ChargeUp
EUROPE

EV CHARGING
BUSINESS FUNDAMENTALS

WHAT DOES THE **EV CHARGING VALUE CHAIN** LOOK LIKE?

- The main roles in the EV charging ecosystem are hardware manufacturers, Charge Point Operators (CPO) (owners and/or operators of EV charging stations), software providers, mobility service providers (MSP), roaming platforms, and service/maintenance and recycling companies. Companies often combine several roles. The sector is innovating rapidly and new business models and services regularly emerge.

- The EV charging sector is part of a broader value chain, with utilities on one end and car manufacturers on the other end. Utilities, EV charging companies and EVs operate as an ecosystem with high dependencies. The success of the EV charging sector goes hand in hand with EV uptake; they are two sides of the same coin. Ensuring this ecosystem operates with fluidity is one of the top technical and commercial tasks of the sector today.

- EV charging company structures and maturities vary. There is a significant share of start-ups and scale-ups, along with larger companies that are diversifying their historical activities.

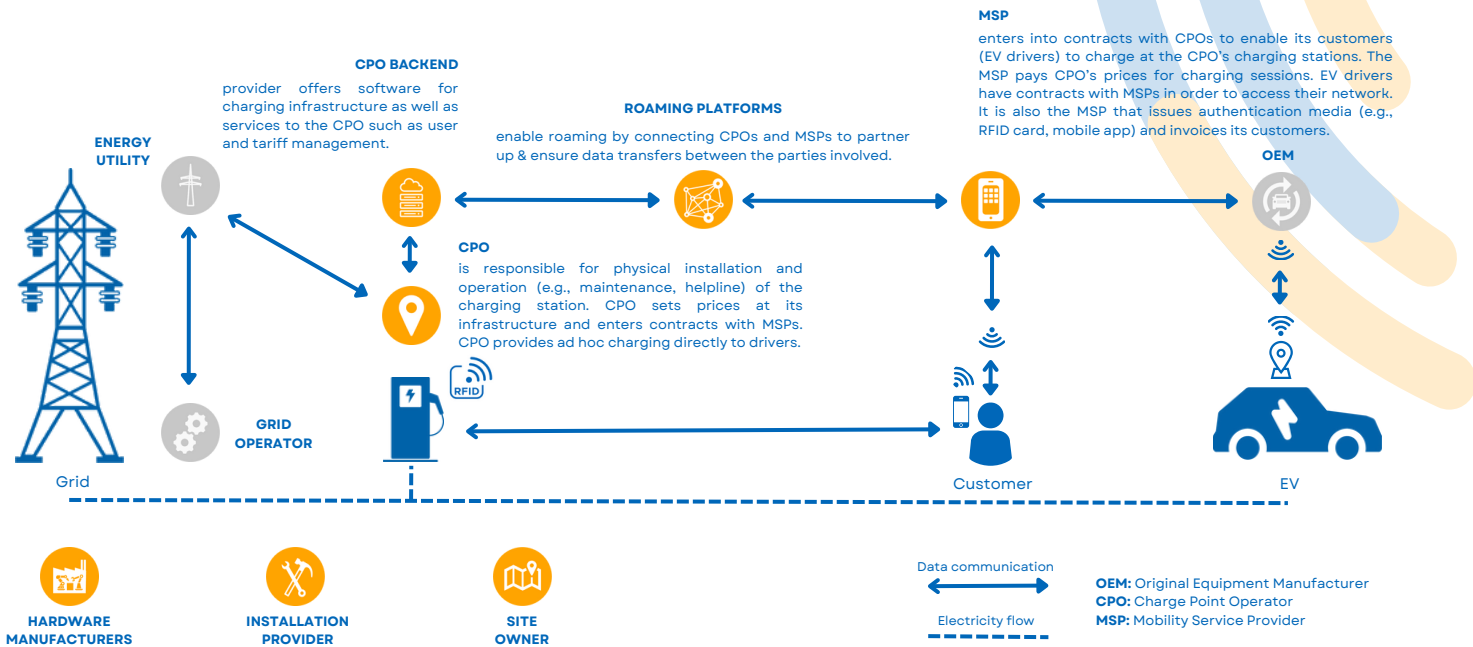## WHAT **STAGE OF DEVELOPMENT** IS THE EV CHARGING SECTOR IN TODAY?

- The industry is in a period of significant growth and maturation. Companies are currently investing heavily. Investments into charging Infrastructure will grow from €5 billion in 2021 to over €15 billion in 2030. Of this, private charging infrastructure is estimated to account for 2x the investment costs of public infrastructure.

- The sector is increasingly treated as a classic infrastructure business – high initial investment with returns over a long period, increasing as EV market share increases in each Member State.

- On average, the EV charging industry in Europe will require about 15,000 new positions per year through 2030. This will lead to the creation of more than 118,000 new jobs from 2022 to 2030, i.e. a growth of approximately +270%. The sector currently experiences labour shortages across skill ranges (technical, digital etc.).

- The industry is very dynamic and standards are under development. Standards are expected to play an outsize role in ensuring a seamless experience for EV drivers in coming years and to catalyse system integration along the value chain.

WHAT ARE SOME OF THE MAIN DIFFERENCES BETWEEN CHARGING & **REFUELING**?

- Whereas refueling can only happen at 'petrol stations', EV charging can take place wherever there is electricity – at home, work, destinations like restaurants & shopping malls, along the highway, and for fleets, buses, and trucks, depots. In most of these use cases, users charge where they are already parked, not going somewhere specifically to recharge.

- When an electric vehicle is plugged into a charging station, communication takes place between the battery in the vehicle and the charging station. In this way, the EV charging sector integrates transport and energy by digital means.

ENERGY UTILITY

CPO BACKEND
provider offers software for charging infrastructure as well as services to the CPO such as user and tariff management.

ROAMING PLATFORMS
enable roaming by connecting CPOs and MSPs to partner up & ensure data transfers between the parties involved.

MSP
enters into contracts with CPOs to enable its customers (EV drivers) to charge at the CPO's charging stations. The MSP pays CPO's prices for charging sessions. EV drivers have contracts with MSPs in order to access their network. It is also the MSP that issues authentication media (e.g., RFID card, mobile app) and invoices its customers.

OEM

CPO
is responsible for physical installation and operation (e.g., maintenance, helpline) of the charging station. CPO sets prices at its infrastructure and enters contracts with MSPs. CPO provides ad hoc charging directly to drivers.

GRID OPERATOR

Grid

Customer

EV

HARDWARE MANUFACTURERS

INSTALLATION PROVIDER

SITE OWNER

Data communication

Electricity flow

OEM: Original Equipment Manufacturer
CPO: Charge Point Operator
MSP: Mobility Service Provider

HARDWARE MANUFACTURERS

- Hardware manufacturers are the companies that design and produce charging infrastructure equipment for different segments and markets.

- Hardware manufacturing involves a lot of R&D and testing (e.g. resistance to temperature, noise reduction, electro-magnetic compatibility...)

- Hardware manufacturing also includes a strong software component, to be able to work with CPOs and MSPs. At its core, an EV charging station is an Internet of Things (IoT) device. As an IoT device, a station typically works with the Open Charge Point Protocol (OCPP), which is widely used by industry.

- Charging stations must be developed in line with car manufacturers' developments. The charger is built according to specificities of the cars; hardware manufacturers aim for more capacity ("charging power") but the vehicle (battery) cannot always take the available dispensed power. The options and limitations of hardware manufacturers therefore are driven by the grid connection and the vehicles.

- Hardware manufacturers develop different products to meet different customers' needs (buses, passenger cars, trucks...).

- Hardware manufacturers are particularly vulnerable to fragmentation in the EU Single Market: today they must develop different versions of the same product for different markets. National requirements which tend to vary drive up costs and lead to longer production and deployment times, a strong drain from an engineering and resource perspective. There is also extra hard costs involved with engineering to adapt the product to each market.

- Competitive sales pressure from Asia has risen in recent years. There is also a value chain dependency on components produced in Asia (e.g. power modules); many manufacturers today try to be more independent from these third markets. The high value segment (i.e. DC or fast & ultrafast charging) manufacturing remains primarily located in Europe for the moment.

CHARGE POINT OPERATORS

- A Charge Point Operator owns and/or operates charging infrastructure for EV drivers to use. This can be its own charging infrastructure or infrastructure it operates on behalf of a landowner or other company (i.e., a company operating an EV charging location does not necessarily own the location site). This can be public, semi-public or not.

- CPOs primarily offer B2B services; however, in the case of 'ad hoc' charging, the EV driver is paying the CPO directly, so in this case the CPO is providing B2C services.

- Some companies which are CPOs are also MSPs (and vice versa) but that is not always the case.

- CPOs tend to experience high upfront costs (site design and development, grid connection costs, hardware deployment costs). Other fixed costs include capacity charges from the distribution system operator (DSO), which can be thousands of euros a month per normal power connection. Additional costs include maintenance, servicing and upgrades, customer support services, and other energy related costs.

- The economics of EV charging for a CPO is based on how much a given station, or the stations in a network are used ("utilisation rate"). The utilisation rate is in turn a function of the number of EVs on the roads using those stations.

MOBILITY SERVICE PROVIDERS

- Mobility service providers (MSPs) serve as the link between EV drivers and the charging infrastructure provided by CPOs. They offer customers access to charging stations by using an authentication device (e.g. app or physical object) that identifies them at the charging station. While the CPO manages and sets up the charging infrastructure and maintains the charging stations, the MSP has – except in the case of ad-hoc charging – the direct relationship with the customer and provide customer services and billing.

- MSPs help CPOs gain revenue by increasing the utilisation of their stations. Agreements between CPOs and MSPs typically include pricing and revenue-sharing arrangements. They may also include data-sharing arrangements related to the use of charging stations, helping both parties gain valuable insights into the usage of these stations.

- The clients of MSPs include private drivers, fleet operators, employees of companies, and others. These clients have an account and retrieve their invoice from their MSP of choice.

- MSPs offer a suite of services to EV drivers. MSP customers have opportunities to charge at many operators with one account through roaming, and benefit from promotions, loyalty schemes, a variety of payment methods (enabling drivers without credit cards to access charging), and route planners to optimise their charging and road trips. Additionally, customer support, billing, invoicing, and charging history are all in one service.

- MSPs show the chargers on their network in a single map, and drivers can click on the location to see the price at that particular location based on their payment plan. Drivers have the choice between fixed pricing through subscriptions or the flexibility of more dynamic pricing related to the ad-hoc price from the CPO or the energy market spot price.

- MSPs grow the size and range of their network by having contracts with more and more CPOs – this offers more value to the end user of the MSP, as their customers can now access an even larger network of charging stations. MSPs connect with CPOs through roaming platforms or directly through peer-to-peer connections. IT and data exchanges are supported by the Open Charge Point Interface (OCPI) protocol, which is widely used by CPOs and MSPs, and some roaming platforms as well.

- MSPs form the foundation of Plug&Charge, the entirely frictionless next frontier of EV charging, which is expected to become more common in the future. Plug&Charge requires a driver to have an account with an MSP in order to work.

- There is no "one-size-fits-all" design for charging locations. The layout of charging stations, type of charging technology used, power levels available at the location, and more, are commonly tailored to the specific location, use case, or geography of that location.

ROAMING PLATFORMS

- Roaming is the ability for an EV driver to recharge on multiple CPO charging networks via the single subscription provided by their MSP. It implies a technical connection between the MSP and the CPO backends, as well as commercial and legal contracts between them.

- A roaming platform is a specific operator that helps develop EV roaming by facilitating and simplifying data exchanges between MSP and CPOs. A roaming platform gathers the demand for and the offer of EV charging services. It handles technical connections and provides operators with commercial, legal and financial tools related to roaming.

- As opposed to CPOs and MSPs which are numerous, there are few players on the market, because the underlying economics of platforms and hubs is to centralise and aggregate.

- With a single connection to a roaming platform, MSPs and CPOs can manage their contractual, operational, financial and technical relations. From that one technical connection, an MSP will be able to create multiple contracts with CPOs across the world. Though each hub has its own IT protocol, some are also OCPI standard users.

- Some hubs also offer additional services such as business agreement solutions, financial and clearing services, or National Access Point compliance.

- Some technical operators offer roaming by aggregating other CPOs and/or MSPs through their backends. They set contractual conditions for their customers. Though this solution is less flexible, it requires less technical integration and operational management.

THE AFTER-MARKET: MAINTENANCE & CIRCULARITY

- As the market is growing and maturing, there is a growing focus on after-market services.

- Repair and maintenance companies seek to extend the life cycle of a product that has been deployed in the field. A charging station is a customer-facing piece of self-service technology which needs to work 24/7. The reliability of charging infrastructure builds on proactive and preventive services, combined with smart spare part logistics that will decrease the number of charger failures and increase uptimes, resulting in higher customer satisfaction. Some of the repairs or updates will be done remotely (online), and some onsite.

- Circularity has emerged in recent years, often building on the knowledge gained on other markets and applied to e-mobility. Hardware manufacturers are building partnerships to make their supply chains more circular, sometimes in response to regulatory evolution. Recycling and refurbishing can also help them control and reduce costs. Finally, the foreseen scarcity of precious resources due to geopolitical developments and growing global demand also stimulates the industry to recycle the "end of life" hardware.

- After-market services rely on cooperation of different companies across the value chain, and this is also where value can be generated, via "feedback loops". Maintenance and recycling companies can feed information back to manufacturers, i.e. on the design to make a product easier to refurbish, recycle or repair, to bring better products to the market, and ultimately to derive higher value from the product.

- Currently this sector relies on skilled, manual labour (both due to low volumes and the required flexibility in development of the optimal aftermarket processes), and is expected to become gradually more automated.

- To tackle the upcoming scarcity of field engineers, the sector is developing new business models, swapping units or parts in the field and repairing them in a controlled repair & refurbish centre.