38th International Electric Vehicle Symposium and Exhibition (EVS38) Göteborg, Sweden, June 15-18, 2025

Toward Healthy Competition in the Public Charging Infrastructure Market: Stakeholder Dynamics and Pricing Trends

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Executive Summary

Concerns about limited competitiveness in public charging infrastructure markets—particularly around pricing transparency and local market power abuse—and its negative impact on electric vehicle (EV) adoption are prompting regulatory action across Europe and North America. Public charging infrastructure data from these markets indicate that the growth in EV sales has not led to a consistent decline in regional market concentration. As of January 2024, in 42% of European NUTS 3 regions, the leading alternating current (AC) charge point operator (CPO) held a market share exceeding 40%, which is indicative of market dominance. For direct current (DC) charging, this figure was 34%. Analysis of pricing data finds that public charging pricing varies widely by region, but there is only a weak correlation between CPO market concentration and average ad hoc prices at the regional level. As public charging networks expand, market dynamics may shift and make ongoing market monitoring essential.

Keywords: electric vehicles, charging business models, public policy and promotion, trends and forecasting of e-mobility, social equity

1 Introduction

Public charging infrastructure is a key component of enabling widespread adoption of electric vehicles (EVs). Sufficient deployment of public chargers can ensure universal access to EVs for those without private charging, alleviate range anxiety, and enable longer journeys. For countries intending to phase out combustion engine vehicles, the development of a user-centric public charging network is essential. As governments increasingly work to ensure that public charging infrastructure is successfully deployed, it is important to better understand market dynamics to help determine if policy and investment decisions are fostering competition with fair and transparent prices.

In Europe, regulators are monitoring competition concerns including the abuse of local market power, price transparency shortcomings, and barriers to market entry [1]. Against this backdrop, this paper presents analysis of the European public charging market through a competition lens and with a focus on the central players: charge point operators (CPOs) and mobility service providers (MSPs). The first part provides an overview of the number of market participants and identifies the leading companies in each industry. A quantitative assessment of national and regional CPO market concentration in select markets follows that. The final part explores how these market players set charging prices and whether pricing correlates with market coverage. While the focus is on Europe, insights into the Canadian and U.S. markets are also provided for comparison, where data allows.

2 Methods

2.1 Definitions

2.1.1 CPOs and MSPs

The EU Alternative Fuels Infrastructure Regulation (AFIR) defines a CPO as the entity responsible for managing and operating a charger, including on behalf of an MSP. Charge point operators can either own the chargers or operate them for third parties. Furthermore, CPOs typically set the tariffs paid by end users for ad hoc charging, though this can also be done by the charging station owner, if different. Ad hoc charging allows users to pay directly at the station without an MSP contract or membership [2].

An MSP partners with one or more CPOs to give users access to a wide charger network through a single platform, a practice known as roaming. The MSPs often offer uniform charging rates across different CPO networks and regions. Agreements between CPOs and MSPs can be established bilaterally or via third-party roaming platforms that connect multiple participants. A single charger can be part of many MSP networks simultaneously.

Some large CPOs (e.g., Ionity, Allego, and Recharge) function as their own MSPs. They provide services such as mobile applications, subscriptions, and customer support, but limit these offerings to their own networks. Other CPOs, including EnBW, Be Charge, and Shell Recharge, are vertically integrated with full-range MSPs and also offer roaming services.

2.1.2 Other definitions

In this paper, the term "charger" refers to a device that provides power to charge only one vehicle at a time; it may have multiple connectors to accommodate different connector types. The term "charging station" refers to a cluster of chargers at a single location. Alternating current (AC) chargers are slow or semi-fast chargers that deliver up to 50 kW of power in the form of alternating current from the electrical grid. In contrast, direct current (DC) chargers, often referred to as fast chargers, supply power directly to the vehicle's battery, bypassing the onboard converter. They typically supply power of 50 kW or greater, which enables faster charging.

The term "semi-public charger" refers to chargers located on private property that typically have access restrictions, such as specific opening and closing times. Public chargers, meanwhile, can be accessed 24 hours a day, 7 days a week, by everyone.

2.2 Geographical and temporal scope and data sources

The market analyses in this paper are presented at both the European level (the European Union, European Free Trade Association, and the United Kingdom) and the national level for France, Germany, the Netherlands, Norway, and Poland. These countries were selected to capture markets at different stages of EV adoption. Norway and the Netherlands ranked first and fourth among European passenger car markets in terms of new plug-in hybrid and battery electric vehicle registration shares in 2023, at 90% and 44%, respectively. Germany and France had new plug-in hybrid and battery electric vehicle registration shares close to the European average and together with the Netherlands were the three leading markets for public charging infrastructure deployment, as of the end of 2023, when they collectively accounted for around 55% of all public chargers installed in Europe. In contrast, Poland's market is still nascent, with plug-in hybrid and battery electric registrations accounting for approximately 6% of total new car registrations in 2023. Poland is home to only about 1% of the public chargers installed in Europe, but it has taken steps to accelerate charger deployment and, since 2018, has supported EV adoption through tax incentives, purchase subsidies, and other measures [3]. The North America analysis covers Canada and the United States, both of which have seen increasing EV sales shares and substantial public and private sector investments in public charging infrastructure [4].

This paper provides a snapshot of public charging infrastructure as of January 1, 2024 and compares it with the previous two years for Europe; pre-2024 data were unavailable for Canada and the United States. Here, Europe comprises the European Union (EU), United Kingdom, and the European Free Trade Association countries. The analysis is based on data from Eco-Movement.

2.3 Market segmentation

This analysis segments the public charging market for EVs by access type, power output type, and geography. In terms of access, we focus on public and semi-public chargers and exclude private ones. Regarding power output type, we differentiate between AC and DC charging markets based on their distinct use cases and infrastructure investment costs [5]. Geographically, the focus is on the NUTS (Nomenclature of Territorial Units for Statistics) 3 region level for the Europe analysis, the county level for the U.S., and municipalities or municipal equivalents in Canada because EV users usually choose a charger within a limited radius. The NUTS is the official geographic division of the European Union and the United Kingdom for regional statistics. NUTS 3 regions are relatively small regions with a population size between 150,000 and 800,000.

2.4 Market concentration measures

We use market concentration indicators to gauge competition intensity. There are two widely used market concentration indicators, the concentration ratio (CR-N) and the Herfindahl-Hirschman Index (HHI); CR-N corresponds to the sum of the market shares of the n leading companies within a market, and the HHI is the sum of squared market shares of all companies in the market. For this analysis, we primarily use CR-1 and include HHI values for comparison. The CR-1 and HHI value ranges for classifying market concentration levels differ across jurisdictions. This analysis uses the CR-1 threshold from the German Act Against Restraints of Competition (40%) and the HHI thresholds from U.S. Federal Trade Commission and Department of Justice guidelines, which specify that HHI values between 1,000 and 1,800 indicate moderate market concentration and values above 1,800 indicate high market concentration [6].

3 Results

3.1 CPOs and MSPs

This section explores how CPOs and MSPs interact in the European public EV charging infrastructure market, who the leading players are, and how the European market compares with that of North America.

3.1.1 Number of CPOs and MSPs

As of January 2024, the number of MSPs in the individual European markets examined in this paper ranged from 80 to 140, while the number of CPOs showed a much wider variation, from 74 in Poland to 973 in Germany (see Table 1). On average, a European charging station was covered by 25 MSP networks. The Netherlands had the highest average number, with 36 MSPs per charging station, and that was about three times higher than the average in Poland. Further, MSPs partnered with 88 CPOs across Europe, on average, although half of the MSPs covered nine or fewer CPO networks.

Table 1: Statistics for active MSPs and CPOs in select European countries as of January 2024

	Number of active MSPs	Number of active CPOs	Number of MSPs per charging station		Number of CPOs per MSP network	
			Mean	Median	Mean	Median
France	124	184	25	26	26	10
Germany	140	973	24	19	56	22
The Netherlands	123	146	36	32	29	25
Norway	82	124	15	12	7	4
Poland	81	74	11	10	8	4
Europe	238	2,301	25	23	88	9

Notes: Calculations regarding the number of CPOs per MSP network and the total number of MSPs only include MSPs that had agreements with two or more CPOs in a given country as of January 2024. That is, MSPs that cover a single CPO (i.e., CPOs that act as their own MSPs) are excluded from the calculations. These CPO-MSPs accounted for 74% of the 911 European MSPs included in the dataset and are typically entities with a low number of chargers such as hotels, shops, and building owners.

In contrast, in North America, the number of CPOs remains relatively low, with roughly 30 in Canada and 80 in the United States. Roaming is a recent development: The first North American roaming hub, Passport Hub, was founded in 2021, while large roaming platforms in Europe, such as Gireve and Hubject, have been active since 2013 [7]. Potentially, roaming has been less relevant in North America due to the significantly higher concentration of the CPO market compared with Europe (see Section 3.2).

3.1.2 Types of CPOs

CPOs and MSPs are typically categorized into two types of companies: pure players that focus exclusively on the EV recharging sector and veteran sector-leaping players such as oil and gas companies, car manufacturers, and utilities. Additionally, CPOs and MSPs can be classified based on their ownership structure as either state-owned or privately owned companies.

These categorizations can be valuable for identifying potential competition concerns. On the one hand, sector-leaping players may have a competitive advantage over pure players due to their access to resources and existing customer relationships. For example, auto manufacturers have access to vehicle data, oil and gas companies have access to valuable land at petrol stations along highways that is well suited for fast charging hubs, and electricity utilities partly control electricity prices. On the other hand, concerns also arise around CPO ownership structures, as there is a risk that state-owned CPOs may receive preferential treatment from local authorities, such as when awarding grid-access permissions or concession contracts for installing chargers in public land.

Figure 1 illustrates the market shares of the 10 leading CPOs in Europe between January 2022 and January 2024 by charger power output type and CPO category. The total number of CPOs active in Europe is shown at the top of each bar. CPOs are classified as pure or sector-leaping players, and the latter are further subdivided into (1) electric utilities, (2) oil and gas companies, (3) original equipment manufacturers (OEMs) or OEM partnerships, (4) retail companies, and (5) companies in technology-related sectors (referred to as "Tech" in the figure), including renewable energy technologies, public infrastructure projects, and electrical equipment supply. There are no state-owned companies among the leading CPOs, but Vattenfall InCharge, EnBW, MER, and Eviny are part of fully or partially state-owned utilities [8].

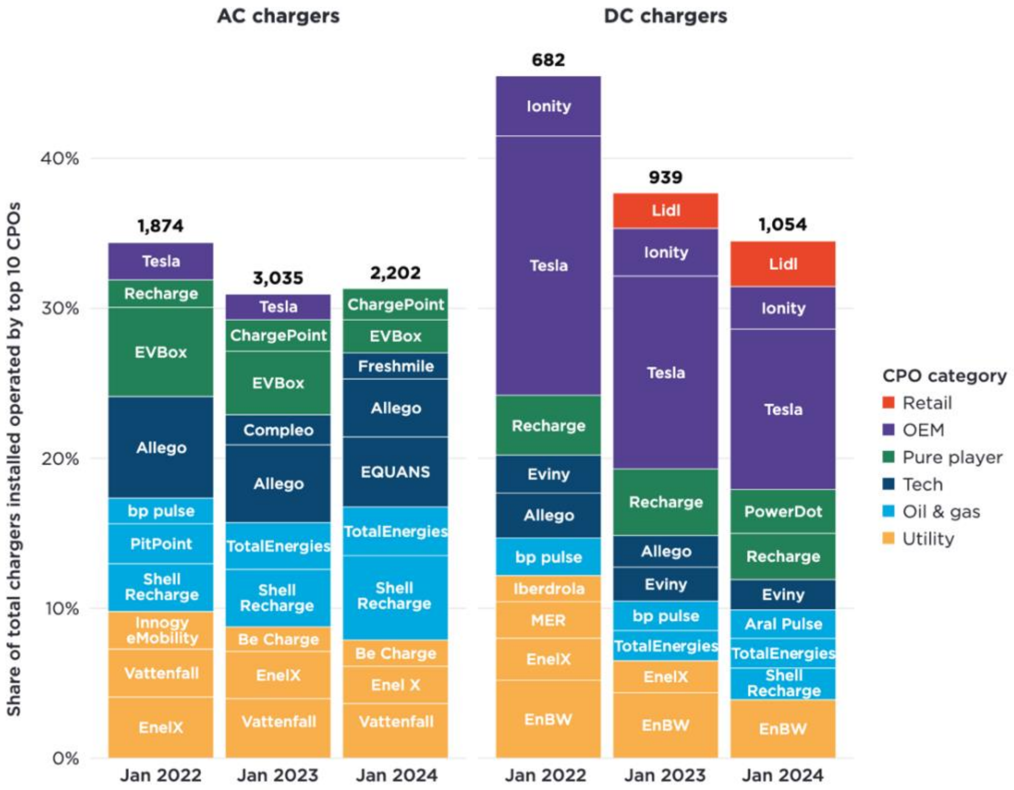

Figure 1: Share of total public chargers installed in Europe operated by top 10 CPOs by CPO category, power output type, and date. The total number of active CPOs is at the top of each bar.

As shown in the figure, the share of AC chargers managed by the top 10 CPOs in Europe dropped slightly from 34% to 31% between January 2022 and January 2024, and the decrease in DC market concentration was more pronounced, dropping from 46% to 34%. Further, we observe that sector-leaping players outnumbered pure players among the leading AC and DC CPOs. As of January 2024, the dominant sectors among the top 10 CPOs offering AC charging were oil and gas companies and technology-related companies, with the latter showing a significant increase compared with January 2022. In the DC market, OEMs led due to Tesla's large network, but oil and gas companies, which entered the market relatively late, are now the fastest growing sector, amid numerous acquisitions by energy and oil companies in recent years [9].

The Canadian and U.S. markets differ greatly from the European market in terms of market concentration and category shares. In Canada, the 10 leading CPOs operated over 90% of public chargers installed in both the AC and DC charger markets as of January 2024. The DC CPO market in the United States featured similar concentration levels, while the 10 largest AC operators in the United States covered a slightly lower share of chargers (83%). In both countries, pure players (e.g., ChargePoint, FLO, Blink Charging) operate over 60% of the AC market while the DC market is dominated by Tesla, with market shares of 41% and 58% in Canada and the United States as of January 2024, respectively.

3.1.3 **Types of MSPs**

Figure 2 shows the charger coverage of the top 10 MSPs in Europe from January 2022 to 2024 by MSP category. The total number of active MSPs is indicated at the top of each bar chart. Information for the United States and Canada is not included due to data limitations.

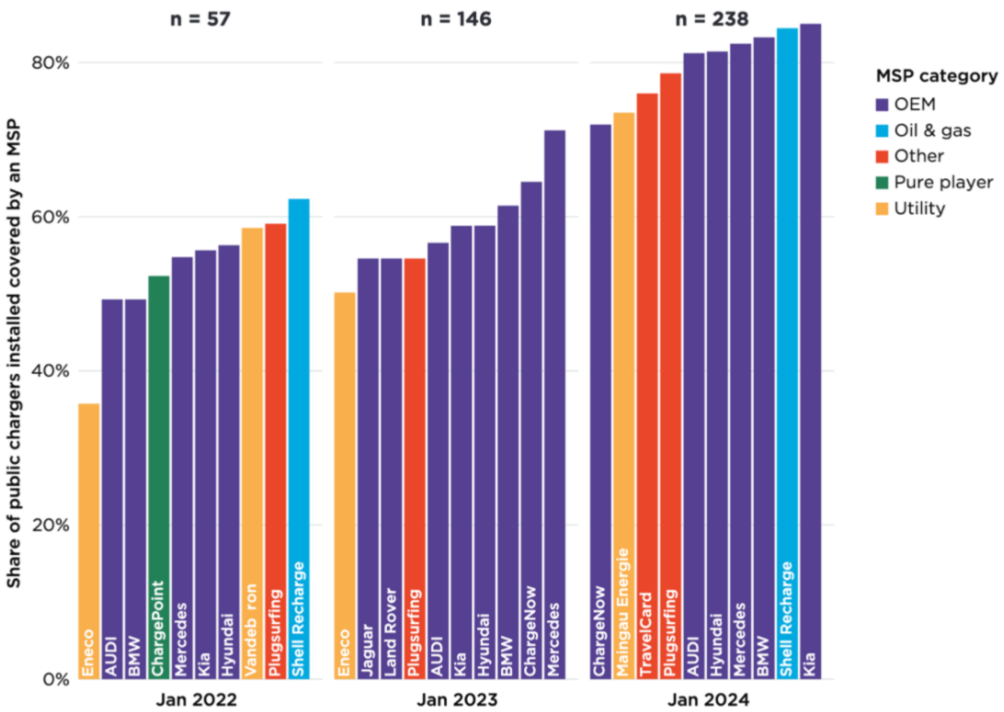

Figure 2: Share of public chargers installed covered by the top 10 MSPs in Europe by category and date. The total number of active MSPs is indicated at the top of each bar chart (MSP tallies exclude MSPs that cover a single CPO, as in Table 1).

The share of installed chargers served by the top 10 MSPs increased considerably from a maximum of about 60% as of January 2022 to a maximum of roughly 85% two years later, reflecting a growing availability of roaming agreements. Like the CPO market, the leading MSPs also featured a higher share of sector-leaping players compared with pure players. Most of the top 10 MSPs were OEMs, which tend to restrict their services to drivers of their own automobiles [10]. This vertical integration allows manufacturers to embed their MSP services in their vehicles, which gives them a competitive edge over other MSPs. As of January 2024, the open MSP with the largest network was Shell Recharge.

3.2 CPO market concentration analysis

High levels of market concentration may cause concern because they can imply high market power that can lead to higher prices and lower quality of services. This section dives into the evolution of CPO market power dynamics by addressing the following three research questions: (1) What are the national and regional CPO market concentration levels in Europe and North America?; (2) How have they evolved in recent years in Europe?; and (3) Do the levels of concentration warrant competition concerns? This section does not assess the MSP market due to limited data availability.

3.2.1 Supranational and national market concentration trends as of January 2024

Error! Reference source not found. summarizes national CPO market concentration trends as of January 2024 by presenting the number of public chargers installed, the number of active CPOs, the average and median CPO network size values, and the CR1 and HHI concentration indicators, all disaggregated by power output type and country. Cells are highlighted in red when the CR1 is above 40% or the HHI is above 1,800, both of which indicate high concentration. Cells are highlighted in light red when the HHI is between 1,000 and 1,800, indicating moderate market concentration.

As shown in **Error! Reference source not found.**, North American CPO markets are significantly more concentrated than those in Europe. As of January 2024, no European country had a CR1 value exceeding 40%, while the United States surpassed this threshold for both AC and DC charging networks, and Canada did so for the DC market. This higher concentration is largely due to the smaller number of CPOs operating in the United States and Canada compared with European countries. Additionally, market concentration levels are similar between the AC and DC segments, with the same countries—Canada, the Netherlands, Norway, Poland, and the United States—consistently standing out for higher concentration across both types of networks.

Table 2: Number of public chargers installed, active CPOs, and average and median CPO network size by power output type and country as of January 2024.

Power output	Country	Number of chargers installed	Number of CPOs	Number of chargers per CPO		Concentration indicators		
				Mean	Median	Country (or Europe) level CR1	Average regional CR1	Country (or Europe) level HHI
AC	Europe	652,940	2,202	229	11	5%	39%	93
	Germany	99,254	947	97	8	10%	37%	260
	France	91,705	181	449	100	13%	37%	380
	The Netherlands	140,757	129	1,091	47	20%	41%	989
	Norway	19,889	116	145	14	26%	32%	1,131
	Poland	4,573	67	66	6	17%	40%	942
	United States	138,814	63	1,986	91	56%	65%	3,457
	Canada	18,740	25	741	29	33%	78%	2,661
DC	Europe	124,280	1,054	87	8	11%	37%	80
	Germany	25,860	387	65	4	19%	32%	662
	France	20,130	112	173	29	13%	26%	560
	The Netherlands	4,559	71	64	7	21%	30%	1,026
	United States	37,998	68	548	15	59%	77%	3,724
	Poland	2,152	45	47	6	35%	42%	1,667
	Norway	9,956	37	266	16	25%	31%	1,597
	Canada	4,704	23	204	54	42%	80%	2,311

Note: Chargers with unknown CPOs are not included in the CPO network mean and median size calculations.

Based on the average market share of the leading CPOs at the regional level, several jurisdictions exceeded the 40% concentration threshold. The most prominent outliers are the United States and Canada, where average regional CR1 values range from 65% to 80% across both AC and DC charging markets. In Europe, Poland also stands out, with average regional CR1 values exceeding 40% in both market segments. It is important to note that U.S. counties and Canadian municipalities cannot be directly compared with European NUTS 3 regions due to their varying sizes, populations, and EV stock levels.

3.2.2 Evolution of regional market concentration levels between January 2022 and January 2024 in Europe

As of January 2024, the leading AC CPO in 42% of European NUTS 3 regions had a market share exceeding 40%, which the German Competition Authority considers a threshold for market dominance (see Figure 3). The leading DC CPO had over a 40% market share in 34% of NUTS 3 regions. At the European level, market concentration in both the AC and DC CPO industries has steadily decreased since January 2022. However, among the national markets surveyed in this study, AC CPO market concentration has not consistently decreased despite the rise in EV adoption. Concentration in the AC market in Norway has increased while it has remained steady in the Netherlands, which stands out for having a top CPO with over 40% market share in half of its regions. Among the European public DC charging markets analyzed, Poland ranks highest in terms of market concentration, with 52% of its regions having a top DC CPO that operates more than 40% of chargers installed.

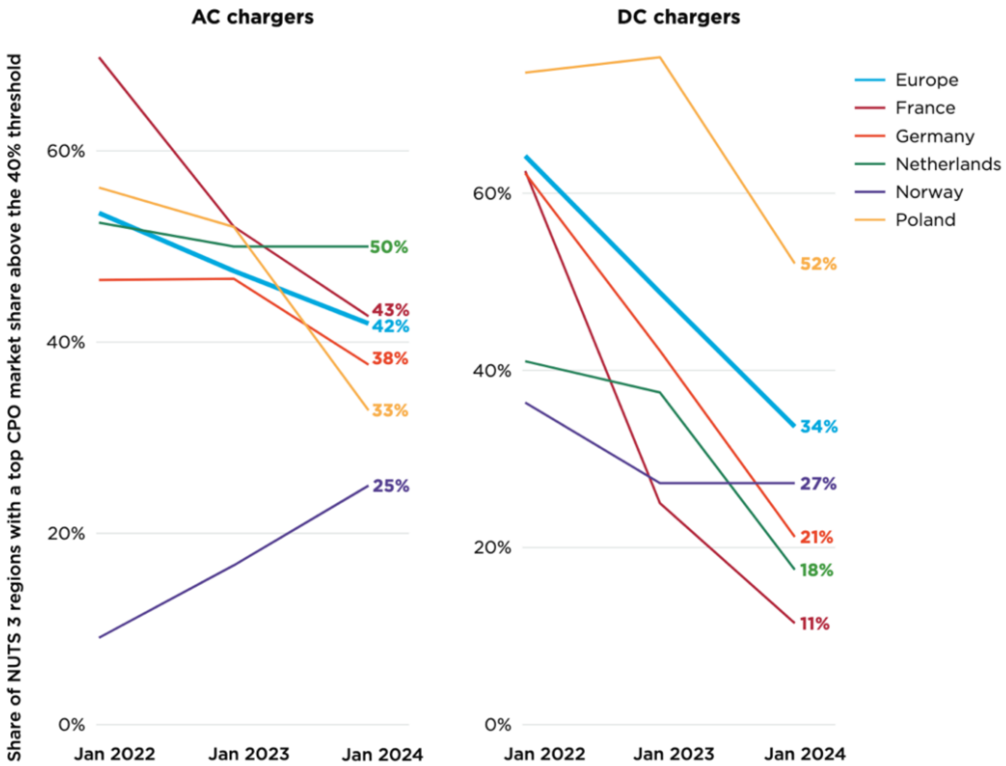

Figure 3: Share of NUTS 3 regions with a market share of the leading CPO above 40% by country, power output type, and date

While fewer than 50% of regions in Europe have a leading AC or DC CPO with a market share above 40%, the picture looks considerably different in North America. Approximately 99% of municipalities in Canada and 80% of counties in the United States have a leading CPO operating more than 40% of AC chargers, while 96% of municipalities in Canada and 95% of counties in the United States have a top CPO operating over 40% of DC chargers installed.

3.3 Public charging infrastructure pricing

This section explores ad hoc and MSP charging rates in the European public charging infrastructure market. We first provide a description of common charging pricing models, and that is followed by a summary of legislative measures aimed at ensuring transparent pricing. We then assess the prevalence of various pricing models and compare the price per kilowatt-hour charged according to several factors: power output type (AC versus DC chargers), ad hoc and subscription-based payments, region, and the level of regional CPO market concentration. The central research questions are: (1) How do market players set prices for public EV charging? and (2) Are ad hoc prices correlated with CPO market concentration?

3.3.1 CPO and MSP charging pricing dynamics and pricing components

CPOs or site owners set the end-user charging rates for ad hoc charging at their stations and for the charging rates passed on to the MSPs with which they have roaming agreements. The MSPs then use CPO-to-MSP charging rates, also known as business-to-business (B2B) rates, to determine end-user charging rates. The MSP rates can be either CPO-specific or uniform across CPOs. Notably, complex B2B charging rates are often simplified before being passed on to drivers, either due to limitations in MSP communication protocols or to avoid driver confusion. However, simplified end-user rates are typically higher than the underlying CPO B2B rates [11].

End-user and B2B charging rates may consist of multiple components or fees. However, there are three basic components: an energy fee, based on the amount of energy transferred to the vehicle, measured in euros per kilowatt-hour; a time fee, based on the duration of the charging session and/or the blocking time, measured in euros per minute; and a flat fee per session, measured in euros. Other components include roaming fees (applicable to MSP prices only) or parking fees. In addition, MSP contracts often include a subscription fee.

The structure of CPO and MSP charging rates can vary depending on several factors, including the charger's location and capacity. Additionally, a penalty fee—often referred to as blocking, idle, or occupancy fee—may be applied when a vehicle is not charging; this is to discourage drivers from blocking chargers for longer than necessary. Rates can also vary based on specific time or energy thresholds. For example, an energy fee may apply for the first hour or two of charging and be followed by a different, higher fee for subsequent hours. Furthermore, rates may fluctuate depending on the time of the day, day of the week, or the real-time energy price. These time-variant rates are typically implemented to encourage more charging at times of low energy demand, such as by offering different rates for peak and off-peak hours, or to align with real-time energy costs, which is known as dynamic or spot pricing.

Energy-based charging rates are widely considered to be the easiest for users to understand, and they ensure all drivers pay a consistent rate for the electricity they use, regardless of the charging speed. In contrast, charging rates based primarily on the duration of the charging session do not consider varying charging speeds across vehicle models, chargers, and ambient temperature levels. These rates can also result in higher costs for drivers when a charging session takes longer than required due to charger malfunctions or energy supply limitations designed to protect the grid from overload.

3.3.2 Review of legislative efforts to ensure transparent pricing and user-friendly payments

Historically, payments to MSPs have largely outpaced ad hoc transactions. This is likely because MSPs tend to offer convenient payment methods for multiple CPO networks and greater price transparency through upfront online information and fixed tariffs across the MSP network than CPOs [12]. Despite the benefits, limited roaming coverage has often forced drivers to maintain multiple MSP contracts, an issue exacerbated by the unreliability of ad hoc charging as a fallback option [13]. Additionally, differences across MSP pricing models, for example regarding subscription fees or special prices within select networks, have made it difficult for drivers to compare charging prices.

To address pricing transparency shortcomings and payment barriers, such as the need to register or enter a contract with a provider to access chargers, the AFIR mandates ad hoc payment options at all new EU chargers since April 2024 and the retrofitting of all fast chargers by 2027. Widely used payment methods must be accepted, and ad hoc prices must be available for free on National Access Points (e.g., public databases) from April 2025. In addition, CPOs must not discriminate in pricing between drivers and MSPs (or among different MSPs), although "proportionate and objectively justified" differences are allowed. For fast chargers, ad hoc pricing is limited to two pricing components: an energy-based component and an optional time-based blocking fee. For chargers under 50 kW, additional components are allowed, but they must be presented to drivers following a specified order. Prices must always be presented to users before charging begins.

In the United States, chargers funded by the National Electric Vehicle Infrastructure (NEVI) Formula Program are required to display charging prices before the start of each charging session. Prices must be based on the energy transferred to the vehicle measured in dollars per kilowatt-hour. Charging rates cannot be altered during a charging session but may include additional fees, which must be "clearly displayed and explained" to users [14]. In California, charging rates for all public chargers must be based on a price per kilowatt-hour or megajoule [15].

3.3.3 Prevalence of pricing models

As of January 2024, 88% of AC and DC charging products used energy-based rates exclusively. The shares of AC and DC products with rates based exclusively on time fees dropped from roughly 8% to 1% from 2023 to 2024, while the availability of rates that combine energy and time fees increased, especially among DC products, rising from 4% to 6%. In the case of these combined rates, time fees are likely to apply only after a certain amount of time to discourage drivers from blocking chargers.

3.3.4 Comparison of CPO and MSP charging prices

Figure 4 compares the average net prices per kilowatt-hour for AC and DC public charging across countries as of January 2024. The focus is on ad hoc charging and MSP monthly subscription-based products. CPO subscription-based products and MSP products with yearly or one-off subscription fees are excluded due to their limited availability. MSP products without a subscription fee are also excluded because the data do not clearly distinguish between products lacking fee information and those that are simply offered without a fee. Furthermore, to enable comparison across products, only those with energy-based charging rates were included.

To calculate MSP subscription fee costs per kilowatt-hour charged, three driver profiles were considered: urban commuter, rural commuter, and long-distance driver. These profiles differ in their annual grid energy consumption and the share of public versus private charging (see Table 3). The rural commuter and long-distance driver have access to home charging, while the urban commuter has access to workplace charging but not home charging **Error! Reference source not found.**. Because the rural and urban commuter profiles consume nearly identical amounts of annual public grid energy, Figure 4 presents results only for the urban commuter. An alternative urban commuter who relies solely on public charging is another profile considered. Subscription fee costs per kilowatt-hour are calculated by dividing annual subscription fees by total annual grid energy charged at public chargers, assuming the same MSP contract is used for both AC and DC charging.

Table 3: Total and public annual energy charged by driver profile

	Power output type	Total energy charged (kWh/year)	Public energy charged (kWh/year)
Urban commuter	AC	1,790	409
	DC	1,073	1,073
Rural commuter	AC	2,123	399
	DC	1,077	1,077
Long-distance driver	AC	3,909	410
	DC	6,153	6,153
Urban commuter public	AC	1,790	1,790
	DC	1,073	1,073

For AC infrastructure, ad hoc average prices per kilowatt-hour charged are generally similar to MSP prices excluding subscription costs. However, in the Netherlands, the average MSP price excluding subscription costs is about 20% higher than the average ad hoc price. Subscription costs significantly impact the total MSP price per kilowatt-hour for urban and rural commuters, and they range from 13% in the Netherlands to 19% in Norway. Subscription costs constitute a smaller portion for the urban commuter public and long-distance driver profiles, with a maximum of 11% and 5% of the total average MSP price per kilowatt-hour charged in Norway, respectively.

For DC infrastructure, average MSP prices per kilowatt-hour charged excluding subscription costs are generally higher than ad hoc prices. However, in Germany and Poland, ad hoc prices are slightly higher than MSP prices excluding subscription costs, on average. The largest price disparity is in France, where average MSP prices excluding subscription costs are about 15% higher than ad hoc prices. For urban and rural commuters, subscription fees account for about 12% of the total MSP price per kilowatt-hour.

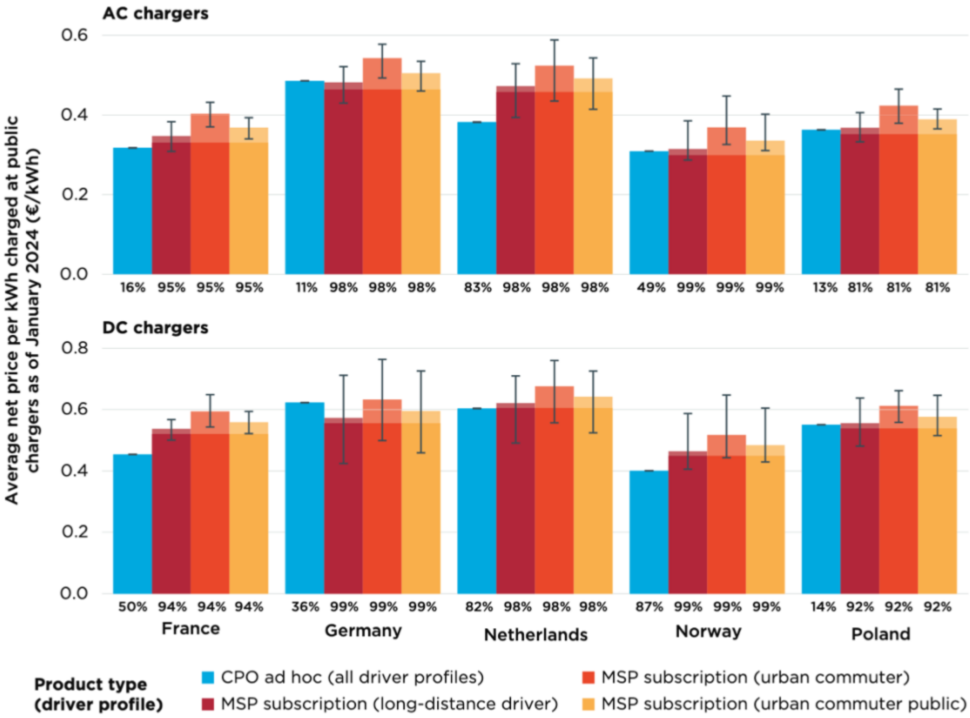

Figure 4: Average net price per kilowatt-hour charged by product type, driver profile, country, and power output type as of January 2024. The share of chargers featuring a certain product type is indicated at the bottom of each bar. The lighter color shade at the top of each MSP bar indicates the additional cost attributed to the subscription fee. Error bars indicate the range between the average lowest and highest prices per kilowatt-hour charged across chargers.

3.3.5 Correlation between regional CPO market concentration and average ad hoc prices

A simple linear regression analysis was conducted across the European markets surveyed to examine the relationship between regional CPO market concentration and average ad hoc AC and DC charging prices as of February 2023 and January 2024. The results show that, at the NUTS 3 regional level, as the market share of the leading CPO increased, there was no clear tendency in average ad hoc charging prices to either increase or decrease. However, considerable price dispersion was observed across regions, with average prices in some regions reaching nearly double those in the lowest-priced regions. These findings highlight the need for further research to better understand the factors driving regional variations in charging prices.

4 Conclusions

This research explored the concentration of charging operators and the pricing of public charging in Europe and, where data was available, North America. This yielded several conclusions that have implications for the expansion and regulation of public charging.

As of January 2024, 42% of European NUTS 3 regions had a leading CPO with a market share exceeding 40%, the threshold for market dominance according to the German Competition Authority. Among European markets analyzed, Poland ranked highest, with 52% of its regions having a top DC CPO that operates more than 40% of chargers installed. Among AC markets, the Netherlands stands out, with 50% of its regions having a top CPO with over 40% market share. In terms of geographic differences, while Eastern Europe generally exhibits slightly higher market concentration levels than the rest of Europe, there is no clear trend.

In contrast, the U.S. and Canadian markets are much more concentrated. As of January 2024, Canada had fewer than 30 CPOs active in either the AC or DC market. In the United States, there were about 60 AC and 70 DC CPOs—significantly fewer than the number of market players in Europe. There was also considerable overlap among CPOs operating in the AC and DC markets. The greater market concentration in North America may explain why the first North American roaming platform was not established until 2021 and roaming remains limited on the continent, while major European roaming platforms have been operational since 2013 and are now widespread. While the lack of roaming may have little impact on day-to-day trips, it may reduce confidence in EVs for long-distance travel in North America and is thus an opportunity for policy intervention.

Despite the rise in EV adoption over recent years, market concentration has not consistently decreased across markets. While the overall share of NUTS 3 regions in Europe with a top CPO holding over 40% of the market decreased between 2022 and 2024, in Norway and the Netherlands—two leading countries in terms of EV sales share—the opposite occurred in the AC market. Importantly, this research did not find a link between market dominance of a CPO and ad hoc charging prices; this indicates that leading CPOs have not, so far, exhibited signs of abusing local market power. Such findings could allay concerns about anticompetitive behavior and point to opportunities to allow faster deployment of charging by leading networks. Nonetheless, ongoing monitoring could provide regulators with the information needed to identify any potential competition concerns.

Charging prices vary widely across Europe, with rates in Germany and the Netherlands much higher than in Norway or France, on average. Ad hoc charging prices are generally similar to MSP prices excluding subscription costs, and when taking subscription fee costs into account, MSP prices tended to be highest among the pricing models analyzed (with the exception of Germany, where ad-hoc prices were similar to or slightly higher than with subscriptions). For frequent drivers, though, the impact on the cost per kilowatt-hour of the subscription fee decreases, making these plans more cost effective. So far, despite ad hoc prices being comparable to MSP rates on average, drivers have rarely opted for ad hoc payments. However, this may shift with provisions in the AFIR that require all chargers to support ad hoc payments and accept widely used payment methods.

Acknowledgments

This paper builds on a report conducted for the International Zero-Emission Vehicle Alliance by the International Council on Clean Transportation (ICCT). The authors thank Jan Dornoff, Irem Kok, Peter Mock, and Carolina Poupinha from the ICCT for their reviews. The authors also thank the members of the International Zero-Emission Vehicle Alliance who provided key input on policy activities and reviewed an early version of the original report; their review does not imply an endorsement. Any errors are the authors' own.

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