ABERDEEN ELECTRIC VEHICLE FRAMEWORK 2020 TO 2030

Draft for Consultation

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1 INTRODUCTION

1.1 Background

The Scottish Government declared a Climate Emergency in 2019 and has set a 2045 target for net zero emissions, the most stringent legislative target anywhere in the world. For vehicles, the Scottish Government has also committed to remove the need for petrol and diesel cars and vans on Scotland's roads by 2032. This Electric Vehicle (EV) Framework forms part of Aberdeen City Council's response to contributing to this target. Two environmental challenges of different scales are tackled by the EV framework; local air pollution and climate change caused by GHGs. The road sector is the largest contributor to transport emissions, accounting for 68% of total transport emissions and, therefore, the EV framework has an important part to play in reducing emissions from transport.

Aberdeen City Council (ACC) has responded to this with a Net Zero Vision and Infrastructure Plan. The plan aligns to the overall objective of Aberdeen meeting the net carbon zero target by 2045 and, ultimately, to achieve climate positive status, with sustainable mobility one of the goals. Aberdeen is already in a relatively strong position in its journey towards low and zero emission road transport. It has a reasonably high share of EVs on the road, compared to many other local authorities in Scotland. Recharging and hydrogen refuelling infrastructure are already in place and there are plans to develop the chargepoint network further with the provision of hubs. ACC has been working with funders Transport Scotland (TS), the Scottish Government Transport Agency, Energy Saving Trust Scotland (EST) and the UK Office for Low Emission Vehicles (OLEV), as well as other partners, since 2011 to roll out Electric Vehicle (EV) chargepoints across the City. There are also many other EV chargepoints across Aberdeen that are not provided by ACC but are available to the public. In addition, ACC has been working with Co-Wheels Car Club to give those people who do not own an EV the opportunity to experience driving an EV.

1.2 Purpose of the Framework

The purpose of this document is to establish an EV framework for Aberdeen from 2020 to 2030 which will encourage and actively cater for a greater uptake of electric vehicles in the city and will support relevant national, regional and local strategies. It should be used to guide the strategy development and investment decisions of the Council and other organisations in the city. The framework primarily concentrates on passenger cars and vans licenced by fleets and individuals within the Aberdeen City Council area. Some sections include more vehicle types and also refer to the Aberdeenshire Council area, reflecting the fact that Aberdeen is the regional centre for the north east of Scotland and many residents will travel into the city for business and leisure.

The fuels and technologies covered by the framework are plug-in electric vehicles (pure battery electric, plug-in hybrid and extended range electric vehicles) Hydrogen fuel cell vehicles are referenced in the framework, however, there is separate consideration of hydrogen fuel cell vehicles in the Aberdeen City Region Hydrogen Strategy and Action Plan (2015 –2025). This EV framework sits as one of the daughter documents to the Aberdeen Local Transport Strategy (2016-2026) and provides more detail on how to realise the EV objectives of the Local Transport Strategy (LTS). It will inform and support the uptake of EVs to help meet the carbon reduction and air quality objectives of the LTS. Most plug-in vehicles fit into the ULEV category which is a vehicle that emits less than 75g CO_2 per km irrespective of the Euro Standard.
The framework should be read in conjunction with the Evidence Base and Baseline Report which provides more detailed information and is the basis for the framework. The key issues considered in the Framework are shown in Figure 1-1.

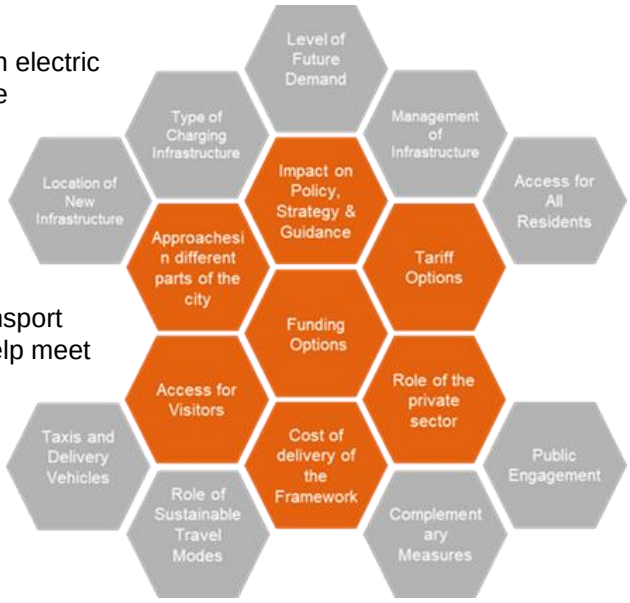


Figure 1-1 Key Issues

2 Baseline of Vehicles and Infrastructure

2.1 Overview

This section summarises the vehicle and charging technology that is available and outlines the vehicles registered in Aberdeen and Aberdeenshire and their associated emissions. The Aberdeenshire area has been analysed for current and future vehicle registrations, emissions and current infrastructure in order to provide context and account for the fact that traffic travelling into Aberdeen from outside the city is primarily from Aberdeenshire. Additional baseline information is provided in Section 6 of the Evidence Base and Baseline Report. Consideration has also been given to synergies with other initiatives, including the Air Quality Management Areas, the proposed Low Emission Zone, Car Club and the Hydrogen Strategy for the city. These are discussed in more detail in Chapter 11.

2.2 Vehicle Technology

There are several types of plug-in vehicles. A battery electric vehicle (BEV) stores energy in a battery (usually lithium-ion) and delivers its power to the wheels through an electric motor. Braking energy is captured by the electric motor and stored as electrical energy in the battery. Plug-in hybrid electric vehicles (PHEV) and extended range electric vehicles (E-REV) both have an internal combustion engine as well as a battery and electric motor. PHEVs are parallel hybrids, which means the wheels can be driven by either the combustion engine or the electric motor. E-REVs are series Hybridge, meaning that the wheels are always powered by the electric motor and the battery is recharged by the combustion engine. Section 3.1 of the Evidence Base and Baseline report and the roadmaps in this section illustrate forecast improvements in EVs and infrastructure technology. A EV typically costs between £15,000 and £20,000.

Figure 1-1 Plug-in vehicle technology roadmap shows the plug-in vehicle technology roadmap.

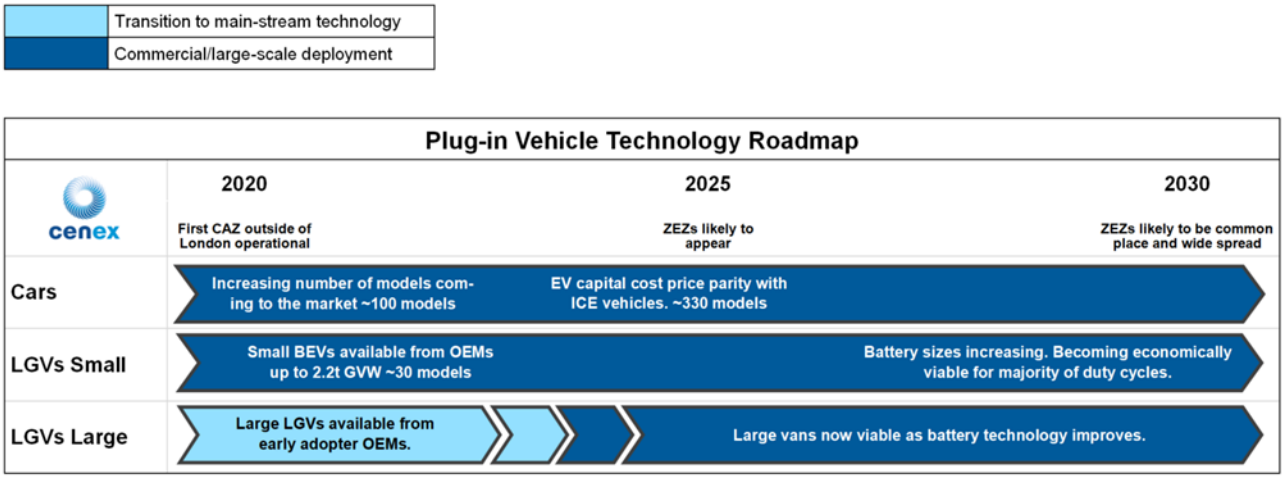


Figure 1-1 Plug-in vehicle technology roadmap

2.3 Charging Technology

2.3.1 Charging Connectors and Charger Types

Slow and standard charging is supplied by either a Type 1 or Type 2 alternating current (AC) connector at up to 7kW. Vehicles will be supplied with the appropriate lead for connecting to these chargepoints, which are typically installed at residential or workplace sites, on the kerbside and long-stay car parks.

Fast (7-22kW), rapid (up to 50kW) and ultra-rapid (approximately 50kW) charging can be supplied by either AC or direct current (DC). AC rapid charging is always supplied via a Type 2 connector. DC rapid charging has two connector types, depending on the vehicle. Japanese vehicle manufacturers such as Nissan and Mitsubishi use the CHAdeMO connector. European vehicle manufacturers use the Combined Charging System (CCS). Rapid chargepoints have tethered cables for both DC connector types and AC Type 2 as

well. However, some rapid chargers do not have an AC outlet and therefore users are required to use their own Type 2 leads.

2.3.2 EV Infrastructure Timeline

The EV Infrastructure Roadmap is shown in Figure 2-2 EV Infrastructure Roadmap and more detail is provided in Section 3.2 of the Evidence Base and Baseline report.

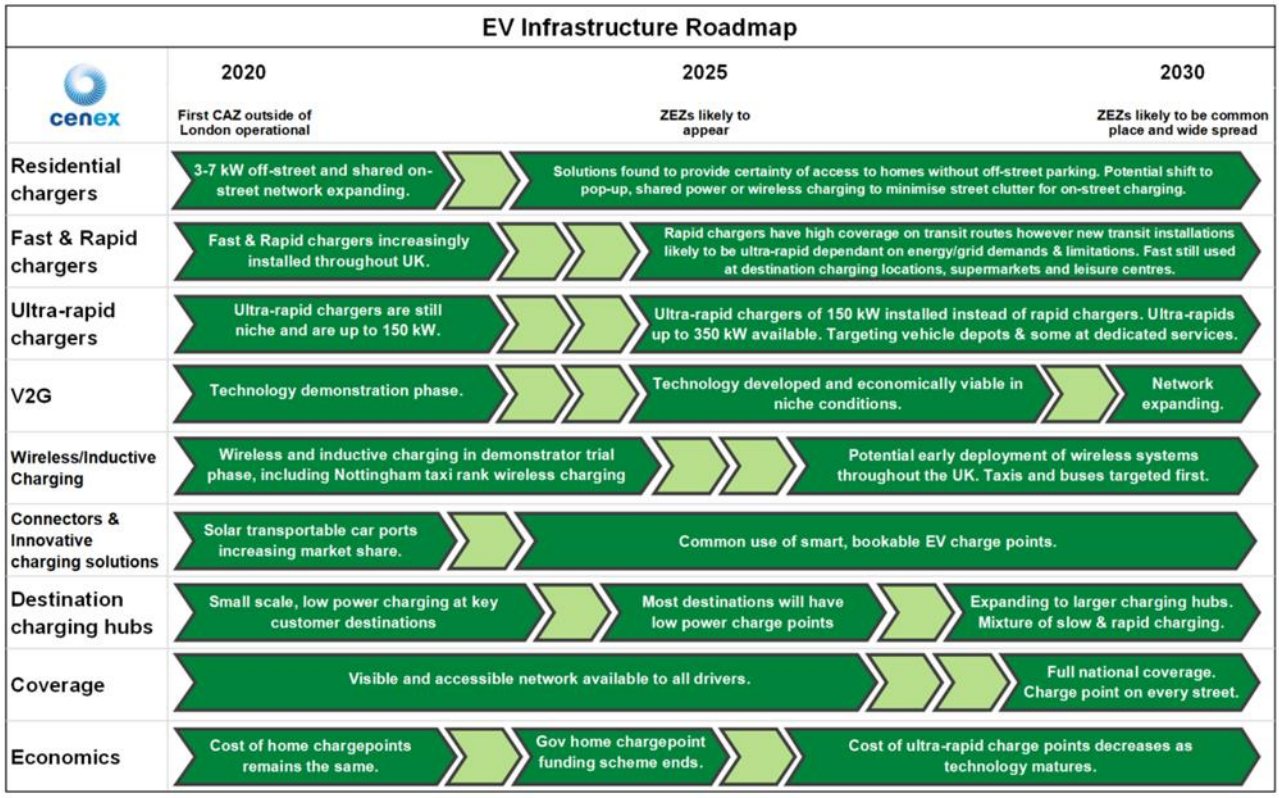


Figure 2-2 EV Infrastructure Roadmap[1]

2.3.3 Novel Charging Solutions

The charging solutions listed below are other technologies which are likely to become more prominent during the timescale of this framework. Section 3.2.3 of the Evidence Base and Baseline report gives a more detailed summary of each solution.

- ***Kerbside domestic charging*** extends domestic electrical supply to the kerb and can be achieved using cable channels and guides.
- ***Pop-up chargepoints*** allow chargepoints to sit flush to the pavement surface when not in use and, in some cases, while charging is underway.
- ***Shared power supplies*** can be retrofitted to existing street furniture with a pre-existing electrical connection.
- ***Wireless (or inductive) charging*** allows an EV to receive a charge without physically connecting the vehicle to a chargepoint.
- ***Battery swapping*** involves replacing a depleted battery with a fully charged one at a battery swapping station, instead of stopping and waiting to recharge.

[1] The timeline is informed by the research provided in the Evidence Base and Baseline Report

2.3.4 Summary

Several technologies which are at the R&D or early deployment phase theoretically support charging infrastructure deployment in residential areas without off-street parking provision. However, the market is reasonably immature and many of the hardware solutions are flawed, not widely proven, and more expensive than conventional options. Updates to planning regulations to aid infrastructure rollouts in these areas should consider community charging hubs, as well as the above solutions.

2.3.5 Proposed Action

- ACC to keep a watching brief on the development of new technologies and investigate opportunities for trials where appropriate.

2.4 Overview of Current Situation

This section summarises the current situation in Aberdeen. A greater level of detail can be found in Section 6.1 of the Evidence Base and Baseline report.

2.4.1 Vehicles

Figure 2-3 and Figure 2-4 demonstrate the current petrol/diesel car ownership levels and EV uptake in Aberdeen City and Aberdeenshire.

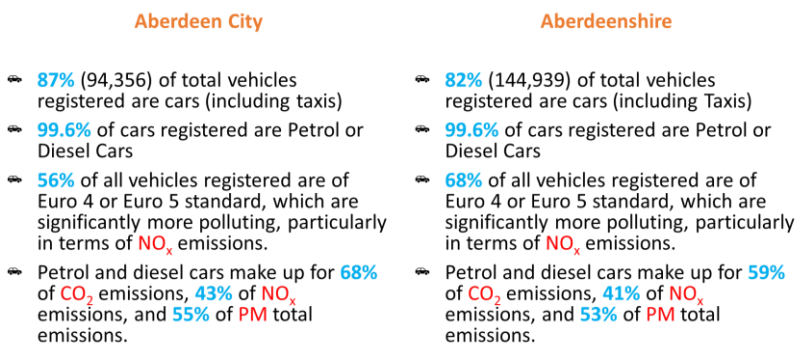


Figure 2-3 Petrol/Diesel Vehicle Ownership

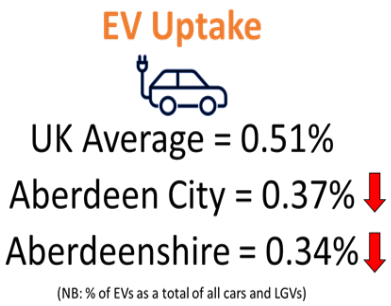


Figure 2-4 EV Uptake against the UK Average

2.4.2 Charging Infrastructure

ACC has over 100 chargepoints under its control. The majority are part of the Charge Place Scotland network and most are available 24 hours a day to the public, with smaller numbers serving the council's own fleet and designated EV car club bays across the local authority area. Chargepoints are located citywide and there is a mixture of 50 kW DC / 43 kW AC rapid chargers, 22 kW fast chargers, 7 kW standard chargers and a small number of 3 kW slow chargers.

ACC has made strategy and policy commitments in its Local Transport Strategy and Local Development Plan Supplementary Guidance to increase EV chargepoints. These commitments are in line with the Scottish Government's aim of phasing out the need for new petrol and diesel cars and vans by 2032, ahead of the UK Government's 2040 target.

Figure 2-5 demonstrates the current levels of EV charging infrastructure in Aberdeen City and Aberdeenshire compared to the Scotland figure.

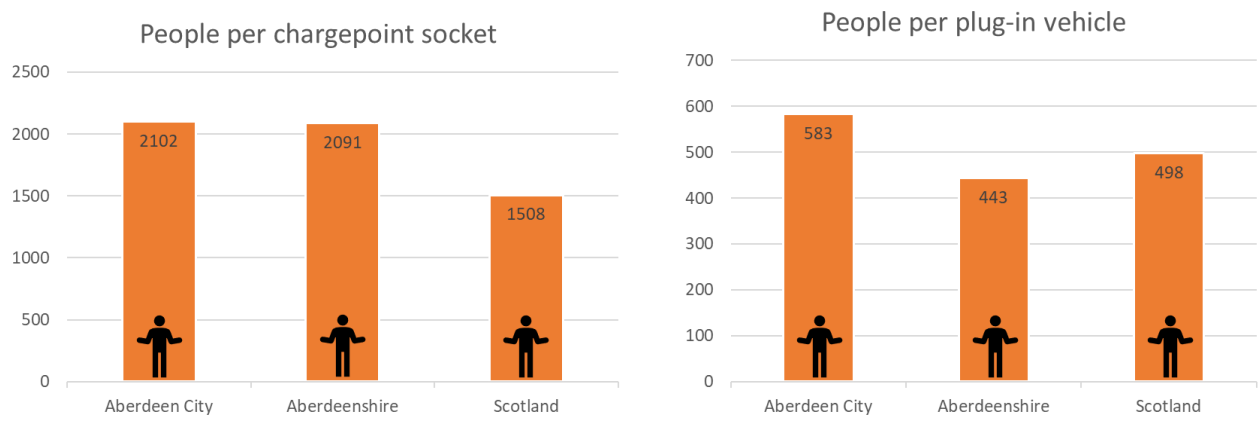


Figure 2-5 People per chargepoint socket and plug-in vehicle

Figure 2-5 shows that the number of people in both Aberdeen City and Aberdeenshire is higher than that of Scotland as a whole. The number of people per-plug in vehicle for Aberdeenshire is lower than the Scottish average, however in Aberdeen City the number of people per plug-in vehicle is higher than both the Scottish and Aberdeenshire average.

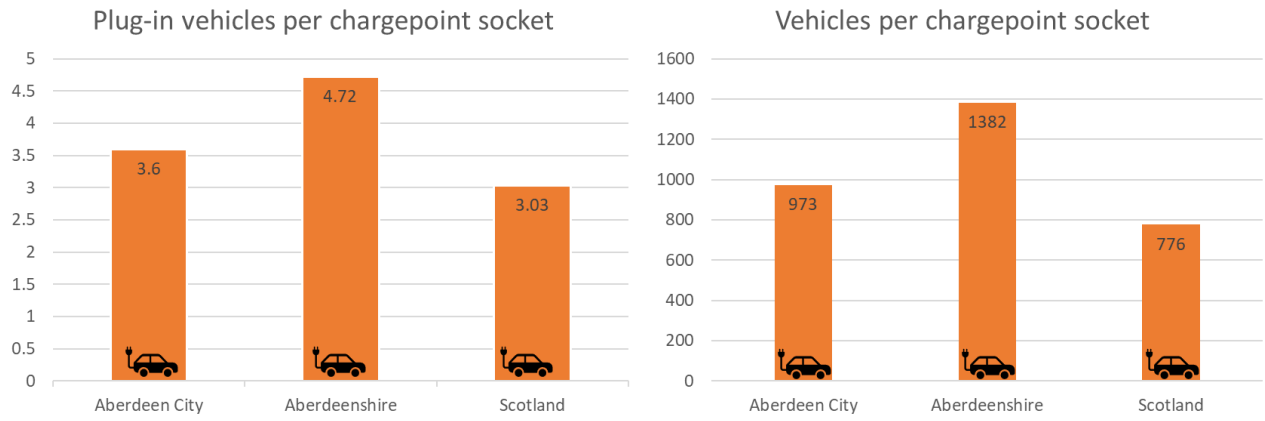


Figure 2-6 Plug-in vehicles and other vehicles per chargepoint socket

Figure 2-6 illustrates that for both Aberdeen City and Aberdeenshire the number of plug-in vehicles per chargepoint socket is higher than the Scottish average. This is also the case for the number of non plug-in vehicles per chargepoint socket. Aberdeenshire particularly stands out with higher numbers of plug-in and non-plug-in vehicles per chargepoint socket.

Figure 2-7 demonstrates the current chargepoint utilisation for different charge types in Aberdeen, based on data provided by Aberdeen City Council on over 50 chargepoints over a period of 12 months.
Figure 2-7 shows the average amount of time EVs spend plugged into a chargepoint after the vehicle reaches full charge, and therefore is not efficient charging time and prevents other EVs from using the chargepoint. Inefficient time spent at slow and fast chargers is significantly higher than time spent at rapid chargers.

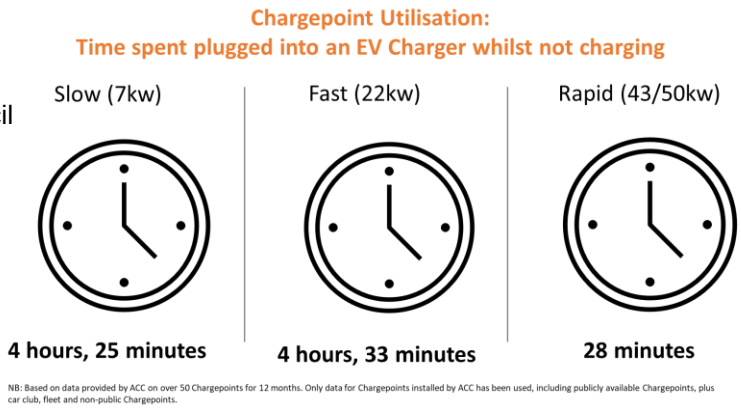


Figure 2-7 Chargepoint Utilisation

Table 2-1 Chargepoint Socket provisions compares Aberdeen City and Aberdeenshire chargepoint socket provisions with Scotland[2]. Cells highlighted in red indicate worse performing areas than the Scotland average, and green indicates better performance. Although the two local authorities perform well in terms of EV uptake, the number of chargepoints provided is below the Scottish average in almost all metrics analysed.

Table 2-1 Chargepoint Socket provisions

	No. of chargepoint sockets	Population	People per chargepoint socket	People per plug-in vehicle	Plug-in vehicles per chargepoint socket	Vehicles per chargepoint socket
Aberdeen City	106	222,793	2,102	583	3.60	973
Aberdeenshire	121	252,973	2,091	443	4.72	1,382
Scotland	3,585	5,404,700	1,508	498	3.03	776

Detailed analysis of baseline vehicle data and chargepoint locations in Aberdeen City and Aberdeenshire can be found in Section 6 of the Evidence Base and Baseline report. Figure 2-8 shows the locations of the existing charging infrastructure.

2.4.3 Tariffs

Aberdeen City Council apply a tariff to public chargepoints under their control of 38p connection fee and 19p per kWh. Where chargers are located in pay in display car parks the users will also have to pay for parking (when these charges apply) even whilst charging. The exceptions are:

- Gallowgate and Broomhill rapid chargers where the parking fee is waived if the user stays with the vehicle whilst charging
- Golden Square if the user displays the relevant parking permit for that zone

Tariffs may also apply at EV chargepoints in locations that are not operated by the Council.

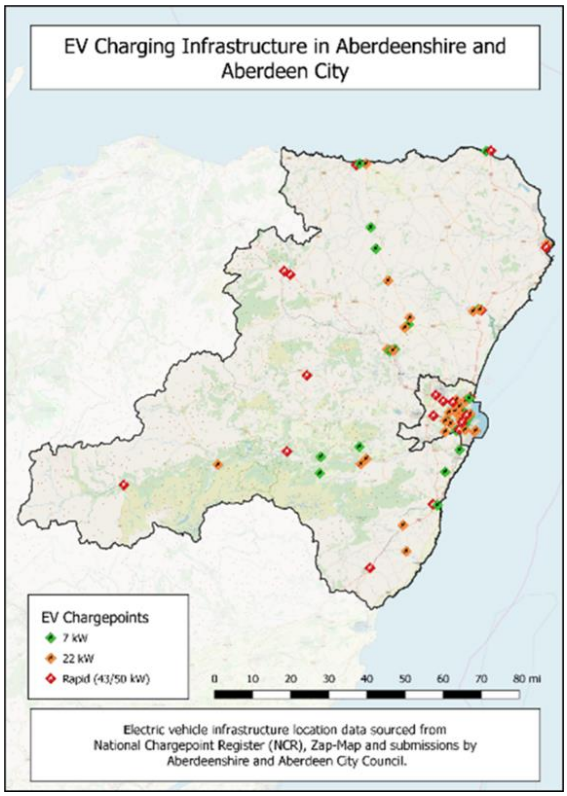


Figure 2-8 Existing Charging Infrastructure

2.4.4 Commuters, Visitors and In-Transit Vehicles

Commuters: UK Census data[3] was used to estimate the number of individuals commuting to Aberdeen from different local authority areas across the UK. A geospatial analysis was conducted to determine the distance, by road, between Aberdeen and each commuter origin.

The results showed that 93% of individuals commuting to Aberdeen by car originate from within 120km. As increasingly affordable EVs have been available for several years, this suggests that most commuters will not need to recharge an EV during the working day in order to continue their existing commute behaviour. Even accounting for a small drop in effective range due to seasonal variation in ancillary equipment use,

[2] Data is triangulated from ChargePlace Scotland data supplied by ACC, Zap-Map.com and the National Chargepoint Registry

[3] UK Census 2011, WU03UK dataset. No Scottish-specific data is available

there is still a significant buffer between the <120km commute shown in the data, and the range of an affordable EV (>200km, even assuming a 10% range loss).

Visitors: Analysis suggests that, by 2030, between 110 and 304 tourists will visit Aberdeen in an EV every day. It is not possible to forecast the exact charging requirements of these vehicles as there is insufficient data on journey origins and the duration of their stay in Aberdeen. For example, whilst a tourist traveling from England to Aberdeen by car is likely to benefit from accessing charging infrastructure during their visit, there is insufficient evidence to suggest what type of charging infrastructure will be of most benefit, or the location that would be most ideal. Refer to Section 9.2 of the Evidence Base and Baseline report for further details.

In-Transit Vehicles: Evidence shows that these users will most frequently use rapid chargers on strategic routes and are likely to favour a stopping points where they can also take a break. The most suitable location for transit charging infrastructure is near to extra-urban A-roads, where minimal detour is required to access the chargepoint. Road links with relatively high traffic flow are typically appropriate sites for transit charging. Locations on or near junctions where several high-flow road links intersect are ideal as the number of potential users increases further. See Figure 6-2 for information on the average annualised traffic flows and proposed EV charging infrastructure.

2.4.5 Taxis

ACC licenses 1,074 taxi and private hire vehicles[4], including 855 taxis of which 436 are wheelchair accessible vehicles (WAV) and 419 are non-WAV taxis and 219 private hire vehicles. ACC currently licenses 11 hybrid vehicles (1% of the fleet) and no EVs. There are two key risks which may constrain uptake of plug-in vehicles:

- Suitable plug-in vehicles must be available in all market segments including relatively niche segments such as MPVs and executive cars
- The use of small cars, hatchbacks or sports utility vehicles (SUV) is not prohibited which limits available options

Refer to Section 13 of the Evidence Base and Baseline report for further detail.

2.4.6 Delivery Vehicles

Cars are by far the most numerous vehicle type in Aberdeen. There are nearly 95,000 cars registered in the city, compared to just 9,000 vans and fewer than 1,200 HGVs. However, these figures are not in proportion to the contribution of each vehicle type to pollution and CO_2 emissions, as shown in Table 2-2 2019 emission values from road transport in Aberdeen City below.

Table 2-2 2019 emission values from road transport in Aberdeen City

	2019 Emissions Values				
	Cars		LGVs	HGVs	
	Petrol	Diesel		Rigids	Artics
% of total vehicles	56.1%	30.9%	8.2%	0.6%	0.3%
% of CO_2 total emissions	39.5%	28.5%	16.5%	4.6%	6.5%
% of NOx total emissions	5.5%	37.5%	22.6%	6.3%	13.5%
% of PM total emissions	4.3%	50.9%	21.0%	4.2%	9.0%

There are 9,000 vans and fewer than 1,200 HGVs registered in the city. Emissions from commercial vehicles are disproportionate to the number of such vehicles on the road, because of the high levels of emissions

[4] Data provided by Aberdeen City Council, Jan 2020

from individual vehicles, the relatively high number of older (pre-Euro 6/VI) vehicles on the road, and the lack of CO2 emissions standards for HGVs. However, it should be noted that this is likely to be an underestimate levels of emissions from road freight in Aberdeen. There is likely to be a significant volume of commercial vehicles coming into and passing through the city which are registered elsewhere and operate within Aberdeen.

2.4.7 Fleet

As part of its commitment to a Net Zero target by 2045, Aberdeen City Council approved the replacement of all fleet vehicles with alternative powered vehicles (where such vehicles were available in the open market) as part of the rolling programme and within the allocated budget for that programme in March 2020.

3 Consultation

3.1 Introduction

Consultation with key stakeholders was essential to inform the development of this draft EV Framework. Consultation targeted key stakeholders and the public, outlined in Figure 3-1, through an online survey, with the aim of understanding their views on the barriers and opportunities for an Electric Vehicle Framework in Aberdeen. This took the form of an online survey on ACC's website available to members of the public and direct stakeholder engagement with key organisations. Feedback on this draft EV Framework will be used to inform the production of the final EV Framework.

Figure 3-1 Stakeholder Groups consulted

3.2 Main Findings

Key themes identified from the responses include concern over the cost and availability of EV vehicles and associated infrastructure; the management of EV infrastructure in Aberdeen; the opportunity for collaboration with existing sustainable travel initiatives; and the need for communication with the public.

3.3 How the Consultation has informed the Framework

Feedback from stakeholders and members of the public identified a number of barriers to increasing the use of EVs. However, more opportunities than barriers were identified, indicating that stakeholders consider that there are multiple ways in which these barriers could be addressed in order to achieve the aim and objectives of the Electric Vehicle Framework. Key themes are summarised in Table 3-1.

Table 3-1 Consultation Findings

You Said	We Did
The implementation of the EV Framework should not be the sole responsibility of ACC and that various organisations should play a role. ACC should provide leadership and strategic oversight.	The draft Framework outlines the role that ACC has to play but also where other parties have a part to play in its delivery.

Access for All to EVs was seen as essential and there were concerns about enabling access to flat dwellers and people living in more rural areas.	The role of Car Clubs, taxis and public transport is highlighted as important to ensure equitable access. The issue of flat dwellers is considered specifically.
The use of existing car parks was mentioned as a significant opportunity and multiple locations were suggested.	This has been taken into account in the development of the criteria for the chargepoint locations and also in the subsequent locations proposed.
The preference is for emissions-based parking It was considered that the use of EV charging should be paid for and there should be a variety of payment options that are easy to use. Time limits and penalties should be introduced similar to the current parking system for non-EVs.	This has been considered.
Effective communications about the benefits of EVs and sharing information about the type of vehicles available and how the charging infrastructure works will be important to encourage people to change to using EVs.	The Evidence Base and Baseline Report discusses the importance of communications with different stakeholders.

4 Policy and Strategy Context

4.1 Introduction

This section outlines the main relevant UK, Scottish, Regional and Aberdeen City policies, strategies and legislation that have informed this framework. These are shown in Table 4-1 Relevant Policies, Strategies and Legislation and more information can be found in Section 2 of the Evidence Base and Baseline report.

Table 4-1 Relevant Policies, Strategies and Legislation

UK	Scotland	Regional	Aberdeen City
Environment Act (1995)	Climate Change Plan: third report on proposals and policies 2018-2032 (RPP3)[5]	Nestrans Regional Transport Strategy (2013)	Aberdeen City Region Deal, Strategic Transport Appraisal: Pre-Appraisal Report
National Air Quality Strategy (2000)	Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[6]	Nestrans 2040 report	Aberdeen Air Quality Action Plan (2011)
Air Quality Regulations (2010)	Protecting Scotland's Future: The Government's Programme for Scotland 2019-20[7]	Aberdeen City and Shire Development Plan (2014)	Aberdeen City Centre Master Plan (2015)

[5] https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-report-proposals-policies-2018/pages/12/

[6] https://www.gov.scot/policies/climate-change/reducing-emissions/

[7] https://www.gov.scot/binaries/content/documents/govscot/publications/publication/2019/09/protecting-scotlands-future-governments-programme-scotland-2019-20/documents/governments-programme-scotland-2019-20/governments-programme-scotland-2019-20/govscot%3Adocument/governments-programme-scotland-2019-20.pdf

Air Quality Management Areas (AQMAs) and Air Quality Action Plans (AQAPs)	Air Quality Management Areas (AQMAs) – Aberdeen: City Centre, Wellington Road, and Anderson Drive/Haudagain/Auchmill Road corridor	2018-23 Regional Economic Strategy Action Plan	Aberdeen Local Development Plan (2017): Policy T2 Managing the Transport Impact of Development, and Policy T3 Sustainable and Active Travel
Introduction of Clean Air Zones (CAZ) in many UK cities	Low Emissions Zones (LEZs) – planned in Aberdeen[8]	Aberdeenshire Local Transport Strategy (2012)	Local Development Plan Supplementary Guidance: Transport and Accessibility
Climate Change Act (2008) – amended 2019[9]	Planning and Building Regulation: ULEV charging and dedicated parking for new developments.[10]	Aberdeenshire Low Emission Vehicle Delivery Plan	Aberdeen Local Transport Strategy (2016-2021)
The Road to Zero Industrial Strategy (UK Government)	Switched on Scotland: A Roadmap to Widespread Adoption of Plug-In Vehicles (2016)		Aberdeen Active Travel Action Plan (2017)
OLEV plug-in car and van grant schemes[11]	Switched on Scotland Phase Two: An Actions Plan for Growth (2017)		Aberdeen Local Outcome Improvement Plan (2016-26)
Benefit in Kind (BiK) exemption for employees offering free charging for EVs a work	The Scottish National Transport Strategy (NTS2) 2020		Aberdeen City Region Hydrogen Strategy and Action Plan (2015-2025)
Funding for V2G projects and installation of publicly accessible hydrogen refuelling stations	Transport Scotland funding for ChargePlace Scotland network and interest-free loans for new BEVs or PHEVs		Strategic Car Parking Review
UK's 3rd Carbon Budget (2018-2022) and UK's 4th Carbon Budget (2023-2027)			Roads Hierarchy Principles
			Net Zero Vision and Infrastructure Plan

4.2 Policy and Strategy Gaps

Having reviewed the above documentation, there are a few gaps in the policy and strategy around EV infrastructure in car parks, taxis and business support. Suggestions to tackle these are addressed in the the proposed actions.

[8] http://www.legislation.gov.uk/asp/2019/17/contents/enacted

[9] Committee on Climate Change Net Zero – The UK's contribution to stopping global warming, 2019

[10] https://urbanforesight.org/wp-content/uploads/2016/11/REP-1409-TS-A-National-Framework-for-Local-Incentives.pdf

[11] OLEV guidance to low-emission vehicles eligible for a plug-in grant https://www.gov.uk/plug-in-car-van-grants

4.3 Proposed Actions

- ACC should consider introducing further EV and Car Club parking in ACC operated car parks, where possible.
- There is no current policy, legislation or strategy for encouraging uptake of EV taxis and Aberdeen lags behind other cities in EV taxi uptake. ACC should consider how to address this with the taxi fleet.
- Other major cities in Scotland have already started to heavily decarbonise their Council fleet vehicles and pledged for all vehicles to be zero emission before the national target of 2030. ACC could also consider accelerating this target.
- ACC should consider how to engage more with local businesses.
- ACC should continue to provide charging standards for new developments in its LDP in order to encourage EV uptake and chargepoint installation.
- ACC should ensure that their future policies, plans and strategies incorporate those projects in the Net Zero Vision and Infrastructure Plan in relation to energy supply, charge points and its own fleet

5 Aims and Objectives of the Framework

5.1 Overview

Taking into account the policy and strategy situation, the current transport situation and the consultation findings outlined in the previous sections, the following aims and objectives have been developed.

This framework aims to allow Aberdeen to encourage and actively cater for a greater uptake of electric vehicles in the city for the period 2020 to 2030 informed by a comprehensive evidence base.

The objectives are to:

- Identify how the city's charging infrastructure should be increased and managed
- Ensure that the Council's policies and strategies facilitate a greater uptake of EVs
- Outline what supporting measures are required
- Identify the key groups that should be involved in delivering the framework
- Set out the costs involved in delivering the framework

6 Electric Vehicle and Infrastructure Forecasting

6.1 Overview

This chapter presents how EV uptake and infrastructure requirements were modelled to inform future provision. Three scenarios were developed:

- **Scenario 1: Business-as-usual (BAU).** This assumes no change to policy; forecasts were extrapolated from current registration trends
- **Scenario 2: Good practice**. In line with the DfT's Road to Zero medium scenario which aims for 50% of new registrations to be plug-in vehicles by 2030
- **Scenario 3: Exemplar.** In line with the Scottish Government's aim to phase out petrol and diesel cars and vans by 2032

It is proposed that Aberdeen works towards achieving the Exemplar Scenario as described in section 7.1. This scenario is estimated to result in 17.6% of the total vehicles in Aberdeen City being an EV by 2030 and reducing emissions by 13% for CO_2, 56% NOx and 71% PM. This estimated reduction in pollutants will have a direct effect on the health of people in Aberdeen with estimated annual mitigated health costs of £11.3 million in 2020.

Reaching 17.6% of vehicles being plug-in by 2030 may seem to be a modest target that will not ensure a net zero transport system by 2045. However, it is important to remember that the Exemplar scenario is in line with the Scottish Government's aim for the phase out the sales of new petrol and diesel cars and vans by 2032. This would be in line with achieving the phase out of petrol and diesel vehicles on the road by 2045.

It should also be recognised that achieving a 17.6% market penetration rate is a very ambitious target; for comparison, the good practice scenario, which would achieve 12.2%, would still require significant action, including additional charging infrastructure and supporting measures. A target that goes over and above the Exemplar scenario is not recommended.

6.2 Aberdeen City EV Forecasts

Figure 6-1 show the three uptake scenarios for Aberdeen through to 2030, including a breakdown of EVs into BEVs and PHEVs. Data is presented for the number of vehicles on the road and the % composition of all vehicles.

Table 6-1 Aberdeen City EV Uptake

			2025		2030	
			Total	% of vehicles	Total	% of vehicles
Aberdeen	BAU	BEV	840	0.8%	1,920	1.7%
		PHEV	730	0.7%	1,030	0.9%
		Total	***1,570***	***1.5%***	***2,950***	***2.6%***
	Good Practice	BEV	2,350	2.3%	8,970	8.0%
		PHEV	2,060	2.0%	4,830	4.2%
		Total	***4,410***	***4.3%***	***13,800***	***12.2%***
	Exemplar	BEV	3,010	2.9%	12,910	11.4%
		PHEV	2,630	2.5%	6,950	6.2%
		Total	***5,640***	***5.4%***	***19,860***	***17.6%***

6.3 Aberdeenshire EV Forecasts

Table 6-2 shows similar uptake figures for Aberdeenshire. The slight difference in the proportion of all vehicles represented by EVs is due to the higher baseline of EVs in Aberdeen.

Table 6-2 Aberdeenshire EV Uptake

		Total	% of vehicles	Total	% of vehicles
BAU	BEV	1,250	0.8%	2,870	1.6%
	PHEV	1,100	0.7%	1,540	0.9%
	Total	***2,350***	***1.5%***	***4,410***	***2.5%***
Good Practice	BEV	3,510	2.2%	13,410	7.7%
	PHEV	3,070	1.9%	7,220	4.2%
	Total	***6,580***	***4.1%***	***20,630***	***11.9%***
Exemplar	BEV	4,490	2.8%	19,300	11.2%
	PHEV	3,930	2.4%	10,390	6.0%
	Total	***8,420***	***5.2%***	***29,690***	***17.2%***

6.4 Aberdeen City Emissions Forecasts

Table 6-3 shows the emission values for the three scenarios and the 2019 baseline values. As older vehicles on the road are replaced with new cleaner vehicles the NOx and PM emissions will significantly reduce in all three scenarios. However, in the BAU scenario CO2 emissions increase due to the total vehicles in the city growing by an estimated 20% by 2030 (based on DfT forecasts for growth in vehicle miles travelled in the UK and a shift from diesel to petrol vehicles (which produce more CO2 per km).

This illustrates the importance of ACC aiming for the Exemplar scenario to ensure that the change to EVs outweighs the expected increase in size of the registered vehicles in the city.

Table 6-3 Emissions values for Aberdeen City in 2019 and 2030

	CO_2 (thousand tonnes)	NOx (tonnes)	PM (tonnes)
2019 - Baseline	269	492	15.8
2030 - BAU	271	322	6.88
2030 - Good Practice	251	292	6.25
2030 - Exemplar	234	216	4.55

6.5 EV Charging for Residents

This section estimates the total number (including existing infrastructure) and types of chargepoints required for each EV uptake scenario. This analysis has been undertaken for Aberdeen City only and the results are displayed in Table 6-4. It is assumed that all chargepoints will have two chargepoint sockets for charging and so the number of sockets required will be double the amount of chargepoint locations.

Table 6-4 Total Number of Chargepoints required in Aberdeen City in 2025 and 2030

Number of chargepoint locations - Total					
2025			2030		
BAU	Good Practice	Exemplar	BAU	Good Practice	Exemplar
11	30	37	13	62	89
8	21	26	13	61	87
9	22	28	14	63	90
28	**73**	**91**	**40**	**186**	**266**

The estimates show that rapid chargers will account for 65-70% of all charging events, 22kW for 20-25% and 7kW for 10% of all charging events. Due to the slow speed of the 7kW chargers, a relatively large number of these units are required to provide a small share of demand. It would also be possible to provide the required amount of charging with fewer rapid chargers and more 7kW chargers.

In summary, rapid charging is likely to be more cost effective at a systems level and reflects trends in vehicle and infrastructure technology. Conversely, providing slower chargers, even if they are not profitable, will increase EV uptake among households without off-street parking and help to mitigate economic inequality.

There is a potential risk associated with encouraging EV uptake (or penalising petrol and diesel use through road user charging), while making the transition more difficult for some parts of society. However, Car Clubs can help to mitigate this risk by widening access to EVs to all parts of society. Decisions about chargepoint provision should not be made from a purely environmental viewpoint. Social and financial benefits should also be considered.

Table 6-5 shows estimated capital costs[12] of the charging infrastructure forecast for Aberdeen. Details of the cost elements included are contained in the footnote on this page[24].

Table 6-5: Capital cost of infrastructure from 2020 onwards to meet demand in Aberdeen City

Capital cost of charging infrastructure from 2020 onwards				
	2025		2030	
	Cost during period	Cumulative cost	Cost during period	Cumulative cost
BAU	£ 153,577	£ 153,577	£ 175,623	£ 329,199
Good Practice	£ 608,479	£ 608,479	£ 1,446,178	£ 2,054,657
Exemplar	£ 792,213	£ 792,213	£ 2,280,339	£ 3,072,552

Table 6-7: Capital costs of individual chargepoints from averaged industry figures

	7 kW twin socket	22 kW twin socket	50 kW twin socket
Total capital cost	£8,176	£8,403	£27,553

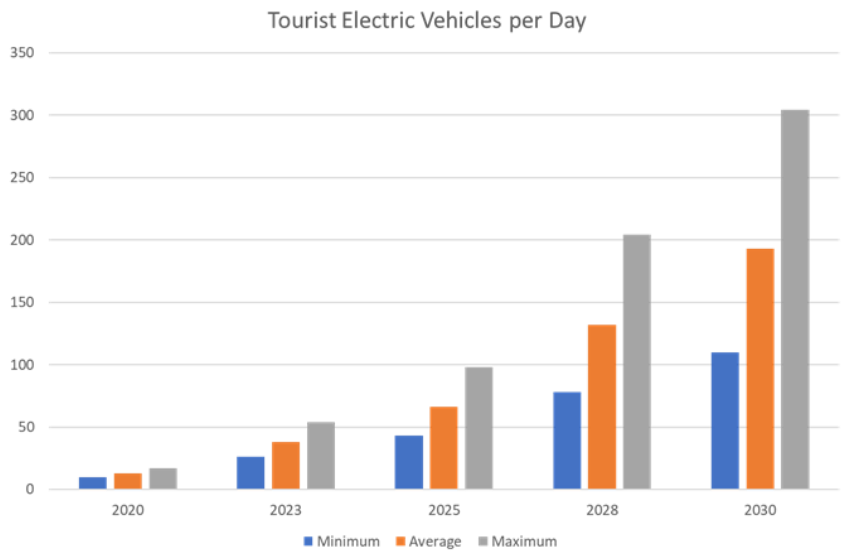
[12] Capital costs include equipment, an electrical connection (feeder pillar, Residual Circuit Breaker with Over-current device (RCBO), RCBO housing, RCBO protection, Miniature Circuit Breaker (MCB) installation, fixings and an assumed 5m electrical cable run), enabling works (foundations, 5m of ducting & surface reinstatement, guard raid/crash protection, bay markings, signage and branding) and warranty. These costs do not include new power supply.

6.6 EV Charging for Tourists

Based on the figures in Section 2.5.3, just under 575,000 domestic tourists visit Aberdeen every year, including those travelling for holidays, business, and those visiting friends and/or relatives, and around 84% of tourists from Scotland, as well as 55% of tourists from England and Wales, travel to Aberdeen using a car.

Visitors to Aberdeen are fairly evenly spread throughout the year, with a peak between the months of July and September. During this period, an average of 1,829 tourists visited Aberdeen each day, assuming visits are evenly spread.

Figure 6-1 shows minimum, average and maximum demand for EV charging infrastructure between 2020 and 2030. In this analysis, the scenarios are described as:



- *Minimum*: Low EV uptake scenario, combined with the number of daily visitors from the quietest tourist season.
- *Average*: Mid EV uptake scenario, combined with the average of daily visitors across the year.
- *Maximum*: High EV uptake scenario, combined with the number of daily visitors from the busiest tourist season.

Figure 6-1 Average number of tourist visits by EV to Aberdeen per day

By 2030 it is expected that between 110 and 304 tourists will visit Aberdeen in an EV every day. It is not possible to forecast the exact charging requirements of these vehicles as there is insufficient data on journey origins and the duration of their stay in Aberdeen. However, it is clear that tourism will add demands to the EV charging network.

6.7 Electric Vehicle Charging for Commuters

This section considers the estimated requirement for chargepoints for those vehicles registered outside of Aberdeen City that commute into the city. UK Census data[13] that covers Scotland was used to estimate the number of individuals commuting to Aberdeen from different local authority areas across the UK and a geospatial analysis was conducted. Section 2.5.3 illustrates the results of the census in further detail.

Given the ranges of electric vehicles and the length of the average commute, it is considered that there will not be a huge charging demand from commuters for the following reasons:

- Vehicle ranges are already sufficient to meet the needs of the majority of drivers
- Many commuters from outside the city will have off-street parking as this is typical in suburban and rural areas and can therefore charge at home. This will reduce load on the grid in Aberdeen.
- Commuters originating in Aberdeen should not be incentivised to use their car for that journey.

However, it is still necessary to ensure that provision does exist for those who cannot charge at home or may have a longer commute.

[13] UK Census 2011, WU03UK dataset. No Scottish-specific data is available

6.8 Electric Vehicle Charging for Through Traffic

Transit charging is needed to enable EV owners to complete journeys that are beyond the range of their vehicle. In most cases, the ideal location for transit charging infrastructure is near to extra-urban A-roads, where minimal detour is required to access the chargepoint. Road links with relatively high traffic flow are typically appropriate sites for transit charging. Locations on or near junctions where several high-flow road links intersect are ideal as the number of potential users increases further.

Analysis has been undertaken in the Evidence Base and Baseline report to help establish which locations would be most suitable. This analysis can be found in Section 9.4.

Along the AWPR, there are three key junctions, where the A90 intersects with the A93, A944 and A96 (shown in Figure 6-2). Traffic count data indicates that these intersecting roads also have high levels of traffic flow – particularly the A944. Transit charging infrastructure sited as near as possible to these junctions can serve users of these main roads without requiring a significant detour. Park and Ride sites already exist at the junctions of the A90/A944 and the A90/A96 and could be used as rapid charging hubs for transit charging.

Charging infrastructure should be at least rapid (50 kW), ideally with sites prepared for upgrade to ultra-rapid (150+ kW) charging as EV technology develops. It is not currently possible to predict the number of chargepoints required at these sites, as there is no data showing trip origin and destination for transitory road users.

Aberdeen's port operates two major ferry services to Kirkwall (Orkney) and Lerwick (Shetland). In 2017 a total of 22,900 cars and 120 commercial vehicles travelled on these services equating to 143,000 passengers including those on foot and other non-motorised transport[14]. While this through-traffic is relatively small compared to that of the AWPR, consideration should be given to locating charging infrastructure in and around the port in the future as EVs become more prevalent.

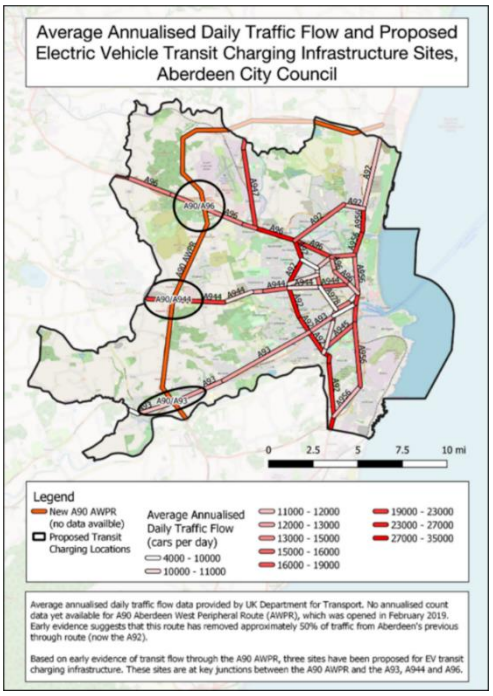


Figure 6-2 Map showing traffic flow on strategic road links in and around Aberdeen, with suggested sites for provision of transit charging infrastructure for EVs. Official traffic count data for the Aberdeen Western Peripheral Route (AWPR) is not yet available.

6.9 Proposed Actions

- Carry out research in partnership with Visit Scotland to determine the extent to which transit charging (e.g. at current petrol stations) is sufficient to meet demand from tourists travelling in an EV, as well as the likely impact that provision of EV charging infrastructure may potentially have on Aberdeen's tourist economy.
- ACC should follow the exemplar scenario in order to help meet Scottish Government targets.

[14] Scottish Transport Statistics, 2018, Table 9.15

- When following the exemplar model, ACC considers the demand from the Aberdeenshire area for charging in the city.
- ACC to continue to promote the benefits of EVs to air quality and carbon emissions.
- ACC to continue to facilitate access to EV car club vehicles and facilitates a range of charging infrastructure types across Aberdeen City.
- ACC to work with Tourist bodies to better understand origins and durations of stay for visitors.
- ACC to encourage charging at park and ride sites rather to reduce to reduce movements into the city.
- ACC to work with partners to promote the benefits of providing workplace charging to the business community.
- ACC to continue to monitor usage of existing charging infrastructure in these locations and investigate opportunities for gaps.

7 Infrastructure Requirements

7.1 Introduction

The previous section identified the forecast levels of EVs and the different types of users who would need to be catered for. This section now looks at how to determine where the required infrastructure should be located.

7.2 Methodology for Identification of Sites for Chargepoints

Longlist

A longlist was created from a list of all possible sites where chargepoints might be located to determine suitability. Figure 7-1 shows the criteria.

Figure 7-1 Longlist Criteria

Shortlist

A shortlist of sites was then identified by assessing each site and scoring each site from one to four against the following criteria shown in Figure 7-2.

Figure 7-2 Shortlist Criteria

Slow or rapid charging

The next step was to determine whether standard (7kW), fast (22kW) or rapid (50kW+) chargers should be installed at each site. This was assessed by reviewing expected vehicle dwell time, likely use cases, and linkages with key strategies and policies. For example, Park & Ride sites will need a combination of slow chargers to serve drivers leaving their vehicles for several hours to work or shop in the city, and rapid chargers to support residents who cannot charge at home and transit journeys.

Site Recommendations

Site recommendations have been mapped together with the number and type of chargepoints it is suggested that should be installed at each site:

- Numbers of active chargepoints to be provided in 2025. Active chargepoints are comprise a socket connected to the electrical supply system that vehicle owners can plug their vehicle into.
- Passive charging capability to be made ready for 2030. Passive chargepoints comprise a network of cables and power supply necessary so that at a future date a socket can be added easily. [15]

It is not suggested that ACC should fund and install all of these sites. However, this is the proposed network coverage (number and distribution) needed to support accelerated EV uptake. The EV Framework sets out actions to be taken by other stakeholders to facilitate the development of this network.

Number of Chargepoints at Each Location

Site infrastructure demand is estimated by modelling based on assumptions about typical annual mileage, battery sizes of current and future EVs and the likely number of vehicles of different specifications. A range of charging speeds (slow, standard, fast and rapid) for EV Supply Equipment (EVSE) is used so that the likely charging output by charger and sessions per day can be calculated.

The methodology used to determine the number of chargepoints at each site is a top-down approach. It models the total power requirement needed to serve a given number of EVs and then disaggregates this across different sites. This has been combined this with a bottom-up approach for selected sites (e.g. Park & Ride car parks).

[15] https://pod-point.com/guides/business/ev-charging-legislation-new-build-uk

7.3 Methodology for Identification of Sites for Residential Charging

This Framework focuses on the provision of charging at rapid charging hubs and other off-street locations because the evidence suggests that it will be more feasible and cost-effective to provide this infrastructure in the short to medium term. However, some on-street charging will be required to support EV adoption by households without off-street parking and to ensure equitable access. At this time, there is significant uncertainty about the potential role of on-street charging, particularly as there is no business case for private sector operators to invest in infrastructure that may only provide charging to two vehicles per 24-hour period.

Evidence suggests that in the short to medium term, EV uptake by private car owners in locations which have the following characteristics are most likely to bring the most benefit:

- OLEV: early EV adopters are most commonly "middle-aged, male, well-educated, affluent, and live in urban areas with households containing two or more cars and with the ability to charge at home[16]"
- Zap-Map: over half of EV owners earn more than £50,000 per year
- The UK Office for National Statistics: those with degrees were more likely to consider buying an EV than those without, those with an annual income of more than £26,000 were 33% more likely to consider buying an EV than those earning less than £26,000 per year[17]

Increased provision of EV Car Club vehicles could be an option to allow households in lower income areas to access EVs, although further work would be required to understand travel needs and journey patterns, to ensure that this does not reduce active travel and public transport trips.

Locations have been identified that are relatively more likely to benefit from on-street charging infrastructure. More detail of the dataset(s) used, and the weightings attributed to factors in the residential charging index can be found in detail in Section 4.4 of the Evidence Base and Baseline report.

In terms of residential charging, stakeholders suggested that the strategic placing of EV chargepoints in key locations in Aberdeenshire would need to be considered if EV uptake is to increase amongst those outside of the city. The use of school and public car parks was suggested to be used for overnight EV charging, and locations such as workplaces, supermarkets and shopping centres could be used as EV charging hubs, and potentially help to solve the issue of where chargepoints may be located for flat dwellers in cities.

A number of potential key locations for EV charging infrastructure in Aberdeen were identified by stakeholders and these included: TECA, Airport, Aberdeen leisure beach and retail park, Kittybrewster retail park, Berryden retail park, Bridge of Don retail park, Union Square, Trinity Centre, Bon Accord centre, RGU, University of Aberdeen, Council car parks, ARI, Woodend Hospital, Parks (Seaton, Hazelhead, Duthie, Westburn), Aberdeen Sports Village, Beach Leisure Centre/Ice Arena, Park & Ride sites, and Hotels.

The top 100 and top 200 sites resulting from this exercise have been mapped to show the potential best sites to trial residential on-street charging and this is shown in Chapter 4 of the Evidence Base and Baseline Report.

7.4 Proposed Actions

- Carry out a study to understand the travel needs and journey patterns of households in regeneration areas to consider the impact of provision of EV Car Club vehicles on active travel and public transport trips.
- ACC should undertake work to understand the travel needs and journey patters of households in regeneration areas to consider the impact of provision of EV Car Club vehicles on active travel and public transport trips.

[16] UK Government Office for Low Emission Vehicles, 2015. Uptake of Ultra Low Emission Vehicles in the UK.

[17] UK Government Department for Transport, 2016. Public attitudes towards electric vehicles (revised).

8 Proposed Location of Charging Infrastructure

8.1 Off-Street Charging

Using the methodology previously described, the proposed infrastructure sites and chargepoint provision are shown in Table 8-1 and Figure 8-1.

Site Name (Rank)	Parking Spaces	2025			2030		
		7 kW	**22 kW**	**50 kW**	**7 kW**	**22 kW**	**50 kW**
Frederick Street (1)	150	0	1	1	0	1	1
Bridge of Don Park & Ride (2)	600	4	0	2	11	0	5
Chapel Street (2)	500	3	1	0	7	1	0
Craibstone Park and Ride (2)	996	6	0	3	17	0	8
Pittodrie Stadium (5)	295	1	1	0	3	3	0
Virginia Street (5)	45	0	0	1	0	0	1
Kittybrewster Hydrogen Station (7)	90	0	1	1	0	3	2
Summer Street (7)	23	1	1	0	2	1	0
Kingswell Park & Ride (7)	950	6	0	3	16	0	8
Golden Square (10)	32	1	1	0	1	1	0
BP/M&S Peterculter (10)	10	0	0	1	0	0	2
Shell Bankhead (12)	10	0	0	1	0	0	2
Gallowgate (12)	138	0	1	1	0	1	2
Esso Kingswell Junction (12)	20	0	0	2	0	0	4
Sclattie Park (15)	28	0	1	1	0	1	2
BP King Street (15)	10	0	0	1	0	0	2
BP North Esplanade (15)	10	0	0	1	0	0	2
Shell North Anderson Drive (15)	10	0	0	1	0	0	2
Total	**3,917**	**22**	**8**	**20**	**57**	**12**	**43**
		50			**112**		

Table 8-1: Chargepoint provision at identified sites

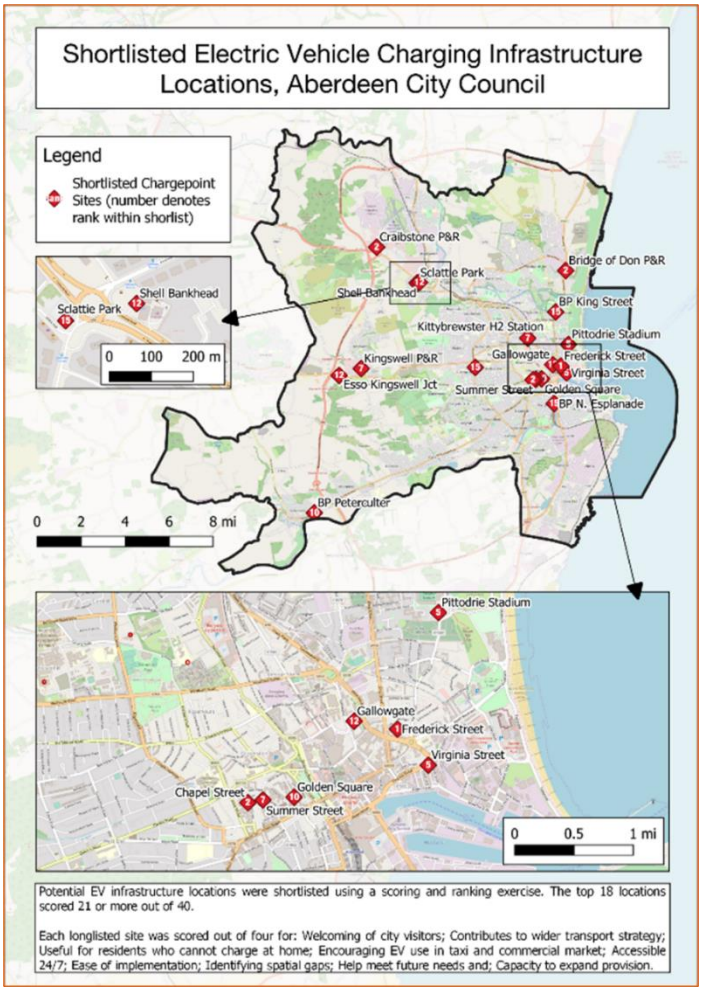


Figure 8-1 Shortlisted EV Charging Infrastructure Sites

When planning and installing infrastructure for the 2025 targets, it will be important to ensure that enough passive charging is built in for 2030 to avoid unnecessary groundworks when expanding the network at already established sites. Similarly, capability to upgrade chargepoints from slow to rapid chargers should also be taken into account, should there be a preferred market solution in the future.
A summary of the required number of chargepoints, the current infrastructure already in place in Aberdeen, and the number of chargepoints identified at the shortlisted sites is shown in Table 8-1 and Figure 8-1.

	2025				2030			
	7 kW	22 kW	50 kW	Total	7 kW	22 kW	50 kW	Total
Required (Exemplar)	37	26	28	91	89	87	90	266
Current Infrastructure	20	20	11	51	20	20	11	51
Shortlisted Sites	22	8	20	50	57	12	43	112
Shortfall	-5	-2	-3	-10	12	55	36	103

Table 8-2: Summary of required, current, proposed and shortfall of EV infrastructure

This analysis shows that, if all 18 identified sites on the shortlist had the recommended infrastructure built, in 2025 ACC would exceed the required number of chargepoints, for all charging speeds, for the exemplar uptake scenario. This would put ACC in a strong starting position for the second half of the decade.

In 2030 there is a shortfall in the required number of sites for all charging speeds if further EV infrastructure is only built at the shortlisted sites. The largest shortfall in chargepoints in 2030 is for the 22 kW fast

chargers. Recommended sites for this type of chargers include destination locations, leisure centres and supermarkets. There are four main ways that this shortfall should be addressed:

- Ensure that when new major developments are brought forward for planning consent that consideration is given to active and passive charging requirements.
- Build infrastructure at the next highest ranked sites that didn't make the shortlist.
- Encourage private landowners to put in place the extra chargers required to meet the recommended number of chargepoints.
- Some workplaces may be able to provide chargepoints for public access.

8.1.1 Proposed Actions

- ACC to work with partners to facilitate the creation of additional charging locations, in line with the selection criteria results
- ACC to encourage the future proofing of sites to allow for additional infrastructure to be installed more easily
- ACC to investigate ways to mitigate the shortfall including working with workplaces, ensuring charging provision is built into new developments and exploring identified sites on the long list

8.2 On-Street Charging

Off-street charging will need to be supported by some on-street charging for households without off-street parking. 100 locations have been identified as potential sites for trialling on-street charging and ranked according to the criteria shown in Chapter 6. The results are displayed in Figure 8-2.

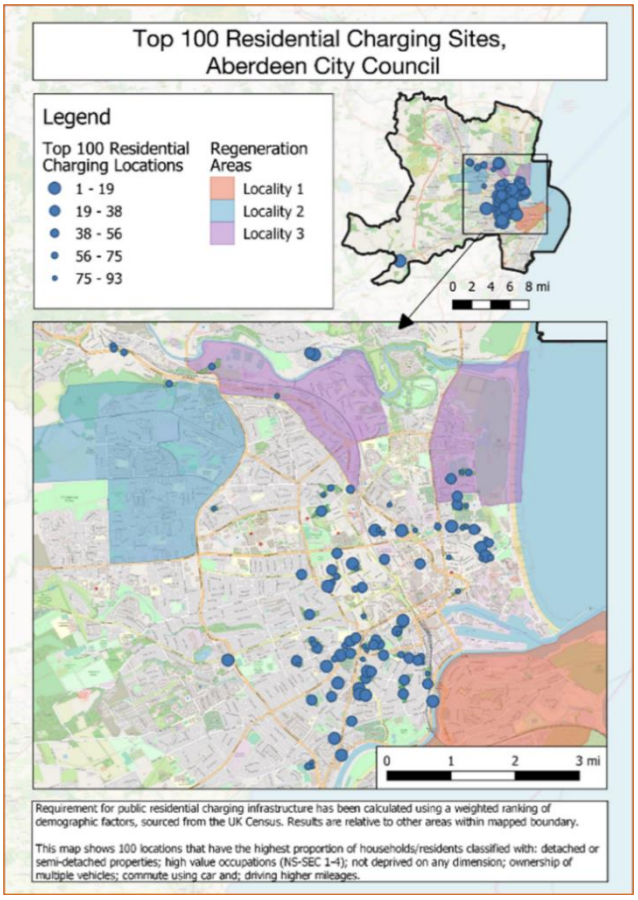


Figure 8-2: Top 100 sites for on-street charging trials

8.2.1 Proposed Actions

- ACC to investigate on-street charging pilot area(s) in the city

8.3 Taxis and private hire vehicles

ACC requires newly licensed standard passenger vehicles to be less than five years old and newly licensed WAVs to be less than ten years old. A maximum age limit or minimum emission standard for renewal of vehicle licences is not specified. Instead, vehicles are removed from the fleet due to natural turnover or upon failure of inspection / compliance tests. This does not provide any direct control over fleet emissions standards. The price of a new Wheelchair Accessible Taxi can range between £20,000 and £40,000. There are three potential alternatives:

- *Improved* - Enforced age limit for renewal of diesel / petrol vehicles (e.g. 10 years), minimum emissions standard for new vehicles (e.g. Euro 6)
- *CAZ / LEZ compliance* - Minimum emissions standard for all vehicles (e.g. new vehicles and renewals must be Euro 6)
- *Best practice for ULEZ introduction* – Enforced age limit for renewal of diesel / petrol vehicles (e.g. 10 years), new vehicles must be ULEV

ACC's proposal to revise licensing conditions to meet LEZ emissions standards, supported by an enforced maximum age limit, is aligned with the approach proposed by other Scottish cities aiming to achieve LEZ / CAZ compliance in short timescales. However, without a package of supporting measures, this policy is not expected to encourage the uptake of plug-in taxi and private hire vehicles.

Other local authorities have favoured the early and phased introduction of ULEVs without the intermediate regulatory introduction of improved Euro standards. These authorities will require new vehicles to be ULEV or ZEV from the early 2020s, and all vehicles to be ULEV or ZEV by 2030.

Incentives aimed at addressing these issues will be most successful in encouraging the uptake of plug-in taxi and private hire vehicles. The feasibility of introducing the following incentives for plug-in vehicles (with preference given to BEVs) should be considered.

- Financial incentives such as interest free loans or grants towards operating costs (e.g. licence fees, vehicle testing etc.)
- Providing opportunities for short term test drives and 'try before you buy' schemes
- Provision of adequate charging infrastructure, consideration of on-street residential charging or alternatives such as charging hubs

Charging infrastructure will be needed to support the uptake of plug-in vehicles. The extent to which taxis can share public points or need their own infrastructure will depend on what measures are put in place to encourage or mandate uptake. In the absence of changes to licensing policy supported by financial measures (such as interest free loans and grants), uptake will be low and, therefore, it may not be appropriate to provide dedicated infrastructure which would be under-utilised. However, if policy is changed and measures are implemented, such that a significant proportion of the fleet will switch to plug-in vehicles, then dedicated infrastructure would be needed. Further research will be required once a decision has been made on taxi licensing policy.

As and when uptake of plug-in taxis becomes larger and dedicated infrastructure is needed, potential locations that could be considered include:

- City centre taxi ranks: Back Wynd, Chapel Street, Dee Street and Hadden Street.
- Stations: possibly only at the main rail station, depending on footfall and taxi pick up frequency at other stations.
- Airports: opposite the main airport terminal and at Bristow's heliport.
- Aberdeen South Harbour to service cruise ship passenger demand.
- Large supermarkets and other major retail sites: e.g. Asda Dyce, Asda Middleton, Tesco Rousay Drive, Tesco Wellington Road, Asda Aberdeen Beach
- Hospitals: Aberdeen Royal Infirmary
- Sites where taxi drivers already take breaks, such as cafes frequented by the trade.

8.3.1 Proposed Actions

- ACC to ensure revised Licensing Conditions are encouraging of EV taxis
- ACC to work with partners to take forward complimentary measures

8.4 Delivery Vehicles

The details of current delivery vehicle numbers and characteristics are outlined in Section 2.4.6. The typical cost of a Light Commercial Electric Vehicle is £20,000 to £25,000.

In addition, this data is likely to underestimate actual emissions from vans and HGVs in Aberdeen. The emissions calculations are based on DfT registration data and as such do not account for emissions from vehicles which are registered elsewhere and operate within Aberdeen. Given the city's location, the presence of a large port, and its industrial links, there is likely to be a significant volume of commercial vehicles coming into and passing through the city which are not captured in the data. The measures in Table 8-3 could be considered to increase ULEV uptake:

Measures	
• Increase chargepoint and refuelling network coverage	• Fleet Support and Engagement
• Engagement with Fleet Operator	• Signposting and Awareness Raising of relevant tools and information sources
• Certification	• Retrofit
• Trials and Demonstrations	

Table 8-3: Measures to encourage ULEV Uptake

8.5 Proposed Actions

- ACC should engage with operators and communicate any increases in chargepoint and refuelling network coverage to increase EV uptake.
- ACC should engage with partners in the Freight Forum to continue structured engagement and collaboration between stakeholders.
- ACC should carry out trials and demonstrations of EVs to increase suppliers' trust and confidence in EV technology to encourage more investment in EVs.

9 Chargepoint Procurement & Management

9.1 National Technical Standards

OLEV publishes technical standards for domestic and workplace charging that must be adhered to by EV charging infrastructure suppliers for them to be permitted to access UK Government funding streams. These standards form a sensible and robust basis upon which ACC can develop more detailed standards tailored to local requirements.

National standards do not cover the implementation of EV charging hubs. EV charging hubs contain multiple chargepoints, possibly of different specifications, plus auxiliary equipment including battery storage or solar photovoltaic canopies. As a result, installations can be complex, involving multiple subcontracting equipment suppliers and installers. It may be sensible to procure charging hubs over three phases:

- Design Phase: Produce viable engineering design schematics that meet quoted specifications.
- Delivery Phase: Provide and install specified equipment for the hub (drawing upon OLEV technical standards).
- Operation Phase: Operate the hub, including back-office systems and maintenance (drawing upon OLEV technical standards).

A number of considerations for the installation of chargepoint installers have been set out in the Evidence Base and Baseline Report.

9.2 Network Operating Models

There are four common chargepoint network operating models that are compared in this section: own and operate, external operator, lease, and concession. In each ownership model, elements of the capital cost, operating cost and revenue are shared differently between the landowner and chargepoint provider. An overview of each of the modes can be found in Section 12.2 of the Evidence Base and Baseline report.

A summary of the proportion of cost incurred and revenue retained by the landowner in different ownerships models is estimated in Table 9-1.

Table 9-1: Proportion of costs incurred, and revenue retained by landowner across ownership models

Ownership Model	Hardware	Groundworks	Back-office	Electricity	Maintenance	Revenue
Own and Operate	100%	100%	100%	100%	100%	100%
External Operator	100%	100%	0%	100%	100%	90%
Lease	0%	0%	0%	0%	0%	20%
Concession	0%	100%	0%	0%	0%	30%

When making decisions on chargepoint ownership models, it is important to also consider the non-financial implications of each model. Whilst the most obvious distinctions between each ownership model are in how costs and revenue are shared, there is also a variable share in the contractual control over how the chargepoints are operated. In most cases, the greater the investment made by an external supplier(s), the greater the control of the supplier(s).

In turn, this means that the landowner will have less control over the quality and type of service(s) provided to EV users on their site which, in a worst-case scenario, could create a negative perception of the landowner that they cannot easily address. Regardless of the ownership model, contractual terms should be sought that ensure both financial and reputational risk are fairly distributed and that a high level of service to EV users is maintained.

The evidence shows that the best option for an individual local authority must reflect its own attitude to risk, willingness to invest, and access to capital. A growing number of cities are opting for the Concession model as a way of balancing risk and reward while growing private sector investment.

ACC has developed guidance on best practice for new developments in its Transport and Accessibility Supplementary Guidance, however, this is a non-technical document which does not cover items such as equipment safety requirements, installation regulations and British Standards, charging equipment electrical rating and maintenance British Standard guidelines. A separate guidance document for developers wishing to install chargepoints would be beneficial. This should build on the OLEV guidance and include details regarding charging hub best practice and layout of equipment.

9.3 Fees and Tariffs

There are three tariff types that can be implemented:

- Pay per kilowatt-hour – users pay proportionately to the electricity they have used but have no incentive to unplug when charged, often leading to poor utilisation.
- Pay per hour/minute – encourages users to unplug when charged and penalises users who leave their vehicle plugged-in.
- Pay per use (flat rate) – this is the simplest to manage and easiest to communicate and dissuades users who only require a short charge.

Overstay Penalties and Maximum Stay Times

If an overstay penalty or maximum stay time is introduced, it needs to be appropriately signposted to ensure users are aware of this fee. Overstay penalties can be implemented to charge users a fee if their vehicle remains plugged into a chargepoint after it has fully charged.

A maximum stay time would limit the time a vehicle can be parked in a bay, and hence charge. While this ensures vehicles rotate throughout the day at these sites, this option can still be abused. If there is no parking fee, there is nothing to deter a driver who is at full charge blocking a charging bay. Conversely if the charger is not rated high enough, the user may not be able to fully charge within the maximum stay time leading to user dissatisfaction. A maximum stay time, however, can be operated either through the chargepoint, through cameras or manually with a traffic warden.

In summary, it is proposed that ACC considers using either a pay per kilowatt-hour tariff (when coupled with an overstay penalty for slow and fast chargers) or a pay per hour/minute tariff. This would help prevent undesirable behaviour (e.g. chargepoint blocking) and would make revenue more predictable, removing some uncertainty from investment plans.

From June 2020, ACC introduced a fee of £0.19 per kWh delivered across all chargepoint types with a connection fee of £0.38. Currently these fees are constant across the city. There may be some benefit in varying tariffs to encourage people to use Park & Ride or suburban charging locations instead of city centre locations.

Table 9-2 shows example fee ranges for each type of tariff broken down into per unit and connection charge based on figures throughout the UK.

Table 9-2: Typical charges for a variety of chargepoint tariffs and speeds

Tariff	Charge Type	7 kW	22 kW	50 kW	150 kW
Per kWh	Per unit	£0.15 - £0.25	£0.15 - £0.30	£0.17 - £0.35	£0.25 - £0.40
	Connection	£0.00	£0.00 - £1.00	£0.00 - £3.00	£0.00 - £4.00

Per hour	Per unit	£1.00 - £2.50	£4.00 - £6.00	£9.00 - £15.00	£30.00 - £40.00
	Connection	£0.00	£0.00 - £1.00	£0.00 - £2.00	£0.00 - £5.00
Flat rate	Connection	£4.00 - £7.00	£5.00 - £8.00	£6.00 - £9.00	£7.00 - £10.00

When setting fees and tariffs, the most appropriate option will depend on whether the aim is for the network to be revenue neutral, or to generate income. When deciding which tariff is most appropriate, as well as factoring in energy costs for the energy being consumed by vehicles charging, it is also worth taking into account, for example, power supply costs, capacity charges, metering costs, back office costs and also the energy that is consumed by the charge points themselves even when vehicles are not charging. It should be noted that these will become more expensive to maintain over time.

There are various options of energy supply when considering 'where' to get your power from for EV charging. Whether existing metering and infrastructure for EV charging is used and extra load is loaded to the existing electricity supply or a brand-new grid connection is obtained, consideration around power supply is often based on the energy supplier selected. All electricity supplied will have a declared 'fuel mix' variable depending on the supplier. Electricity suppliers will also be able to offer 'fully renewable tariffs' within their product range if green credentials are a priority. Suppliers will be able to guarantee the electricity used is from a renewable source (wind, biomass, solar etc) through REGOs (renewable guarantees of origin).

Tariffs will vary dependent on the supplier selected and prices will fluctuate in line with the energy market. Fixed, pass-through and flexible contracts dominate the marketplace and a combination of risk appetite, total consumption and usage profile are the primary considerations when looking at a suitable power contract. Small scale EV charging will lend itself to fixed tariffs, while flexible tariffs are a potential consideration for large scale projects.

When considering a more 'off grid' solution, on-site generation can work well with EV installations. Solar and wind installations can contribute (or fully supply) EV charge points (dependent on weather) with or without battery storage and EV solutions can be easily linked into existing projects such as Combined Heat & Power in order to reduce the cost per kWh. Savings and payback times will vary depending on the solution but can provide savings over the lifetime of the asset.

9.4 Proposed Actions

- ACC to review evidence and decide which model(s) would be most beneficial to implement and in which sites, appreciating that site and funding availability will affect this.
- ACC to monitor the effectiveness of the current tariff and review if necessary
- ACC to investigate the introduction of maximum stay time for units and overstay penalties
- ACC to produce a separate guidance document for developers wishing to install chargepoints. This should build on the OLEV guidance and include details regarding charging hub best practice and layout of equipment.

10 Complementary measures

10.1 Overview

Evidence from other cities shows that only providing additional charging infrastructure will not be sufficient to increase EV uptake. Complementary measures will also be required to support the transition to EVs, and a broad package of measures and incentives will be required to achieve the exemplar uptake scenario.

A high-level assessment of a long list of potential measures and incentives has been carried out to determine their suitability in Aberdeen. Details of these can be found in Section 15 of the Evidence Base and Baseline report and are summarised below:

- Demand management tools such as Park & Ride sites and a Workplace Parking Levy which aims to encourage employers to reduce the number of free workplace parking bays by charging an annual fee
- Public Engagement to improve understanding and awareness of the benefits of EVs among private vehicle owners
- Business Engagement by establishing fleet working groups to ensure fleet operators are kept up to date with the latest technology developments, vehicle availability and funding opportunities, explore options for joint procurement to reduce the costs of vehicles and infrastructure and discuss the barriers to accelerate EV adoption and work to identify and implement solutions.
- Organise workshops or events for businesses
- Fleet Reviews to incentivise increased fleet adoption of EVs
- Leading by Example: Aberdeen City Council's fleet. In line with the Scottish Government's Programme for Scotland 2019/20 which committed to phasing out the need for all new petrol and diesel vehicles in Scotland's public sector fleet by 2030, and phasing out the need for all new petrol and diesel cars and light vans from the public sector fleet by 2025
- Incentivisation through the Council's procurement process to ensure that EVs are used wherever feasible in its fleet operations and in its supply chains
- Increase availability of Car Club vehicles to reduce the number of private cars, the number and distance of journeys made in cars and improve accessibility for lower income households who may not be able to afford a vehicle, helping to provide social equality
- Co-location of Facilities lounges at Chargepoints e.g. shopping, refreshments and Wi-Fi
- Emissions-based parking charges to incentivise motorists to choose lower emission vehicles
- Educational Programmes with Schools to indirectly influence drivers
- Renewable Energy Generation and Energy Storage to consider the potential for renewable energy generation and energy storage to support ULEV use

10.2 Proposed Actions

- ACC to explore the feasibility of taking forward these complementary measures

11 Initiatives that support Electric Vehicle Uptake

11.1 Overview

A review was undertaken to compare the recommendations for additional chargepoint infrastructure and other measures with other activity underway or planned in Aberdeen. This was to ensure that measures to increase EV uptake would fit well with other strategic activity in the city.

Table 11-1 set out the activities in the city that complement increased EV uptake. More details can be found in Chapter 16 of the Evidence Base and Baseline Report.

Initiatives		
Existing Chargepoint Implementation	Public Transport and Park & Ride	Car Clubs
Car park permits	City Centre Master Plan (CCMP)	Hydrogen
Regeneration and New Developments	Roads Hierarchy Principles (RHP)	Strategic Car Parking Review

Low Emission Zone (LEZ)	Sustainable Urban Mobility Plan (SUMP)	Rail Interchange Improvements
Smart Transport App	Energy Transition Zone (ETZ)	Energy Supply
Council Fleet		

Table 11-1 Existing/Planned Measures to Support EV Uptake

11.2 Proposed Actions

- ACC to work with partners to ensure that EVs continue to be considered as part of these projects and other relevant projects that emerge.

12 Funding the Framework

12.1 Overview

This section considers how the delivery of the framework could be funded. As noted earlier, delivery of this framework is not the sole responsibility of Aberdeen City Council. Other organisations, including private sector organisations and individuals can play a role in increasing the number of EVs and the availability of EV chargepoints in Aberdeen.

There are significant Government spending commitments to support the increase in EVs and charging infrastructure. These include:

- An EV energy taskforce which brings together the energy and automotive industries to plan for an increase in demand on energy infrastructure.
- New powers through the Automated and Electric Vehicles Act (2018) to ensure chargepoints are available at motorway service areas and large fuel retailers.

12.2 Grants and Loans for Individuals

- The Office for Low Emission Vehicles (OLEV) plug-in car and van grant schemes provide a discount on the price of new eligible vehicles via a grant to vehicle manufacturers and dealers.
- There is a Benefit in Kind (BiK) exemption for employees using free charging at work
- Through the Energy Saving Trust, Transport Scotland provides funding for a 6-year interest-free loan that offers drivers up to £35,000 to cover the cost of purchasing a new Battery Electric Vehicle (BEV) or Plug-in Hybrid Electric Vehicle (PHEV), or up to £10,000 to cover the cost of purchasing a new electric motorcycle or scooter.

12.3 Government Support for Organisations

- Support is available to increase the number of publicly accessible hydrogen refuelling stations and increase uptake of fuel cell vehicles, and support for Vehicle-to-Grid (V2G) projects to create a smarter energy system.
- From 2018 to 2019 Transport Scotland invested £15 million in the ChargePlace Scotland network, providing 1,500 chargepoints in homes, businesses and on local authority land. ACC has taken advantage of this funding to introduce chargepoints.

12.4 Revenue Generation

- Depending on the operating model taken forward, there is potential for ACC to generate income from the EV chargepoints in its control.

12.5 Proposed Actions

- ACC to promote the range of grants and loans though their website
- ACC to continue to work with Transport Scotland to access funding to develop the charging network
- ACC to further explore the different operating models

13 Monitoring

13.1 Overview

Delivery of this EV Framework will be monitored through an annual monitoring report which will report on progress to deliver the proposed actions included in the Framework and summarised in 16.1 as well as the key indicators shown in Table 13.1.

Indicator	Source
Number of Electric Vehicles in Aberdeen	
• Cars and Vans	DfT
• Taxis	Aberdeen City Council Taxi Licensing
Number of EV Chargers in Aberdeen	Chargeplace Scotland

Table 13-1 Key Indicators

13.2 Proposed Actions

The proposed actions are set out in Table 13-2 together with the section of the report to which they refer.

Proposed Actions
• Keep a watching brief on the development of new technologies and investigate opportunities for trial where appropriate.
• Consider introducing further EV and Car Club parking in ACC operating car parks, where possible.
• There is no current policy, legislation or strategy for encouraging uptake of EV taxis and Aberdeen lags behind other cities in EV taxi uptake. ACC should consider how to address this with the taxi fleet.
• Other major cities in Scotland have already started to heavily decarbonise their Council fleet vehicles and pledged for all vehicles to be zero emission before the national target of 2030. ACC could also consider accelerating this target.
• There is a lack of support for local businesses to move to EVs through either partial funding or drive before you buy schemes. ACC should consider how to engage more with local businesses.
• ACC's new Local Development Plan (LDP) is still under development and will not be adopted until 2022. ACC should continue to provide charging standards for new developments in order to encourage EV uptake and chargepoint installation
• ACC should ensure that their future policies, plans and strategies incorporate those projects in the Net Zero Vision and Infrastructure Plan in relation to energy supply, charge points and its own fleet
• Ensure that future updates to documents such as the Local Transport Strategy should reflect the Council's commitment to Net Zero when making the case for EV development.
• Carry out research in partnership with Visit Scotland to determine the extent to which transit charging (e.g. at current petrol stations) is sufficient to meet demand from tourists travelling in an EV, as well as the likely impact that provision of EV charging infrastructure may potentially have on Aberdeen's tourist economy.
• Follow the exemplar scenario set out in section 6.
• ACC to continue to facilitate access to EV car club vehicles and to a range of charging infrastructure types across the city.
• ACC to encourage EV charging at Park & Ride sites to reduce movements into the city.

• ACC to work with partners to promote the benefits of providing workplace charging to the business community.
• Continue to monitor usage of existing charging infrastructure and identify gaps.
• Undertake a study to understand the travel needs and journey patters of households in regeneration areas to consider the impact of provision of EV Car Club vehicles on active travel and public transport trips.
• ACC to work with partners to facilitate the creation of additional charging locations, in line with the selection criteria results.
• ACC to encourage the future proofing of sites to allow for additional infrastructure to be installed more easily.
• ACC to investigate ways to mitigate the shortfall including working with workplaces, ensuring charging provision is built into new developments and exploring identified sites on the long list.
• ACC to investigate on-street charging pilot area(s) in the city.
• ACC to ensure revised Licensing Conditions are encouraging of EV taxis.
• ACC to work with partners to take forward complementary measures to encourage EV taxis.
• ACC should engage with partners to set up a Freight Working Group in partnership with Nestrans to provide structured engagement and collaboration between stakeholders.
• ACC should carry out trials and demonstrations of EVs to increase suppliers' trust and confidence in EV technology to encourage more investment in EVs.
• ACC to produce a separate guidance document for developers wishing to install chargepoints. This should build on the OLEV guidance and include details regarding charging hub best practice and layout of equipment.
• ACC to review evidence and decide which EV charging operating model(s) would be most beneficial to implement and in which sites, appreciating that site and funding availability will affect this
• ACC to monitor the effectiveness of the current tariff and review if necessary
• ACC to investigate the introduction of maximum stay time for units and overstay penalties
• ACC to work with partners to ensure that EVs continue to be considered as part of other projects in the city
• ACC to work with partners to communicate the benefits of EVs to consumers
• Facilitate the roll-out of conventional on- and off-street charging, while keeping a 'watching brief' on developments in new EV charging infrastructure.
• Develop a strategy for encouraging uptake of EV taxis in Aberdeen.
• Produce a separate guidance document for developers wishing to install chargepoints. This should build on the OLEV guidance and include details regarding charging hub best practice and layout of equipment.
• Review the complementary measures to identify which are appropriate for Aberdeen.
• ACC to review the opportunities for synergies with other activities to identify which are appropriate for Aberdeen.
• ACC to promote the range of grants and loans though its website
• ACC to continue to work with Transport Scotland to access funding to develop the charging network

Table 13-2 Proposed Actions

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