Report
August 2023

Electric Vehicles: Consumer Information Review

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Fédération Internationale de l'Automobile: European Bureau

steer

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Glossary

Acronym	Description
ACEA	European Automobile Manufacturers Association
ACI	Automobile Club D'Italia
ACP	Automóvel Club de Portugal
ADAC	Allgemeiner Deutscher Automobil-Club
AMAK	National Automobile Club of Azerbaijan
AMZS	Avto-moto zveza Slovenije
ANWB	Koninklijke Nederlandse Toeristenbond
AVERE	European Association for Electromobility
BEUC	Bureau Européen des Unions de Consommateurs
BIHAMK	Bosnia and Herzegovina Automobile Club
CAMC	Caravan and Motorhome Club
CPO	Chargepoint Operator
CTEK	Battery care and management solutions provider
FDM	Forenede Danske Motorejere
FIB	Felag Islenskra Bifreidaeigenda – Icelandic Automobile Association
ICE	Internal Combustion Engine
KNA	Kongelig Norsk Automobilklub
MS	M Sverige
NAF	Norges Automobil Fordbund
ÖAMTC	Österreichischer Automobil-, Motorrad- und Touring Club
RAC	Royal Automobile Club
RACC	Reial Automobil Club De Catalunya
RACE	Real Automovil Club de Espana
TCB	Touring Club Belgium
TCO	Total Cost of Ownership
TCS	Touring Club de Suisse
UAB	Union Des Automobilistes Bulgares
WLTP	Worldwide Harmonised Light Vehicle Test Procedure

Executive Summary

Background

The Fédération Internationale de l'Automobile European Bureau (FIA EB) appointed Steer to deliver **a study on the information provided to consumers on electric vehicles' performance and usage.**

With increasing climate change concerns and the need to reduce emissions from transport, the European Union (EU) introduced the 'Fit for 55' package in July 2021, which included a series of proposals to revise and update EU legislation to achieve climate objectives. Adoption of electric vehicles (EVs) and phasing out of Internal Combustion Engine (ICE) vehicles would support delivery of these climate change goals.

According to European Automobile Manufacturers Association, battery electric vehicles accounted for 12.1% of passenger car sales in 2022 in the EU, up from 9.1% in 2021 and 1.9% in 2019. In June 2023, battery electric vehicle sales reached 15.1%, overtaking diesel share for the first time.[1] Despite this growth, there are several barriers to EV adoption such as range anxiety, high purchase costs, lack of equitable chargepoint provision and lack of overall consumer knowledge on EVs. Therefore, **the need for clear and transparent information for consumers considering purchasing or using an electric vehicle is important for wider adoption and supporting climate change goals.**

Scope

This study has reviewed the information provided to consumers on EVs to understand if it is clear, consistent, and transparent. A multi-faceted approach has been undertaken for the delivery of this study including the following tasks:

- A literature review;
- 16 stakeholder interviews with both FIA EB members and wider industry representatives (European consumer or industry policy groups/organisations);
- An online survey with FIA EB members;
- A review of relevant EU regulations;
- A review of six vehicle manuals; and
- A review of nine chargepoint operator websites.

Research Findings

This study has found that **consumer information on EVs is inconsistent and could be improved.**

This study identifies barriers to EV adoption such as affordability, range anxiety, vehicle performance, chargepoint provision, chargepoint usability, and EV availability (i.e. waiting times to purchase a vehicle). Clear, concise, and transparent consumer information could help mitigate these barriers and improve overall EV adoption.

The review of the vehicle manuals has revealed that important areas such as vehicle range, battery optimisation, and charging requirements are inconsistent both in terms of quality and quantity of information. Some of the vehicle manuals are clearly designed for new adopters with introductory sections whilst others do not provide as much information (e.g. Renault Zoe

[1] ACEA (2023) **'New car registrations: +17.8% in June, battery electric 15.1% market share'**

vs Telsa Model Y). This inconsistency of information does not provide a like for like experience for consumers. The vehicle manual review raises a wider point about what information should be included in manuals and what alternative sources of information consumers should use for anything the manual does not address.

The review of chargepoint operator websites has indicated that information provided to consumers is inconsistent both in terms of quality and quantity of information. Areas such as chargepoint speed classifications and chargepoint availability are lacking clear and consistent information. Pricing is a mismatch of price per minute and price per kWh (sometimes both) and guidance on indicative charging costs is lacking. Based on the review of chargepoint operator websites and stakeholder feedback, public vehicle charging across Europe is not interoperable or consistent for user experience and consumer information.

Recommendations

This study demonstrates that barriers to EV adoption such as range anxiety, vehicle performance and concerns about affordability could be mitigated through improved and consistent information provision. These improvements can be facilitated by various decision makers from the EU, national governments, city/transport authorities and vehicle manufacturers.

A series of recommendations have been developed which seek to improve consumer information on EVs. The recommendations are split into two categories: general recommendations and EU regulatory related recommendations. General recommendations are grouped into:

- Vehicle information recommendations;
- Charging information recommendations; and
- Wider recommendations.

Research area	Recommendations
General Recommendations	
Vehicle Information	Recommendation 1: optimise vehicle manuals to provide consistent and clear information for consumers. Recommendation 2: improve information provision and clarity on EV affordability. Recommendation 3: provide transparent information on campervan and leisure application of EVs. Recommendation 4: provide more accurate information on vehicle performance in adverse weather conditions. Recommendation 5: car dealerships should provide more transparent and clear information to consumers.

Research area	Recommendations
Charing Information	Recommendation 6: standardise information provision at public chargepoints. Recommendation 7: enhance accessibility information & user experience at public chargepoints.
Wider recommendations	Recommendation 8: raise public awareness of accurate EV information. Recommendation 9: promote information on sustainable transport options. Recommendation 10: promote use of car sharing & shared transport models.
EU Regulatory Recommendations	
Recommendation 11: revise the Car Labelling Directive to properly include electric vehicles. Recommendation 12: harmonise charging point payment regulations. Recommendation 13: provide more reliable/realistic information to consumers on an EV's range. Recommendation 14: make information on battery health more accessible and provide it proactively for second-hand purchases.	

Introduction

Study Context

1.1 The Fédération Internationale de l'Automobile European Bureau (FIA EB) appointed Steer to deliver this study on the information provided to consumers on electric vehicles' (EVs) performance and usage.

1.2 The FIA EB aim to understand the implications on the uptake of EVs in Europe from a consumer perspective. This includes understanding what information consumers should receive or find when considering purchasing an EV, and relevant information that is not readily available for consumers, including on vehicle performance and the overall charging experience.

FIA EB

1.3 The FIA EB, based in Brussels, is a consumer body comprised of 65 Mobility Clubs that represent over 36 million members from across Europe. The FIA EB has an important role in providing:

- Representation of the European Member Clubs' interests towards the European Union institutions;
- Building up links and exchange of best practices between its Member Clubs across Europe; and
- Engaging in new campaign activities together with Automobile Clubs throughout the region (e.g., such as the FIA Action for Road Safety campaign).

Steer

1.4 Steer is an industry-leading transport consultancy with a sustained history of tackling the most complex and challenging transport projects and policies. Steer's **New Mobility Team** have delivered this study.

Study Background

1.5 With increasing climate change concerns and the need to reduce emissions from transport, the European Union (EU) introduced the 'Fit for 55' package in July 2021, which included a series of proposals to revise and update EU legislation to achieve climate objectives. Within the Fit for 55 package, Regulation (EU) 2023/851 on CO_2 emission performance standards for new passenger cars and light commercial vehicles aims to 'increase carbon dioxide (CO_2) emission reductions targets for new cars and vans, so as to ensure that the automotive sector contributes to the EU's climate goals, and to stimulate innovation'.[2]

[2] European Council (2023) '**Fit for 55: why the EU is toughening CO2 emission standards for cars and vans'**

1.6 The adoption of EVs and phasing out of Internal Combustion Engine (ICE) vehicles would support the delivery of the climate change objectives. According to European Automobile Manufacturers Association, battery electric vehicles accounted for 12.1% of passenger car sales in 2022 in the EU, up from 9.1% in 2021 and 1.9% in 2019. In June 2023, battery electric vehicle sales reached 15.1%, overtaking diesel share for the first time.[3] Despite this growth, there are several barriers to EV adoption such as range anxiety, high purchase costs, lack of equitable chargepoint provision and, importantly for this study, overall consumer knowledge on EVs.

1.7 It is vital that consumers receive the same level of convenience for EVs as they do with ICE vehicles, including the same level of information available. Berkeley et al., (2018) highlight the importance of reliable information as key to countering misinformed perception around new technologies such as EVs.[4] The European Environment Agency report on EVs in Europe similarly notes that many potential EV users do not understand the capabilities of EV technology, particularly charging infrastructure, and often criticise the quality of information available such as limited information on driving range, chargepoints, access and payment methods.[5]

Study Objectives

1.8 Understanding the availability, quality and consistency of consumer information on EVs is central to this study. Prime objectives of this study are to:

- Identify whether the level of information provided to consumers regarding EV is adequate; and
- Provide recommendations to ensure that consumers can make informed decisions when purchasing an EV.

Study Methodology

1.9 A multi-faceted approach has been undertaken for the delivery of this study including the following tasks:

- **Literature review:** a desktop review of relevant literature and industry reports to help understand the barriers to EV adoption and the role of information provision in addressing those.

- **European Union regulatory review:** a desktop review of EU Directives and Frameworks that are relevant to EVs.

- **Vehicle manuals review:** a sample of six original equipment manufacturer (OEM) manuals (vehicle manuals) have been reviewed to help understand the current level of provision considering consistency, detail and quality of information.

- **Chargepoint operator review:** nine chargepoint operators' websites have been reviewed to help understand the current level of information provision around charging, including consideration of consistency, detail and quality of information.

[3] ACEA (2023) **'New car registrations: +17.8% in June, battery electric 15.1% market share'**
[4] Berkeley et al. (2018) '**Analysing the take up of Battery Electric Vehicles: An investigation of barriers amongst drivers in the UK'**
[5] European Environment Agency (2016) '**Electric vehicles in Europe'**

- **Stakeholder interviews:** to supplement the desktop research, 16 semi-structured interviews have been completed with a range of stakeholders. This includes FIA EB mobility clubs and various industry organisations. The interviews sought to understand views on barriers to EV adoption with a particular focus on information provision. A full list of interviewed stakeholders can be found in Appendix A.

- **Online survey:** to reach a wider FIA EB audience, an online survey was undertaken between June to July 2023. This sought to replicate topics covered in the interviews. A full list of survey respondents can be found in Appendix B.

1.10 Throughout the report, interview feedback and survey responses are used to support or counter a particular argument. It should be noted when referring to FIA members (i.e., "X% of FIA members noted") this is referencing FIA EB members who were surveyed.

Report Structure

1.11 This report is structured as follows:

- Chapter 2: 'Barriers to EV Adoption' provides an overview of barriers to EV adoption to help frame and contextualise the study.
- Chapter 3: 'EU Regulatory Summary' outlines relevant EU regulations with commentary on gaps and their importance for consumer information.
- Chapter 4: 'Vehicle Information Review' undertakes a review of vehicle manuals to help understand information provided to consumers on electric vehicles.
- Chapter 5: 'Chargepoint Information Review' provides a review of chargepoint operator websites to help understand information provided to consumers on public chargepoint usage.
- Chapter 6: 'Recommendations' outlines a series of recommendations to improve information provided to consumers.

2 Barriers to EV Adoption

Introduction

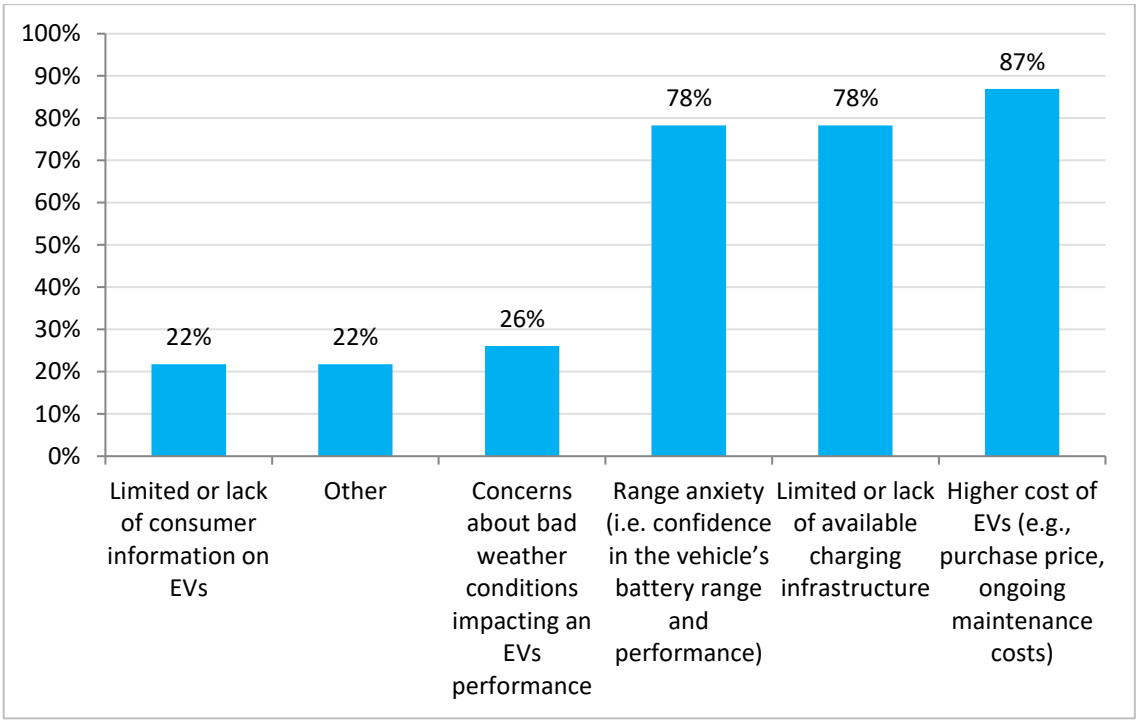
2.1 Understanding the barriers to EV adoption is important to help frame, analyse and understand the current situation with regards to the information provided to consumers on EVs. In turn, this can help contribute towards recommendations and inform how EU regulatory frameworks need to change.

2.2 Consumer confidence in EVs is growing. A survey by EY in 2022 (featuring 13,000 respondents from 18 countries including France, Germany, UK, Sweden, Spain, Norway, Netherlands, and Italy) reported that 52% of respondents intended to buy an EV in the next two years.[6] However, mass adoption of EVs still faces several challenges.[7] There are several barriers hindering EV adoption including affordability, range anxiety, chargepoint provision and usability, vehicle availability and lack of overall information provision. Whilst some of these barriers are real, it is important to note that in certain geographies these barriers have diminished over time and are often perceived or over-indexed from reality. For example, range anxiety is more of a perceived barrier when many EV models on the market have more than sufficient range to meet a typical consumers' needs.

2.3 Figure 2.1 highlights the main factors that surveyed FIA members consider as barriers discouraging consumers from purchasing an EV. High vehicle costs (87%), limited or lack of available charging infrastructure (78%) and range anxiety (78%) were identified as the three most significant factors discouraging EV adoption. Of the factors discouraging EV adoption, FIA members identified higher cost of EVs as the most important factor (Figure 2.2).

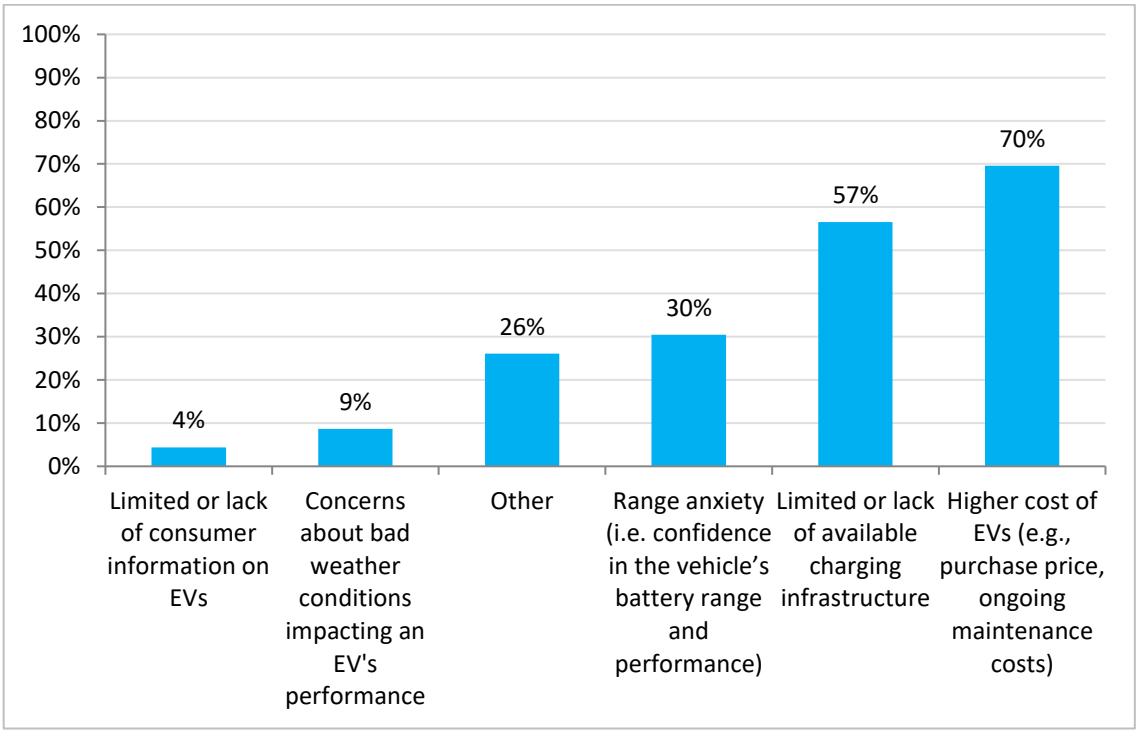
[6] EY (2022) '**EY Mobility Consumer Index 2022 study**'
[7] Chakraborty et al. (2022) '**Addressing the range anxiety of battery electric vehicles with charging en route**'

Figure 2.1: FIA Member Survey – factors discouraging consumers from purchasing an EV



Source: Based on survey responses of 23 FIA EB members

Figure 2.2: FIA Member Survey – most important factor discouraging consumers from purchasing an EV



Source: Based on survey responses of 23 FIA EB members

Barriers to EV Adoption

2.4 This section explores barriers to EV adoption around affordability, range anxiety, vehicle performance, chargepoint provision and usability, EV availability and information provision.

Affordability

2.5 Financial factors have a substantial impact on EV adoption; these include purchase price, running costs, the availability of financial incentives and vehicle depreciation.[8] 87% of FIA members[9] agreed that price is a key factor discouraging consumers from purchasing an EV (Figure 2.1) with 70% of members noting it as their top factor inhibiting EV adoption (Figure 2.2).

2.6 The high purchase price of an EV is one of the most commonly cited barriers to adoption. A survey by CTEK of 15,000 consumers across five European countries (Germany, Netherlands, Norway, Sweden and the UK) found that 37% of respondents had not bought an EV due to high purchase costs.[10] Additionally, a survey by Jardine Motors Group, featuring 2,000 consumers based in the UK, reported that 75% of respondents would consider switching to an EV if the price of EVs is reduced.[11] 'In part, purchase costs are high because many EVs currently available on the market are medium to high end models. Furthermore, as EVs are an emerging technology, the supply of second-hand vehicles has been low until recently, limiting the cheaper options for consumers.

2.7 There is also a tendency for consumers to focus on high upfront costs of EVs and to discount the benefits of lower running costs.[12] The evidence from the Transport Research Laboratory states that EVs can offer reduced running costs compared to Internal Combustion Engine (ICE) vehicles.[13] This sentiment was shared by European Association for Electromobility (AVERE), noting how Total Cost of Ownership (TCO) awareness is lacking and is hindering EV uptake as a result. Similarly, 74% of FIA members[14] identified information on total cost of ownership as important for consumers to receive when purchasing an EV.

2.8 Provision of information on lower running costs and highlighting the affordability benefits of an EV could reduce perceived concerns of consumers. Indeed, TCS (Switzerland) argued that EV cost is more of a perceived barrier with many EV models on the market similar in price to equivalent ICE vehicles. Further, an FIA EB commissioned study[15] demonstrated that EVs can provide a better TCO than ICE vehicles and therefore should be considered a viable option. Notably, TCO is more favourable the higher the annual mileage but in some geographies average annual milage has reduced in recent years. For example, from 2000 to 2019, there has been a decline of 1,700 km/per year at the EU level. Countries such as Finland, Greece, Italy and Portugal have seen some of the highest reductions of around 20%.[16] Consumers therefore need to be aware of their likely annual mileage to understand if TCO with EVs is favourable.

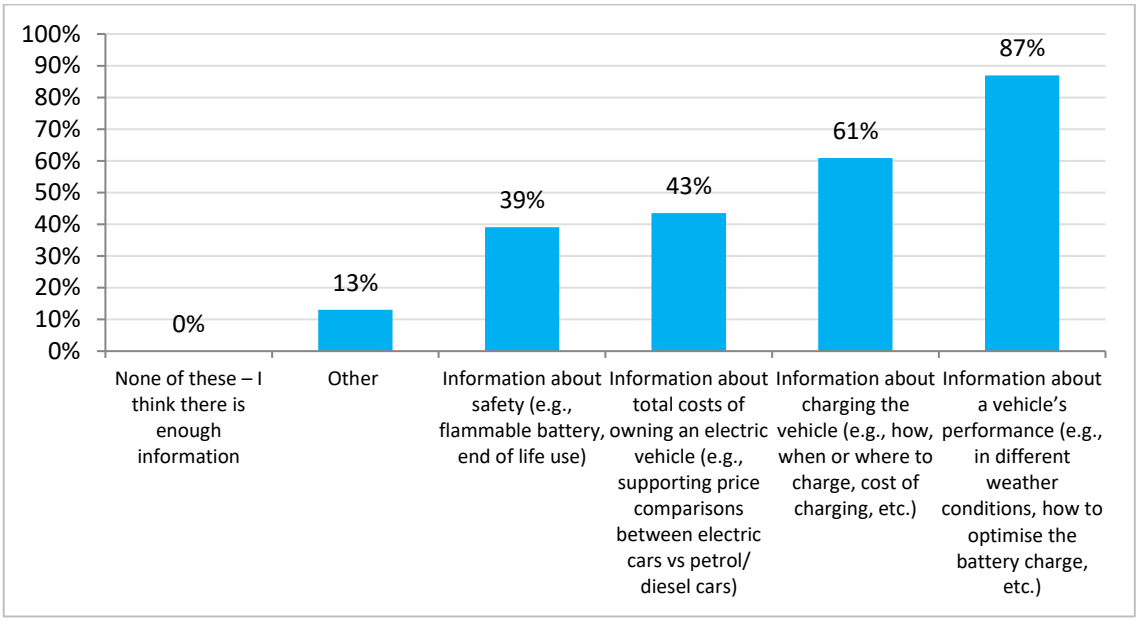
[8] TRL (2020) '**Driving and accelerating the adoption of electric vehicles in the UK'**
[9] Based on survey responses of 23 FIA EB members
[10] CTEK (2021) '**Electrical Vehicle Ownership and Take Up In Europe'**
[11] Ibid.
[12] TRL (2020) '**Driving and accelerating the adoption of electric vehicles in the UK'**
[13] Ibid.
[14] Based on survey responses of 23 FIA EB members
[15] Transport & Mobility Leuven (2022) '**Study on the implications of EU policies for the affordability of car use in the future**'
[16] ODYSSEE-MURE (2023) '**Sectoral Profile – Transport: Change in Distance Travelled by Car'**

2.9 Concerns around higher depreciation rates are cited as a barrier to uptake by the Transport Research Group.[17] Insurance can also be higher for EVs because they tend to require higher premiums due to EVs costing more to repair and replace if badly damaged.[18] Despite this, research by McKinsey found that 41% of EV buyers in Norway stated the primary reason to buy an EV was to save money.[19] In Norway, supply side policies including the exemption of zero-emission vehicles (ZEVs) from the registration tax, VAT and motor fuel taxes has helped reduce the financial barrier to consumers.[20] Whereas, Bosnia and Herzegovina Automobile Club (BIHAMK) suggested the reason for poor uptake of EVs in Bosnia & Herzegovina (1.3 million register cars of which 0.13% are EVs) was that there were no benefits or incentives in place until the end of 2022.[21] Therefore, financial incentives to reduce upfront costs and information provided on these incentives is clearly important for increasing EV adoption.

Range Anxiety & Vehicle Performance

2.10 Many consumers consider EV technology to be relatively novel and therefore perceive certain vehicle performance indicators, including vehicle range and battery life expectancy insufficient. Notably, 74% of FIA members[22] acknowledge that information on a vehicle's performance (i.e., information on battery optimisation, impact of weather conditions on performance) is important for consumers to receive when purchasing an EV. 87% of FIA members[23] suggested this information is currently lacking (Figure 2.3).

Figure 2.3: FIA Member Survey – Information lacking when purchasing an EV



Source: Based on survey responses of 23 FIA EB members

[17] TRL (2020) '**Driving and accelerating the adoption of electric vehicles in the UK'**
[18] European Environment Agency (2016) **'**Electric vehicles in Europe'
[19] McKinsey & Company (2014) '**Electric vehicles in Europe: gearing up for a new phase**'
[20] OECD (2023) '**Norway's evolving incentives for zero-emission vehicles'**
[21] BIHAMK Interview
[22] Based on survey responses of 23 FIA EB members
[23] Ibid.

2.11 Battery optimisation (i.e., maximising a battery's health and longevity) is a barrier for many consumers because potential users are concerned the battery will not last as long, and then either the owner will need to purchase a new battery, or the resale value will fall.[24]

2.12 Range anxiety is also a vehicle performance concern. 78% of FIA members[25] (Figure 2.1) reiterated this sentiment, identifying range anxiety as a factor discouraging consumers from purchasing an EV. Similarly, a survey by Jardine Motors Group found that 80% of people considering switching to an EV are apprehensive around charging mid-journey, emphasising range anxiety is a significant barrier to EV adoption.[26]

2.13 Many EVs are suitable for the vast majority of journeys. For example, the Office for Zero Emission Vehicles notes that 99% of car journeys in England are under 100 miles.[27] Despite this, potential users state that their minimum required EV range is higher than they need.[28] A survey by Deloitte cited that U.S. consumers expect fully charged EVs to have a driving range greater than 500 miles whilst German consumers expect a range of 383 miles.[29] Chakraborty et al., (2022) cited that for many consumers the requirement for long distance driving coupled with limited battery range can be a barrier to uptake.[30] Whilst respondents to the interviews by Capgemini Invent ranked 'charging anxiety' as the fourth most important barrier to EV uptake.[31]

2.14 However, in certain geographies, range anxiety is diminishing as a barrier. Forenede Danske Motorejere (FDM) in Denmark highlight how range anxiety was more of an issue a few years ago. TCS in Switzerland argue that whilst range was a genuine concern five years ago, there are now many models on the market with a range between 300-600kms that should suffice for most user requirements. This emphasises the need for reliable information around battery range and how to optimise range for everyday and long-distance trips for consumers.

Chargepoint Provision

2.15 The research from Chakraborty et al., (2022) highlighted that limited access to reliable public or private chargepoints is a significant barrier to EV adoption. Despite many major cities progressing their EV chargepoint rollout with several chargepoint options available, in rural areas charging infrastructure is relatively insufficient.[32] Indeed, 78% of FIA members[33] (Figure 2.1) identified a lack of/limited charging infrastructure as a barrier to EV adoption with 57% of members ranking it as their top barrier to EV adoption (Figure 2.2). Österreichischer Automobil-, Motorrad- und Touring Club (ÖAMTC) for example noted there are too few charging points in Austria.[34] This sentiment was shared by AVERE who noted how EV infrastructure varies by geography with dense provision in countries such as Netherlands, Denmark, and Norway but poor provision in locations such as Romania and Eastern Europe.

[24] European Environment Agency (2016) '**Electric vehicles in Europe'**
[25] Based on survey responses of 23 FIA EB members
[26] Jardine Motors Group (2019) '**What would make you go electric'**

[27] Office for Zero Emission Vehicles (2022) **'Common misconceptions about electric vehicles'**
[28] European Environment Agency (2016) '**Electric vehicles in Europe'**
[29] Deloitte (2022) '**2022 Global Automotive Consumer Study'**
[30] Chakraborty et al. (2022) '**Addressing the range anxiety of battery electric vehicles with charging en route'**
[31] Capgemini (2018) '**Key Factors Defining The E-Mobility of Tomorrow'**
[32] Chakraborty et al. (2022) '**Addressing the range anxiety of battery electric vehicles with charging en route'**
[33] Based on survey responses of 23 FIA EB members
[34] According to the European Alternative Fuels Observatory, Austria has 0.17 chargepoints per battery electric vehicle (BEV). This ranks 15th amongst EU member states (117,919 BEVs and 20,092 chargepoints).

2.16 A report by Element Energy concluded that if there were reliable public chargepoints available, consumers would willingly purchase an EV. Moreover, a survey by CTEK highlighted that 70% of respondents agreed that there was not enough EV charging infrastructure to meet demand, 17% cited having better access to EV chargepoints would encourage them to buy an EV and 66% would not buy an EV due to lack of chargepoint infrastructure at home or in their local area.[35] However, caution should be noted on the perceived view of charging infrastructure availability vs actual utilisation rates. In the UK, for example, a report by the Green Finance Institute noted how public chargepoint utilisation is around 15% (time based) and 10% (energy based) suggesting the barrier around chargepoint provision is more perceived than actual and better information needs to be provided to consumers.[36] Indeed, AVERE noted how there is more charging infrastructure than consumers realise.

2.17 Lack of charging capability at or near to an individual's home is a concern for potential EV users. Research by Berkeley et al., (2018) cited that for consumers in multi-unit dwellings or without access to off-street parking, where home charging may not be feasible, anxieties around public charging infrastructure are significant.[37] The European Automobile Manufacturers Association (ACEA) and TCS reiterated this concern, citing the lack of home charging capability for those without access to off-street parking. A report by the European Environment Agency highlighted that for consumers it is most important to have access to charging at or extremely near to home, followed by access to charging at work and lastly the availability of nationwide public charging to facilitate longer journeys.[38]

2.18 Both actual and perceived chargepoint availability are critical to EV adoption. Despite the number of chargepoints rapidly expanding across Europe with varying speeds (e.g., ultra-rapid, rapid and fast chargers), for many consumers the chargepoint provision is still insufficient to meet their needs and remains a barrier to EV adoption.[39]

Chargepoint Usability

2.19 A significant barrier to EV adoption is chargepoint usage including long charging times, usability and etiquette. For example, research by Krishna (2021) found that charging time was a significant barrier to EV uptake.[40] According to Chakraborty et al., (2022) the requirement to detour to a charging station and the limited availability of chargepoints and charging time has been cited as frustrating amongst consumers.[41] For many potential users the ideal charging time would be under five minutes similar to what consumers are used to when refuelling ICE vehicles on-demand.[42] 77% of FIA members[43] agreed that it was important for consumers to understand how long it will take to charge an EV.

2.20 The Jardine Motors Group survey (in the UK) found that two-thirds of respondents highlighted charging time as a deterrent to EV adoption, whilst 9% of German respondents stated charging time was a barrier to EV uptake in a survey by Deloitte.[44][45] Consumers currently prioritise the

[35] CTEK (2021) '**Electrical Vehicle Ownership and Take Up In Europe'**
[36] Green Finance Institute (2023) '**Demystifying Utilisation'**
[37] Berkeley et al. (2018) '**Analysing the take up of Battery Electric Vehicles: An investigation of barriers amongst drivers in the UK'**
[38] European Environment Agency (2016) '**Electric vehicles in Europe'**
[39] Ibid.
[40] Krishna (2021) '**Understanding and identifying barriers to electric vehicle adoption through thematic analysis'**
[41] Chakraborty et al. (2022) '**Addressing the range anxiety of battery electric vehicles with charging en route'**
[42] Krishna (2021) '**Understanding and identifying barriers to electric vehicle adoption through thematic analysis'**
[43] Based on survey responses of 23 FIA EB members
[44] Jardine Motors Group (2019) '**What would make you go electric'**
[45] Deloitte (2022) '**2022 Global Automotive Consumer Study'**

importance of on-the-go charging (as they are accustomed to refuelling in this way), despite being likely to complete the majority of charging at home.[46] In addition, a report by Capgemini Invent highlighted that the current charging experience/usability lacks standardisation with unclear pricing schemes and insufficient interoperability between different chargepoint operators which further complicates consumer journeys.[47] Universal charge cards are increasingly being used such as Radio Frequency Identity Cards (RFID) which allow users to initiate a charge by tapping the card against the contactless payment option on the chargepoint.[48] Octopus Energy are also working on a universal charging card and app service called Electric Juice which would provide consumers with access to chargepoints in one place.[49]

2.21 Chargepoint usability and information provision is covered in further detail in the report in Chapter 5 in the review of chargepoint operator websites.

EV Availability (supply chain)

2.22 It is common in the car industry for car manufacturers to provide consumers with the product after a "waiting period" due to the manufacturing and supply chain lead times.[50] The waiting period can vary significantly and in times of high demand and low supply, many consumers can face an extended waiting period. More recently, the EY Consumer Index suggests that external factors around geopolitics such as the war in Ukraine and the consequences of ongoing supply chain disruptions have had a substantial impact on meeting EV demand.[51]

2.23 Allgemeiner Deutscher Automobil-Club (ADAC), for example, note how waiting times can be in excess of one year for an EV. This is the same in Sweden with 12 month waiting lists. [52] According to the website Electrifying, in April 2023, waiting times for a new EV was on average 21 weeks. For some models, availability is immediate whilst others have a lead time over a year.[53] Many consumers find this waiting period particularly long compared to ICE vehicles which can be a further barrier to EV adoption.

2.24 The European Environment Agency Report on EVs in Europe cited that although there are over 30 models of EVs available in Europe, this is significantly less compared to ICE models available to consumers.[54] Therefore, the overall market is still relatively small and manufacturers do not always offer alternative vehicle configurations. At the same time Volkswagen is introducing over ten new EV models by 2026 as a contribution to meet the changing mobility needs and will only be offering EVs in Europe from 2033.[55] Similarly, Jaguar Land Rover aim to have all EVs by 2025 for Jaguar and six EV models for Land Rover by 2025.[56]

2.25 Alongside EV supply chain issues Berkeley et al., (2018) cited consumer concerns over the availability of EV maintenance services and repair infrastructure as a barrier to uptake. This concern was shared by various FIA members such as the Caravan and Motorhome Club (CAMC) and Koninklijke Nederlandse Toeristenbond (ANWB), suggesting confidence in

[46] TRL (2020) '**Driving and accelerating the adoption of electric vehicles in the UK'**
[47] Capgemini (2018) '**Key Factors Defining The E-Mobility of Tomorrow'**
[48] LeaseFetcher (2022) '**What is an RFID Electric Car Charging Card and How Do You Use One?'**
[49] Ibid.
[50] European Environment Agency (2016) '**Electric vehicles in Europe'**
[51] EY (2022) '**EY Mobility Consumer Index 2022 study'**
[52] CleanTechnica (2022) '**Sweden's BEVs Take Over Third of Market'**
[53] Electrifying (2023) '**Waiting times for new electric car deliveries down by 39% since October peak'**
[54] European Environment Agency (2016) **'**Electric vehicles in Europe'
[55] Volkswagen (2023) '**Representative survey: Next car - majority of Europeans want to buy an electric car'**
[56] Forbes (2021) '**Jaguar To Turn All Electric By 2025, Land Rover EVs Start In 2024'**

mainstream recovery networks (i.e., roadside assistance) is lacking. Information which provides consumers with the relevant details of where they can get their EV repaired/maintained and the associated costs could help overcome this barrier.

Information Provision

2.26 An important part of increasing uptake for EVs is ensuring consumers have adequate knowledge of EVs. Without appropriate information on EVs many consumers may be less likely to adopt an EV due to limited knowledge.[57] As Eurelectric noted, unless consumers feel comfortable with a switch to EVs, they will not do it. Eurelectric argue that the whole EV ecosystem (including adequate information) needs to be easy to understand.[58] Berkeley et al., (2018) highlight the importance of reliable information as key to countering misinformed perception around new technologies such as EV.[59] This ranges from how the technology works, functionality, how and where to charge, the types of models available, where to find EVs, what the costs are and where to find information.

2.27 22% of FIA members[60] identified limited/lack of consumer information on EVs as a barrier to purchase (Figure 2.1). However, 70% of FIA members[61] believe consumers receive about the same level of information when purchasing an EV or an ICE vehicle. This would suggest the information is available but that it needs to be promoted and communicated more clearly for EVs.

2.28 There is also a degree of mistrust around whether EVs are more environmentally friendly than ICE vehicles based on previous government information provided around diesel vs petrol vehicles (diesel vehicles were promoted as being better for the environment but research ultimately demonstrated this is not the case with petrol vehicles more optimal). 64% of FIA members[62] agreed that the information on environmental considerations such as an EVs' emissions impact and battery production and recycling impact should be provided to consumers. There is also a wider concern about the energy used to charge EVs (i.e., is it generated from renewable or non-renewable energy sources).

2.29 The European Environment Agency (EEA) report on EVs in Europe cited that many potential users do not understand the capabilities of EV technology and often criticise the quality of information such as limited information on driving range, chargepoints, access and payment methods.[63] In the UK, for example, the Advertising Standards Authority (ASA) recently found adverts from Toyota and Hyundai stating EV charging times to be misleading.[64]

2.30 The EEA report highlighted that car labelling for ICE vehicles typically provides information on fuel consumption and CO_2 emissions so that consumers can make informed decisions. However, EU Member States do not provide tailored information for EVs, and this lack of information provision can be a barrier to uptake.[65] Despite this, only 4% of respondents from a

[57] TRL (2020) '**Driving and accelerating the adoption of electric vehicles in the UK'**

[58] Eurelectric Interview

[59] Berkeley et al. (2018) '**Analysing the take up of Battery Electric Vehicles: An investigation of barriers amongst drivers in the UK'**

[60] Based on survey responses of 23 FIA EB members

[61] Ibid.

[62] Ibid.

[63] European Environment Agency (2016) '**Electric vehicles in Europe'**

[64] Fleet News (2023) '**Electric vehicle charging times quoted in adverts 'misleading''**

[65] TRL (2020) '**Driving and accelerating the adoption of electric vehicles in the UK'**

CTEK survey of 15,000 consumers across five European countries (Germany, the Netherlands, Norway, Sweden and the UK) cited familiarity with EV technology as a factor for buying an EV.

2.31 The development of positive attitudes towards EVs is an important component which can drive purchasing behaviour. However, many consumers have become accustomed to how ICE vehicles work, for example, how they can cope with distance, handling of performance and on-demand refuelling. Results from a survey of European consumers conducted by CTEK cited the main barrier to EV adoption was that respondents (52%) did not want to change their existing vehicle.[66] Whilst Krishna (2021) highlighted that many consumers believe the EV technology is still in its infancy and as such consumers are reluctant to adopt the technology.[67] Similarly, Berkeley et al., (2018) highlighted that charging technology may not be clearly understood by consumers.[68]

2.32 Another barrier for many consumers is concerns around the longevity of incentives encouraging EV ownership and information provision in this regard. Many consumers expect that practical incentives such as free city parking and charging could be removed in the future which could affect purchasing decisions: for example, in the UK, EV owners will have to pay road tax from 2025.[69]

Summary

2.33 A summary of key points explored in this section is presented below:

- **Affordability**: high vehicle purchase costs is one of the most commonly cited barriers. However, when factoring in TCO and cheaper EV models coming to market, in certain geographies, this could be seen as a perceived barrier. Consumer information highlighting the lower running costs, availability of financial incentives and energy costs of an EV compared to an ICE vehicle could help to address this barrier.
- **Range Anxiety & Vehicle Performance:** the relatively novel nature of EVs means that many consumers consider vehicle range and battery life expectancy as insufficient. However, many EVs are suitable for the vast majority of journeys and recent EV models offered on the market have vehicle ranges in excess of 300km. This reinforces the need for reliable information around battery range and how to optimise it for everyday and long-distance trips for consumers.
- **Chargepoint Provision:** limited access to reliable public or private chargepoints is a significant barrier to EV adoption. If there were more reliable public chargepoints, consumers would likely be more willingly to purchase an EV. A combination of reliable chargepoint infrastructure and providing consumers with more robust and accurate information on chargepoint provision can help mitigate this barrier.
- **Chargepoint Usability:** A significant barrier to EV adoption is chargepoint usability including long charging times, functionality (i.e., ease of use), and etiquette. For many potential users the ideal charging time would be under five minutes as consumers are used to refuelling conventional ICE vehicles on-demand. The current charging experience/usability lacks standardisation with unclear pricing schemes and insufficient interoperability between different chargepoint operators. Provision of consistent

[66] CTEK (2021) '**Electrical Vehicle Ownership and Take Up In Europe'**
[67] Krishna (2021) '**Understanding and identifying barriers to electric vehicle adoption through thematic analysis'**
[68] Berkeley et al. (2018) '**Analysing the take up of Battery Electric Vehicles: An investigation of barriers amongst drivers in the UK'**
[69] European Environment Agency (2016) '**Electric vehicles in Europe'**

consumer information at chargepoints and when consumers purchase a vehicle can reduce the impact of this barrier.

- **EV Availability:** current waiting times for purchasing an EV can be in excess of 12 months. Many consumers find this waiting period particularly long compared to ICE vehicles which can be a further barrier to EV adoption. Better information provision and management of expectations could help alleviate this concern.
- **Information Provision:** without appropriate information on EVs many consumers may be less likely to purchase an EV due to limited knowledge. Many potential users do not understand the capabilities of EV technology and often criticise limited information on driving range, chargepoint availability, access and payment methods.

3 EU Regulatory Summary

Introduction

3.1 This chapter presents a summary of the EU regulations relevant to the uptake of EVs and the provision of information to consumers to make informed choices on the purchase of EVs. Relevant EU-UNECE regulations are also considered where appropriate.

3.2 The regulations are split into two categories:

- Directly relevant: regulations which explicitly mention EVs, include policy measures directly intended to increase the uptake of EVs, and/or include policy measures directly intended to provide consumers with information on EVs to make informed choices; and
- Indirectly relevant: regulations which may impact the uptake of EVs and/or the provision of information on vehicles for consumers but are not explicitly targeted to either of these issues.

Relevant EV Regulations

3.3 Table 3.1 provides an overview of relevant EU regulations, highlighting their remit and relevance to consumer information and EVs. More detailed commentary is provided in Appendix C.

Table 3.1: Summary of relevant EU-UNECE regulations on EV uptake and provision of information to consumers

Regulation	Summary	Relevance
Directive 1999/94/EC on car CO_2 labelling[70]	The Car Labelling Directive sets out requirements for **consumer information on a car's fuel efficiency and CO_2 emissions**. Car sales must contain a label showing fuel economy and CO_2 emissions, a poster showing all new car models' fuel economy and CO_2 emissions, an annual guide on fuel economy and CO_2 emissions available freely to consumers, and all promotional material must contain this information. It does not, however, contain guidance on **how to include alternatively fuelled vehicles such as EVs** in a comparable manner (i.e., to ICE vehicles). As a result, the following shortcomings are identified: • **Consumers are not guaranteed to be provided with information on the energy efficiency and battery range of EVs.** Whilst some Member States have unilaterally introduced additional regulations to address this shortcoming, and some manufacturers may voluntarily provide this information to consumers, the lack of a harmonised approach across the EU may impact the ability of all consumers to make informed purchase decisions. • **Consumers may lack the ability to compare between EVs to make informed choices.** The absence of a guide comparing new passenger cars that is specific to EVs may limit consumers' ability to comprehensively compare all vehicles available on energy efficiency and battery range, and thus lack the ability to make fully informed choices. • **Consumers may not have standardised information to compare between ICE vehicles and EVs.** The nature of labelling ICE cars based on fuel economy and tailpipe CO_2 emissions is not conducive to a like-for-like comparison with EVs. This may limit the ability of consumers to make meaningful comparisons, such as lifecycle CO_2 emissions and average running costs, which may be useful to make informed choices. The Commission is already aware of the need to review the Directive, stating in Regulation 2019/631 (EU) its intention to review the Directive before the end of 2020 and propose new legislation where relevant, with a particular focus on "better designed and further harmonised Union requirements on labelling that could provide consumers with comparable, reliable and user friendly information about the benefits of zero- and low-emission vehicles, including information concerning air pollutants".[71]. The newly adopted 2023/851 regulation (amending 2019/631) includes the amendment that the Car Labelling Directive will be revied by 31st December 2024 recognising the need to provide consumers with accurate, robust and comparable information on the fuel and energy consumption, CO_2 emissions and air pollutant emissions of new passenger cars placed on the marked.	Directly relevant

[70] EUR-Lex (2008) '**Directive 1999/94/Ec Of The European Parliament And Of The Council**'
[71] Regulation (EU) 2019/631. OJEU 25.4.2019, L 111/15.

Regulation	Summary	Relevance
Communication COM (2013) 17 on a European alternative fuels strategy[72]	Sets out the requirements to develop an alternative fuels strategy. Covering all modes of transport and numerous fuel types, its relevance to EVs focuses on the needs to **improve battery technology** to make recharging faster and easier, **develop a common plug** to be used across the EU, and **address consumer acceptance** through privileged access to urban restricted zones, **harmonising consumer information (e.g., availability of chargepoints)**, and providing guidelines on financial incentives for EVs. The Proposal was subsequently adopted into Directive 2014/94/EU described in more detail below.	Directly relevant
Directive 2014/94/EU on EU Alternative Fuels Infrastructure[73]	Introduces new EU rules to support the **development of alternative refuelling points**. Includes a standardised approach for the design and usage of refuelling points, notably **establishing a common plug** for recharging EVs (as set out in COM (2013) 17 above). Vehicles and charging points must be labelled according to the type of configuration (e.g., voltage). Each Member State must make **national plans** for installing EV charging points consistent with the expected growth in EVs by the end of 2020. The following key points are included in the Directive: • **Ensuring interoperability across the Union:** the Directive notes a need for future policy action to develop a non-proprietary charging connector which can be used across the EU; • **Provision of information:** information concerning the availability of charging points should be included in traffic and travel information services where applicable. Prices on charging points should be reasonable, easily comparable, transparent, and non-discriminatory. Information on which fuels or charging points cars can use should be available in manuals, at recharging points, and in car dealerships. The Commission intends to use a common fuel unit price comparator, though this is not developed within this Directive. In 2021, as the European Commission launched its 'Fit for 55' package of proposals, a proposal to revise the Directive was published. The Commission proposed to repeal the Directive and to replace it with a new Regulation, with the suggestion that a Regulation is needed to encourage more timely action (a Directive which enters into force must then be transposed into national law of each Member State before it becomes directly applicable; a Regulation applies to all Member States after its entry into force). The new proposal is discussed below.	Directly relevant

[72] EUR-Lex (2013) **'Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions'**

[73] EUR-Lex (2014) '**DIRECTIVE 2014/94/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 October 2014 on the deployment of alternative fuels infrastructure**'

Regulation	Summary	Relevance
Alternative Fuels Infrastructure Regulation[74]	Regulation to **replace the Alternative Fuels Infrastructure Directive** - a part of the Fit for 55 policy package. It establishes more ambitious targets for Member States, such as **minimum power for recharging** based on the national fleet, **60km maximum distance between charging points**, and **better provision of information** on locations and pricing of recharging points. Notably, the Regulation establishes the following key points: • **Reasonable, comparable, transparent, and non-discriminatory prices** available to users, including price information per recharging session, per minute, and per kWh; • **Appropriate signposting** of recharging infrastructure along the TEN-T network; • **Comparable pricing** must be displayed between fuels, electricity, and hydrogen where applicable using price per 100km (defined under Regulation 2018/732). Under the Regulation, only fast charging points are allowed payment by credit card, debit card, or proprietary systems such as QR codes, as well as displaying charging prices per kWh. Slower chargers under 50kW are not allowed credit/debit card payments and would not have to display prices per kWh. Given that slower chargers outnumber fast charges by a significant proportion, the value of this Regulation is limited and at present would not make a sufficient difference in harmonising information provision on charging point pricing across the Union. Related to charging infrastructure, it is also worth noting COM (2021) proposal to upgrade the Energy Performance of Buildings Directive which seeks to complement AFIR. The proposal includes the need for modernising buildings including the provision of EV charging.[75]	Directly relevant
Directive 2018/2001 on renewable energy[76]	The Renewable Energy Directive is the legal framework to support the development of renewable energy across the EU. The 2018 amendment sets a binding target of 32% of energy produced by renewable sources. It includes specific targets for renewable energy usage in transport, such as a 14% target for renewable fuels in transport by 2030. The amendment states that consumers should be provided with **information on the lower running costs of EVs** to make informed choices and avoid technological lock-in.	Directly relevant

[74] EUR-Lex (2021) '**Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council'**
[75] EUR-Lex (2021) **'Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings'**
[76] EUR-Lex (2022) '**DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources'**

Regulation	Summary	Relevance
	The latest agreement reached in March 2023 between the European Parliament and the Council of the European Union establishes a revised 42.5% target of energy consumption deriving from renewable sources. Key points from the amendments proposed include: • The provision of consumer information on how such bidirectional charging agreements would affect their battery health and usage of their car, including terms for remuneration; and • Information on battery health, charge, power, capacity, and the location of vehicles should be made available to owners and third parties such as electromobility service providers at no cost. The proposed amendment to Regulation 2019/631 for all new vehicles sold in the EU from 2035 to be zero-emission offers a better vision of the trajectory of the uptake of EVs than what is presented in the proposed amendments to the Renewable Energy Directive. Nonetheless, it remains unspecified what measures will be taken for vehicles entering the EU fleet prior to 2035 and how renewable fuel and energy targets will reduce emissions from these vehicles in the longer term (i.e., post-2030).	
Regulation (EU) 2023/851 amending Regulation (EU) 2019/631 as regards strengthening the CO_2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition	The previous Regulation 2019/631 established **performance standards for CO_2 emissions** for passenger cars and light commercial vehicles. The new Regulation (EU) 2023/851 **strengthens the CO_2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition** to achieve a reduction in net greenhouse gas emissions by at least 55% compared to 1990 levels by 2030.[77] The Regulation recognises that a clear pathway also needs to be set for further reductions beyond 2030 to contribute to achieving the climate-neutrality objective by 2050. The Regulation notes that CO_2 emissions reduction standards are technology neutral, including battery electric vehicles. Regulation (EU) 2019/631 is amended with the following notable changes: • Average emissions of new passenger car fleet have a revised target equal to a reduction of 55% of the target in 2021 (changed from 37.5%); • For light commercial vehicles this changes from a 31% reduction to 50%; • From 2035, an EU wide target equal to a 100% reduction of the target in 2021 is established for both new passenger cars and light commercial vehicles;	Directly relevant

[77] European Sources Online (2023) **'Regulation (EU) 2023/851 amending Regulation (EU) 2019/631 as regards strengthening the CO2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition'**

Regulation	Summary	Relevance
	• From 1 January 2025 to 31 December 2029, a zero- and low-emission vehicles' benchmark equal to a 25% share of the fleet of new passenger cars and equal to a 17% share of the fleet of new light commercial vehicles shall apply; • From 31st December 2025, the Commission will publish a report setting out a methodology for the assessment and the consistent data reporting of the full life cycle CO_2 emissions of passenger cars and light commercial vehicles that are placed on the Union market; and • The Commission will review the effectiveness and impact of the Regulation in 2026.	
Regulation 2017/1151 on type-approval of motor vehicles with respect to emissions[78] from light passenger and commercial vehicles (Euro 5 & 6)[79]	Introduces the Worldwide harmonised Light-duty vehicles Test Procedures (WLTP) into EU legislation to **more accurately measure fuel consumption and CO_2 emissions**. It also sets out a defined methodology for the calculation of **electric energy consumption** for EVs and **range of EVs**. Manufacturers must also use **on-board monitoring devices** to detect deterioration and malfunctions and install devices to constantly monitor fuel/energy consumption of vehicles. Importantly, the Regulation sets out that: • Vehicles must be installed with on-board diagnostics systems to detect deterioration and/or malfunctions over the vehicle's lifetime; • Vehicles must be installed with on-board monitoring devices to measure the fuel/energy consumption of vehicles on an ongoing basis; Despite these improvements, feedback from ADAC in a stakeholder interview indicated that the WLTP does not sufficiently reflect real-world EV ranges. This is due to factors such as the weather (particularly in winter) and driving styles impacting the actual achieved range. ADAC suggested that achieved ranges for EVs typically fell 20% below WLTP stated ranges. This may reduce consumer confidence in the official stated range.	Directly relevant

[78] EUR-Lex (2023) 'Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008'

[79] EUR-Lex (2017) 'Commission Regulation (EU) 2017/ of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008'

Regulation	Summary	Relevance
Communication COM (2022) 586 on type-approval of motor vehicles and engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7) and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009[80]	Establishes a **new standard** for vehicle emissions (Euro 7). Also includes measures aimed at **reducing non-CO_2 emissions** from brakes and tyres in order to reduce air pollution in urban areas. Introduces criteria for **testing battery durability** of EVs, as well as establishing **minimum durability criteria** in line with the UNECE regulations. The review below is focused on the regulation on the durability of electric vehicle batteries: • On-board monitors of battery health should be required on all new EVs, which can provide information to owners and potential buyers (e.g., second-hand purchases) on the battery health in the vehicle. This will help to improve consumer confidence when purchasing second-hand vehicles, as they will be able to determine the state of health of the battery when making a purchase decision; • The proposal includes a minimum performance requirement on battery durability, in line with the UN Global Technical Regulation 22 on EV battery durability. EVs will be certified as Euro 7 compliant if the battery retains at least 80% of its original battery energy capacity after 5 years or 100,000km (whichever comes first), and at least 70% of its original battery energy capacity after 8 years or 160,000km (whichever comes first). For light commercial vehicles, the targets are 75% and 65% respectively. Vehicles exceeding these targets by at least 10 percentage points can be designated at Euro 7+, indicating their stronger battery durability performance; • The inclusion of minimum performance standards for battery durability, as well as on-board monitoring of battery health, closes an important gap in the existing Regulations which would otherwise lead to a lack of information for consumers looking to purchase second-hand electric vehicles. The proposed regulation does not establish a format for communicating this information, nor is there any specific obligation on second-hand EV sales to display this information to consumers. This may mean that whilst information is available for consumers on battery health and durability, consumers may not have the knowledge to interpret battery health data, and/or they may not be proactively provided with information on battery health; and • The proposal suggests the introduction of an environmental vehicle passport, which records information on the level of pollutant emissions, CO_2 emissions, fuel/energy consumption, electric range, engine power, battery durability and other related data at the time of the car's registration. This is made available to consumers in the vehicle's electronic systems and can be transmitted off-board. It is not clear in the proposed regulation whether a similar system could be used to transmit actual battery health status.	Directly relevant

[80] EUR-Lex (2022) '**Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on type-approval of motor vehicles and engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7) and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009**'

Regulation	Summary	Relevance
Regulation on batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC	Regulation focused on batteries and waste batteries, to replace the existing Batteries Directive. The relevance to EVs includes battery **recycling targets**, a mandatory declaration of the **carbon footprint of EV batteries** (with potential to expand to carbon performance classes and maximum carbon thresholds), **information requirements on performance and durability** of EV batteries (with potential to expand to minimum requirements), mandatory declaration of **recycled content** in batteries, mandatory provision of information on batteries through **labels and documentation**, and **due diligence on battery supply chains**. The Regulation sets out a range of requirements on information provision specific to EV batteries, most notably on battery performance and durability. Despite this, there is no guidance on how this information should be presented to consumers in an understandable format; it is unlikely that providing consumers with a battery health percentage would be sufficient for users to understand how that will affect performance, time to recharge, and actual range achieved. Particularly for second hand purchases of EVs, it will be important for consumers to understand the health of the battery in the car they are buying, the estimated remaining life of the battery, and the actual range taking into account the battery degradation. This does not appear to be sufficiently reflected within the proposed Regulation, though the proposed Euro 7 requirements would include information on battery durability as well as minimum standards to improve consumer confidence.	Directly relevant
UNECE Regulation 101[81]	Establishes a methodology for the **measurement of CO_2 emissions and fuel consumption** from passenger cars and the **electrical energy consumption and range** for EVs. New car models must attain **type approval** through testing that the manufacturer's declared figures do not exceed 4% of tested figures.	Directly relevant
UNECE Global Technical Regulation 22 on In-vehicle Battery Durability for Electrified Vehicles[82]	Establishes a methodology to **test battery durability** and sets **minimum performance standards** for battery durability. This Regulation has been adopted in the proposed Euro 7 standards. Key points of the Regulation include:	Directly relevant

[81] Publications Office of the European Union (2004) '**Regulation No 101 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of passenger cars equipped with an internal combustion engine with regard to the measurement of the emission of carbon dioxide and fuel consumption and of categories M1 and N1 vehicles equipped with an electric power train with regard to the measurement of electric energy consumption and range**'

[82] UNECE (2022) '**UN GTR No.22 (In-vehicle Battery Durability for Electrified Vehicles)**'

Regulation	Summary	Relevance
	• The information should be provided on a scale between 0 and 100; and • Manufacturers must make the information available to consumers via the dashboard indicator, infotainment system, or remotely (e.g., via a mobile phone).	
Directive 2000/53/EC on end-of-life vehicles[83]	The Directive on end-of-life vehicles sets out procedures for the dismantling, reusing, and recycling of cars at end of life. As well as prohibiting certain hazardous materials and setting targets for the proportion of cars recycled, it also requires manufacturers to make information available about the end-of-life process and progress made to reuse/recycle waste, including in the promotional material for the vehicle. A proposal to review the management of end-of-life vehicles was published in July 2023 with the aim to facilitate the transition of the automotive sector to the circular economy, at all stages of the vehicle - from design to final treatment at end-of-life.[84]	Directly relevant
Directive 2005/64/EC on re-use, recycling and recovery of vehicle parts[85]	Sets out regulations to ensure vehicles can be reused, recycled, and recovered as much as possible in a safe manner. Similarly, to Directive 2000/53/EC, this Directive mandates that new vehicles can only be sold if they can be **reused/recycled at 85% by mass or above**, or if they can be reused/recovered at 95% by mass or above.	Indirectly relevant

[83] EUR-Lex (2000) '**DIRECTIVE 2000/53/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 September2000 on end-of life vehicles'**
[84] European Commission (2023) '**REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL: on circularity requirements for vehicle design and on management of end-of-life vehicles, amending Regulations (EU) 2018/858 and 2019/1020 and repealing Directives 2000/53/EC and 2005/64/EC'**
[85] EUR-Lex (2005) '**DIRECTIVE 2005/64/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 October 2005 on the type-approval of motor vehicles with regard to their reusability, recyclability and recoverability and amending Council Directive 70/156/EEC'**

Regulation	Summary	Relevance
COM (2023) 127 - Proposal on driving licences, amending Directive (EU) 2022/2561; 2018/1724; repealing Directive 2006/126/EC and EU Regulation No 383/2012[86]	The proposal seeks to establish common legal measures for the recognition and issuance of driving licences in the European Union. The proposal aims to revise the existing framework (Directive 2006/126/EC, also known as the Driving Licence Directive) to improve road safety and facilitate the freedom of movement by: • introduction of an EU single driving licence model mandatory for all drivers; • categorisation of driving licences according to types of vehicle and minimum ages to drive them; • compulsory administrative renewal of all new driving licences every ten years; • simplification of the administrative burden on drivers changing their residence to another Member State; • application of common minimum standards on skills, knowledge, physical and mental fitness of drivers; • progressive access to powerful motorcycles; and • creation of network for information exchange related to driving licences between national authorities. The proposal also includes recommendations on the theory test for all vehicle categories, including asking questions to provisional drivers on charging of electric vehicles.	Indirectly Relevant

[86] European Commission (2023) 'DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL: on driving licences, amending Directive (EU) 2022/2561 of the European Parliament and of the Council, Regulation (EU) 2018/1724 of the European Parliament and of the Council and repealing Directive 2006/126/EC of the European Parliament and of the Council and Commission Regulation (EU) No 383/2012'

4 Vehicle Information Review

Introduction

4.1 This section provides a summary of the review of original equipment manufacturer (OEM) manuals, also known as vehicle manuals.

4.2 Vehicle manuals are a key source of information for vehicle owners, typically providing consumers with a comprehensive overview of their vehicles. As such, they are a useful reference to consider for understanding the current level of information available for electric vehicles. This review is supplemented with interviews and survey feedback.

4.3 Six operator manuals have been considered for this study as outlined in Table 4.1. The models have been selected from the top ten of the bestselling EVs in Europe in 2022 and cover a range of different OEMs.[87]

Table 4.1: Manufacturer/models for the vehicle manual review.

OEM Make & Model		Description[88]
	Renault Zoe	Type: Hatchback Battery: 52 kWh Cost: €36,840
	Volkswagen ID.4	Type: Crossover SUV Battery: 52 kWh Cost: €39,995
	Tesla Model Y	Type: Crossover SUV Battery: 57.5 kWh Cost: €47,567
	Fiat 500e	Type: Hatchback Battery: 37.3 kWh Cost: €34,990
	Peugeot e-208	Type: Hatchback Battery: 46.3 kWh Cost: €39,100
	Kia e-Niro	Type: Crossover SUV Battery: 64.8 kWh Cost: €45,690

4.4 The manual review is focused on EV specific information as opposed to general vehicle information (i.e., features unique to an EV compared to an ICE). To provide a framework for

[87] EVplug (2022) 'The 50 Best Selling EV in Europe'

[88] EV Database (information sourced 18th July 2023; prices based off the German price as per this database; battery refers to useable battery)

the review, five broad themes have been used to help interrogate what level of information has been provided. This review does not provide a comprehensive analysis of all the EV related content in the manuals but rather provides a flavour of what type of information is included in the manuals.

Table 4.2: OEM Manual Review Themes

Theme	Description
General EV related information	Within the first few pages, does the manual provide a general overview of the vehicle noting its fundamental EV functions and how it operates?
Charging	Does the manual provide information on how to charge the vehicle, covering charging cables, types of charges and overall optimal charging conditions?
Vehicle range & performance	Does the manual cover information on the vehicle's range (distance), how the range can be optimised or impacted and how the overall vehicle performance and other factors which may impede its performance?
Safety	Does the manual cover information around battery safety and EV specific risks to be aware of (e.g., high voltage risks)?
Environmental impact & battery disposal	Does the manual cover information on emissions and environmental impact of an EV? Does the manual cover information on how the EV specific components (i.e., the battery) are recycled or repurposed at the end of the vehicle's life?

4.5 For each of these themes, a summary table has been developed comparing each of the six manuals and the level of information provided. The summary tables include relevant sub-categories to help provide an indicative comparison per manual.

Table 4.3: Manual review - information comparison scoring

Key	Description
	Clear information provided / category criteria is clearly provided
	Basic information provided / category criteria is addressed but with limited detail
	Limited to no information provided / category criteria is not addressed or provided with very limited detail

General EV Information

General EV Information	Within the first few pages, does the manual provide a general overview of the vehicle noting its fundamental EV functions and how it operates?

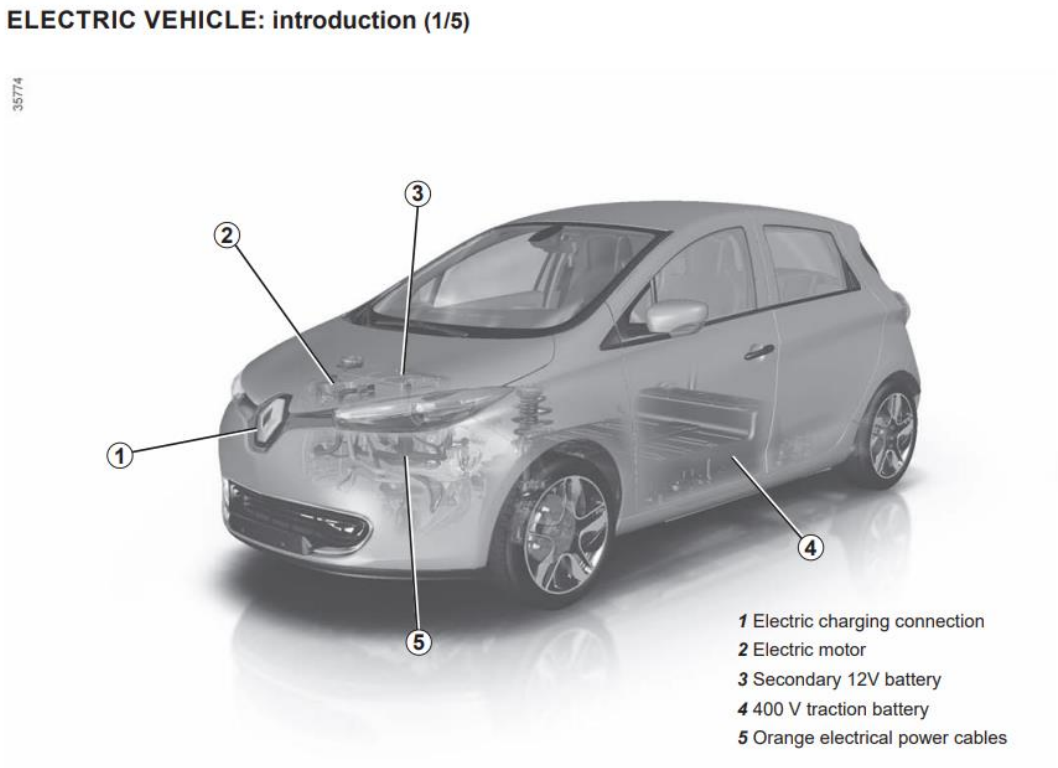
4.8 Table 4.4 demonstrates the variation across vehicle manuals in terms of introductory information. Renault Zoe, Fiat 500e and the Kia e-Niro all have introductory sections outlining the fundamentals of an EV and how it is powered along with an accompanying visual with the key EV components.

Table 4.4: General EV Information

Category	Definition	Zoe	Model Y	ID.4	500e	e-208	e-Niro
EV Introductory/ Summary Information	*Introductory and/or summary section on EVs*						
Visual/ schematics	*Summary visual on the vehicle schematic with fundamental EV components*						

4.9 Renault Zoe includes an introductory section with a visual highlighting fundamental electric elements of the vehicle (see Figure 4.1) followed by an overview of the batteries, charging requirements and fundamental safety concerns.

Figure 4.1: Renault Zoe Vehicle Manual Introductory Image



Source: Renault Zoe Vehicle Manual

4.10 Similarly, the Fiat 500 has an 'Operating Principle' summary page, noting how 'the propulsion system of the New 500 is completely powered by the energy contained in the high-voltage lithium-ion rechargeable battery of the car' and the need for the battery to be charged for the vehicle to operate. The Fiat manual also distinguishes between the conventional 12V battery (also used in ICE vehicles) and the main high voltage lithium rechargeable battery. The Kia e-Niro manual has an entire first chapter introducing the EV.

4.11 Although the Peugeot-e-208 does outline the key instruments and controls within the EV such as the steering manual and the key displays within the car including the remaining driving range, it is buried within a lengthy introductory section about the vehicle more generally and thus is not as clear. With the Volkswagen ID.4, whilst there is a vehicle schematic in the introduction (including outlining where the charging port is located), there is little detail outlining the fundamental EV components. This is similar to the Tesla Model Y, where there is no introductory section but there is a summary visual outlining the key EV components. Tesla's lack of an introductory EV section could be explained by the "EV only" nature of the company (i.e., there is no need to distinguish from conventional ICE models as they only manufacture EVs).

Charging

Charging	Does the manual provide information on how to charge the vehicle, covering charging cables, types of charges and overall optimal charging conditions?

Table 4.5: Manual review- charging

Category	Definition	Zoe	Model Y	ID.4	500e	e-208	e-Niro
How to charge your vehicle	*Guidance on how to charge your vehicle*						
Graphic(s) showing charging components	*Graphic(s) / visual(s) with key charging components (plug, cable etc)*						
Different chargepoint types (e.g. AC, DC)	*Information on the different chargepoint types and cables*						
Battery charging times	*Information on how long charging takes*						
Battery optimisation	*Information on optimising the battery with different charge thresholds*						

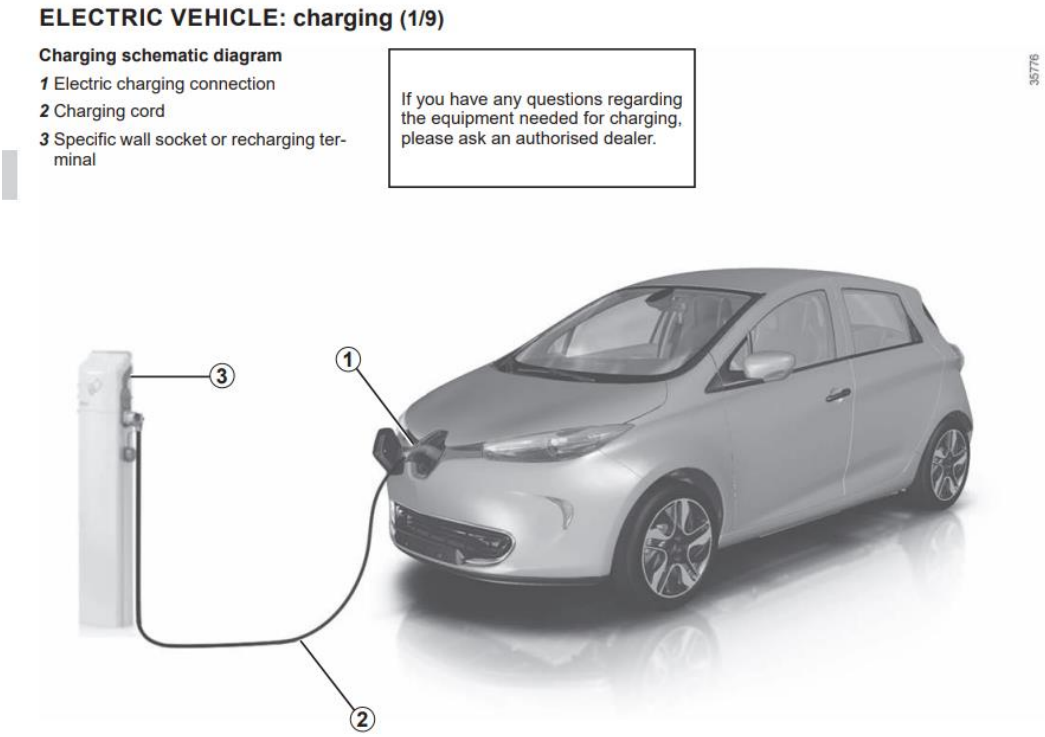
4.12 Table 4.5 above demonstrates that the information provided on charging is varied. Whilst all manuals provide some degree of information on charging, the consistency and detail vary by each OEM, with certain sub-categories of charging lacking in detail and consistency.

How to charge your vehicle: graphic(s) showing charging components & different chargepoint types (e.g., AC, DC)

4.13 91% of FIA[89] members agree that consumers should receive information on charging their vehicle when purchasing an EV.

4.14 All six manuals reviewed have information on how to charge your vehicle. All manuals have a section on charging and within this provide details on the practicalities of charging your vehicle such as notifying the owner where the chargeport is and how to charge the vehicle. All of the manuals have some visuals and graphics that accompany the charging sections. Renault Zoe, for example, provides a simple graphic showing the fundamental charging components (see Figure 4.2) followed by a summary section covering charging requirements and charging programming (i.e., the ability to schedule a charge instantly, daily or weekly).

Figure 4.2: Renault Zoe Charging Schematic



Source: Renault Zoe Operator Manual

4.15 Whilst Fiat 500 has various graphics and visuals throughout their charging section, there is not an overall schematic outlining the fundamental charging components and, therefore, it could be more challenging for a consumer to understand.

[89] Based on survey responses of 23 FIA EB members

4.16 All manuals had information on different chargepoint types (i.e., Alternative Current (AC) vs Direct Current (DC) chargepoints)[90] and their use (i.e., when, and where to use them) and impact on the vehicle. Tesla, for example, notes that DC Fast charging should only be used when necessary, such as during long road trips. Renault Zoe has a summary visual comparing different charging chords (i.e., ones you would use at a public or domestic chargepoint terminal). However, none of the manuals use taxonomy for public chargepoint plug types (e.g., Type 2, CHAdeMO, or CCS).

4.17 In essence, the manuals do not refer to plug types using the same language or categorisation as Chargepoint Operators (CPOs). This could be confusing for consumers when charging their vehicle at a CPO.

Battery charging times & Battery optimisation

4.18 73% of FIA members[91] agreed it is important for consumers to receive information on how long it will take to charge their vehicle. Only the Kia e-Niro manual has information on indicative battery charging times (Figure 4.3). Renault Zoe, Volkswagen ID.4, Tesla Model Y and Fiat 500 touch on charging times more generally (i.e., fast vs slow) but the level of detail is limited.

Figure 4.3: Kia e-Niro Charing Time Information

Charging time information

Charging Type		City-Type	Cruise-Type
AC Charge		Takes about 4 hours and 30 minutes at room temperature. (Can be charged to 100%)	Takes about 7 hours room temperature. (Can be charged to 100%)
DC Charge	100kW-level charger	Takes about 54 minutes at room temperature to 80% of SOC. (Can be charged to 100%)	Takes about 54 minutes at room temperature to 80% of SOC. (Can be charged to 100%)
	50kW-level charger	Takes about 57 minutes at room temperature to 80% of SOC. (Can be charged to 100%)	Takes about 75 minutes at room temperature to 80% of SOC. (Can be charged to 100%)
Trickle Charge (230V)		Takes about 18 hours at room temperature. (Can be charged to 100%)	Takes about 29 hours at room temperature. (Can be charged to 100%)

❇ Depending on the condition and durability of high voltage battery, charger specifications, and ambient temperature, the time required for charging the high voltage battery may vary.

Source: Kia

4.19 100% of FIA members[92] identified range optimisation as very or somewhat important as a piece of information that is key for consumers to understand. Only Volkswagen ID.4 and Tesla Model Y have information on optimising the battery health with different charge thresholds. For example, the Volkswagen ID.4 has a comprehensive section called 'High-voltage battery' covering the mechanics of charging a vehicle, including the charging settings in the infotainment system, setting battery charging limits (i.e., capping the charge to 80%) and the different types of charging modes (AC vs DC).

4.20 Tesla recommends not letting battery charge get to 0% due to the damage it can cause to other vehicle components and notes how there is natural discharge to power onboard electronics even when not being driven. It also suggests aligning the charge limit with the

[90] The power that comes from the grid is always AC and the energy stored in batteries is always DC. For EV charging, all domestic chargepoints and many public chargepoints are AC where the vehicle then converts the current to DC. DC is used for fast charging where the chargepoint itself does the conversion.

[91] Based on survey responses of 23 FIA EB members

[92] Ibid.

installed battery requirements. Natural discharge is an important area for consumers to be aware of as, even when parked, the battery is still powering a vehicle's electric system.[93]

4.21 Kia e-Niro has limited advice on charging at different thresholds on a regular basis. However, it does provide some basic guidance such as charging the vehicle to 100% at least once a month or more and to charge the battery at least once every three months to avoid discharging if the vehicle is not going to be in use. Peugeot e-208 states that to obtain optimum service life of the battery, it is important to maintain an adequate state of charge within the vehicle but nothing specific beyond this. Fiat 500, and Renault Zoe do not cover charging threshold detail.

4.22 The Kia e-Niro suggests users to use AC charge for everyday (i.e., slow to fast) charging of the EV and DC charge at high speeds in public charging stations. The manual also highlights the use of 'trickle charging' and recommends when consumers might want to use trickle charging. For example, when there is no public chargepoint available, consumers can use portable charging cables to 'trickle' charge a low battery. Trickle charging is essentially a form of charging using a portable charging cable with a 3-pin plug, which Kia recommend using only 'when you cannot drive to a public charging station due to low battery'.

[93] **Pentagon Group (2022) '**Do electric cars lose charge when parked'

Vehicle Performance & Range

Vehicle range & performance	Does the manual cover information on the vehicle's range (distance), how the range can be optimised or impacted and how the overall vehicle performance and factors which may impede its performance?

Table 4.6: Manual Review - Vehicle Performance & Range

Category	Definition	Zoe	Model Y	ID.4	500e	e-208	e-Niro
Battery range	*Information on the battery range*						
Maximising driving range	*Information on optimising the vehicle range*						
Range warning and indicators	*Information on how battery range is highlighted to the driver*						
Weather considerations	*Impact of weather conditions on charging and battery performance*						

Battery Range

4.23 Battery range is clearly a crucial aspect for consumers to understand - 96% of FIA members[94] noted that information on marketed range vs adjusted range is important for consumers to know. However, none of the manuals reviewed contains headline information on the specific battery range. This is likely because manuals are designed to cover multiple models under the same vehicle type and, therefore, range can vary based on specific vehicle types. Some models also come with different sized batteries.

4.24 Range is, however, typically provided on OEM websites. For example, Renault note that the Zoe has a driving range of WLTP of 239 miles. However, when comparing two different Zoe models (Techno and Iconic), the range varied from 239 WLPT and 223 WLPT (in miles).[95]

4.25 There are elements of the vehicle's range buried within the manuals themselves. For example, the Kia e-Niro manual notes the approximate range and how this varies in different driving modes: 'On average, a vehicle can drive approximately 385 km (Cruisetype)/246 km (City-type) or 239 miles (Cruisetype)/153 miles (City-type)'.

Maximising driving range

4.26 Five out of six manuals contain information on maximising driving range. The Fiat 500 has a section in the manual covering the different driving modes (Normal, Range, Sherpa) and notes how the car is equipped with a battery management system that is designed to optimise driving range. All three modes have slightly different functionalities that impact the vehicle range. There is also a 'Turtle' mode which kicks in when the remaining range is less than 24km.

4.27 The Kia e-Niro manual has a section titled 'tips for improving distance to empty' containing some recommendations on how to improve the range such as use of the air conditioner, heater and excessive use of electrical components while driving.

4.28 The Tesla manual has a section titled 'Getting Maximum Range' which contains various information on how to optimise the range. Tesla's manual provides a section which outlines behaviours users can establish to maximise their driving range to conserve power. This includes advice to drive at reduced speeds and avoid rapid acceleration. Tesla also has information on how users can implement 'chill mode' and 'speed assist' which can help control speed and acceleration. Tesla's manual also recommends reducing excessive energy consumption while the vehicle is in idle by keeping the vehicle plugged in when not in use. The manual states that to maintain range it is important not to supercharge regularly or the mileage and age of the battery will diminish.

4.29 Volkswagen ID.4 manual has a section titled 'Driving Economically' which provides recommendations on how to optimise range such as adopting a steady driving style, avoiding full throttle and having a vehicle serviced on a regular basis.

4.30 Renault Zoe manual has a section called 'Driving Advice' which contains information on how to maximise range such as the use of their ECO mode and highlighting how factors such as speed and driving style, type of road, heating level, tyres, use of electrical accessories and vehicle load (weight) can impact range.

[94] Based on survey responses of 23 FIA EB members
[95] Renault (2023) 'Compare version ZOE E-Tech 100% electric'

Range warning and indicators

4.31 All of the manuals contain information on range warning and how this is shown to the driver. The Fiat 500 manual contains information on the visuals displayed in the vehicle which show the battery charge threshold and subsequent range.

4.32 The Tesla Energy App provides a visual representation of the vehicle's real-time and project energy usage which helps inform the driver of range optimisation features.

4.33 The Volkswagen ID.4 manual contains information on the vehicle dashboard which includes visual indicators on the charger level and the vehicle range.

4.34 Renault Zoe manual highlight their display dashboard which has information on the vehicle's estimated range and battery threshold.

4.35 The Kia e-Niro manual highlight its 'EV menu' which is a multimedia screen with a total of five menus including: available range, energy information, charge management, ECO driving and EV settings. Within this interface users can check the reachable range, battery power remaining, and expected charging time for each charger type (Figure 4.4).

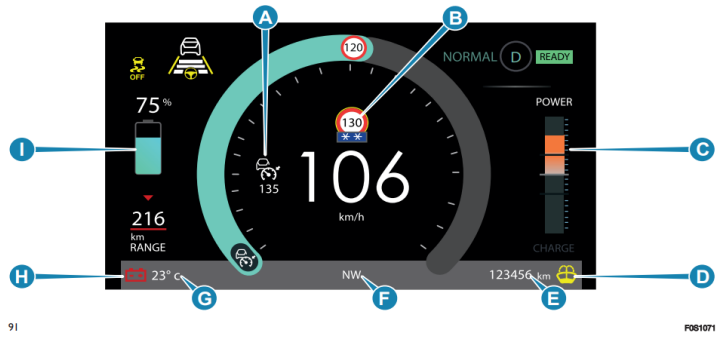
Figure 4.4: Kia e-Niro EV Menu

Source: Kia

4.36 The Peugeot e-208 manual highlight the computer functionality within the vehicle that displays the remaining vehicle driving range. In addition, the manual summarises the different warning / indicator lamps designed to flash when the ignition is switched on to indicate the remaining driving range and highlighting the "state", "cause" and "action/observation".

4.37 The Fiat-500 manual describes the dashboard feature which displays the high-voltage battery state of charge and range through the main screen dashboard (see Figure 4.5). There are also different colour notifications based on the state of charge: for example, range lower than 16km is marked red with the power socket highlighted in green whereas range greater than 24km is marked blue.

Figure 4.5: Fiat 500 Main Screen Dashboard



The main screen fig. 91 shows the following information:
A. Driving assistance system in operation indicator B. Traffic sign and speed limit indicator C. Driving style indicator D. Signalling symbols E. Distance travelled indicator F. Compass G. Temperature indicator H. Warning symbols I. High-voltage battery state of charge and range

Source: Fiat

4.38 The Tesla manual summarises its model Y system which will display a message with a list of charging stations nearby when the vehicle is at risk of driving beyond the range of known charging locations.

Weather considerations

4.39 100% of FIA members[96] identified the importance of providing information to consumers on how vehicles perform in different weather conditions. Norges Automobil Fordbund (NAF) highlighted the need for dealerships to be aware of battery performance in extreme weather conditions and ensuring consumers are provided with accurate information in this regard. Four out of six manuals provide clear information on weather considerations in terms of vehicle performance. In extreme weather conditions, there is a general consensus from the manuals reviewed on what conditions should be avoided, for example:

- Volkswagen ID.4 and Tesla Model Y manuals note to avoid temperatures above 60 degrees and below -30 degrees for more than 24 hours at a time;
- Fiat-500 manual advises users to not charge in adverse weather conditions such as during thunderstorms and to not charge when the connector and charging plug are wet;
- Renault Zoe manual recommends avoiding parking the vehicle for more than one month with high charge, especially when the weather is hot and more generally to park in shaded locations when recharging. The manual also touches on dealing with snow and how to handle the charging socket in this scenario;
- Volkswagen ID.4 manual notes how “the range for electric driving may be reduced at very low outside temperatures when the high-voltage battery is consequently very cold.”; and
- The Kia e-Niro manual has minimal information on weather and its impact on charging/vehicle performance but does state what to do in the event that the chargeport cannot be opened due to freezing temperatures.

[96] Based on survey responses of 23 FIA EB members

Safety

Safety	Does the manual cover information around battery safety and EV specific risks to be aware of (e.g., high voltage risks)?

Table 4.7: Vehicle Manual Review - safety

Category	Definition	Zoe	Model Y	ID.4	500e	e-208	e-Niro
Battery/charging heat warnings	*Information on battery/charging warnings with over heating*						
Electric shock warnings	*Information on electric shock risks arising from the high voltage battery and charging*						
Battery modification settings	*Information cautioning any battery modification*						

Battery Heat Warnings

4.40 All manuals provide information regarding battery heat warnings.

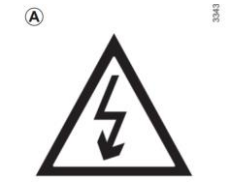
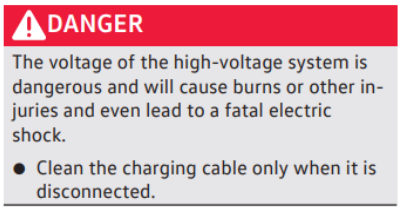
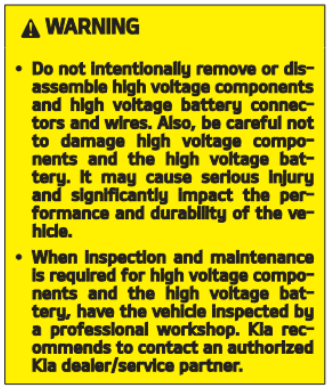
4.41 For example, Fiat 500 manual notes how 'During normal operation, the domestic power socket can overheat. In the case of extreme overheating, the charge is interrupted and the warning LED on the front of the cable control unit will turn on'. The Tesla manual notes various trouble shooting warnings when the wall connector is too hot for charging such as 'Wall Connector too hot Let Wall Connector cool and try again'. Similarly, Peugeot 208 manual highlight 'An electric vehicle's power train can become hot during use and after switching on the ignition. Observe the warning messages shown on labels'.

Electric Shock Warnings

4.42 All manuals provide information regarding electric shock warnings associated with the high voltage battery.

4.43 Renault Zoe manual notes 'the use of a charging cord not recommended by the manufacturer is strictly forbidden. Failure to follow this Instruction can lead to risks of fire or electric shock that can prove fatal'. The Volkswagen ID.4 manual similarly highlight 'High voltages can cause serious injuries or death. Never touch the battery terminals with your fingers, tools, jewellery or any metal objects'. Kia e-Niro manual precautions the presence of water when using the charging cable connector: 'Connecting while there is water or dust on the charging cable connector and plug may cause a fire or electric shock'. Some examples of safety warnings are shown in Table 4.8.

Table 4.8: Safety warnings in vehicle manuals

Renault Zoe	Volkswagen ID.4	Kia E-Niro
 The **A** symbol denotes the electrical elements of your vehicle which may present health risks.		
Source: Renault	Source: Volkswagen	Source: Kia

Battery Modification Warnings

4.44 All operator manuals provide safety warnings on the high-voltage lithium battery included in EVs. In particular, warnings focus on charging and any modifications associated with the high-voltage battery.

Environmental Impact & Battery Disposal

Environmental impact & battery disposal	Does the manual cover information on emissions and environmental impact of an EV? Does the manual cover information on how the EV specific components (i.e., the battery) are recycled or repurposed at the end of the vehicle's life?

Table 4.9: Vehicle manual review - Environmental Impact & Battery Disposal

Category	Definition	Zoe	Model Y	ID.4	500e	e-208	e-Niro
Vehicle production and environmental impact	*Information on the vehicle's environmental production impact*						
Environmental user guidance	*Information for the user on how to minimise environmental impacts (driving style)*						
Battery disposing practicalities	*Information on how to dispose of the high voltage battery and the associated safety concerns*						

Vehicle production and environmental impact

4.45 Only the Renault Zoe manual provides information on the vehicle's environmental production impact. It notes under its 'Environment' section that the vehicle has been designed to respect the environment for the entire service life: during production, during use and at the end of service life. The manual details that the vehicle has been manufactured using a 'progress policy' which aims to reduce environmental impacts on rivers and natural areas such as emissions and wastewater.

Environmental user guidance

4.46 The Volkswagen ID.4 manual has added 'tips' for users to inform themselves on how to protect the environment through the use of the vehicle.

4.47 Table 4.10 outlines environmental symbols that are highlighted to users of vehicles in the Fiat 500 and Peugeot e-208. The Fiat-500 manual outlines an 'environmental protection' symbol which aims to highlight environmental principals throughout the manual.

4.48 The Peugeot-e-208 manual has environmental indicators throughout the manual showing certain elements of driving or vehicle features which 'contributes to the protection of the environment'. The manual also encourages users to not throw away batteries as they contain metals which can be harmful to the environment.

Table 4.10: Environmental user guidance symbols

Peugeot-e-208	Fiat-500
 Contributes to the protection of the environment	 environmental protection.
Source: Peugeot	Source: Fiat

Battery disposing practicalities

4.49 Four out of six manuals provide information on battery disposal. Fiat 500 manual has a section titled 'High-voltage battery disposal' and notes that in the event of disposing it is best to contact a Fiat Dealership. The manual also states that 'if the car is scrapped, it must be taken to a Fiat Dealership to have the high-voltage battery removed and disposed properly by the Fiat Dealership personnel who have the technical skills to operate in complete safety'.

4.50 The Renault Zoe manual provides guidance on disposal considerations: 'please make your own contribution towards protecting the environment too: worn parts replaced in the course of routine vehicle maintenance (secondary 12 V battery, batteries, etc.) must be disposed of through specialist organisations. – At the end of the vehicle's service life, it should be sent to approved centres to ensure that it is recycled. – In all cases, comply with local legislation'.

4.51 The Telsa manual regularly mentions warnings about not replacing or removing the battery but does not explicitly state how to dispose of the high voltage battery.

Summary

4.52 The key takeaways from the OEM manuals review are presented below:

- The fundamentals of an EV (range, charging, battery safety etc) is suitably covered across all manuals. However, there is **inconsistent information in terms of both quality and**

quantity regarding EV specific points such as battery charging thresholds or charging time estimates.

- Whilst all manuals have information on different chargepoint types (i.e., AC vs DC chargepoints) and their use (i.e., when and where to use them), their language does not align with plug type descriptions used by CPOs (e.g. CHAdeMO, or CCS). This could cause confusion for consumers when using public chargepoints.
- Most of the manuals (five out of six) reviewed provide information on maximising driving range (e.g., eco driving, minimising use of vehicle features such as heating and media systems). However, only the Tesla Model Y and Volkswagen ID.4 manuals provide information on optimising a battery's health (e.g., prolonging its health through optimal charging thresholds). Given the consumer concern on range optimisation (and that is arguably a perceived barrier), the lack of information on battery optimisation is notable.
- All manuals contain information on safety concerns regarding the high voltage battery.
- There is a lack of information on environmental impact both in terms of vehicle production (e.g., how sustainable) and other emission impacts (e.g., particulate matter) with only the Renault Zoe manual providing information on the vehicle's environmental production impact.
- Some of the manuals are clearly designed for new adopters (e.g., Renault Zoe) with introductory sections whilst others (e.g. Tesla) do not provide as much information. Legacy ICE manufacturers (i.e. Renault) perhaps feel the need to provide more reassurance on EV elements to distinguish from previous models. However, this inconsistency of information does not provide a like for like experience for consumers.
- This review raises a wider point about what information should be included in manuals and what alternative sources of information consumers should use for anything the manual does not address. For example, a vehicle's range is not included in manuals given they typically cover multiple model iterations (i.e. the exact range will differ depending on the vehicle's modifications). It is important for consumers to be aware of all suitable sources of information to understand any concerns or specific queries they have with their EV.

5 Chargepoint Information Review

Introduction

5.1 A fundamental aspect of using an EV is the charging requirement, including public charging usage. For example, it is estimated that 24% of households do not have access to off-street parking in the UK and, therefore, cannot take advantage of home charging.[97]

5.2 This study has reviewed a sample of chargepoint operator (CPO) websites to understand the level of information provided to consumers around EV usage. This review has considered nine CPOs (see Table 5.1) including a mixture of leading CPOs in terms of market size across Europe (number of chargepoints) and those serving a specific geography (i.e., a specific country or group of countries).

Table 5.1: Chargepoint providers reviewed

Chargepoint Provider	Description	Locations
Elli	A provider of energy and charging solutions with over 400,000 chargepoints across Europe.	Austria, Czech Republic, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland Republic, Romania, Slovakia, Spain, Sweden, Switzerland, UK
IONITY	Ionity provides chargepoint solutions across Europe with over 2,300 high power chargers in 481 locations and with 85 locations currently building chargepoints.	Austria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Norway, Poland, Republic, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK
TotalEnergies	Total Energies is building a network of high-powered charging services across 300 stations in Western Europe.	Belgium, France, Germany, the Netherlands, Spain
FASTNED	Fastned has expanded its network to over 250 charging stations across Europe, with the aim of installing 1,000 fast charging stations by 2030	Belgium, France, Germany, the Netherlands, Switzerland, UK
chargepoint	Chargepoint has a strong presence in Europe with over 163,000 charging points in operation worldwide and over 45,000 of which are in Europe.	Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Kosovo, Latvia, Lithuania, Macedonia, Montenegro, the Netherlands, Norway, Poland, Romania, Serbia, Slovakia, Spain, Sweden, UK

[97] Britain thinks (2022) **'Public Electric Vehicle Charging Infrastructure'**

Chargepoint Provider	Description	Locations
bp pulse	BP Pulse have more than 8,750 charging points across the network including 3,200 rapid and ultra-fast BP pulse points..	UK
	Tesla operates more than 45,000 superchargers with more 5,000 stations worldwide with over 985 stations in Europe.	Belgium, Bulgaria, Croatia, Croatia, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, Norway, Poland, Republic, Romania, Serbia, Slovakia, Spain, Sweden, UK
Shell Recharge	Shell Recharge operates as one of the largest global EV charging networks with more than 300,000 public charging stations which can be found through a dedicated mobile app.	Austria, Belgium, Bulgaria, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Kosovo, Latvia, Lithuania, North Macedonia, the Netherlands, Poland, Romania, Serbia, Slovenia, Spain, Sweden, UK
Allego	Allego is based in Amsterdam and has installed over 31,000 chargepoints across Europe. Allego has a comprehensive product and service offering including AC and DC chargers, and fast and ultra-fast chargers.	Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, UK

Chargepoint Operator Review

5.3 The information provided by CPOs on charging is varied (see Table 5.2): there is no single CPO that consistently provides all information in the categories identified.

Table 5.2: Chargepoint Operator Review: Summary Table

Category	Definition	Elli	IONITY	TotalEnergies	FASTNED	chargepoint	bp pulse	Tesla	Shell Recharge	Allego
Chargepoint type	*Information on the plug type e.g. CCS, CHAdeMO*									
Chargepoint speed classification	*Information on the speed classification e.g. slow, rapids etc*									
Maximum power of chargepoint	*Information on how much power the chargepoint can deliver e.g. most can deliver from 11 to 22kW*									
Chargepoint Status	*Information on whether the chargepoint is available, in-use or out of service*									
Number of chargepoint heads	*Number of individual plugs per chargepoint (e.g. single vs twin/dual outlet).*									
Price: per kWh	*Information on how the chargepoint charges: per kWh*									
Price: per hour/minute based	*Information on how the chargepoint chargers: per hour/minute*									
Approximate costs of charging	*Information on the rough outline of charging for 1hr, 2hrs etc*									

Category	Definition	Elli	IONITY	TotalEnergies	FASTNED	chargepoint	bp pulse	Tesla	Shell Recharge	Allego
Route planning	*Information on directions to the chargepoint*									
Information on how to book chargepoint	*Step-by-step guide on booking & payment*									
Alternative CPOs	*Information on where other CPOs chargepoints are located*									
Payment	*Information on how to pay (payment types/method – incl. card, cash, contactless)*									
Opening Times	*Information on hours of use*									

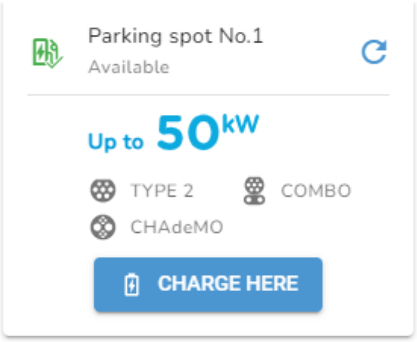
Chargepoint type

5.4 All CPOs provide information on chargepoint type.

5.5 Total Energies outline information regarding the chargepoint type using icons to explain clearly what plug type is available such as Type 2, Combo or CHAdeMO. BP Pulse outline information regarding the chargepoint type on their chargepoint map for each chargepoint profile (e.g., type 2 or CHAdeMO). Allego similarly highlight the information regarding the chargepoint plug type through symbols (see Figure 5.1 for these examples).

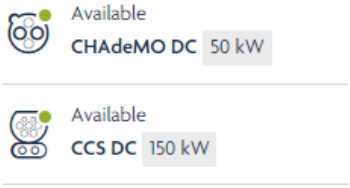
5.6 However, the variety of chargepoint plug types can be confusing for consumers trying to understand if their vehicle is compliant with the relevant chargepoint. 32% of FIA members[98] believe that it is difficult to understand different chargepoint types. Some CPO websites illustrate the chargepoint type through icons, however, often it is not clear what plug type the chargepoint is which could be challenging for consumers. This contrasts with ICE vehicles where refuelling is universal with fuel nozzles.

Figure 5.1: Example Chargepoint type information



Source: Total Energies

Source: BP Pulse



Source: Allego

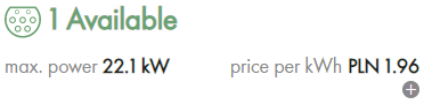
Maximum power of chargepoint

5.7 Eight out of nine CPOs provide information on the maximum power output of the chargepoint. For example, Shell Recharge provide information regarding the maximum power of the chargepoint, whilst Fastned similarly provide information on the chargepoint speed, such as 6 x 300kW (Figure 5.2).

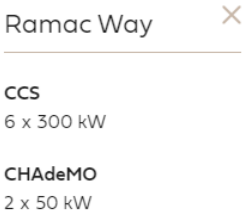
5.8 A wider point that is not covered on CPO websites is the limitation of charging speeds set by a vehicle's onboard chargers. For instance, with the Kia e-Niro the maximum speed it can charge at is 80kW.[99] This means that any charger above 80kW (e.g., an ultra-rapid 350kW) would have no additional benefit to the vehicle's chargepoint speed.

[98] Based on survey responses of 23 FIA EB members
[99] Electric Vehicle Database (2023) '**Kia Niro EV**'

Figure 5.2: Shell Recharge chargepoint speed information



Source: Shell Recharge



Source: Fastned

Chargepoint speed classification

5.9 Only one of the CPOs reviewed (Shell Recharge) had information on speed classifications (i.e., fast, rapid, ultra-rapid). Considering that speed in terms of kWh may not be well understood and that 'fast' or 'rapid' taxonomy is regularly used in public discourse from city authorities when describing public charging infrastructure, this omission is notable.

Chargepoint status & number of chargepoint heads

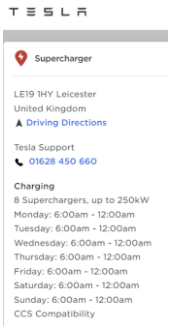
5.10 Six out of the nine CPOs provide clear information on the chargepoint status (i.e., occupied or available). For example, Total Energies display the chargepoint status across their chargepoint map including when chargepoints are out of service (Figure 5.3), and when chargepoints are in use or available. However, given not all CPOs adopt this approach, this could be frustrating for consumers looking to plan their journey or seeking a chargepoint in close proximity to their location.

5.11 The role of aggregated chargepoint maps from organisations such as Zap Map and PlugShare can help mitigate the inconsistent approach across CPOs in this regard. Therefore, aggregated maps can be a more useful resource for consumers planning their journey.

5.12 Information on the number of chargepoint heads is also inconsistent with only four CPOs clearly providing this information. There are inconsistencies with reporting how many chargepoints are available, for example, whether it is a single or twin socket. This could be frustrating for consumers looking to book or plan their journey. In a similar vein, it can be confusing for consumers when a charger has multiple connectors but in fact can only be used by one vehicle. For example, a charger with three different plug types (e.g., CCS, CHAdeMO, and Type 2) can often only support one vehicle.

Figure 5.3: Total Energies chargepoint status

Source: Total Energies

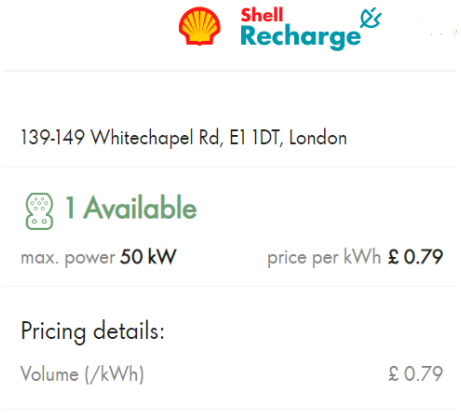


Source: Tesla

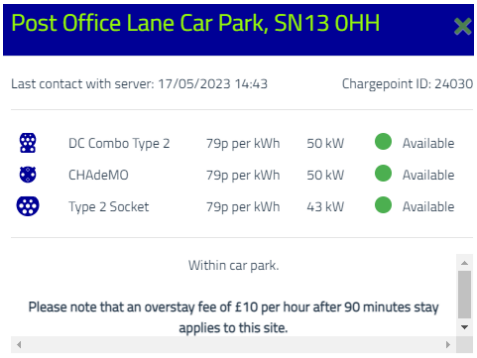
Pricing

5.13 Seven out of nine operators provide some degree of information on price (either as a per kWh or time-based metric). Six of the CPOs use kWh only as their metric, whilst Total Energies and ChargePoint use a combination of the two metrics (although this can vary per chargepoint location). Total Energies provides a kWh charge up to a certain limit (i.e., 45 minutes) and thereafter adopts a time-based charge. Notably, two CPOs do not provide any information on price. Some examples of how price is displayed to customers are included below. This inconsistency can be confusing for consumers; 59% of FIA members[100] also believe that information on pricing is not easily understood.

Figure 5.4: CPO Price Information



Source: Shell Recharge



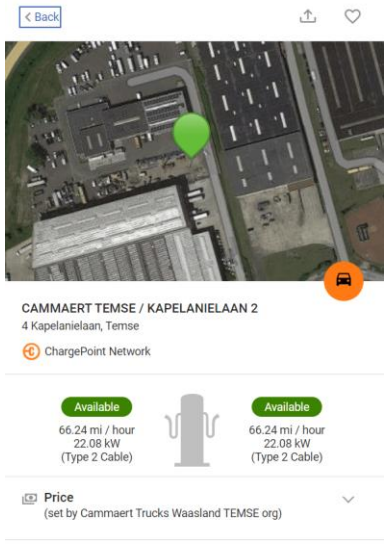
Source: BP Pulse

Approximate costs of charging

5.14 Only ChargePoint provides information regarding approximate costs of charging (see Figure 5.5). However, this is not always displayed on all their chargepoints. This information gap could be due to the vehicle's onboard charging capability. In essence, a CPO will struggle to provide indicative costs of charging because the actual charge rate, and hence kWhs, is dependent on a vehicle's onboard charging capability. Given this will vary per vehicle, it is likely futile for CPOs to provide a meaningful and accurate indication of charging cost for consumers.

[100] Based on survey responses of 23 FIA EB members

Figure 5.5: ChargePoint cost estimation



Source: Chargepoint (location: CAMMAERT TEMSE / KAPELANIELAAN 2, 4 Kapelanielaan, Temse, Antwerp)

Route planning & Opening Times & Other Local Information

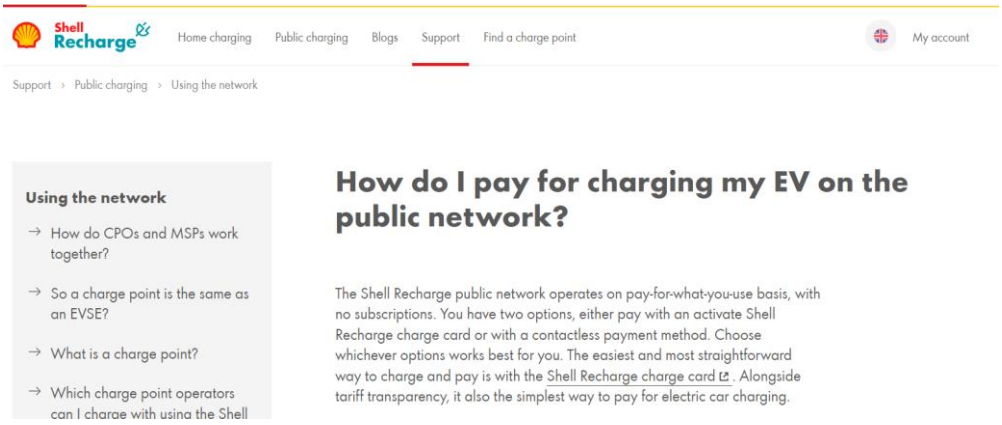
5.15 Eight of the nine CPOs provide information on route planning such as how to access the chargepoint. Only four CPOs provide opening time information which could suggest that chargepoints from other operators are open 24/7, or they simply do not provide this information which could cause confusion to customers.

Information on how to book chargepoint & payment options

5.16 There is limited information on how to book a chargepoint in advance, with only Shell Recharge providing clear instructions. CPOs are likely deterred from introducing this functionality at risk of causing confusion for consumers wanting to charge and finding out the CPO is booked (particularly at a motorway station). Further, there is a revenue risk if consumers do not turn up and another customer is prevented from charging.

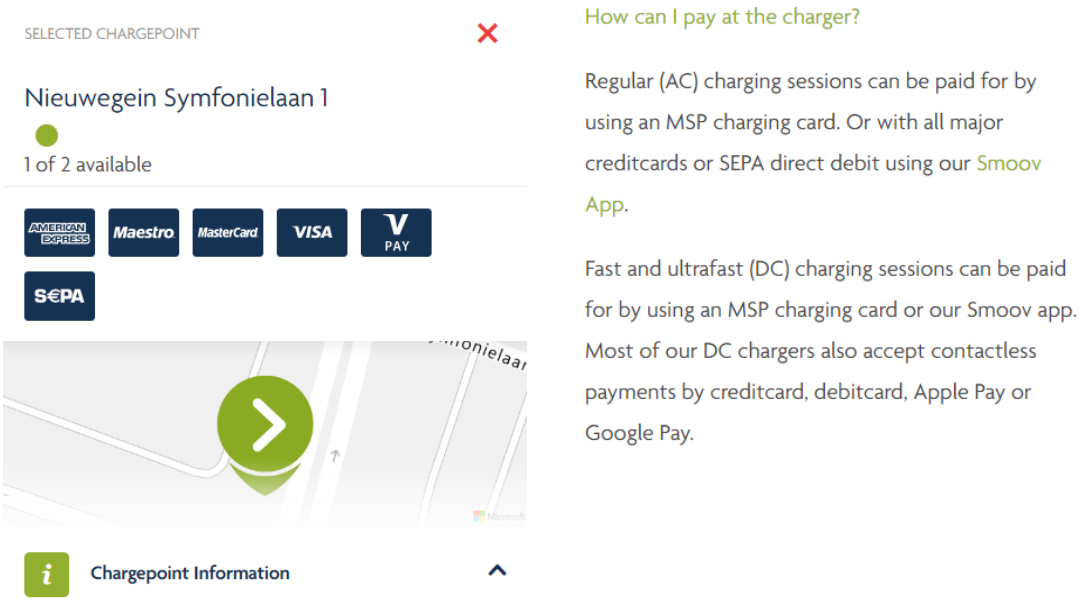
5.17 With payment options, only Shell Recharge and Allego provide clear information. Payment requirements can be difficult to find on websites and are often not overlayed onto CPO maps. In most cases payment is facilitated by a membership card or via contactless.

Figure 5.6: Shell Recharge Payment Information



Source: Shell Recharge

Figure 5.7: Allego Payment Information



Source: Allego

Summary

5.18 Based on the CPO review, it is evident that the **information provided to consumers is inconsistent**. The key takeaway points are described below.

- Chargepoints:
  - **Speed classifications are often not listed** on the chargepoint websites which could be confusing for consumers (slow, fast, rapid, ultra-rapid etc).
  - There are **several plug types that can be used** on EVs. CPO websites tend to clearly display the required plug type. However, there is disconnect with information provided in vehicle manuals where plug types are often described more generally (e.g., a CPO may use Type 2 or CHAdeMO taxonomy or an image/icon of a specific plug type whilst a vehicle manual describes plug types as AC or DC capable).
  - There are inconsistencies across chargepoint websites in terms of information on **how many chargepoints are available** at each location and it can be unclear whether the chargepoint is a single or twin socket which could cause confusion for consumers.
- Pricing:
  - There is a **mismatch of how price/cost of charging is presented to customers** (i.e. price per minute or kWh).
  - There is **minimal explanation of how kWh speeds** translate to actual time required to charge.
  - The **price of charging is not always readily available** or information on how much a 'full charge' could cost depending on battery size.
- General Consumer Experience:
  - There is very **little capability to book/reserve chargepoints**.
  - **Information regarding opening times is not always readily available** particularly regarding 24/7 use or weekend use.

5.19 In short, chargepoints across Europe are not interoperable or consistent for user experience and consumer information.

6 Recommendations

Introduction

6.1 To reduce barriers to EV adoption, better information and more consumer outreach programmes are required to provide users with confidence and knowledge on EV technology. The perceived value of an EV and the consumer trust in EVs are largely affected by the level of information provided.[101]

6.2 Based on the desktop research, review of the EU regulations, stakeholder interviews, FIA member survey, review of CPOs' websites and vehicle manuals, a range of gaps and inconsistencies with regards to information provision for consumers considering purchasing and using an EV have been identified.

6.3 This section outlines a set of proposed recommendations to address the gaps which are structured as follows:

- General Recommendations:
  - Charging Information;
  - Vehicle Information; and
  - Wider recommendations.
- EU Regulatory Recommendations.

6.4 In some instances, the recommendations extend beyond the scope of information provision and into the wider EV adoption debate.

General Recommendations

Vehicle Information

Recommendation 1: optimise vehicle manuals to provide consistent and clear information for consumers.

6.5 Based on the review of vehicle manuals, there are some gaps and inconsistencies in how information is presented. Whilst OEMs will need to tailor information to their specific vehicles and policies, a degree of uniformity in vehicle manuals could help provide reassurance to consumers.

6.6 A minimum requirement on EV specific information from OEMs could be of benefit to consumers: for example, greater clarity on EV components, charging times, charging cable types (aligned to CPO plug type descriptions) and battery optimisation. Greater transparency and prominence on a vehicle's maximum charging limit should be provided given its impact on charging speed, cost and overall user experience. OEMs could benefit from a 'bottom-up' approach in terms of useful and informative content provided to consumers in their manuals.

[101] Anastasiadou & Gavanas (2022) '**State-of-the-Art Review of the Key Factors Affecting Electric Vehicle Adoption by Consumers'**

More widely, a minimum standard for vehicle manual information could be facilitated by the EU through an existing or planned regulation.

Recommendation 2: improve information provision and clarity on EV affordability.

6.7 Given that there is disconnect between perceived cost and actual costs of EVs, it is important that educational information is provided. This links to the Recommendation 8 on raising public awareness and debunking EV myths. Nudge techniques could be utilised at petrol stations, for example, to highlight the costs of charging an EV compared to refilling an ICE vehicle with petrol/diesel. Another option is to advertise the affordability of EVs at car dealerships through TCO price comparisons with ICE vehicles.

6.8 More widely, greater clarity and awareness should be provided on tax relief schemes to ensure consumers can readily take advantage of those. Further, any tax relief initiatives should also be designed in a way to incentivise and benefit users. For example, FDM noted that the tax deduction threshold in Denmark is too high with many alternative vehicles available for purchase at a much lower cost.

Recommendation 3: provide transparent information on campervan and leisure application of EVs.

6.9 It is important that campervan users receive adequate information when purchasing an EV, particularly around vehicle performance. CAMC note how EVs that tow campervans typically see a reduction in range of around 50%. However, there is uncertainty around this figure and the overall impact of towing campervans with an EV.

6.10 The Peugeot e-208 manual, for example, strongly advises against towing: 'Electric vehicles must never be equipped with towing devices. It is therefore not possible to tow a trailer or caravan'. However, given this is buried within the manual, this should be made more prominent and clearer for consumers. This can be particularly problematic for larger campervans with very few EVs on the market with the capability to tow effectively.

6.11 There is a wider point about tailoring information on EV performance to different use cases (e.g. campervan use, local trips or long distance trips) and how an EV can work to meet consumer needs regarding range expectations and battery optimisation.

6.12 As per the Recommendation 1, this could link to a minimum standard for vehicle manual information and can be facilitated by the EU with an existing or planned regulation. More widely, dealerships should be better informed to help consumers in this regard.

Recommendation 4: provide more accurate information on vehicle performance in adverse weather conditions.

6.13 ADAC, CAMC, FDM, and NAF, all highlighted how lack of information on vehicle performance in adverse weather conditions is a key issue for consumers. This relates to both vehicle range and speed of charging. In more extreme climates such as Norway with regular sub-zero temperatures this is more pressing. For example, the American Automobile Association note how EVs can lose 10-12% of their range while being driven in temperatures below freezing.[102]

102 E-Vehicle Info (2022) '**How does hot and cold weather affect EV range'**

Whilst Mer UK highlight how charging is slower in winter conditions due to the battery temperature with ideal charging conditions being between 20-40 degrees.[103]

6.14 Evidently, more prominent information should be provided in this regard across dealerships, manuals, advertisements and wider promotion campaigns, in particular in geographies with more extreme winters and hot summers.

6.15 In context of an EVs' performance in adverse weather conditions but also more widely to provide reassurance, it is also important for consumers to have relevant details of where they can get their EV repaired/maintained and the associated costs.

Recommendation 5: car dealerships should provide more transparent and clear information to consumers.

6.16 Dealerships are a vital point of reference for consumers when purchasing vehicles in particular seeking reassurance on fundamental EV aspects such as vehicle performance, range and charging. As per recommendation 4, dealerships should also provide consumers with information on where an EV can be repaired and maintained.

6.17 However, feedback from stakeholders such as Bureau Européen des Unions de Consommateurs (BEUC), CAMC, FDM and NAF suggested dealerships are not always providing enough information in this regard. This could reflect the wider EV sales market and the current distribution channels. Leasing companies, company car programmes and salary sacrifice schemes are the main channels manufacturers have prioritised for sales thus far and not dealerships. As such dealerships will not necessarily actively promote sales of EVs until manufacturers start supplying them with suitable stock. This limited supply of EVs at dealerships could be impacting the quality of information consumers are receiving from dealership staff (i.e. lack of EV familiarisation).

6.18 As second-hand EVs start to proliferate the market (with company cars and leasing deals terms ending) and dealerships likely increase their EV portfolio, it is vital that consumers are provided with adequate and useful information on EVs.

Charging Information

Recommendation 6: standardise information provision at public chargepoints.

6.19 The review of CPOs' websites demonstrates that consistency of information and user experience is lacking. As a minimum, there should be greater consistency around pricing, speed classifications, cost estimates and interoperability with payments.

6.20 Consumers would benefit from greater understanding of the cost of charging in advance of using a charging point. Recharging an EV should be as simple and transparent for consumers as refuelling at a petrol station. Further, as discussed in the CPO review, consumers may not be aware of their own vehicle's maximum charging capacity. CPOs should remind consumers of this consideration and highlight any price or speed impacts this may have for a consumers' chargepoint experience. Similarly, consumers should be informed about a charger having multiple connectors but only being capable of charging one vehicle at a time.

103 Mer (2022) **'How Does the Cold Weather Affect EV Car Battery Performance?'**

6.21 Key decision makers involved in chargepoint rollout should tailor local chargepoint provision information for local communities so that communities are kept up to date regarding chargepoint roll out plans and when chargepoints are being serviced etc. Finally, rather than several apps/websites providing some level of information, a centralised application which provides information regarding operators/chargepoint availability/chargepoint type could help overcome barriers associated with chargepoint availability.

6.22 Given the relevance of this recommendation to the Alternative Fuels Infrastructure Regulation (AFIR), further commentary is provided in Recommendation 12.

Recommendation 7: enhance accessibility information & user experience at public chargepoints.

6.23 It is important to consider inclusivity and accessibility across all information provided to consumers on EVs. In particular, this applies to information provided at chargepoints.

6.24 The transition to e-mobility should not leave anyone behind. Emerging examples include Polis' '**Just Transition Report**' on making EV charging a reality for people with disabilities and the UK's '**Design considerations for electric vehicle chargepoints**'. The EU should consider a standardised approach to accessibility both in design and user information. This could be facilitated through an existing or planned regulation (e.g., AFIR).

Wider Recommendations

Recommendation 8: raise public awareness of accurate EV information.

6.25 Reliable and trustworthy information is key to overcoming the spread of misinformation regarding EVs. This should be coordinated with transport authorities, local government, industry bodies and car dealerships to ensure EV related information is communicated from a credible source.

6.26 Running public awareness campaigns can help dispel myths, particularly around infrastructure, battery reliability and range on EVs. Awareness campaigns are an opportunity to promote the benefits of EVs highlighting lower operational and maintenance costs. Provision of educational information in the form of simple images/icons highlighting the lower running costs, availability of financial incentives and energy costs of an EV compared to an ICE vehicle could help with visualising the benefits and overcoming the perceived barriers regarding affordability. Anastasiadou and Gavanas (2022) propose measures such as EV exhibitions, conferences, EV rental and sharing programmes which provide consumers with an opportunity to test drive EVs and increase their familiarity with the technology and realise their associated benefits.[104]

6.27 It is also important that policies and information/awareness campaigns target specific groups of people of different social and sociodemographic characteristics. For example, research by Anastasiadou and Gavanas (2022) found that age, gender, income, education level and commuting distance were important determinants for EV adoption.[105] As such, it is important

[104] Anastasiadou & Gavanas (2022) '**State-of-the-Art Review of the Key Factors Affecting Electric Vehicle Adoption by Consumers'**
[105] Ibid.

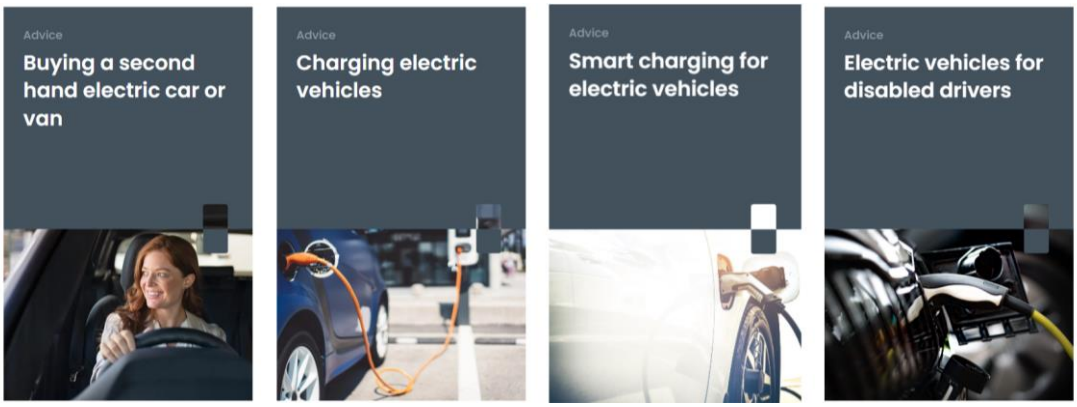
for any information campaign to be targeted and tailored to different sociodemographic groups.

6.28 Table 6.1 demonstrates some emerging examples of information and public awareness campaigns introduced in the UK.

Table 6.1: Information / public awareness campaign examples

Information/public awareness campaigns
Energy Saving Trust • The Energy Saving Trust in the UK provides information/educational materials targeted at consumers around EVs which outline benefits, different types of EVs, videos and 'how to' guides, and advice on charging and buying an EV.[106] The Energy Saving Trust provide information around EV range, price and battery disposal to help address barriers to uptake. • The Department for Transport (DfT) and Energy Saving Trust have developed a Local Authority Toolkit focused on EV adoption which highlights the importance of try before you buy schemes, engagement events, raising awareness on funding and finance and the benefits of EVs through targeted communications.[107]

Figure 6.1: Energy Saving Trust – EV information materials



Source: Energy Saving Trust

BP Pulse try-before-you-buy

- BP Pulse held a try-before-you buy scheme in Milton Keynes at an EV Experience Centre showcasing a range a of EV models. This initiative provided consumers with an opportunity to familiarise themselves with the technology, complete a test drive and overcome concerns around range anxiety.[108]

Recommendation 9: promote information on sustainable transport options.

6.29 Whilst this study's focus has been on information provision around purchasing or using an EV, it is important not to lose sight of wider decarbonisation goals. Whilst EVs are cleaner than ICE vehicles, they still contribute harmful pollutants such as particulate matter from tyre wear and tear.

6.30 OECD state that 'Electric vehicles are estimated to emit 5-19% less PM10 from non-exhaust sources per kilometre than internal combustion engine vehicles (ICEVs) across vehicle classes.

[106] Energy Saving Trust (2023) **'Electric Vehicles'**
[107] Department for Transport (2022) **'Zero emission fleets: local authority toolkit'**
[108] BP Pulse (2023) **'And that's a wrap'**

However, EVs do not necessarily emit less PM2.5 than ICE vehicles. Although lightweight EVs emit an estimated 11-13% less PM2.5 than ICEV equivalents, heavier weight EVs emit an estimated 3-8% more PM2.5 than ICE vehicles. In the absence of targeted policies to reduce non-exhaust emissions, consumer preferences for greater autonomy and larger vehicle size could therefore drive an increase in PM2.5 emissions in future years with the uptake of heavier EVs'.[109]

6.31 To deliver decarbonisation goals at both national and EU levels, there is a need to reduce private car use and encourage sustainable and public transport use and uptake. Relevant decision makers (e.g., EU, National Governments, Transport/City Authorities) should therefore promote alternative transport options and focus on relevant information provision in this regard.

Recommendation 10: Promote use of car sharing & shared transport models.

6.32 EV car sharing is increasingly perceived as an emerging solution for breaking down barriers and options on driving and using an EV. Through careful promotion from government, transport authorities and other relevant decision makers, EV car sharing can provide consumers with the opportunity to test drive an EV before purchasing. For example, ShareNow operate in 16 cities across eight European countries, with more than 2,900 EVs in its 11,000-car fleet.[110]

6.33 Subscription car services such as on.to and Voltric can provide a 'try before you buy' approach with no high upfront costs and no long tie-in periods along with comprehensive package including insurance and often charging.

6.34 Promoting information provision for EV car clubs can help provide practical experience for consumers in the transition to EVs. For example, in the UK, CoMoUK noted how 91% of users were satisfied or very satisfied with driving EV sharing vehicles. CoMoUK revealed that each car sharing vehicle in the UK replaced 22 private cars leading to air quality and congestion benefits.[111]

EU Regulatory Recommendations

Existing policies are encouraging uptake of EVs

6.35 As demonstrated in Chapter 3, the EU has enacted and proposed several Regulations and Directives, which aim to stimulate the market development of EVs. To date, there are policies in place and/or in development to cover:

- EV recharging point standards (speed of recharging, power of recharging points, payment, information on availability of recharging points, common plug);
- EV recharging point network development;
- Calculating EV range and energy consumption;
- On-board monitoring of energy consumption;
- On-board monitoring of battery state of health;
- Minimum performance standards for battery durability;

[109] OECD iLibrary (2020) **'Non-exhaust Particulate Emissions from Road Transport : An Ignored Environmental Policy Challenge'**

[110] C40 Knowledge (2021) '**How to drive electric vehicle uptake in your city**'
[111] CoMoUK (2023) **'CoMoUK Annual Car Club Report: Key Findings'**

- Information provision requirements on the performance and durability of batteries;
- Reductions in CO_2 emissions at an EU-wide level, where EVs can assist meeting these targets;
- Targets on renewable energy content in transport;
- Provisions for using EVs as bidirectional charging points (i.e. able to absorb and supply electricity to the grid to meet peaks in electricity demand); and
- Type approval of EVs, including the proposed Euro 7 standard for battery durability.

There remains scope for further improvement of the regulatory framework.

6.36 Despite the positive evidence of recent significant growth in sales of EVs, there are several recommendations regarding consumer information presented below that could go further and support the European EV market in aiming towards 100% zero-emission new vehicles from 2035.

Recommendation 11: revise the Car Labelling Directive to properly include EVs.

6.37 The 1999 Car Labelling Directive is outdated and does not reflect the reality of present-day and future use of electric vehicles. The following changes could be made to the Directive:

- **Define an electric vehicle standard for car labelling**. At present, all zero-emission EVs attain an 'A' rating by default; this simply shows that these vehicles have zero tailpipe CO_2 emissions. Whilst this demonstrates that EVs are more environmentally friendly than ICE vehicles, the blanket 'A' rating has limited value to consumers when making a choice between EVs. The directive should look to provide greater clarity on an EVs' energy and environmental efficiency. This could include consideration of an EVs typical efficiency in terms of kilometres per kWH. In addition, the weight of the vehicle should be considered as this determines the particulate matter emissions and can be used as a proxy for the amount of raw materials used in a vehicle production. A combination of these two factors could help determine more energy and environmentally efficient EVs for consumers.
- **Consider harmonising labelling formats across the Union.** The Car Labelling Directive currently applies loose limits on the design of the car labels across the EU. This provides the Member States the flexibility to adjust the design as required for local needs (such as taxes). However, more prescriptive guidelines could achieve greater clarity on consumer information without sacrificing these local needs. For example, the current mix of absolute CO_2 emissions and relative CO_2 emissions can mean that the current labelling is confusing. An absolute scale which matches the EU Energy Label format (A-G) could be introduced as well as providing context on how the model in question compares to the best in class for similar models.
- **Facilitate the comparison of battery range and/or energy efficiency of EVs.** There is no provision in the current Directive to allow consumers to compare the official range of EVs. An improved official range metric based on new drive cycles would be of benefit to consumers.
- Similarly, there is no provision to compare the energy efficiency of EVs (linking to the point above regarding kWh efficiency and weight impact on PM emissions). Including this information would allow consumers to make more informed choices on the most eco-friendly vehicles, as well as being able to choose an EV with a suitable range.

Recommendation 12: harmonise charging point payment regulations.

6.38 AFIR makes good improvements (from the previous 2014 Alternative Fuels Infrastructure Directive) to encourage the development of recharging infrastructure, with a maximum of 60km between recharging points along the TEN-T Core and Comprehensive Networks, minimum power requirements based on the EV fleet size, and greater provision of information on pricing and availability of recharging points. However, there are some areas for additional consideration with AFIR:

- **Pricing transparency limited to rapid chargers only.** Under the Regulation, only public recharging points over 50kW would be required to present pricing in a cost per kWh format. Slower recharging points (under 50kW) would not have this requirement and could present pricing on a per minute, per hour, or per session basis. The inconsistencies between pricing transparency may hinder consumers' abilities to understand which recharging point is most cost-effective and is not consistent with the cost per unit approach taken for fuel prices (which are displayed on a cost per litre basis).
- **Harmonise the chargepoint speed classifications:** there remains inconsistency in how chargepoints are defined (i.e., slow, fast, standard, rapid and ultra-rapid). AFIR or a similar regulation could provide clarity on speed classifications to ensure consistency across industry and CPOs with information provided to consumers.
- **Payment method flexibility limited to fast chargers only**: requirements to accept payments from credit cards, debit cards, and/or proprietary payment mechanisms (such as through apps, QR codes, or subscriptions) only extends to rapid recharging points; for chargepoints below 50kW, chargepoint providers are not obliged to accept credit and debit card payments. This can be an impediment to ease of use of recharging points and does not match the intended aim of the Regulation to make payment simple, transparent, and non-discriminatory. The EU should explore the feasibility of including contactless payment with chargers below 50kW.
- Whilst the Regulation seeks to provide transparent and non-discriminatory prices, the encouragement to provide pricing both on a per minute and per kWh basis could create further confusion for customers (e.g., compared to ICE vehicles whereby you have the cost per litre only).

6.39 More widely, several stakeholders emphasised the importance of interoperability across member states and Europe more widely with 82% of FIA members[112] agreeing that the EU should improve interoperability with public charging information and accessibility for consumers (i.e., more interoperable payment, functionality and accessibility, pricing etc). It is important that consumers can readily and easily use chargepoints across Europe with no barriers around payment and usability.

6.40 Stakeholders in this study pointed to the Roaming Regulation 2022 (2022/612) as a proxy that should be applied to public chargepoints. Through AFIR and/or other relevant regulations, the EU should seek to adopt an interoperable approach with any chargepoint regulation (i.e., standardised, and consistent consumer information and overall chargepoint experience for users). Automóvel Club de Portugal's (ACP) approach should be seen as a best practice example of an interoperable approach (albeit within a single country) to charging: the ACP app

[112] Based on survey responses of 23 FIA EB members

simplifies and consolidates information about public chargepoint networks across Portugal (and across Europe) along with a payment functionality.

Recommendation 13: provide more reliable/realistic information to consumers on an EV's range.

6.41 The current testing protocol for vehicle emissions and EV range is established through the Worldwide harmonised Light-duty vehicle Test Protocol (WLTP), which aims to replicate realistic driving conditions so that official stated values are realistic. However, WLTP does not sufficiently reflect real-world EV ranges. This is due to the factors such as weather (particularly in winter) and different driving styles impacting the actual achieved range. ADAC, for example, suggested that achieved ranges for EVs typically fell 20% below WLTP stated ranges. This may reduce consumer confidence in the official stated range.

6.42 An improved testing cycle or standard which factors in weather and driving style impacts could help provide more accurate information on a vehicle's range. The EU could take lead on introducing this either as part of the existing or future regulations.

6.43 OEMs also have an important role to play in ensuring their manuals and other information channels provide greater clarity on factors affecting range.

Recommendation 14: make information on battery health more accessible and provide it proactively for second-hand purchases.

6.44 Trust and confidence in an EV's battery health is key to unlocking wider EV adoption, particularly in supporting the second-hand market. Mass market consumer experience with battery performance largely stems from use of mobile phones, laptops and other smaller electronic devices. These devices are synonymous with deterioration in battery health and this perception can influence consumer views on EVs.

6.45 ADAC noted how trust in battery health is a key barrier and that currently manufacturers provide no information on battery health, state of the battery or number of charging cycles in a battery use. They add that consumers can be uncertain about how a battery will last beyond a period of ten years which can cause reluctance both in purchasing new and second hand EVs. ANWB suggested confidence in battery health could be improved with longer battery warranties from manufacturers (e.g., ten years or up to a certain distance threshold such as 200,000 kilometres). Greater application of independent tools provided by organisations such as **AVILOO**[113] could benefit consumers.

6.46 At an EU level, a battery health standard could be introduced, ideally led by the European Union. Indeed, 96% of FIA members[114] suggested a battery health standard would benefit consumers purchasing an EV. The UNECE Regulation 22 on battery durability which has been incorporated into the proposed Euro 7 standard is a positive step supporting this issue. Similarly, the recently approved regulation on batteries and waste batteries, repealing of Directive 2006/66/EC and amendment of Regulation (EU) No. 2019/1020 provides additional focus on battery health, including the need for a battery passport when the vehicle is put on the market.

[113] AVILOO is an independent organisation that has battery testing services. This includes a test on an EVs battery providing information on the state of the battery's health.
[114] Based on survey responses of 23 FIA EB members

6.47 The collection and monitoring of battery health and durability, as well as minimum standards on battery durability, will help consumers gain trust that compliant vehicles will maintain adequate battery capacity and range over the vehicle's life. Nonetheless, there would be significant benefit in providing information on battery health to consumers wishing to purchase second-hand vehicles. Where possible, second-hand sales should provide this information to consumers to be fully informed on the actual condition of the car's battery they wish to purchase.

6.48 It may also be useful to consider whether a percentage value is appropriate and clearly understood by consumers, or whether this information should be presented to consumers in a different manner (such as 'RAG'[115] rating battery health values within certain parameters).

[115] A RAG rating is an indicator value mechanism, typically using red, amber and green colours to denote a particular score, risk or value (i.e., green typically denotes a criteria/value has scored favourably vs red indicates a criteria/value has scored unfavourably)

A Stakeholder Interviews

Stakeholder Interview List

Stakeholder	Stakeholder Group	Geography
Automovel Club De Portgual (ACP)	FIA Mobility Club Member	Portugal
Allgemeiner Deutscher Automobil-Club E.V. (ADAC)	FIA Mobility Club Member	Germany
Koninklije Nederlandse Toeristenbond (ANWB)	FIA Mobility Club Member	Netherlands
Bosnia and Herzegovina Automobile Club (BIHAMK)	FIA Mobility Club Member	Bosnia & Herzegovina
Caravan and Motorhome Club (CAMC)	FIA Mobility Club Member	United Kingdom
Forenede Danske Motorejere (FDM)	FIA Mobility Club Member	Denmark
Norges Automobil-Forbund (NAF)	FIA Mobility Club Member	Norway
Österreichischer Automobil-, Motorrad- und Touring Club (ÖAMTC)	FIA Mobility Club Member	Austria
Touring Club de Suisse (TCS)	FIA Mobility Club Member	Switzerland
European Automobile Manufacturers Association (ACEA)	Industry Association	Europe
Bureau Européen des Unions de Consommateurs (BEUC)	Industry Association	Europe
ChargePoint	Chargepoint provider	Europe
CoMoUK	Shared Transport Charity	United Kingdom
Eurelectric	Industry Association	Europe
European Association for Electromobility (AVERE)	Industry Association	Europe
POLIS	European Cities & Regions Network	Europe

B Survey Respondents

List of survey respondents

Stakeholder	Geography
Allgemeiner Deutscher Automobil Club EV (ADAC)	Germany
Automobile Club D'Italia (ACI)	Italy
Automóvel Club de Portugal (ACP)	Portugal
Avto-moto zveza Slovenije (AMZS)	Slovenia
Bosnia and Herzegovina Automobile Club (BIHAMK)	Bosnia & Herzegovina
Caravan and Motorhome Club (CAMC)	United Kingdom
Felag Islenskra Bifreidaeigenda Automobile Association (FIB)	Iceland
Forenede Danske Motorejere (FDM)	Denmark
Kongelig Norsk Automobilklub (KNA)	Norway
Koninklijke Nederlandse Toeristenbond (ANWB)	Netherlands
Mobilité Club France (MCF)	France
M Sverige (M)	Sweden
National Automobile Club of Azerbaijan (AMAK)	Azerbaijan
Norges Automobil Fordbund (NAF)	Norway
Osterreichischer Automobil-, Motorrad- Und Touring Club (OAMTC) x2	Austria
Real Automovil Club de Espana (RACE)	Spain
Reial Automobil Club De Catalunya (RACC)	Spain
Royal Automobile Club (RAC)	United Kingdom
Touring Club Belgium (TCB)	Belgium
Touring Club de Suisse (TCS)	Switzerland
Union Des Automobilistes Bulgares (UAB)	Bulgaria

C EU Regulatory Commentary

Introduction

C.1 This section considers whether existing regulations address EVs and whether these regulations are sufficient in the aim to reduce barriers to EV uptake.

Directive 1999/94/EC on car CO_2 labelling

C.2 The Directive aims to ensure that information on fuel economy and CO_2 emissions is made available to all consumers at the point of sale to make informed choices.

C.3 The measures set out in the Directive include:

- **Labelling of fuel economy and CO_2 emissions:** all new cars sold must clearly display information on the fuel economy and CO_2 emissions in a consistent, understandable format.
- **Guide on fuel economy and CO_2 emissions of all new passenger cars:** Member States must make available a guide on fuel economy and CO_2 emissions for new passenger cars that is freely available at all points of sale upon request.
- **Poster of fuel economy and CO_2 emissions:** a poster/display must be displayed with official fuel economy and CO_2 emissions data at the point of sale in a prominent position.
- **Inclusion of fuel economy and CO_2 emissions in promotional material:** all promotional literature for the sale of new passenger cars must contain the official fuel economy and CO_2 emissions for the specific car model advertised.

C.4 An impact assessment[116] completed in 2016 for the European Commission on the regulation notes that there was a lack of guidance on how to incorporate alternatively-fuelled vehicles into the Directive's measures. This gap will become increasingly salient as the share of EVs on the market increases in the future. The impact assessment notes that there is no mandated labelling of energy efficiency or EV range in the Regulation; all EVs are rated 'A' by default, as labelling is based on tailpipe CO_2 emissions. The Directive also only applies to new car sales and is not required for used car sales.

C.5 The use of a Directive affords Member States some level of discretion over the design of the label, which has led to differences across Europe. Some Member States opt for absolute scales based on the actual levels of CO_2 emissions, whilst others use relative scales based on the level of CO_2 emissions relative to vehicles of a similar mass. This can mean that two cars with different absolute values of CO_2 emissions can receive the same grading, which may not sufficiently signal to consumers the benefits of EVs. The lack of a standard design for labels also means that in some Member States, such as in the Czech Republic and Poland, each car dealer can use a different format, which can be confusing for consumers.[117]

[116] Publications Office of the European Union (2016) 'Evaluation of Directive 1999/94/EC ("the car labelling Directive")'
[117] BEUC (2020) 'Better car labelling to choose the cleanest models'

C.6 Without this information required in the Directive, the following shortcomings for consumers are identified:

- **Consumers are not guaranteed to be provided with information on the energy efficiency and battery range of EVs.** Whilst some Member States have unilaterally introduced additional regulations to address this shortcoming, and some manufacturers may voluntarily provide this information to consumers, the lack of a harmonised approach across the EU may impact the ability of all consumers to make informed purchase decisions.
- **Consumers may lack the ability to compare between EVs to make informed choices.** The absence of a guide comparing new passenger cars that is specific to EVs may limit consumers' ability to comprehensively compare all vehicles available on energy efficiency and battery range, and thus lack the ability to make fully informed choices.
- **Consumers may not have standardised information to compare between ICE vehicles and EVs.** The nature of labelling ICE cars based on fuel economy and tailpipe CO_2 emissions is not conducive to a like-for-like comparison with EVs. This may limit the ability of consumers to make meaningful comparisons, such as lifecycle CO_2 emissions and average running costs, which may be useful to make informed choices.

C.7 The Commission recognise the need to review the Directive. The newly adopted Regulation 2023/851 includes the following amendment: "By 31 December 2024, the Commission shall review Directive 1999/94/EC considering the need to provide consumers with accurate, robust and comparable information on the fuel and energy consumption, CO_2 emissions and air pollutant emissions of new passenger cars placed on the market, including under real-world conditions, as well as evaluate the options for introducing a fuel economy and CO_2 emissions label for new light commercial vehicles." This is a positive step but considering the 2019/631 Directive indicated a review would take place before the end of 2020, this still represents a slow response to review and change the Directive.

Communication COM (2013) 17 on a European alternative fuels strategy

C.8 The Communication emphasises the reasons for the need to develop a European strategy for the development and uptake of alternative fuels in transport. It states the intention to develop a long-term legislative framework to achieve this strategy, with the following key points in the legislative proposal:

- **Binding targets for infrastructure build up:** each Member State has a defined target for the number of recharging points, of which at least 10% must be publicly accessible;
- **Common technical specifications for alternative fuels:** the development of a common plug standard across the EU was proposed to overcome the barrier around chargepoint usability to broad market uptake consistently across the Union;
- **Addressing consumer acceptance:** introducing privileged access rights to urban areas, information campaigns, large-scale demonstration projects, harmonising consumer information on the availability of recharging points, and financial incentives to purchase clean vehicles; and
- **Addressing technical development:** the provision of R&D funding through Horizon 2020 through the European Green Cars initiative, involving stimulating public-private partnerships and research into EV smart grid interoperability through the EU's Joint Research Centre.

C.9 Under the Proposal, each Member State must develop a national policy framework to encourage the uptake of alternative fuels and infrastructure. The EU evaluates these frameworks to ensure there is coherence at an EU level. Each Member State has a minimum number of recharging points to be put into place in accordance with forecasted numbers of EVs by the end of 2020.

C.10 The Proposal was subsequently adopted into Directive 2014/94/EU described in more detail below.

Directive 2014/94/EU on EU Alternative Fuels Infrastructure

C.11 The Directive aims to encourage the development of infrastructure across the EU for alternative fuels in transport, including biofuels, hydrogen, and electricity. With regards to EVs, the following key points are included in the Directive:

- **Intelligent metering systems:** charging infrastructure should include intelligent metering which can recharge batteries via the grid at times of low electricity demand to maintain a stable electricity system. Using the grid at times of low electricity demand encourages recharging in off-peak periods which can lead to lower costs for charging. Intelligent metering systems may also offer the opportunity for EVs to feed power back into the grid at times of high electricity demand;
- **Competitive, open access charging networks:** charging points should be developed in a competitive market with open access to all parties;
- **Ensuring interoperability across the Union:** the Directive notes a need for future policy action to develop a non-proprietary charging connector which can be used across the EU;
- **Provision of information:** information concerning the availability of charging points should be included in traffic and travel information services where applicable. Prices on charging points should be reasonable, easily comparable, transparent, and non-discriminatory. Information on which fuels or charging points cars can use should be available in manuals, at recharging points, and in car dealerships. The Commission intends to use a common fuel unit price comparator, though this is not developed within this Directive; and
- **Targets for number of recharging points:** Member States will be given targets by the Commission for the number of recharging points available to the public by the end of 2025, at least on the TEN-T Core Network and in urban/suburban areas.

C.12 In 2021, as the European Commission launched its 'Fit for 55' package of proposals, a proposal to revise the Directive was published. The Commission proposes to repeal the Directive and to replace it with a new Regulation, with the suggestion that a Regulation is needed to encourage more timely action (a Directive which enters into force must then be transposed into national law of each Member State before it becomes directly applicable; a Regulation applies to all Member States after its entry into force). The new proposal is discussed below.

Alternative Fuels Infrastructure Regulation

C.13 The Regulation repeals Directive 2014/94/EU. The Regulation was one of a package of Proposals set out in the Fit for 55 strategy. The reasons for repealing of 2014/94/EU Directive was, namely:

- There is **no binding methodology** to calculate targets;
- The **ambitiousness of the Directive** differs between Member States;
- **Obstacles to using EVs remain** despite the Directive's application;

- There is a need to **accelerate deployment** of recharging infrastructure above current rates; and
- The Directive is **not well suited to the increased climate ambition** to 2030.

C.14 The newly established Regulation establishes the following key points:

- Fleet-wide **minimum power levels** per EV for publicly accessible recharging stations in the national fleet (i.e. for every light duty EV in the fleet, 1kW);
- **Minimum power levels** per recharging pool along the TEN-T core and comprehensive networks;
- A **maximum distance of 60km between recharging stations** along the TEN-T core and comprehensive networks;
- **Reasonable, comparable, transparent, and non-discriminatory prices** available to users, including price information per recharging session, per minute, and per kWh;
- **Appropriate signposting** of recharging infrastructure along the TEN-T network;
- The **development of national policy frameworks** to achieve the targets set out in the Regulation proposal; and
- **Comparable pricing** must be displayed between fuels, electricity, and hydrogen where applicable using price per 100km (defined under Regulation 2018/732).

C.15 The Regulation is more ambitious than the previous Directive it has repealed, notably due to its binding targets on infrastructure deployment, minimum targets for the geographic distribution of recharging stations, and minimum power targets. A review of the proposal by the European Parliament's TRAN committee established even more ambitious policy targets, such as higher power per charging station, achieving infrastructure targets earlier, and establishing a data access point to monitor the availability and prices of recharging stations across Europe.[118]

C.16 Whilst there is clear progress with the new Regulation, there has been some industry pushback on its ambition. For example, a joint letter signed by the International Road Transport Union (IRU), European Automobile Manufacturers' Association (ACEA), Transport & Environment (T&E), and Hydrogen Europe (HE) called for ambitious timeframes for mandatory TEN-T targets from 2025 at the latest.

C.17 BEUC shared in an interview that the provisions within the Regulation on charging points pricing transparency do not go far enough. Under the Regulation, only fast charging points would have to allow payment by credit card, debit card, or proprietary systems such as QR codes, as well as displaying charging prices per kWh. Slower chargers under 50kW would not have to allow credit/debit card payments and would not have to display prices per kWh. Given that slower chargers outnumber fast charges by a significant proportion, the value of this could be limited and may not make a sufficient difference in harmonising information provision on charging point pricing across the Union.

Directive 2018/2001 on renewable energy

C.18 The Directive aims to encourage the use of energy from renewable sources across different sectors, with a focus on the use of renewables in electricity, heating and cooling, and transport. The key points of relevance to EVs include:

- A binding EU-wide target of 32% energy consumption deriving from renewable sources;

[118] European Parliament News (2022) '**Car-recharging stations should be available every 60 km, say MEPs**'

- A binding cap of 14% of energy in transport from renewable sources, including at least 3.5% of advanced biofuels by 2030;
- Caps on conventional biofuels and a phase out of biofuels which do not sufficiently reduce emissions; and
- Consumers should be informed of the lower running costs of EVs to inform choices.

C.19 A series of amendments have been proposed since the 2018 Directive entered into force. In the context of both the Fit for 55 policy proposals and the Russian war of aggression against Ukraine leading to renewed focus on reducing fossil fuel usage, renewable energy targets have been strengthened. The latest agreement reached in March 2023 between the European Parliament and the Council of the European Union establishes a revised 42.5% target of energy consumption deriving from renewable sources. Key points from the amendments proposed include:

- A reduction in greenhouse gas intensity of transport by 14.5% or a 29% share of renewable energy for transport in final energy consumption;
- A sub-target of 5.5% of final energy consumption in transport from advanced biofuels, of which at least 1% for renewable fuels of non-biological origin;
- Economic operators supplying renewable energy to EVs via public recharging stations can earn credits to sell to fuel suppliers to meet their obligations on reduced CO_2 emissions;
- Specific measures set to encourage using EVs to both absorb electricity from the grid when supply is plentiful and supply energy back to the grid when demand is high;
- The provision of consumer information on how such bidirectional charging agreements would affect their battery health and usage of their car, including terms for remuneration; and
- Information on battery health, charge, power, capacity, and the location of vehicles should be made available to owners and third parties such as electromobility service providers at no cost.

C.20 The latest agreement requires formal adoption by the Parliament and the Council, after which it will be published in the Official Journal of the Union and enter into force. This is expected to be completed in the near future.

C.21 The main issue with the existing Directive, which is addressed via the Fit for 55 proposed amendment, is that poor regulatory design from the 2009 Fuel Quality Directive set out biofuel mandates, despite the fact that certain biofuels from oils crops do not significantly reduce greenhouse gas emissions intensity. This also meant that there are no targeted incentives to encourage the use of EVs through this Directive.

C.22 The proposed trading scheme of credits will allow fuel suppliers to meet greenhouse gas emissions intensity targets in more ways than just through biofuels – such as renewable electricity, green hydrogen, and e-fuels. Providing credits towards targets for renewable electricity for transport will encourage the development of public charging infrastructure across Europe, according to a position paper on the Directive by Transport & Environment, an environmental advocacy group.[119]

C.23 However, the proposed measures only offer credits for renewable electricity supplied to public recharging points, and not at private recharging points (such as at home or at the workplace) where the majority of charging takes place. This was achieved in Germany by offering credits

[119] Transport & Environment (2021) '**A clean shift for EU transport fuels: T&E Briefing RED II review'**

based on the average electricity consumed by an electric car driver and the average renewable share of the grid electricity. Third parties can then pool the credits generated by private charging. This would help to encourage the further uptake of EVs.

C.24 A position paper[120] on the amended Renewable Energy Directive from the European Automobile Manufacturers' Association, which represents the interests of car manufacturers in Europe, states that the lack of a roadmap post-2030 for renewable fuels and energy does not provide a long-term view on the trajectory to zero-emission road transport.

C.25 The proposed amendment to Regulation 2019/631 for all new vehicles sold in the EU from 2035 to be zero-emission offers a better vision of the trajectory of the uptake of EVs than what is presented in the proposed amendments to the Renewable Energy Directive. Nonetheless, it remains unspecified what measures will be taken for vehicles entering the EU fleet prior to 2035 and how renewable fuel and energy targets will reduce emissions from these vehicles in the longer term (i.e. post-2030).

Regulation (EU) 2023/851 amending Regulation (EU) 2019/631 on EU CO_2 targets for new cars

The previous 2019/631 Regulation set out the EU fleet-wide CO_2 emission targets from new cars and vans relative to 2021 levels, as well as incentivising zero- and low-emission vehicles. The new Regulation (EU) 2023/851 strengthens the CO_2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition to achieve a reduction in net greenhouse gas emissions by at least 55% compared to 1990 levels by 2030.[121]

The Regulation recognises that a clear pathway also needs to be set for further reductions beyond 2030 to contribute to achieving the climate-neutrality objective by 2050. The Regulation notes that CO_2 emissions reduction standards are technology neutral, including battery electric vehicles.

Regulation (EU) 2019/631 is amended with the following notable changes:[122]

- Average emissions of new passenger car fleet have a revised target equal to a reduction of 55% of the target in 2021 (changed from 37.5%).
- For light commercial vehicles this changes from a 31% reduction to 50%
- From 2035, an EU wide target equal to a 100% reduction of the target in 2021 is established for both new passenger cars and light commercial vehicles.
- From 1 January 2025 to 31 December 2029, a zero- and low-emission vehicles' benchmark equal to a 25 % share of the fleet of new passenger cars and equal to a 17 % share of the fleet of new light commercial vehicles shall apply.
- The consideration of innovative technologies to achieve CO_2 savings is amended. The total contribution of those technologies to reducing the average specific emissions of CO2 of a manufacturer may be up to: 7 g CO_2/km until 2024; 6 g CO_2/km from 2025 until 2029; and 4 g CO_2/km from 2030 until and including 2034.

[120] ACEA (2021) '**ACEA Position Paper Renewable Energy Use Directive and Fuel Quality Directive'**

[121] European Sources Online (2023) **'Regulation (EU) 2023/851 amending Regulation (EU) 2019/631 as regards strengthening the CO2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition'**

[122] EUR-Lex (2023) '**Regulation (EU) 2023/851 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2019/631 as regards strengthening the CO2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition**'

- From 31st December 2025, the Commission will publish a progress report setting out a methodology for the assessment and the consistent data reporting of the full life cycle CO2 emissions of passenger cars and light commercial vehicles that are placed on the Union market.
- The progress report will consider all factors that contribute to a cost-efficient progress towards climate neutrality by 2050. Notably this includes progress in the affordability of zero and low emission vehicles and analysis of the market for second hand vehicles.
- The Commission will review the effectiveness and impact of the Regulation in 2026

Regulation 2017/1151 on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 & 6)

C.26 The Regulation establishes rules and regulations specifically targeted at testing real-world driving emissions, through incorporating the Worldwide harmonised Light-duty vehicles Test Procedure (WLTP) into EU law. The key points are as follows:

- EU type-approval requires vehicles to meet the requirements on emissions set out in Regulation 715/2007 when tested under both the Real Driving Emissions and WLTP tests;
- Vehicles must be installed with on-board diagnostics systems to detect deterioration and/or malfunctions over the vehicle's lifetime;
- Vehicles must be installed with on-board monitoring devices to measure the fuel/energy consumption of vehicles on an ongoing basis; and
- Stricter measures aimed at preventing the use of defeat devices to circumvent emissions regulations.

C.27 Where vehicles are found to be non-compliant with the Regulation through the on-board monitoring devices, the Commission has the power to suspend the type-approval of the vehicle in question.

C.28 The WLTP is an improvement on the previous New European Driving Cycle (NEDC) test protocol, and better reflects real-world driving emissions performance. It also introduces a defined methodology to measure the range of EVs.

C.29 Despite these improvements, feedback from ADAC in a stakeholder interview indicated that the WLTP does not sufficiently reflect real-world EV ranges. This is due to factors such as the weather (particularly in winter) and driving styles impacting the actual achieved range. ADAC suggested that achieved ranges for EVs typically fell 20% below WLTP stated ranges. This may reduce consumer confidence in the official stated range. ADAC introduced its own 'Ecotest' to measure real-world performance, which it states delivers results more in line with actual performance achieved in the real world, and publishes its findings on its website using a grading system between one and five stars.[123]

Communication COM (2022) 586 'Euro 7' repealing Regulations (EC) No 715/2007 and (EC) No 595/2009

C.30 Communication COM (2022) 586 considers type-approval of motor vehicles and engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7) and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009

[123] ADAC (2023) '**ADAC Ecotest'**

C.31 The proposal for a new Regulation establishes a new standard for vehicle emissions (Euro 7). The introduction of the new Euro 7 standard aims to reduce the emissions produced by vehicles not only from the tailpipe, but also from brakes and tyres. This is relevant as even by 2050, the Commission estimates that over 20% of cars and vans, plus over half of heavier vehicles in the EU-wide fleet, will still emit tailpipe emissions. In addition, all vehicles (including EVs) can still cause air pollution from brakes and microplastics used in tyres.

C.32 The key points around the Euro 7 standard include:

- Expanding the range of driving conditions used in real-world emissions tests to better reflect the range of conditions that vehicles experience across Europe (-10°C to 45°C);
- Stricter limits for emissions regardless of fuel type;
- Including previously unregulated pollutants (such as NO_x emissions) from heavy-duty vehicles in emissions limits;
- Introducing new limits on emissions of particulates from brakes and microplastics from tyres for all vehicles;
- Regulating the durability of batteries in new cars and vans to improve consumer confidence; and
- The use of sensors inside the vehicle to monitor emissions throughout the vehicle's life.

C.33 The review below is focused on the regulation on the durability of EV batteries:

- On-board monitors of battery health should be required on all new EVs, which can provide information to owners and potential buyers (e.g. second-hand purchases) on the battery health in the vehicle. This will help to improve consumer confidence when purchasing second-hand vehicles, as they will be able to determine the state of health of the battery when making a purchase decision;
- The proposal includes a minimum performance requirement on battery durability, in line with the UN Global Technical Regulation 22 on EV battery durability. EVs will be certified as Euro 7 compliant if the battery retains at least 80% of its original battery energy capacity after 5 years or 100,000km (whichever comes first), and at least 70% of its original battery energy capacity after 8 years or 160,000km (whichever comes first). For light commercial vehicles, the targets are 75% and 65% respectively. Vehicles exceeding these targets by at least 10 percentage points can be designated at Euro 7+, indicating their stronger battery durability performance;
- The inclusion of minimum performance standards for battery durability, as well as on-board monitoring of battery health, closes an important gap in the existing Regulations which would otherwise lead to a lack of information for consumers looking to purchase second-hand EVs. The proposed regulation does not establish a format for communicating this information, nor is there any specific obligation on second-hand EV sales to display this information to consumers. This may mean that whilst information is available for consumers on battery health and durability, consumers may not have the knowledge to interpret battery health data, and/or they may not be proactively provided with information on battery health; and
- The proposal suggests the introduction of an environmental vehicle passport, which records information on the level of pollutant emissions, CO_2 emissions, fuel/energy consumption, electric range, engine power, battery durability and other related data at the time of the car's registration. This is made available to consumers in the vehicle's electronic systems and can be transmitted off-board. It is not clear in the proposed

regulation whether a similar system could be used to transmit actual battery health status.

Regulation on batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC

C.34 The Regulation acknowledges the growing role of EVs in the EU and a corresponding need to modernise the legislative framework for batteries in the context of incorporating EV batteries more explicitly into the EU framework. The key points of the Regulation for EVs are as follows:

Battery content and carbon footprint

- EV batteries above 2kWh capacity should come with documentation to declare the carbon footprint of the battery (methodology TBC), and should be clearly marked with the carbon footprint performance class;
- EV batteries above 2kWh capacity should declare the life cycle carbon footprint and this must be below a maximum level established by the Commission (methodology TBC);
- EV batteries above 2kWh capacity should come with documentation to declare the recycled content of rare earth metals (cobalt, lead, lithium, or nickel), with minimum standards on recycled content of each metal to be introduced from 2030, and rising in 2035; and
- EV manufacturers must communicate to suppliers and the public their supply chain due diligence on the traceability of materials used in the battery and address any adverse impacts;

Battery capacity and durability

- EV batteries over 2kWh capacity should come with documentation to demonstrate the electrochemical performance and durability of the battery, and must meet minimum standards from 2026 on these parameters;
- Automotive batteries should be labelled with information on their capacity;
- EV batteries above 2kWh capacity should include a battery management system which can determine battery health and the expected lifetime of batteries;
- Information on data in the battery management system should be available to the owner to assess the residual value of the battery and capacity for further use;
- Each EV battery over 2kWh entering into service from 2026 must have an electronic battery passport, containing information on the battery type, model, performance, and durability; and
- Battery passports should be available online, with information made available when the battery is placed on the market.

End-of-life processes

- Producers of EV batteries should take back waste batteries without charge or requirement to purchase a new battery;
- Producers of EV batteries should provide suitable collection infrastructure to achieve this, and can hand over responsibility to waste management firms; and
- Independent operators can access the battery management system of EV batteries to assess whether batteries can be repurposed or remanufactured.

C.35 The Regulation sets out a range of requirements on information provision specific to EV batteries, most notably on battery performance and durability. Despite this, there is no guidance on how this information should be presented to consumers in an understandable

format; it is unlikely that providing consumers with a battery health percentage would be sufficient for users to understand how that will affect performance, time to recharge, and actual range achieved.

C.36 Particularly for second hand purchases of EVs, it will be important for consumers to understand the health of the battery in the car they are buying, the estimated remaining life of the battery, and the actual range taking into account the battery degradation. This does not appear to be sufficiently reflected within the Regulation, though the proposed Euro 7 requirements would include information on battery durability as well as minimum standards to improve consumer confidence.

UNECE Regulation 101

C.37 The Regulation sets out the procedures for the measurement of CO_2 emissions and fuel consumption, as well as the measurement of electrical energy consumption and range of electric-powered vehicles. The key points are as follows:

- **Testing procedure:** all new passenger cars must be tested under simulated urban and extra-urban driving conditions, determined by UNECE Regulation 83;
- **Testing results:** for ICE vehicles, test results must be expressed in grams of CO_2 per kilometre; for EVs, results must be expressed in Watt hours per kilometre and the range in kilometres;
- **Approval criteria:** vehicles tested must demonstrate results within 4% of the stated values for fuel efficiency and CO_2 emissions/electrical energy efficiency and range by the manufacturer;
- **Extension of approval criteria:** approval can be extended to similar vehicles provided vehicles are comparable.

C.38 Type approval is required for the sale of new passenger car models within the EU in accordance with Regulation 101 and other applicable EU law and Directives (such as vehicle safety and production requirements).

C.39 UNECE Regulation 101 also describes the use of a symbol to signify type approval, which must be included to the vehicle approval form and close to or on the vehicle data plate. There is no requirement under Regulation 101 to publish test values or manufacturer stated values, though this is established under Directive 1999/94/EC described above.

UNECE Global Technical Regulation 22 on In-vehicle Battery Durability for Electrified Vehicles

C.40 The Regulation establishes a methodology to test battery health, as well as setting minimum performance requirements for battery durability. Key points of the Regulation include:

- Vehicles should be fitted with monitors to estimate the state of certified range, and state of certified energy of batteries over the life of the vehicle;
- The information should be provided on a scale between 0 and 100;
- Manufacturers must make the information available to consumers via the dashboard indicator, infotainment system, or remotely (e.g. via a mobile phone);
- Vehicles reaching the earlier of 5 years use or 100,000km should maintain at least 80% of the original battery capacity, falling to a minimum of 70% upon reaching the earlier of 8 years or 160,000km;
- If a family of batteries fail testing, then corrective measures must be taken to bring the family into compliance.

C.41 The battery durability testing criteria and pass/fail criteria have been adopted in the proposals for Euro 7 standards, which covers battery durability. This is discussed in more detail under COM (2022) 586 above.

Directive 2000/53/EC on end-of-life vehicles

C.42 The Directive establishes measures to reduce waste from end-of-life vehicles through the reuse, recycling, and recovery of components. The key points include:

- Manufacturers must factor in disassembly, reuse, and recovery of vehicles when designing them;
- At least 85% of a vehicle's mass should be reused/recycled and/or at least 95% of its mass should be reused and/or recovered;
- Manufacturers should establish facilities/systems to collect and reuse components from end-of-life vehicles where possible, and bear the cost to do so;
- Hazardous substances should be treated separately; and
- Clear targets set for the reuse, recycling, and recovery of end-of-life vehicle components.

C.43 The Directive is applicable to all passenger vehicles and small trucks with limited exceptions. The Directive does not contain specific instructions on the reuse, recycling, and/or recovery of EV components, though the processes for EV batteries is proposed in COM (2020) 798 discussed above.

C.44 A proposal to review the management of end-of-life vehicles was published in July 2023 with the aim to facilitate the transition of the automotive sector to the circular economy, at all stages of the vehicle - from design to final treatment at end-of-life.[124]

Directive 2005/64/EC on re-use, recycling and recovery of vehicle parts

C.45 The Directive establishes rules to ensure vehicle parts can be reused, recycled, and recovered to the greatest possible extent, and that reused components do not cause safety risks. The key points from the Directive are as follows:

- New vehicles can only be sold in the EU if at least 85% of its mass can be reused/recycled and/or if at least 95% of its mass can be reused and/or recovered;
- Manufacturers must plan to reuse, recycle, and recover parts when designing cars;
- Manufacturers meeting these criteria obtain a compliance certificate valid for a minimum of 2 years;
- Certain components which would cause safety or environmental risks cannot be reused, such as airbags, seat belts, and steering locks.

C.46 There is no provision within this Directive that explicitly covers the reusability, recyclability, and recoverability of EV parts, in particular the electric battery. The disposal of waste batteries is already covered in the proposal to repeal 2006/66/EC and amend 2019/1020 discussed above.

[124] European Commission (2023) '**REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL: on circularity requirements for vehicle design and on management of end-of-life vehicles, amending Regulations (EU) 2018/858 and 2019/1020 and repealing Directives 2000/53/EC and 2005/64/EC**'

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