



ChargeUp
EUROPE

State of the Industry

Insights into the Electric Vehicle Charging Infrastructure Ecosystem

This report has been developed by ChargeUp Europe in cooperation with P3 Automotive.

Unless indicated otherwise, the research has been conducted by P3 with public sources and via a survey among ChargeUp Europe members.

ChargeUp Europe is responsible for the provision of context, interpretation, case studies, and text.



ChargeUp Europe is proud to present our first "EV Charging in Europe: State of the Industry" report, drawing on the real data and market experiences of our members, who are active in all EU Member States. As the voice of the charging infrastructure industry, sharing these insights directly 'from the field' is important and makes a valuable contribution to the awareness of, and knowledge about, our rapidly growing, quickly evolving industry. We are very pleased to present this data and contribute to the discussion.

Mathieu Bonnet
President, ChargeUp Europe
CEO, Allego





« *Transport and mobility are the lifeblood of society and an essential part of everyday day life, affecting the wellbeing of European citizens. Simply put, it concerns all of us. Sustainable alternative fuels and their infrastructure play a key role in the transition to ensure the successful decarbonisation of the transport sector. Recharging of vehicles is one of the most important elements when it comes to e-mobility and it must be easy, efficient, and accessible for everybody in society. Legally binding minimum requirements for Member States to deploy EV charging infrastructure will give the European Union the best possible capability to support the required uptake of e-mobility, in all Member States and across all transport modes. European wide provisions will ensure the required accessibility to recharging stations, facilitating the mobility of citizens in daily life, while also strengthening territorial cohesion and helping all regions in their transition towards a greener, climate neutral future.*

Ismail Ertug
Member of the European Parliament
Alternative Fuels Infrastructure Regulation (AFIR)
Chief Rapporteur

STATE OF THE INDUSTRY REPORT

1 Who we are
and what we do

2 Where and how EV charging
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SECTION 1

Who we are and what we do



ChargeUp
EUROPE

WHO WE ARE

ChargeUp Europe is the voice of the electric vehicle (EV) charging industry, working towards an expeditious and seamless rollout of EV charging infrastructure in Europe.

We have

28 MEMBERS

OPERATING

500k+

CHARGING POINTS

IN ALL **27** EU MEMBER STATES

Our foundational values:



CONSUMER FIRST – The EV driver is at the center of what we do, and our industry aims to provide an excellent user experience.



OPEN MARKET MODEL – An open, competitive market for EV charging ultimately provides the best customer service and allows for new entrants.



OPEN STANDARDS AND PROTOCOLS – These are key to communication between vehicle-charger-backend systems, and a key enabler of a pan-EU internal market for EV charging.

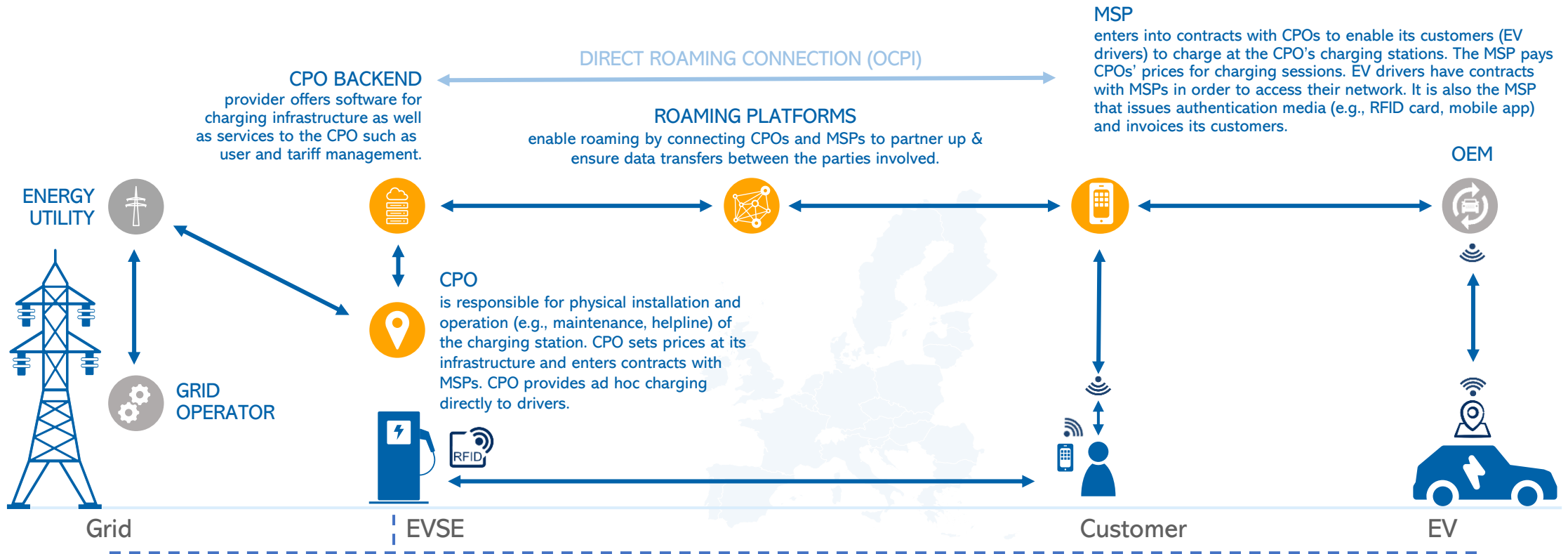


SAFETY AND SECURITY – Both physical and cyber security related to recharging are essential for EV drivers and the mainstream success of the e-mobility transition.



PARTNERSHIP – Especially in an interconnected industry like e-mobility, we work together with other industries, non-governmental organizations, and policymaking stakeholders to build the optimal EV driving and charging ecosystem.

THE EV CHARGING ECOSYSTEM – ROLES & RESPONSIBILITIES



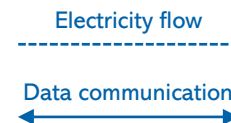
HARDWARE MANUFACTURERS
design, develop, and assemble the charging hardware.



INSTALLATION PROVIDER



SITE OWNER



OEM: Original Equipment Manufacturer
CPO: Charge Point Operator
MSP: Mobility Service Provider
EV(SE): Electric Vehicle (Supply Equipment)

WE REPRESENT THE ENTIRE EV CHARGING ECOSYSTEM



SECTION 2

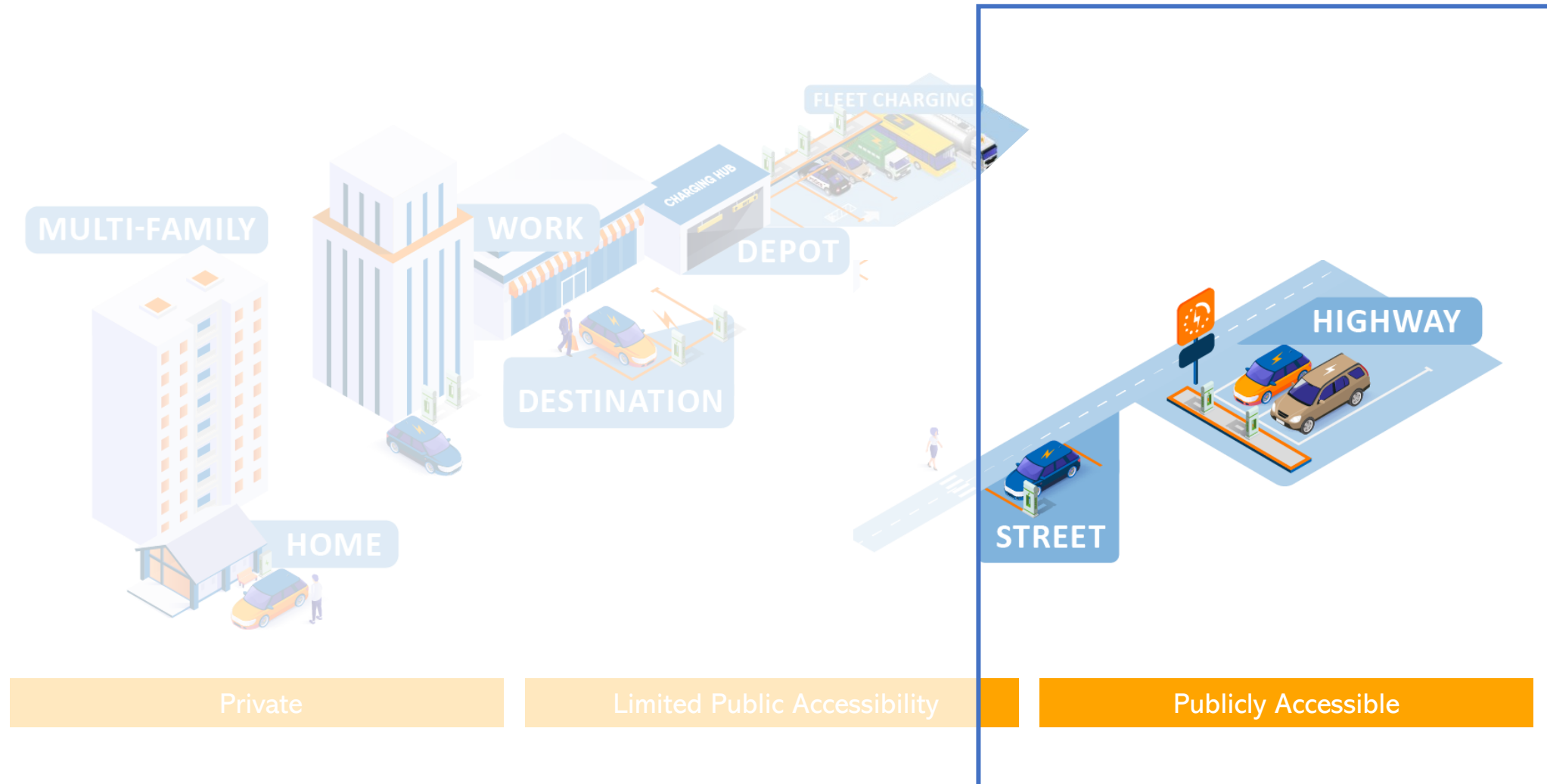
Where and how EV charging takes place today



DIFFERENT CHARGING LOCATION TYPES HAVE UNIQUE CHARACTERISTICS AND NEEDS



DIFFERENT CHARGING LOCATION TYPES HAVE UNIQUE CHARACTERISTICS AND NEEDS



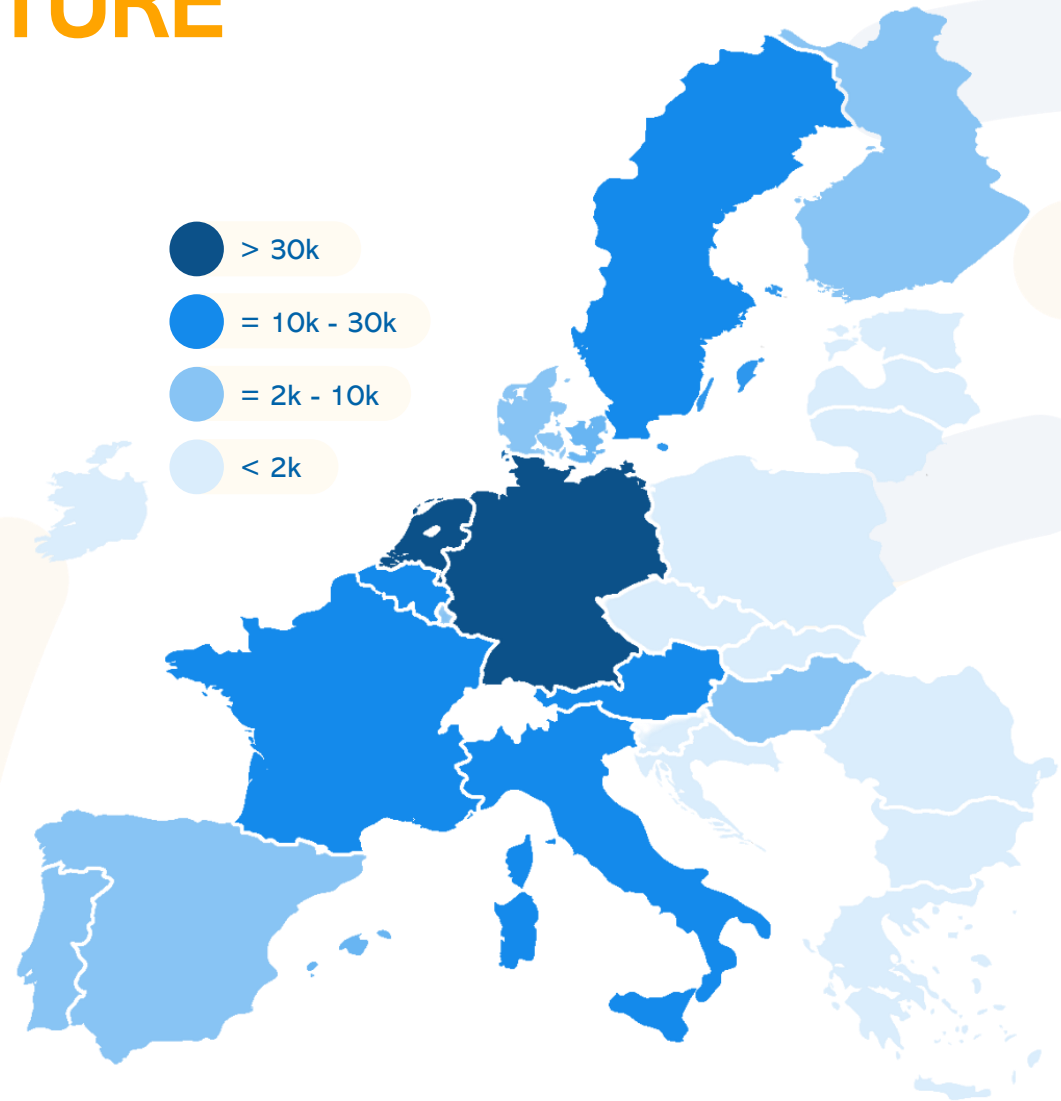
PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE THROUGHOUT THE EU



There were more than 330,000 publicly accessible charging stations in the EU as of the end of 2021.

While on average there are 73 charging points per 100,000 inhabitants across the EU, this is very unevenly distributed across countries, and only 8 countries surpass this ratio (Germany, Austria, Benelux and Nordics).

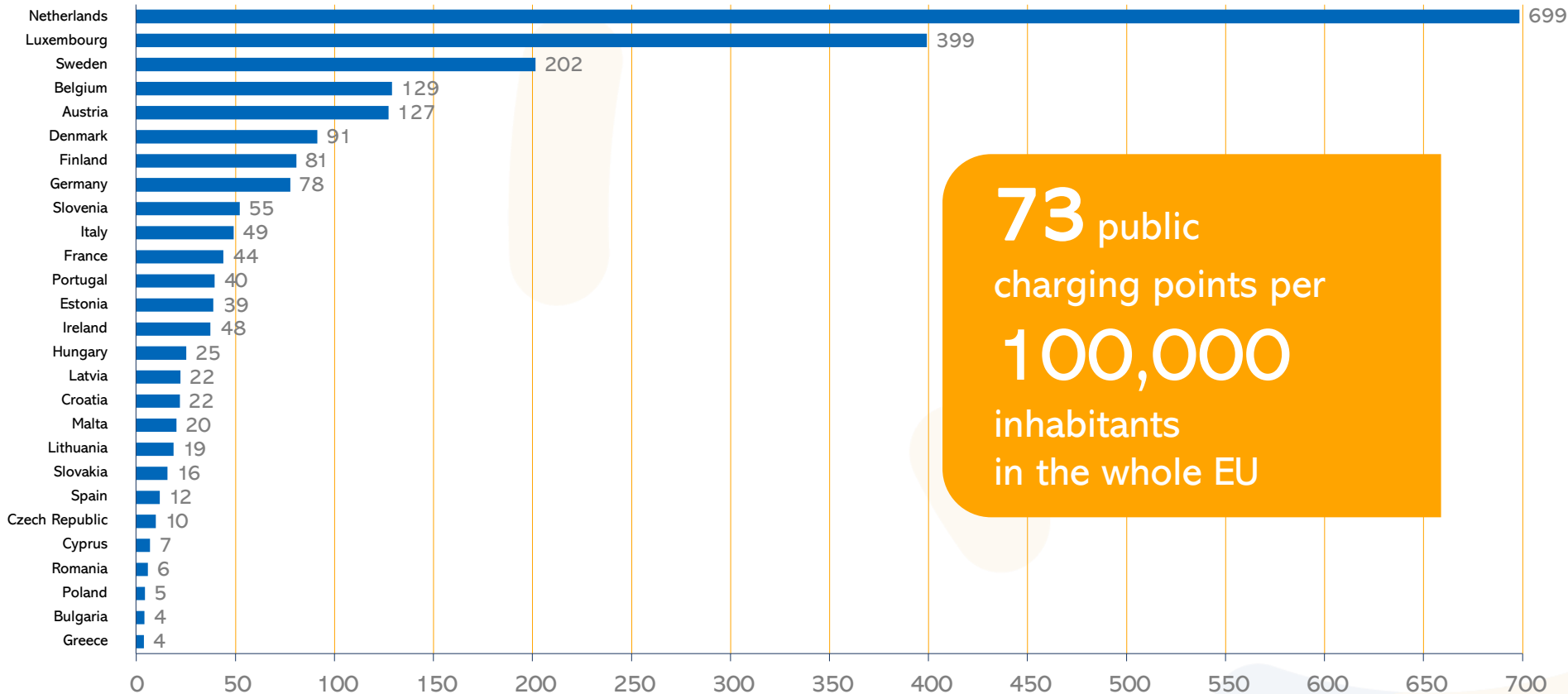
More than 50% of Europe's public charging infrastructure is in the Netherlands (122,000) and Germany (65,000).



WIDE DISPARITY IN NUMBER OF CHARGERS BETWEEN MEMBER STATES

Installed Public Charging Infrastructure per 100,000 Inhabitants per Country in EU-27

[in charging points per 100,000 inhabitants]



There are inequalities between the North and West on the one hand and South and East on the other hand.

There is the great risk that countries with a high proportion of charging points today stay ahead of the others – entrenching a two-speed Europe divide.

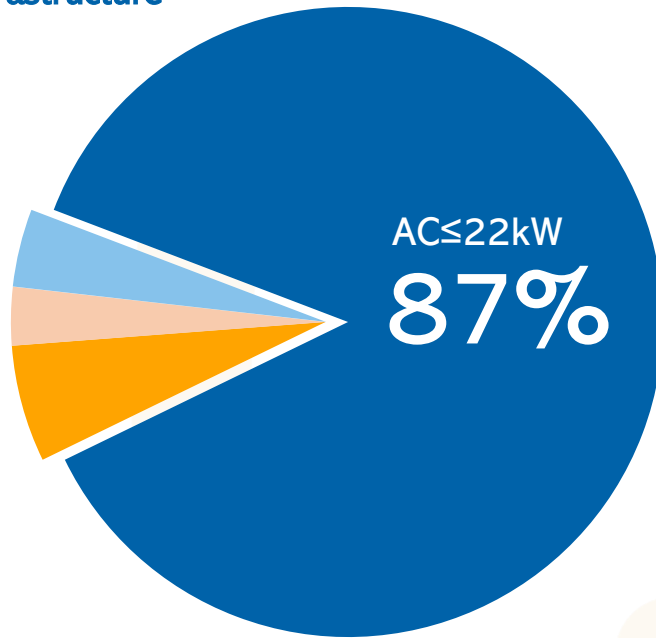
POWER LEVEL DISTRIBUTION VARIES ACROSS EU

Installed Public Charging Infrastructure in EU-27 by Type *[in %]*

AC 22-43kW 4%

HPC > 100kW 3%

DC ≤ 100kW 6%



More than 90 % of all publicly accessible charging infrastructure are AC charging stations, mostly with 22 kW or less.

Countries with a high density of charging points tend to have a higher share of AC chargers.

In contrast, Central, Eastern, or Southern European countries (e.g., Poland, Czech Republic, Spain) have the highest national shares for DC charging, despite having a comparably lower number of charging points in total.

Highest national shares in EU-27 by charging type *[in %]*

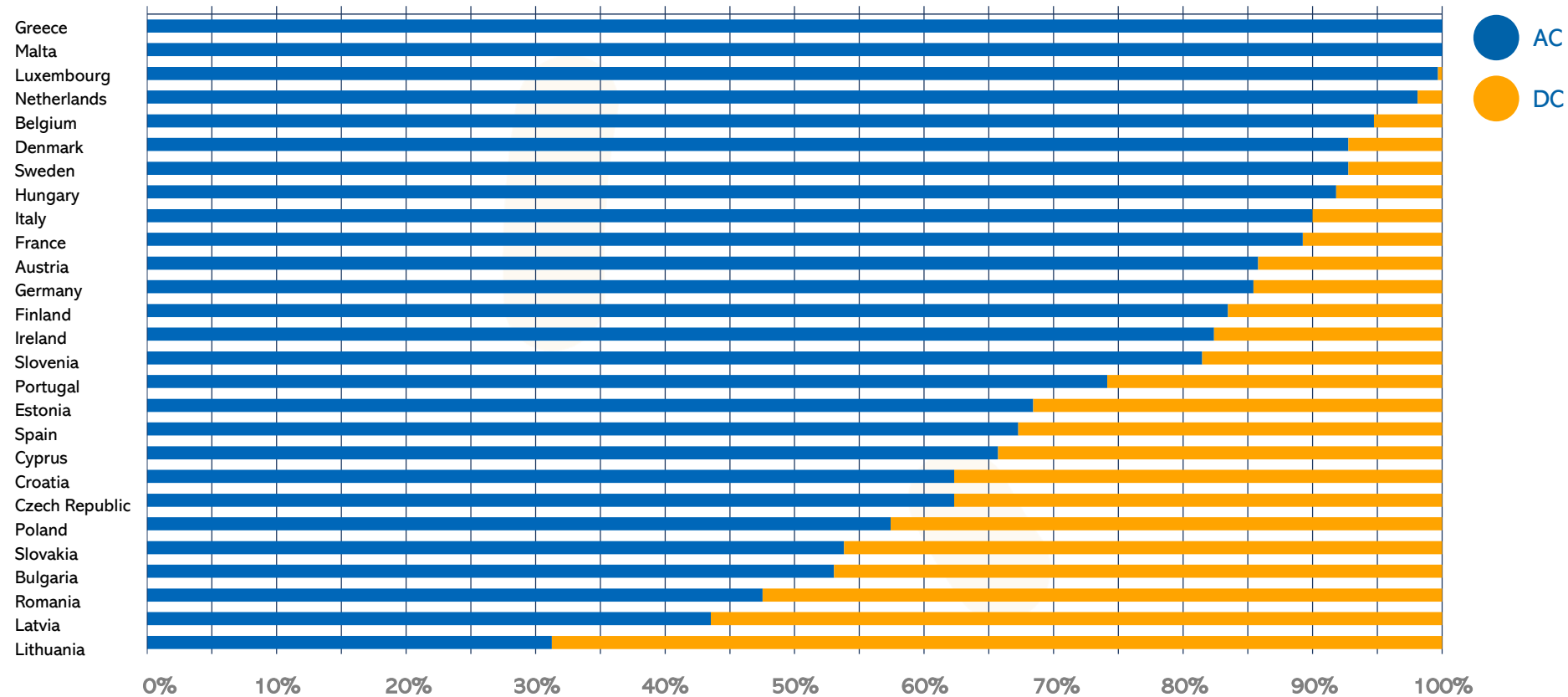
AC	Rank	Country	Share (%)
AC	1.	Luxembourg	99.7 %
	2.	Netherlands	98.1 %
	3.	Belgium	94.8 %
	4.	Denmark	92.8 %
	5.	Sweden	92.8 %

DC	Rank	Country	Share (%)
DC	1.	Poland	32.5 %
	2.	Czech Republic	31.5 %
	3.	Spain	27.0 %
	4.	Portugal	20.3 %
	5.	Slovenia	15.2 %

HPC	Rank	Country	Share (%)
HPC	1.	Poland	10.1 %
	2.	Germany	6.5 %
	3.	Czech Republic	6.2 %
	4.	France	4.3 %
	5.	Ireland	4.0 %

AC/DC SPLIT BY MEMBER STATE

Installed Public Charging Connectors per Charging Type by Country in EU-27
[in %]

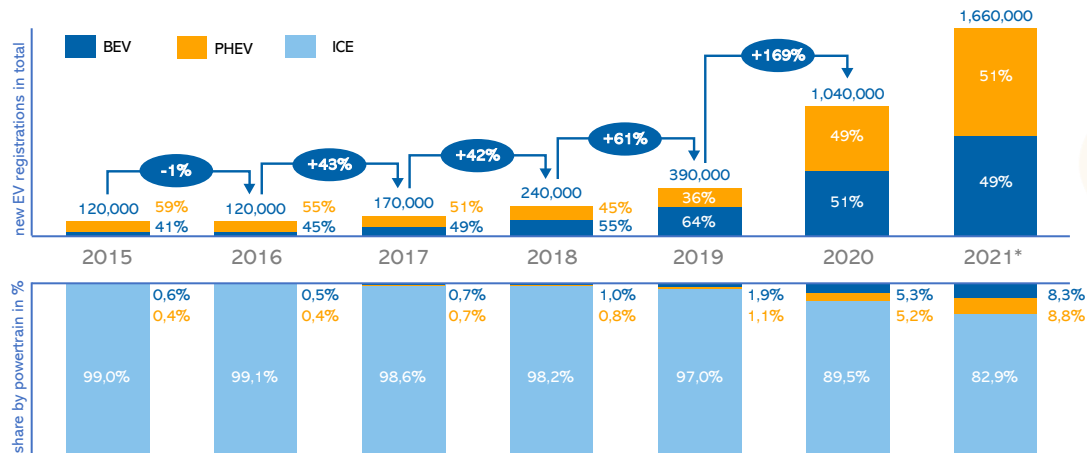


The split between AC and DC charging infrastructure is not uniform across the EU, and reflects different local conditions and preferences, economies, and market approaches in Member States.

THE EU'S EV FLEET IS GROWING QUICKLY, BUT SHARE BY MEMBER STATE VARIES CONSIDERABLY

Throughout the EU, the EV market is booming, with significant year by year growth reaching almost 4 million EVs today. However, the vehicle distribution is also very uneven, with extreme disparities across markets.

New EV Registrations & Share by Powertrain for Passenger Car Market in UE-27
[new EV registrations in total numbers; share of new registrations in %]



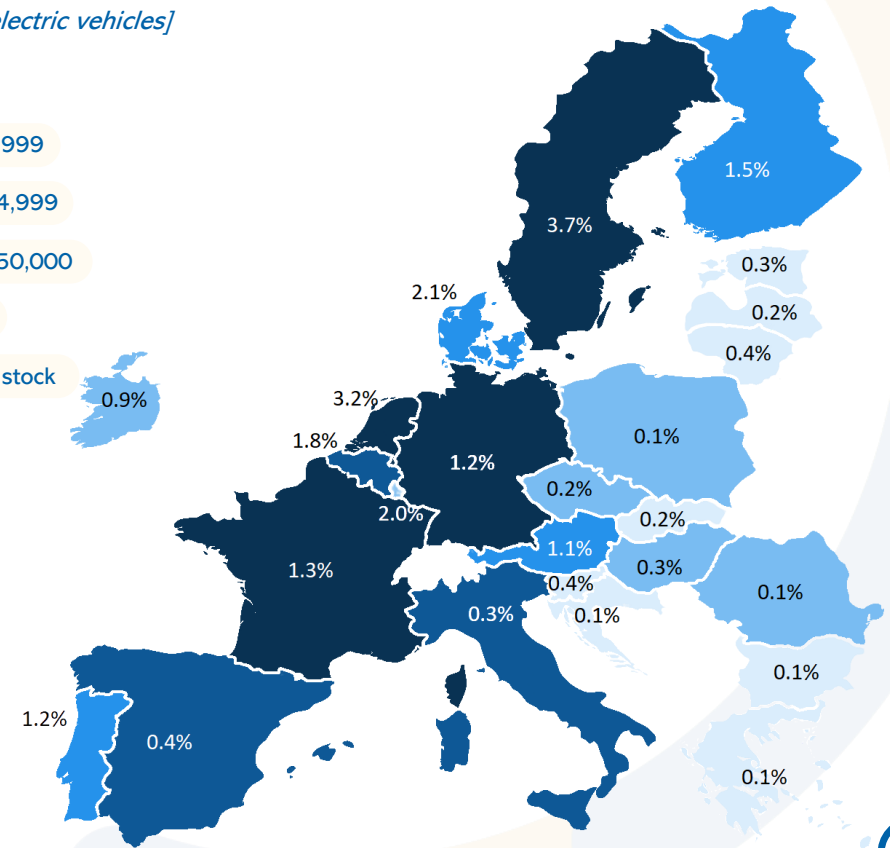
Source: P3 analysis based on figures from EAFO and ACEA
 Figures are rounded to nearest ten thousand

*Forecast based on YTD figures until November 2021

Distribution of EV Stock in EU-27

[battery-electric vehicles + plug-in hybrid electric vehicles]

- < 5,000
- 5,000 – 24,999
- 25,000 – 74,999
- 75,000 – 150,000
- > 150,000
- % EV share of stock



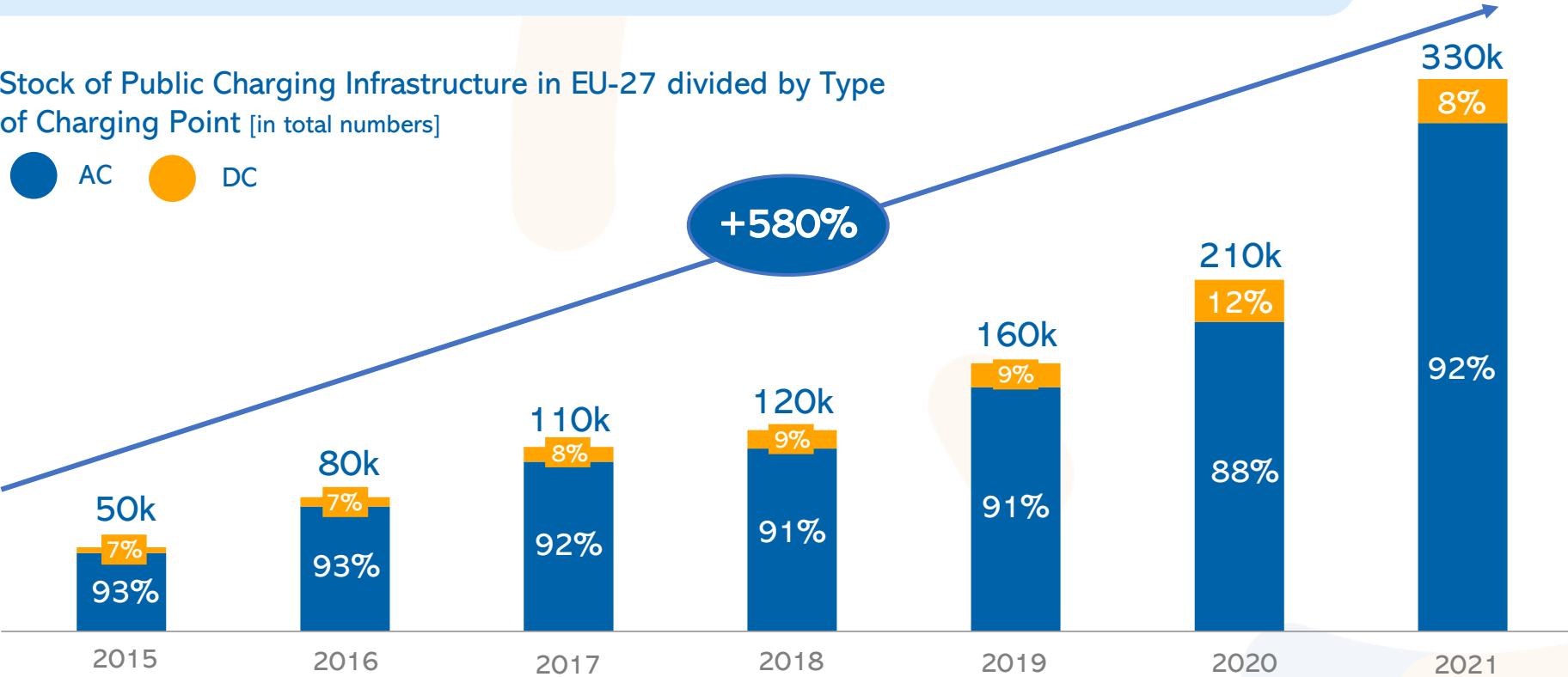
Source: P3 analysis based on figures from EAFO and ACEA
 Analysis is based on vehicle stock at the end of 2020

EV CHARGING INFRASTRUCTURE HAS BEEN GROWING EXPONENTIALLY

As the EV fleet has been growing, so has the amount of charging infrastructure. Public charging alone has grown 6 times since 2015, and still this only accounts for a small amount of the overall charging market.

Stock of Public Charging Infrastructure in EU-27 divided by Type of Charging Point [in total numbers]

● AC ● DC



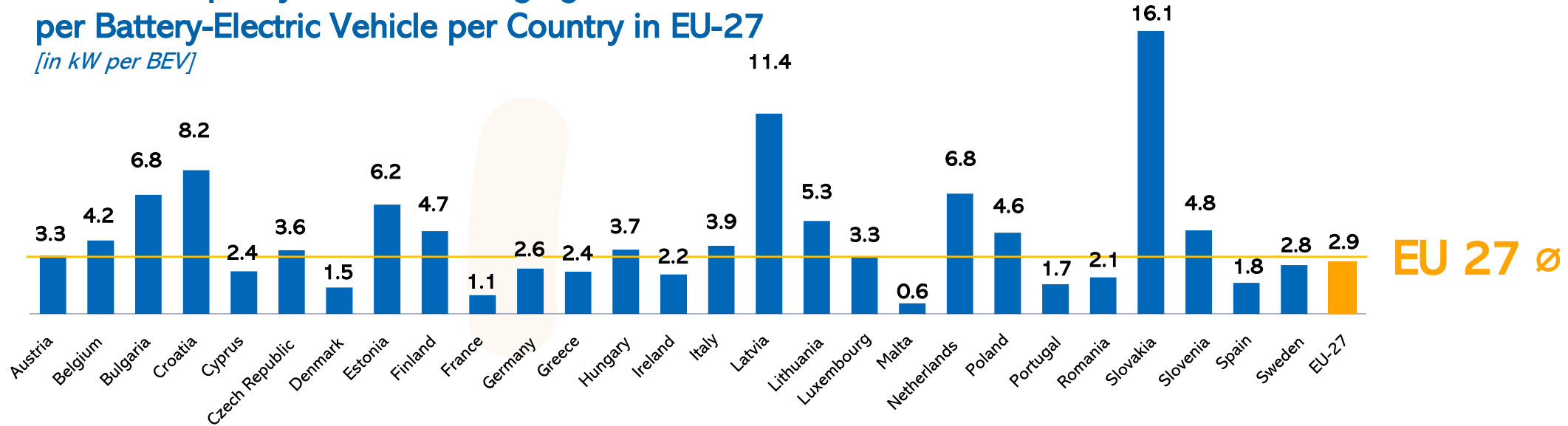
Source: P3 analysis

Growth in number of chargers is important but given the wide range of power levels, installed capacity kW per vehicle is the more important metric.

INSTALLED CAPACITY/BEV VARIES CONSIDERABLY

Installed Capacity of Public Charging Infrastructure per Battery-Electric Vehicle per Country in EU-27

[in kW per BEV]



The reason for this uneven distribution is the EU's uneven EV fleet. In order to prevent a large gap in the amount of public charging infrastructure between Member States, it is important to implement a tailored approach through the introduction of mandatory minimum targets in the Alternative Fuels Infrastructure Regulation.

EV charging infrastructure targets should be linked to the share of EVs in a country's overall passenger vehicle fleet. There should be higher targets for countries with low BEV and PHEV fleets and lower targets for countries with higher adoption rates. These targets should then be reduced according to the fleet's electric vehicle share. After reaching an EV share of 7.5 % for the overall fleet, the market should be operating organically so that binding infrastructure targets are no longer necessary.



Some of the countries with the smallest EV fleets have highest amounts of installed capacity / BEV. This is because they have high powered chargers relative to a smaller electrified fleet.

DESTINATION CHARGING

Destination charging refers to charging infrastructure at places that people visit. EV drivers can charge while shopping, exercising, or while at the cinema. Many businesses offer chargers to provide an additional service for customers and incentivize EV drivers to come to their location. The idea is to 'charge where you park', in other words, charge while you are doing something else, rather than 'park where you charge.'

CASE
STUDY



Shell
Recharge 

Shell Recharge Solutions provides Aldi UK with charge points for their customers to charge up their EVs whilst shopping. Providing charging locations at frequently used destinations like supermarkets gives EV drivers the comfort of widely available recharging options. The initial agreement aimed at installing 140 charge

points at Aldi locations, but currently, already more than 200 charge points have been installed. Shell Recharge Solutions has also installed charge points at Aldi's headquarters in Atherstone which has encouraged and supported the uptake of sustainable driving among Aldi employees.



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CHARGING ON THE HIGHWAY

Recharging on the highway or along main roads is a specific use case. Drivers who typically cover longer distances over shorter time periods tend to prefer recharging quickly at higher power levels and are prepared to pay for this service. They also want amenities – coffee or lunch, an area to walk or exercise – while they top up. A significant amount of emphasis on charging infrastructure in the Alternative Fuels Infrastructure and TEN-T regulations focuses on this use case.

CASE
STUDY




FASTNED

The Kreuz Hilden hub (A3/A46 near Düsseldorf) prides itself on its outstanding facilities: electric vehicle drivers can use Fastned's 12 high powered 300kW charging points, and whilst the car charges, they can visit the on-site café, shop and bakery. The Seed and Greet shop and Schüren Bakery offer high quality, healthy, and sustainably produced food with indoor and outdoor seating

available - with a view over the pond, it is a great place to enjoy a salad and coffee, pizza or juice while on the road. At Kreuz Hilden, every need has been accounted for, from the basics like clean bathrooms, right down to the details, like vacuum cleaners to clean your car. *This* is the charging station of the future.



CHARGING ON THE HIGHWAY

Chargers found alongside highways tend to be located at existing rest areas alongside restaurants, petrol stations, and accommodation. Despite this, some unique considerations must be accounted for: How can the available energy grid be used to power the chargers for fast charging? How can capacity be extended to where it is needed? How can concessions be structured to ensure quality services for drivers?



CASE
STUDY



Allego>

Allego operates more than 830 fast and ultra fast charging stations across 14 EU countries, many of whom are directly on or close to major highways. Allego was the first CPO to introduce Ultra Fast charging - 300 kW - to Europe back in 2018. Today its HPC sites provide a mix of different charging speeds at the same location. The

company has also started to differentiate the charging price in relation to the charging speed. Why pay the same if you are charging at 50 kW or 200 kW? This variable pricing also helps with demand management locally on the grid as well. The next step will be the introduction of peak and off-peak pricing when fast charging.

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CHARGING HUBS

Multiple charging stations co-located together constitute a charging 'hub'. Precisely how many chargers that is varies. Whether on highways or in cities, hubs with amenities are becoming increasingly important to the overall user experience of EV drivers – and business case for operators. Available power capacity can be an issue to be addressed at these locations.

For electric vehicle use to continue growing, drivers need to feel confident that there are convenient and reliable means of recharging their vehicles. That's why Shell is investing in EV infrastructure to meet the charging needs of electric vehicle drivers. In Fulham, central London, we have converted one of our conventional fuel service stations into an electric vehicle charging hub that features 9 high powered, 175kW charge points. The site joins our growing network of Shell Recharge sites at forecourts and other locations.

CASE STUDY



Shell
Recharge



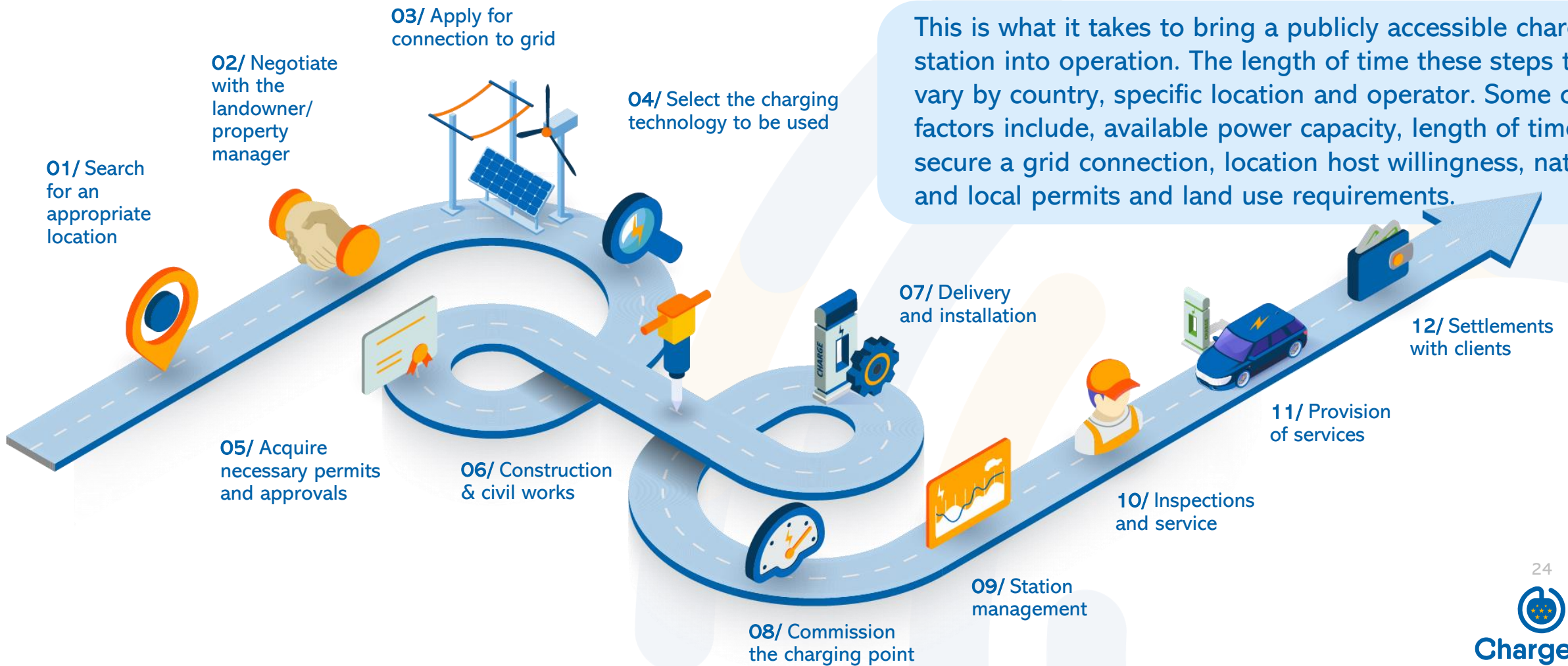
CASE STUDY



In June 2021, TotalEnergies opened the first fully electric service station in the La Défense business centre in Paris. From a technical point of view, beyond the dismantling of a petrol installation in the middle of high-rise buildings, one of the major constraints was to bring in the electrical power needed to operate 9 fast chargers. In order to enhance the user experience, our customers will find additional services such as coffee, snacks and car wash services and our team ready to accompany them. The energy in our vehicles is changing and this requires companies like ours to continually adapt in order to ease the transition for our customers and offer them the best.



THE LONG ROAD FOR PUBLICLY ACCESSIBLE CHARGING INFRASTRUCTURE



This is what it takes to bring a publicly accessible charging station into operation. The length of time these steps take vary by country, specific location and operator. Some of the factors include, available power capacity, length of time to secure a grid connection, location host willingness, national and local permits and land use requirements.

PERMITTING AND GRID CONNECTION OBSTACLES

One of the largest bottlenecks identified by CPOs is the length of time it can take to go from submitting a request for a grid connection to the point where that station can operate commercially. Precise times vary across member states and between distribution system operators, but it's a universally cited challenge.

Lack of transparency in process timelines and milestones, as well as municipal permitting issues add complexity, cost and uncertainty to the rollout of charging infrastructure. The current system is not well suited to the rapid rollout of charging infrastructure needed to meet EU climate goals and legal changes are needed to fix this.

up to **3 years**

is the time it can take to establish a grid connection for a new DC charging point.

greenway

CASE STUDY



Installing and connecting EV charger takes just a few days – but the advance work may take years. We face many procedural hurdles when connecting directly to the grid in Poland – from the local public administration or highway authority and from the distribution system operator (DSO).

This situation is especially challenging at highway locations because the energy distribution network is not well developed, the process of permitting is very complex and not harmonized across the country and expensive construction is often required.

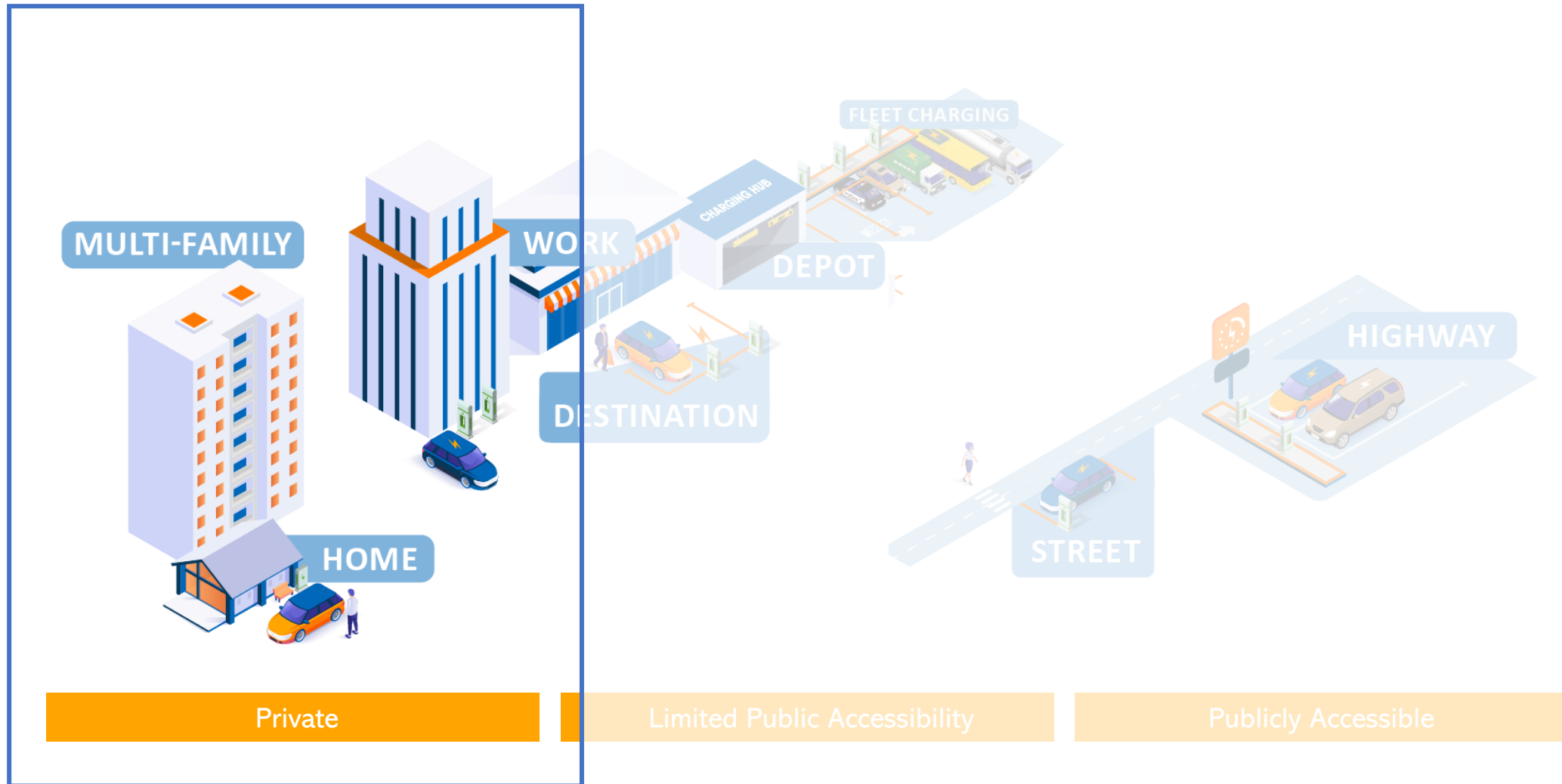
First, we identify a suitable location, itself an exhaustive process. Then, we need to secure rights to use the land from the property owner, and only then can we submit a request for a grid connection at the desired power level to the DSO. The DSO informs us what level of low voltage (LV) power is available. If we do not accept the proposed LV level, we receive terms for a medium voltage (MV) connection.

Once we finalize the contract with the DSO, in the case of a LV connection, we may wait for up to 18 months for it to be made. For more complex MV connections, the contract with the DSO specifies the particulars at that location. These usually include identifying significant parts of the

investment, such as MV lines and transformer station, to be funded by the CPO. The costs vary depending on the connection, but MV transformer stations cost between €40-200.000. Complexity of the design and construction process and how long it will take vary depending on distance to the grid connection point (which can be as far as a few km away), settling land use agreements with property owners whose land cables will pass through (which can be time-consuming, costly and even unsuccessful, requiring new designs), permits required from local authorities and environmental regulators, and finally, the required construction. The process is not the same across the country and a lot depends on the knowledge and experience of the official handling the file. Overall, MV connections can take 2-3 years from contract agreement to completion and all of this uncertainty makes the investment less attractive.

We are working with the government, DSOs and national energy regulator on legal changes to better support the EV charging market. Already, we have collaboratively developed an e-tariff where fixed capacity costs are tied to utilization. This is a good first step towards addressing the other obstacles to charging infrastructure deployment, because regulatory changes are needed, without which the EV transition will be severely undermined and delayed.

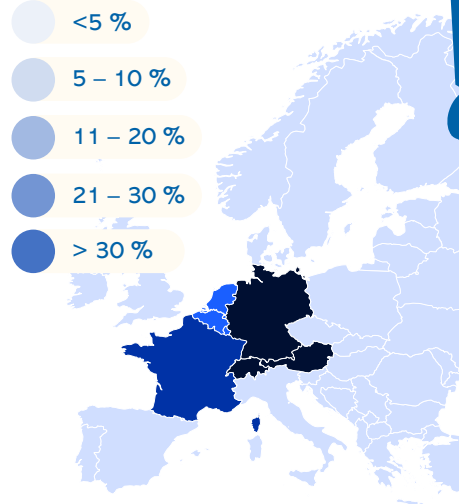
DIFFERENT CHARGING LOCATION TYPES HAVE UNIQUE CHARACTERISTICS AND NEEDS



IMPORTANCE OF HOME AND WORKPLACE CHARGING – BY GEOGRAPHY

PRIVATE CHARGING BY REGION

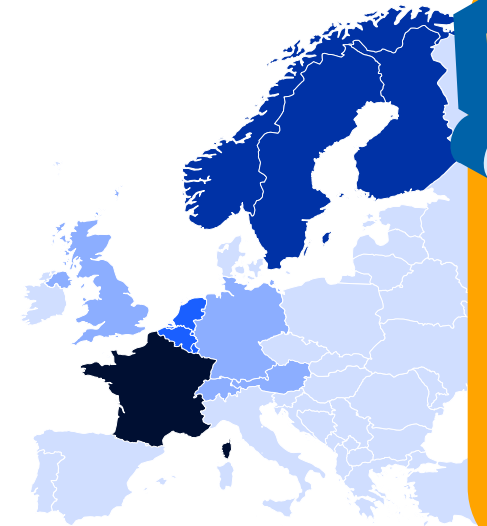
RESIDENTIAL CHARGING



Majority of residential chargers sold in DACH and France (>80 %), 90% with BeNeLux – these results fit to the current distribution of the EV stock.

Charging capacity varies between focus on 7.4 and 22 kW – possibly due to high shares in France (largely 7.4 kW due to local grid conditions) and DACH (where it will change to 11 kW due to recent subsidy conditions).

WORKPLACE CHARGING



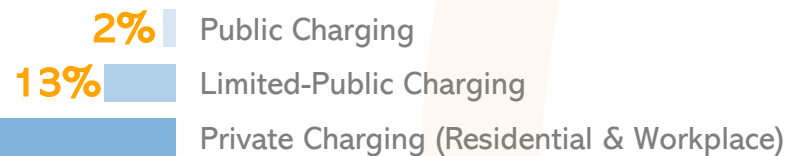
Different picture than residential charging – France and Nordic countries with highest share (60 % combined), followed by BeNeLux and DACH.

Predominant charging capacity at workplaces is AC 22 kW.

Residential charging is more than twice as large as workplace charging, in terms of total units.

AC CHARGING HARDWARE BY USE CASE

85%



IMPORTANCE OF HOME AND WORKPLACE CHARGING – BY UTILIZATION

	RESIDENTIAL CHARGING	WORKPLACE CHARGING
NUMBER OF CHARGING SESSIONS PER WEEK [in total]	>4 charging sessions per charging point per week on average	>8 charging sessions per charging point per week on average
ENERGY CHARGED PER WEEK [in kWh]	100 kWh charged per week on average	400 kWh charged per week on average
SPREAD OF CHARGING SESSIONS OVER THE DAY	95+% of residential charging sessions take place between 12 pm – 8 am	75% of workplace charging sessions take place between 8 am – 4 pm, and 25 % between 4 pm – 12 pm



Charging points at work have much higher utilization than residential charging points.

This is also reflected in the energy charged at work, which is 4x more than for residential charging.

While residential charging sessions more often take place at night, charging at work more often takes place during the day.



The number of charging sessions as well as the energy charged are both considerably higher in the workplace than at home.

On average, 13 kWh are charged during an AC charging session.

CHARGING IN MULTI-FAMILY BUILDINGS

With 46% of EU citizens living in apartment buildings, providing charging solutions for these residents is very important. The majority of shared parking garages receive electricity from the common area meter which presents a barrier to the installation of individual EV chargers. Additionally, many local regulations do not allow for the direct connection of a charger installed in the parking garage to the corresponding apartment. The ongoing revision of the Energy Performance of Buildings Directive (EPBD) represents an opportunity to address this challenge.



The **right to plug** is the right for people to install charging infrastructure near where they live. It will limit the ability of housing associations to deny resident's requests to install chargers.

It will accelerate the relatively slow uptake of EV charging infrastructure in buildings by ensuring: a speedy response to connection requests, administrative peace-of-mind, and guaranteed accessibility

Several Member States, like Spain and France, have already implemented it, facilitating the installation of charging points in parking lots of apartment buildings.



CASE
STUDY



EDP solutions offer features that address the main pain points of EV users in shared parking garages:

- Individualizes the electricity consumption of each tenant for EV charging and allows the correct cost settlement of electricity consumption;
- Provides automatic cost settlement between EV users & condominium, eliminating payment risk (integrated e-wallet).

WORKPLACE CHARGING

CASE
STUDY



-chargepoint+

ChargePoint helped Konica Minolta in Germany to meet their sustainability, environmental protection, and climate protection goals, which include decarbonized transport solutions.

Konica was looking for more than a charging station provider, but also an experienced supplier with software, installation, reporting and servicing options. The ChargePoint as a Service® subscription model enabled the company to provide low risk intelligent charging solution with lower capital expenditure and predictable operating and maintenance costs.

Ultimately the infrastructure also offers charging facilities to employees and other user groups such as residents, service providers and the public. Konica Minolta had a number of crucial requirements for the new charging solution, including a billing function, the creation of

different user groups, and a web portal where everything can be configured and viewed. The future has also been taken into consideration: The ChargePoint waiting list function offers a smart way to increase the use of the stations. It allows drivers to easily “join the queue” at local stations via the charging provider’s app, which then sends users a notification as soon as a charging space becomes free.

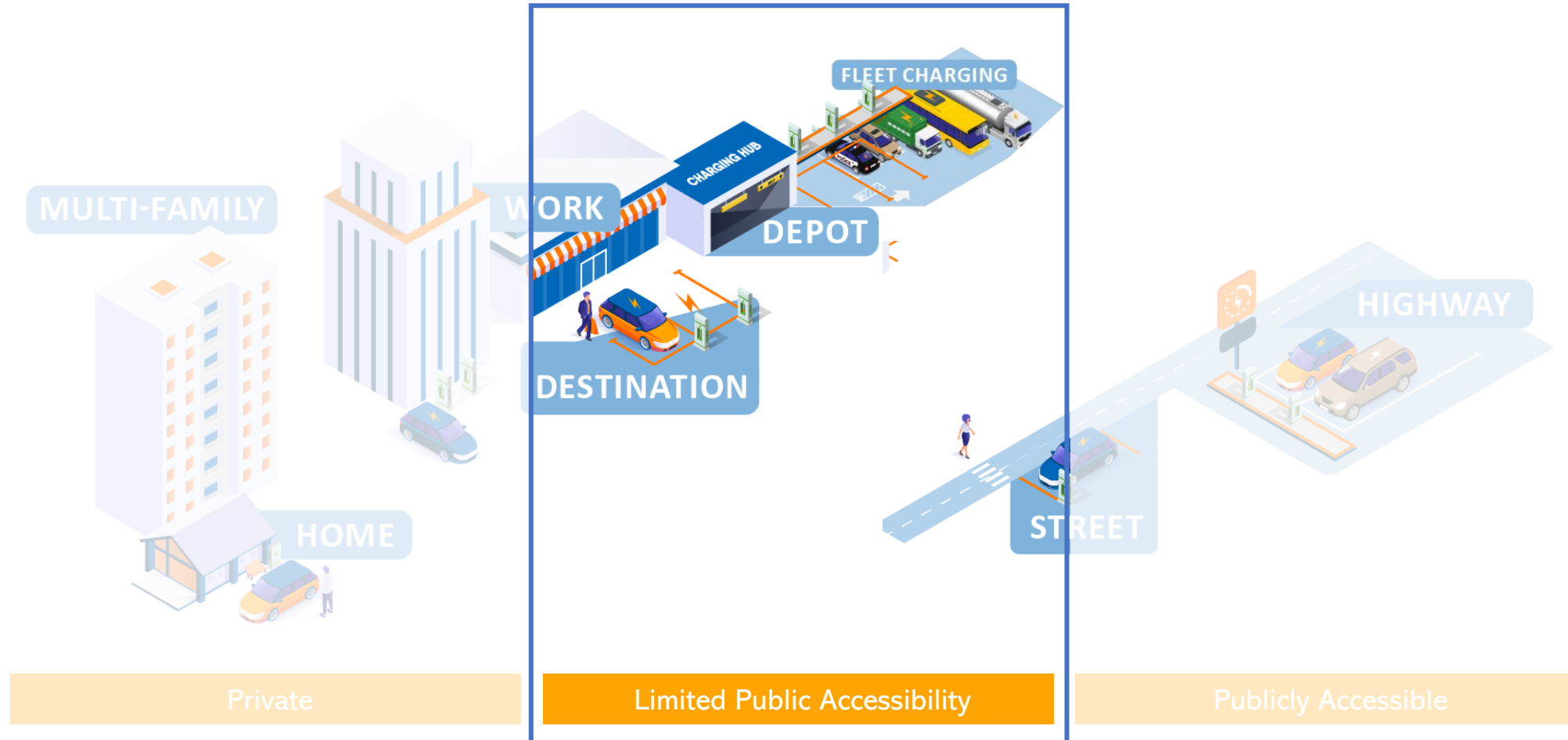
In this case, the subscription model illustrates the different functionalities that it can offer, not only to the drivers but also to the charging point owners to optimize its charging infrastructure from a use and management perspective. These functionalities and flexibility offered by the software solution reduce the investment risk and also allows for more predictability in terms of use, operating and maintenance costs.

Workplace charging is crucial, especially for those without a home charger. People go to work for multiple hours and can charge slowly over the course of the day at low power, helping to balance energy system load. Providers play an important role in helping companies set up their workplace charging program to identify individual users, track energy consumption, manage smart charging, and meet their overall needs. Whatever happens with office culture in the future, charging in buildings and at offices is expected to play a large role.



Photo: Konica Minolta

DIFFERENT TYPES OF CHARGING LOCATIONS HAVE UNIQUE CHARACTERISTICS AND NEEDS



LIMITED PUBLICLY ACCESSIBLE CHARGING

'Limited' or 'semi' publicly accessible charging is a category used to refer to charging infrastructure use of which is limited to a defined group of users. It need not support all the functions of publicly accessible infrastructure, but an EMP usually manages authentication, invoicing, energy management and other tasks. Most fleet, depot, and workplace charging falls in this category.

Elements of a limited publicly accessible charging station include:

- Access is limited to selected users (e.g., taxi drivers, residents/tenants, fleet drivers, etc).
- Roaming is not enabled or in use.
- No guarantee to make use of ad-hoc payment for charging.
- Charging station is not published online.
- Opening hours for the public are too short (less than 65% of the day).

CASE
STUDY



Allego >

At Amsterdam Central Station, Allego operates a fast-charging station that was installed exclusively for the use of EV taxis. The taxi stand has a barrier which ensures only taxis have access to the station. It is open 24/7.



CHARGING AT COMMERCIAL PARKING SPACES

With around 15% of all charging happening at limited publicly accessible locations, this segment is extremely important, especially for drivers without access to a home charger, those making a stop for commercial activities, or simply taking a rest and eating something. Limited-public charging needs can be covered both by normal and fast chargers, depending on needs and the use-case. Providers can play an important role in helping companies set up their commercial charging programs to identify individual users, track energy consumption, manage smart charging, and meet their customers' needs overall.



CASE
STUDY



EVBOX

YourParkingSpace is revolutionizing the parking industry by helping hospitality and retail owners provide EV motorists with a wide range of pre-bookable park and charge spaces. Since the launch of the partnership with EVBox in 2020, YourParkingSpace successfully trialed 5 charging points at the Holiday Inn Express in Bicester, UK, and is now planning to install another 200 EVBox

business charging ports across the UK at Atlas Hotel sites.

The partnership with EVBox will transform their business model to include park and charge and ultimately to become the destination for EV motorists and an industry leader in the UK.

CHARGING SOLUTIONS FOR ELECTRIC FLEETS

Most new car sales in Europe are company cars purchased by leasing companies. These companies have the potential to drive the market and are innovatively integrating an 'end to end' recharging solution into their offer.

CASE
STUDY



ALD
Automotive

ALD Automotive is a world leader in vehicle leasing and mobility solutions. In order to accompany clients in their electrification journey, ALD is going well beyond simple lease offers for electric vehicles. This involves facilitating the customer experience by providing advisory services and integrating access to charging solutions into the leasing product. This approach is enabled by strategic partnerships with “pure players” in the electricity ecosystem, supplying both the charging stations, associated software, and data flows. In this respect, ALD

entered into a partnership with ChargePoint. The ALD Electric offer includes the financing of the vehicle itself, access to charging solutions at home, in the workplace, and in public areas. For the driver, it means an easy digital on-boarding experience, electricity reimbursement solution, dashboard reporting, home charger installation and maintenance, with 24/7 customer support.



SECTION 3

**The EV charging
experience**



ChargeUp
EUROPE

At ChargeUp Europe, we approach the EV charging industry from the driver's perspective. By placing the customer experience at the core of our business, we are able to tackle many new problems by offering innovative solutions ranging from accessibility to safety to convenience of payment.



PAYING AT PUBLICLY ACCESSIBLE CHARGERS

Subscription approach
Payment via MSP / MSP pricing

**GOOD NEWS,
YOU HAVE MANY OPTIONS**

YES

**DO YOU HAVE
A SUBSCRIPTION
FOR THIS
CHARGING STATION?**

NO

Ad-hoc approach
Payment through CPO / CPO pricing

**GOOD NEWS,
YOU HAVE MANY OPTIONS**

Use the app
from your
MSP

Use
the charging
card from
your MSP

Use
Plug &
Charge

Conveniently, receive an invoice at the end of each month giving you visibility on all your sessions

Enables smart charging and energy management, offline charging, tailored pricing, special offers, package deals, Plug & Charge and more



(at Charger)
Direct payment via
NFC reader

(Via electronic means)
Scan QR Code / link

Use your
credit or
debit card

Use mobile
wallet /
payment
app

Be
redirected
to the MSP
platform

Be
redirected
to banking
app

Remain flexible, anonymous, and able to charge at all publicly accessible stations throughout Europe



95%

Of payments on publicly accessible chargers are made via subscriptions.

THE IMPORTANCE OF E-ROAMING

Roaming is the driver's ability to use and charge their electric vehicle across networks and across countries. In our vision, it ought to be a seamless experience across all EU Member States, where it does not matter how or when the car is charged.

CASE STUDY



greenway

One way GreenWay makes roaming smooth and cost transparent for its subscribed customers is with the option to 'Roam like at Home' - to pay the same low price for charging out-of-network as they pay for in-network charging. This flat rate approach helps EV drivers know exactly what their charging session will cost, wherever they choose to recharge.



CASE STUDY



evway

Electric mobility is the perfect enabler for sustainable tourism, especially for countries like Italy, whose heritage and economy relies on tourism. Each year, millions of Europeans drive through the Alps to visit palaces, museums, or eat at our trattorias, and bring home samples and bottles of our cuisine. Travel is thus an experience full of opportunities to pamper our guests, let them feel welcomed and 'at home'. Therefore, when EV drivers arrive in Italy, or in any other country, they should be able to rely on their

preferred MSP, the one they prefer, trust and enables them to travel effortlessly all over Europe. That's the essence of sustainable tourism with an EV - feeling free to roam the territories with zero impact, feeling at ease, knowing that your MSP will enable all your recharging sessions. Thanks to our roaming agreements our customers enjoy positive experiences while driving and charging their EVs.

~99%

of publicly accessible charging stations are technically e-roaming capable

Source: P3 analysis

ACCESSIBILITY FOR PEOPLE WITH LIMITED MOBILITY

Access for people with limited mobility and older people is something that the charging industry takes seriously. This includes in the manufacturing of hardware as well as location set up, such as curbs, parking spaces and more. Some of these are outside the scope of the CPO, so we work with location hosts to ensure that the parking spaces at their location are accessible and sufficient.

CASE
STUDY



ABB

An important aspect in leading the way to a zero-emission mobility future is ensuring accessibility to charging technology for all electric vehicle drivers. This means developing e-mobility solutions which are accessible for use by drivers with disabilities or limited mobility. For example, innovations which we have already integrated into to our Terra 360, the world's fastest all-in-one charger, include:

- Locating the charger interface, payment terminal and connectors below 1.2m so they are accessible for wheelchair users.
- Bright visual indicators which can be seen at a distance that identify the availability of a charger and the state of charge, limiting the need for someone with restricted mobility to approach the charger screen unnecessarily.
- A flexible cable retraction system making it easier for all drivers to easily maneuver 5m long cables.



RECHARGING SAFELY

Safety while charging is very important, and, as EV driving and charging enter the mainstream, must be prioritized. From visible locations with lighting and cameras to data protection and cybersecurity, the safety of users is one of our foundational values.

CASE
STUDY




FASTNED

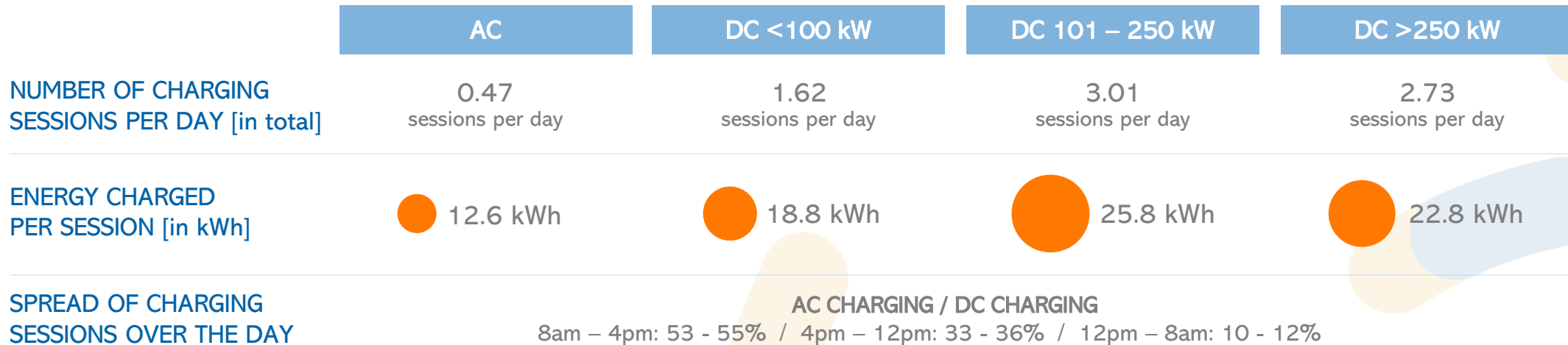
People's safety while they recharge is of utmost importance. Fastned is committed to making sure EV drivers always feel safe and secure when they are charging up, no matter the time of day or the remoteness of the station. We carefully choose locations with safety in mind, install CCTV at every station, and the lighting in our roofs ensure that stations are well lit all night to help make sure that drivers feel comfortable and secure.



ChargeUp
EUROPE

UTILIZATION OF PUBLICLY ACCESSIBLE CHARGERS

The average number of charging sessions as well as the energy charged per charging session increase significantly with higher charging capacity.



- In general, the number of charging sessions per day as well as the energy charged per charging session both increase with a higher charging capacity – the drop for DC >250 kW can be explained by the limited number of vehicles able to charge at this capacity.
- The energy charged per session is about 50% higher for DC (<100 kW) and 100% higher for DC (101-250 kW) than for AC charging.
- Charging technology and capacity don't affect the timeframe for charging at all – more than half of all charging sessions take place during the day, about a third in the evening, and about 10 % at night.

SECTION 4

Growth and impact of the EV charging industry



MASSIVE GROWTH IN INFRASTRUCTURE TO SUPPORT EV FLEET NEEDS – MOSTLY NON-PUBLIC

The total stock of charging points will increase sharply from about 3 million today to close to 30 million by 2030.

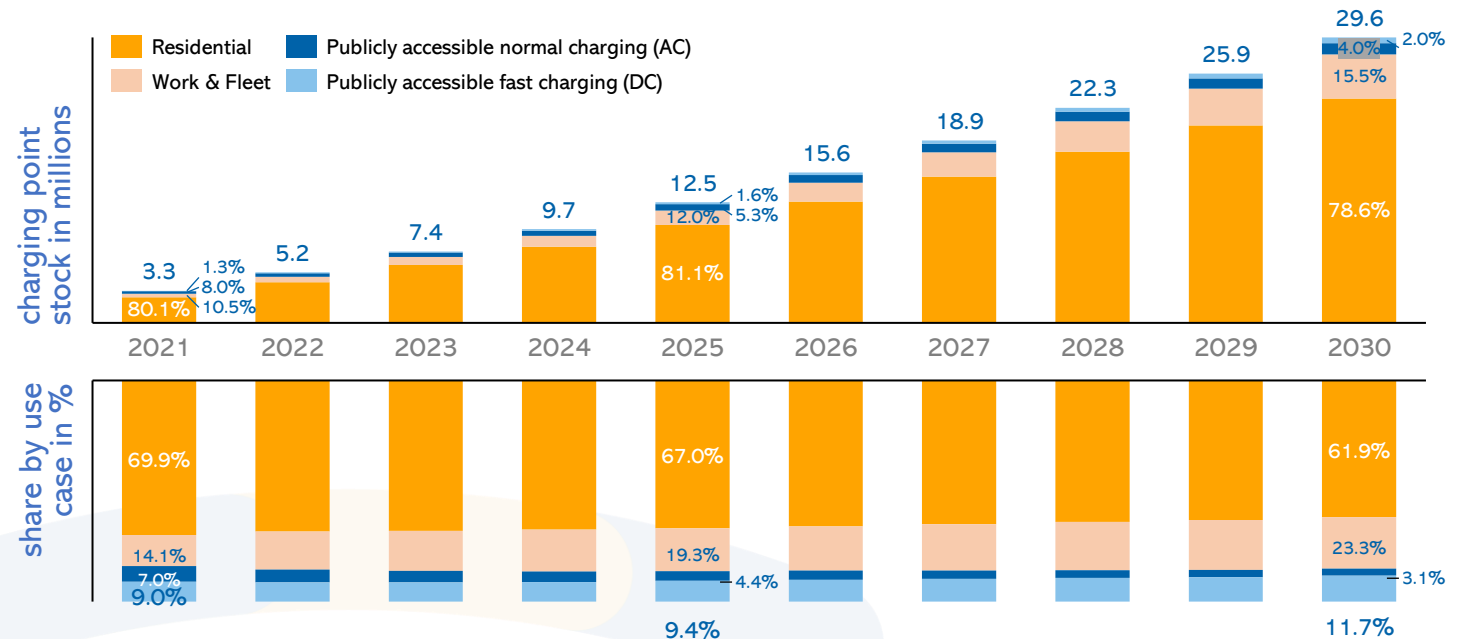
Residential charging is and will remain the dominant use case comprising 4/5 charging points today and in years to come.

Workplace charging will increase from 10% today to 15% in 2030 and private charging will account for more than 94% of charging infrastructure deployed.

While fast DC charging will only account for 2% of the charging infrastructure stock by 2030, the installed charging capacity of these charging points will represent almost 12% of the total installed capacity in the EU.

While the share of public AC charging points decreases from about 8% in 2021 to 4% of the charging infrastructure stock by 2030, the share of DC charging points increases from 1.3 % to 2 %.

Forecasted Stock of Charging Infrastructure & Share of Installed Charging Capacity in EU-27 divided by Use Case
[in million units; share of installed capacity in %]



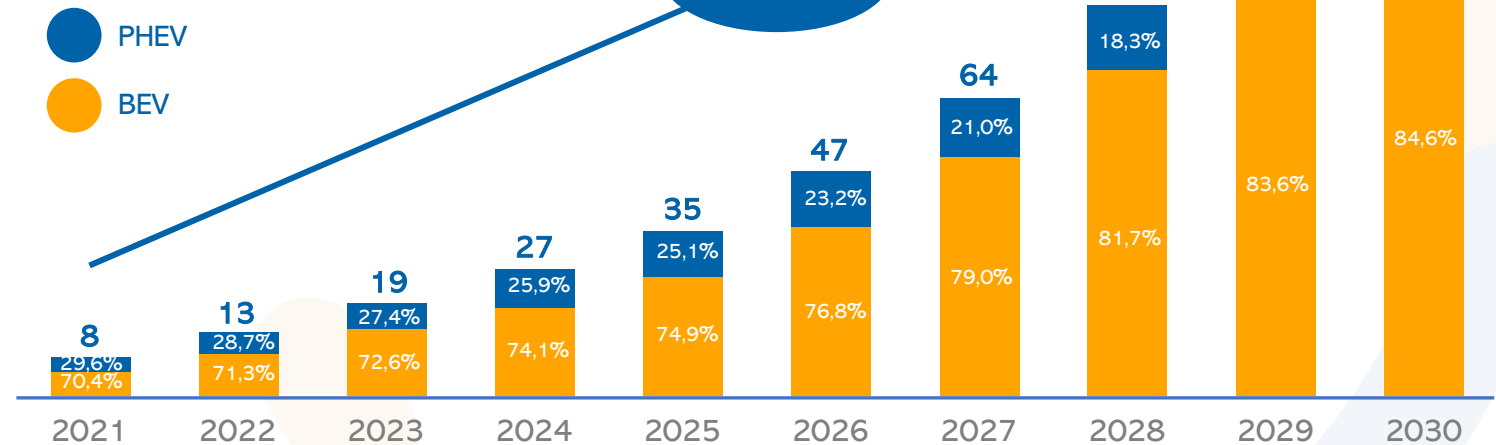
Source: P3 analysis

MORE EVS REQUIRE MORE ELECTRICITY

As EV numbers grow, the amount of electricity they need will also grow – this will require more investments. Compared to the distribution of charging points by use case, installed charging capacity shows a slightly different picture. An increasing rise in charging capacity is observable for workplace as well as for public DC charging, as their shares of installed capacity are significantly higher than their shares in terms of the number of charging points.

- In 2020, the total annual electricity demand of the EU-27 nations was about 2,778 TWh.*
- In 2020 EVs consumed ~0,3% of the total electricity demand. This is projected to be ~4 percent by 2030.
- As of today, public charging points have an average charging capacity of about 37 kilowatts in the EU-27. The average charging capacity of public charging points will increase continually in the upcoming years with the widespread setup of HPC infrastructure.
- In 2030, of the required 128TWh in 2030, 18,8TWh (14,7%) will be provided by publicly accessible charging points

Forecast of Annual Electricity Demand of Electric Vehicles in EU-27 [in TWh]



Source: P3 analysis



Smart charging and load balancing will keep overall energy needs manageable.

*Source: Agora Energiewende and Ember (2021)

INVESTMENTS NEEDED TO MEET THE DEMAND

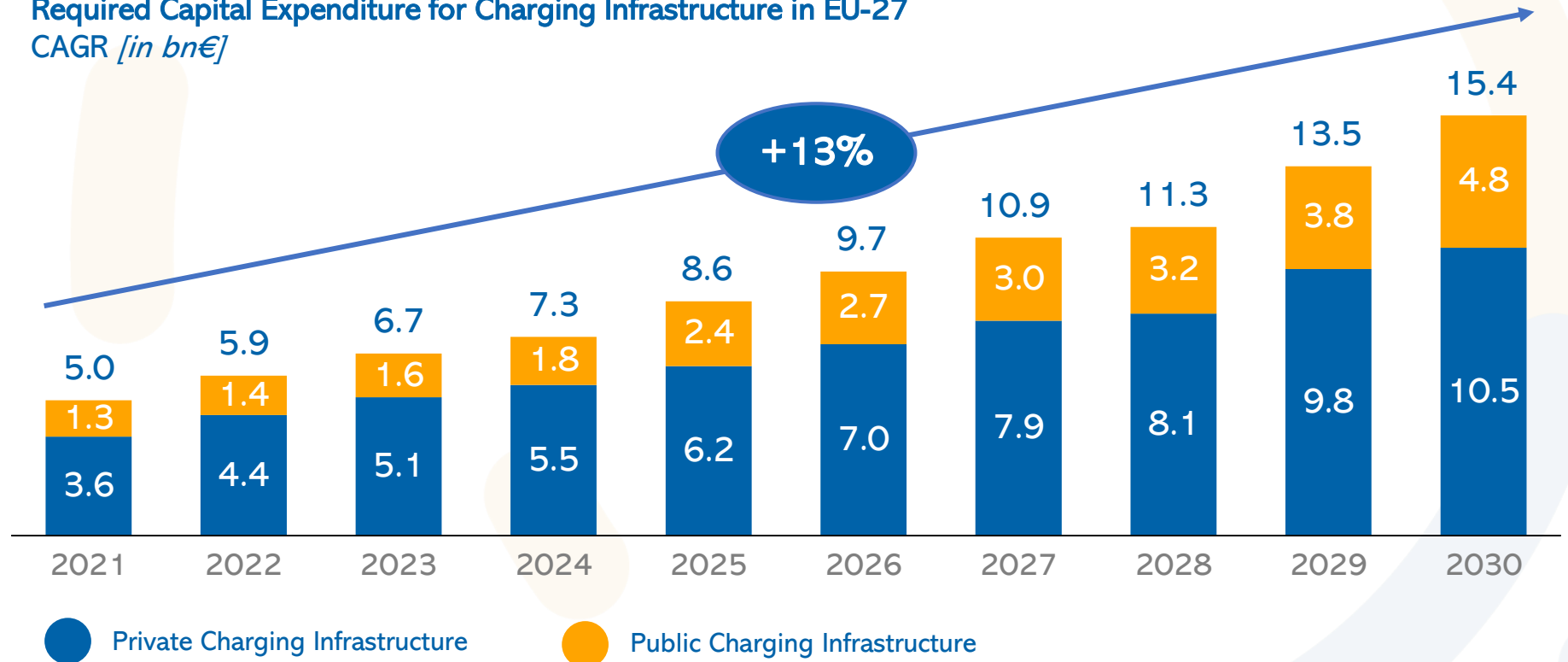


Also in terms of publicly accessible charging infrastructure, the bulk of investment should continue to come from private companies.

Investments into charging Infrastructure will grow from €5 billion in 2021 to over €15 billion in 2030.

Of this, private charging is estimated to account for 2x the investment costs of public infrastructure

Required Capital Expenditure for Charging Infrastructure in EU-27
CAGR [in bn€]



Source: P3 analysis

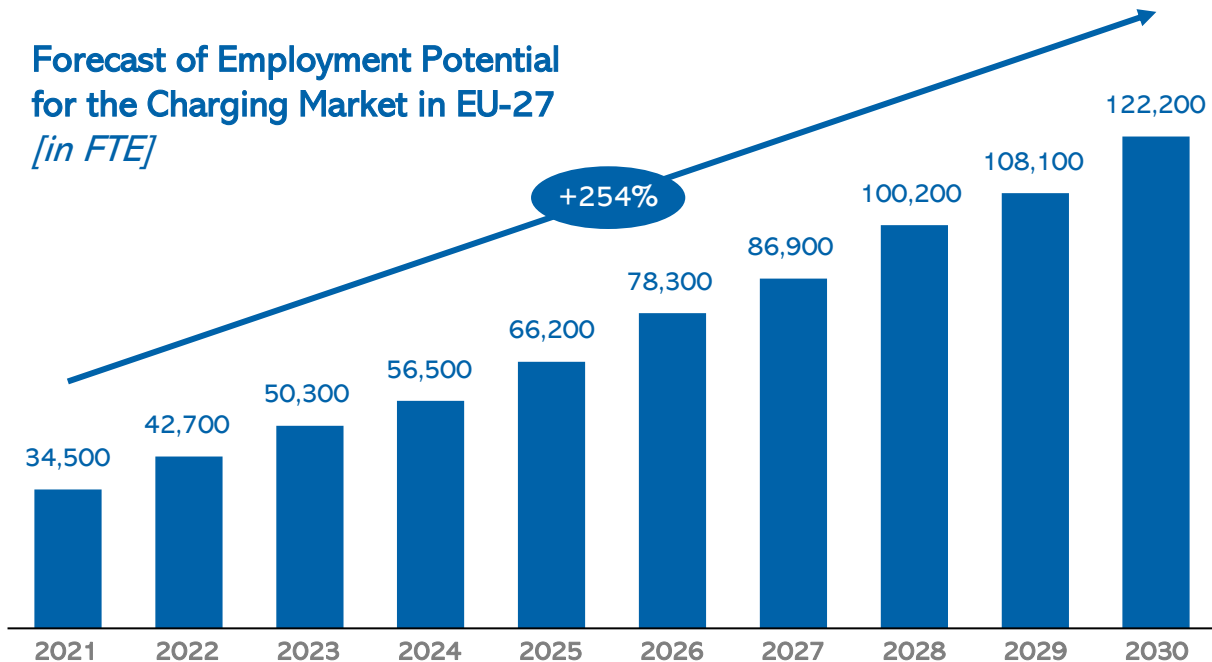
Figures are rounded and include investment costs for charging hardware, installation, planning and grid connection (incl. transformers for MV)

THE PEOPLE BEHIND THE INFRASTRUCTURE

In 2021, there were around 34,500 job positions across different segments in the European Union's charging market.

The size of the charging market will increase as more electric vehicles are put on the road, causing an expected growth of the workforce by +254 % by 2030 and a total of more than 122,000 job positions.

Forecast of Employment Potential
for the Charging Market in EU-27
[in FTE]



Source: P3 analysis. Rounded to the nearest hundred

The realization of complex charging infrastructure projects such as the N-ERGIE car park in Nuremberg-Sandreuth is the result of effective teamwork: e-mobility hardware manufacturer ABL, e-mobility software company reev and the e-mobility electrical specialist company reev solutions working hand in hand. The partner companies combine the expertise of high-quality hardware, intelligent software and specialist expertise in installation. In this way, the increase in e-mobility and the demand for charging infrastructure are addressed with a holistic approach.

«In complex charging infrastructure projects, the power output must be intelligently controlled between an increasing number of users and new local power generation such as photovoltaics. Solving these challenges requires electrical engineering understanding.»

Maximilian Boss, Managing director reev solutions.

CASE
STUDY



ABL+
reev

ChargeUp
EUROPE

SECTION 5

Current developments in the industry



ChargeUp
EUROPE

SMART CHARGING

Smart charging is common practice in the EV charging industry and refers to the ability to adjust the amount of power flowing to an EV while it is connected. It can refer to balancing power among sockets on a single charger, balancing power between charging stations in a hub, balancing between EV charging and other uses, or modulating power flow to optimize charging based on pricing, CO2 content, and more. Through smart charging, the vehicle, charger, home and broader energy system

communicate with each other. Smart charging will be an important feature in balancing the impact on the grid at peak times, thereby reducing grid development costs, integrating renewable energy sources, and other system integration benefits which will play a key role in decarbonising transport and energy system optimisation. Smart charging can bring many benefits to EV drivers as well, such as programming the car to charge when demand for power is low and electricity is cheap - for example overnight.

CASE
STUDY



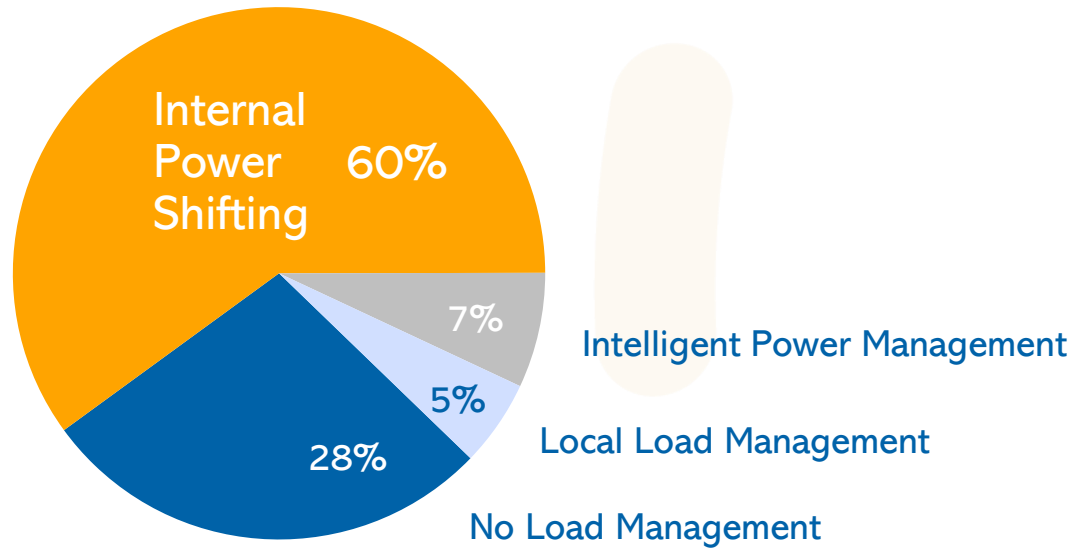
Schneider
Electric

The city of Oslo is a role model in electric mobility adoption. In a country with the highest EV market share in the world, the city has set an ambitious target to reach zero emissions by 2025 for all new cars, public buses, and light vans. Schneider Electric is collaborating with Oslo to reach this goal by providing a reliable and sustainable solution: EV charging on-street and in public garages along with a dynamic energy management system. With this, we can limit electrical retrofits, prevent overloads, and avoid peak-hour charging. It also prioritizes green energy usage for more sustainable and cost-efficient charging.

48

USE OF SMART CHARGING TODAY

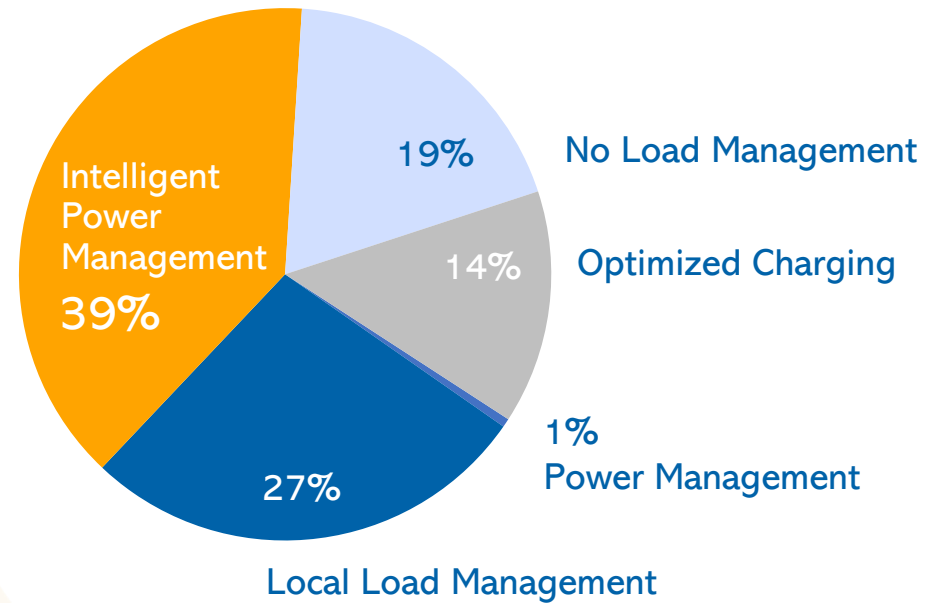
Share of public DC/HPC charging points applying at least one of the following smart charging functionalities [in %]



Internal Power Shifting:
Intelligent Power Management:
Local Load Management:

balancing power output between multiple outlets
dynamic distribution of available load among several charging stations
power management between charging station and other consumers in microgrid to balance loads (e.g. stationary battery)

Share workplace charging points applying at least one of the following smart charging functionalities [in %]



Power Management:
Optimized Charging:

static limitation of power at each charging station
intelligent management of charging sessions in order to optimize regarding time, costs, CO2, or self-consumption

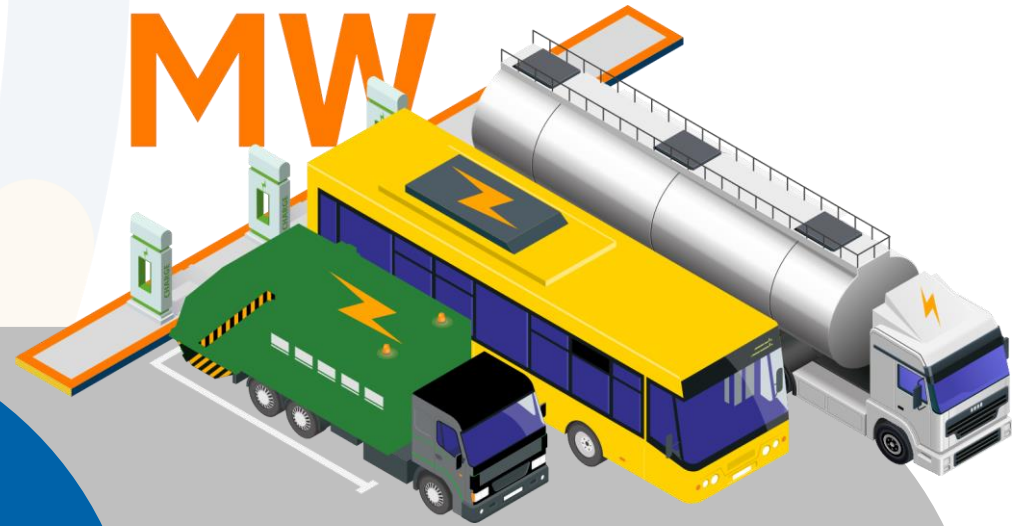
EMERGING TRENDS



Building on the smart charging experience, many industry players are developing and rolling out Vehicle-to-X (grid/home/building) solutions that will capture the full energy system integration potential of EVs.



Another emerging trend is Plug n' Charge, which is a functionality whereby an EV can arrive at a charging station, be plugged in, communicate directly with the charging station, and start the session.



With an increasing uptake of electric vans, busses and trucks (HDVs) there will be an accelerating need for higher-power charging stations with higher capacities. The industry is developing and deploying a new standard in the area of megawatt charging.

SECTION 6

The legislative dimension and how it can support EV charging



KEY EU LEGISLATION DEFINING THE BUSINESS FRAMEWORK

AFIR

Alternative Fuels Infrastructure Regulation



Shapes public electric vehicle charging in Europe, creates a uniform market, sets ambitious targets and minimum technical requirements. [Read our full position here.](#)

RED III

Renewable Energy Directive



Plays an important role in creating the right framework to allow EV charging to enable further system integration between transport, buildings and energy sectors. [Read our full position here.](#)

EPBD

Energy Performance of Buildings Directive



Determines if Europe can be successful in EV uptake by setting technical requirements for residential and non-residential buildings, which cover the most EV charging use-cases. [Read our full position here.](#)

TEN-T

Policy on Trans-European Transport Network



Defines the practicalities of seamless and multimodal EV charging infrastructure in the EU across the Transport-European Core and Comprehensive Networks. [Read our full position here.](#)

EEAG

Energy and Environmental State Aid guidelines



Defines the rules on Member States public support for the installation and operation of EV charging infrastructure. [Read our full position here.](#)

VAT

Value Added Tax Directive



Sets the rules what and how VAT is applied uniformly across the e-mobility value chain in the EU Member States. [Read our full position here.](#)

THIS IS WHY WE PRIORITIZE

CONSUMER FIRST



We want to get infrastructure ambition (availability) and accessibility right to make sure all EV drivers can themselves install or find and access chargers with peace of mind. Our solutions benefit both the driver and wider society.

OPEN MARKET MODEL



This is a very dynamic, rapidly growing market. Whether in terms of payment technologies or how concessions are made, regulation should support this dynamism and encourage open access, new market entrants and future-proof solutions.

OPEN STANDARDS AND PROTOCOLS



Interoperability is a key tenet of our industry, and so protocols and standards should be developed to ensure EV drivers can roam freely regardless of which vehicle they drive or their home MSP.

SAFETY AND SECURITY



With drivers at the core of the EV charging industry, we work to provide for the safety of their data and their person while charging.

PARTNERSHIP



In an expanding ecosystem with more and more businesses from OEMs to retail players to IT companies all getting involved in e-mobility, trustworthy partnerships are key to success.

For further information about our report, you can contact us at:



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<http://www.chargeupeurope.eu>



<https://twitter.com/ChargeUpEurope>



<https://www.linkedin.com/company/chargeupeurope>



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