Electric Vehicle Charging Deployment in Cumbria

ANALYSIS & FORECASTING

Funded by Innovate UK

CUMBRIA ACTION FOR SUSTAINABILITY

June 2021

Contents

About This Report

This report has been compiled by Cumbria Action for Sustainability, to inform engagement work as a partner in a programme to expand electric vehicle charging infrastructure in the north of England.

The **Scaling On-Street Charging Infrastructure** (SOSCI) programme is led by **Charge My Street** and funded by **Innovate UK**.

The SOSCI programme's ultimate vision is for all the UK's estimated 8 million homes without off-street parking to have access to a public electric vehicle (EV) chargepoint within 5 minutes' walk.

Over the 18-month programme, SOSCI aims to install 200 community chargepoints across the north of England, contributing to:

- increased adoption of electric vehicles, particularly for those without private driveways for home charging, and in rural areas which otherwise may not be a priority for commercial chargepoint operators
- reduced CO_2 emissions and air pollution from road transport

Report authored by Nigel Jenkins, Cumbria Action for Sustainability.

About Cumbria Action for Sustainability

Cumbria Action for Sustainability (CAfS) is Cumbria's climate change organisation.

CAfS' vision is a zero-carbon Cumbria, bringing about a better way of life in balance with our environment.

Our mission is to empower and enable people, communities and businesses to live and work more sustainably by sharing our knowledge, practice, skills, networks and practical experience.

We promote low-carbon living, energy saving and reduced use of fossil fuels across Cumbria through our inspiring events, training courses and practical projects.

CAfS is a registered charity and company, based in Penrith.

Eden Rural Foyer, Old London Road, Penrith, Cumbria, CA11 8ET

Company Number: 6492907 | Registered Charity Number: 1123155

GLOSSARY

The following commonly used terms are adopted in this report to describe relevant aspects of vehicles and charging:

BEV	Battery Electric Vehicle Vehicle running purely on electricity stored in onboard batteries
Chargepoint	Device that supplies the electricity used to charge an EV
EV	Electric Vehicle Definition typically refers principally to BEVs, but also PHEVs
ICE	Internal Combustion Engine Referring to vehicles powered by petrol or diesel engines
kW	Kilowatt Unit of electrical power as a measure of battery charging rate
OZEV	Office for Zero Emission Vehicles Team working across UK government to support the transition to zero emission vehicles
PHEV	Plug-In Hybrid Electric Vehicle Vehicle using a combination of electricity supplied from onboard batteries plus an internal combustion engine
ULEV	Ultra-Low Emission Vehicle Electric or hybrid vehicle emitting <75g of CO_2/km from tailpipe

Executive Summary

The UK is now accelerating the mass switch to electric vehicles (EVs) over the coming decade.

This transition is principally to meet carbon emission reduction targets as part of responses to climate change, plus to significantly reduce air pollution from road transport and the associated impacts on public health.

The switch to electric has been given added impetus by the UK government's commitment to end sales of all new petrol & diesel vehicles by 2030.

Ready availability of chargepoints is a significant factor in public confidence to switch to EVs, yet there can also be hesitation from some policymakers about widespread expansion of charging infrastructure ahead of more EVs appearing on our roads. While acknowledging this 'cart & horse' conundrum, nevertheless it is vital that the expanding chargepoint network keeps pace with - and ideally helps lead - the anticipated mass uptake of EVs.

The purpose of this research by Cumbria Action of Sustainability is to assess the possible scale of chargepoint deployment required across Cumbria by 2030 to support the anticipated growth in EVs.

Sustainability, carbon reduction, social inclusion and economic prosperity will all be affected by the number and type of chargepoints deployed in Cumbria over the next 10 years as the UK switches to EVs, driven by government legislation, consumer choices, and market forces.

This research focuses principally on assessing potential demand for publicly accessible chargepoints to support the EV transition, rather than charging provision also needed on private driveways and/or private workplaces.

Currently there is no strategic lead or vision in Cumbria for how chargepoint deployment will be managed, or on what scale it can and should occur across the county. Rather in effect it is currently a market-driven free-for-all, so naturally operators will often focus on those charging locations considered to be the most commercially lucrative.

Whilst market forces can rapidly deliver positive change, it is also very clear that this hands-off approach can leave people, communities and business inadvertently marginalised or even excluded. The expansion of supermarkets across Cumbria's towns and cities, and the recent rollout of broadband services, can both serve as helpful parallels and provide valuable learning.

Whilst for Cumbrian residents a high % of EV charging is likely to take place using privately-owned chargepoints either at home or at workplaces, publicly accessible chargepoints will be key for:

- ✓ the estimated 30% of residents who live in homes or flats without private driveways
- ✓ motorists journeying around or through the county for work or leisure purposes, including many of the 20m+ tourists visiting Cumbria annually

A key piece of quantitative data that has been missing so far is a demand-driven analysis of what numbers of publicly accessible chargepoints are likely to be needed in Cumbria by 2030 to support the EV switch.

In any assessment there are many variables which need consideration, including:

- ✓ Multiple **types of chargepoints** (slow / fast / rapid) which charge vehicles at different rates (from 30 minutes to 7hrs+ / overnight)
- ✓ **Installation costs per chargepoint** varying from £100s to >£50,000, and in some cases options restricted by the available local grid capacity
- ✓ Widely varying **pricing for charging**, from off-peak home charging overnight, up to rapid charging on a motorway
- ✓ Emerging infrastructure which still lacks full **interoperability** and **accessibility**, particularly because drivers may often need to download multiple apps to access charging on a wide variety of networks

As of May 2021, Zap-Map listings include 139 chargepoint locations / 259 connectors currently in Cumbria.

[Note: a small number of publicly listed chargepoint sites may have some restrictions on public access, for example on private driveways or at workplaces.]

Whilst forecasting the demand for publicly accessible EV charging in Cumbria is complex and far from a precise science (as explained in this report), a total of between **2,100** and **6,400** public chargepoints is suggested as being a likely requirement by 2030 in order to service residents' needs.

Given the high significance of the tourism sector for Cumbria, adequately meeting visitors' charging needs must also be carefully considered, particularly as visitors increasingly switch to EVs and seek destinations where chargepoints are plentiful and available. It is possible that seasonal competition may develop between residents and visitors for access to a limited provision of public chargepoints.

Tourism data suggest that Cumbria's population can effectively increase by up to 50% during peak holiday season. Visitors driving EVs other than on local day trips will also be away from their usual charging services such as at home or workplaces, so will have a greater reliance on the public charging network.

Therefore even as a conservative forecast it is not unreasonable that the above projections for chargepoints should be increased by at least 50% to service visitors' charging needs.

Cumbria must also plan for adequate charging provision for through traffic (particularly arterial routes such as the M6 / A66 / A69), plus commercial and public sector traffic operating in the county.

Currently few organisations in Cumbria have set targets for deployment of pubic chargepoints by 2030, and even for those that have, it appears demand may be significantly underestimated by orders of magnitude.

This report aims to inform and challenge organisations responsible for policy and planning in Cumbria, by highlighting the major implications of the electric transport revolution, and the likely need for active intervention in how and where public chargepoints are deployed.

1. Scope & Objectives of Analysis

The following report summarises findings from a high-level assessment of possible scale of demand for electric vehicle (EV) chargepoints in Cumbria (NW England) by 2030.

This research has been conducted by environmental charity **Cumbria Action for Sustainability** (CAfS), principally to help inform our engagement work on the government-funded 'SOSCI'* programme to install community EV chargepoints (November 2019 - July 2021).

* Scaling On-Street Charging Infrastructure

It is imperative that the exciting opportunity to move to electric transport in Cumbria is fully recognised and realised, and that appropriate leadership is shown to ensure a fit-for-purpose charging network emerges to support the switch. This in turn first requires a thorough understanding of the scale of the challenge over the next decade.

Predicting the evolution of the EV charging infrastructure is far from an exact science, and there is no single right answer. This is amply evidenced by a range of external reports (typically focused on the UK's national situation) already published on this theme, which in some cases arrive at markedly different conclusions on what would represent a fit-for-purpose chargepoint network across the UK.

The focus for this research has been as much about identifying significant trends / influences / assumptions affecting the scale-up of EV switching and chargepoint deployment, as about estimating precise numbers of chargepoints needed.

Any forecast numbers presented must be seen as indications of orders of magnitude, not as absolute values, and together with the analysis are intended to help prompt discussion and action amongst those with more direct responsibilities for transport and infrastructure policy.

LIMITATIONS:

CAfS is an environmental charity working on a wide range of climate change responses across multiple sectors, however is not a dedicated research organisation, nor has any formal responsibility for transport and infrastructure planning policy in Cumbria.

CAfS does not have specific technical expertise in deploying or operating vehicle charging infrastructure.

This report principally focuses on charging infrastructure likely to be needed to service **electric cars & vans**, rather than directly considering electrification of other forms of transport such as buses, HGVs, or e-bikes.

This report does not discuss the causes and consequences of climate change.

2. Environmental & Social Context

In 2020 the UK government reported that transport remains the UK's largest carbon emitting sector, responsible for 28% of domestic greenhouse gas emissions, with road traffic as the most significant source of transport emissions, in particular passenger cars.

Petrol and diesel internal combustion engines ('ICE' vehicles) also remain a very significant cause of air pollution, adversely affecting public health.

Decarbonisation of domestic transport is therefore a critical contribution to the wider transition to net zero emissions, and to improving air quality and public health.

Electrification of vehicles powered from clean energy generation is identified as a vital part of an integrated strategy to rapidly reduce overall travel emissions.

PROPOSED BAN ON NEW PETROL AND DIESEL SALES FROM 2030

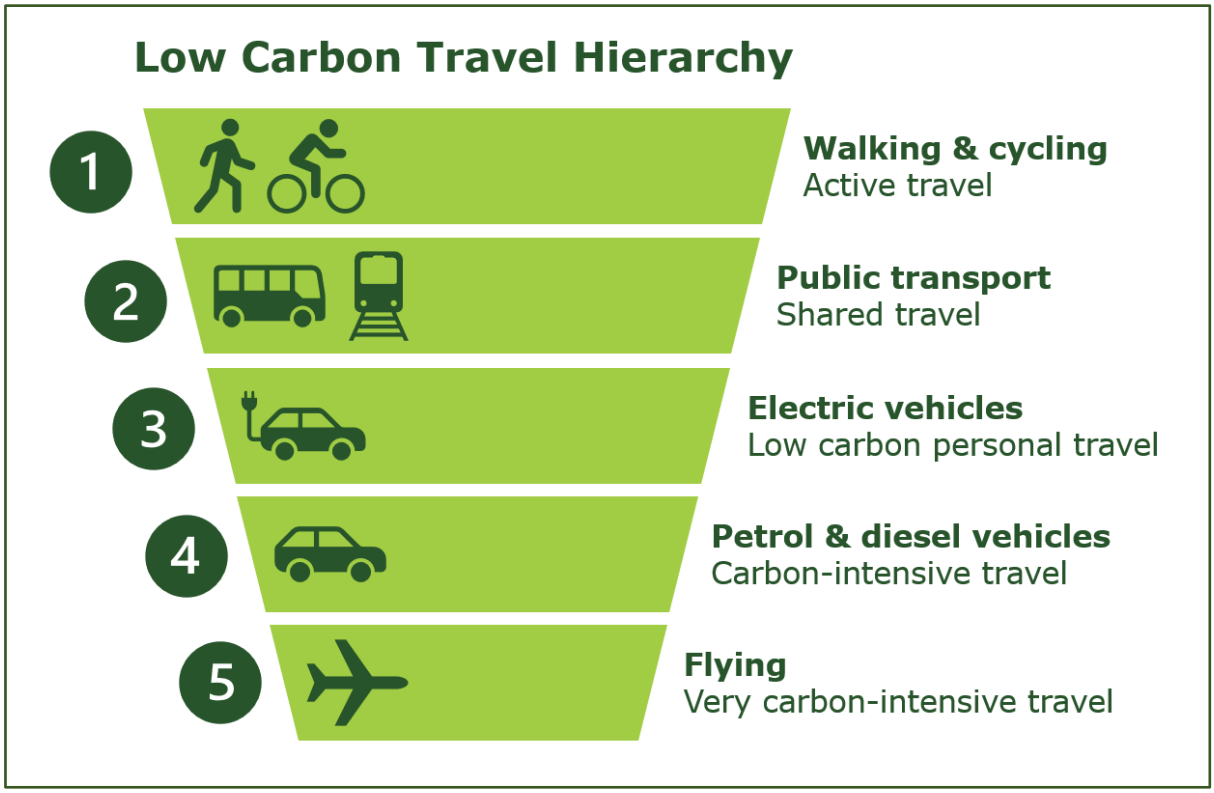
In November 2020 the UK government announced intentions to phase out all sales of new petrol & diesel vehicles by 2030, a deadline brought forward as part of a 'Ten Point Plan for a Green Industrial Revolution'.

This accelerated timetable adds further urgency to developing a fit-for-purpose public charging network nationally, to enable and effectively support the switch to EVs.

This network also needs to be fair and socially inclusive, offering realistic access to the EV transport revolution for all residents and visitors across Cumbria.

While realistically the widespread personal use of privately-owned vehicles is likely to continue, environmental challenges will not be fully met by simply switching to EVs.

Rather a wholistic response to reducing travel emissions requires an understanding of the comparative environmental impacts of different modes of travel within a **Low Carbon Travel Hierarchy**:



EVs certainly offer significant environmental benefits over existing petrol and diesel vehicles, including greatly reduced emissions and air pollution.

Nonetheless the travel hierarchy clearly illustrates the greater sustainability advantages of choosing active travel (walking & cycling) and public transport where available and practical.

3. IDENTIFYING THE CHARGING NEED

A fit-for-purpose public charging network for Cumbria needs to adequately serve a range of diverse audience groups, including:

- Residents
- Visitors
- Through traffic
- Commercial transport, including business fleets, delivery vans and HGVs
- Public service vehicles, such as buses and blue light emergency responders

3.1 RESIDENTS:

Public data indicates that the resident population of Cumbria is approximately 500,000, representing around 0.75% of the total UK population (67.8m).

Clearly the distribution of vehicles varies nationwide, and is affected by socioeconomic factors such as demographics, employment, and rurality.

Vehicle licensing data for 2019 published by UK government includes 259,000 registrations in Cumbria, indicating a rate of vehicle registration in the county which is slightly lower than the national average.

Within this total figure, a pro rata estimate of vehicle registrations in example cities / towns across Cumbria would then be:

Cumbrian City / Town	**Local Authority District**	**Total Vehicle Registrations** (proportionate estimates by population, based on total vehicle registrations in Cumbria for 2019)
Carlisle	Carlisle	56,300
Barrow-in-Furness	Barrow	34,650
Kendal	South Lakeland	14,700
Penrith	Eden	8,200
Cockermouth	Allerdale	4,500

3.2 VISITORS:

Cumbria Tourism (CT) headline figures for visitors (62.7m 'tourist days' in 2017) indicate a substantial increase in overall numbers in the county at any given time, above the normally resident population (500,000 x 365 = 182.5m 'resident days').

Within the overall tourism draw, a significant factor is clearly the Lake District which remains Britain's most popular national park.

Interpreting CT data and making some assumptions on:

- Average daily visitor numbers
- Likely peaks during high season
- Typical modes of travel

suggests that visitors could inflate the effective resident Cumbria population and vehicle numbers by up to 50% during peak periods.

The 'Friends of the Lake District' group reports that:

- Growth in visitors to the Lake District over the past few years has been significant, rising from 14.8m visitors in 2012 to around 20m in 2018.
- The Lake District National Park Authority (LDNPA) is predicting 5% visitor growth annually.
- 83% of visitors travel to the Lake District by car, and over half use their cars as their main mode of transport within the national park.

The high number of visitors combined with the geography of a largely rural county poses the challenge of whether Cumbria encourages an approach of 'VISIT & CHARGE UP' or 'CHARGE UP & VISIT'.

3.3 THROUGH TRAFFIC:

Cumbria sees medium to high through traffic volumes on longer journeys, particularly on major arterial routes N-S (M6 motorway) and E-W (A66 & A69 trans-Pennine routes).

The Department for Transport (DfT) reports the following traffic counts for 2019:

Location	Average Daily Traffic Flows	Count Basis
M6 nr Penrith (between J40 & J41)	50,251	Automatic
A66 nr Penrith (Brougham)	18,262	Automatic
A69 nr Brampton	10,257	Estimate

[Map Road traffic statistics - Road traffic statistics (dft.gov.uk)]

Clearly these totals will include a mix of local and longer-distance through traffic.

In contrast to destination chargers which are often intended for charging at slower speeds during longer stops, for through traffic there will typically be a higher dependence on rapid chargers on or very close to major routes.

Motorists stopping during longer journeys are typically expected to seek ready availability of 20-30 min slots to recharge 50-80% of range, in locations close to opportunities such as food / drink / exercise while charging.

On the M6 motorway in Cumbria there is currently at least some rapid charger provision at service stations (including Tebay & Southwaite), and close to some junctions (including J40 Penrith – Rheged).*

* Zap-Map listings

Helvellyn summit

VISITOR SCENARIO – LAKE DISTRICT NATIONAL PARK (LDNP):

In assessing what future charging infrastructure may be required for visitors to Cumbria, it can be helpful to consider specific scenarios.

For instance, a visit to the LDNP might be typified by parking in Glenridding for a full day's fell walk up Helvellyn (ranked in a recent survey as 'Britain's most popular mountain').

Visitors arriving by electric vehicles might do so as:

- **Short / medium distance day trips** (for instance from Penrith, Kendal or Carlisle), with sufficient range to make their return journey on a single charge from home (although top-up charging might be used if readily available and competitive).
- **Longer day trips** (for instance from urban populations in cities such as Manchester, Leeds or Newcastle), requiring recharge either during a walk or before / afterwards. Charging might be in Glenridding, or at rapid charging facilities on arterial routes such as M6 / A66 / A69.
- **Visitors staying overnight locally**, who increasingly might expect to have reliable access to EV charging readily available at their hotel / guesthouse / campsite, and for whom recharging while out on their walk may not be essential.

If leaving a car parked for the day, clearly it is not feasible (other than the unlikely introduction of some form of 'valet parking' service) for this to be moved away from a chargepoint after 2 hours to allow others to access, nor (for many reasons including cost, space, and available grid capacity) is it realistic to expect most or all public parking spaces to provide individual chargepoints as standard.

4. FORECASTING ELECTRIC VEHICLE UPTAKE

An understanding of the UK's current and future vehicle population is an important early step in analysing chargepoint needs, particularly during the transition to EV transport as ICE vehicles are phased out.

4.1 EXISTING VEHICLE POPULATION (2020):

DfT data (October 2020) indicates approx. 39.9m vehicles registered in UK, of which 390,500 were Ultra-Low Emission Vehicles (ULEVs).

[Note: **ULEVs** are currently defined as low emission cars or vans having <75 grams of CO_2 per km from the tailpipe.]

The number of ULEV vehicles in the UK increased from just under 9,000 at the end of Q1 2010 to 317,000 at the end of Q2 2020, representing an increase of 3,427% [House of Commons Briefing Paper - Electric Vehicles & Infrastructure].

The DfT reports that 79,747 ULEVs were registered for the first time in Great Britain during 2019, an increase of 26% on 2018. ULEVs made up 2.7% of all new registrations.

While due to the COVID pandemic new vehicle registrations then slowed significantly, still the number of battery electric cars registered for the first time in 2020 Q2 doubled (up 103%) compared to 2019 Q2.

Detailed local figures for EV registrations within Cumbria are not readily available, although anecdotal evidence suggests that for socioeconomic reasons there may be a slight lag in early adoption of EVs in the county, as compared to locations such as major cities elsewhere across UK.

[Note: While ULEV sales figures and new vehicle registrations indicate a significant growth in EVs on UK roads during 2019-20, some evidence also indicates at least a temporary slowing in new public chargepoint installations over the same period, inevitably at least in part due to the COVID pandemic, nonetheless suggesting charging infrastructure may not be keeping pace with vehicle demands.]

4.2 FUTURE VEHICLE POPULATION (2030):

The UK government has announced intentions that 100% of new car and van sales will be ULEVs by 2030. Assuming this policy commitment is adhered to, supported by rapid progress then needed in switching automotive production and increasing public chargepoint provision, it is then possible to estimate potential numbers of EVs which may be registered over the next 10-20 years.

While there are many variables, one reasonable projection is that approx. 30% of UK vehicles could be EVs by 2030, based on the following main assumptions:

- Incremental EV sales over the decade leading to 2030
- Typical scrappage rates based on average lifespan of vehicles (generally 8-12 years)

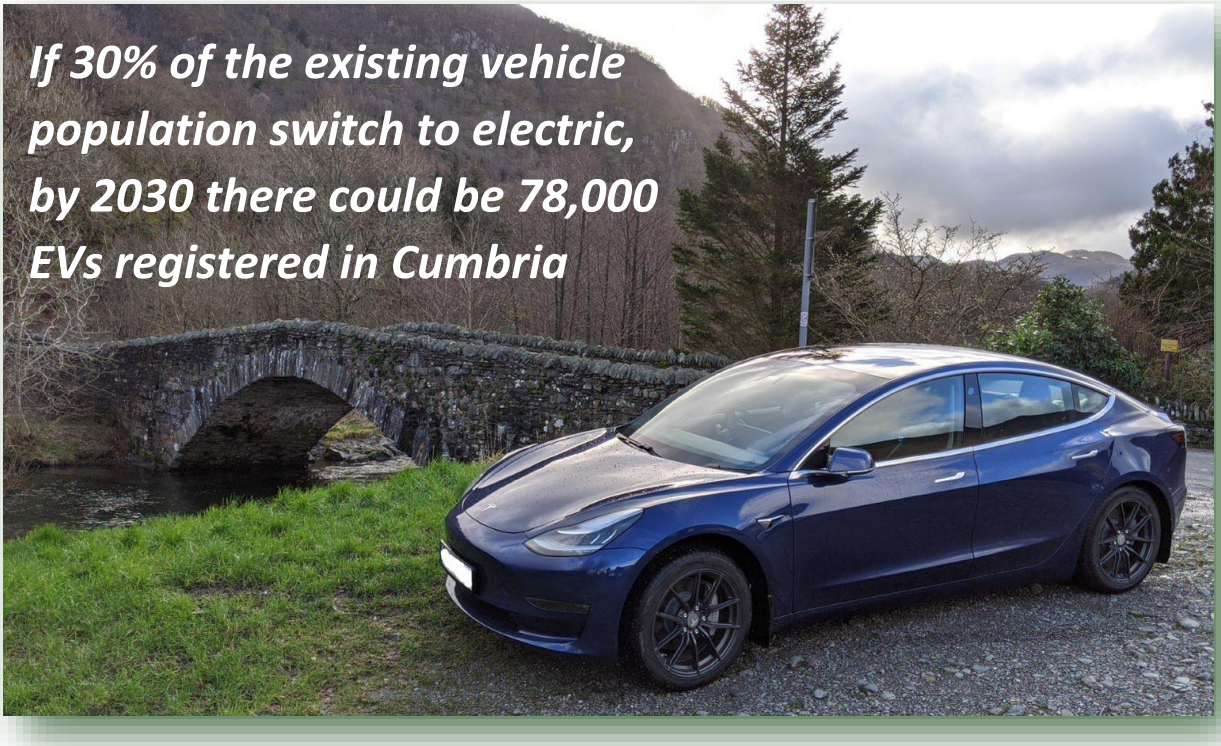
- Auto manufacturers increasingly switching production focus to ULEVs over 2020s
  [Announcement of intention to cease new ICE sales by 2030 gives manufacturers a higher degree of confidence to switch production to electric models, e.g. Jaguar car brand to be all-electric by 2025 - BBC News, Ford announces all electric car range in Europe by 2030 – BBC News]
- Expanding secondhand market, helping disperse EVs away from more affluent early adopters

Assuming overall vehicle numbers remain constant, a possible 30% of the total licensed vehicles (39.9m as of Oct-2020) switching to electric by 2030 equates to approximately 12m EVs.

[Note: Some studies forecast a slight decline in total registered vehicles, partly due to a trends of reduced overall mobility for work and leisure, moves away from personal vehicle ownership, and increases in use of public transport.]

The Climate Change Committee's '**Sixth Carbon Budget - The Path to Net Zero**' estimates 15m ULEVs by 2030, of which approximate predictions are 80% BEVs (battery electric vehicles) and 20% PHEVs (plug-in hybrid electric vehicles). This projection would then be closer to 40% of the total UK vehicle population becoming ULEVs, of which an estimated 12m would be BEVs.

Based on the estimated vehicle numbers which could switch to electric over this decade, it is then possible to consider future number of public chargepoints likely to be needed to support the transition, applying this analysis specifically to the requirements for Cumbria.



[image credit: Eugene Lambert]

5. Types & Locations of Chargepoints

Unlike the traditional petrol and diesel pumps which have become familiar at designated locations over the last 100+ years, the fact that electric transport can be charged in some way almost anywhere there is an adequate grid connection makes electrification a revolution in how vehicles are 'fuelled'.

Any forecast figures of total chargepoints required must acknowledge that – unlike the standard petrol or diesel pump - a fit-for-purpose network will comprise a diverse range of charging solutions.

Therefore estimating numbers of chargepoints needed represents only one aspect of infrastructure planning, given that the **types** and **locations** of chargepoints installed are massive variables affecting accurate forecasting.

In reality a broad mix of different public and private types of charging solutions will be needed, and clearly a wide range of installed charging solutions are already in use, as evidenced on Zap-Map.

Public charging infrastructure is generally installed either by chargepoint network operators or by host site organisations, with sometimes a joint approach taken to supplying / fitting / operating the equipment.
For those responsible for infrastructure planning, approaching charging provision in a wholistic way may offer benefits for procurement and standardisation.

Selecting suitable chargepoints for a given location depends on a range of factors, including:

- Anticipated use – type of location, level of demand, types of vehicles, and journey patterns
- Installation costs
- Electrical supply availability
- Practicalities of space and access

EV drivers are expected to meet their various charging needs through a combination of:

- **Home Charging** (based on having private garages / driveways)
  eg 3-7kW slow chargers using a typical domestic single phase AC supply, sufficient for overnight charging
- **Destination & Community Charging**
  eg 7-22kW fast chargers, which (depending on the vehicle) aim to add 50-100 miles' range in 1-3 hours while en route, within the community, and at destinations such as hospitality venues, retail and workplaces
- **Electric Forecourts**
  DC rapid / high-power chargers of 44kW up to 350kW, capable of delivering a full charge to enabled vehicles in as little as 30 minutes (eg Gridserve, Shell Recharge)

It is estimated that at least 30% of UK residents do not have garages or private off-street parking to install home chargepoints, so are likely to rely largely on public and/or workplace charging. The lack of private parking for EV charging at many homes is identified as a major barrier to switching.

For some the installation of ultrarapid charger hubs universally across the UK is viewed as the answer, attempting to replicate the familiar fuel forecourt model.

While certainly electric forecourts will make an important contribution to overall charging provision, for instance in dense urban populations and on arterial routes, in practice they will not prove universally possible close to all communities and neighbourhoods, for reasons including available electricity grid capacity, installation cost, space, commercial viability, etc.

Specifically for urban and rural Cumbria, it is not realistic to assume there will be blanket coverage of ultrarapid charger hubs as a direct replacement for existing petrol and diesel forecourts.

The county is characterised largely by hills and countryside, so whereas in future electric forecourts might reasonably be anticipated in locations such as Carlisle and the M6 corridor, in more rural areas other combinations of home / community / workplace-based charging are far more deliverable and effective.

In many cases charging at locations such as homes, workplaces, retail and hospitality venues should actually prove cheaper and more convenient for motorists as part of daily lifestyles.

6. Methodology for Chargepoint Infrastructure Analysis & Forecasting

In simple terms, a reasonable basis for assessing future EV chargepoint requirements is to:

a) Understand the current situation on chargepoint deployment
b) Identify trends and influences affecting future charging needs
c) Make informed assumptions
d) Generate forecasts for EV charging and chargepoint deployment, with associated caveats & limitations
e) Adapt and improve model based on further experience, data and research

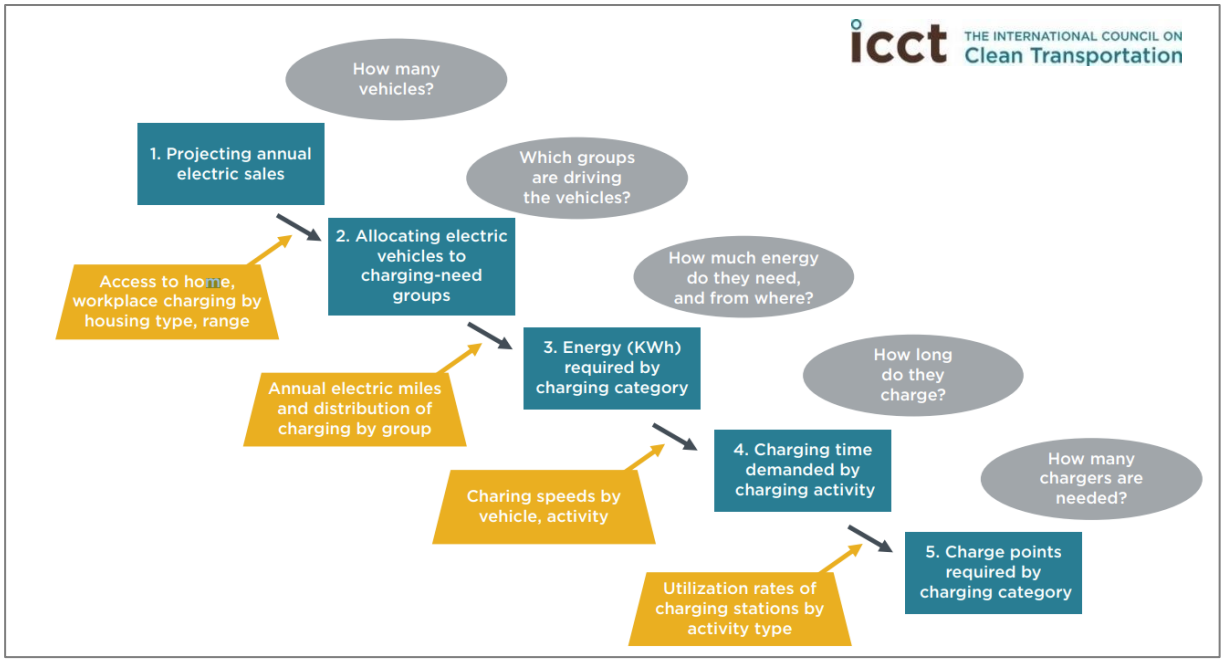
The forecasting of future public chargepoint needs can be based on various metrics & data, including:

Relevant national / regional data is publicly available from sources such as:

- Department for Transport (DfT) - vehicle registrations
- Cumbria Observatory - population, housing stock
- Cumbria Tourism - visitor numbers

This base data can be combined with EV-specific data and evidence, such as vehicle performance, driver behaviours, and chargepoint use.

The International Council on Clean Transportation (ICCT) working paper '**Quantifying the Electric Vehicle Charging Infrastructure Gap in the United Kingdom**' (page 5) adopts the following very useful methodology for forecasting chargepoint requirements:



Credit: International Council on Clean Transportation

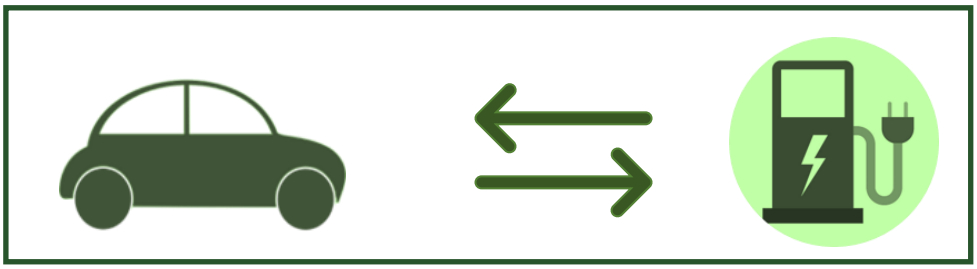
While forecasting chargepoints needed based on vehicle numbers, interim steps 2-4 analyse in greater detail how those vehicles will actually be used (ownership --> mileage --> energy required --> charging time), aiming to refine results based on real-world patterns of driving behaviour.

7. Interdependency Between Electric Vehicles & Chargepoints

The accelerating take-up of EVs in the UK necessitates an expanding national network of public chargepoints.

The chargepoint network is also an enabler to switching to EVs, providing a clear visual indicator that EVs are becoming a reality and a realistic proposition as an alternative to combustion engines. Clearly the timely introduction of new chargepoints at prominent locations contributes directly to this effect and helps build public confidence.

Accordingly there is self-evidently a '**push-pull**' effect and interdependency between numbers of EVs and numbers of public chargepoints:



One basis for analysis can therefore be to attempt to correlate the **numbers of EVs registered** to the **numbers of chargepoints required to charge them**.

The results from various existing studies seek to quantify the likely ratio of:

NUMBER OF EVs : NUMBER OF PUBLIC EV CHARGEPOINTS REQUIRED

While clearly very unlikely to be linear or uniform, this correlation offers a basis for forward planning.

Using national data, 35,689 connectors (listed on Zap-Map, December 2020) serving 390,500 ULEV* registrations (Department for Transport, October 2020) indicates a current chargepoint : EV ratio of approximately **1:11** nationally.

Clearly this is only a nationwide snapshot in time, and the EV market and associated charging infrastructure are evolving rapidly. There will of course also be marked regional variations - while some areas may be well-served for current and even anticipated future needs, others have gained a reputation for being so-called charging 'not spots'. Nonetheless it offers an initial insight into current charging provision.

The Recharge EU report '**How Many Charge Points will Europe and its Member States need in the 2020s**' (page 12) refers to a chargepoint : EV ratio of **1:10** as an EU infrastructure planning guideline.

The ICCT working paper '**Quantifying the Electric Vehicle Charging Infrastructure Gap in the United Kingdom**' (p14) forecasts that for normal charging at workplace and public locations, the chargepoint : EV ratio is expected to increase from **1:10** in 2020 to **1:16** in 2030.

This shift to more vehicles being served by each chargepoint on average is based on a range of influencing factors, including anticipated improvements in battery technology / range / charging speeds, but partly offset by a higher % of EV drivers not having home charging facilities (also see **Section 9 Major Influences on EV Charging Requirements**).

[Note: The ICCT paper is based on scenarios of either 50% or 70% of new vehicle sales being EVs by 2030, therefore pre-dated the latest UK government intentions (December 2020) to phase out new petrol and diesel sales by 2030. Corresponding with the author of the ICCT paper, based on an updated model of 100% of new vehicle sales being EV by 2030, the forecast chargepoint : EV ratio by 2030 could adjust to **1:14**, principally due to the accelerated switch resulting in more EVs by 2030.]

The Climate Change Committee's '**Sixth Carbon Budget - The Path to Net Zero**' (p98) makes a contrasting forecast, suggesting that approximately 280,000 public chargepoints will be needed by 2030 to support an estimated ULEV population of around 15 million (chargepoint : EV ratio of **1:54**).

Without offering supporting detail, to achieve this the CCC report predicts that the most cost-effective charging mix will focus primarily on 22kW, 50kW, 150kW and 350kW chargers (meaning mostly rapid / high-powered chargepoints), and obviously this again highlights that the types of chargers actually installed will significantly affect the total numbers required.

Public chargepoint launch, Kendal College
[image credit: Charge My Street]

8. CHARGEPOINT PROVISION (CUMBRIA)

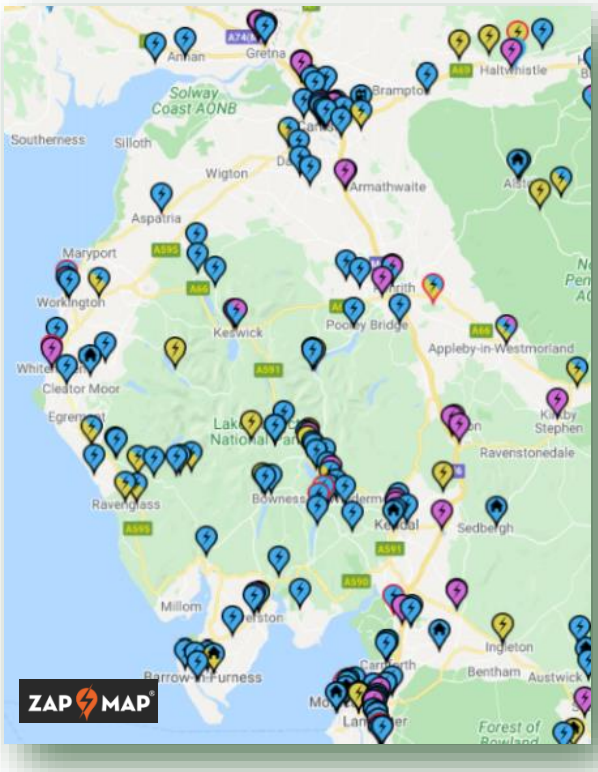
8.1 EXISTING CHARGEPOINTS (2021):

A review of Zap-Map data indicates the following listings in Cumbria as of May 2021:

- 139 chargepoint locations
- 259 connectors

Note:

- While not necessarily exhaustive, **Zap-Map** is still a main reference source for public chargepoint listings.
- Approximately 20% of chargepoint sites listed indicate some restrictions on public access, for example at workplaces or on private driveways.
- As of May 2021, the UK government's **National Chargepoint Registry** (NCR) lists 69 charging locations in Cumbria.



[image credit: Zap-Map]

Results from Zap-Map have been categorised according to parameters including:

- Council district
- Urban v. rural locations
- Ratios v. resident population and housing
- Inside / outside national park boundaries
- Network operator

Chargepoints By Local Authority District:

District	Number of Chargepoint Locations	Number of Chargers	% Chargers
Allerdale	11	24	9.3%
Barrow	6	15	5.8%
Carlisle	30	51	19.7%
Copeland	20	33	12.7%
Eden	22	42	16.2%
South Lakeland	50	94	36.3%
Totals:	**139**	**259**	**100%**

Chargepoints by Public Accessibility:

Public Availability	Number of Chargepoint Locations	Number of Chargers	% Chargers
Public	110	212	81.9%
Restrictions	23	41	15.8%
Zap-Home	5	5	1.9%
Zap-Work	1	1	0.4%
Totals:	**139**	**259**	**100%**

Chargepoints by Host Location - Urban / Rural:

Locality	Number of Chargepoint Locations	Number of Chargers	% Chargers
Urban (broadly defined as cities / towns)	64	128	49.4%
Rural (broadly defined as villages / countryside)	75	131	50.6%
Totals:	**139**	**259**	**100%**

Chargepoints by Host Location - Sector:

Location Sector	Number of Chargepoint Locations	Number of Chargers	% Chargers
Business Centre	4	14	5.4%
Car Dealership	5	10	3.9%
Car Park	13	19	7.3%
Community	3	6	2.3%
Education	1	2	0.8%
Faith Site	1	1	0.4%
Health Care	1	2	0.8%
Hospitality / Tourism / Leisure	72	118	45.6%
Industrial	1	2	0.8%
Local Authority Office	2	4	1.5%
Motorway	8	20	7.7%
Offices	2	3	1.2%
Residential	6	6	2.3%
Retail - Other	6	9	3.5%
Retail - Supermarket	14	43	16.6%
Totals:	**139**	**259**	**100%**

Chargepoints by Host Location - inside/outside National Parks:

Location Status	Number of Chargepoint Locations	Number of Chargers	% Chargers
Lake District National Park (LDNP)	51	95	36.7%
Yorkshire Dales National Park (YDNP)*	3	4	1.5%
Outside National Parks	85	160	61.8%
Totals:	**139**	**259**	**100%**

[*portion of YDNP within Cumbria only]

Chargepoints by Network Operator:

Operator	Number of Chargepoint Locations	Number of Chargers	% Chargers
Charge My Street	10	20	7.7%
Ecotricity	8	14	5.4%
EV Charge.Online	3	8	3.1%
GeniePoint	13	18	6.9%
Hubsta	1	2	0.8%
Hyundai Dealerships	2	4	1.5%
InstaVolt	7	24	9.3%
Nissan Dealerships	1	2	0.8%
Pod Point	18	46	17.8%
Polar	7	14	5.4%
Renault Dealerships	1	2	0.8%
Tesla Destination	15	32	12.4%
Tesla Supercharger	1	8	3.1%
VendElectric	2	4	1.5%
Zap-Home	6	6	2.3%
Zap-Work	2	2	0.8%
ZeroNet	18	19	7.3%
Other	24	34	13.1%
Totals:	**139**	**259**	**100%**

Chargepoints by Charger Type:

Max Charging Capacity	Number of Chargepoint Locations	Number of Chargers	% Chargers
Slow (3 - 5 kW)	9	15	5.8%
Fast (7 - 22 kW)	92	169	65.3%
Rapid (43 kW+)	31	67	25.9%
Not Known	7	8	3.1%
Totals:	**139**	**259**	**100%**

[All data based on analysis of Zap-Map chargepoint listings, May 2021]

The above figures from Cumbria form part of the emerging national charging network.

In May 2021 Zap-Map announced that the UK reached 15,000 charging locations on the Zap-Map database, with >23,000 charging devices and >40,000 connectors at these locations.

8.2 FORECAST CHARGEPOINT NEEDS (2030):

The Policy Exchange's **Charging Up** report (p34) highlights that there is still 'significant uncertainty over the number of EVs that each public chargepoint can support'.

At a forecast chargepoint : EV ratio of 1:14, in order to support up to 12 million EVs in UK by 2030, this could indicate the need for a national network of up to 855,000 public chargepoints.

[Note: chargepoint network assumed to comprise a broad mix of rapid / destination / workplace charging.]

Assuming a uniform distribution of vehicle registrations nationwide, and a uniform rate of switching, and with Cumbrian residents representing approximately 0.75% of the national population, this could then require a possible **6,400 public chargepoints in Cumbria** to meet local residents' needs by 2030.

As an alternative approach, using national forecasts from the Climate Change Committee and scaled down pro rata for Cumbria (280,000 chargepoints nationally, Cumbria has 0.75% of UK population), this gives an estimate of a possible **2,100 public chargepoints in Cumbria t**o meet local residents' needs by 2030.

These forecasts are **approximate only**, intended just to illustrate the scale of challenge in expanding the charging network in Cumbria from current levels. They should be considered together with **Section 9 Major Influences on EV Charging Requirements**.

Compared to the 259 chargers in Cumbria listed above (registered on Zap-Map as of May 2021), even the lower forecast of 2,100 public chargepoints represents an approximate 8x increase in provision by 2030.

Taking mid-range figures from above, for what could be a realistic estimate of 7,500 public chargepoints required in Cumbria by 2030 to meet combined public and visitor demand, an accelerating expansion of the Cumbrian network over the next decade would require a 45% annual rate of increase of new public chargepoints.

At a linear rate of network expansion, this would equate to 70 new public connectors being added in Cumbria every month to 2030.

9. Major Influences on EV Charging Requirements

As already emphasised, there are a wide range of variables in forecasting fit-for-purpose EV charging networks, and previous studies have in some cases reached diverse conclusions based on the methods used and assumptions made.

The EV market and charging infrastructure are still evolving and maturing, and will continue to do so over the coming decade as the switch to EVs gains momentum.

Therefore any assessment of future charging infrastructure must be considered together with a thorough understanding of the main variables affecting forecasting.

Significant direct influences include:

9.1 CHARGEPOINT TYPES & LOCATIONS:

As explained in Section 5, the **types** and **locations** of chargepoints which are installed represent massive variables affecting accurate forecasting, along with variations in the associated assumptions for how the network will be deployed and used.

In reality a broad mix of different public and private types of charging solutions will be needed.

Selecting suitable chargepoints for a given location depends on a range of factors, including:

- Anticipated use – type of location, level of demand, types of vehicles, and journey patterns
- Installation costs
- Electrical supply availability
- Practicalities of space and access

Other factors and trends affecting chargepoint requirements include:

TECHNOLOGICAL ADVANCES (generally *reducing* reliance on public charging):

- Improvements in **battery technology** (and therefore vehicle range) should reduce dependence on public charging, particularly for those with home charging making short-medium journeys.
  [Note: this effect may be partly offset by newer generations of EVs having smaller batteries, reducing embedded carbon and cost but also limiting maximum range.]
- Improvements in **chargepoint technology** / ratings (eg ultra-rapids) should speed up charging, resulting in an overall increase in the average number of vehicles which can be served by each chargepoint.

LIMITATIONS OF HOME CHARGING (generally *increasing* reliance on public charging):

Early adopters of EVs have often been in more affluent areas & demographics, and may make switching decisions in part due to having homes with private off-road parking for home charging.

Conversely as the switch to EVs gains momentum across the population, increasingly a greater % of EV drivers will live in flats / terraces without home charging, resulting in a higher dependence on public charging.

[Note: this effect could be partly moderated by a higher % of residents without off-street parking not owning a car, either as a deliberate lifestyle choice, or because their lack of parking makes car ownership impractical.]

9.2 COMMERCIAL FACTORS:

Clearly the prevailing landscape of **taxation** and **incentives** will heavily affect the rate of switching to EVs and how they are then used.

Examples of commercial influences include:

EV OWNERSHIP & LEASING:

There is an understandable public perception that the cost of EV ownership (whether via purchase or lease) is high v. petrol and diesel.

As a contribution towards upfront purchase costs, the UK government currently offers plug-in grants of up to £2.5k for qualifying new low-emission vehicles. The maximum grant has recently reduced from the 2020 allowance, and this trend to reduce subsidy incentives may well continue as EV switching gains pace.

There is an anticipation that the cost of EVs may gradually fall as auto manufacturers scale up production, new models become available, and the secondhand market matures.

Over recent years there has also been a general shift away from upfront purchase towards leasing vehicles on fixed-term agreements, with regular monthly payments tending to disguise the actual full 'cost' of the vehicle.

As well as the environmental benefits of switching, in drivers' decision-making it is also important to consider their full cost of ownership, offsetting the upfront purchase price through the anticipated considerable savings in fuel and maintenance costs over the vehicle's lifespan.

VEHICLE EXCISE DUTY (ROAD TAX):

VED is calculated according to the CO_2 tailpipe emissions for all vehicles registered since March 2001. From April 2020 zero emission EVs are now zero-rated standard tax for both the first year and all subsequent years, meaning drivers do not currently pay any road tax on a pure electric (battery) vehicle.

Long-term as the transition to electric accelerates, it is not yet certain whether public finance revenue from EVs will be generated principally through increases in VED to rates similar to those for existing petrol & diesel vehicles, and/or via road pricing schemes.

TRAFFIC MANAGEMENT CONTROLS:

Particularly during the transitional phase away from combustion engines, there can be other ways of prioritising EVs and incentivising public uptake through various forms of traffic management.

Examples include:

- Preferential treatment in **congestion zones**, for instance a full-time **Ultra Low Emission Zone** (ULEZ) already operates in London (and increasingly planned in other major cities such as Birmingham, Leeds, Newcastle & Manchester) to help improve air quality.
  To enter the London ULEZ, most vehicles need to either meet the zone's emissions standards, or pay a daily fee (currently £12.50 for most vehicle types up to 3.5 tonnes, £100 for heavier vehicles).
  From October 2021 the London ULEZ is expanding, to create a single larger zone extending to the North and South Circular Roads.
- Keswick Town Council are considering a proposal to conduct a feasibility study on introducing charges levied on visitors to the Lake District National Park, intended to ease congestion and generate revenue to invest in rural transport:
  [https://keswickreminder.co.uk/2021/02/15/mayor-calls-for-lake-district-visitors-to-face-road-charges/]
- Approaches such as **dedicated traffic lanes** and **preferential parking** may also contribute to increasing public enthusiasm for making the switch to EVs (although 'displacement' consequences of shifting non-EV traffic elsewhere then also need to be considered).

CHARGEPOINT INSTALLATIONS:

The UK government offers chargepoint grants to support the wider use of electric and hybrid vehicles via the Office of Zero Emission Vehicles (OZEV), with incentives including subsidies through the **Workplace Charging Scheme** and the **Electric Vehicle Homecharge Scheme**.

Eligible businesses and dwellings can apply for a contribution to the chargepoint installation cost.

In the March 2020 Budget the UK government also announced the **Rapid Charging Fund**, as part of a £500 million commitment for EV charging infrastructure on the strategic national road network. The fund is intended to help ensure advance provision of a rapid-charging network, ready to meet long-term consumer demand for EV chargepoints.

9.3 DRIVER ATTITUDES & BEHAVIOURS:

The switch to electric represents a revolution in personal motorised transport, therefore effective communication campaigns and associated training will be critical to developing public confidence in EVs.

In 2016 the Department for Transport released results of a study assessing **Public Attitudes Towards Electric Vehicles**.

More recently (September 2020) the Society of Motor Manufacturers and Traders (SMMT) reported survey findings suggesting almost half of UK motorists don't yet feel ready to make the switch to EVs. Findings also estimated a further 507 new chargepoints will be needed every day to 2035 in order to prepare for the mass EV market and drive buyer confidence.
[Note: findings pre-date the UK announcement of 2030 for phaseout of new petrol & diesel sales, which obviously adds further urgency to chargepoint provision.]

Locations recognised as leading the charge on EV switching along with supporting infrastructure include Dundee, which runs a Scottish government / OZEV-funded **Drive Dundee Electric** public campaign, aimed at promoting EVs and busting myths.

Unsurprisingly previous experience of introducing new modes of transport have demonstrated that technology and travelling patterns are not independent, nor does one wholly dictate the other, rather they each influence each other and coevolve.

Therefore it is unlikely that driving behaviours and journey patterns for EVs will simply match exactly petrol / diesel predecessors, rather there are anticipated implications for:

- Journey planning (including incorporating charging into existing or new lifestyle patterns)
- Psychology, patience and etiquette while charging (including inevitable driver frustration if there are queues to access chargepoints, they are blocked by non-charging vehicles, or chargepoints are found to be out of order)

Behavioural phenomena such as driver 'range anxiety' are already well-established, plus a desire to make effective use of use of 'dwell time' while charging (for instance charging for an hour while shopping or visiting a café may effectively be considered as taking no extra time to charge, as compared to the perception of wasting that hour in an isolated charging location with no parallel activity on offer).

As EV ownership increases and the charging network matures, it is anticipated that acceptable norms will become established among most EV drivers for:

- Driving distance to reach an available chargepoint
- Walking distance from housing (if returning home from leaving a vehicle at a nearby public chargepoint for an extended period)
- Wait times to use chargepoints
- Total time required to partly / fully charge

Clearly it will be important that these behavioural effects are noted and addressed, in order to optimise use of the charging network.

While the 20th century undoubtedly saw the inexorable rise of the motorcar, a growing number of researchers are now suggesting that society may have reached saturation point and already passed a 'peak car' scenario. Potential reasons for car use to plateau and even decline are attributed to a variety of possible causes, including reduced population movement, cultural shifts, a focus on public transport and active travel, and the cost of buying / fueling / maintaining a private vehicle.

9.4 HOME WORKING:

In the past two decades, the number of people working mainly from home has increased significantly. A major enabler contributing to this shift has obviously been technological advancements, along with more flexible part-time working.

For many employees and employers there can be significant benefits to home working, including for staff fitting work around commitments such as other employment or childcare.

On a practical level this also reduces employees' dependence on commuting (often by vehicle), and the associated travel costs.

Clearly the COVID pandemic has brought this underlying trend into sharp focus (see **9.6 COVID Impacts**).

9.5 HOME SHOPPING:

Retail analysts indicate that more than half of UK consumers are now shopping online, and that this trend to online spending is predicted to continue.

While this has prompted a general rise in commercial deliveries ranging from supermarket vans to parcel couriers, for many it has also reduced dependence on making specific shopping journeys to highstreets or retail parks.

There is already some anecdotal evidence to indicate that the expanding population of commercial electric vans is putting growing pressure on limited rapid charging infrastructure currently available.

9.6 COVID IMPACTS:

In addition to increased working and shopping from home, the COVID pandemic has also highlighted and accelerated other societal shifts in attitudes and behaviours.

Reports indicate that for some the challenges of coping with lockdown have significantly influenced longer-term choices such as where they now wish to live, employment, lifestyle, and leisure pursuits, all of which are likely to affect future travel patterns.

Some analysts suggest that these and other effects may remain at least partly 'locked in' to societal behaviours, even when COVID movement restrictions are eventually eased.

10. Charging Infrastructure Planning – Implications for Cumbria

Forecasting the likely need for 1000s of public chargepoints as part of an expanding network for Cumbria raises a series of significant challenges for planning, policy and investment.

It is important to consider whether a 'hands-off' approach allowing market forces to shape the emerging charging network will deliver fit-for-purpose outcomes, or to what extent this should be complemented by more active intervention & regulation from authorities, and if so what benefits and efficiencies might be gained for procurement and operation.

The risks of inaction also need to be assessed, including the impact on businesses if a lack of charging provision deters customers (for example in the tourism sector – see below).

[Note: faced with developing a fit-for-purpose public charging network, some stakeholders draw parallels with the challenges of fibre broadband rollout over the past decade, including the degree to which this has been left to market forces, the level of state intervention for planning, investment and regulation, and the risk of regions / demographics being left marginalised and excluded from the switching opportunity.]

For the EV chargepoint network, the particular challenges include:

10.1 CLIMATE CRISIS RESPONSES:

Switching to low carbon travel is vital to achieving net zero carbon emissions. However despite various policy efforts intended to reduce the environmental impacts of transport, domestic travel is now the biggest sector for carbon emissions.

As already outlined in the **Environmental Context**, the charging network supports the switch to EVs in order to decarbonise travel, as part of the overall **Low Carbon Travel Hierarchy**.

Therefore fit-for-purpose charging infrastructure is pivotal to achieving CO_2 reduction targets in the transport sector, emphasising the direct relevance for those such as local authorities, national parks and businesses responsible for achieving net zero commitments.

The Climate Change Committee's '**Sixth Carbon Budget - The Path to Net Zero**' highlights the need for substantial change across all sectors over the next decade to achieve climate goals, and that (p98) 'chargepoints for electric vehicles will need to be scaled up rapidly in the 2020s to support the phase-out of new petrol and diesel cars and vans by the early 2030s'.

10.2 ELECTRICITY SUPPLY CAPACITIES:

The accelerating switch to electrified transport will clearly increase overall loading on the electricity network, and presents significant challenges for both power generation and distribution.

Advance network planning will require DNOs (Distribution Network Operators) to forecast where, when and at what capacity EVs are expected to charge, and to adopt smart charging to help spread load away from peak times.

Spikes in demands on power supply networks are also expected to be managed in part through use of technologies such as V2G (Vehicle to Grid) charging, which at peak times should allow substantial amounts of energy to be returned from charged EV batteries back to the grid, effectively forming a huge decentralised 'power station', and reducing the need for additional power generation.

Static energy storage (made possible by advances in battery technology) is also increasingly being considered to ease deployment of EV charging, in cases where the grid is constrained or where a high number of rapid chargers (50+kW) are to be installed. This can be a solution to help avoid costly grid upgrades, while still keeping charging tariffs at reasonable levels.

Combining on-site battery storage with renewable energy generation such as solar voltaic arrays creates an integrated means of managing variations in power supply and demand, as well as allowing vehicles to charge from 100% clean energy generated locally. EV chargepoints can be an excellent strategic fit with community energy schemes.

Dundee is at the forefront of the drive to switch to electric transport. In 2018 a former petrol station was redeveloped into the UK's first EV rapid charging hub, featuring solar canopies combined with on-site battery storage:

EV Charging Hub – Princes Street, Dundee

The Princes Street development is part of a series of charging hubs planned for the city.

Another recent high-profile example of this approach is the **Gridserve electric forecourt** in Essex, opened in December 2020 and a model which the operator is intending to replicate elsewhere:

EV power - Overview | GRIDSERVE

10.3 TOURISM SECTOR:

Cumbria Tourism reports that in 2018 a combined 62.8m tourist days brought in £3 billion to the region's economy, and provided employment for 37,766 FTE (full-time equivalent) posts. As many tourism jobs are part time or seasonal, Cumbria Tourism estimates the total number actually employed in tourism jobs to be 64,940, representing around 20% of the county's workforce.

As already explained, the effective resident population in Cumbria at any given time is inflated substantially by visitors, particularly in popular areas at high season. Most visitor journeys continue to be made by private vehicles.

Therefore it is essential for the tourism sector to consider charging provision for visitors across a range of sites and locations, as part of a broader mix of public charging. Overnight charging provision for guests at locations such as hotels, B&Bs and campsites, combined with chargepoint facilities at hospitality / leisure attractions, can all make a significant contribution to Cumbria's overall public charging needs, as well as combining visitors' charging with other lifestyle activities in order to minimise dwell time.

An assessment of where chargepoints are most needed must also be balanced with feasibility. For instance, popular rural areas of the LDNP attracting high vehicle numbers may not have spare grid capacity, may be subject to tighter planning restrictions on developments, and in future could be subject to more radical interventions to manage vehicle access.

10.4 SOCIAL INCLUSION:

The switch to electric vehicles is likely to revolutionise how society travels, how the energy required to do so is supplied, and how adverse environmental and health impacts can be substantially reduced.

However just as with other significant periods of innovation and change, there is the potential for this revolution to be either inclusive or exclusive.

In addition to current concerns on affordability of vehicle purchasing or leasing, EV chargepoint deployment will also prompt other societal challenges including:

- How already poorer / disadvantaged areas will receive the necessary charging infrastructure.
- How isolated rural areas (in many cases likely to be far less attractive to large commercial operators, and which may not have spare electricity grid capacity) can be adequately supplied with public charging facilities.
- How residents of the estimated 30%+ of UK dwellings without driveways or other off-street parking (and therefore far greater reliance on public and workplace charging) will be able to charge.
- How the locations and operation of chargepoints can be made fully accessible to people with disabilities / special needs, complying with requirements of the Disability Discrimination Act.
- How charging locations will be adequately lit, weather-protected and secure, creating a comfortable and safe environment for all chargepoint users including lone female drivers.

10.5 PUBLIC TRANSPORT & EMERGENCY SERVICES:

Careful consideration will be needed for how frontline fleets, including public transport and blue light emergency services, will efficiently charge their electric vehicles.

Decisions are likely to be based on factors such as typical modes of operation, requirements for range and availability, provision for depot charging, and minimising vehicle downtime.

10.6 BUSINESSES & SERVICES:

Clearly most petrol and diesel vehicles currently rely on the established fuel forecourt network, and are generally able to fully refuel in a matter of minutes.

Conversely as commercial fleets switch to electric, this may increasingly challenge how they operate in order to still transport goods and people effectively.

[image credit: Lake District National Park Authority]

During operational hours it is unrealistic for most commercial vehicles to spend hours idle while charging, hence it is likely that:

- Some electric fleets (for instance local authorities, utility companies, delivery couriers) will operate from depots with dedicated charging provision, for example overnight.
- Some operators may require or encourage staff driving commercial vehicles to park and charge these at home while not in use, however clearly this then relies on staff having private off-road parking and a suitable chargepoint, and would undoubtedly increase pressure on home chargepoints overall, particularly if employees' own vehicles also need charging.
- In other instances drivers will rely on ultrarapid charging during operation ('electric forecourt' model), or expect ready availability of slower public chargepoints during times when their vehicle is not operational (for instance overnight and at weekends).
- Taxis which can be in use for extended shifts of 12 hours+ may look for 'trickle charge' options, to regularly top-up range while waiting at locations such as taxi ranks.

10.7 CHARGEPOINT ACCESS / EASE OF USE:

An expanding network of chargers installed by a range of operators raises challenges of accessibility and interoperability.

While it is anticipated there will be some increased regulation and standardisation as the emerging network matures, it is likely to require intervention at national and local levels to achieve this.

Particular issues include:

- How any existing parking fees and associated enforcement (such as in local authority car parks) are administered, without creating obstacles for accessing chargepoints.
- Adopting best practice in the layout of chargepoints and charging bays, maximising flexibility for vehicles wishing to charge, and helping address possible issues with petrol or diesel vehicles blocking chargepoints.
- Ease of access (plug > charge > pay) equivalent to the familiar fuel forecourt scenario, rather than the need for customers to pre-register / create accounts / use access cards / enter passwords etc. across a multitude of different network operators.
- Compliance with current accessibility standards for special needs groups.
- Clear signage, both to chargepoint locations where not immediately obvious, and at chargepoints covering use, tariffs, or any restrictions.

In February 2021 the UK government launched a consultation on the consumer experience at public chargepoints, seeking feedback on factors such as finding chargepoints, ease of payment, and reliability.

10.8 PLANNING POLICY FOR NEW BUILDING DEVELOPMENTS:

As already highlighted, while for many residents a home chargepoint may well be adequate for most short-medium journeys, it is estimated that at least 30% of existing UK housing stock (particularly terraces and flats) does not have private off-street parking, and therefore will be directly reliant on the public charging network.

To avoid exacerbating this issue, local planning authorities responsible for new developments will need to consider whether / how private or communal charging provision is included for new developments.

This may include liaising with developers and distribution network operators on installing 3-phase AC supplies (typically not available at most existing domestic properties) for rapid charging.

In July 2019 the UK government launched a public consultation on proposals to change building regulations in England, in order to require all new-build homes to be fitted with an EV chargepoint.

[Electric vehicle chargepoints in residential and non-residential buildings - GOV.UK (www.gov.uk)]

10.9 TOWN PLANNING / TRANSPORT INTEGRATION:

The addition of 1000s of public chargepoints has significant implications for local authorities and national parks on many aspects of planning for streets, neighbourhoods and countryside, including car parking provision, availability of utilities, street furniture, signage, and health & safety.

As already stated, when assessing the environmental impacts of different modes of travel, private vehicle use should be seen within the context of the **Low Carbon Travel Hierarchy**.

While the transition to EVs underpins decarbonisation of the transport sector, there are also opportunities for integration with other forms of transport.

Examples could include combining provision of EVs via car hire and car clubs, and supporting facilities including chargepoints and parking, with transport hubs at locations such as:

- Railway stations
  [EXAMPLE: Co-Wheels pay-as-you-go car hire at Penrith, Oxenholme and Windermere stations]
- Bus stations
- Park & Ride schemes
  [EXAMPLE: 18 electric car charging points available at Lancaster Park & Ride]
- Cycle hire (including e-bikes)
- Footpaths

Particularly where EV charging can be fully integrated with other modes of transport or activities, the aim can be to reduce drivers' effective 'dwell time' spent charging to near zero.

10.10 TECHNICAL SKILLS / TRAINING / EMPLOYMENT:

The forthcoming national transition to EVs represents a significant opportunity to rethink personal transport. It is also an important part of a broader 'Build Back Better' response, tackling fragilities highlighted by the COVID pandemic, and meeting climate challenges over this critical decade.

in moving away from the traditional model of combustion engines and fuel forecourts which has dominated much of the last century, there are significant opportunities for Cumbria to transition to long-term sustainable jobs as part of a new green economy.

In order to fully realise this opportunity in the transport sector, a cross-societal challenge facing private and public sectors will be the development of the necessary skills and capacities for:

- Servicing and maintaining EVs
- Installing / operating / maintaining EV charging infrastructure
- Installing / operating / maintaining associated technologies such as renewable generation and battery storage

11. What Next? - Key Recommendations

This analysis report highlights the need for those responsible for policy and infrastructure planning in Cumbria to consider the scale of EV charging demand over the next 10-20 years, and assess the relevant implications for their particular sphere of influence and responsibility.

It is a clear call to action in Cumbria, including by:

- ✓ sectors - especially tourism, transport, economic development and carbon management
- ✓ organisations and agencies - such as those responsible for county or area-based sustainable transport strategies, planning, electricity management, and social inclusion

It will be extremely helpful for organisations to set out their positive vision for chargepoint deployment in Cumbria, and to assess how active intervention can bring about a better outcome.

Simultaneously within this analysis should be a risk assessment of simply 'doing nothing', for instance the business risk to the tourism sector of not ensuring adequate chargepoint provision for visitors.

Strategies must note the likely scale of charging demand, and organisations should incorporate the revolution in EVs and chargepoints into their target setting and review structures.

On a practical level, for facilities such as workplaces, hospitality venues, retail outlets, and local authority car parks this is likely to require:

- ✓ Review of how such facilities are currently used by people and vehicles, including average and peak numbers, time on site, existing parking provision, and charging regimes
- ✓ Identification of what alternatives are available to car use, including links to public transport and active travel corridors, both currently and possible future provision
- ✓ Survey of what other EV charging provision already exists or may be planned in the surrounding area
- ✓ Understanding of what electricity supply is current available at site for supporting chargepoints - early dialogue is recommended with the Distribution Network Operator (Electricity Northwest Ltd) regarding grid capacity, limitations, upgrade feasibility, and costs, given that this can currently exert significant upward pressure on the cost of installation
- ✓ Assessment of current demand (if any) from site users for EV charging facilities, for instance via user survey
- ✓ Assessment of anticipated future need for EV charging, considering factors discussed in this report as they may relate to the location, plus again possibly via user survey (understanding this forecasting exercise will certainly not be an exact science, but making reasonable assumptions)
- ✓ Review of the risk of inaction, for instance through possible loss of trade or other disruption if on-site EV charging is not made available

In particular the LEP and affiliated business organisations should consider how EV charging will affect logistics, their 'bottom line' and economic prosperity.

The tourism sector and the Lake District National Park Authority will both need to give careful consideration to 'messaging' about chargepoint provision.

For example, are EVs promoted and prioritised over leaving the car at home and using public transport…? Should day visitors driving to 'honeypot' destinations be encouraged to charge up before they leave home, or to visit and charge at their destination as part of their day out…?

Finally - but very significantly - it is also vital to assess how the accelerated deployment of chargepoints to support the anticipated switch to EVs will contribute to carbon reduction across Cumbria, and therefore how it will help the county to achieve its commitments to net zero targets.

[image credit: Richard Waller]

APPENDIX A: ALTERNATIVE VEHICLE CHARGING TECHNOLOGIES

Beyond the EV chargepoint approach outlined above, it should be noted that trials and pilot schemes have also taken place on alternative methods for charging electric vehicles, including:

- **WIRELESS CHARGING:**
  Suitable vehicles receive power simply by parking over a ground-based pad connected to the power grid, using a magnetic resonance field that sends power through an air gap.
  [EXAMPLE: trialled with Nottingham City Council at railway station taxi rank]

- **LAMP POST CHARGING:**
  Lamp post-based chargers have been identified as potentially a cost-effective way to quickly install extra on-street charging capacity, particularly using surplus supply capacity which may result from switching to low energy lighting, and reducing the need to fit additional street furniture.
  [EXAMPLE: trialled with local authorities in London and elsewhere]

- **BATTERY EXCHANGES:**
  Rather than waiting to recharge batteries, battery exchange schemes allow drivers to swap out batteries for fully charged replacements.
  [EXAMPLES: schemes actively in use on arterial routes in China and for urban rickshaws in India]

- **ELECTRIC ROADS:**
  An adapted highway is used to transfer energy from tracks in the road, in order to recharge the batteries of electric vehicles.
  [EXAMPLE: trialed on a short stretch of road in Sweden]

Appendix B: Trends on Car Use / Alternative Modes of Travel

The last century has been undisputedly the age of the motor car, with the aspiration / expectation of private car ownership increasing over the course of several generations. However there is no certainty that this situation will perpetuate in its current form.

Research commissioned by the Department for Transport (DfT) indicates that young adults in UK and other countries are now driving less compared to those in the early generations. This trend was identified after driving licensing among young people peaked in 1992/4.

The DfT report finds that overall young people now generally travel less, with the total number of trips per person made between 1995-99 and 2010-14 reducing by 24% (young women) to 28% (young men).

Conversely there has been a small increase in the number of trips per person on public transport.

Although there has been variation from year to year, the general trend identified has been for each cohort of young people since the early 1990s to own and use cars less than the preceding cohort, and for the growth in car use with age to also be at a lower rate, suggesting that this changing behaviour is more than just a postponement of driving.

While clearly overall the widespread use of personal cars continues, other flexible approaches to accessing vehicles on demand include:

- Vehicle rental, ranging from short-term hire (such as Twizy fleet offered for daily hire in LDNP) to medium-term lease agreements for private or business users
- Car share schemes
- Car clubs
- Autonomous vehicles
- Ridesourcing services such as Uber, which use apps to connect passengers with drivers who typically drive part-time and use their own car

[Note: The Climate Change Committee's '**Sixth Carbon Budget - The Path to Net Zero**' forecasts that:

- Total car miles fall by 9% by 2035 relative to their baseline, driven by a modal shift from cars to walking, cycling (including e-bikes) or public transport, an increase in average car occupancy, and a reduction in travel from factors such as increased working from home.
- For vans, demand is reduced by 3% through measures such as increased use of urban consolidation centres and e-cargo bikes.
- Factors such as improved logistics lead to 10% lower total HGV miles, relative to baseline forecasts.]

Appendix C: Reference Reports Relevant to Chargepoint Forecasting

In this course of this analysis wide-spread reference has been made to broad-ranging external data and research assessing EV take-up and future chargepoint network requirements.

Relevant publicly available external reports include:

REF.	REPORT TITLE / DATE	AUTHOR / PUBLISHER
1	Plugging the gap: An assessment of future demand for Britain's electric vehicle public charging network January 2018	Climate Change Committee
2	Committee on Climate Change - The Sixth Carbon Budget: The UK's path to Net Zero December 2020	Climate Change Committee
3	Transport & Environment Study – Recharge EU: How many charge points will Europe and its Member States need in the 2020s January 2020	Transport & Environment
4	Quantifying the Electric Vehicle Charging Infrastructure Gap in the United Kingdom August 2020	International Council on Clean Transportation
5	Department for Transport Road Traffic Forecasts 2018	Department for Transport
6	Public Attitudes Towards Electric Vehicles September 2016	Department for Transport
7	National Travel Survey: England 2019 August 2020	Department for Transport
8	Understanding the Drivers of Road Travel: Current Trends In and Factors Behind Roads Use January 2015	Department for Transport
9	Charging Up - Policies to Deliver a Comprehensive Network of Public EV Chargepoints February 2021	Policy Exchange
10	Electric Vehicle Charging Behaviour Study March 2019	National Grid
11	Distribution Future Electricity Scenarios 2020 December 2020	Electricity Northwest
12	Electric Vehicles & Infrastructure December 2020	House of Commons Briefing Paper