PRICING OF ELECTRIC VEHICLE RECHARGING IN EUROPE

www.eafo.eu

Study performed by the European Alternative Fuels Observatory on request of the European Commission

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INTRODUCTION

▎E-mobility

Any pathway to mitigate climate change requires the rapid reduction of CO2 emissions and deployment of negative-emissions technologies to cut atmospheric concentrations of greenhouse gasses. Electromobility is an important way of enabling this reduction and technological advances and smart regulation will be the key to its deployment. Today transport contributes approximately one quarter of all energy related carbon dioxide emissions to the atmosphere, which is set to reach one-third, growing faster than any other sector.

To achieve a cleaner transport sector, a combination of measures needs to be implemented world-wide: better-designed cities; non-motorized transport facilities; reinforced public transport; and cleaner and more efficient on-road fleets, including electric vehicles.

With demand rising and manufacturers ramping up production capacities, the market will continue to grow. Looking forward, the confluence of government action, greater attention by OEMs, rising customer acceptance, and ingenious suppliers will accelerate the segment's growth by 2020.

How quickly electric powertrains are adopted and what share of the portfolio they will make up will depend on the development of the oil price (more specifically, fuel prices in Europe), the regulatory environment, and the deployment of infrastructure. However, it is most likely that, in the long run, EVs will become a commonplace and significant part of our everyday life.

Evolution 2020

In 2019, electric mobility seemed poised to reach a tipping point. With more than two million electric vehicles (EVs) sold around the world, electric passenger cars accounted for a record 2.5 percent of the global market. Then the COVID-19 pandemic hit, endangering lives, shaking up supply chains and workforces, and shutting down factories. The economic slowdown has significantly disrupted the auto industry, causing rapid declines in light vehicle (LV) sales.

Despite these unfavourable conditions for the broader LV market in 2020, EV sales more than doubled in Europe. Over the coming years, the EV market is likely to see a continued swift recovery and strong growth in Europe. Despite the COVID-19 pandemic, European leaders have maintained a strict fleetwide CO2-emission target of 95 grams of CO2 per kilometer by 2021.

European governments have introduced new purchase subsidies, tax reductions, or a combination of incentives to encourage EV adoption and promote green mobility. While they implemented those policies to reduce emissions, they are also responding to increased consumer concerns about sustainability and environmental issues. The incentives (such as Germany's subsidies toward the purchase of an EV), combined with the increase in available EV models, has led to soaring consumer demand—despite the continued COVID-19 pandemic. For example, in Germany vehicle registrations for plug-in hybrid EVs and battery-powered EVs increased by 200 percent in the first half of 2020, whereas in first half of 2019 it increased by only 43 percent.

Global automakers will reportedly launch approximately 340 BEV and PHEV models in the next three years, significantly improving supply, which was previously a barrier to market uptake. The OEMs' increased attention mainly reflects tougher emissions targets, especially in Europe, and announcements that several countries, as well as cities around the world, will set end dates for the sale of diesel- and gasoline-powered vehicles. Norway, for example, wants BEVs to account for 100 percent of its new-car sales by 2025. California, France, and the United Kingdom have also proclaimed that they will end sales of ICEs.

While the rebound from the COVID-19 crisis will differ by country, we see that Europe is likely to make a quick recovery. Europe's EV market share is also increasing, in line with trends that were occurring before the COVID-19 crisis. The market share rose from 3 percent in 2019 to 7 percent by June 2020. By 2022, we expect that EVs may have a 12–15 percent market share in Europe—slightly higher than the pre-crisis projection in the most likely scenario.

In addition to instituting monetary subsidies for EV purchases, several governments are investing in recharging infrastructure as part of their economic stimulus programs. Measures range from direct investments in public recharging points, to subsidies for the installation of private recharging points at homes and workplaces.
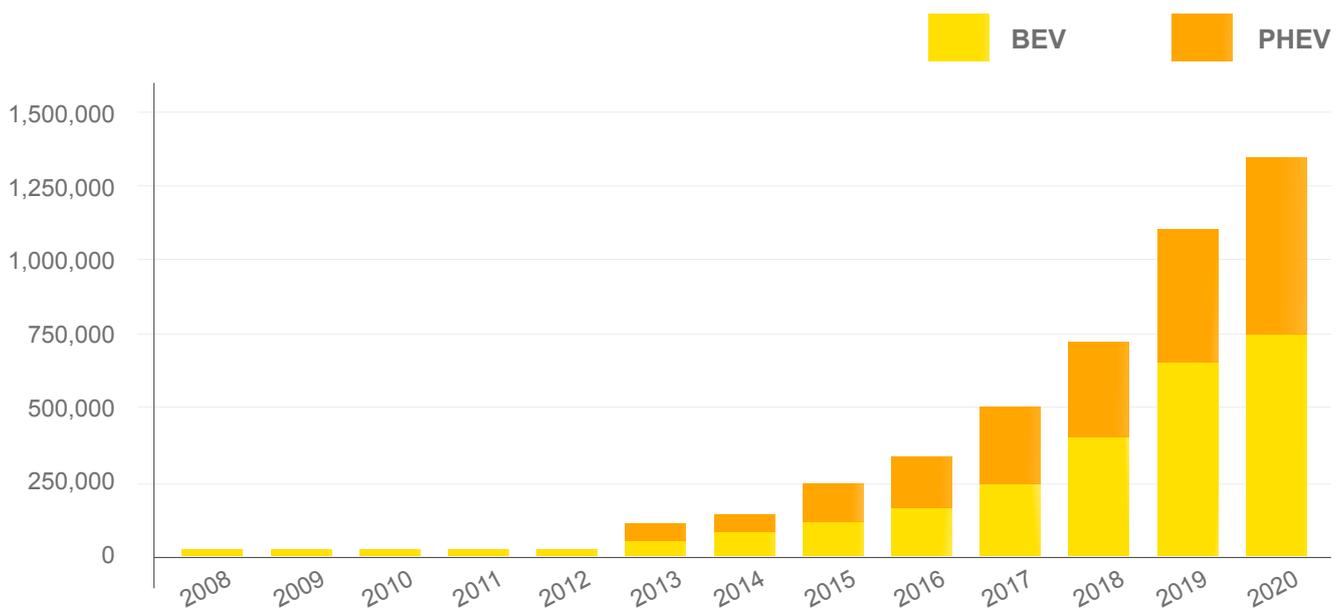
Source: www.eafo.eu AF FLEET M1 Electricity (2020) The total number of BEV and PHEV passenger cars.

The Electric Vehicle Recharging Demand Structure

EV users tend to follow a recharging hierarchy that starts at home. Most individual passenger cars remain parked at home for eight to twelve hours at night, and home recharging can be easier and often cheaper than recharging elsewhere.

In a home-centered base case, approximately 75 to 80 percent of EV owners in the European Union should have access to recharging at home and/or at work, which should provide up to 75 percent of their energy needs in 2020. Even when considering the role of public recharging infrastructure, the highly relevant role of recharging at home will need to be taken into account.

Choosing normal, fast, or ultra-fast recharging

The second relevant question beyond where EV owners will recharge, concerns the type of technology they will use.

Two broad categories of EV recharging infrastructure exist today:

1. Alternating-current (AC) recharging, also known as level 1 or level 2. In this system, an in-car inverter converts AC to direct current (DC), which then recharges the battery at either level 1, equivalent to a household outlet at max 3.7 kilowatts (kW), or level 2, where it operates at powers up to roughly 22 kilowatts.

However, recharging speeds can be limited by the vehicle itself: when for instance a BEV with a 1-phase inverter is connected to a 22 kW recharging point, the vehicle itself will be the bottleneck and will recharge at a maximum of approximately 7 kW, as opposed to a BEV with a 3-phase inverter, which can recharge at 11 or even up to 22 kW.

2. DC recharging, also known as level 3 or direct-current high power recharging. This recharging system converts the AC from the grid to DC, before it enters the vehicle and recharges the battery without the need for an inverter in the vehicle itself. Commonly called 'DC fast charging' (officially called 'DC high-power recharging'), it operates at powers from 25 kW to more than 350 kW.

As in the case with AC recharging, the vehicle can be the bottleneck for the speed of DC recharging. The type of batteries inside an EV and their State of Charge (SoC) dictate how fast energy energy can be transferred from the recharger to the batteries. When the batteries are almost empty, they can take up energy much faster than when they are almost full. The picture below from Fastned shows the so called 'charging curve' for a Tesla Model 3 Long Range on different DC rechargers. When recharging at a 300 kW recharger, the drop in recharging power occurs already at 40% SoC.

As electric-vehicle demand looks increasingly likely to grow and EVs emerge as viable alternatives to ICE cars, an ecosystem of industries needs to stack hands on actions that can enable their broader use.

Closing the recharging gap is one such action, and resolving it will require a concerted, collaborative effort. That's why the accelerated deployment of recharging infrastructure should top the agendas of all stakeholders across the EV ecosystem, especially if recharging access becomes the number-one impediment to EV penetration.

Understanding specific local needs for early demand and adaptation will be the key to making effective targeted investments, matching demand and supply, and enabling quick returns on investments.

Tesla Model 3 Long Range
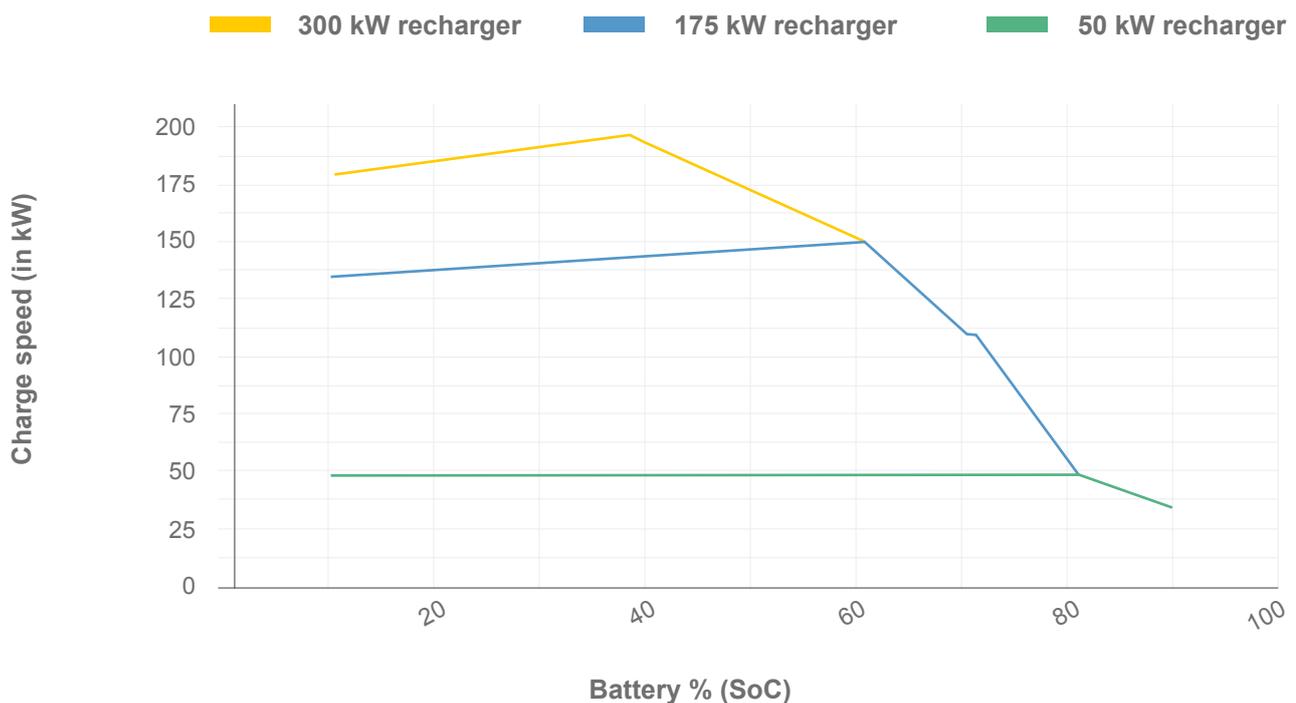
	AC-recharging Wall outlet	AC-recharging Wall outlet IC-CPD	AC-recharging Wallbox	AC-public recharging-station	DC - recharging
Mode	1	2	3		4
Standard		IEC 62752/UL 2231	IEC 61851-1/-21/-22		IEC 61851-23
Power class	max. 1ph 16A (3.7kW) max. 3ph 16A (11kW) max. 3ph 32A (22kW)		max. 1ph 16A (3.7kW) max. 3ph 63A (43kW)		25kW - 400kW

	N. America	Japan	EU and the rest of markets	China	All Markets except EU
AC	J1772 (TYPE 1)	J1772 (TYPE 1)	Mennekes (TYPE 2)	GB/T	Tesla
DC	CCS1	CHAdeMO	CCS2	GB/T	
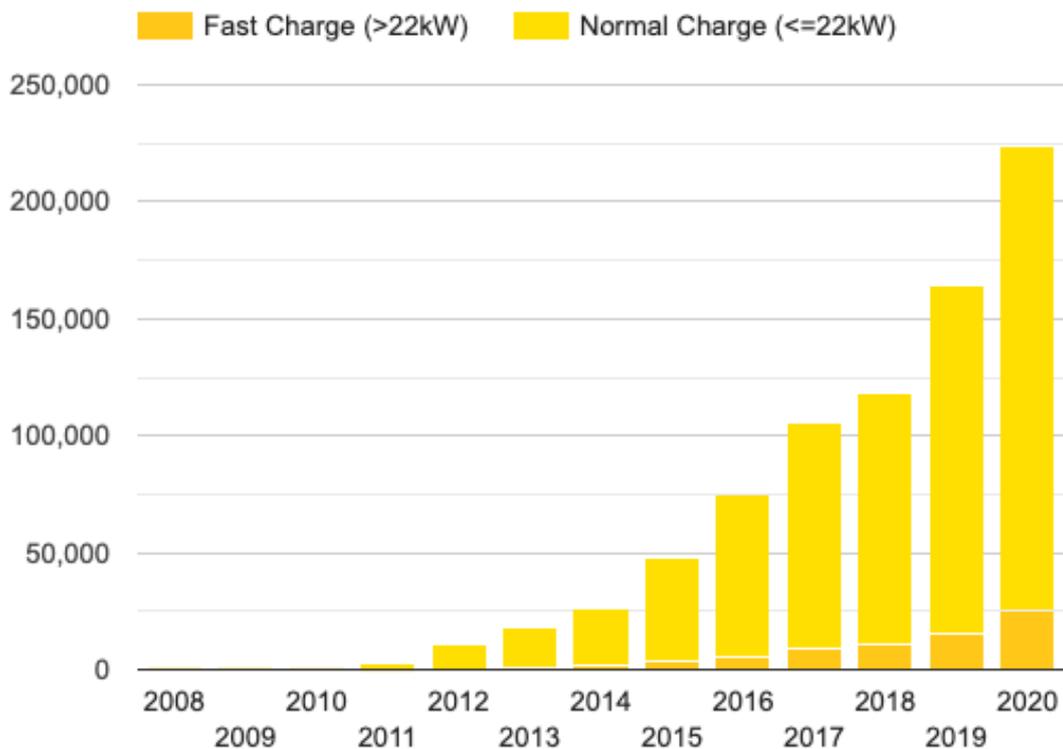
Source: www.eafo.eu (December 2020) Total number of Normal and High power public recharging points

Recognizing the recharging-capacity gap

Unlike traditional internal-combustion engine (ICE) vehicles, which typically only refuel at gas stations, EVs can recharge at multiple locations and in multiple ways.

Poor range and the availability of recharging points, are still the two biggest bottlenecks to EV uptake, as the McKinsey EV Consumer Survey 2019 shows.

Nowadays, with new EV models available to market, increasingly boasting ranges over 300 km and increasing trust in battery durability, some concerns are slowly moving to the background. However, if consumers purchase EVs at the expected rates in the next five to ten years, a lack of recharging infrastructure could become an obstacle to EV adoption.

Where consumers ranked recharging related concerns (i.e. not having sufficient recharging points available) as the least serious barrier to EV purchase, nowadays it is one of their highest concerns, even while most recharging is currently carried out at homes and workplaces (see figure below).

Along with different levels of EV adoption across regions, structural considerations will make recharging-station demand highly localized.
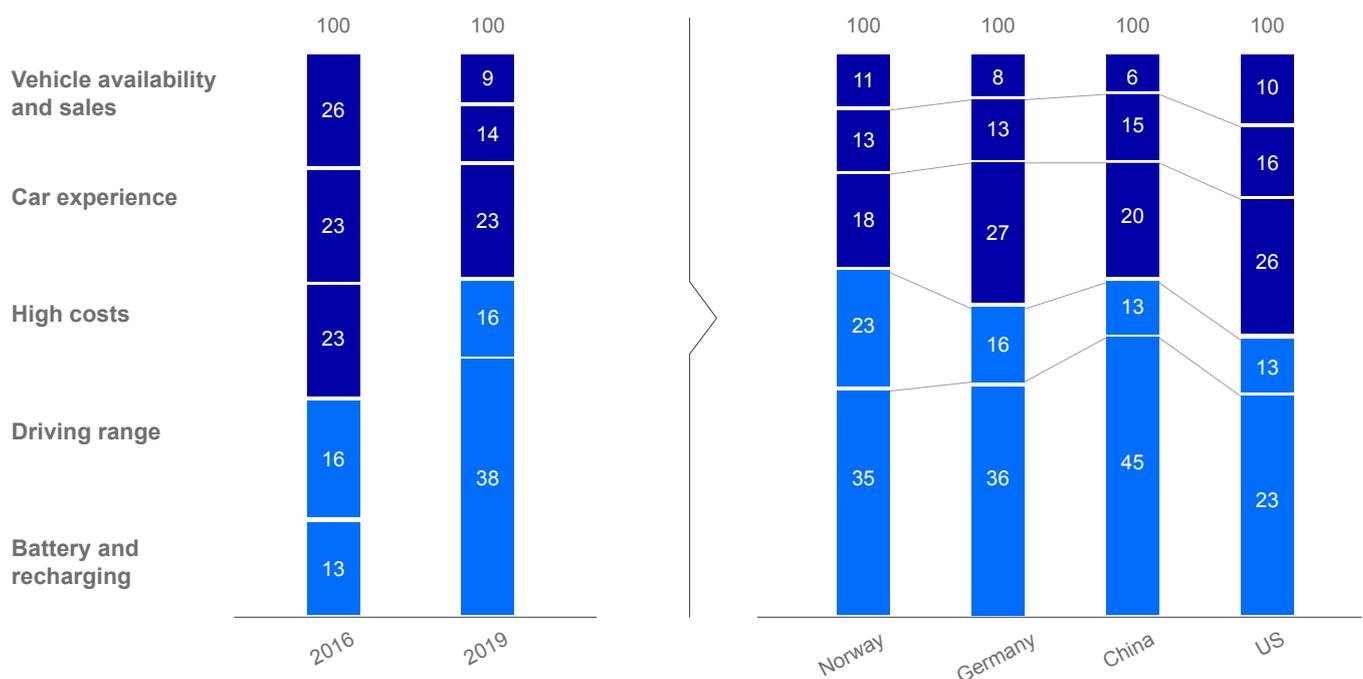
Source: McKinsey EV Consumer Survey 2016 and 2019

Number of BEV per public recharging point (December 2020)

Total amount of public recharging points per country (December 2020)

Normal (<22kW) and High power (>22kW) public recharging points (counted according to AFID)
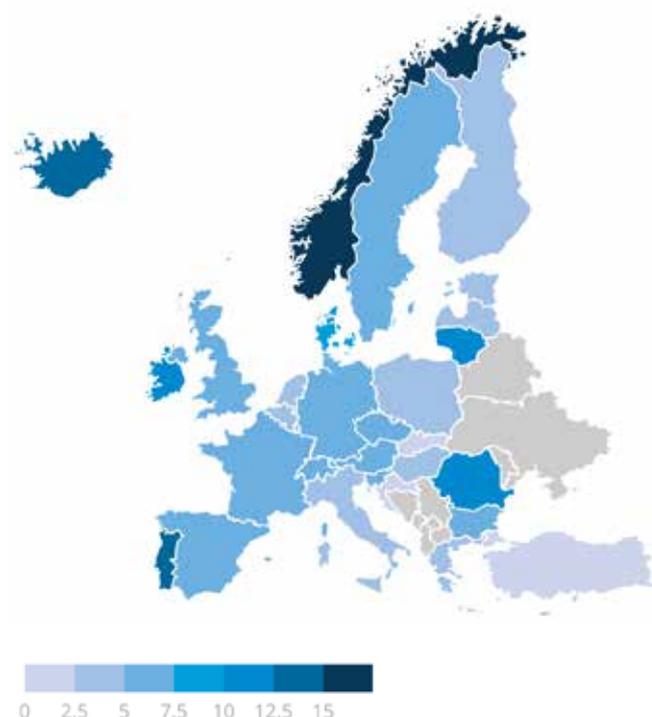
Source: European Alternative Fuels Observatory
created with LocalFocus
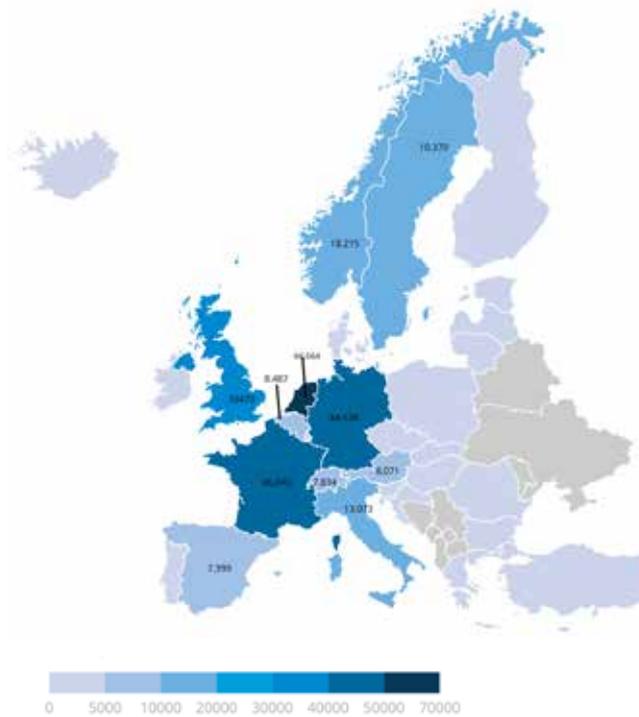
Source: European Alternative Fuels Observatory

The goal of this study

INTRODUCTION

To illustrate the differences between a fossil fuel car and an electric car:

Imagine you buy a car. The first thing you want to do is fill up the car, so you head for a gas station. But before you can even get a liter of fuel, you realise you can't just pay with your credit card or bank card, but you have to download an app first. In the app, you have to register an account, providing your name, address and a payment method. After all this hassle, you can finally fill up your tank. When you arrive later at the next petrol station, you can't do anything with the app and you come to the conclusion you will need to install another app, register another account, etcetera, or you have to get an additional RFID charge card.

The third time you come to a gas station and you can't fill up because you would have to have signed a contract beforehand and at the fourth station you need to send a SMS with your phone to some number to open the gate to the filling nozzle.

This sounds absurd and extremely awkward? This is exactly the reality at the recharging points for electric cars in Europe. It is therefore hardly surprising that some buyers continue to prefer the comfortable route with combustion engines and have easily accessible refuelling stations.

CHAOS

As described above, the amount and structuring of different tariffs of different providers for recharging in Europe makes recharging too complex for consumers at present. In many cases, consumers also don't know in advance how much they will have to pay for their recharging session. Tariffs are not displayed at the recharging point in a convenient way, or tariffs are made up of confusing combinations of price per minute, price per kWh an/or a session fee. EV-drivers are often taken by surprise by expensive recharging invoices when these finally arrive one or two months after the recharging session. According to some surveys, the average e-car owner uses five recharging cards and six apps to recharge their EV - in addition to credit cards, PayPal or other payment options offered by recharging point Operators and e-Mobility Service Providers, each with another tariff.

Recharging point operators can set prices as they want. In regions in which an expensive local recharging point operator has a monopoly, consumers may not even be able to avoid high prices or a subscription.

In view of the large divergence in tariff structures throughout the EU and within Member States, and in particular due to the large differences between contract-based and ad hoc prices, it has proven impossible to establish average prices for recharging per Member State. This was the initial objective of the study ordered by the European Commission.

This situation has the potential to greatly hinder the advancement of e-mobility, making consumers who are interested in e-mobility reconsider their purchasing decision. In addition to the range anxiety, there is also the worry of being overcharged at a recharging station, due to the intransparent recharging tariffs.

GOAL

The goal of this study is to give an overview of the costs of public recharging for electric vehicles across Europe.

If recharging an EV is overly expensive, it risks not catching on as fast as is needed to reach the ambitious climate targets set out in the

Green Deal and the European Climate Law. An open and competitive market and clear common technical standards are needed to ensure competitive pricing, ease of consumer experience, and to ensure the switch to e-mobility happens at a sufficiently fast rate.

The research and methodology

The data for this study was collected from an in-depth analysis of the recharging map apps accessible to EV users between February and March 2020.

The apps used for this research were Chargemap, New Motion and Plugsurfing. They were chosen because they indicate the recharging tariffs regardless of the electric vehicle driven. Not all apps offer this possibility without subscribing to a contract beforehand. Whenever possible, prices given by the CPO are also indicated. They are referred to as "ad-hoc prices" or "own prices, pay as you go".

We drew a distinction between what is referred to in the research as normal power recharging (up to 22 kW) and high power recharging (more than 22kW).

Many CPOs and networks coexist in some national markets. Our study does not take them all into account and focuses on the one identified as the biggest networks, in order to cover a substantial market-share.

Country Analysis

The following section provides an in-depth country-by-country overview of recharging infrastructure and pricing in the respective member state. The introduction to each of these analyses gives an assessment of the state of electromobility in that country. Indicators used include the number of recharging stations in

a given country (from EAFO) or the number of networks identified by Open Charge Map. This latter figure must be treated with caution as Open Charge Map is not always accurate and comprehensive: one network can be registered with different names and some networks might not be included.

The below table of content links towards the data collected per country at the end of the document.

State of the European market of public recharging infrastructures

European states are at very different stages of development of public EV recharging infrastructures. In some countries, the market competition is fierce, and many economic actors are involved in the race.

Norway, Netherlands, Germany, France and the UK are identified as the 5 front-runner countries in Europe. In other less advanced countries regarding electromobility, only a few players developed[1] public recharging infrastructure.

Some of these players have not yet introduced recharging fees, as it is the case for some Polish networks, or as it was the case until November 2019 in Ireland for the biggest Irish CPO.

Economic actors involved in public recharging infrastructures have developed many different business models. Speaking of CPOs, eMSPs or roaming platforms does not always refer to the same roles across European countries.

With the growing number of economic actors involved on the European market and the many networks accessible for drivers, a need for further harmonisation and interoperability at European scale arises.

Problems identified and recommendations

The initial goal of the research was to calculate the average cost of publicly recharging an electric vehicle in different European countries. After the first round of data collection, it occurred that this would not be easily possible due to the different units used to display prices and due to the large differences between contract-based and ad hoc price structures. For this reason, the findings of the research outline the difficulties that drivers find when navigating among EV public recharging infrastructures.

Below is a list of difficulties identified and options that should be considered to address through legislation.

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1 Source: ICCT/EAFO, 2021, available at: https://www.eafo.eu/sites/default/files/2021-03/EAFO%20Europe%20on%20the%20electrification%20path%20March%202021.pdf

1. Lack of transparency in recharging prices

The Directive on the deployment of Alternative Fuels Infrastructure (AFID) states that transparency should be ensured regarding EV recharging prices.

> **Article 4-10:** *"Member States shall ensure that **prices charged by the operators of recharging points accessible to the public** are reasonable, easily and clearly comparable, **transparent** and non-discriminatory."*

DIFFICULTY IDENTIFIED

Finding data for the research was time consuming due to the lack of comprehensive sources collecting them. The solution was to go through different apps available to consumers and reference the prices indicated there, without subscribing to a contract beforehand. This information should always be accessible to the public and updated regularly.

RECOMMENDATIONS

In order to improve the transparency of prices:

- All pricing for EV recharging should be made readily available and easily accessible for all consumers within the EU. Ideally consumers should at least know quantity, speed, and price prior to recharging.

- Prices should be displayed at the recharging station (i.e. through the physical display on the recharging point)

- Prices should be made available through an easily accessible data hub (such as National Access Points).

2. Unclear price settings for consumers

The Directive on the deployment of alternative fuels infrastructure (AFID) further mandates Member States to ensure the comparability of prices at recharging points:

> **Article 4-10:** *"Member States shall ensure that prices charged by the operators of recharging points accessible to the public are reasonable, **easily and clearly comparable,** transparent and non-discriminatory."*

DIFFICULTY IDENTIFIED

Observations suggest that prices are not easily and clearly comparable. A variety of tariff structures apply on the market. The cost of a recharging session can be based on the time spent recharging (€/minute), on the energy used (€/kWh) or on a flat fee for the whole session (€/session). A combination of two or even three of these tariff criteria is also common. On top of these three main types of billing, several other fees may apply depending on the recharging schedule (day or night recharging), on the time spent recharging (extra fee after a certain amount of time recharging) or on payment for a parking slot for example.

All these options to display information makes it difficult for the driver to anticipate the cost of a recharge at a public recharging point. This situation is not user friendly and may deter drivers from switching to electric driving.

At the same time, in certain situations, Member States' legislation can limit the choices for operators. For instance in Germany, kWh pricing is mandatory, whereas it is also allowed to include additional time-based parking fees or other infrastructure

fees[2]. In France, kWh pricing is only possible if certified metering is in place. However, there are no specifications and requirements set for DC meters (especially ≥150kW), hence it is not possible to certify metering solutions (yet) forcing operators to use time-based pricing.

There is, therefore, a need to harmonise price indications without hindering the freedom of operators to set their own price (and price structure).

RECOMMENDATIONS

In order to improve comparability of prices:

- Maintain the flexibility to pay ad-hoc and without having to set up a contract with a particular service provider

- Price settings to consumers should be standardised: price per kWh with necessary session fees.

- Regulatory requirements for price settings accross Member States should be harmonised.

3. Gaps in network-interoperability: roaming

The AFID acknowledges that the services provided to drivers to recharge their car can be based on a contract. Due to the many companies active on the market, the Directive calls for the interoperability of networks.

> *Article 4-8: "The operators of recharging points shall be allowed to provide electric vehicle recharging services to customers on a contractual basis, including **in the name and on behalf of other service providers**."*

Roaming is in the business interests of both CPO and eMSP alike and is achieved via roaming platforms or direct connection. Both connections are suitable options as roaming platforms connect a lot of smaller businesses while larger players can offer additional services via direct connection.

DIFFICULTY IDENTIFIED

In some instances, subscribing a contract with one EMSP does not guarantee access to a comprehensive network. National situations are varied on this matter and European roaming is not well established, as shown by the gaps in the data collected from the three different apps.

This is an issue for consumers. Subscribing to one contract might not be enough to access all the networks available. Having to subscribe to several contracts is inconvenient at least but can also be costly. Besides, having to either subscribe to multiple contracts or recharging ad-hoc with various different charge cards and/or payment methods can make recharging confusing and roaming with an EV cumbersome.

The situation is further complicated by the applicability of differing roaming fees depending on the network used by an EV-user, as a result of the differing underlying contractual arrangements made by the EV-user's EMSP and the multitude of CPOs at whose recharging points EV-users can recharge via roaming. The applicability of a multitude of differing roaming fees depending on the network used even causes issues for EMSPs, in particular when transactions are facilitated through roaming platforms. This very often results in the late communication by the EV-user's EMSP of the roaming fees applicable to a specific transaction; sometimes only weeks after the recharging session took place.

[2] https://www.bmwi.de/Redaktion/DE/Downloads/P-R/preisangabe-fuer-und-abrechnung-von-ladestrom-fuer-elektromobile-rechtsgutachten.html

Furthermore, the market of public recharging infrastructures is today especially dynamic: newcomers enter the market, substantial changes in the price structure can occur and the overall cost of driving an electric vehicle can be rather unstable. Therefore, it is difficult for consumers to foresee what their contract gives them access to in the long term.

RECOMMENDATIONS

In order to improve cross-network interoperability:

- Based on best practices in the EU and worldwide, the European Commission should mandate national governments to organize cross-network compatibility. (eg: MOBI.E in Portugal)

- EMSPs should be obliged to communicate applicable roaming fees ahead of a recharging session.

- Flexibility to pay ad-hoc using common payment options and without having to set up a contract with a particular service provider should be maintained.

- The cost of ad-hoc roaming, which can currently be unreasonably high, should be legally limited.

- Ensure clarity and quicker exchange of applicable roaming fees to avoid consumers receiving their bill weeks after roaming ad-hoc

Conclusion

In conclusion, the study has revealed that EV users in the EU are currently facing the following difficulties in relation to the pricing of electromobility services: a lack of transparency in recharging prices, and a lack of comparability between different price settings. Moreover, since the study used apps provided by three different EMSPs to analyse contract-based price setting, it revealed that all three apps covered different recharging points while none of the three offered comprehensive coverage to EV-users.

The conclusions of this study, and the problems identified through this study, indicate that several provisions of AFID, and not least Article 4(10), have not yet been fully or correctly implemented in Member States, at least in practice. The proposal for the revision of AFID, planned for summer 2021, provides an excellent opportunity to address these issues.

In particular, the revision of AFID could provide an opportunity to create more transparency over recharging prices in Europe. Operators of recharging points could be mandated to provide consumers with information on, at a minimum, quantity, speed and price prior to recharging. One convenient way of displaying such information would be at the recharging point, e.g. through physical displays.

To improve comparability of prices, AFID could harmonise regulatory requirements for price setting across the EU. One option would be to make price data available via centralised data hubs. The harmonisation of price measurement (price/kWh) could also be considered.

One last area of concern identified in this study relates to the contract-based recharging by EV-users at networks operated by companies with whom they don't have a direct contractual relationship (cross-network 'roaming' or 'e-roaming'). Not only are roaming fees intransparent, they can also be very high. The AFID review could potentially address these issues by obliging EMSPs to communicate applicable roaming fees ahead of the recharging session.

Acknowledging it may take time for contract-based recharging to fully mature, even in the onset of legal obligations to that end, legislators could use the AFID review to ensure a convenient fall-back recharging and payment option, the ad hoc recharging option, remains available. In this respect, it could be considered to mandate a single common payment solution (e.g. bank card payment) for ad hoc payments.

The implementation of these recommendations would not only make pricing structures in EV recharging more transparent to consumers, but it would thereby also enhance the functioning of the recharging market and spur competition, better matching supply and demand and ultimately bringing consumer prices down across the EU.

This will make electromobility significantly more attractive from a consumer perspective – both by lowering cost and by enhancing user experience – and thereby help the EU in achieving its ambitions for the decarbonisation of transport.

Austria

In Austria in 2019 there were 4236 public recharging stations, which represents 9 vehicles per recharging point. The dominating price structure is time-based payment. According to Open Charge Map, there are 17 networks operating the 2524 recharging points listed on the website.

The roaming system promoted by the Austrian Federal Association for Electromobility (BEÖ) contributes to a greater interoperability for consumers and could therefore provide an interesting "best practice" example.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
EVN AT	0.035€/min (3.7kW) 0.1€/min (11kW) 0.2€/min (22kW)	-	-	**Variable** 0.08€/min (3.8kW) 0.16€/min (13kW) 0.22€/min (27kW) (…)
Has.to.be	Not available, variable with unit owner	**Variable** 0.022€/min (22kW) 0.40€/kWh (11kW) 0.099€/min (11kW) (…)	**Variable** 0.396€/kWh (22kW) 0.11€/min (22kW) 0.264€/kWh (22kW) (…)	0.13€/min (27kW)
Smatrics	0.04€/min (11kW) 0.15€/min (22kW)	-	-	0.19€/min (22kW)
Wien Energie	**City 11kW** 2.9€/hour (day) 0.7€/hour (night) **Parking/Spot** 1.2€/hour (3.7kW) 2.9€/hour (11kW) 4.9€/hour (22kW)	**Variable** 0.088€/min (3.7kW, 11kW) 0.323€/min (11kW) 0.191€/min (11kW)	**Variable** 0.088€/min (3.7kW) 0.191€/min (11kW, 22kW)	**Variable** 0.08€/min (3.8kW) 0.17€/min (13kW)

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
EVN AT	43kW: 0.4€/min 50kW and 80kW: 0.45€/min	-	-	0.88€/min
Has.to.be	Not available, variable with unit owner	**Variable** 0.22€/min 0.143€/min 4.99€/session (…)	**Variable** 0.22€/min (50kW) 0.33€/min (50kW) 0.726€/kWh (50kW, 80kW) (…)	0.3€/min (135kW, 50kW)
Smatrics	0.45€/min	-	-	0.19€/min (22kW)
Wien Energie	15€/hour	0.99€/min (43kW, 50kW)	0.99€/min (43kW, 50kW)	0.9€/min

Belgium

In Belgium in 2019, there were 6464 public recharging stations, which represents a ratio of nine vehicles per recharging point. The market is rather well developed. The prices are time based or energy based. According to Open Charge Map, there are 30 networks operating the 1767 recharging points listed on the website.

In Belgium, e-mobility service providers are often provided with the home energy supplier. They offer interesting advantages to their consumers for using their network.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Allego	0.325€/kWh (billed to the EMSP)	Variable (11kW) 0.32€/kWh; 0.39€/kWh	0.433€/kWh (11kW, 22kW)	0.34€/kWh
Blue corner	0.40€/kWh (AC) + 0.01€/min if charge completed and vehicle still plugged	0.48€/kWh after 8h adding 0.011€/min after 20h 0.48€/kWh (3.7kW, 11kW)	-	0.4€/kWh + 0.5€/session + 0.01€/min (11kW)
EV Box	Not available	0.36€/kWh	-	0.35€/kWh (11kW)
Last mile Solutions	Not available	1 station for free	**Variable** Free 0.333€/kWh (22kW) 0.466€/kWh + 0.666€/session (11kW)	0.34€/kWh (11kW) 0.48€/kWh (3.7kW

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Allego	0.65€/kWh (billed to the EMSP)	**Variable:** 0.72€/kWh 0.65€/kWh 0.25€/min+0.76€/kWh	0.86€/kWh	0.69€/kWh
Blue corner	0.69€/kWh (AC) + 0.25€/min if charge completed and vehicle still plugged	-	-	-
EV Box	Not available	-	-	-
Last mile Solutions	Not available	2€/session + 0.80€/kWh (one station)	-	0.48€/kWh (50kW) 0.34€/kWh (43kW)

Bulgaria³

In Bulgaria in 2019, there were 111 recharging stations, which represents 14 vehicles per recharging point. The market is still at an early stage of development. According to Opencharge map, there are 3 recharging providers operating the 40 recharging stations listed on the website.

There is one main CPO on the Bulgarian recharging market. The prices are mostly indicated in kWh and vary with a day and night schedule. The different recharging speeds have different price structures: from a simple price per kWh to a starting fee combined with a price per minute and kWh.

There are few other players, who mainly offer free public recharging. The prices are given in euros, following the conversion rate 1BGN=0.51€.

Normal power recharging (up to 22 kW)

Network	Specification	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
ElDrive Bulgaria (AC charging 22kW)	-	0.24€/kWh	0.14€/kWh	-	-
ElDrive Bulgaria (DC between 20-24kW)	**Night**- From 22:00 to 5:59	€/min + €/kWh	0.11€/min + 0.17€/kWh	-	-
	Day - From 6:00 to 21:59	€/min + €/kWh	0.14€/kWh + 0.13€/min		
ElDrive Bulgaria 25kW DC	-	€/min + €/kWh + €/session	-	-	-

High power recharging (>22 kW)

Network	Specification	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
ElDrive Bulgaria	**Night**- From 22:00 to 5:59	0.28€/session + 0.10€/min + 0.28€/kWh	0.37€/session + 0.11€/min + 0.33€/kWh	-	-
	Day - From 6:00 to 21:59	0.28€/session + 0.08€/min + 0.25€/kWh	0.37€/session + 0.13€/min + 0.36€/kWh	-	-

³ Inputs from BAEPS, the Bulgarian Electric Vehicles Association

Croatia

In Croatia in 2019, there were 651 recharging stations which represents 1 vehicle per recharging point. The market is still at an early development stage. The prices are mostly given in kWh, although this is occasionally combined with a price per minute. According to Opencharge map, there are 9 recharging providers operating the 309 recharging stations listed on the website.

Some recharging stations are available with MOL Plugee operating the NEXT-E project in Slovenia, Romania, Croatia and Hungary. The numbers of recharging stations in Croatia remain marginal (6), providing both AC and DC recharging for different fixed prices.

The prices are indicated in euros, following the conversion rate 1HRK=0.13€.

Normal power recharging recharging (up to 22 kW)

Normal power recharging stations are in the huge majority free of use.

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
ELEN	No pricing list available	-	-	-
Gremo Na Elektrico	No pricing list available	-	-	-
Hrvastski Telekom		**Variable** FREE (most) 0.22€/kWh 0.02€/min	FREE	FREE

High power recharging (>22 kW)

There are not many high power recharging stations.

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
ELEN	No pricing list available	-	-	-
Gremo Na Elektrico	No pricing list available	-	-	-
Hrvastski Telekom		**Variable** FREE 0.35€/kWh 0.32€/kWh	**Variable** FREE 0.35€/kWh 0.32€/kWh	FREE

Cyprus

In Cyprus in 2019, there were 38 recharging stations, which represents a ratio of twelve vehicles per recharging point. The market is at an early stage of development. According to Open Charge Map, there is 1 recharging provider operating the 28 recharging stations referenced on the website.

No recharging stations are listed on Plugsurfing and New Motion. Chargemap shows very few normal recharging points (3) but as the Chargemap pass is not compatible with them, it is not possible to see the prices at the recharge points. When looking at the website of a local CPO, no pricing list is available. The recharging price depends of the unit owner, and the only indication found was for a station free of charge.

As the market is not yet developed in Cyprus, it is likely that most recharging stations still offer free recharging.

Czech Republic

In Czech Republic, in 2019 there were 1049 recharging stations, which represents 4 vehicles per recharging point. The market is developing. The prices are indicated per minute and per kWh. According to Opencharge map, there are 12 recharging providers active in Czech Republic on the 583 recharging stations referenced on the website. Many of the recharging stations are concentrated around Prague.

The prices are indicated in euros, following the conversion rate 1CZK=0.039€.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
E.ON Ceska	0.351€/kWh (AC)	-	-	-
Elektromobilita (ČEZ)	0.07€/min	-	-	-
PREmobility	2.34€/1h	-	-	0.13€/min

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
E.ON Ceska	0.429€/kWh (DC) 0.507€/kWh (ultrafast recharging)	-	0.52€/kWh	-
Elektromobilita (ČEZ)	0.35€/min	0.52€/kWh	-	-
PREmobility	7.8€/1hour	-	0.44€/min	-

26

Denmark

In Denmark in 2019, there were 2 678 public recharging stations, which represents 9 vehicles per recharging point. The market is well developed. The prices are indicated in kWh. According to Open Charge Map, there are 8 networks operating the 451 recharging points listed on the website. From what was observed, there tariffs are the same for normal and high power recharging in Denmark.

The prices are given in euros, following the conversion rate 1DKK=0.13€.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Clever	0.78€/kWh	1.15€/kWh (22kW)	1.31€/kWh	1.16€/kWh (22kW)
E.ON	32.37€/session (SMS) OR 0.72€/kWh (app)	1.19€/kWh (22kW)	1.31€/kWh	1.19€/kWh (22kW)

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Clever	0.78€/kWh	1.16€/kWh	1.31€/kWh	1.15€/kWh
E.ON	32.37€/session (SMS) OR 0.72€/kWh (app)	1.08€/kWh	1.31€/kWh	1.19€/kWh

Estonia

In Estonia in 2019, there were 398 recharging stations, which represents 4 vehicles per recharging point. The market is at an early stage of development. According to Open Charge Map, there are 3 recharging providers operating the 166 recharging stations listed on the website.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ELMO	0.24€/kWh after 60min + 0.1€/min added	-	-	-

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ELMO	0.22€/kWh after 180 min + 0.1€/min added	-	-	-

Finland[4]

In Finland in 2019, there were 1113 public recharging stations, which represents 15 vehicles per recharging point. The market is rather well developed. The prices are indicated per kWh or per minute. According to Open Charge Map, there are 10 networks operating the 1326 recharging points listed on the website.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Fortum	0.04€/min	0.04€/min + 0.31€/kWh (11kW, 22kW) 0.04€/min	-	0.05€/min
VIRTA	Variable with unit owner	0.68€/kWh (3.7kW, 22kW) 0.9€/min	0.68€/kWh	0.62€/kWh
Helsingi Energia	Variable with location and with night/day 2€/hour + 0.15€/kWh 1€/h0.15€/kWh 0.25€/kWh	-	0.68€/kWh	-

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Fortum	0.2€/min	0.20€/min	0.25€/min	0.9€/kWh, most not included
VIRTA	Variable with unit owner	0.90€/kWh	0.82€/kWh	0.9€/kWh
K Charge	0.20€/min + 1€/session	-	0.68€/kWh	-

| [4] Inputs from IMF – Technology Industries of Finland

France[5]

In France in 2019, there were 29 648 recharging stations which represents 8 vehicles per recharging point. The market is rather well developed, as France is considered as one the five front-runner countries for electromobility . The prices are mostly given in kWh, which is occasionally combined with a price per minute. Time limitations are sometimes introduced. According to Open Charge Map, there are 25 recharging providers active in France, but the website only covers 8023 recharging stations.

In France, local public networks represent an important part of the offer for normal and fast public recharging. However, the coverage from one region to another can be quite uneven. Each of these local actors sets their own price, which is not representative for the whole territory. They are most of the times open to roaming and integrated in the offer of eMSP nationally.

Normal power recharging (up to 22 kW)

Network	Own Prices without subscription	Plugsurfing prices	Chargemap prices	New Motion prices
Bouygues Energies et services	Not available, variable with unit owner (local networks…)	-	-	-
Mairie de paris	1€/15min Free at night	0.023€/min after 1h 0.293€/min	0.022€/min and 0.293€/min after 1h (22kW, 3kW)	0.27€/min
SPIE	Not available, variable with unit owner (local networks…)	-	-	-

High power recharging (>22 kW)

Nationwide networks are developing on the high power recharging market segment. Izivia with its Corri-Door network covers the highway, with some competition in specific segments, such as for example Move in Pure in South-East France. Other networks of auto manufacturers (eg. Nissan), and oil companies (eg. BP) are also deploying high power recharging stations. Free high power recharging networks can be found at supermarket or shops parking lots (Ikea, Lidl, Auchan…). The price structures for high power recharging can considerably vary.

Network	Own Prices without subscription	Plugsurfing prices	Chargemap prices	New Motion prices
Izivia	1€/5min (no contract)	0.29€/min + 0.79€/session	0.247€/min + 1.452€/session	-
Move in pure	5€/45min	0.15€/min	5.5€/charge + 0.24€/min after 30min of charge	0.154€/min
Freshmile	0.19€/kWh + 0.22€/min	VARIABLE 0.035€/min + 0.28€/kWh 0.046€/min	0.19€/kWh + 0.22€/min	-

Germany

In Germany in 2019, there were 39 922 recharging stations, which represents 7 vehicles per recharging point. The market is at a rather advanced stage of development and Germany is considered as one the five front-runner countries for electromobility[6].

There are many public recharging networks in Germany: Open charge map lists 108 for 30 415 recharging stations referenced on their website. Some of them are nation-wide, whilst others are localized in a region or a city.

They are public and private; and a lot of municipalities have developed their own networks. The different prices of these local networks can considerably change the price of driving electric from one area to another if the network is predominant in the region or in the city.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
EnBW	0.39€/kWh (AC)	0.109€/min	0.175€/min (22kW, 3kW)	0.37€/kWh (22kW, 3.7kW)
has.to.be	Not available, variable with unit owner	-	**Variable** 0.581€/kWh (22kW) 8.316€/session (22kW) 0.726€/kWh (22kW)	0.13€/min (27kW)
Innogy	0.39€/kWh	0.011€/min + 0.46€/kWh (22kW, 43kW)	-	0.42€/kWh + 0.01€/min (22kW)
New Motion	0.5€/kWh (22kW) 0.3€/kWh (11kW) 0.2€/kWh (3.7kW)	-	0.053€/min + 0.333€/kWh (22kW)	0.5€/kWh (22kW) 0.3€/kWh (11kW) 0.2€/kWh (3.7kW)

High power recharging (>22 kW)

22% of the recharging points in Germany are recharging at 43kW and more[7].

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
EnBW	0.49€/kWh (DC)	0.502€/min (50kW) 0.109€/min (43kW)	0.545€/min	0.7€/kWh
has.to.be	Not available, variable with unit owner	**Variable** 22€/session 0.58€/kWh 0.39€/kWh	0.726€/kWh	0.30€/min
Innogy	7.95€/session	10.47€/session (50kW)	-	9.52€/session
New Motion	2/session + 0.27€/kWh	0.55€/min	0.266€/min + 0.333€/kWh	2/session + 0.27€/kWh

[7] https://www.goingelectric.de/stromtankstellen/statistik/

Greece

In Greece in 2019, there were 52 recharging stations, which represents 17 vehicles per recharging point. The market is at an early stage of development. According to Opencharge map, there are 2 recharging providers operating the 118 recharging stations referenced on the website. Many recharging stations are free charge. When when there are fees, the cost is given per kWh, per session or per minute and session combined. The maps used to cover Greece are rather uncomplete, and the website Heliev was used to complement the study.

Normal power recharging (up to 22 kW)

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
Fortizo	**Variable** FREE 1€/session + 0.025€/min 7€/session	-	-	-
Charge.gr	No pricing list available	-	-	-

High power recharging (>22 kW)

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
Fortizo	2€/session + 0.22€/min	-	-	-
Charge.gr	No pricing list available	-	-	-

Hungary[8]

In Hungary in 2019, there were 692 public recharging stations, which represents 8 vehicles per recharging point. The market is at an early stage of development. The prices are indicated per minute, per kWh and per session. According to Open Charge Map, there are 7 networks operating the 1106 recharging points listed on the website.

20 recharging stations in AC and DC were also built as part of the NEXT-E project in Hungary. The prices are indicated in euros, following the conversion rate 1HUF=0.003€.

Normal power recharging (up to 22 kW)

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
E.ON	No prices available	-	-	-
Fortum	No prices available	-	-	-
NKM Mobilitas	0.15€/min	0.34€/kWh	0.42€/min	0.38€/kWh
ELMÜ	2.7€/session	0.004€/kWh	-	0.34€/kWh
MOL Plugee	5.97€/session	-	-	-

High power recharging (>22 kW)

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
E.ON	No prices available	-	-	-
Fortum	No prices available	-	-	-
NKM Mobilitas	0.24€/kWh	0.206€/min, 0.209€/min	0.42€/min	0.38€/kWh
MOL Plugee	8.97€/session	-	-	-

[8] Inputs from the Hungarian electromobility association

Ireland

In Ireland, in 2019, there were 1036 public recharging stations, which represents 10 vehicles per recharging point. The market is still at an early stage of development. According to Open Charge Map, there are 10 networks operating the 1097 recharging points listed on the website.

There is one dominant CPO on the market and pricing for this network was introduced in November 2019.

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ESB	0.33€/kWh	Free charge	0.43€/kWh +0.30€/min after 45min of charge	0.39€/kWh + 0.12€/min

High power recharging (>22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ESB	0.33€/kWh	Free charge	0.43€/kWh +0.30€/min after 45min of charge	0.39€/kWh + 0.12€/min

Italy[9]

In Italy, there were 4 414 public recharging stations in 2019, which represents 9 vehicles per recharging point. According to Open Charge map, there are 36 recharging providers operating the 12 892 recharging stations listed on the website.

The pricing structure for both normal and fast recharging is time based and/or energy based. It is frequent for a network to offer a monthly subscription giving access to a fixed amount of kWh per month.

Normal power recharging (up to 22 kW)

Several networks cover the country for the normal power recharging segment.

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ENEL X	0.45€/kWh (up to 22kW)	0.42€/kWh (up to 22kW)	-	-
Emoving A2A	No pricing list available without a subscription	-	-	-
Neogy (Alperia e Dolomiti Energia)	0.06€/min (22kW)	-	-	0.98€/kWh 0.67€/kWh
Duferco (Liguria e Val d'Aosta)	2.5€/hour (up to 22kW)	0.47€/kWh	0.47€/kWh	-

High power recharging (>22 kW)

Fewer networks than for normal power recharging are comprehensive on the high power recharging network in Italy.

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ENEL X	0.5€/kWh	-	-	-
Emoving A2A	No pricing list available without a subscription	-	-	-
Neogy (Alperia e Dolomiti Energia)	0.55€/min	0.87€/kWh	0.872€/kWh	-
Duferco (Liguria e Val d'Aosta)	2.5€/10min	-	-	-

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[9] Inputs from CIVES, the Italian Electric Vehicle Association of Italian Electrotechnical Committee.

Latvia

In Latvia in 2019, there were 234 recharging stations, which represents 3 vehicles per recharging point. The market is at an early stage of development. According to Open Charge Map, there are 2 recharging providers operating the 158 recharging stations listed on the website.

There is one dominant CPO in Latvia, its stations seen through the eMSP studied here only indicate it is active in fast recharging. However, on its website there is no specification regarding the recharging speed.

Normal power recharging (up to 22 kW)

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
e-mobi / CSDD	0.15€/min	-	-	-
SIA Ekstracom	0.21€/kWh	-	-	0.25€/kWh

High power recharging (>22 kW)

Network	Own prices	Plugsurfing prices	Chargemap prices	New Motion prices
e-mobi / CSDD	0.15€/min	0.262€/min	0.26€/min	0.13€/min

Lithuania

In Lithuania in 2019, there were 326 recharging stations, which represents 5 vehicles per recharging point. The market is at an early stage of development. According to Open Charge Map, there are 3 recharging providers operating the 34 recharging stations listed on the website.

None of the three apps used in this research covers networks in Lithuania. The biggest CPO in the country does not offer services associated to its recharging points. No pricing list is available when looking at this market actor.

The expansion of recharging stations continues in the country: the Mayor of Vilnius announced in November 2019 that 59 new fast recharging stations will become available by the end of the year in the capital. Most of the recharging stations in the country are free of use[10].

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go
Fortum	No pricing list available
Ignitis ON	0.20€/kWh (slow recharging AC connections)

High power recharging (>22 kW)

Network	Own prices – Pay as you go
Fortum	No pricing list available
Ignitis ON	0.30€/kWh (50kW)

[10] https://www.100procentuelektrinis.lt/naudinga-informacija/elektromobilio-ikrovimas/elektromobiliu-greito-ikrovimo-stoteles-lietuvoje/

Luxembourg

In Luxembourg in 2019, there were 960 recharging stations which represents 5 vehicles per recharging point. The market is rather well developed, especially for normal power recharging. The prices are mostly given in kWh, but can also incorporate a price per minute. Time limitations are sometimes introduced. According to Open Charge map, there are 8 recharging providers operating the 127 recharging stations listed on the website.

One CPO dominates the market. The offer of EMSPs is diverse and roaming is well established among market players.

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Chargy	Not available	0.27€/kWh (22kW)	0.268€/kWh (22kW)	0.18€/kWh (22kW)

High power recharging (>22 kW)

There are very few high power recharging stations in Luxembourg. Semi-public recharging stations are a component of them. Prices would not be an interesting indicator as they are not representative.

Malta

In Malta in 2019, there were 102 recharging stations, which represents 13 vehicles per recharging point. The market is at an early stage of development. According to Open Charge Map, there are 2 recharging providers operating the 54 recharging stations listed on the website.

No recharging stations are listed on Plugsurfing and New Motion, whereas Chargemap shows a few without indicating a price for recharging. It seems like there are no fast recharging points on the island. The main network on the island is from an OEM, and other networks appear not to have introduced pricing lists yet.

Netherlands

In the Netherlands in 2019, there were 50 466 recharging stations, which represents 4 vehicles per recharging point. The market is advanced, and Netherlands is considered one of the most advanced EU countries regarding electromobility[11]. The prices are mostly, but not exclusively charged per kWh. According to Open Charge Map, there are 33 networks on the 10 985 recharging stations listed.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Allego	**Variable** 0.37€/kWh 1.20€/hour 0.39€/kWh	0.37€/kWh	0.407€/kWh	0.34€/KWh
EV Box	Not available	**Variable** 0.36€/kWh 0.37€/kWh 0.29€/kWh	-	0.34€/KWh
LastMile Solutions	Not available	0.67€/session + 0.39€/kWh	0.426€/kWh + 0.333€/session	0.34€/KWh
Pitpoint	**Variable** 0.33€/kWh 0.32€/kWh 0.66€/kWh	-	-	0.34€/KWh
Vattenfall	**Variable** 0.3388€/kWh	-	-	0.34€/KWh

[11] As Norway is not an EU member states

High power recharging (>22 kW)

Based on the data provided by Laadpas, and on the collection made from the three eMSP selected, the chart below provides the details of high power recharging prices in the Netherlands.

Network	Own prices - Pay as you go	Laadpas data	Chargemap prices	New Motion prices
FastNed	0.59€/kWh	0.65€/kWh	-	0.59€/kWh
Allego	0.69€/kWh	Between 0.4 and 0.72€/kWh or combined prices per min + per kWh, per session + per min	0.76€/kWh	0.67€/kWh
Vattenfall	0.55€/kWh	-	-	-
NewMotion	0.69€/kWh	**Variable** 0.56€/min 0.37€/kWh	0.27€/min + 0.33€/kWh	-
E-Flux	0.71€/kWh	-	-	0.55€/kWh
Ecotap	0.69€/kWh	-	Variable: 0.47€/kWh + 0.67€/session; 0.67€/kWh; 0.33€/kWh	-

Norway[12]

In Norway in 2019, there were 12 473 recharging stations, which represents 24 vehicles per recharging point. The Norwegian market is at an advanced stage of development, as Norway has been transitioning towards broad electrification of transport for several years already. The prices are displayed per kWh and per minute, and sometimes combine both. According to Open Charge Map, there are 12 networks on 9 906 recharging points listed on the website.

Roaming between operators has been established, but there are also remarkable gaps. It is possible to recharge your vehicle with a mobile app or with an SMS, the latter one being more expensive.

The prices are given in euros, following the conversion rate 1NOK=0.099€.

Normal power recharging (up to 22 kW)

Many municipalities have set up their own network. Shopping malls and stores are also developing their own networks to attract customers. Some of them are free of use, other charge for the service.

Network	Specifications	Prices provided by Elbil	Plugsurfing prices	Chargemap prices	New Motion prices
City of Oslo	Daytime in the city center (9h-20h)	1.49€/hour	-	-	-
	Daytime outside the city center (9h-20h)	0.99€/hour	-	-	-
	Night (20h-9h)	0.5€/hour	-	-	-
Fortum Charge&Drive	-	0.1€/min	0.099€/min	-	0.124€/min
Lyse	-	0.01€/min + 0.25€/kWh	-	-	-
BKK	-	0.01€/min + 0.25€/kWh	-	-	-
Grønn kontakt	-	0.01€/min + 0.25€/kWh	-	-	-

[12] Inputs from Elbil, the Norwegian EV user association.

High power recharging (>22 kW)

It should be noted that some operators have different prices for ultrafast recharging as of 150kW.

Network	Prices provided by Elbil	Plugsurfing prices	Chargemap prices	New Motion prices
Fortum Charge&Drive	0.31€/min	0.31€/min	-	0.38€/min
Grønn kontakt	0.12€/min + 0.29€/kWh	-	-	-
BKK	0.25€/min + 0.57€/kWh	-	-	-
Lyse	0.25€/min + 0.57€/kWh	-	-	-
Ionity	0.83€/kWh	-	-	-
Circle K	0.49€/kWh	-	-	-

Poland[13]

In Poland in 2019, there were 919 public recharging stations, which represents 5 vehicles per recharging point. Poland is still at an early stage in the development of e-mobility and recharging infrastructure. According to Open Charge Map, there are 9 networks operating the 580 recharging points listed on the website.

Due to current legislation there is no separation between CPO and eMSP. Hence CPOs are operating as eMSP and simultaneously they are not obliged to grant access to their infrastructure to any other eMSPs (at least until the end of 2022).

The first operator to have introduced payable recharging service in Poland did so in May 2018. Several operators still offer free recharge to drivers.

The prices are indicated in euros, following the conversion rate 1PLN=0.24€.

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Fortum	Not available	-	-	-
Greenway Polska	AC - 0.27€/kWh (3h use maximum) DC (≤40kW) – 0.47€/kWh (1h45 use maximum)	0.2€/kWh	-	0.2€/kWh

High power recharging (>22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Fortum	Not available	-	-	-
Greenway Polska	0.53€/kWh for 1h30	0.6€/kWh	-	0.6€/kWh

[13] Inputs from PSPA, the Polish Alternative Fuels Association

Portugal

In Portugal in 2019, there were 3 069 public recharging stations, which represents 9 vehicles per recharging point. The number of public recharging infrastructure approximately doubled between 2018 and 2019. According to Open Charge Map, there are 7 networks operating the 1709 recharging points listed on the website.

In Portugal, EV drivers joining any eMSP are granted an access card for all public recharging stations, regardless of who is the recharging point operator. Therefore, eMSP prices can be more relevant.

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Mobi.E	Not available	-	-	-
PRIOE	0.01€/min	-	-	-

High power recharging (>22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Mobi.E	Not available	-	-	-
PRIOE	0.102€/min for the first 30min then 0.163€/min	-	-	-

Portugal

It is common for eMSP to offer different prices per hour, varying with a daily or weekly subscription. The daily subscription is made for people usually recharging their car in the weekdays, and weekly for people who have the same recharging use for all the week. It is then cheaper to recharge during some hours, hence allowing for a better grid management.

Some **eMSP offers:**

EMSP	Prices and price structures
Bluecharge	Varying with cycles seasons the hours that can be used Client: 0.19€/kWh; 0.16€/kWh depending on the hour and the contract chosen Not client: 0.21€/kWh; 0.17€/kWh
Digital Charging Solutions – ChargeNow	Variable prices not specified + 7.5€/card
Eco Choice – Charge2Go	*Prices in the defined hour:* 0.14€/kWh (green) or 0.13€/kWh (eco-green) *Prices outside the defined hour:* 0.18€/kWh or 0.17€/kWh
EDP Commercial	*Prices for non EDP client:* 0.21€/kWh *Prices for EDP client:* 0.168€/kWh To this the Special consumption price (IEC) and the VAT should be added, as well as CPO's charge which is variable.
Galp Power	0.489€/session + 0.162€/kWh
PRIO.E	0.0.102€/min for the first 30min then 0.163€/min
GRCAPP	*Prices in the defined hour:* 0.0981€/kWh – 0.14€/kWh + 0.0419€/session *Prices outside the defined hour:* 0.0987€/kWh – 0.18€/kWh + 0.0813€/session

Source: https://www.mobie.pt/how-electric-mobility and company websites

Romania[14]

In Romania in 2019, there were 376 public recharging stations which represents 9 vehicles per recharging point. The market is still at an early stage of development, and the number of public recharging stations more than trebled between 2018 and 2019. According to Open Charge Map, there are 3 networks operating the 84 recharging points listed on the website.

Prices are mostly indicated per kilowatt hour, sometimes per minute. Several operators provide free recharging in Romania, or are about to introduce a pricing list.

The prices are indicated in euros, following the conversion rate 1RON=0.21€.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
EON Drive	0.294€/kWh	-	-	-
Enel X	Free, pricing list to be introduced in April 2020	-	-	-
Renovatio e-charge	0.30€/kWh	0.30€/kWh	-	-
EVConnect.ro	Up to 11kW: 0.04€/min Up to 22kW: 0.15€/min	0.35€/kWh	-	0.33€/kWh

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Renovatio e-charge	0.41€/kWh	0.41€/kWh	-	-
EON Drive	0.399€/kWh	-	0.218€/min	-
Enel X	Free, pricing list to be introduced in April 2020	-	-	-
EVConnect.ro	0.45€/min	-	-	-

[14] Inputs from AVER Romania

Slovakia[15]

In Slovakia in 2019, there were 584 public recharging stations, which represents 3 vehicles per recharging point. According to Open Charge Map, there are 11 networks operating the 265 recharging points listed on the website. Prices are indicated per kWh or per minute depending on the network.

The two networks mentioned below for normal and high power recharging are acting as CPO and eMSP in Slovakia.

Municipalities also contributed to the development of recharging infrastructures and they are connected to different eMSP offers.

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ZSE (E.ON Group)	AC: 0.19€/kWh DC <40kW: 0.39€/kWh Free parking time vary with charging speed	-	0.48€/kWh 0.682€/kWh	0.43€/kWh
Greenway	AC: 0.25€/kWh DC<40kW: 0.44€/kWh Free parking time vary with charging speed	-	-	0.19€/min

High power recharging (>22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
ZSE (E.ON Group)	40-150kW: 0.49€/kWh	-	0.805€/kWh	0.73€/kWh
Greenway	40-150kW: 0.59€/kWh	-	-	0.59€/min

[15] Inputs from SEVA, the Slovak Electric Vehicle Association.

Slovenia[16]

In Slovenia in 2019, there were 576 public recharging stations, which represents 4 vehicles per recharging point. According to Open Charge Map, there are 6 networks operating the 194 recharging points listed on the website.

Recharging stations are mostly owned by energy market players. Some municipalities start to develop in this area. Roaming exists between some CPOs, but the whole country is still not connected by one operator. Some operators still offer free recharging, especially on the normal recharging segment.

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Gremo na Elektriko **(Elektro Ljublkana and Elektro Celje have the same price lists, other are free of use)**	X<7.99kW: 1€/session + 0.01€/min, after 180min 0.03€/min 7.99<x<14.99kW: 1€/session + 0.02€/min, after 180min 0.06€/min 14.99<x<23kW: 1€/session + 0.03€/min, after 180min 0.06€/min	0.55€/session + 0.044€/min	-	-

High power recharging (>22 kW)

High power recharging is available mainly on highways. Some recharging stations have been developed with the NEXT-E project in Slovenia, Romania, Croatia and Hungary. The numbers of recharging stations in Slovenia remain limited (10).

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Petrol Slovenia	0.22€/min	-	-	0.43€/min
MOL plugee	7.90€/session	-	-	-

🇪🇸 Spain

In Spain in 2019, there were 8622 public recharging stations, which represents 5 vehicles per recharging point. The prices are mostly indicated per kWh. According to Open Charge Map, there are 27 networks operating the 2772 recharging points listed on the website.

Some regional and municipal recharging networks are free of charge for drivers as the service is subsidised by public authorities.

Normal power recharging (up to 22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Fenie Energia	No prices available	1.10€/session + 0.28€/kWh	-	-
Iberdrola	0.30€/kWh	-	-	0.19€/min

High power recharging (>22 kW)

Network	Own prices – Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Iberdrola	0.30€/kWh	-	-	0.73€/kWh
Fenie Energia	No prices available	-	-	-
IBIL	No prices available	0.52€/kWh	0.386€/kWh	0.47€/kWh
GIC	0.45€/kWh	0.6€/kWh	-	0.55€/kWh
EDP Commercializadora	No prices available	0.53€/kWh	Free or 0.53€/kWh	0.48€/kWh

Sweden

In Sweden in 2019, there were 8 408 public recharging stations, which represents 23 vehicles per recharging point. The market is rather well developed. The prices are indicated in kWh, in minutes or per session, and sometimes combine several of these elements. According to Open Charge Map, there are 10 networks operating the 5822 recharging points listed on the website.

Prices are indicated per minute or per kilowatt hour depending on the CPO.

The prices are indicated in euros, following the conversion rate 1SEK=0.097€.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Fortum Charge & Drive	0.097€/min	0.10€/kWh	-	0.121€/min
E.ON	0.1455€/min	0.51€/kWh	0.644€/kWh	-
Bee Charging	0.291€/kWh	1.29€/kWh	1.306€/kWh	-
Vattenfall	0.291€/kWh	-	-	-

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Fortum Charge & Drive	0.2425€/min	Between 0.18 and 0.2€/min 11.28€/session (once)	-	0.304€/min
E.ON	0.2425€/min	0.88€/kWh	1.306€/kWh	-
Bee Charging	0.47€/kWh	1.29€/kWh	1.306€/kWh	1.22€/kWh
Vattenfall	0.23€/min (50kW) 0.34€/kWh (43kW)	-	-	-

The United Kingdom

In the UK in 2019, there were 27 204 recharging stations, which represents a ratio of 10 vehicles per recharging point. The market is rather at an advanced stage of development and the UK is considered one the five front-runner countries for electromobility[17]. The prices are mostly indicated per kWh. According to Open Charge Map, there are 53 networks on 23 215 recharging points listed on the website. Zap Map lists about 16 major networks.

Most networks are not active in Northern Ireland, where there is a dominant local CPO. Further geographically anchored networks also exist in a variety of other regions.

The prices are indicated in euros, following the conversion rate 1GBP=1.19€.

Normal power recharging (up to 22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Polar	0.2142€/kWh (app)	-	-	-
Charge your car	Variable 1.19€/session Other fees depending on the unit's owner	-	Variable 0.741€/kWh 0.576€/kWh	-
PodPoint	Free or variable	-	-	-
Source London	0.07€/min + higher price in London	-	-	-
Ubitricity	0.286€/kWh	-	-	-

[17] Research for TRAN committee – Charging infrastructure for electric road vehicles, June 2018

High power recharging (>22 kW)

Network	Own prices - Pay as you go	Plugsurfing prices	Chargemap prices	New Motion prices
Polar	0.357€/kWh (bank card) or 0.2975€/kWh (app) 150kW: 0.476€/kWh	-	-	-
Charge your car	**Variable** 1.19€/session Other fees depending on the unit's owner	-	-	-
Genie Point	0.36€/kWh + 1.19€/session	-	-	-
Instavolt	0.42€/kWh	-	-	-
Engenie	0.43€/kWh	0.57€/kWh	-	0.51€/kWh
PodPoint	**Variable** between 0.27 and 0.3€/kWh	-	-	-

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