Office for
Low Emission
Vehicles

High level analysis of the Plugged-in Places chargepoint usage data

September 2013
Version 1.0

The Office for Low Emission Vehicles (OLEV) is a cross Government, industry-endorsed, team combining policy and funding streams to simplify policy development and delivery for ultra-low emission vehicles. OLEV currently comprises people and funding from the Departments for Transport (DfT), Business, Innovation and Skills (BIS), and Energy and Climate Change (DECC). The core purpose is to support the early market for electric and other ultra low emission vehicles (ULEVs). OLEV is based in DfT and this document is published by The Department for Transport.

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Chapter 1: Management Summary

1.1 Background

The Plugged in Places programme was set up by the Government in 2010 to deliver recharging infrastructure in the UK.

With most major vehicle manufacturers bringing some form of electric vehicle to the UK market in the next few years, the Government recognised that understanding drivers' requirements for recharging infrastructure and how best to support an emerging infrastructure market was key to the success of ultra low emission vehicle (ULEV) uptake in the UK. The PIP programme was therefore designed to be a learning programme. As well as supporting the 8 regionally based schemes to install infrastructure, it was important to learn as much as possible to help create the right conditions for this emerging market and provide the right infrastructure to meet driver requirements.

As part of the Plugged-in Places (PIP) Programme, the Office for Low Emission Vehicles (OLEV) is collating usage data from plug-in vehicle chargepoints that have been installed using Government funding in PIP areas to provide detail on patterns in chargepoint usage thereby informing future installations of charging infrastructure.

A condition of the PIP grant was that recharging usage data from the chargepoints was to be collected and provided to the industry to help the market grow. The first batch of usage data was collected by OLEV in December 2012, and has been published at www.data.gov.uk.

Alongside this first batch of data we are publishing a small amount of analytical work OLEV and the DfT have carried out. We carried this analysis out for two reasons:

- to investigate the usefulness of the data to the industry and to demonstrate at a high level the type of analysis which may be carried out
- to investigate some of the data to help support and inform the strategy for ultra low emission vehicles in the UK: 'Driving the future today' published today

This report details the high-level analysis of the first batch of data both to provide a picture of how the infrastructure already installed is being used, and to inform what future analysis might be undertaken. Data from 39,525 individual charging events were analysed covering a collection period of between August 2010 to December 2012.

The analysis confirmed that this data will be useful to the industry. For example, we see this data possibly being used by the electricity industry to help understand how clusters of chargepoints can impact on local electricity requirements, it could be important for infrastructure managers to identify where best to install the right type of chargepoint in different locations, it could help vehicle manufacturers understand the vehicle capabilities important to their customers, and it can help Government at national and local level in how best to support the rollout of further infrastructure.

It is important to recognise the limitations of the data, especially this first batch:

- To December 2012, very few rapid chargers had been installed across the UK, with only four 50kW rapid chargers in PIP regions. This clearly has an impact on the robustness of the analysis carried out with regard to rapid chargepoint usage. Recognising that drivers require the provision of rapid chargers to facilitate certain types of journeys, the Government announced a national grant scheme to help fund Local Authorities to install rapid chargepoints. Future releases of chargepoint usage data will include data from these chargepoints, and from the rapid chargepoints installed by PIPs since December 2012.

- From other studies in the UK, we know that most drivers charge at home and overnight, and this propensity to charge overnight is demonstrated by this data. However, most of the domestic chargepoints installed at home up to December 2012 through Plugged in Places did not have the ability to provide data. We are also aware that a lot of drivers may not have installed a chargepoint at home and were charging using a domestic 3-pin socket. We wish for vehicle owners to charge safely and securely at home, which is why we have a national grant scheme for domestic chargepoints, the usage data of which will also be released to add to the data analysed so far.

- There are many instances in the data of extremely long charging events, extremely short or zero energy drawn charging events, and some invalid dates or time of charging. Most of these instances have been excluded from the main analysis and these are noted in the report. These data reflect the very early nature of this infrastructure rollout where, for example, new infrastructure was being tested or new drivers were acclimatising to their new vehicle. We expect such instances to reduce in number as plug-in vehicle numbers and infrastructure usage increases.

- There are some instances where the data is incomplete (i.e. missing dates, plug in times, location or type) or the data was supplied in slightly different format (i.e. in some cases it was not possible to distinguish between a chargepost and a chargepoint. A chargepost may have two chargepoints). Carrying this piece of work out has helped us identify these instances and work with the PIPs to ensure that future usage data is more complete.

- Although the amalgamated data period is August 2010 to December 2012, data from individual PIP schemes does not necessarily cover the whole period. Similarly, the chargepoint type varied across PIP scheme (i.e. not every PIP had installed a rapid charger prior to data collection)

- This data is from chargepoints installed in PIP areas funded under the PIP Programme. It excludes data from chargepoints outside of PIP areas and chargepoints in PIP areas but not funded through the PIP Programme.

We are collecting more recharging usage data from the PIPs alongside usage data from the national recharging schemes part funded by OLEV. This data will be released on a regular basis and we envisage the next batch to be released around December 2013.

1.2 Key findings

Chargepoint location

- The utilisation rate for domestic chargepoint was higher than the other locations: 4% of all chargepoints available were at domestic locations, but 16% of all charging events occurred at domestic chargepoints.
- Where the location of the chargepoint was known (73%), the majority of charging events were at public locations (i.e. street or car park) (76% of charging events), and only a small proportion at domestic (16%) and workplace (9%) locations.

Chargepoint type

- Where the chargepoint type was known (89%), the majority of charging events were at standard / fast chargepoints (3/7 kW) (91% of charging events). A small proportion of charging events were at rapid (22/50 kW) chargepoints (9%).
- At public locations, the standard/fast chargepoints had a higher utilisation rate than the rapid chargepoints: 89% of chargepoints available were standard/fast chargepoints, but 94% of all charging events were at standard/fast chargepoints.

Time of plugging-in

- At workplace and public locations, the majority of charging events started between 9am-5pm. However, at domestic locations, the majority of charging events started later in the day (between 5pm and 9pm).
- At public locations, charging events at standard/fast chargepoints were significantly more likely to start earlier in the day (with peaks between 7am-9am). Charging events at rapid chargepoints were significantly more likely to start later in the day (with peaks between 1pm -3pm and at 9pm).

Day of plugging-in

- The majority of charging events started Monday – Thursday.
- Workplace charging events were significantly less likely to start on weekends in comparison with domestic and public locations.
- At public locations, a higher proportion of rapid charging events were used on weekends (In comparison with weekdays).

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 mean plug-in duration was 5 hours 9 minutes, and the median was 2 hours 21 minutes. This suggests that some charging events had long plug-in durations, which skewed the data. 3% of charging events lasted more than 1 day.
- 17% of charging events were less than 10 minutes long and 35% lasted less than 1 hour.
- Plug-in durations were shorter for charging events that started between 9am-5pm. Plug-in duration did not vary across day of plugging-in.

- At public locations the plug-in durations were shorter than at domestic and workplace locations.

Energy

- The mean amount of energy withdrawn was 6.2 kWh, and the median was 4.5 kWh.
- In 98% of charging events less than 20 kWh was withdrawn. In 32% of charging events, less than 2 kWh of energy was withdrawn. These events might be manufacturer testing events or genuine “quick booster” charging.
- Less energy was withdrawn during individual charging events which started during the week and between 9am-5pm.
- The amount of energy withdrawn did not vary across charging point type or location.

Chapter 2: Introduction

2.1 Data

Datasets

The datasets used in the analysis were:

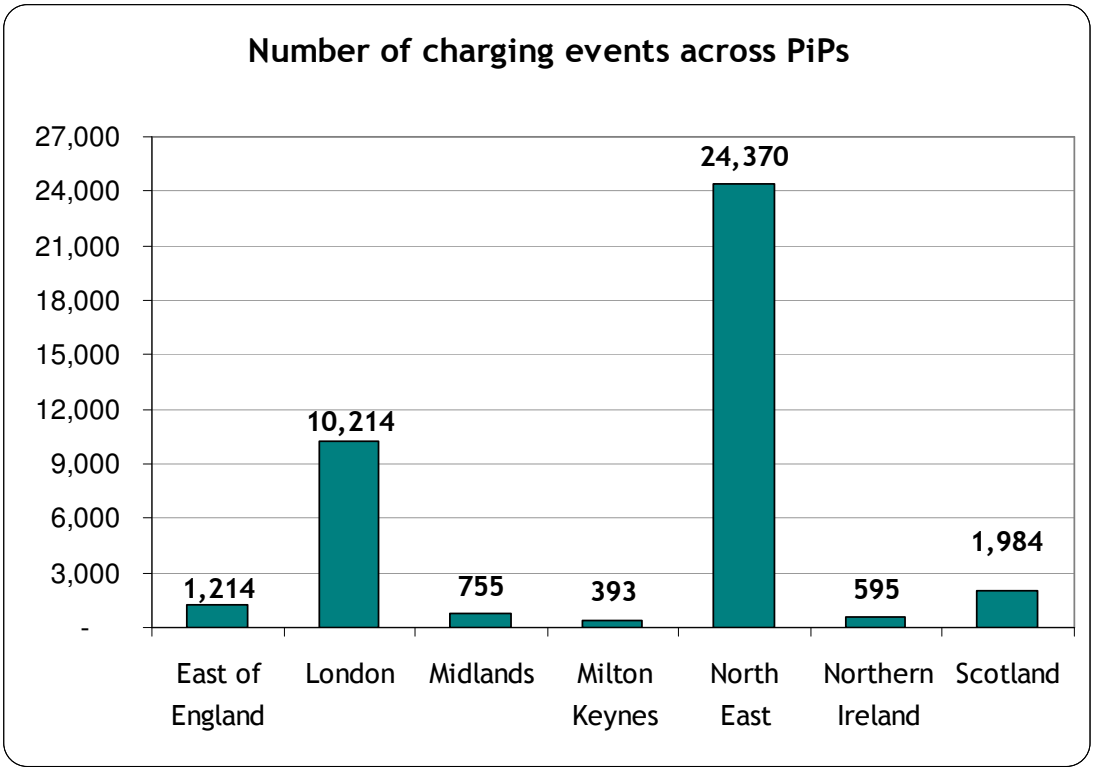
- Details of individual charging events at chargepoints within each PIP – provided by PIPs.
- National Chargepoint Registry (NCR) – publically accessible database with information on the publically accessible chargepoints (downloaded 19/12/2012).
- Further information on the chargepoints from Asset Registers, provided by PIPs.

Individual charging events were matched to the charging point data using the chargepoint ID (CPID).

Logistic regression analysis was performed to analyse whether there were any differences in charging behaviour (i.e. amount of energy withdrawn and length of time plugged-in to the chargepoint) across chargepoint type, chargepoint location, time of charging and day of charging.

Data coverage

39,525 charging events were recorded across seven of the PIPs (Greater Manchester did not yet have chargepoints installed at the time of data collation). Due to when each individual PIP scheme started and installed the first chargepoints, data from different PIPs covered different time periods. The amalgamated range **covered August 2010 to December 2012**. Data from all of these PIPs was consolidated and analysed as a whole.



The amount of data provided by the PIPs varied because of:

- different numbers of chargepoints in each PIP,
- different data coverage periods, and technical problems and issues with collating the data from some chargepoints.

There are a number of reasons why some PIPs had more charging events than others. The primary reasons were:

- Length of time that funding as been available: the first wave of PIPs (London, Milton Keynes and North East) have been installing infrastructure for 1 year longer than the second wave PIPs.
- Local projects, such as the “Switch EV” trial in the North East, which increased usage
- External factors, such as the Olympics in London, producing spikes in usage
- Geographical extent and the numbers of installed chargepoints varies considerably between PIPs.

2.2 Analysis

The main technique used to analyse data was logistic regression. The inequalities and differences identified have been described in non-statistical terms throughout this report. However, where differences have been found to be statistically significant at 95% confidence level (from the logistic regression analysis), this has been highlighted. By statistically significant, we mean that the difference is unlikely to have occurred by chance. Where results are not specifically discussed, this generally means that no statistically significant inequalities were found.

Chapter 3: Detailed results

3.1 Chargepoint location

Data

- Chargepoints were split across three locations: domestic, workplace and public (street or car park).
- A large proportion (27%) of charging events were at an unknown location.
- **Results from the chargepoint type and location analysis should be taken with caution, as data for different chargepoint types may not be consistent. For example, data for rapid chargepoints might have been more difficult to provide.**

Results

- On average, individual domestic chargepoints were used more frequently than workplace or public charge points: 4% of chargepoints available were at domestic locations, but 16% of all charging events were at domestic locations.
- Where the location was known, the majority of charging events were at public locations (i.e. street or car park) (76% of charging events), and only a small proportion at domestic (16%) and workplace (9%) locations.

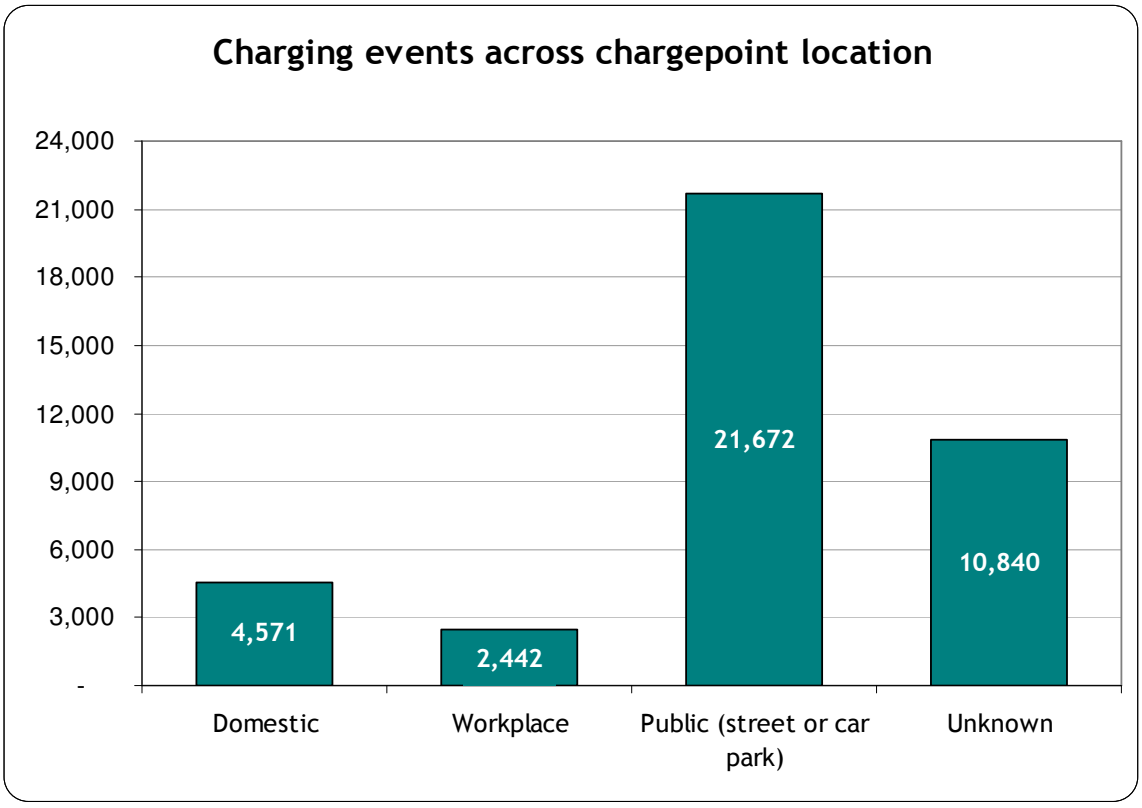


Table 3.1-1: Proportion of charging events and chargepoints available across locations

Chargepoint location	Proportion of chargepoints available	Proportion of all charging events
Domestic	4%	16%
Workplace	14%	9%
Public	82%	76%

3.2 Chargepoint type

Data

- The analysis compares two types of chargepoints: standard / fast (3 / 7 kW) and rapid (22 / 50 kW) chargepoints.

It is important to note the low number of rapid chargepoints installed during this period of data.

- As for chargepoint locations, there were a proportion of charging events (11%) at unknown chargepoint types.

Results

- Where the chargepoint type was known, the majority of charging events were at standard (3 kW) / fast (7 kW) chargepoints.
- Only a small proportion of charging events were at rapid (22 / 50 kW) chargepoints, reflecting the low number of rapid chargepoints for which data was available.
- As expected, all domestic charging events were at standard / fast chargepoints as no rapid chargers are installed in homes.

Table 3.2-1: Proportion of charging events and charging points available across charging point type

Chargepoint type	Proportion of chargepoints available	Proportion of all charging events
Standard / fast (3 kW)	91%	91%
Rapid (22 / 50 kW)	9%	9%

- At workplace and public locations, the majority of charging events were made at standard / fast chargepoints. A small proportion of charging events were made at rapid chargepoints in workplace and public locations.

Table 3.2-2: Proportion of charging events across chargepoint type and location (where chargepoint type is known)

Chargepoint location	Standard / fast	Rapid
Domestic	100%	0%
Workplace	97%	3%
Public (car park or street)	94%	6%
Unknown	71%	29%
All	91%	9%

- At public locations, the individual standard / fast chargepoints were used more frequently than the rapid chargepoints. This in part reflects the low number of rapid chargepoints installed and providing data within this period. Standard / fast chargepoints made up 89% of the chargepoints for which data is available, but accounted for 94% of all charging events.
- It would be beneficial to repeat this analysis with a more complete data set, and once there is a larger sample of rapid chargepoints.

Table 3.2-3: Proportion of charging events and chargepoints available across chargepoint type

Chargepoint type and location	Proportion of chargepoints available	Proportion of all charging events
Public – Standard / fast	89%	94%
Public - Rapid	11%	6%

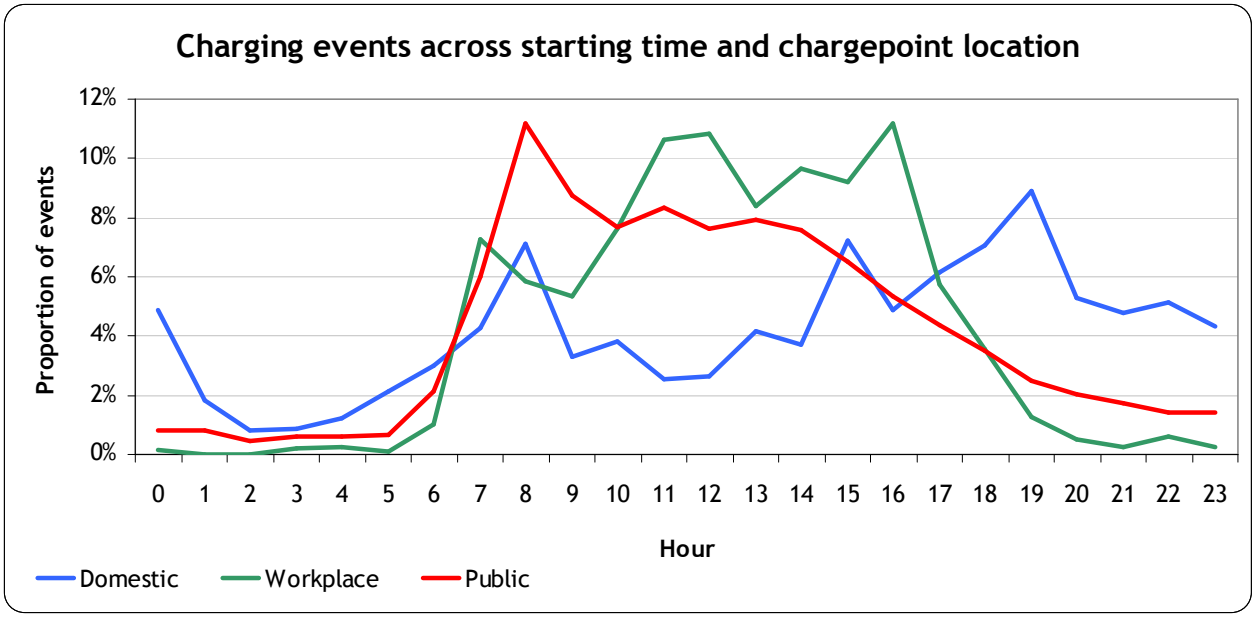
3.3 Time of plugging-in

Data

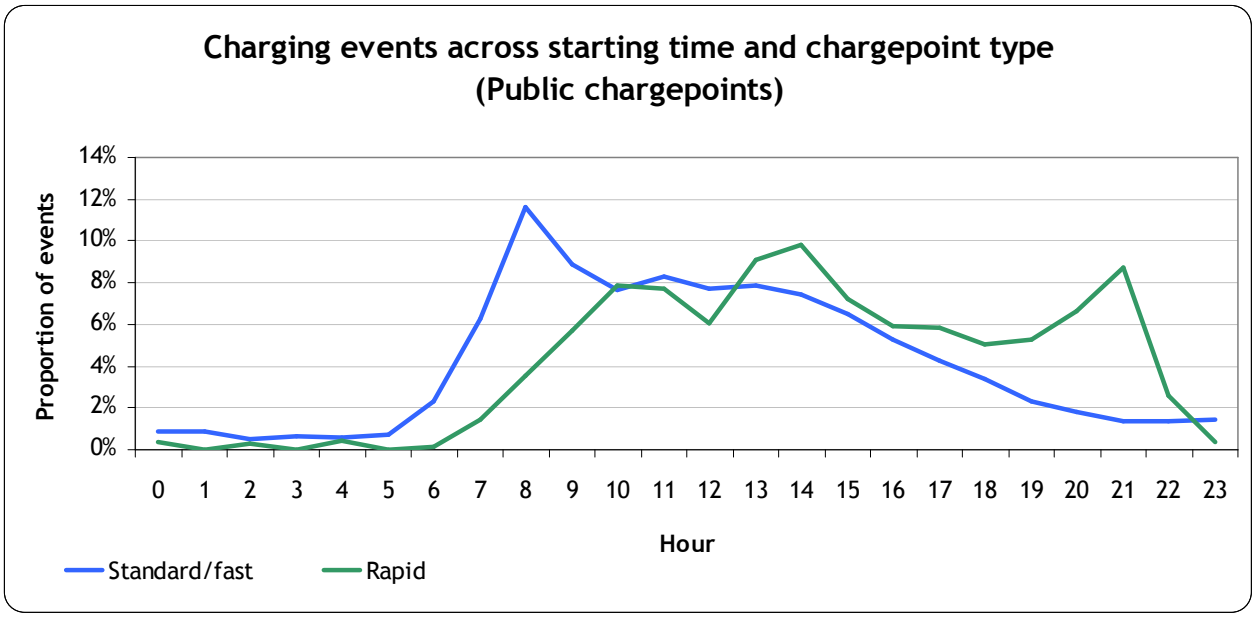
- Charging events were grouped according to plug-in start time: 9am-5pm, 5pm – 9pm and 9pm – 9am.

Results

- The majority of charging events at workplace and public locations started between 9am and 5pm. Domestic charging events did not follow the same trend – more domestic charging events started between 5pm and 9pm. This is depicted in the graph below.



- The majority of charging events started and finished during the same time period. (i.e. 9am – 5pm, 5pm – 9pm or 9pm – 9am). This was mainly due to the fact that around 70% of events were less than 5 hours long. As a result, the pattern of charging events across plug-in end time is similar to the plug-in finish time.
- At public locations, the time of charging was different between chargepoint types: On the one hand, standard / fast charging events were significantly more likely to start earlier in the day (with peaks between 7am and 9am). On the other hand, the rapid charging events were significantly more likely to start later in the day (with peaks at 1pm – 3pm and 9pm).

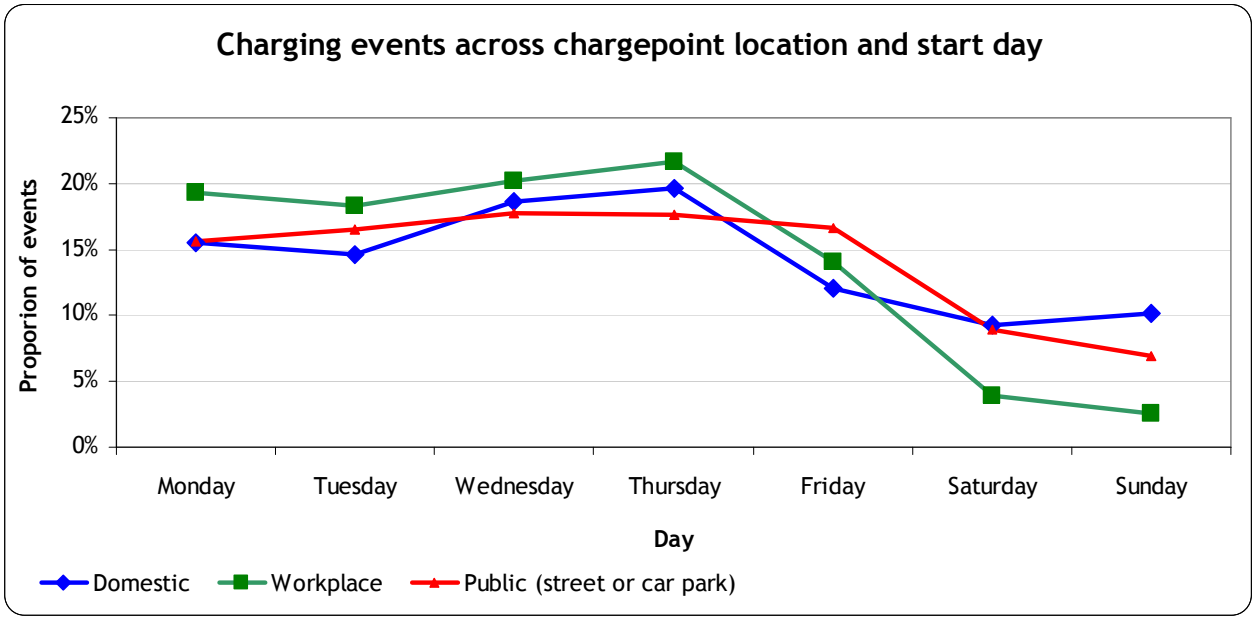


3.4 Day of plugging-in

Results

- Across all locations, the highest proportions of start times for charging events took place between Monday to Thursday.

For all locations, the proportion of charging events starting at weekends were lower than weekdays.

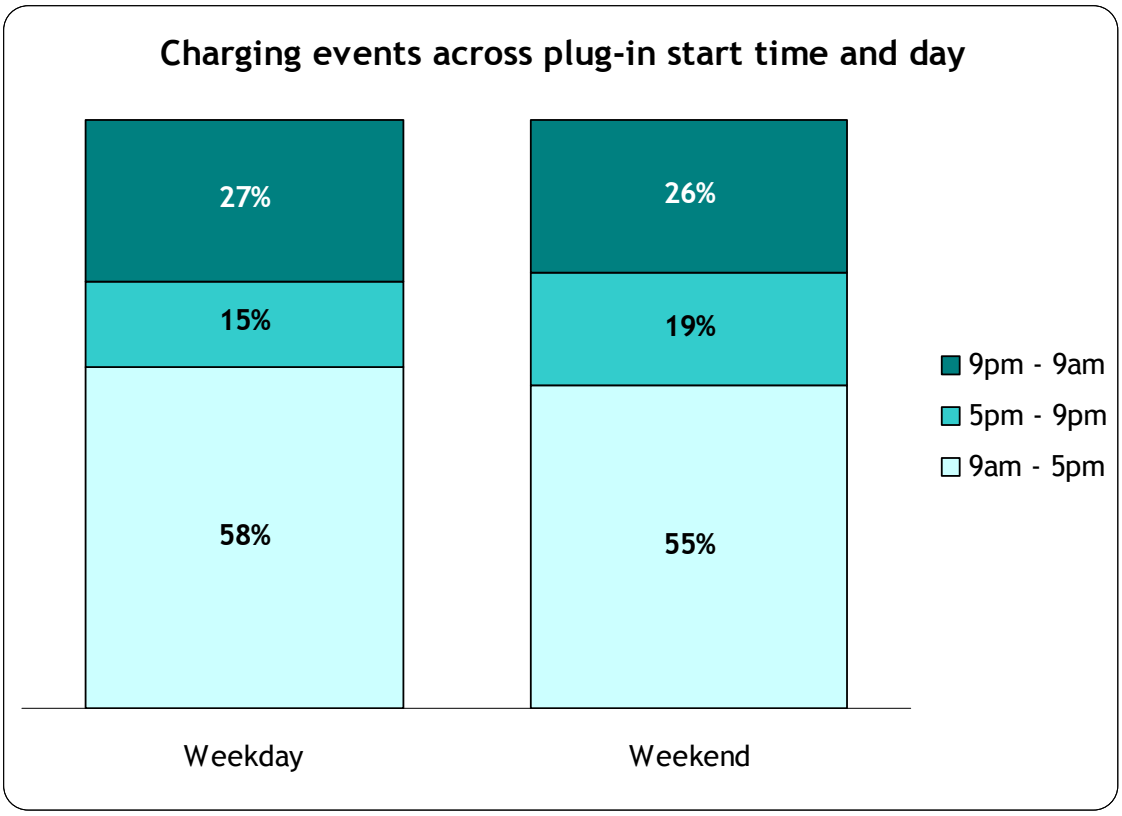


- In comparison with domestic and public charging events, workplace charging events were significantly less likely to start during the weekend.
- At public locations, charging behaviour varied across start day: A higher proportion of rapid chargers were used on weekends than on weekdays.

Table 3.4-1: Proportion of charging events at different chargepoint type starting on weekdays/weekends at public locations

	Standard / fast	Rapid
Weekday	95%	5%
Weekend	92%	8%

- The majority of charging events started and finished during the same day. As a result, the pattern of charging events across plug-in start day is similar to that of the plug-in finish day.
- There was no significant difference in the plug-in start times between weekday and weekend charging events.



3.5 Plug-in duration

Data

- Data was only available on the length of time the vehicle was plugged-in to the chargepoint (rather than the length of actual charging time).
- 2% of all charging events had an unknown plug-in duration. 4% of all charging events had zero plug-in duration. All plug-in duration analysis excluded the events with unknown plug-in duration, but included the entries with zero plug-in duration. (98% of all the charging events had a valid plug-in duration that could be analysed).
- Plug-in durations which exceeded 3 days were also set as unknown (833 charging events).
- A large proportion of charging events were less than 10 minutes long (17% of all charging events). These charging events may represent testing events or short "grazing" periods, when users are using an available chargepoint in an opportunistic way while pausing on a journey, rather than because their vehicle requires charging. Further analysis is recommended for the future to establish the reason for these short plug-in durations.

Results

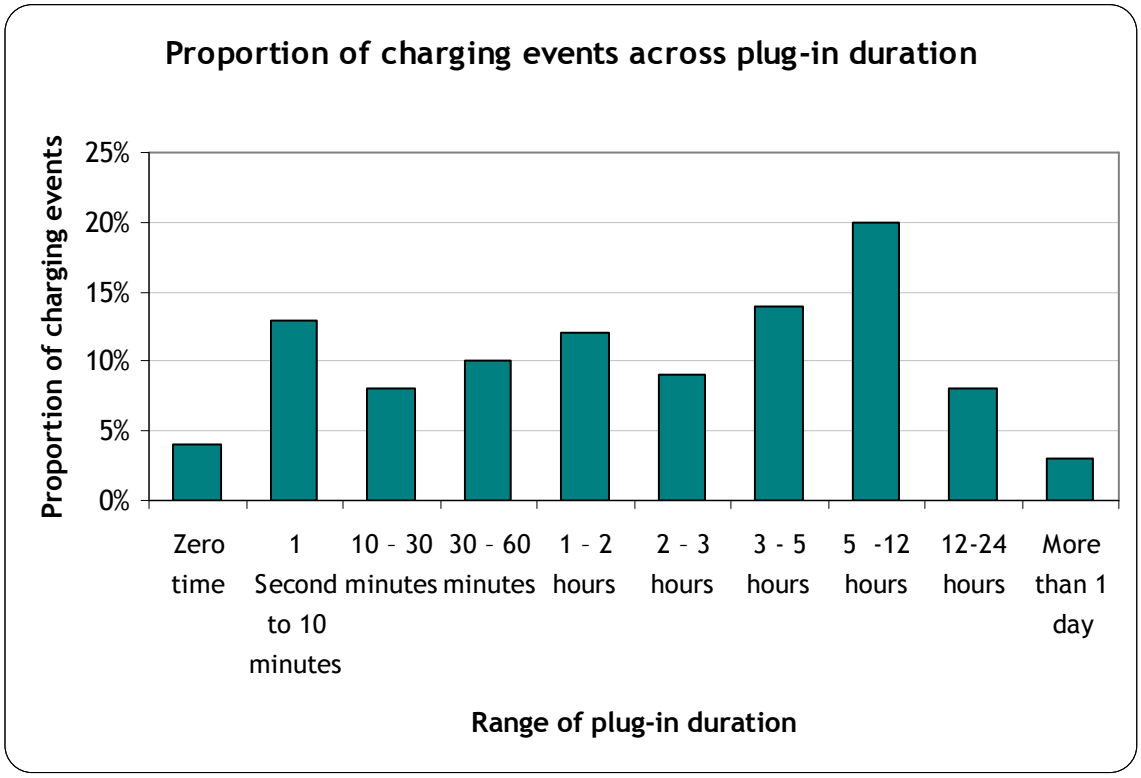
Table 3.5-1: Average plug-in duration for individual charging events

Mean	5 hours 9 minutes
Median	2 hours 21 minutes

- The median is much lower than the mean – this suggests unusually large plug-in durations skewing the data. A small proportion of events lasted more than 1 day (3%). 35% of charging events were less than 1 hour long.

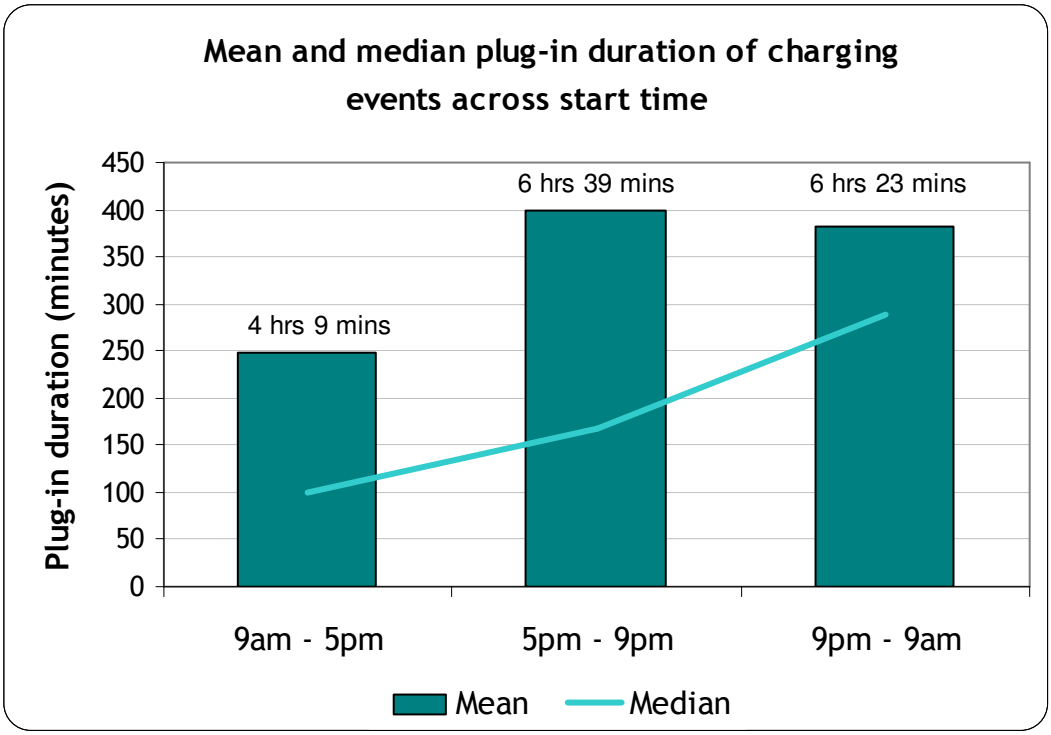
Table 3.5-2: Range of plug in duration for individual charging events

Range of plug-in duration	Proportion of all charging events
Zero duration	4%
1 second to 10 minutes	13%
10 – 30 minutes	8%
30 – 60 minutes	10%
1 – 2 hours	12%
2 – 3 hours	9%
3 - 5 hours	14%
5 -12 hours	20%
12-24 hours	8%
More than 1 day	3%

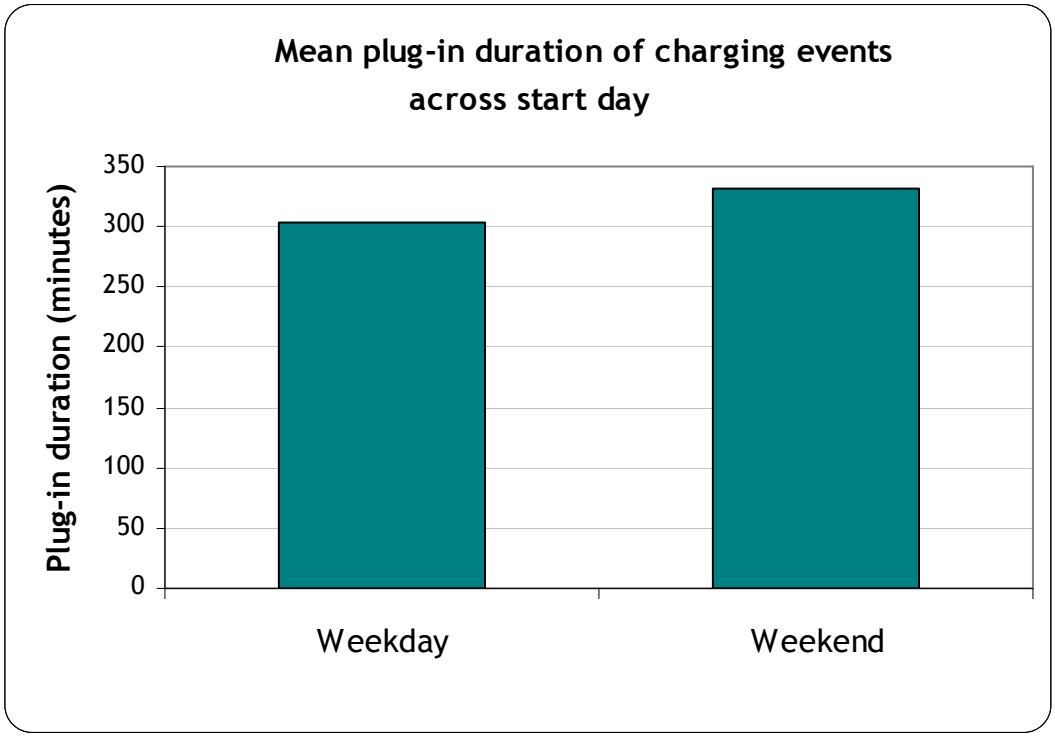


Results: plug-in duration by start day and time

- Plug-in durations were significantly shorter for charging events that started between 9am-5pm.



- There were no significant differences in length of duration plugged-in across start day of charging events.



Results: plug-in duration by chargepoint type

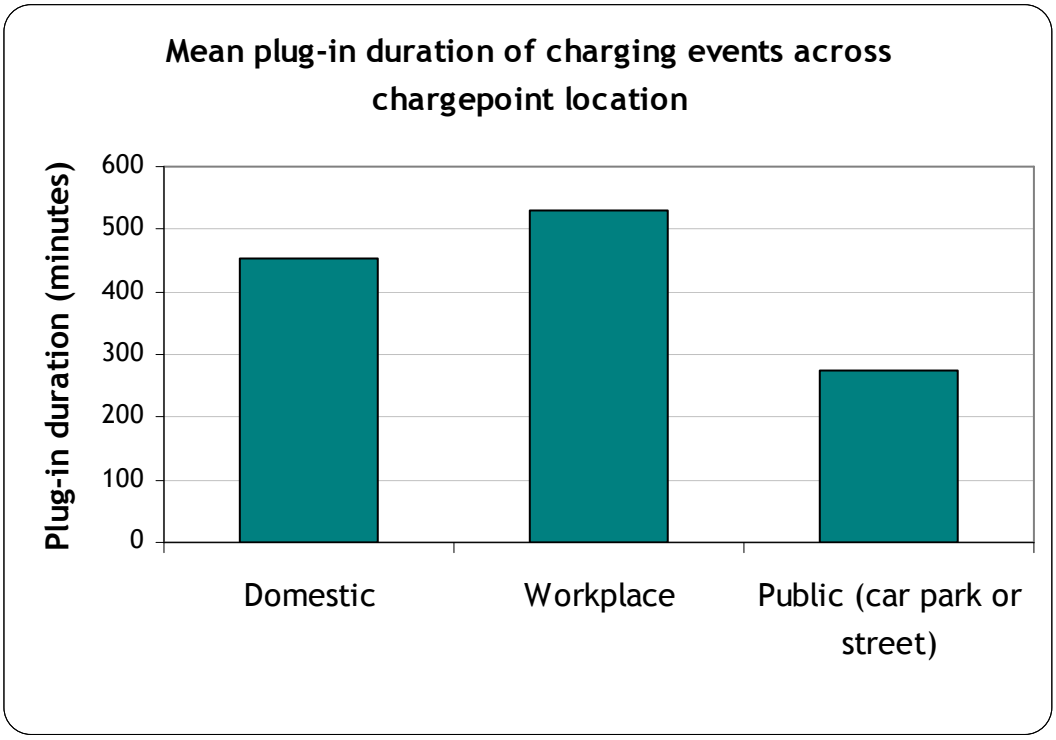
- Overall and as expected, plug-in durations were significantly longer at standard/fast chargepoints (3 / 7 kW) compared to rapid chargepoints (22 / 50 kW).

Table 3.5-3: Mean plug-in duration at different chargepoint types

Chargepoint type	Mean plug-in duration
Standard / fast	5 hours 14 minutes
Rapid	56 minutes

Results: plug-in duration by chargepoint location

- Plug-in durations were shorter at public locations (car park or street). This is a result of several actions, such as the higher proportion of rapid chargepoints (which had shorter plug-in durations) available at public locations, the fact that most people charge from home and overnight, and the effect of external factors such as parking restrictions.



3.6 Energy

Data

- Less than 1% of all charging events had unknown energy. 7% of all charging events had exactly zero energy withdrawn.
- The charging events with zero energy drawn may represent erroneous data, or could be genuine occurrences (such as testing of new equipment), but it is not possible to draw a distinction.
- All charging events with more than 100kWh energy withdrawn were assumed to be incorrect and the energy withdrawn was set to unknown. This was the case in 7 charging events; representing less than 1% of all charging events in the analysis.
- All energy analysis excluded the events with unknown energy, but included the entries with zero energy.
- A large proportion (32%) of charging events had less than 2 kWh of energy withdrawn. These charging events might be quick “booster” charges. Future investigation needs to take place to understand the underlying cause of this data..
- 98% of charging events had less than 20 kWh withdrawn.

Table 3.6-1: Average energy withdrawn during an individual charging event

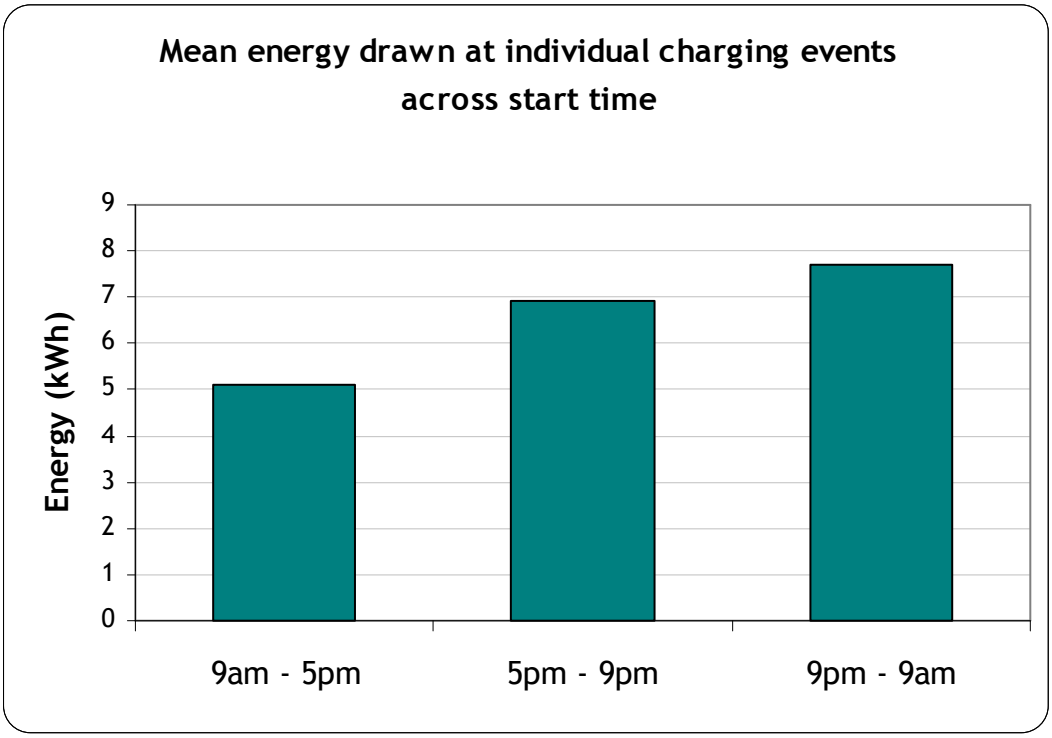
Mean	6.17 kWh
Median	4.50 kWh

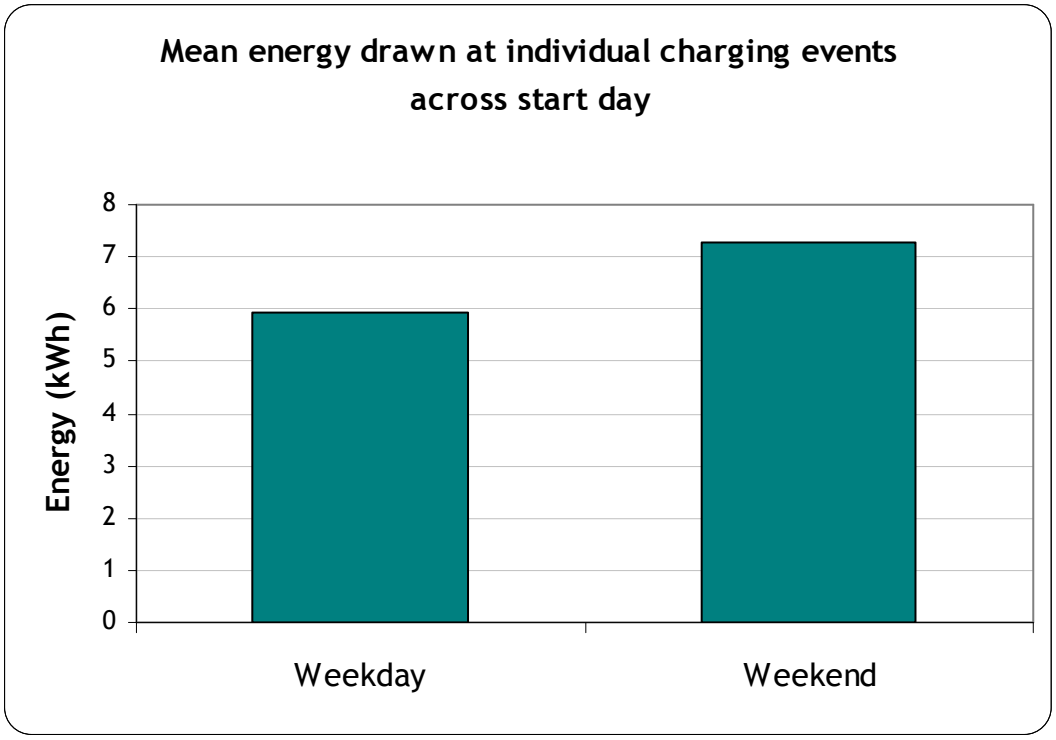
Table 3.6-2: Range of energy withdrawn for individual charging events

Range of energy	Proportion of all charging events
0-10	78%
11-20	19%
21-30	3%
31-100	Less than 1%

Results: energy by start day and time

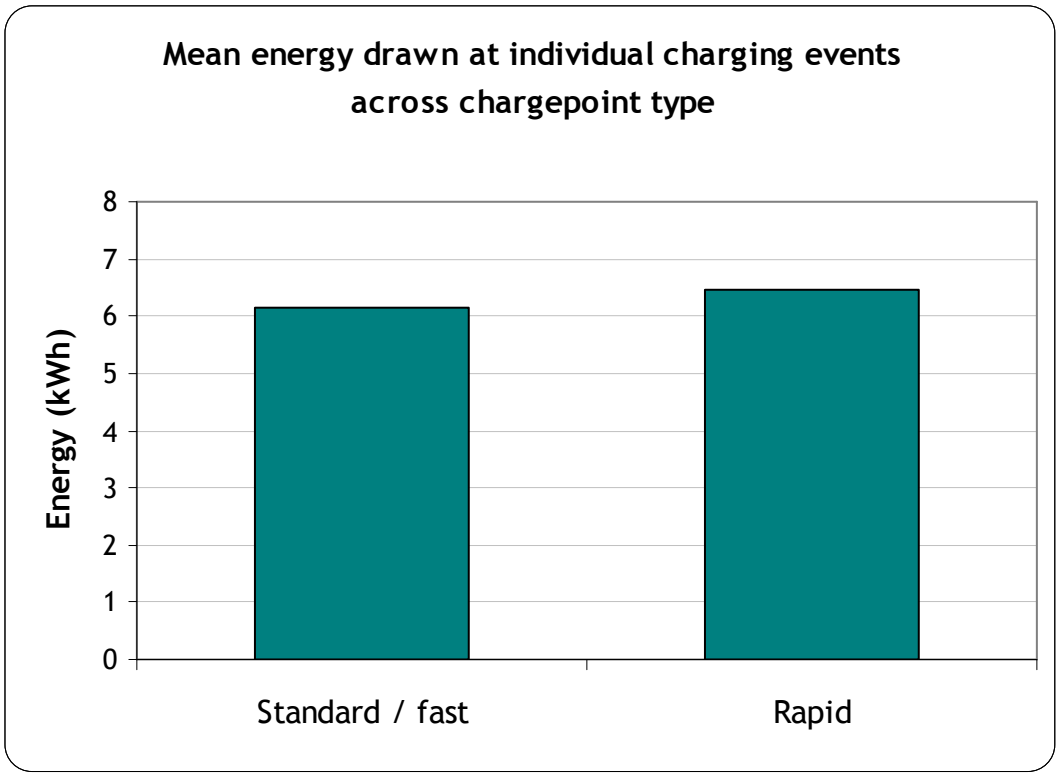
- The amount of energy withdrawn was significantly smaller for charging events that started during the week and between 9am-5pm.





Results: energy by chargepoint type

- The average amount of energy withdrawn did not vary across chargepoint type.



Chapter 4: Data information and recommendations

4.1 Data challenges

- A number of data challenges were resolved before analysis, with some problems remaining. The high level analysis reflects this and it is recognised that more data and further investigation is required to be able to infer statistically robust conclusions.

4.2 Data amendments and corrections

- Domestic chargepoints with unknown chargepoint type were all set to standard / fast (as there are no rapid domestic chargepoints).
- All chargepoints on the NCR were assumed to be publically accessible (car park or street).
- All charging events lasting more than 3 days were assumed to be incorrect. For these events plug-in times and dates and un-plugging times and dates were set to unknown (833 charging events; 2% of all charging events in analysis).
- All charging events with more than 100kWh energy withdrawn were assumed to be incorrect and the energy withdrawn was set to unknown. (7 charging events; less than 1% of all charging events in analysis).

4.3 Data coverage

Data coverage

The table below highlights the data period used for analysis,.

Table 4.3-1: Data coverage across PIP

	Data period	
PIP	**First date**	**Last date**
East of England	14/03/2011	02/07/2012
London	26/05/2011	03/10/2012
Midlands	01/10/2011	30/09/2012
Milton Keynes	26/04/2011	30/09/2012
North East	03/08/2010	04/12/2012
Northern Ireland	14/04/2012	24/10/2012
Scotland	30/03/2011	23/10/2012

4.4 Data limitations

Plug-in durations

There were many charging events with extremely short plug-in durations. These may have been testing or demonstration events, or genuine short charging events. It was

impossible to differentiate between these events, and so short charging events were not removed from the analysis.

Data was only available on the plug-in duration rather than the duration that the vehicle was actually charging.

Chargepoint type and chargepoint location

All standard and fast chargepoints were grouped together in the analysis.

All public chargepoints were analysed together with no differentiation between on-street and car park.

Any results for chargepoint type / location may be unreliable because of the large proportion of unknowns in the dataset.

4.5 Potential further analysis

This piece of work was carried out to inform what other analysis could be possible on the PIP data. Further analysis may include:

- More detailed analysis of plug-in start time i.e. split the time periods further.
- Separation of standard and fast, and 22kW and >40kW chargepoints.
- Individual day analysis instead of weekday/weekend.
- Comparison of “Pay as you go” and “Annual membership” users (based on User ID, if this can be collected in the future).
- Analyse charging frequency (based on User ID).
- More reliable demand analysis.

On a frequent basis OLEV will be releasing usage data from the PIPs plus usage data from the national infrastructure grant schemes (domestic chargepoint grant, the Local Authority Grant Fund, the Train Station carpark grant and the public estate chargepoint grant). Recognising that this will significantly increase the data set, particularly with regards to domestic and rapid chargepoint usage, the following analysis may be possible:

- Chargepoint location in relation to the local electricity supply
- Greater analysis of domestic chargepoint use
- Rapid charger usage
- The use of recharging infrastructure at public transport interchanges such as train stations
- workplace and fleet charging

Chapter 5: Summary tables

Some % may not add up to 100 because of rounding.

5.1 Chargepoints available

These tables show the number of unique chargepoints that were present in the data.

Table 5.1-1: Unique chargepoints across PIP

PIPs	Unique chargepoints	% of chargepoints
East of England	40	4%
London	401	41%
Midlands	28	3%
Milton Keynes	19	2%
North East	300	30%
Northern Ireland	76	8%
Scotland	124	13%
All	988	

Table 5.1-2: Unique chargepoints across location and chargepoint type

Unique chargepoints	Standard / fast	Rapid	Unknown	All
Domestic	31	0	0	31
Workplace	110	2	5	117
Public (car park or street)	600	75	2	677
Unknown	124	4	35	163
All	865	81	42	988

	% of chargepoints (where chargepoint type is known)	
Chargepoint location type	Standard / fast	Rapid
Domestic	100%	0%
Workplace	98%	2%
Public (car park or street)	89%	11%
Unknown	97%	3%
All	91%	9%

5.2 Charging events

Table 5.2-1: Charging events across PIP

PIPs	Charging events	% of charging events
East of England	1,214	3%
London	10,214	26%
Midlands[1]	755	2%
Milton Keynes	393	1%
North East [2]	24,370	62%
Northern Ireland	595	2%
Scotland	1,984	5%
All	39,525	

Table 5.2-2: Charging events across chargepoint type

Chargepoint type	Charging events	% of charging events (where chargepoint type is known)	% of all
Standard / fast	31,959	91%	
Rapid	3,161	9%	
Unknown	4,405		11%
All	39,525		

Table 5.2-3: Charging events across chargepoint location

Chargepoint location type	Charging events	% of charging events (where chargepoint location is known)	% of all
Domestic	4,571	16%	
Workplace	2,442	9%	
Public (car park or street)	21,672	76%	
Unknown	10,840		27%
All	39,525		

[1] 174 charging events were excluded from this total for Midlands (and from the analysis) because the records referred to multiple charging events (i.e. plug-in end times and dates were not captured for single charging events).
[2] 27 charging events were excluded from this total (and from the analysis) because they were linked to invalid chargepoints (outside the PIP area)

Table 5.2-4: Charging events across chargepoint type and location

Charging events	Standard / fast	Rapid	Unknown	All
Domestic	4,571	0	0	4,571
Workplace	2,202	59	181	2,442
Public (car park or street)	20,454	1,211	7	21,672
Unknown	4,732	1,891	4,217	10,840
All	31,959	3,161	4,405	39,525

	% of charging events (where chargepoint type is known)	
Chargepoint location type	**Standard / fast**	**Rapid**
Domestic	100%	0%
Workplace	97%	3%
Public (car park or street)	94%	6%
Unknown	71%	29%
All	91%	9%

Table 5.2-5: Charging events across plug-in start time

Start and end times were grouped into time periods to simplify analysis.

Start time	Charging events	% of charging events (where start time is known)	% of all
00:00 – 00:59	551	1%	
01:00 – 01:59	474	1%	
02:00 – 02:59	204	1%	
03:00 – 03:59	215	1%	
04:00 – 04:59	338	1%	
05:00 – 05:59	320	1%	
06:00 – 06:59	880	2%	
07:00 – 07:59	2040	5%	
08:00 – 08:59	3597	9%	
09:00 – 09:59	3015	8%	
10:00 – 10:59	2727	7%	
11:00 – 11:59	2858	7%	
12:00 – 12:59	2779	7%	
13:00 – 13:59	2867	7%	
14:00 – 14:59	2699	7%	
15:00 – 15:59	2645	7%	
16:00 – 16:59	2161	6%	
17:00 – 17:59	1842	5%	
18:00 – 18:59	1650	4%	
19:00 – 19:59	1333	3%	
20:00 – 20:59	1139	3%	
21:00 – 21:59	780	2%	
22:00 – 22:59	812	2%	
23:00 – 23:59	692	2%	
Unknown	907		2%
All	39,525		

Start time	Charging events	% of charging events (where start time is known)	% of all
9am - 5pm	21,751	56%	
5pm - 9pm	5,964	15%	
9pm - 9am	10,903	28%	
Unknown	907		2%
All	39,525		

Table 5.2-6: Charging events across plug-in end time

End time	Charging events	% of charging events (where end time is known)	% of all
00:00 – 00:59	375	1%	
01:00 – 01:59	358	1%	
02:00 – 02:59	358	1%	
03:00 – 03:59	235	1%	
04:00 – 04:59	340	1%	
05:00 – 05:59	481	1%	
06:00 – 06:59	471	1%	
07:00 – 07:59	1149	3%	
08:00 – 08:59	1809	5%	
09:00 – 09:59	2218	6%	
10:00 – 10:59	2348	6%	
11:00 – 11:59	2440	6%	
12:00 – 12:59	2793	7%	
13:00 – 13:59	3104	8%	
14:00 – 14:59	2880	7%	
15:00 – 15:59	2969	8%	
16:00 – 16:59	2944	8%	
17:00 – 17:59	2999	8%	
18:00 – 18:59	2506	6%	
19:00 – 19:59	1917	5%	
20:00 – 20:59	1376	4%	
21:00 – 21:59	1059	3%	
22:00 – 22:59	858	2%	
23:00 – 23:59	683	2%	
Unknown	855		2%
All	39,525		

End time	Charging events	% of charging events (where end time is known)	% of all
9am - 5pm	21,696	56%	
5pm - 9pm	8,798	23%	
9pm - 9am	8,176	21%	
Unknown	855		2%
All	39,525		

Table 5.2-7: Charging events across plug-in start day

Days were grouped into weekday and weekends to simplify analysis.

Start day	Charging events	% of charging events (where start day is known)	% of all
Monday	5,962	16%	
Tuesday	6,282	17%	
Wednesday	6,904	18%	
Thursday	6,794	18%	
Friday	5,988	16%	
Saturday	3,249	9%	
Sunday	2,600	7%	
Unknown	1,746		4%
All	39,525		

Start day	Charging events	% of charging events (where start day is known)	% of all
Weekday	31,930	85%	
Weekend	5,849	15%	
Unknown	1,746		4%
All	39,525		

Table 5.2-8: Charging events across plug-in end day

Start day	Charging events	% of charging events (where end day is known)	% of all
Monday	5,824	15%	
Tuesday	6,164	16%	
Wednesday	6,951	18%	
Thursday	6,861	18%	
Friday	6,179	16%	
Saturday	3,329	9%	
Sunday	2,526	7%	
Unknown	1,691		4%
All	39,525		

End day	Charging events	% of charging events (where end day is known)	% of all
Weekday	31,979	85%	
Weekend	5,855	15%	
Unknown	1,691		4%
All	39,525		

5.3 Plug-in duration

The mean and sum of plug-in durations are based on charging events which are less than 3 days in length (which were included in the analysis). The maximum values are based on all charging events with valid[3] start and end dates (including those which exceed 3 days and so were excluded from the analysis).

Table 5.3-1: Plug-in duration across chargepoint type

Chargepoint type	Mean plug-in duration	Sum of plug-in duration
Standard / fast	5 hours 14 minutes	6,626 days
Rapid	56 minutes	120 days
Unknown	7 hours 29 minutes	1,348 days
All	5 hours 9 minutes	8,094 days

Table 5.3-2: Plug-in duration across chargepoint location

Chargepoint location type	Mean plug-in duration	Sum of plug-in duration
Domestic	7 hours 33 minutes	1,128 days
Workplace	8 hours 51 minutes	826 days
Public (car park or street)	4 hours 34 minutes	4,052 days
Unknown	4 hours 42 minutes	2,088 days
All	5 hours 9 minutes	8,094 days

Table 5.3-3: Plug-in duration across plug-in start time

Start time	Mean plug-in duration	Sum of plug-in duration
9am - 5pm	4 hours 9 minutes	3,751 days
5pm - 9pm	6 hours 39 minutes	1,610 days
9pm - 9am	6 hours 23 minutes	2,733 days
All	5 hours 9 minutes	8,094 days

[3] Some charging events had invalid start and end dates e.g. in 2000 or 2001 (which is before the chargepoints were installed).

Table 5.3-4: Plug-in duration across plug-in end time

End time	Mean plug-in duration	Sum of plug-in duration
9am - 5pm	4 hours 26 minutes	4,008 days
5pm - 9pm	5 hours 18 minutes	1,841 days
9pm - 9am	6 hours 55 minutes	2,245 days
All	5 hours 9 minutes	8,094 days

Table 5.3-5: Plug-in duration across plug-in start day

Start day	Mean plug-in duration	Sum of plug-in duration
Weekday	5 hours 4 minutes	6,746 days
Weekend	5 hours 32 minutes	1,348 days
All	5 hours 9 minutes	8,094 days

Table 5.3-6: Plug-in duration across plug-in end day

End day	Mean plug-in duration	Sum of plug-in duration
Weekday	5 hours 6 minutes	6,790 days
Weekend	5 hours 21 minutes	1,304 days
All	5 hours 9 minutes	8,094 days

5.4 Energy drawn

The mean and sum of energy drawn values are based on charging events which had less than 100 kWh of energy drawn (which were included in the analysis). The maximum values are based on all charging events (including those which exceed 100 kWh of energy and were excluded from the analysis).

Table 5.4-1: Energy drawn across chargepoint type

Chargepoint type	Mean energy drawn (kWh)	Sum of energy drawn (kWh)
Standard / fast	6.15	196,372.08
Rapid	6.48	20,492.56
Unknown	6.16	27,094.67
All	6.17	243,959.32

Table 5.4-2: Energy drawn across chargepoint location

Chargepoint location type	Mean energy drawn (kWh)	Sum of energy drawn (kWh)
Domestic	5.79	26,470.24
Workplace	4.53	11,059.25
Public (car park or street)	6.43	139,254.67
Unknown	6.20	67,175.16
All	6.17	243,959.32

Table 5.4-3: Energy drawn across plug-in start time

Start time	Mean energy drawn (kWh)	Sum of energy drawn (kWh)
9am - 5pm	5.12	111,357.01
5pm - 9pm	6.94	41,409.32
9pm - 9am	7.71	84,023.48
Unknown	7.92	7,169.51
All	6.17	243,959.32

Table 5.4-4: Energy drawn across plug-in end time

End time	Mean energy drawn (kWh)	Sum of energy drawn (kWh)
9am - 5pm	5.15	111,675.77
5pm - 9pm	6.77	59,587.80
9pm - 9am	8.05	65,770.59
Unknown	8.12	6,925.15
All	6.17	243,959.32

Table 5.4-5: Energy drawn across plug-in start day

Start day	Mean energy drawn (kWh)	Sum of energy drawn (kWh)
Weekday	5.95	190,078.53
Weekend	7.28	42,573.08
Unknown	6.48	11,307.71
All	6.17	243,959.32

Table 5.4-6: Energy drawn across plug-in end day

End day	Mean energy drawn (kWh)	Sum of energy drawn (kWh)
Weekday	5.94	189,884.53
Weekend	7.35	43,011.43
Unknown	6.55	11,063.35
All	6.17	243,959.32

Annex - Analytical Assurance Statement

Plugged in Places Chargepoint Usage Analysis (Low)

The level of assurance for the results of the analysis undertaken is low.

As part of the Plugged-in Places (PIP) Programme, the Office for Low Emission Vehicles (OLEV) has collated usage data from plug-in vehicle chargepoints. These have been installed using Government funding and provide detail on patterns in chargepoint usage which is expected to inform future installations of charging infrastructure.

The In House Analytical Consultancy (IHAC) has written a report detailing the analysis of the first batch of data (up to December 2012) in order to provide a picture of how the infrastructure already installed is being used, and to inform what future analysis might be undertaken. **From the start, the exercise was recognised as exploratory in order that future data collection would be more robust.**

The report provides a high level analysis of the data – for example looking at the usage by Time and Day, also the Chargepoint Type and Location of plug in. Statistical tests were undertaken to establish whether the differences in the data were significant. The data had a number of limitations in terms of coverage and accuracy – these were fully identified in the report. Given the quality of the data the results are not conclusive – again this is recognised in the report.

The work was undertaken by experienced and skilled staff with sufficient time and resources to analyse the data.