Department for Transport

Electric Chargepoint Analysis 2017: Public Sector Fasts

About this release

This release presents experimental statistics on the usage of fast electric vehicle chargepoints part-funded by the Office for Low Emission Vehicles (OLEV). Public sector entities, including rail companies, that received grants from the Local Authority Grant Fund (LAGF) provided data to OLEV as a condition of the grants. Complete data is only available for 2017.

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

Key findings:

- **Energy supplied** The median average energy supplied by fast charging events was 6.7 kWh. The mean average energy supplied was 8.6 kWh, as there were a small number of charges from vehicles with larger-capacity batteries.

- **Plug-in duration** The median average plug-in time was just short of 3 hours, at 179 minutes. The mean average duration was much higher at 7 hours 24 minutes, as there were a number of extremely long plug-in times of up to 14 days in duration.

Data represents the time that the vehicle was plugged in. It is not possible to identify when the vehicle was actually drawing charge.

- **Time and day of plugging-in** Fast charging events were noticeably more frequent on weekdays and during daylight hours. This may be related to the location of the chargepoints, which is typically on or near public sector property such as local government offices. This type of property may be likely to be used less on the weekends.

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. Train station charging data is not included in the analysis due to the small size of the dataset, but it is included in the raw dataset. Please see the notes and limitations section for more details.

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What is a public sector fast chargepoint?

The Office for Low Emission Vehicles has provided funding towards the installation of chargepoints via a number of grant schemes. This includes funding for public sector bodies and train operating companies to install fast chargepoints. These would typically be installed in areas of on- or off-street parking associated with a public body, and can be used by their employees or the public. This publication focuses on funded fast chargepoints which have a power rating of 7-22 kW. **For more details see p8.**

There were 103,300 charging events recorded across approximately 540 fast chargepoints. 35 public sector bodies provided data for 2017.

Around 6,000 charging events did not have any chargepoint identifier. It is also possible that chargepoint identifiers may not be consistent across time, and a single chargepoint may have more than one ID in the dataset. For this reason, the number of chargepoints should be read as an estimate.

Public Sector Body	Number of chargepoints	Average number of charging events per chargepoint
Bristol City Council	1	480
Cheshire East Borough Council	5	87
City of Bradford Metropolitan District Council	3	167
City of York Council	6	81
Cornwall Council	34	24
Croydon Council	4	30
Cumbria County Council	4	79
Defence Science and Technology Laboratory	9	117
Department for Regional Development Northern Ireland	N/A	N/A
Derbyshire Community Health Services NHS Trust	10	212
Driver and Vehicle Licensing Agency	2	230
Durham County Council	5	34
Exeter City Council	11	244
Hampshire County Council	13	52
Kent County Council	27	223
Lancashire Borough Council	2	124
Leeds City Council	11	258
London Fire and Emergency Planning Authority	78	85
Merseytravel	25	184
Milton Keynes Council	97	208
North Hertfordshire Council	5	255
Northumberland County Council	22	258
Oxford City Council	3	423
Plymouth City Council	24	214
Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	4	322
Slough Borough Council	4	66
South East Coast Ambulance NHS Foundation Trust	13	45
South Tyneside Borough Council	1	175
Southern Health NHS Foundation Trust	5	141
Sunderland City Council	3	28
The Open University	2	173
Transport Scotland	72	307
University of Leeds	9	299
West Berkshire Council	2	109
Wiltshire Council	26	181

Data on charging events was provided by each public sector body in the above list. The number of chargepoints recorded reflects those that had at least one valid charging event during 2017. The Department for Regional Development Northern Ireland's data did not include chargepoint identifiers so we could not establish the number of chargepoints.

Four train operating companies provided chargepoint usage data for 2017, however data sharing commitments for some companies did not cover the whole of 2017, and the number of valid charging events for other companies, despite covering the whole year, was too low to enable any meaningful analysis to be produced for this publication. In the interests of transparency, train operating company charging event data has been included in the raw data file published alongside this document.

Energy Supplied

The median average energy withdrawn from public sector fast chargepoints was 6.7 kWh per charge in 2017, whilst the mean average was 8.6 kWh. This difference is caused by the 3% of charge events that were greater than 25 kWh, which influence the mean value more than the median.

71% of charging events drew less than 10 kWh. A further 23% of events drew 10 - 20 kWh, meaning that only 7% of events drew more than this.

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

A chargepoint location can have multiple connectors, which will be compatible with a range of different electric vehicles. It is possible for fast chargepoints to charge any electric vehicle from a Nissan Leaf to a Tesla Model X, although the speed of charging for each vehicle will be limited by the capability of its on-board charger with not all models able to accept the full charging speed of the chargepoint.

Charging events drawing greater than 30 kWh could be attributed to fully electric vehicles with larger capacity batteries such as the latest Nissan Leaf, while smaller amounts can represent top-up charges for a wide range of vehicles.
Despite excluding all charging events greater than 100 kWh (see p8), there were 143 charging events that drew more than 70 kWh of energy.

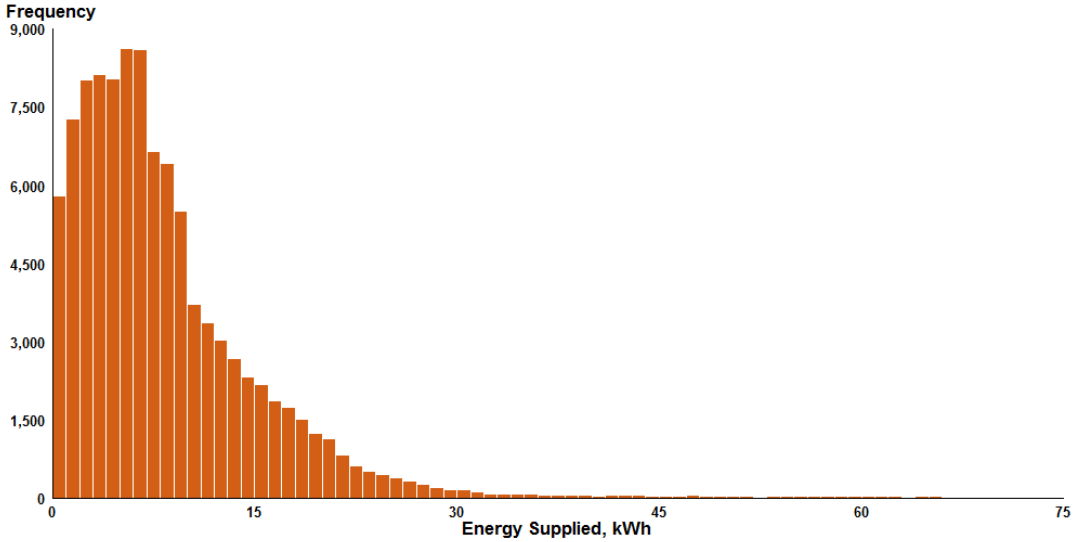
Why do we use median averages to examine chargepoint data?

The mean and median are both measurements that attempt to capture the centre point in a data set.

The mean is usually called the “average” and takes into account every number in the dataset. The median is the middle value, so that half of the values are below it, and half are above.

Chargepoint data follows a skewed pattern with a large number of short charging events and a long tail of longer events. The mean is more influenced by very long events so this publication typically uses the median average to describe the data.

Distribution of energy drawn for public sector fast charging events in 2017

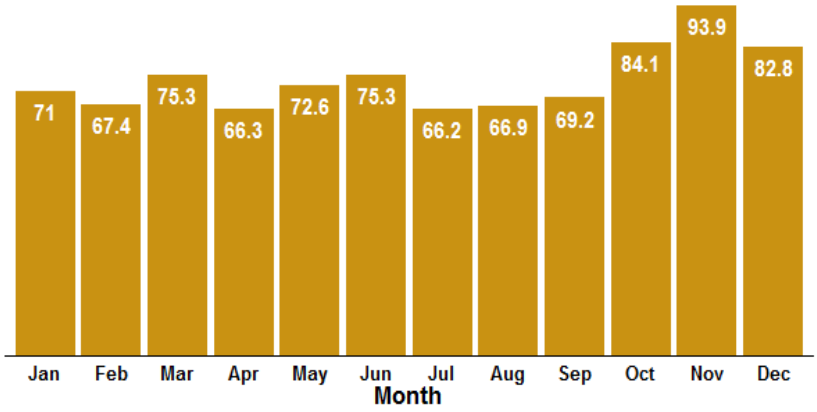


Charging events supplying more than 75 kWh were relatively few, and are not shown here.

Total Energy Supplied

891 MWh of energy were supplied across the whole of 2017 by fast charging events. The highest amount of energy was supplied in the last three months of 2017, which is consistent with an increasing number of plug-in vehicles being purchased over time.

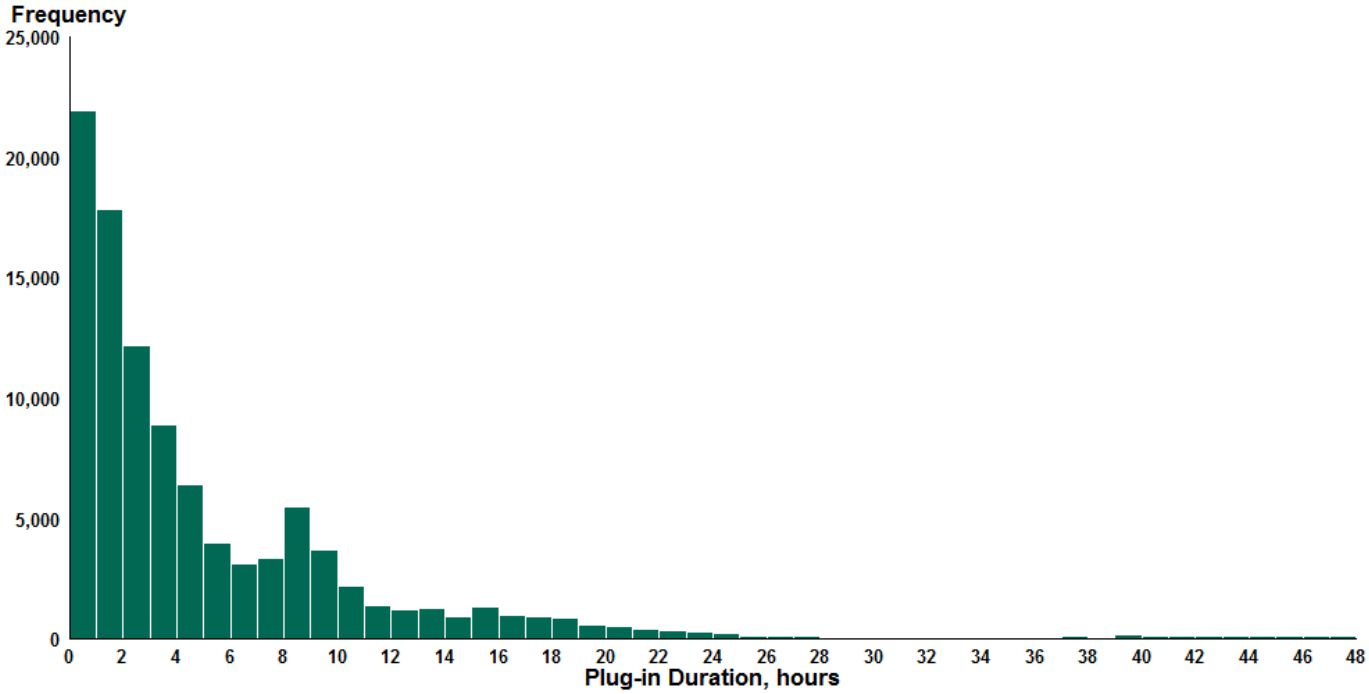
Total energy supplied by fast charging events in 2017 (thousand kWh)



Plug-in duration

4% of plug-in times exceeded 24 hours, with some events lasting longer than 5 days. This meant the mean plug-in time was 7 hours 24 minutes, though the median plug-in time was much shorter at just under 3 hours. 21% of the plug-in times were less than one hour, with a further 29% of charging events ranging between 1 and 3 hours. The histogram below shows the plug-in duration of charging events divided into hours. A small peak can be seen in the 8 hours interval, corresponding to an average working day. The number of events plugged-in for longer intervals is much smaller.

Plug-in duration for public sector fast charging events in 2017, hours



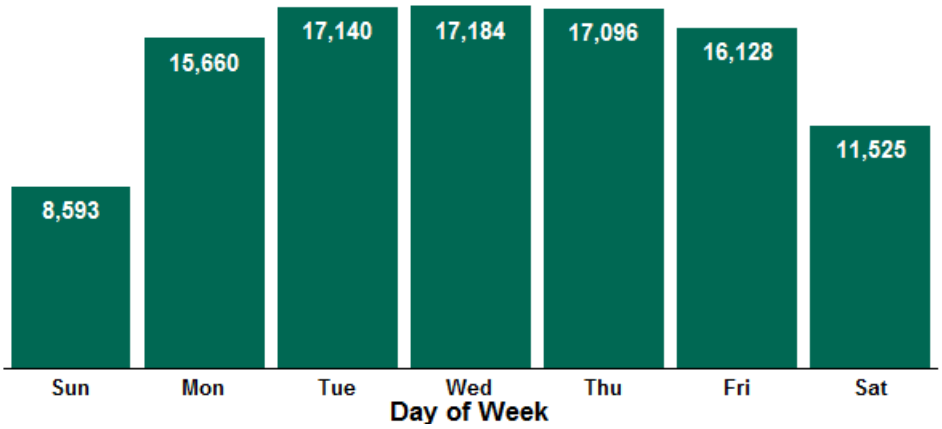
Data was only available on the duration the vehicle was plugged-in rather than the actual charging duration. 2% of charging events had plug-in times greater than 48 hours, and are not shown here.

Day of Plugging-In

Number of charging events

There were noticeably fewer charging events for fast chargepoints on the weekend, especially Sundays. This may be related to their location, which is typically on or near public sector property such as local government offices, which themselves may be likely to be used less on the weekend. Tuesday, Wednesday and Thursday were the most popular days of the week.

Number of charging events on each day of the week, 2017



Energy supplied

There were only small differences in the median and mean charge supplied across the week, as shown in the table below. Caution is advised when comparing small differences, as measurements were given with varying degrees of accuracy, with some charging events being recorded to only one decimal place.

Day of the week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Median energy supplied, kWh	6.3	6.9	6.7	6.9	6.8	6.7	6.0
Mean energy supplied, kWh	8.5	8.9	8.7	8.7	8.7	8.7	8.0

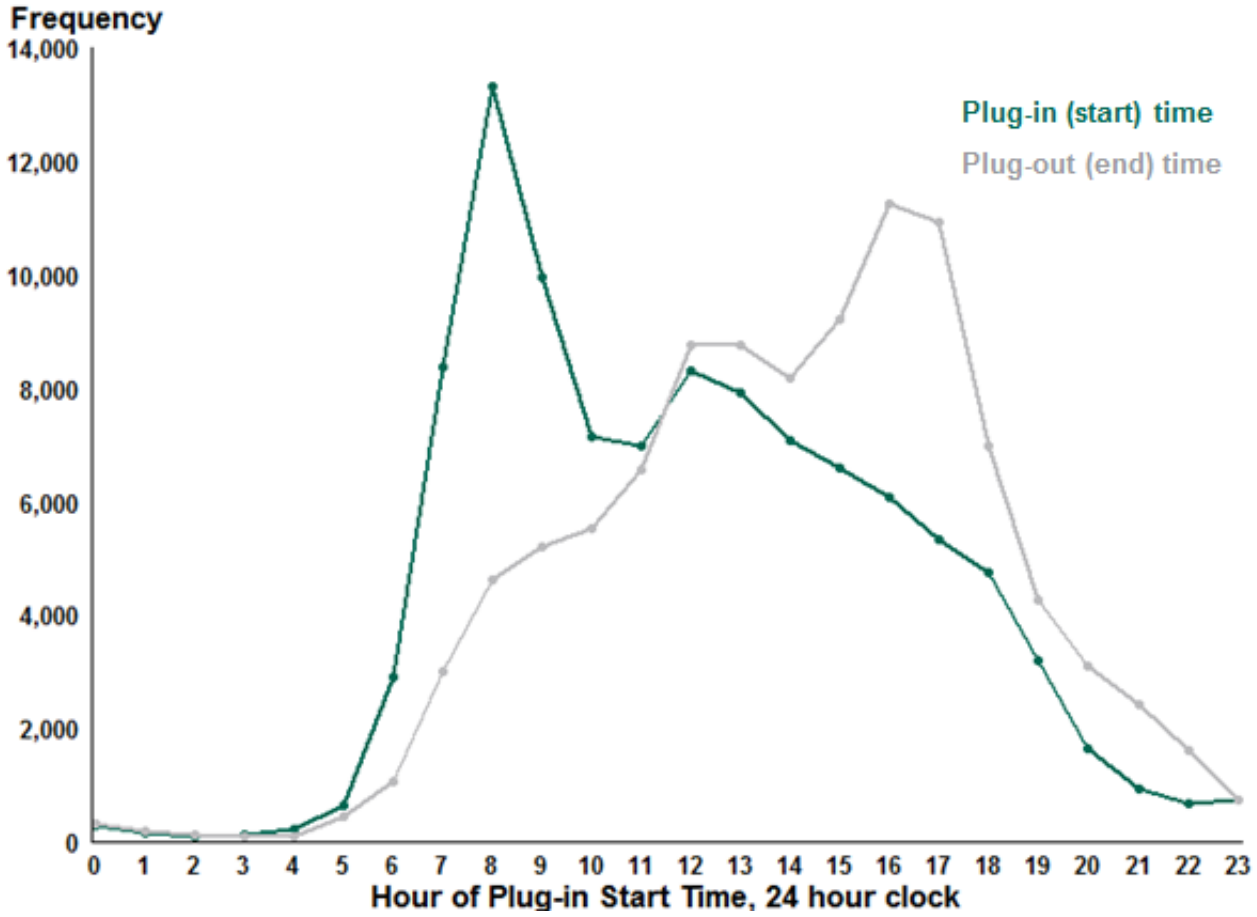
Plug-in duration

Similar to energy supplied, there was a different pattern in duration for weekday and weekend events. The mean average plug-in duration was consistently much larger than the median plug-in duration, which was around 3 and a half hours on weekdays and just under 2 hours on weekend days.

Day of the week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Median plug-in time	1h 50m	3h 33m	3h 37m	3h 29m	3h 28m	3h 17m	1h 51m
Mean plug-in time	5h 21m	6h 59m	7h 40m	7h 12m	7h 58m	9h 32m	5h 38m

Time of Plugging-In

Number of charging events by plug-in start time, public sector fasts 2017

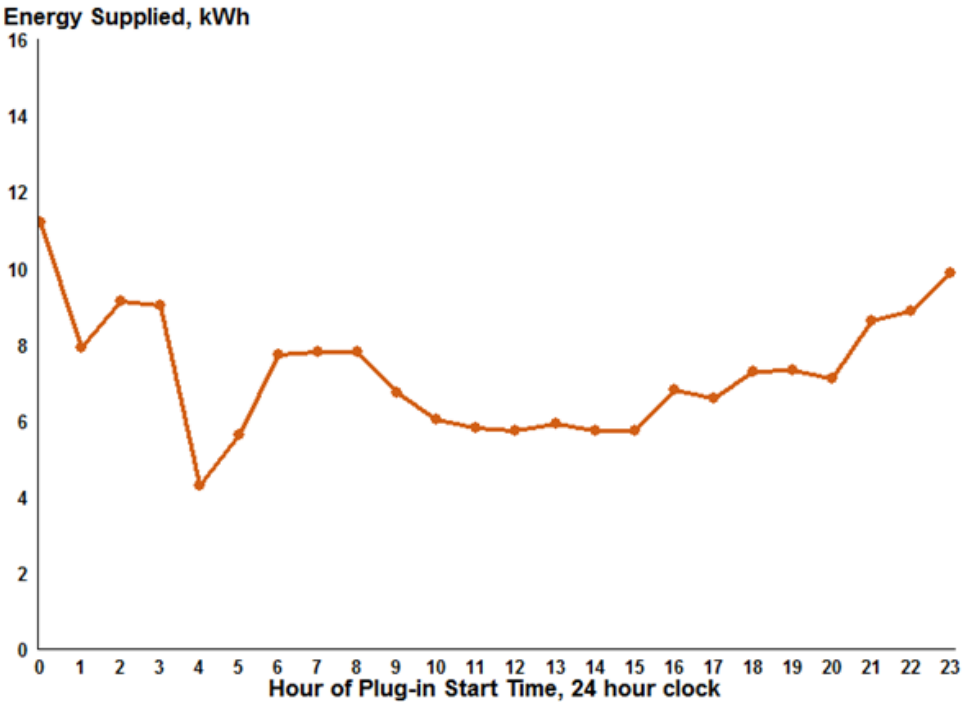


Frequencies are shown in 'top-of-the-hour' format, so that the point at 12 hours represents events occurring between 12:00 and 13:00.

The peak hour for plugging in was 8:00 - 9:00, with 71% of all events starting between 8:00 and 17:00. Few events start later in the evening or in the early hours of the morning. The most common plug-out times were in the early evening, perhaps corresponding to the end of a typical working day.

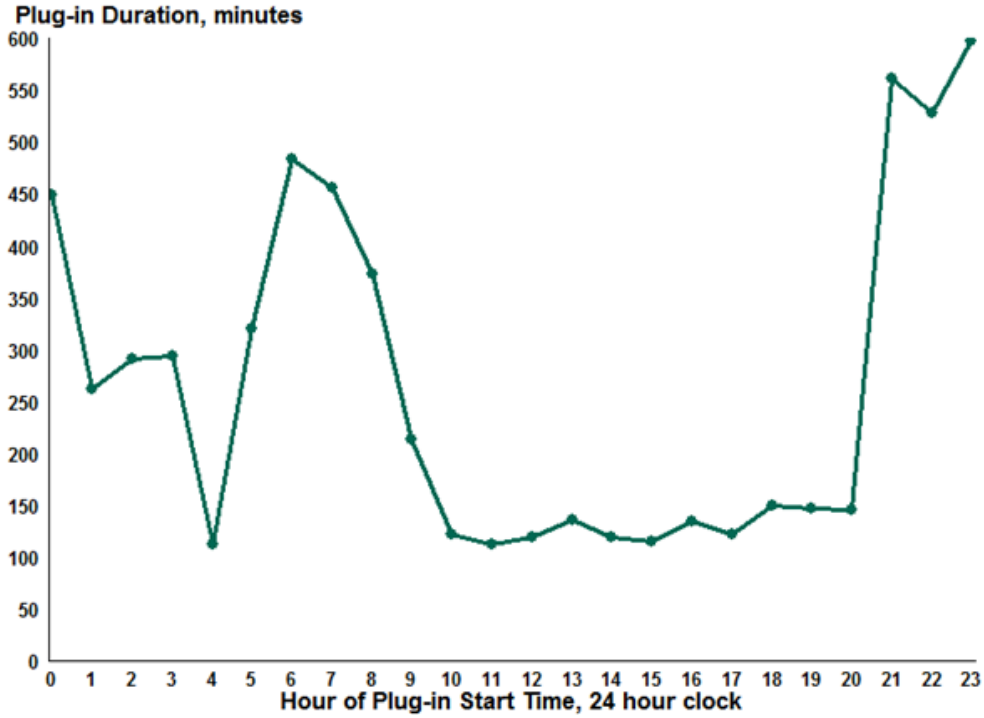
The profile of the number of charging events per hour was consistent on weekdays, in contrast to the weekend, where the most common start time was 12:00 - 13:00 on both Saturdays and Sundays.

Median average energy supplied by hour of start time, public sector fasts 2017



While peaks and troughs in the hours where charging events were infrequent should not be over-interpreted, there was a fairly consistent amount of energy supplied for events starting at different times of the day, with slightly higher amounts supplied at events starting during night-time hours.

Median average duration of plug-in by hour of start time, public sector fasts 2017



There are two clear peaks where the average charging duration was longest, around 06:00 - 07:00 and 22:00 - 0:00. The pattern for durations overnight should not be over-interpreted due to the low number of events occurring at those times.

Frequencies are shown in ‘top-of-the-hour’ format.

Background Notes and Limitations of the Data

Funding schemes for electric vehicle chargepoints

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 grant eligible 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. Data in this publication was provided under the Public Sector Estate scheme.

As part of their project to fund both public and private chargepoints, OLEV has collated 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: Local Authority Rapids, published 21 June 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 domestic data published covering later dates.

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. As chargepoints were installed at different dates, data collection will end at different times for each public body.

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 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.

- 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.

- We attempted to match provided chargepoint IDs to the National Chargepoint Registry in order to determine the location of the chargepoints. A basic matching exercise resulted in less than 10% of IDs matching. We have therefore been unable to determine the location of the chargepoints or provide any analysis based on location, however it may be possible to match records using more sophisticated matching techniques.

- Finally, the data does not include chargepoints wholly funded by private companies or individuals as OLEV can only collect data where it has provided grant funding. Therefore when interpreting the data it is important to note that this analysis will not include every chargepoint in the UK.

Background Notes and Limitations of the Data (continued)

This is part of a series of ad-hoc statistical releases on electric chargepoint data. We would welcome feedback from users of the statistics. This can be provided via environment.stats@dft.gov.uk.

Data tables. This release is a summary of the 2017 fast 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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