of EV charging data and insights - Zapmap (zap-map.com)

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