Department for Transport

Electric Chargepoint Analysis 2017: Local Authority Rapids

About this release

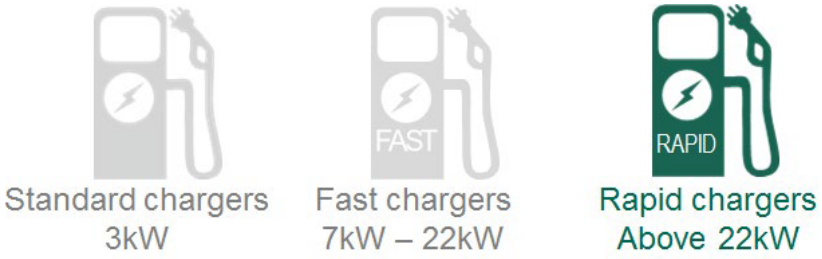
This statistical release presents experimental statistics on local authority rapid plug-in vehicle chargepoints in England in 2017. Data from the 27 local authorities that received grants from the Local Authority Grant Fund (LAGF) was provided as a condition of the grants. Complete data is only available for 2017. Consequently this report focuses on that year alone.

The Local Authority Grant Fund was set up in 2013 by the Office for Low Emission Vehicles (OLEV) to deliver recharging infrastructure in the UK. This analysis has been produced to help support and inform the strategy for ultra low emission vehicles in the UK.

In this publication

This publication has been revised for the following reasons:

- The original release omitted data from Cornwall Council, approximately 2,500 charging events. This has now been added to the underlying data and analysis presented in this release.
- Some of the chargepoints reported to DfT as rapids were actually fast chargers. Charging events from fast chargers have been removed and added to our separate publication on Public Sector Fasts. This removed approximately 25,000 events from the dataset and resulted in slightly higher average energy supplied per event and shorter average durations. Most of the figures in the release have been revised.
- Further analysis has revealed that several local authorities received funding for chargepoints outside their geographical boundaries, for example via joint bids. Therefore the local authority name does not indicate where the chargepoint is located. Less than half of the chargepoints had an identifiable location, so geographical analysis is not possible and the local authority map has been removed.



Key findings:

- **Energy supplied** The median average energy supplied by rapid charging events was 9.3 kWh. As there was a minority of very large charges from vehicles with battery capacities of up to 100 kWh, the median or central amount of energy supplied is more representative than the mean average of 11.0 kWh (see histogram on p4).
- **Plug-in duration** Data was only available on the duration the vehicle was plugged-in to the chargepoint rather than the actual charging duration. The median average plug-in time was 29 minutes. The mean average was 38 minutes, as there were a number of extremely long plug-in times of up to 5 days in duration.
- **Time and day of plugging-in** The frequency of charging events was affected more by the time of the day than the day of the week.

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This statistical release presents statistics on chargepoint data from 27 local authorities. Caution must be taken when comparing the authorities concerned, as they vary both in size and in the number of chargepoints installed.

Analysis is based on the location of the local authorities which received grant funding, not the location of chargepoints. Some local authorities received funding for chargepoints outside their geographical boundaries. However the majority of the chargepoints are expected be within the geographical area of the Local Authority which made the bid. It was only possible to identify locations for less than half of the chargepoints in the dataset, so this is uncertain.

Local authority rapid charging data from years 2014, 2015 and 2016: Chargepoint data from years prior to 2017 were incomplete, as local authorities installed chargepoints at varying dates over a three year period. 2017 is the first year of complete data and has therefore been used as the basis for all analysis in this release.

Local authorities that supplied data are listed below:

Local Authorities	Number of chargepoints
Aylesbury Vale District Council	3
Basingstoke and Deane Borough Council	1
Bristol City Council	11
Cheshire East Borough Council	6
City of York Council	8
Cornwall Council	30
Cotswold District Council	2
Cumbria County Council	5
Dartford Borough Council	3
Dudley Metropolitan Borough Council	3
Essex County Council	3
Hackney Borough Council	3
Hampshire County Council	14
Hyndburn Borough Council	1
King's Lynn and West Norfolk	4
Milton Keynes Council	59
Northumberland County Council	15
Poole Borough Council	15
Royal Borough of Greenwich	4
Slough Borough Council	1
South East EV (Rapid Charger) Network	17
South Tyneside Borough Council	4
Stockton-on-Tees Borough Council	1
West Yorkshire Combined Authority (WYCA)	1
Wiltshire Council	5
Wokingham Borough Council	6
Worcestershire County Council	12

This list will only include chargepoints for which at least one valid charging event was recorded.

All analyses are restricted to those charging events that actually drew some positive charge. Plug-in events that registered no electric charge or were less than or equal to 3 minutes in length were excluded. Other issues affecting the data and data quality are discussed in the background notes.

What is a local authority rapid chargepoint?

The Department for Transport has provided funding for the installation of a number of chargepoint schemes, of which local authority rapid chargepoints are one. These would typically be installed in areas of on-street parking associated with local authority managed roads, although other locations are also likely, including locations outside the geographical boundary of the funding recipient. Such chargepoints are separate to those in other locations such as in workplaces or at home, which some drivers will also use. **For more details see p13.**

Energy supplied

The median average energy withdrawn from local authority rapids was 9.3 kWh per charge in 2017, whilst the mean average was 11 kWh. This difference is caused by the 5% of charge events that were greater than 25 kWh, which influence the mean value more than the median. Consequently, in this case the median average charge is a better reflection of a typical charge event than the equivalent for the mean.

50% of charging events drew between 5.0 to 14.5 kWh. There was a consistent increase in the number of events up to the 5.0 - 7.0 kWh range, with a marked drop off after this point.

Given the battery capacity of popular vehicles that use chargepoints, such as the Mitsubishi Outlander (12.0 kWh), and that many vehicle owners will also charge at home, this finding is consistent with expectations.

A charging station can have multiple chargepoints, but each chargepoint has a connector compatible with a number of electric vehicles. Compatibility depends on the vehicle manufacturer, though it is possible for local rapids to charge anything from a Nissan Leaf to a Tesla Model X. Charging events drawing greater than 30 kWh could be attributed to fully electric vehicles such as the latest Nissan Leaf, while smaller amounts could be explained by a wider variety of cars topping up. It is worth noting that most charges never reach maximum capacity, with many car models limiting charging below the maximum level to extend battery life.

Despite excluding all charging events greater than 100 kWh (see p14), there were 61 charging events that drew more than 70 kWh of energy.

Why do we use median averages to examine chargepoint data?

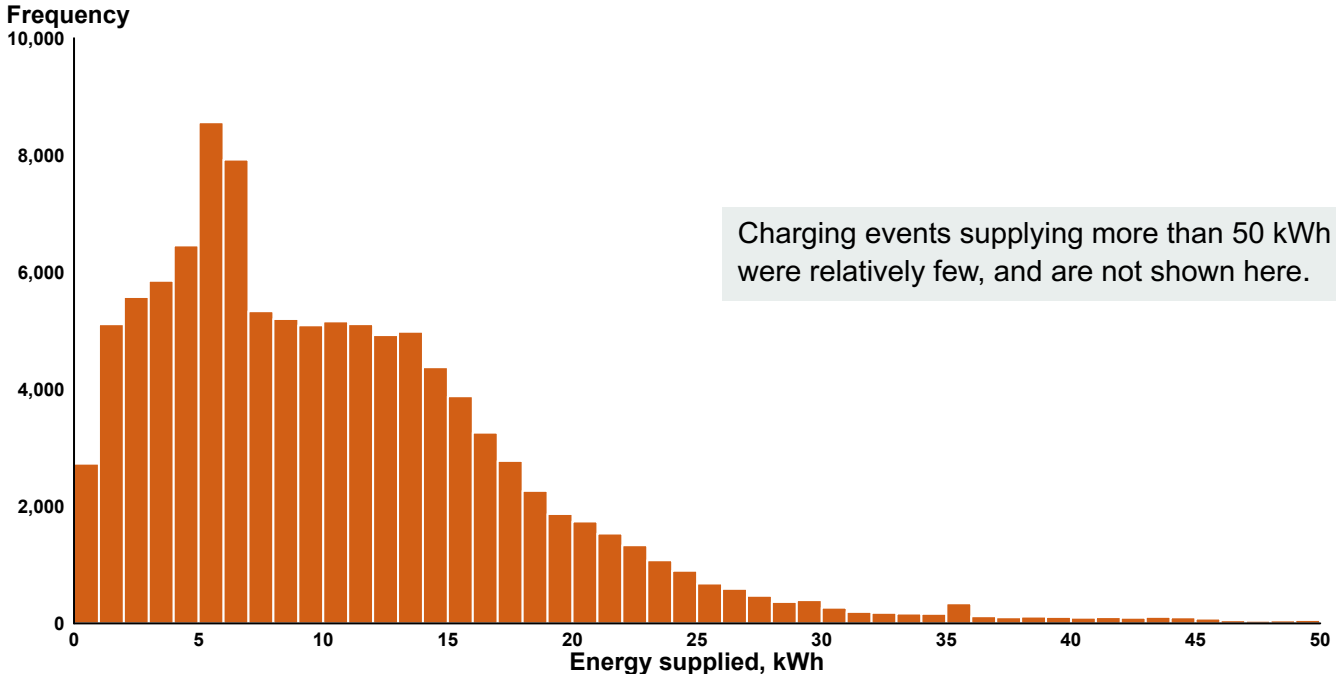
The mean and median are both measurements that attempt to capture how a typical entry in a data set may look like.

The mean is usually called the “average” and takes into account every number in the dataset. As every number is used to calculate the mean, its value is easily influenced by extreme values or ‘outliers’.

The median value divides the charges in two equal halves, so that half of the values are below it, and half are above. It is less affected by the outliers in the dataset.

Consequently this publication typically uses the median average to describe the data.

Distribution of energy withdrawn for local rapids charging events in 2017

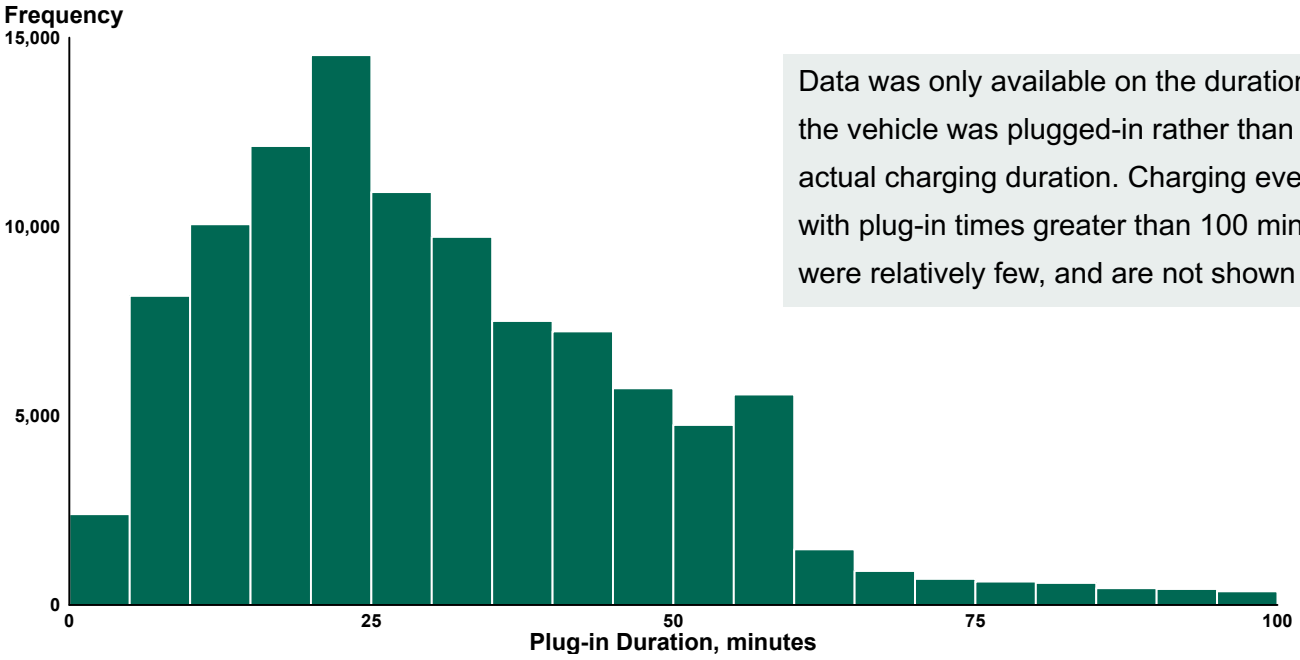


Charging events supplying more than 50 kWh were relatively few, and are not shown here.

Duration of Plug-In Time

23 charging events exceeded 24 hours, with some events lasting longer than 5 days. This meant the mean plug-in time was 38 minutes, whereas the median plug-in time was 29 minutes. 60% of the plug-in times were between 10 - 40 minutes long, with 81% of charging events ranging between 10 - 60 minutes. The histogram below shows the plug-in duration of charging events divided into 5 minute intervals. It can be seen that the interval with the greatest number of events actually had plug-in times around 25 minutes in length. The number of events plugged-in for longer then declines, with a small peak for plug-in times around 60 minutes in length.

Plug-in duration for local rapids charging events in 2017



Data was only available on the duration the vehicle was plugged-in rather than the actual charging duration. Charging events with plug-in times greater than 100 minutes were relatively few, and are not shown here.

Day of Plugging-In

Number of charging events

There were only small differences across the week in the number of charging events, with the proportion of charging events recorded per day ranging between 13% and 16%.

Sundays were slightly less popular, with the proportion of charging events being 13%. Thursday charging was a little more frequent, with each day accounting for roughly 15% of all charging events. Friday was the favourite day of the week for charging with the largest share of 16%.

Day of the week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
% of charging events	13%	14%	14%	14%	15%	16%	14%

Energy supplied

There were only small differences in the median and mean charge supplied across the week, as shown in the table below. However, small differences must be taken with caution as measurements were given with varying degrees of accuracy, with some being recorded to one decimal place.

Day of the week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Median energy supplied, kWh	10.0	9.1	9.1	9.2	9.2	9.4	9.4
Mean energy supplied, kWh	11.6	10.9	10.8	11.0	10.8	11.0	11.2

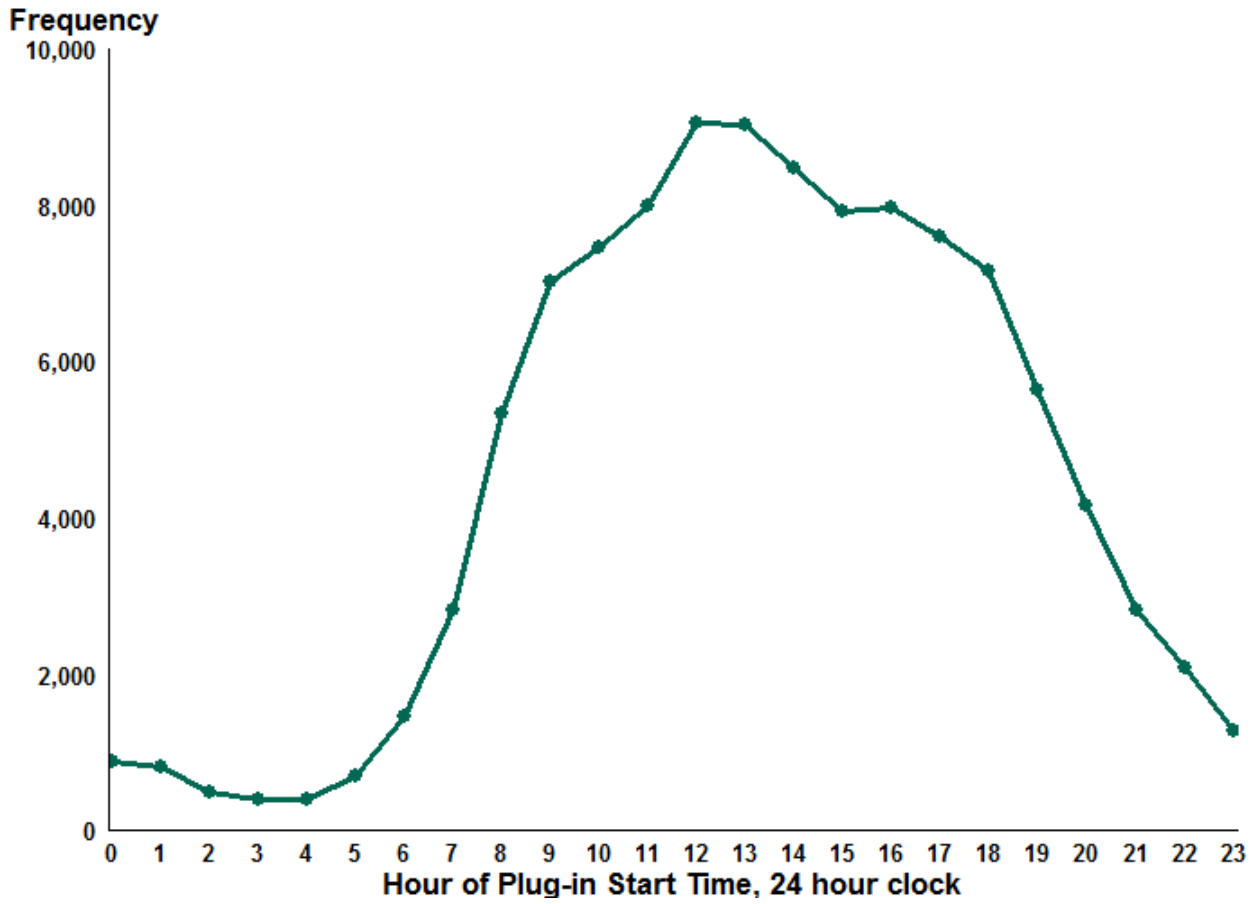
Plug-in duration

The mean plug-in duration for each day of the week ranged between 38 - 42 minutes. The mean average plug-in duration was larger than the median plug-in duration, which was consistent at around 28 - 30 minutes throughout the week.

Day of the week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Median plug-in time, mins	30	28	28	29	28	28	29
Mean plug-in time, mins	37	37	39	38	38	42	36

Time of Plugging-In

Number of charging events by plug-in start time, local rapids 2017



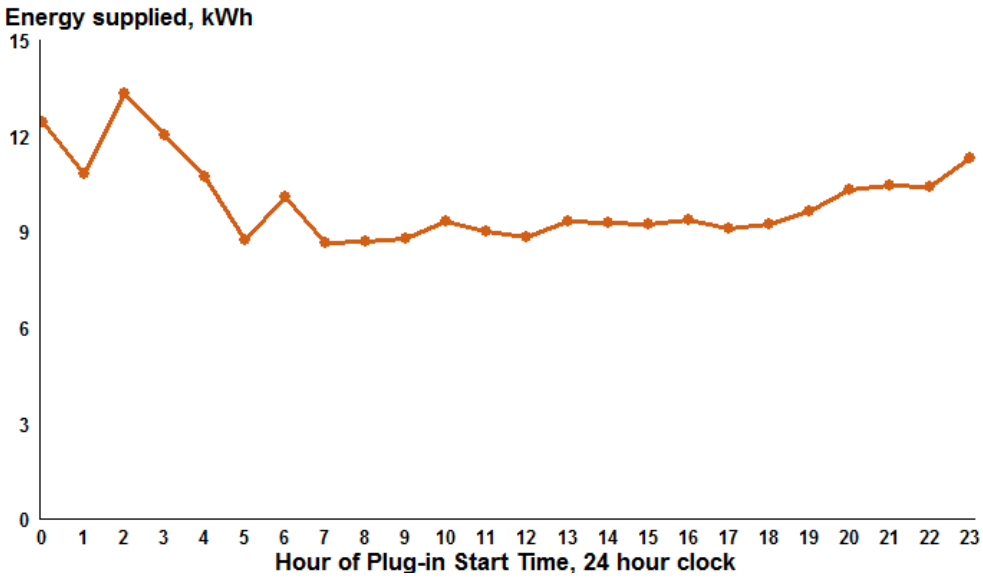
Frequencies are shown in 'top-of-the-hour' format, so that the point at 12 hours represents events occurring between 12:00 and 13:00.

The frequency of charging events was much more affected by time of day than day of the week.

For example, the number of charging events where plug-in was during the peak hour of 12:00 to 13:00 was 9,054 in 2017, whereas only 379 charging events started during the least popular hour from 03:00 to 04:00. This lunchtime peak for publically-located rapid chargepoints is in contrast to the charging profile of domestic chargepoints, which tend to be used for charging overnight.

The profile of the number of charging events per hour was consistent with this pattern across all the days of the week, initially rising from the early hours of the morning before reaching a peak at lunchtime. The number of charging events then rapidly declines after 14:00, levelling off only briefly in the late afternoon.

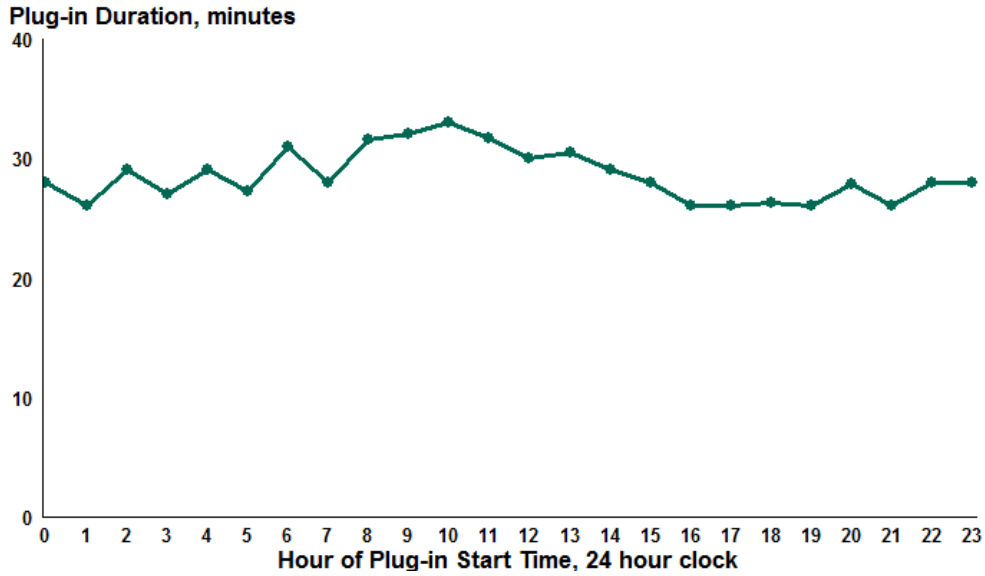
Median average energy supplied by hour of start time, local rapids 2017



While peaks in the hours where charging events were infrequent should not be overinterpreted, on average larger amounts of energy were supplied when vehicles were plugged-in in the evening and at night.

This may indicate a higher number of 'top up' charges take place during the day.

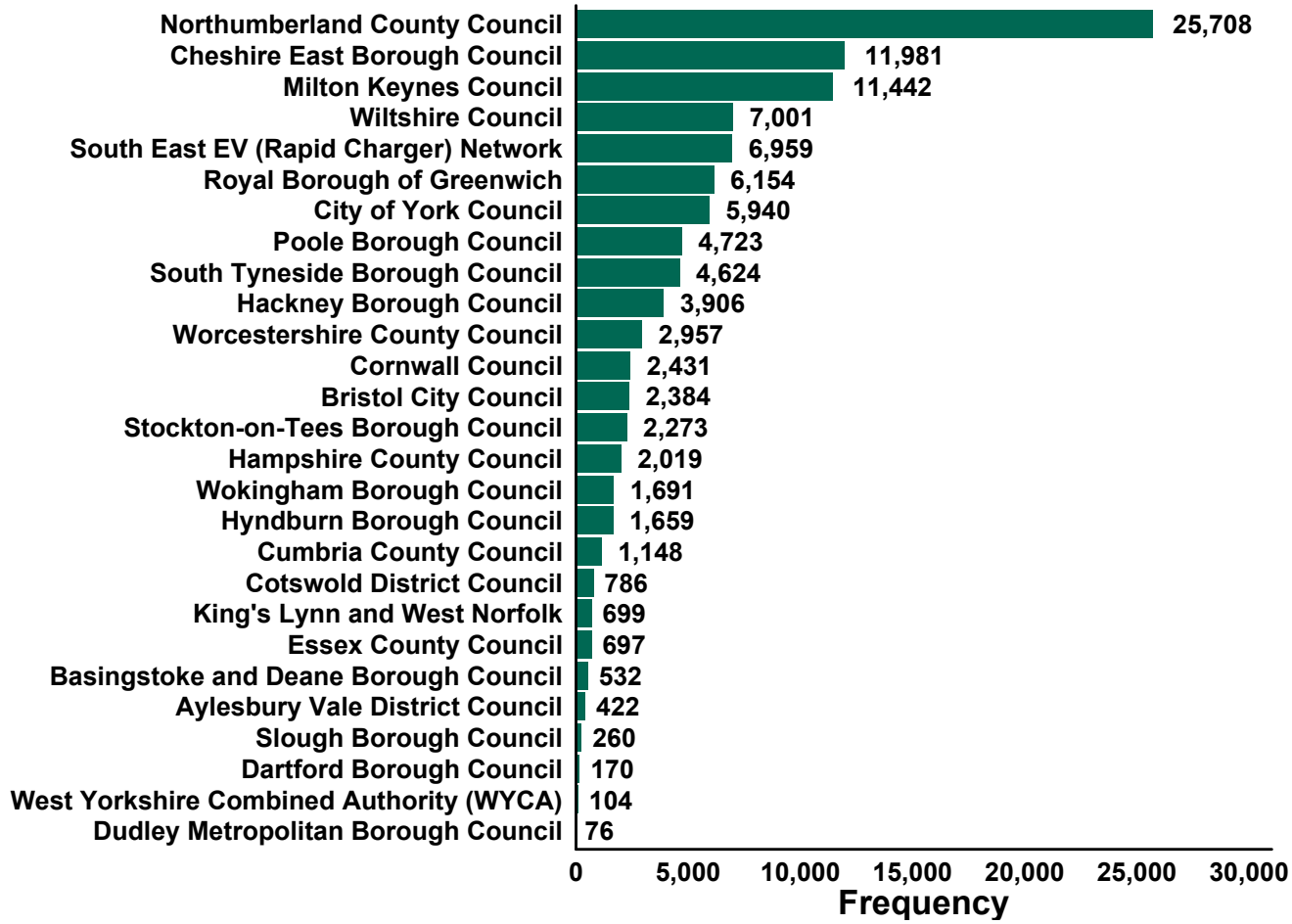
Median average duration of plug-in by hour of start time, local rapids 2017



The median average plug-in time did not vary greatly for events starting at different times during the day, except that events starting mid-to-late morning tended to be slightly longer than those at other times.

Frequencies are shown in 'top-of-the-hour' format, so that the largest value for median energy supplied for all events in 2017 were for events plugged-in between 02:00 and 03:00.

Total number of rapid charging events by local authorities in the Local Authority Grant Fund scheme, 2017*



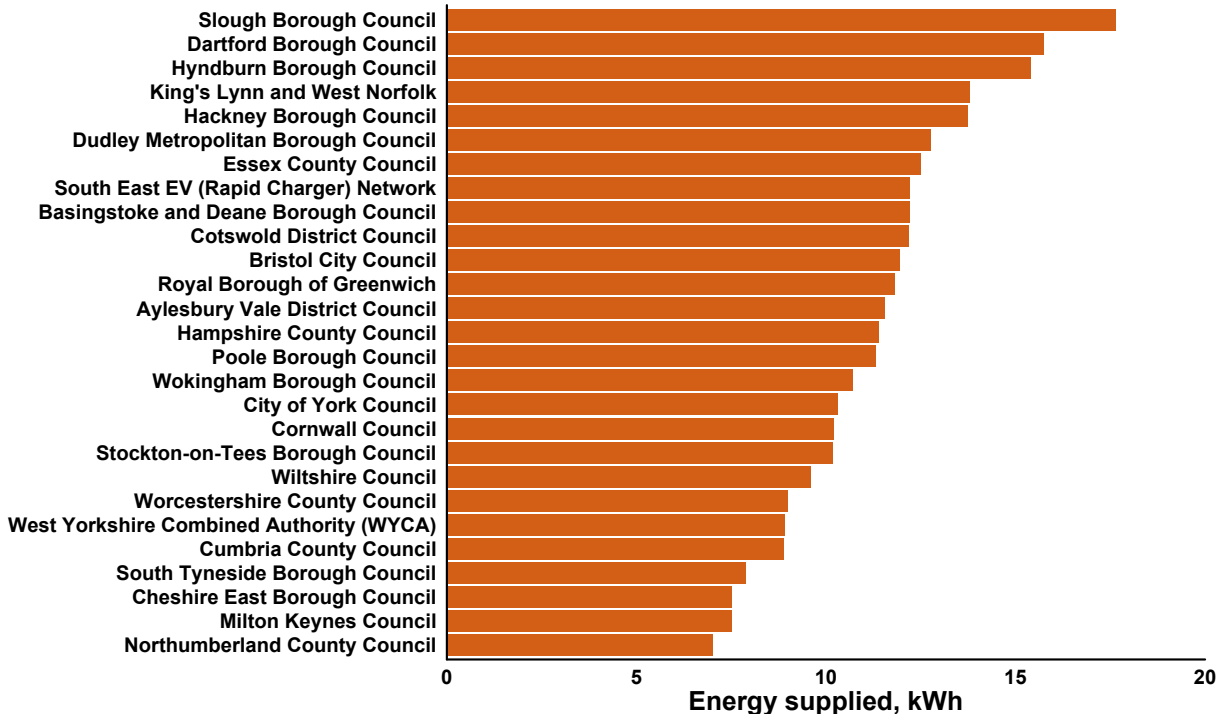
*Charging events less than or equal to 3 minutes, supplying greater than 100 kWh, and charging events that are believed to have been recorded incorrectly have been removed. For further details, please see background notes (p14).

When considering these results, it is important to note that chargepoints are not necessarily located within the geographical boundary of the local authority which received the funding. In addition the size and type of the local authorities may vary considerably. For example, Northumberland County Council is much larger than Dartford Borough Council which is located within the County of Kent and therefore they would not be comparable. This is because all levels of local authority were permitted to apply for grants from the Local Authority Grant Fund.

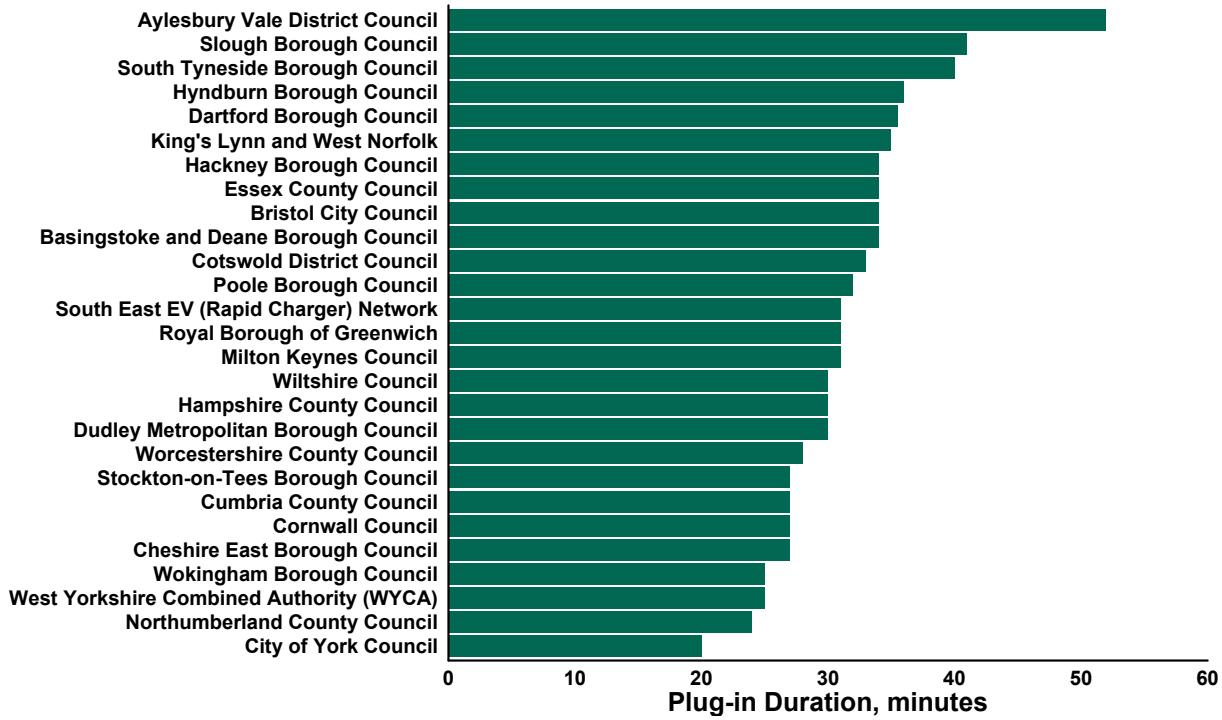
Other possible factors affecting usage would include rurality, proximity to major roads, traffic levels and local pricing, as well as the actual number of chargepoints installed.

The number and location of non-government funded chargepoints in each area would also affect results.

Median average charge supplied at local rapid chargepoints in 2017, by funding recipient

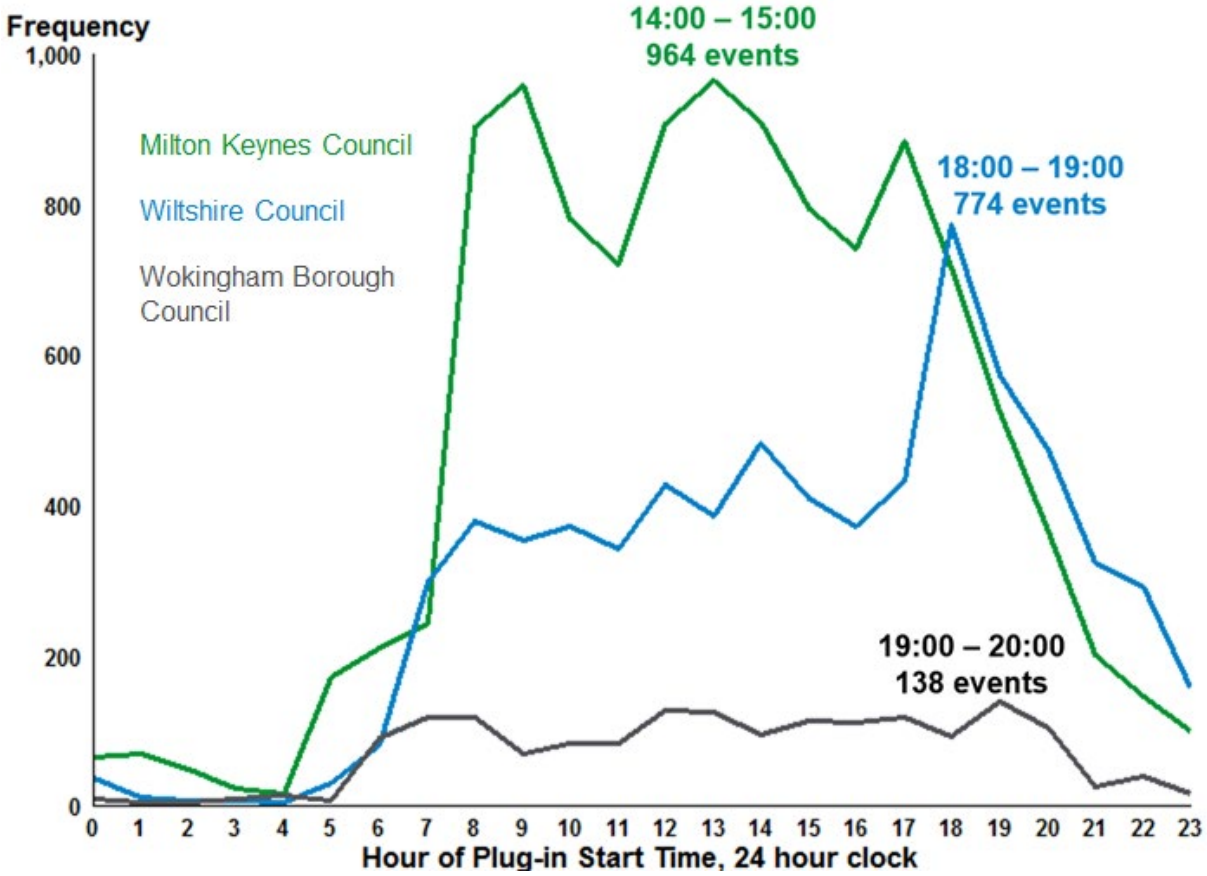


Median plug-in duration at local rapid chargepoints in 2017, by funding recipient



Aylesbury Vale District Council had the longest median plug-in time with 52 minutes, and City of York Council had the shortest with a median of only 20 minutes. Some differences can also be seen when comparing local authorities that have similar and relatively large numbers of charging events in 2017. For example, Milton Keynes Council appears to have longer charging events than Cheshire East Borough Council, despite recording a similar number of events.

Differences in peak charging time for different funding recipients, local rapids 2017



Frequencies are shown in 'top-of-the-hour' format, so that the point at 12 hours represents the total number events occurring between 12:00 to 13:00.

Most recipients had 3 noticeable peaks in activity in the morning, lunchtime and early evening. The majority experienced their greatest number of charging events at lunchtime, which is reflected in the overall peak hour at 12:00 - 13:00 in the graph on p6.

Some variation is naturally expected in local authorities with a small number of users. However, even for authorities with a larger number of charging events such as Milton Keynes, Wiltshire and Wokingham there are still notable differences in charging profiles between recipients, as shown in the graph above.

Milton Keynes' peak hour was between 14:00 - 15:00, while Wiltshire and Wokingham's were between 18:00 - 19:00 and 19:00 - 20:00 respectively. The highest number of events and peak hour for charging are labelled on the graph above.

The 30 most popular local rapid chargepoints in 2017

CP_ID	Local Authority Name	Frequency
70035	Northumberland County Council	3,254
41119	Northumberland County Council	3,050
South Drive 1	Cheshire East Borough Council	2,987
South Drive 2	Cheshire East Borough Council	2,862
70038	Northumberland County Council	2,769
70033	Northumberland County Council	2,643
70623	Royal Borough of Greenwich	2,540
70041	Stockton-on-Tees Borough Council	2,273
21023	Wiltshire Council	2,095
Love Lane 1	Cheshire East Borough Council	1,912
70093	Northumberland County Council	1,886
21026	Wiltshire Council	1,871
70030	Northumberland County Council	1,839
62040	City of York Council	1,795
70034	Northumberland County Council	1,785
62031	City of York Council	1,767
21029	Hyndburn Borough Council	1,659
21025	Wiltshire Council	1,622
70625	Royal Borough of Greenwich	1,585
70096	Northumberland County Council	1,549
Princess Street 1	Cheshire East Borough Council	1,498
70624	Royal Borough of Greenwich	1,458
GP10043	Hackney Borough Council	1,447
40059	South Tyneside Borough Council	1,419
41116	Northumberland County Council	1,411
Princess Street 2	Cheshire East Borough Council	1,400
GP10045	Hackney Borough Council	1,393
40047	South Tyneside Borough Council	1,369
70630	South East EV (Rapid Charger) Network	1,345
21027	Wiltshire Council	1,343

Chargepoints from the local authorities recording the largest number of charging events feature prominently in the table above, particularly Northumberland CC, Cheshire East BC, Wiltshire Council and City of York Council

Both London boroughs on the scheme, RB Greenwich and Hackney BC, featured in the top 30 most used chargepoints and none of their chargepoints appeared in the bottom 30 list. Of the 3 most popular Greenwich rapids to make the list, one was the 7th most popular overall, with Hackney's most used at 23rd and 27th.

The 30 least popular local rapid chargepoints in 2017

Chargepoint ID	Local Authority Name	Frequency
APT_CWL18	Cornwall Council	2
22025	Milton Keynes Council	4
APT_CWL01	Cornwall Council	5
APT_CWL26	Cornwall Council	5
22046	Milton Keynes Council	6
APT_CWL22	Cornwall Council	6
APT_CWL20	Cornwall Council	7
APT_CWL25	Cornwall Council	7
CPS199	Cornwall Council	8
70585	Dudley Metropolitan Borough Council	11
APT_SSE05	Hampshire County Council	13
APT_CWL23	Cornwall Council	14
GP10133	Hampshire County Council	14
21013	Milton Keynes Council	17
60467	Bristol City Council	17
APT_SSE04	Hampshire County Council	18
70586	Dudley Metropolitan Borough Council	20
22023	Milton Keynes Council	23
APT_CWL35	Cornwall Council	24
APT_CWL24	Cornwall Council	27
APT_SSE07	Hampshire County Council	27
GP10140	Cornwall Council	30
APT_SSE01	Hampshire County Council	33
GP10144	Cornwall Council	35
GP10143	Cornwall Council	36
22044	Milton Keynes Council	38
APT_CWL19	Cornwall Council	38
60615	Dartford Borough Council	40
APT_CWL21	Cornwall Council	42
APT_CWL33	Cornwall Council	43

Cornwall Council had the largest number of chargepoints in the bottom 30 least used category, with 16 chargepoints making the list. Milton Keynes Council and Hampshire CC each had 5 single chargepoints that made the list.

Background Notes and Limitations of the Data

In February 2013 the Secretary of State for Transport announced a series of grant schemes for plug-in vehicle chargepoints. Since that time, the Government has provided up to 75% towards the cost of installing new chargepoints.

There were various National Infrastructure Schemes (Public Sector Estate, Train Stations and Local Authority Rapids), which funded charging infrastructure (over 580 fast chargepoints and 250 rapids) between 2013 and 2015. All three national infrastructure schemes ended in 2015.
As part of their project to fund both public and private chargepoints, OLEV is collating usage data from plug-in vehicle chargepoints that have been installed using Government funding. The purpose of this is to provide detail on patterns in chargepoint usage thereby informing future installations of charging infrastructure as well as wider policy.

A condition of the grant was that usage data from the chargepoints was to be provided to OLEV for a period of three years following installation. This data and analysis is being made available to help the industry grow.

This publication is one of three published by the DfT in 2018. The other publications are:

- Electric Chargepoint Analysis 2017: Public Sector Fasts, published 13 December 2018
- Electric Chargepoint Analysis 2017: Domestics, published 13 December 2018

All publications cover the calendar year 2017. 2017 is considered to be the most complete year of data and it is not expected that there will be any rapids data published covering later dates.

Background Notes and Limitations of the Data (continued)

- Depending on the source of the data, there can be marked differences in how the individual charging events have been recorded. With the example of charge time, some organisations and local authorities have rounded their start and end time to the nearest half hour while others have provided the exact hours, minutes and seconds.

- Some data has also had to be excluded because it is incomplete, for example no start time or start day, end day or end time. Some events that were not consistent with local rapid chargepoints, and assumed to be accidentally included from other schemes, have also been excluded.

- There are also a number of extremely long events, and short charging events with zero energy supplied. The way that the charging units are designed means that charging sessions do not end until the charging connector has been fully closed. Users sometimes fail to close sockets properly which would lead to the plug-in duration to continue to be recorded until a new user arrives or the maintainer of the charging socket closes it properly. Though plug-in times less than or equal to 3 minutes have been removed, extremely long charging events have driven up the mean average plug-in duration considerably. Therefore care must be taken when looking at the longest plug-in times, which considered alone are potentially misleading.

- Finally, the data does not include chargepoints funded by private companies as it only looks at those partially funded by the grant from OLEV. Therefore when interpreting the data it is important to note that this analysis will not include every chargepoint.

Usage data from OLEV funded chargepoints is currently set to finish 3 years after each scheme's chargepoints have been installed, as per the original conditions of the grant. Again, as chargepoints were installed at different dates, data collection will end at different times for each local authority.

Background Notes and Limitations of the Data (continued)

This the first in the series of ad-hoc statistical releases on electric chargepoint data, and as such we intend to continue to explore ways in which our analysis might be improved. We would welcome feedback from users of the statistics, including suggestions for improvement. This can be provided via environment.stats@dft.gov.uk.

Data tables. This release is a summary of the 2017 rapid chargepoint data that is available together with data tables accompanying this publication from GOV.UK: https://www.gov.uk/government/collections/energy-and-environment-statistics.

Notes and definitions. A technical note describing the data sources, definitions and data issues in more detail can be found alongside the publication on GOV.UK.

Experimental Statistics. These statistics are badged as Experimental Statistics. Users should exercise caution when using them or interpreting findings. The data has been provided by third parties and we do not have a full picture of how it is collected and collated. The statistics are therefore still subject to testing in terms of their volatility and ability to meet customer needs. They do not meet the rigorous quality standards of National Statistics, for example with respect to partial coverage. Further details on the limitations of Experimental Statistics can be found at: https://www.ons.gov.uk/methodology/methodologytopicsandstatisticalconcepts/guidetoexperimentalstatistics.

Details of Ministers and officials who receive pre-release access to these statistics up to 24 hours before release are published on GOV.UK.

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