RAC Foundation

Electric Vehicle charging in Scotland

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The ChargePlace Scotland Network

The ChargePlace Scotland scheme is the initiative behind Scotland's free charge point network and was launched in 2010. This scheme also offers 100% funding to install a home charging point for electric vehicles and has three main areas:

1. Domestic charge points – the installation of a home charging point.
2. Commercial Workplace charge points
3. Community Planning Partnerships (CPP) & the High Powered Interoperable Network.

Charge Your Car (CYC) is the operational provider of the ChargePlace Scotland network. This report analyses usage data from August 2013 and August 2014 of the ChargePlace Scotland network obtained via a freedom of information (FOI) request[1]. Not all the charge points in the ChargePlace Scotland network are publically accessible as they were installed under the Commercial Workplace scheme. The data analysed refers to both the commercial and public charge point usage. As such, domestic charge point usage is not considered in the data provided. Between August 2013 and August 2014 the number of domestic charge points ChargePlace Scotland installed rose from 64 to 126.

Definitions:

- **Charging unit** = the physical charging post which is placed at a location. It is assigned an ID code and can have either 1 or 2 sockets.
- **Charging socket** = the actual point you plug into to charge your electric vehicle.

Summary:

In August 2014 there were 482 charging units with a total of 885 sockets in the ChargePlace Scotland network (this does not include domestic charge points). Unfortunately, the Scottish Government no longer has a list of charge point locations from August 2013.

The Committee for Climate Change suggests that at least 5% of the car fleet in Scotland should be electric by 2020 in order to reach "critical mass" for a larger roll out. This would mean a total of approximately 120,000 electric vehicles with 27,000 new car sales of electric vehicles a year in 2020[2]. At the end of Q3 2014 the number of licensed vehicles in Scotland which were eligible to receive the plug-in car and van grant was only 1,071. There is a £20 membership fee to receive a near field communication (NFC) card which is used to gain access to a charge point. In addition, Charge Your

[1] and one record (2 charging sessions) was removed by Transport Scotland as it did not provide all the information requested in the FOI

[2] Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027.

Car has a free mobile application which can be used to find, navigate to and begin charging at the charge point.

ChargePlace Scotland charging network pattern:

Table 1: ChargePlace Scotland usage summary

	August 2013	August 2014	% change
Total number of charging sockets	-	885	-
Total number of charging units *	-	482	-
Percentage of charging units with two sockets	-	81%	-
Total number of charging sessions	619	2,885	+366.1%
- Percentage of which were at charging units with 2 sockets	78%	82%	+5.1%
Number of different users who used the network in that month.	77	311	+303.9%
Number of Electric vehicles in Scotland**	362	792	+118.8%
Average number of charging sessions at every used charging unit that month.	8	11	+37.5%
Average number of charging sessions across the entire network .	-	6	-
Longest charging session and location (hh:mm:ss)	485:19:00 (Bleaching Field Community Centre, Dunbar)	667:06:00 (Milesmark Depot car park Dunfermline)	+37.5%
Mean charge duration (hh:mm:ss)	19:16:45	13:00:10	-32.6%
Total electricity used (kWh)	4,717.12	23,175.29	+391.3%
- Percentage of which were at charging units with 2 sockets	86%	85%	-1.2%
Price of electricity at the average commercial rate for South Scotland (15.21p per kWh*)**	£717.47	£3,524.96	+391.3%
Mean average electricity used per charging session (kWh)	7.62	8.03	+5.4%
Mean average electricity used per unique users (kWh)	61.26	74.52	+21.6%
The number of miles a 2014 Nissan Leaf** would be capable of from the average electricity used in a session.**	31.75	33.47	+5.4%
The number of miles a 2014 Nissan Leaf would be capable of from the average electricity used per unique user	255.26	310.49	+21.6%
Total number of miles a 2014 Nissan Leaf would be capable of from all electricity used that month	19,654.65	96,563.70	+391.3%

*Includes 3 portable charging units without a set location.

**The number of Plug-in-Grant Eligible Cars in Scotland at the end of Q2 for 2013 and 2014.

***Average annual domestic electricity bills for selected towns and cities in the UK and average unit costs (DECC: Annual domestic energy bills, Quarterly Energy Prices 2.2.3)

****A 2014 Nissan Leaf has an energy consumption of 0.24 kWh/mile and a maximum range of 124 miles from a full charge (NEDC).

Licensed Plug-in electric grant vehicles:

At the end of Q2 2013 there were 6,226 licensed vehicles which were eligible to receive the plug-in car and van grant in the UK of which 362 were licensed in Scotland. This had increased to 11,373 licensed vehicles by the end of Q2 2014. Of these 792 vehicles were registered in Scotland compared to 9,856 in England and 245 in Wales. By the end of Q3 2014 the number of licensed vehicles which were eligible to receive the plug-in car and van grant had risen sharply to 16,147. Of these 1,071 vehicles were registered in Scotland compared to 14,114 in England and 377 in Wales. Examples of vehicles eligible for the plug-in car grant include the BMW i3, Nissan Leaf and the Mitsubishi Outlander PHEV.

Table 2: Network usage

	August 2013	August 2014
Number of charging sessions	619	2,885
Number of units used	77	265
Percentage of units used	-	55%
Percentage of off-street* charging units in the ChargePlace Scotland network	-	27%
Percentage of off-street charging sessions	22%	31%
Percentage of electricity used in off-street locations for all use charge sockets.	11%	28%

*This includes locations which indicate that they are "car parks". This also includes Commercial Workplace units.

Top ten tables:

Table 3: Top ten charging units by number of charging sessions:

August 2013				August 2014			
Charge Unit name	**Postcode**	**Number of Sessions**	**Total electricity used (kWh)**	**Charge Unit name**	**Postcode**	**Number of Sessions**	**Total electricity used (kWh)**
Earls Road, Grangemouth	FK3 8XD	35	295.196	**Janet Brougham House**	DD4 7TQ	103	567.16
Clark Street Depot	PA3 1RX	29	232.979	Victoria Quays	EH6 6QQ	80	494.91
Springkerse Depot	FK7 7TE	29	135.908	Ingliston Park and Ride	EH28 8LS	61	597.6
Springkerse Depot	FK7 7TE	28	155.507	Moray Carshare	IV36 3TZ	56	288.54
Renfrewshire Council Vehicle Workshop	PA3 1TL	24	333.887	**Menziehill House**	DD2 4DG	54	196.95
East Lothian Council, John Muir House, Haddington	EH41 3HA	23	337.376	Braehead Shopping Centre	G51 4BN	53	456
Old Academy Stromness	KW16 3AN	23	164.697	Greenmarket Car Park	DD1 4QD	48	227.64
Dundas Buildings	EH19 3YD	22	165.147	Broxden Park & Ride	PH2 0PX	41	366.289
Bankhead Depot	EH11 4HD	20	133.022	Edinburgh College Sighthill Campus	EH11 4BN	38	342.01
Multi Storey Car Park Kilmarnock	KA1 1LU	20	95.199	Greenmarket Car Park Dundee	DD1 4QD	38	279.282

Bold indicates locations which most likely were not available for public use.

In August 2013, 7 out of the top 10 locations (indicated in bold) by the number of charging sessions were likely not to have been publically accessible. Instead, these units seem to be in council locations or in private commercial use. For example, Menziehill House is a charge point located in a care home.

Table 4: Top ten locations by longest charging session:

August 2013			August 2014		
Charge unit name	**Postcode**	**Longest charge session (hhh:mm:ss)**	**Charge unit name**	**Postcode**	**Longest charge session (hhh:mm:ss)**
Bleaching Field Community Centre	EH42 1DX	485:19:00	Milesmark Depot car park Dunfermline	KY12 9AX	667:06:00
Northern Constabulary	IV2 3SY	440:13:00	Duke Street Car Park	G4 0UW	382:30:00
Renfrewshire House	PA1 1BR	213:41:00	**Chivas Brothers (Kilmalid)**	G82 3SS	333:50:00
Falkirk Community Hospital	FK1 5SU	143:25:00	Fintry Development Trust	G63 0YA	331:31:00
Duke Street Multi Storey Car Park	ML3 7DT	142:07:00	**Montrose Police Office, George Street, Montrose**	DD10 8EW	263:46:00
Wellington Square Ayr	KA7 1HL	142:01:00	**Menziehill House**	DD2 4DG	262:39:00
East Lothian Council, John Muir House, Haddington	EH41 3HA	123:43:00	**Dumfries and Galloway Council - Council HQ, English Street, Dumfries**	DG1 2DD	247:57:00
Forrest Street Car Park, Blantyre	G72 0JP	122:33:00	Fleet Services Cupar	KY15 4SX	185:45:00
Montrose Police Office, George Street, Montrose	DD10 8EW	111:12:00	Edinburgh College Sighthill Campus	EH11 4BN	168:33:00
Bankhead Depot	EH11 4HD	95:35:00	Broom Place Portree	IV51 9HL	167:41:00

Bold indicates locations which are likely not to be or were accessible to the public.

Caution must be taken when looking at longest time period. The data for average charging time and longest charging time is potentially misleading. The way that the charging units are designed means that a charging session is not ended until the charging socket has been fully closed. Users sometimes

fail to close the socket properly which would lead to the charging duration to continue to register until a new users or the maintainer of the charging socket closes it properly.

Table 5: Top ten charging units by electricity used:

August 2013				August 2014			
Charge unit name	**Postcode**	**Number of charging session**	**Electricity used (kWh)**	**Charge unit name**	**Postcode**	**Number of charging session**	**Electricity used (kWh)**
East Lothian Council, John Muir House, Haddington	EH41 3HA	23	337.376	Riverside Museum	G3 8RS	37	617.844
Renfrewshire Council Vehicle Workshop	PA3 1TL	24	333.887	Ingliston Park and Ride	EH28 8LS	61	597.6
Earls Road, Grangemouth	FK3 8XD	35	295.196	**Janet Brougham House**	DD4 7TQ	103	567.16
Clark Street Depot	PA3 1RX	29	232.979	Victoria Quays	EH6 6QQ	80	494.91
Dundee University Multi Story CP	DD1 4HN	16	220.93	Braehead Shopping Centre	G51 4BN	53	456
Inch Park, Old Dalkeith Road	EH16 4SU	18	189.772	**East Lothian Council, John Muir House, Haddington**	EH41 3HA	35	429.88
Old Academy Stromness	KW16 3AN	20	167.268	Aberdeen Snowsports Centre	AB10 7BA	38	376.83
Dundas Buildings	EH19 3YD	22	165.147	Broxden Park & Ride	PH2 0PX	41	366.289
Old Academy Stromness	KW16 3AN	23	164.697	Edinburgh College Sighthill Campus	EH11 4BN	38	342.01
Springkerse Depot	FK7 7TE	28	155.507	Greenmarket Car Park Dundee	DD1 4QD	37	323.305

Bold indicates locations which are likely not to be or were accessible to the public.

Table 6: Network Usage:

	Aug-14				
Local Authority	**Number of units**	**Number of units used at least once in Aug 14 (% used)**		**Number of Sockets**	**Charging sockets per square mile**
Aberdeen City	21	9 (43%)		38	0.48
Aberdeenshire	4	3 (75%)		8	0.003
Angus	10	4 (40%)		16	0.02
Argyll and Bute	12	3 (25%)		22	0.01
City of Edinburgh	38	38 (100%)		76	0.55
Clackmannanshire	7	3 (43%)		13	0.21
Dumfries and Galloway	12	8 (67%)		24	0.01
Dundee City	40	24 (60%)		79	3.29
East Ayrshire	6	2 (33%)		12	0.02
East Dunbartonshire	4	0 (0%)		8	0.12
East Lothian	14	8 (57%)		26	0.10
Falkirk	9	9 (100%)		15	0.12
Fife	42	21 (50%)		82	0.15
Glasgow City	42	25 (60%)		84	1.23
Highland	21	5 (24%)		37	0.004
Midlothian	15	9 (60%)		21	0.15
Moray	9	5 (56%)		18	0.02
Na h-Eileanan an Iar	6	1 (17%)		12	0.01
North Ayrshire	3	1 (33%)		6	0.02
North Lanarkshire	16	10 (63%)		31	0.17
Orkney Islands	6	2 (33%)		11	0.03
Perth and Kinross	15	10 (67%)		27	0.01
Renfrewshire	16	10 (63%)		32	0.31
Scottish Borders	23	6 (26%)		31	0.02
Shetland Islands	6	1 (17%)		12	0.02
South Ayrshire	10	5 (50%)		18	0.04
South Lanarkshire	48	28 (58%)		76	0.11
Stirling	9	9 (100%)		17	0.02
West Dunbartonshire	5	1 (80%)		10	0.14
West Lothian	10	2 (20%)		20	0.12
Portable unit, no Local Authority	3	0 (0%)		3	-
Scotland	**482**	**265 (55%)**		**885**	**0.08**

Table 7.1: Usage statistics by local authority in which units were used at least once, August 2014

	August 2014							
Local Authority	**Number of sessions**	**Number of used units**	**Average number of sessions per unit**	**Electricity used (kWh)**	**Average Electricity used per session (kWh)**	**The number of miles a 2014 Nissan Leaf would be capable of from the average electricity used in a session***	**Longest charge (hh:mm:ss)**	**Average charge (hh:mm:ss)**
Aberdeen City	178	9	8	1,439.82	8.09	33.7	141:53:00	0:47:50
Aberdeenshire	32	3	8	329.01	10.28	42.8	12:18:00	0:23:04
Angus	27	4	3	192.64	7.13	29.7	263:46:00	9:46:09
Argyll and Bute	22	3	2	243.47	11.07	46.1	6:40:00	0:18:11
City of Edinburgh	494	38	13	3,519.01	7.12	29.7	168:33:00	0:20:28
Clackmannanshire	56	3	8	428.23	7.65	31.9	93:22:00	1:40:02
Dumfries and Galloway	49	8	4	589.30	12.03	50.1	166:51:00	3:24:18
Dundee City	459	24	11	2,983.20	6.50	27.1	262:39:00	0:34:20
East Ayrshire	14	2	2	68.36	4.88	20.3	95:22:00	6:48:43
East Lothian	51	8	4	579.94	11.37	47.4	66:28:00	1:18:12
Falkirk	47	9	5	430.22	9.15	38.1	72:07:00	1:32:04
Fife	175	21	4	1,606.72	9.18	38.3	667:06:00	3:48:43
Glasgow City	365	25	9	3,319.35	9.09	37.9	162:51:00	0:26:46
Highland	17	5	1	158.57	9.33	38.9	167:41:00	9:51:49
Midlothian	87	9	6	560.71	6.44	26.9	113:33:00	1:18:19
Moray	75	5	8	418.26	5.58	23.2	70:50:00	0:56:40
Na h-Eileanan an Iar	1	1	0.2	7.68	7.68	32.0	0:16:00	0:16:00
North Ayrshire	7	1	2	31.69	4.53	18.9	2:27:00	0:21:00
North Lanarkshire	58	10	4	572.46	9.87	41.1	22:21:00	0:23:07
Orkney Islands	42	2	7	293.28	6.98	29.1	5:30:00	0:07:51
Perth and Kinross	122	10	8	1,274.59	10.45	43.5	105:02:00	0:51:39
Renfrewshire	178	10	11	1,667.98	9.37	39.0	65:24:00	0:22:03
Scottish Borders	42	6	2	360.50	8.58	35.8	21:53:00	0:31:16
Shetland Islands	1	1	0.2	6.69	6.69	27.9	1:48:00	1:48:00
South Ayrshire	40	5	4	272.52	6.81	28.4	27:56:00	0:41:54
South Lanarkshire	149	28	3	1,108.22	7.44	31.0	69:30:00	0:27:59
Stirling	73	9	8	380.83	5.22	21.7	331:31:00	4:32:29
West Dunbartonshire	17	4	3	257.41	15.14	63.1	333:50:00	19:38:14
West Lothian	7	2	1	74.64	10.66	44.4	119:10:00	17:01:26
Scotland	**2,885**	**265**	**6**	**23,175.29**	**8.03**	**33.5**	**667:06:00**	**13:00:10**

*A 2014 Nissan Leaf has an energy consumption of 0.24 kWh/mile and a maximum range of 124 miles from a full charge (NEDC).

Table 7.2 Usage statistics by local authority in which units were used at least once, August 2013

August 2013							
Local Authority	**Number of sessions**	**Number of used units**	**Electricity used (kWh)**	**Average Electricity used per session (kWh)**	**The number of miles a 2014 Nissan Leaf would be capable of from the average electricity used in a session***	**Longest charge (hh:mm:ss)**	**Average charge (hh:mm:ss)**
Angus	11	2	75.67	6.88	28.7	111:12:00	47:53:22
Argyll and Bute	3	1	39.25	13.08	54.5	64:52:00	43:09:00
City of Edinburgh	73	7	560.28	7.68	32.0	95:35:00	26:26:39
Dundee City	32	5	318.91	9.97	41.5	67:57:00	10:51:06
East Ayrshire	20	1	95.20	4.76	19.8	95:28:00	29:01:57
East Lothian	28	3	373.75	13.35	55.6	485:19:00	41:34:09
Falkirk	74	8	522.55	7.06	29.4	143:25:00	15:02:11
Fife	2	2	17.26	8.63	36.0	1:50:00	1:43:00
Glasgow City	6	2	26.76	4.46	18.6	7:36:00	2:07:50
Highland	28	6	381.83	13.64	56.8	440:13:00	38:47:58
Midlothian	42	3	284.70	6.78	28.2	68:19:00	5:33:50
Orkney Islands	43	2	331.97	7.72	32.2	5:51:00	3:11:42
Renfrewshire	74	6	656.72	8.87	37.0	213:41:00	22:36:17
Scottish Borders	6	2	61.48	10.25	42.7	21:03:00	9:26:20
South Ayrshire	12	4	140.28	11.69	48.7	142:01:00	37:18:50
South Lanarkshire	88	16	407.46	4.63	19.3	142:07:00	26:11:29
Stirling	77	7	423.05	5.49	22.9	5:01:00	2:25:45
Scotland	**619**	**77**	**4,717.116**	**7.62**	**31.8**	**485:19:00**	**19:16:45**

*A 2014 Nissan Leaf has an energy consumption of 0.24 kWh/mile and a maximum range of 124 miles from a full charge (NEDC).

Tables 7.1 and 7.2 shows the breakdown of charging by local authorities in which charging sessions for August 2013 and August 2014 took place. The local authority with the greatest number of charging sessions was the City of Edinburgh (494) then Dundee City (459) followed by Glasgow City (365) in August 2014. A year earlier the number of charging sessions for these three authorities were 73, 32 and 6 respectively. This indicates a large rise in city use of public electric charging. Table 7.1 also shows that the average amount of electricity used per session Dumfries and Galloway (12.03 kWh) which equates to just over 50 miles per average charge for a 2014 Nissan Leaf. North Ayrshire had the smallest average amount of electricity use per session (4.53 kWh) which equates to just 18.86 miles for a 2014 Nissan Leaf. This suggests differing usage patterns across the local authorities.

Table 6 shows that for August 2014, Dundee City has the highest density of charging points per square mile with Glasgow City, City of Edinburgh, Aberdeen City and Renfrewshire completing the top five most charge point dense local authorities. Interestingly, Dundee City has almost 6 times greater charge point density than the City of Edinburgh despite the fact that the number of charging sessions was actually higher in the City of Edinburgh than Dundee. This suggests that the charging network in the City of Edinburgh was used better in this month.

Table 6 shows that all charging units were used in the City of Edinburgh, Falkirk and Stirling in August 2014. Only 12 out of the 30 Local Authorities used less than 50% of their charging units. The top three local authorities with the most unused units were Fife (21), South Lanarkshire (20) and Scottish Boarders and Glasgow City (17 each).

Summary:

There has been a significant increase in the use of the ChargePlace Scotland charging network between August 2013 and August 2014. The number of charging sessions increased by 366% (619 to 2,885 sessions) and the mean average electricity used per charging session increased only slightly (by 5%). 55% of charging units were used at least once in August 2014 with all units being used in 3 local authorities.

Caution must be taken when looking at longest time period. The data for average charging time and longest charging time is potentially misleading as improper closure of the charging socket will continue to register as use until it is closed properly. However, we can see from the top ten lists by number of charging sessions and by electricity used that there seems to have been a shift from use by private entities to more widely spread public electric charging.

Overall, the ChargePlace Scotland network experienced rapid growth between August 2013 and August 2014 with 55% of all charging units were used across the entire network in August 2014 at least once. Despite the rapid growth and uptake of electric vehicles and the use of electric charging units the proportion of electric vehicles still remains small in Scotland (1,071 at the end of Q3 2014). Furthermore, it is also difficult to determine how the ability of electric vehicle users to charge their vehicles at home will affect the demand for public charging units. The higher increase in the number of unique users compared to the installation of domestic charge points may indicate that users prefer public charging as opposed to charging at home. However, this is unclear as the data does not indicate if it is possible for all electric car owners to charge at home.