



EV Charging Infrastructure in Europe Market Insights

Introduction



"Cars are responsible for around 12% of total EU emissions of carbon dioxide (CO₂), the main greenhouse gas."



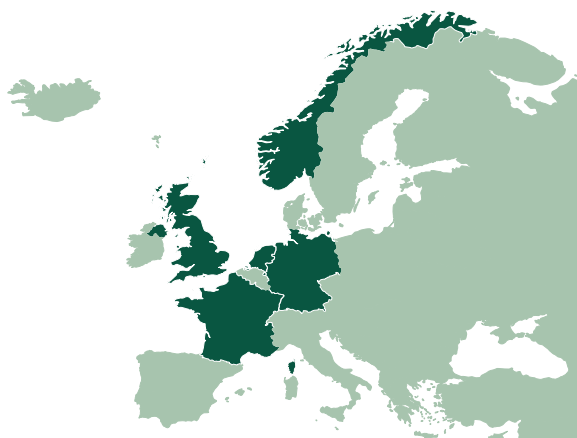
"We want to create 1 million charging points by 2030."

The reduction of carbon dioxide (CO₂) emissions – in particular from transport – is a key target of the European Union's (EU) current climate and energy policies. By 2050, emissions from transport are supposed to be 60% lower than in 1990, with a zero emission scenario as a long-term vision. Electromobility is regarded as a promising solution to tackle CO₂ emissions in individual transport and the proliferation of (plug-in) electric vehicles (EV¹) is currently strongly pushed by EU legislation and automakers.

While it would be well worth assessing the ecological and economical pros and contras of EVs, this paper is focusing on the recent developments regarding EV charging infrastructure, particularly in Europe.

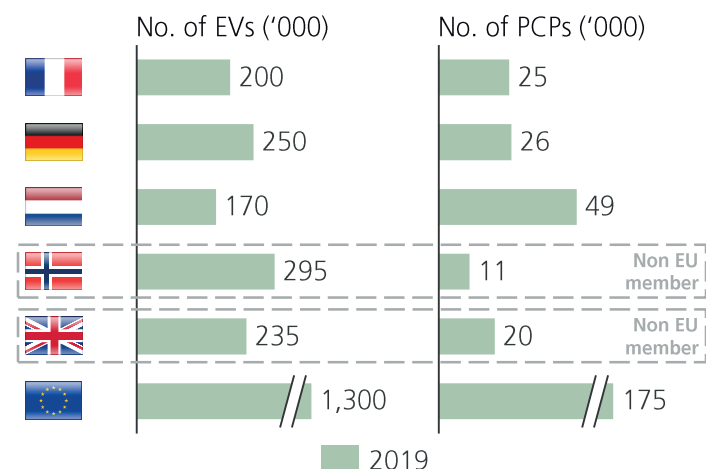
1 Current state of play

1.1 Status quo of EV proliferation and EV charging infrastructure In Europe



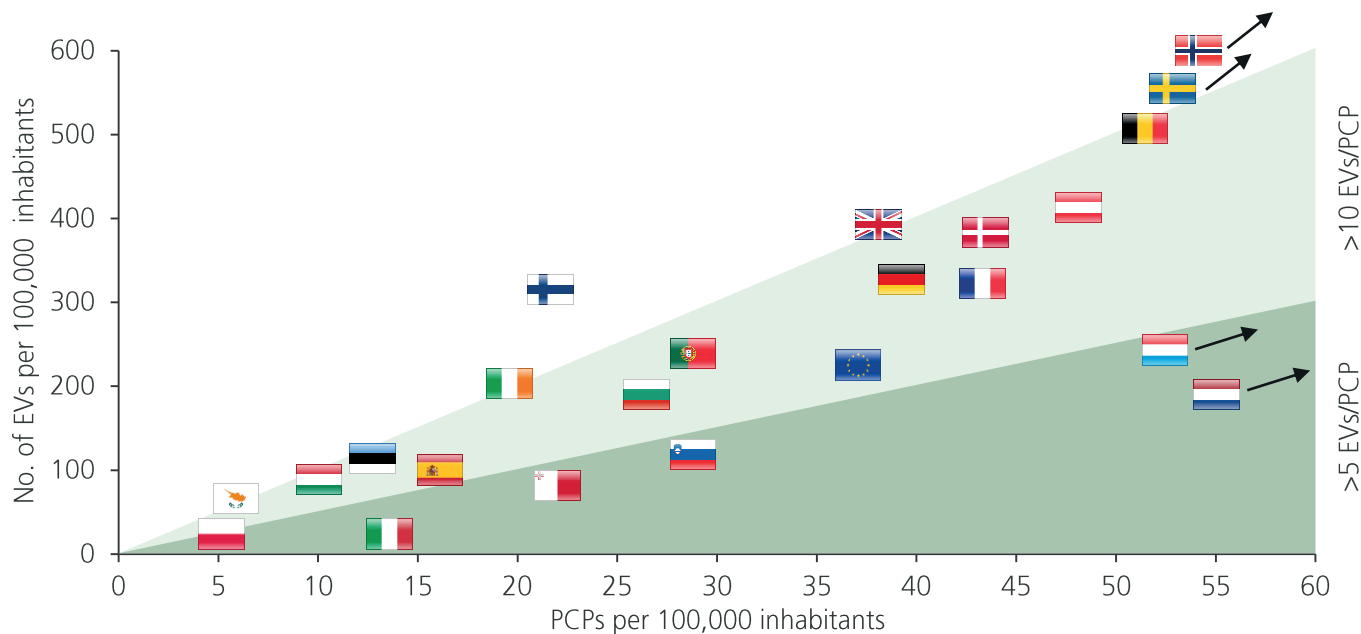
Based on the market share of EVs and the number of installed charging points, France, Germany, Netherlands, Norway and the United Kingdom are the five front-runner countries in Europe.

With a share of over 10% of the total car stock, Norway is the only European or even global EV market which has entered early maturity. All other European countries are more or less lagging behind their ambitions. With Norway and UK not being a member of the EU and the three other front-runner countries barely reaching 1% EV share of the total car stock, the current situation on EU-level is even worse compared to official target scenarios.



Looking at the number of public charging points (PCP²), the results are heterogenous. The Netherlands has the highest total number of public charging points while having the lowest total number of EVs of the front-runner countries in Europe, whereas in Norway the relation is exactly the opposite.

However, the simple comparison of absolute numbers is misleading. The European Commission, for instance, is applying the ratio of EVs/PCP and recommends a maximum of 10 EVs per PCP, which is currently well met in the EU (~7.4).



The idea behind metrics like the EV/PCP ratio is to obtain a better understanding whether the number of charging points for the number of EVs on the road can be described as sufficient. An insufficient EV charging infrastructure is regarded as a major barrier for the proliferation of EVs, as consumers might be reluctant to give up the convenience of conventional refueling.

While providing a better idea of the charging infrastructure coverage, the EV/PCP ratio is still incomplete. Norway, for example, with a ratio of over 26 would be regarded as highly insufficient

The figure above puts EVs and PCPs in context with the population size. With over 200 public charging points per 100,000 inhabitants, Norway has one of the densest PCP networks, only surpassed by Netherlands.

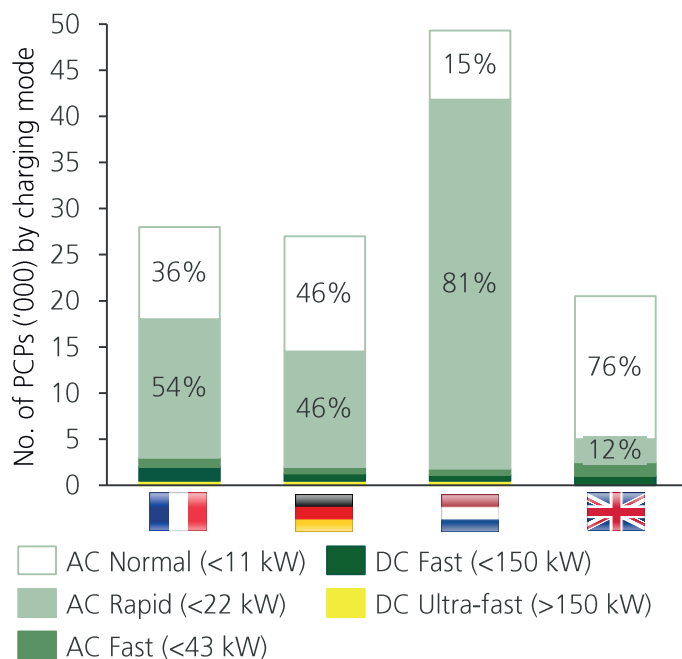
The PCP landscape in Europe is heterogenous, but overall adequate for the current number of EVs. Furthermore, the correlation between available PCPs and EV uptake doesn't seem to be as high as often assumed. However, a (perceived) dense PCP grid is a key driver for users to purchase an EV.

1.2 Technology overview

Charging modes		
AC Normal Charging	AC Rapid Charging	AC Fast Charging
⚡ 3.7 – 11 kW	⚡ 11 – 22 kW	⚡ Up to 43 kW
DC Fast Charging	DC Ultra-fast Charging	
⚡ 50 – 150 kW	⚡ > 150 kW	
↓↑ AC: Alternating Current ↑↑ DC: Direct Current		

One of the reasons, why switching to an electric vehicle is not yet completely hassle-free today, is the multitude of technological standards. At the moment, five connector types can be found across Europe. Furthermore, charging points are working with different protocols, payment methods and pricing models. The EU is trying to address this issue with norms and standards to enable pan-European traveling.

Another important aspect is the different charging modes of charging points, characterized by the power output, voltage and speed as well as the communication between vehicle and power outlet. The higher the power output of a charging point, the faster it charges an EV, provided the higher charging rates are supported by the car. Fast charging is crucial for seamless long-distance travels.

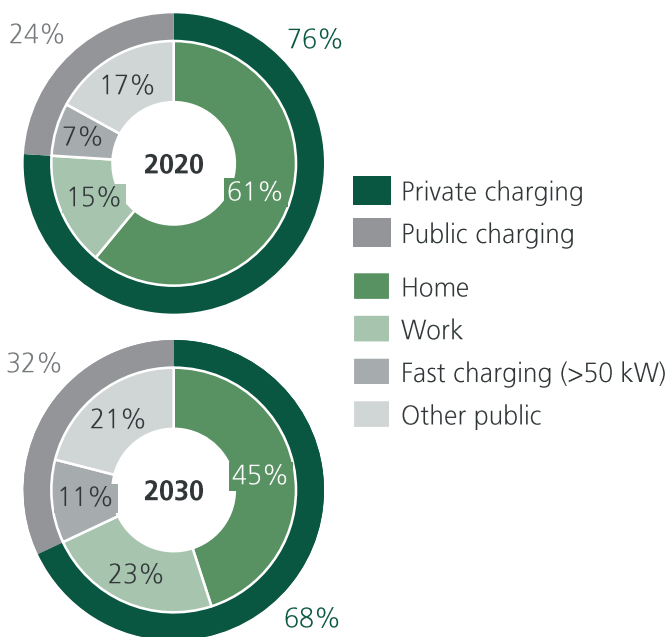
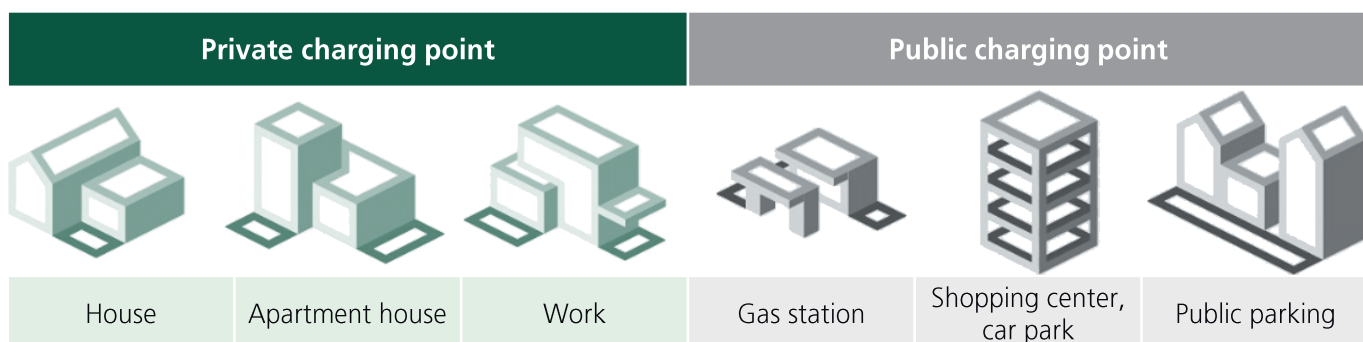


The diagram to the left illustrates the charging mode split of the PCPs of selected European countries. As illustrated, the majority of installed PCPs only supports charging up to 22 kW per hour, in the United Kingdom even only up to 11 kW per hour.

With the battery capacity of actual EV models of up to 100 kWh, recharging to 80% of the capacity at these rates would take between four and eight hours. Current ultra-fast chargers with charging rates of 350 kW need less than 25 minutes for the same operation, if supported by the EV (maximum charging rates of currently available selected models ~250 kW per hour).

The PCP landscape in Europe is quantitatively sufficient, but not qualitatively. Especially for long-distance travels, a comprehensive network of fast and ultra-fast chargers is necessary.

1.3 Charging behavior



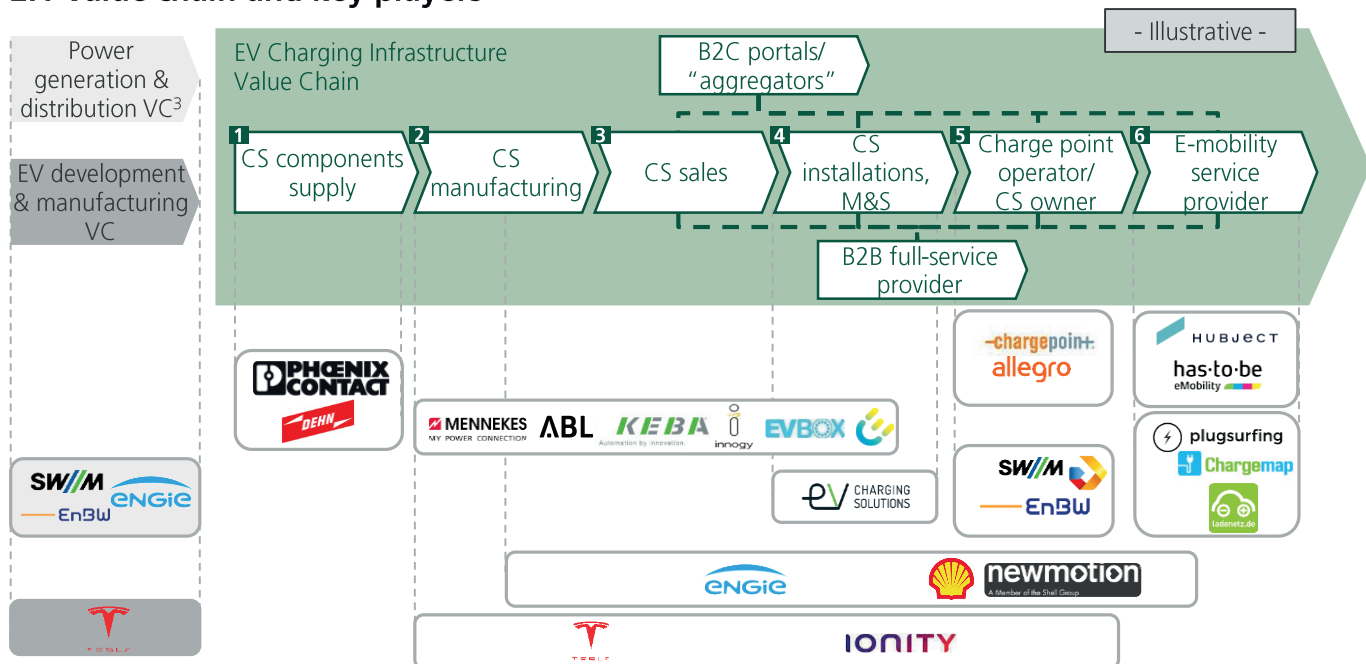
While the public EV charging infrastructure is often the center of debates about challenges for EV proliferation, the figure to the left shows where charging today mainly happens: at private locations such as home and work. One reason for this is that primarily persons with private access to charging points belong to the early adopters of e-mobility.

This can be explained mainly by the comparatively easy access to electricity at almost every urban location. Therefore, the share of public charging is only expected to increase from 24% today to 32% in 2030. Within private charging, the share of charging at work is expected to significantly increase in the same period.

The EV charging today and in the near future will mainly happen at home and work.

2 The EV charging eco system

2.1 Value chain and key players

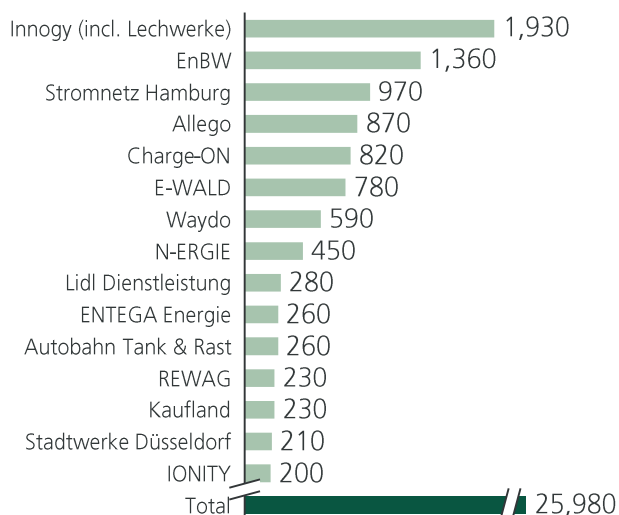


A term often used when comparing the ecological footprint of different powertrain types of vehicles is “well to wheel”, which is also a perfect description for the EV charging infrastructure value chain. The generation, transport, distribution and usage of energy for electric vehicles is almost completely different to fossil fuel powered cars. This circumstance offers a variety of new niches and business models.

The above illustration gives an idea of key elements and players involved. Engie, for instance, evolved from a utility to a full-service provider, supplying charging stations as well as e-mobility services, while carmakers like Tesla are reshaping the automotive industry by also providing their customers with energy instead of ‘just’ selling cars.

The increasing e-mobility momentum offers an opportunity for established players and newcomers to actively participate in the new EV market environment.

2.2 Key operators in Germany



The PCP operator market in Germany is fragmented with the top 15 operators making up for about 40% market share, leaving 60% to operators with under 200 PCPs each. Innogy with almost 2,000 and EnBW with ~1,360 charging points are the market leaders.

Compared to global players like ChargePoint Inc. with over 100,000 and Engie/EVBox with over 60,000 charging points, those numbers are close to zero. A possible explanation is that players like Innogy and EnBW are rather focusing on service business models than operating charging points.

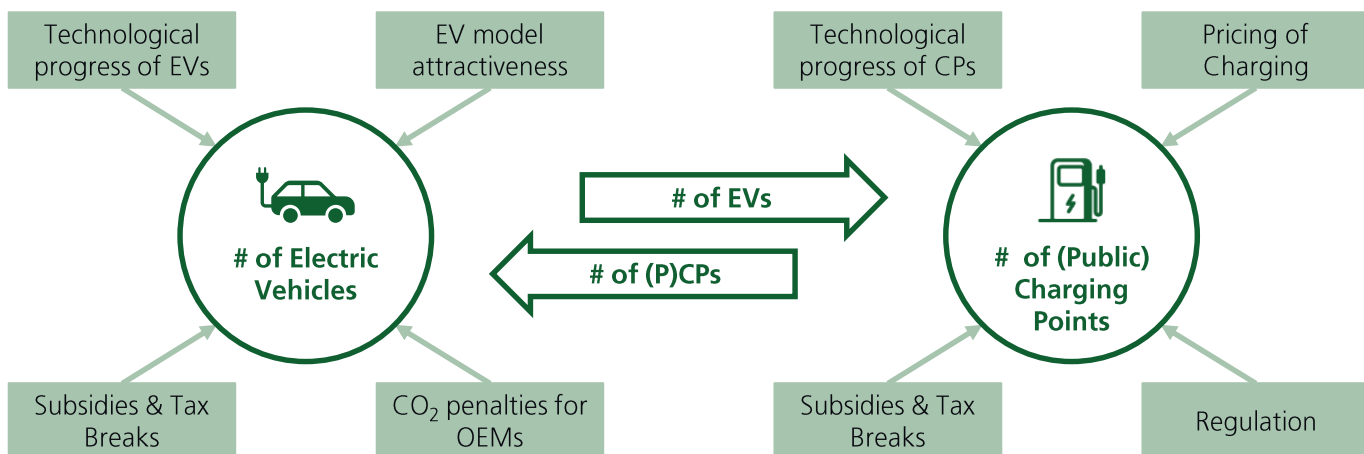
The operation of charging points in Germany is very fragmented, offering a high potential for consolidation.

Note: ³Value chain.

Sources: Bundesnetzagentur Jan. 2020; European Fed. for Transport and Environment 2020; OpenChargeMap; Plugsurfing; EAFO; Proventis Partners research.

3 Market outlook 2030

3.1 Drivers of EV proliferation and EV charging infrastructure

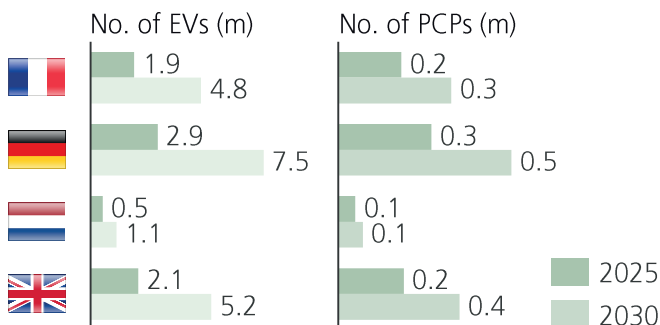
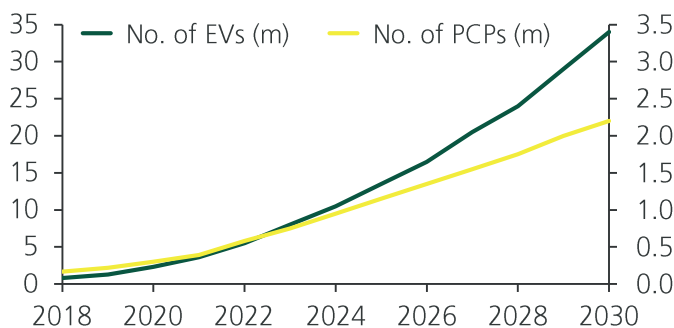


The relationship between EV uptake and EV charging infrastructure is reminiscent of the chicken or egg causality dilemma: what comes first? On the one hand, an adequate charging infrastructure is necessary, both public and private, to operate an electric vehicle. On the other hand, a minimum number of EVs on the road is required to enable sustainable business models along the value chain of EV charging infrastructure. When looking at the drivers of EV proliferation and EV charging infrastructure, it is important not to only focus on the above relationship, but a broad variety of drivers.

Recent sales numbers, for instance, support the importance of the availability of attractive EV models. With the surge in new EV models being launched to the market in 2020/21, this issue might be solved. And subsidies and tax breaks help reducing the barrier of entry into charging infrastructure.

A variety of drivers influence the proliferation of EVs and the development of public and private charging infrastructure. To accelerate both, it is important that regulators and industry players try to address multiple of the drivers rather than focus on one or two.

3.2 The EV environment until 2030



Based on current EU policies, in particular the EU car CO₂ standards, it is expected that the market share of EV sales will increase to 19% in 2025 and 33% in 2030, resulting in approx. 13.5m respectively 34m EVs on the road. In this scenario, the assumption is that, with the increasing proliferation of electric vehicles, the ratio of EVs per PCP will successively increase from about 7.4 today to over 15 in 2030.

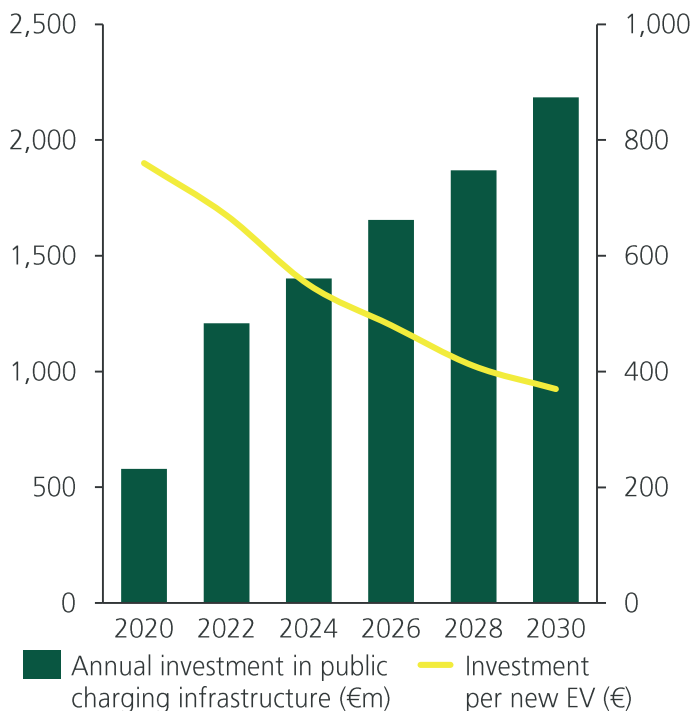
The number of EVs is forecasted to grow at a CAGR⁴ of approx. 30% between 2020 and 2030, while the number of PCPs is expected to grow at a CAGR of about 22% in the same period.

It is expected that the markets in the respective countries will grow accordingly, resulting in a comparable ranking as today. However, in some countries, in particular Spain and Italy, over-proportional growth is expected.

Note: ⁴Compound Annual Growth Rate.

Sources: European Federation for Transport and Environment 2020; OpenChargeMap; Plugsurfing; EAFO; Proventis Partners research.

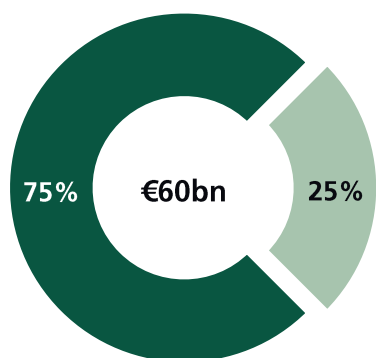
3.3 Annual investments in public charging infrastructure



The graph to the left illustrates the estimated annual spending in public charging infrastructure (CAPEX only) in the EU, based on the scenario in chapter 3.2. While already resulting in a billion-euro market in 2022, these numbers only make up for approx. 1% of the total annual spending in road transport infrastructure of the EU in 2020, up to 2% in 2030. While the absolute annual investment increases, the average investment per new EV decreases from approx. 800€ in 2020 to less than 400€ in 2030. This is based on the progressive industrialization, i.e. reduction of equipment costs, and a higher utilization of the available infrastructure.

In order to comply with the current EU CO₂ policies, only an average spending of 1 – 2% of the annual EU budget for road transport infrastructure into public charging infrastructure is necessary, which nevertheless results in a very attractive market with a total size of about €15 billion until 2030.

3.4 Public versus private charging



As illustrated before, approx. 3/4 of charging currently takes place at private locations, such as home and work, with only a slight shift toward public charging in 2030, resulting in a share of about 2/3 private charging. Thus, by far the largest part of investments will be made in the private sector.

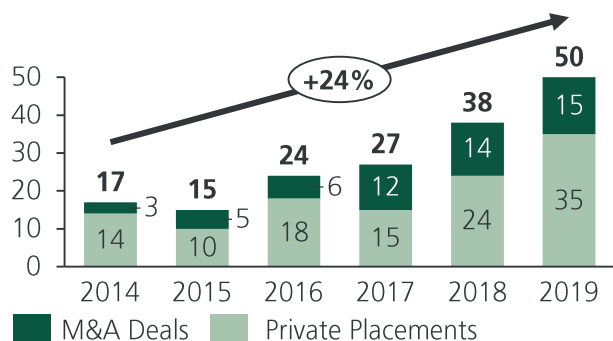
Investments in public charging infrastructure are only the tip of the iceberg in terms of the overall investments needed to meet the EU's CO₂ emission targets. The €15 billion for public infrastructure represents only about 25% of the expected total investments. 75% or €45 billion will supposedly be spent on private charging infrastructure (CAPEX only) resulting in a highly attractive market.

Summary

When looking at the numbers, the current EV charging infrastructure in Europe is fairly sufficient for the electric vehicles on the road. Challenges like multiple technological standards are successively addressed. EVs and the related infrastructure, as already proven, have disruptive potential for the entire automotive and energy industries, which results in a very active M&A environment. With investments of €60 billion until 2030, EV charging infrastructure is evolving to a major market in Europe.

4 Recent M&A activity in EV charging infrastructure

4.1 Global Transactions 2014 – 2019



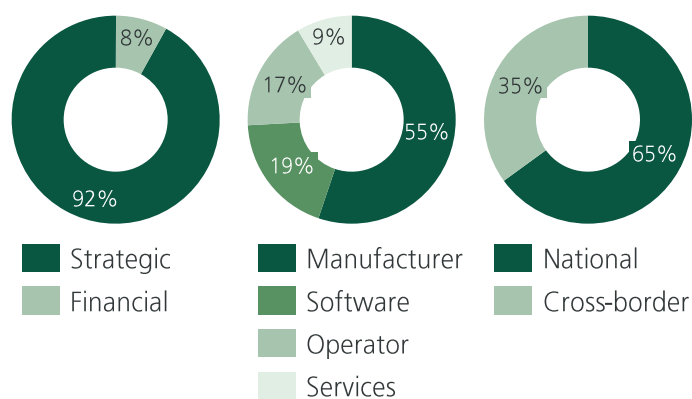
Young dynamic market

Despite EV charging infrastructure historically representing a niche market, the M&A and private placement activity has been growing at 24% CAGR from 17 transactions in 2014 to 50 transactions in 2019. Key driver is the growing market, driven by increasing demand for EV vehicles and supporting governmental policies.

In line with expectations for a young market with its own risks and innovative products, EV charging infrastructure market attracts mostly strategic buyers (92%).

55% of all targets between 2014 and 2019 are manufacturers (charging points, stations and their components); 19% of targets are software and 17% are CP operators.

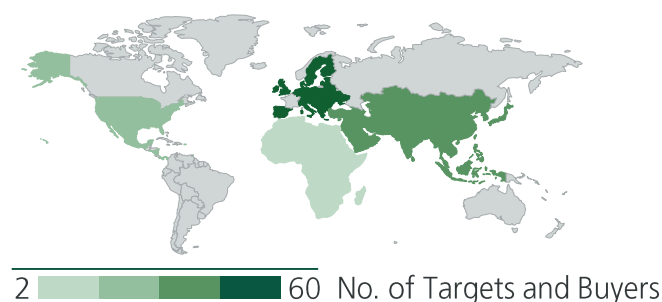
M&A activity by KPIs



Predominantly national market

Two thirds of transactions happen within country's borders and only one third has a cross-border nature, which can be partly explained by regionality of the market, i.e. absence of single international regulatory standards for EV infrastructure.

M&A activity by region

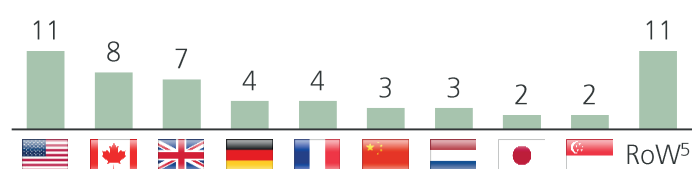


Most active markets in the EV charging infrastructure according to the number of transactions are USA and China, followed by UK, France and Germany. 20% of the targets and 16% of the buyers are located in the USA. Roughly every seventh target and buyer is located in China.

Promising picture for Europe

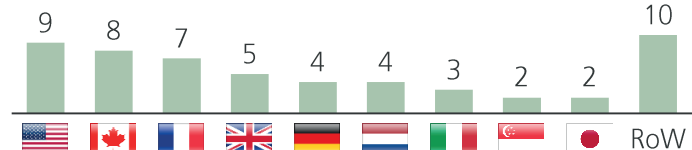
With 29 buyers and 28 targets, Europe is twice as active in M&A transactions as Asia with 14 buyers and 14 targets.

Deal count by target's region



European market looks promising – especially considering the high fragmentation of the market today with respect to hardware manufacturers as well as charge point operators.

Deal count by buyer's region



The EV charging infrastructure M&A segment is still a niche market with most of financing being conducted via private placements. Nevertheless, the number of both private placements and M&A transactions globally has been increasing with mostly strategic transactions and remains predominantly a national market.

Note: ⁵Rest of World. Disclosed transactions only.
Sources: S&P Capital IQ 2020; Mergermarket.

4.2 Recent M&A activity in global EV charging infrastructure

Largest transactions with published deal value in EV charging infrastructure involved US and Chinese players as well as selected European players (UK, Switzerland and Austria).



GLOBAL: Recently announced M&A transactions worldwide

2014 – 2019, by transactions value (>1 €m) – disclosed values only

Date ⁶	Target	Target HQ	Buyer	Buyer HQ	TTV ⁷ In €m	Stake in %
29.11.16	Nanjing Nengrui Auto Equipment Co. LTD		Jilin Jinguan Electric Co. LTD		197	100
28.06.18	(BP) Chargemaster LTD		BP PLC		148	100
27.03.17	Beijing SG-EPRI UHV Transmission Tech. Co. LTD		NARI Technology Co. LTD		96	100
04.06.18	AeroVironment INC (Efficient Energy Systems Business)		Webasto Charging Systems INC		33	100
29.08.17	Beijing Changde Technology Development Co. LTD		Beijing Silu Caihong Car Rental Co. LTD		14	85
25.03.16	Green Motion SA		Zhongding Holding Europe GmbH		11	43
22.11.17	Evatran, LLC		Zhejiang VIE Science & Technology Co. LTD		9	84
23.04.19	DiShangTie Car Rental (Shenzhen) Co. LTD		Shenzhen Qianhai Chaxi Think Tank No. 3		7	6
30.03.15	Beijing Hua Shang Clear New Energy Technology Co., LTD		Beijing Hua Shang Wei Ye Assets Management Co. LTD		4	35



EUROPE: Selected recent transactions with EV CS operator and services targets

2017 – 2019

Date	Target	Target HQ	Buyer	Buyer HQ	Transaction rationale	Stake in %
06.24.19	Alperia Smart Mobility SRL		Dolomiti Energia Holding SpA		Joint development of the e-mobility segment in Italy	25
06.17.19	ChargePoint Services LTD		ENGIE SA		Leadership in the UK green mobility infrastructure	100
03.29.19	Bornes Solutions SAS		OCEA SMART BUILDING SAS		Extension of cleantech service portfolio	100
06.28.18	(BP) Chargemaster LTD		BP PLC		Scaling up and deploy a fast charging UK network	100
03.06.18	MOVE Mobility AG		Alpiq E-Mobility AG		Strategic positioning in the sector/ expansion	25

4.3 Recent M&A activity in European EV charging infrastructure

European EV charging infrastructure market offers a diverse target base incl. French manufacturers, German software targets and international operator / service provider, mostly acquired regionally.











EUROPE: Selected recent transactions with manufacturing targets

2017 – 2019

Date	Target	Target HQ	Buyer	Buyer HQ	Transaction rationale	Stake in %
11.04.19	Pivot Power LTD		EDF Renouvelables SA		Technology-based synergies	100
20.09.18	G2 Mobility SA		TOTAL SA		Expansion of EV charging sector	100
06.07.18	EVTRONIC		EV-Box B.V.		Establish/scale R&D Expand global presence	100
27.04.18	Chargestorm AB		CTEK Sweden AB		Scale R&D New market entry	100
25.07.17	G2 Mobility SA		Nexans SA		Technology-based synergies, sector growth	100
14.03.17	EV-Box B.V.		ENGIE SA		Strategic positioning in global EV infrastructure	100

EUROPE: Selected recent transactions with Software targets

2017-2019

Date	Target	Target HQ	Buyer	Buyer HQ	Transaction rationale	Stake in %
09.12.19	wallbe GmbH		Weidmüller Interface		Scale up EU market presence, develop tech	25
07.31.19	has.to.be GmbH		Elli Group GmbH		Strategic positioning in E-mobility	n/a
09.25.19	Hubject GmbH		Enel X SRL		Existing network extension	13
03.06.18	PlugSurfing GmbH		Fortum Charge & Drive AS		Network expansion and app-user base extension	100
10.12.17	The New Motion B.V.		Royal Dutch Shell PLC		Market entry into the E-mobility segment	100

Highlights – M&A Transactions

Operators and service providers acquire targets in the same segment in order to extend customer base and establish their market leadership in the region, as demonstrated by an acquisition of MOVE Mobility AG by the swiss market leader Alpiq E-Mobility AG.

Software and innovative fast charging solutions attract investors to leverage the know-how such as a Fortum charge & Drive AS acquisition of PlugSurfing GmbH – a software company providing an app for drivers to find access as well as pay for EV charging.



















Players from conventional areas such as oil and gas – Royal Dutch Shell PLC invest in EV infrastructure portfolio and anticipate rising demand for e-mobility in the foreseeable future while the automotive OEMs establish their e-vehicles segments and start purchasing EV charging infrastructure targets.

4.4 Recent activity in private placements

Private placement (PP) has already become an established vehicle to finance growth in the US and China for companies from EV infrastructure segment and now it is making its way to Europe.









Private placement – selected financing rounds with disclosed transaction value over €20m

2014 – 2019

Date	Target	Target HQ	Investor	Investor HQ	Transaction details	TTV €m
16.11.18	ChargePoint INC		Siemens VC GmbH American El. Power Co. INC	 	Common shares	213
21.02.17	ChargePoint, INC		Siemens Venture Capital GmbH Daimler AG	 	Common shares	110
22.12.17	IES Synergy SA		Eurazeo SE Nexans S.A.		Common shares	60
19.04.16	ChargePoint INC		Northwood Ventures, L.L.C. Braemar Energy Ventures		Equity	53
12.03.18	Volta Industries INC		GE Ventures, LLC Ørsted A/S	 	Common shares	50
16.07.19	Volta Industries, INC		-	-	Loan	39
30.04.18	Fastned B.V.		-	-	Common shares	30
08.03.19	YIQI Exchange		Cathay Capital PE Tencent Holdings LTD	 	B round of funding	27

Targets that issued private placements 5 times and more between 2014 and 2019

2014 – 2019

Placement Years	Target	Target HQ	Investor HQ	Transaction details	Count PP ⁸
2014 – 2019	Volta Industries INC		 	Membership units, Preferred and common shares, loan, non-convertible debt	9
2014 – 2017	Blink Charging Co.			Preferred and common shares, convertible promissory note	5
2014, 2016 – 2018	ChargePoint INC		 	Common shares, equity	5

Highlights – Private Placements

Private placement is used for financing by US targets in the EV charging infrastructure sector. Companies in Europe, however, already begin to recognize its importance – with such private placements as IES Synergy SA from France or Fastned B.V. from Holland, financing rounds of which were €60m and €30m, respectively.

Systematic use of private placement in financing can be seen in the US. The media platform player Volta Industries Inc. had 9 financing rounds /private placements between 2014 and 2019, followed by Blink Charging Co. and Charge Point Inc. with 5 private placement rounds.

US EV infrastructure company ChargePoint Inc. had two most significant private placements by transaction value: 213 and 110 €m in 2017-2018 that involved US and German investors.

Proventis Partners – Energy & Sustainability sector

Our experienced integrated professional team benefits from an extensive network at national and global level and has a strong track record in the energy and sustainability sector.

Our profile

Proventis Partners is a partner-managed M&A advisory firm whose clients include mainly corporate groups, medium-sized family businesses and private equity funds. With 30 professionals, Proventis Partners focus in the sectors Industrials, Business Services, Consumer & Retail, TMT, Healthcare and Energy and covers the German-speaking region with offices in Hamburg, Cologne, Munich and Zurich.

Our track record and KPIs

+300 successfully closed transactions

>10bn total transaction value

Fifteen countries where we served clients

>50% cross-border transactions

Six focus sectors

Our network

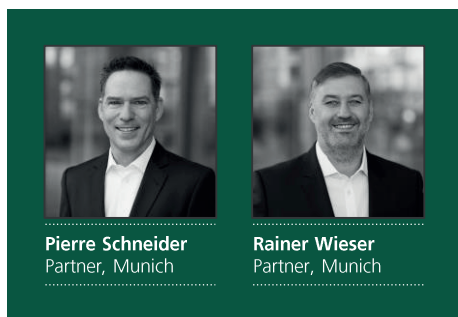
Through its exclusive membership in Mergers Alliance - the international partnership of leading M&A specialists - Proventis Partners offers local market coverage in the 30 most important economies globally.

The 21 members of the Mergers Alliance, with more than 200 M&A professionals, offer Proventis Partners and our clients unique access to local markets in Europe, North America, Latin America, Asia and Africa.

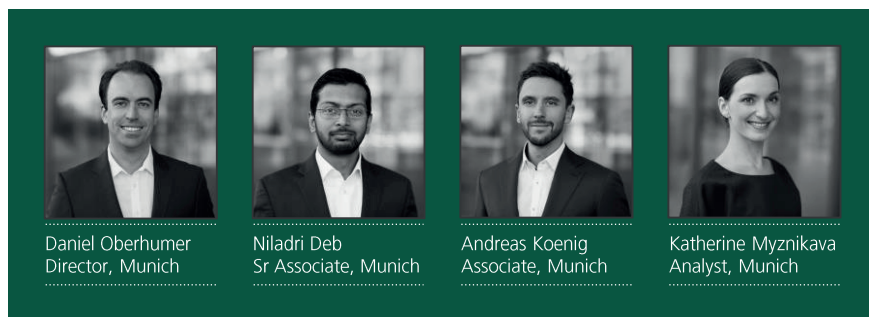
Our Energy & Sustainability team

Located in Munich, our energy and sustainability team has extensive expertise in sustainable energy topics accompanied by relevant contacts in the industry.

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