

Tactran Regional EV Strategy: Baseline Report

This report provides information about the current electric vehicle (EV) fleet and charging provision across the four Tactran Local Authorities (LAs) in support of the development of the Tactran Region EV Strategy.

This report includes:

1. An estimation of the number and location of EV charge points in the area;
2. An estimation of the number and location of EVs in the area;
3. Information regarding the existing operation and maintenance of the EV charging network across the different local authorities in the region;
4. An investigation into payment regimes, including using payment regimes to manage demand and encourage adoption of EVs.

1. EV charge points across the Tactran LAs

We have carried out an initial assessment of the public charging infrastructure in the four Tactran local authorities.

There has already been notable investment in infrastructure in the region. Dundee is regarded as Scotland's leading city in the adoption, promotion, and operation of electric vehicles and is Scotland's only Go Ultra Low city, a status awarded by the Office for Low Emission Vehicles (OLEV). The city has been at the forefront of developments in EVs, implementing one of Europe's most extensive city-wide EV charging networks. Scotland's first rapid charging hub was deployed in Dundee by 203020 taxis, with support from Dundee City Council and Transport Scotland. There are currently over 90 publicly available charging posts in the city, most notably through three charging hubs at priority locations – the city centre, Lochee and Broughty Ferry – with dedicated EV parking.

Alongside Dundee, other parts of the region have also deployed charging infrastructure and sought to encourage EV roll-out. Several key projects are also in the pipeline. For example, Perth and Kinross Council's Low Carbon Transport Hub at Broxden Park & Ride incorporating battery storage technologies and renewable energy solution.

Table 1 shows the number of publicly available charging posts and charge points¹ across the four Tactran LAs. Charge points are categorised as either slow (<3 kW), fast (7-22 kW) or rapid (>43

¹ Here and throughout this document we make the distinction between charging posts – the physical charging units - and charge points – the number of individual connections through which vehicles can charge. Many charging posts are dual socket and therefore consist of two charge points.

kW).

Table 1: Publicly available charge points across the four TACTRAN LAs in 2019² (Note this does not include restricted use e.g. workplace, or home chargers, data was sourced from the respective LAs complemented by data from Zapmap).

	Total publicly available		Total on CPS network		Type of charging post		
	Charging posts	Charge points	Charging posts	Charge points	Slow	Rapid	Fast
Angus	35	68	32	62	2	21	12
Dundee City	91	157	75	133	3	41	47
Perth and Kinross	48	84	31	62	0	19	29
Stirling	29	55	18	33	0	16	13

The majority of publicly available EV charge points in Scotland are on the Charge Place Scotland (CPS) network. Across the four TACTRAN LAs it is estimated that 80% are on the CPS Network. The devices which are not on the CPS network are primarily Tesla charge points privately installed in either supermarkets or hotels, such as the 8 Tesla superchargers on the west side of Dundee. Other private networks are becoming established in Scotland such as Ecotricity, Engenie and Polar.

For the Tactran region as a whole there are approximately 111 rapid chargers on the ChargePlace Scotland network. There are also more than 177 fast chargers and approximately 2 slow chargers on the CPS network. In Angus and Stirling there are greater numbers of fast charge points, whereas in Dundee City rapid charge points dominate the publicly available charge point mix.

Transport Scotland has undertaken analysis of data recorded in relation to the use of the CPS network in 2018. Tables 2 and 3 below present an extract of this analysis with statistics pertinent to the Tactran region. The analysis demonstrates how Dundee City has the highest number of charging events across the Scotland. Perth and Kinross has a significantly greater number of charging events than for the average Scottish LA, Angus and Stirling are marginally lower than the average. The low number of households per sq km in Angus, Perth and Kinross, and Stirling, highlights the additional challenges of rurality for these LAs compared to Dundee City.

² Urban Foresight endeavoured to accurately estimate this number of publicly accessible charge points, but with continual expansion of the charging network, the numbers given here are accurate to the best of our knowledge.

Table 2: Charging post utilisation statistics from Transport Scotland's analysis of CPS data

ChargePlace Scotland 2018	Infrastructure Statistics	Usage Statistics	Charging Point Utilisation [by Event]		Charging Point Utilisation [by Time]			Energy Consumption	
	Total CP	Total Events	Total Events per CP	Average Events per CP [Per Day]	Total Time	Total Utilisation	Average Duration	Total kWh Drawn	Average kWh Drawn
Angus Council	20	10,612	531	1.45	28,219	16.11%	2.66	108,202	10.20
Dundee City Council	73	80,498	1103	3.02	361,330	56.50%	4.49	775,232	9.63
Perth & Kinross Council	34	24,052	707	1.94	32,666	10.97%	1.36	263,101	10.94
Stirling Council	16	12,772	798	2.19	34,863	24.87%	2.73	130,267	10.20
Scotland TOTAL	701	442,856	N/A	N/A	1,585,555	N/A	N/A	4,220,721	N/A
MEAN	22	13,839	601	1.65	49,549	25.82%	3.58	131,898	9.53
Minimum	5	929	62	0.17	3,534	2.69%	0.88	11,404	7.58
Maximum	73	80,498	1,158	3.17	361,330	56.50%	9.04	775,232	12.28

Table 3: Energy consumption and fiscal and social statistics from Transport Scotland's analysis of CPS data

ChargePlace Scotland 2018	Energy Consumption Costs		Fiscal & Social						
	Total Cost	Average Cost	Total Households	Flats and Terraced	Flats and Terraced	Area per CP	Household per CP	Area	Households per sq km
Angus Council	£ 16,230.37	£ 1.53	56,135	46%	25,822	109.1	2806.8	2,182	26
Dundee City Council	£ 116,284.78	£ 1.44	74,354	68%	50,561	0.8	1018.5	60	1,243
Perth & Kinross Council	£ 39,465.09	£ 1.64	71,810	40%	28,724	155.5	2112.1	5,286	14
Stirling Council	£ 19,540.10	£ 1.53	41,250	45%	18,563	136.7	2578.1	2,187	19
Scotland TOTAL	£ 633,108.11	N/A	2,595,031	N/A	1,509,064	N/A	N/A	77,925	N/A
MEAN	£ 19,784.63	£ 1.43	81,095	58%	47,158	111.16	3701.90	2,435	33
Minimum	£ 1,710.61	£ 1.14	11,180	15%	1,789	0.82	746.13	60	5
Maximum	£ 116,284.78	£ 1.84	308,293	85%	262,049	1115.62	9889.00	25,659	1,757

2. EVs across the Tactran LAs

The Department for Transport (DfT) publishes the number of EV registrations by Local Authority (LA) on an annual/quarterly basis. Table 4 presents figures for the past seven years for each of the four local authorities and for Scotland as whole. Figure 1 illustrates these same data as a percentage of total vehicle registrations and shows growth over time.

Table 4: EV Registrations

Region/Local Authority	2011 Q4	2012 Q4	2013 Q4	2014 Q4	2015 Q4	2016 Q4	2017 Q4	2018 Q4
Scotland	241	448	673	1547	2915	4563	7089	10 854
Angus	0	0	14	35	63	91	132	219
Dundee City	27	64	74	126	159	205	264	347
Perth and Kinross	0	11	17	39	87	150	248	357
Stirling	0	12	24	54	133	316	590	959

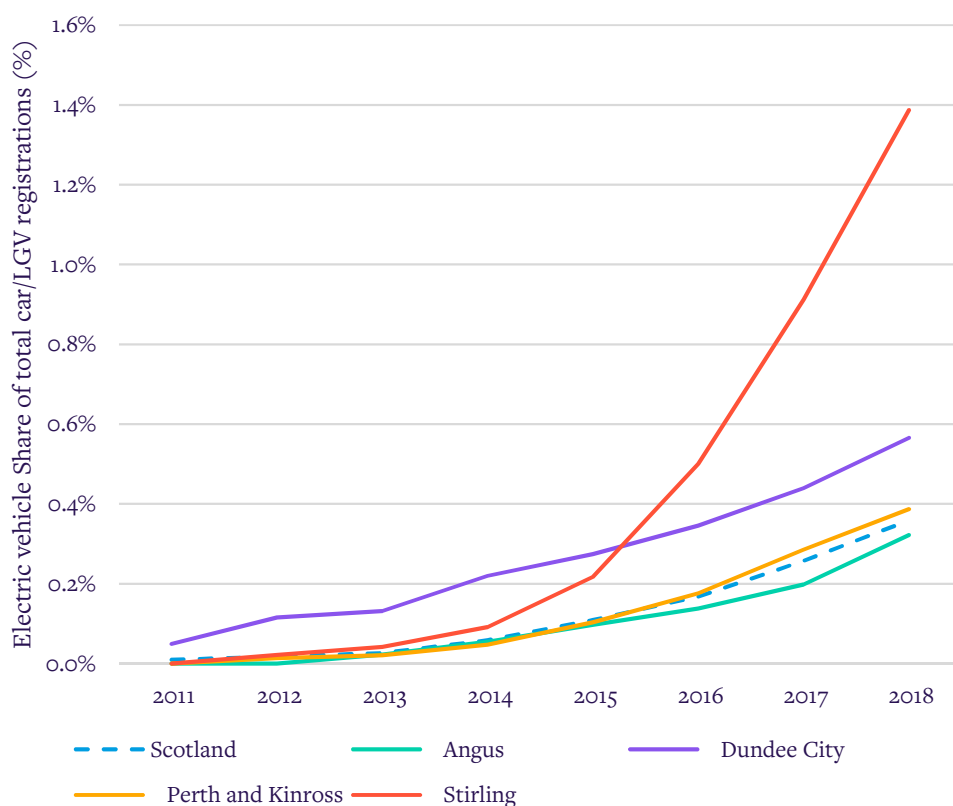


Figure 1: EV registrations as a percentage of total car/LGV registrations 2011-2018

However, using vehicle registration this way as a proxy for actual EV usage in the region is limited, mainly due to the fact that many vehicles used and located in the region will be registered elsewhere. Leased vehicles are registered to the vehicle leasing company and therefore in the DfT stats they are attributed to the company location rather than where they are operational. There are approximately 1.3 million business fleet leases³ in the UK, and lease vehicles represent a high proportion of taxis and council fleets. Therefore, when, for example, an LA leases an EV it is unlikely to be accounted for by DfT registration statistics in the LA where it is operated.

Another source of data which could help improve this estimate is data relating to Charge Place Scotland charging sessions. This data includes a unique – and anonymised – identifier for each user of the network and therefore it is possible to determine the number of different users utilising public charging infrastructure in the region.

Through Charge Place Scotland data for each region, we can estimate the number of EVs from the charging user IDs of these publicly available charge points. Building on this from discussions with LAs regarding charging behaviour from their taxi and fleet vehicles we can estimate how many additional vehicles which usually charge in restricted areas there are in the LA. This analysis is summarised in Table 5 and Figure 2 below.

Table 5: EV registrations (2018 sourced from DfT) and unique CPS IDs by LA (sourced from LA for 2018 CPS charging sessions)

	EV registrations (sourced from DfT)	Unique CPS IDs	Number that charged more than once a month
Angus	219	820	156 (19%)
Dundee City	347	1737	608 (35%)
Perth and Kinross	357	2289	353 (15%)
Stirling	959	1378	117 (13%)

³ <https://www.bvrla.co.uk/uploads/assets/uploaded/bbo8da98-45da-4ee2-864eco2e7bc17842.pdf>

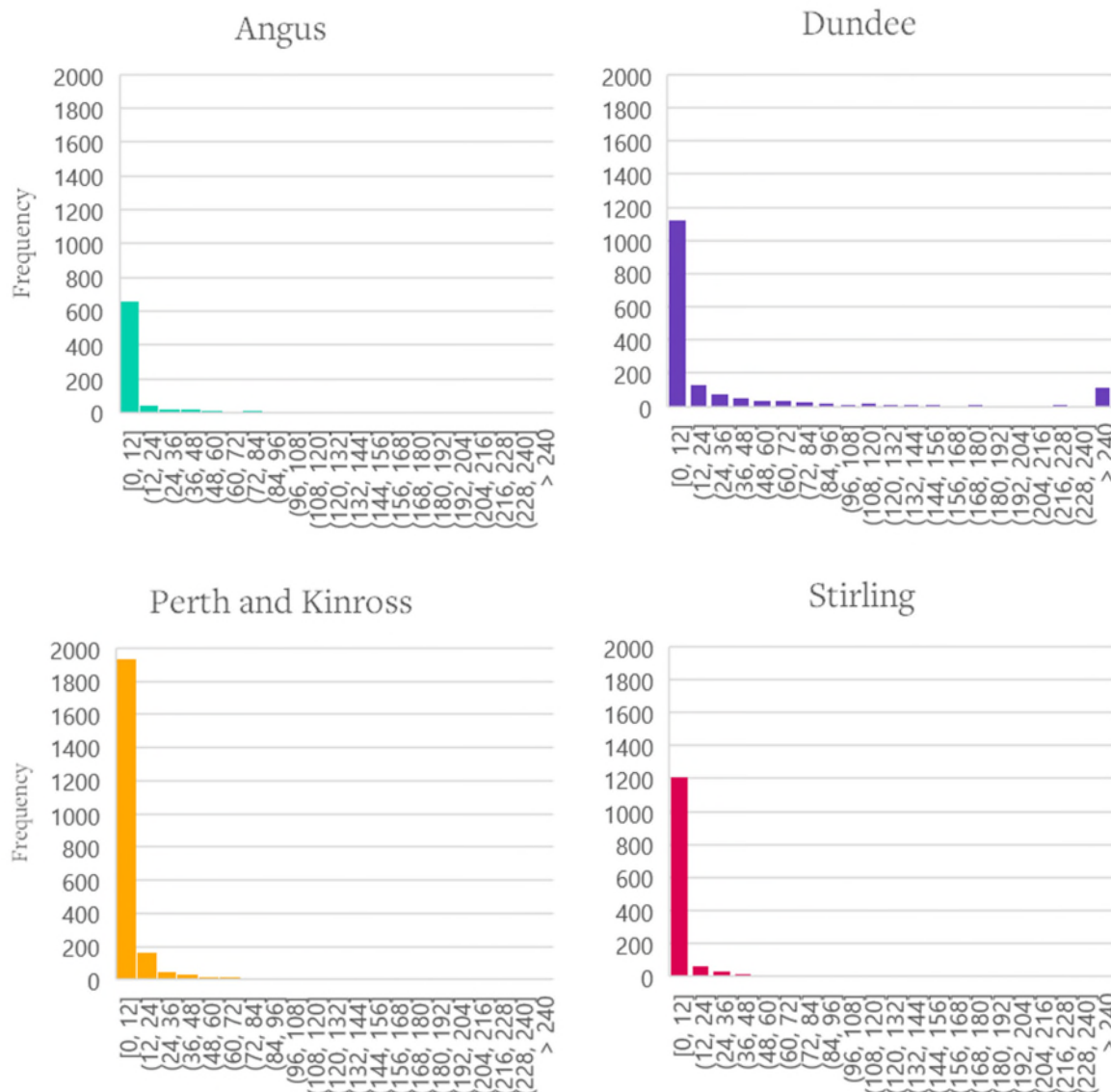


Figure 2: Frequency of CPS charging events in different LAs in 2018 (data sourced from LAs)

A large number of CPS IDs only recorded one charging session or less a month. By assuming an EV is primarily located in an area if it is charging on average of once a month, there is clearly a large disparity between this number and the number of EVs registered (see Table 5). The DfT EV registration figures given here represent the number of vehicles with their V5C registration documents registered to the LA. Given that many council vehicles are leased, the V5C documents do not reflect how many EVs are leased and are therefore operating in the area. Even by estimating the number of EVs using the CPS data (assuming that an EV that charges an average of once a month is based in the LA) this cannot properly account for EVs that only charge at home or utilizing private workplace charge points. Given that charging tariffs are currently free for charge points on the CPS network it is likely that many EV drivers will take advantage of this incentive rather than paying for electricity from their home charge point, therefore it is likely that this estimate is more representative. Estimating the number of EVs in a LA is challenging without home charging data but using CPS IDs currently gives a more representative figure than the DfT registration data.

3. Operation and Maintenance of the EV charging network

Each LA manages its own network of EV charge points. In each LA different sections of the council are responsible for this. The Charge Place Scotland back office system records all charging events including the user ID, the length of charging session and energy drawn. All LAs received funding from Transport Scotland for maintenance and warranty package for their EV charging network which will continue until December 2022.

The costs for the maintenance, warranty and comms of the EV charging network will be variable depending on how suppliers are procured. As a guideline, the maintenance fee per dual-headed 7 kW - 22 kW post would usually be at least £600 per year. This cost would cover annual preventative maintenance / warranty as well as the sim-card/connection to the supplier's back office management system. For higher-powered, rapid chargers, the costs would be higher at least £1,800 per annum. These estimates are sourced from Dundee City Council based on historical operational costs. Based on the currently installed charging infrastructure in 2019 the cost for maintaining the current publicly available charging provision on the CPS network annually would be approximately £60k, £138.6k, £75.6k and £31.8k in Angus, Dundee City, Perth and Kinross, and Stirling respectively.

Maintenance of charge points will be covered by TS until 2022. When TS no longer cover the maintenance costs for charge points in Scotland, LAs need to ensure that revenue from charging sessions can cover these ongoing costs to ensure that the network of charge points remains reliable for users.

4. Payment regimes

To date, EV charge points on the Charge Place Scotland network have been free to use for EV drivers. However, this is likely to change with councils implementing their own tariffs. For example, Dundee City Council are proposing a new charging tariff of 15p per kwh + 38p connection charge per transaction, with possible public discount.

In this section the tariffs for the different private networks are detailed, to indicate the variation of tariffs already in use. Table 6 provides an overview of charging tariffs adopted by different public and privately operated charging networks across the UK. There is a clear variety of different charging and payment mechanisms currently in operation.

EV charging tariffs can be used to encourage different types of behaviour such as to discourage charging at times of peak electricity demand when there could be strain on local distribution grids. Price variations for charging at different times of the day could be effective at controlling when users charge. A tariff could be structured that informs consumers of rates in advance. Vehicles can also be programmed to begin charging at a set time when preferential pricing begins, therefore acting as a financial incentive for users. Similarly, the charging of vehicles can be remotely interrupted (i.e. paused) to reduce the costs of charging at a specific time.

Table 6: Review of tariffs introduced across the UK and Ireland

Network	Connection fee	Minimum Fee	Price per kWh	Overstay Charge	Price for charging 30kWh vehicle from empty to 80% (24 kWh)
Charge Place Scotland	Free	-	Free	-	Free
Moray Council	-	-	£3.80 per session	-	£3.80
Highland Council	-	£1.50	15p/kWh	-	£3.60
Shetland Council	-	£1.50	15p/kWh	-	£3.60
ESB Ecars (ROI)	Free	-	Free	-	Free
ECARNI (NI)	Free	-	Free	-	Free
Charge Your Car (UK)	£1	-	Varies: Free-£4.50 per hour+	Varies: some rapids charged £5 after 1st hour	Varies (Minimum: £1)
Shell	Free	-	39p/kWh –	-	£7.50
Polar Plus	£1.20	-	Varies: Free to 10.8p/kWh	-	£2.59
Polar Instant (non-members)	£1.20	-	£1 per hour 13A 3kW units. £1.50 per hour for type 2 units – (3.6kW, 7kW, 11kW, 22kW)	-	3kW: £11.20 3.6kW: £14.20 7kW: £8.20 11kW: £5.20 22kW: £3.20

Network	Connection fee	Minimum Fee	Price per kWh	Overstay Charge	Price for charging 30kWh vehicle from empty to 80% (24 kWh)
Polar Instant (non-members) Rapids	£1.20	-	£6 per 30 minutes	-	£7.20
Ecotricity		-	Fast Charging - 30p/kWh (Ecotricity customers 15p/kWh). Slow Charge - Free	-	Fast Charging - £7.20 Ecotricity - £3.60
Source London Fast (Reserve scheme)	Full membership: £4 monthly Flexi - £10 on off	-	Full - 9.5p/min Flexi - 11.9p/min PAYG - 14.3p/min	Full £8.64 (8pm - 7am) Flexi - £14.16 (8pm - 7am)	Full - £2.85 Flexi - £3.57 PAYG - £4.29
Source London 3-7kW	Full membership: £4 monthly Flexi - £10 on off	-	Full - 3.6p/minute Flexi - 5.9p/min PAYG - 7p/min	-	3kW: ~ £21.60 7kW: ~ £9.26
Genie Point 7kW-22kW	£0.50	-	30p/kWh	£10 overstay charge over 4 hours	£7.70
Genie Point Rapids	£1.80	-	30p/kWh	£10 overstay charge over 1 hour + each subsequent hour	£9
Plugged-In Midlands	Plus: free Instant: £1.20	-	Free - 10.8p/kWh	-	£3.79

Network	Connection fee	Minimum Fee	Price per kWh	Overstay Charge	Price for charging 30kWh vehicle from empty to 80% (24 kWh)
GMEV (Manchester) operated by CYC	£1	-	Free	-	£1
Source West 3kW-7kW	£1	-	Free	-	£1
Source West Rapid	(£1 if no charging fee)	-	£4.50 for 1st hour	£5 after 1st hour	£1 / £4.50
ChargerNet Rapid	Free	-	£4 for 1st hour	£12 after 1st hour	£4
Recharge (Liverpool)	£1	-	Free	-	£1
Energise	£1	-	Free	-	£1
Engenie (Rapids) (Cheshire & Hampshire)	-	-	36p/kWh	-	£8.64
LiFe (North West)	-	£2	30p/kWh	-	£7.20
EV Driver (Suffolk)	Free RFID fee: £8	-	25p/kWh	-	£6
Instavolt (rapids)	-	-	35p/kWh	-	£8.4
BP	£1.20	-	Plus: 10.8p/kWh Instant: £6/30mins 20p/min	-	£3.79

It is generally agreed that tariffs will soon be introduced to bring in revenue streams to cover the cost of maintenance of infrastructure. Using the 2018 CPS data the revenue stream can be estimated under three different tariff scenarios:

1. Tariff 1: 30p/kWh
2. Tariff 2: 15p/kWh plus 38p connection charge
3. Tariff 3: £1 connection charge

Table 7: Potential revenue streams under different tariff scenarios

LA	# charging events in 2018	Ave. energy drawn per event (in 2018) kWh	Tariff 1	Tariff 2	Tariff 3
Angus	10 612	10.2	£34 473	£20 269	£10 612
Dundee City	80 498	9.63	£232 559	£146 869	£80 498
Perth and Kinross	24 052	10.94	£78 939	£48 610	£24 052
Stirling	12 772	10.20	£39 082	£24 395	£12 772

However, this doesn't account for the reduction in usage if tariffs are introduced. In other regions, when tariffs have been introduced usage has fallen considerably as users revert to home charging where possible.