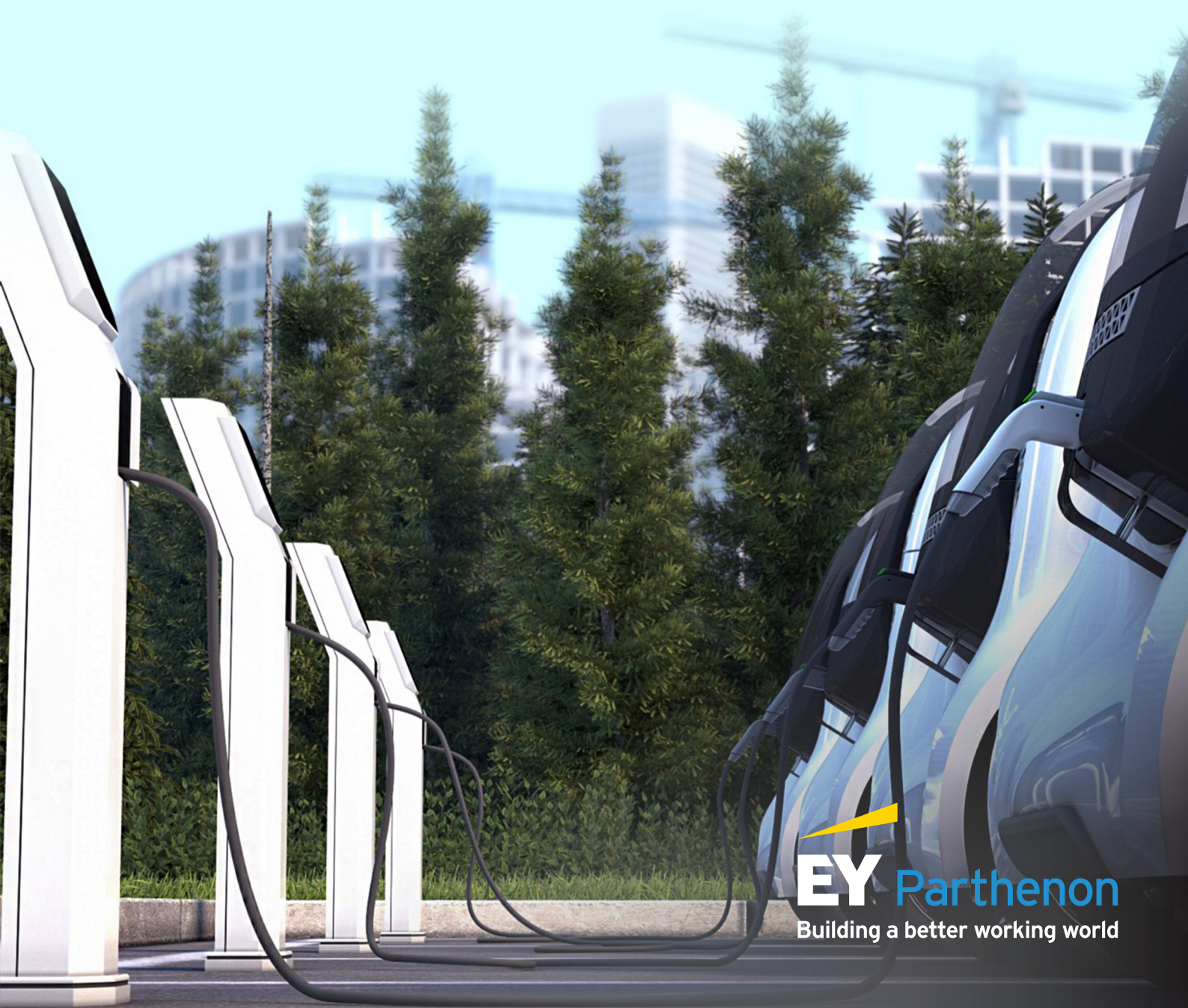


How charging infrastructure can drive the eMobility wave

September 2022



Introduction

After several years of optimistic forecasting about the adoption of electric vehicles (EVs), eMobility has finally reached a turning point. In 2021, [one in five new vehicle registrations in Europe was electric](#). And while EVs represent just [1.5% of Europe's total 326 million vehicle park today](#), EY analysts predict the share will grow to 65 million vehicles by 2030 and double to 130 million vehicles by 2035.

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A host of factors, especially around the charging infrastructure is helping eMobility transition from turning point to tipping point:

- ▶ **OEM EV offerings.** Incumbent and startup Original Equipment Manufacturers (OEMs) are offering a wide range of EVs for just about every budget and need.
- ▶ **Battery range.** Technology advancements have extended the EV battery's capacity for longer distances.
- ▶ **Network development.** The network of charging solutions continues to proliferate.
- ▶ **Fast chargers.** Fast chargers are beginning to pop up in cities and are a prerequisite for public and on-street charging to minimize waiting time.
- ▶ **Infrastructure hardware standardization.** Hardware standardization harmonization is ongoing.
- ▶ **Infrastructure software interoperability.** An absence of common standards has proven to be a stumbling block to maximizing the benefits of the non-interoperable points of charge. However, harmonization is a common goal across the industry.

The rising popularity of eMobility presents a potential range of profitable value pools for a cross-section of players. First movers that can find the right proposition and take lead on the EV infrastructure by collaborating across the ecosystems, can seize a considerable competitive advantage. But they need to move quickly before the other players move in to fill the gap.



Chapter 1 Diving into charging infrastructure opportunities

Numerous value pools are emerging in the rapidly growing eMobility ecosystem. EY commissioned to study 29 EV value pools to identify the eight most attractive opportunities for utilities. The study identified eight high-value opportunities and business cases for charging station applications that were grouped into three categories: public, home and community.

However, the size and relevance of these value pools vary by geography, based on the local market and regulatory conditions. Industry players are still figuring out the fields of play where they will enjoy the right mix of market opportunity and synergies with their existing business.

Where charging infrastructure stands today

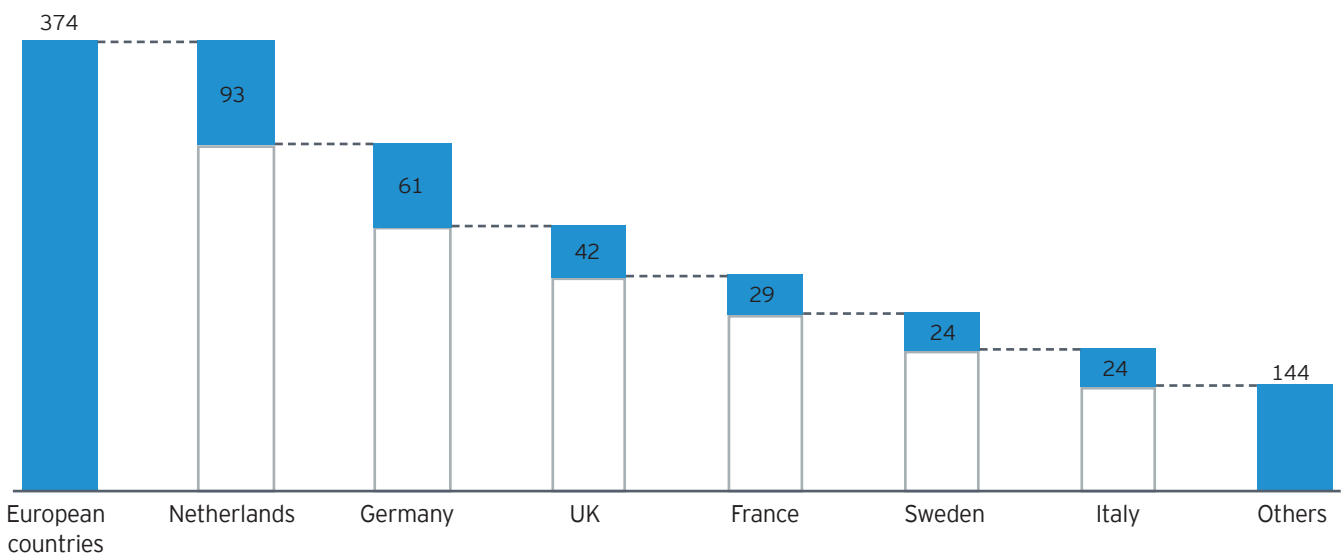
Currently, there are 374,000 publicly accessible charging points in Europe, up by 40% in 2021.

But the number of chargers in across geographies remains uneven. France, Germany, Italy, the Netherlands and the UK account for two-thirds of total publicly accessible charger stock.

Conversely, there are 10 European countries that don't have a single charger per 100 km of road. Rural locations tend to be underserved compared with urban areas whereas a lack of off-street parking creates significant demand for on-street drivers by chargers in residential zones in cities. According to a recent survey of European EV drivers by NewMotion, 33% of respondents cannot install a charging point at home.

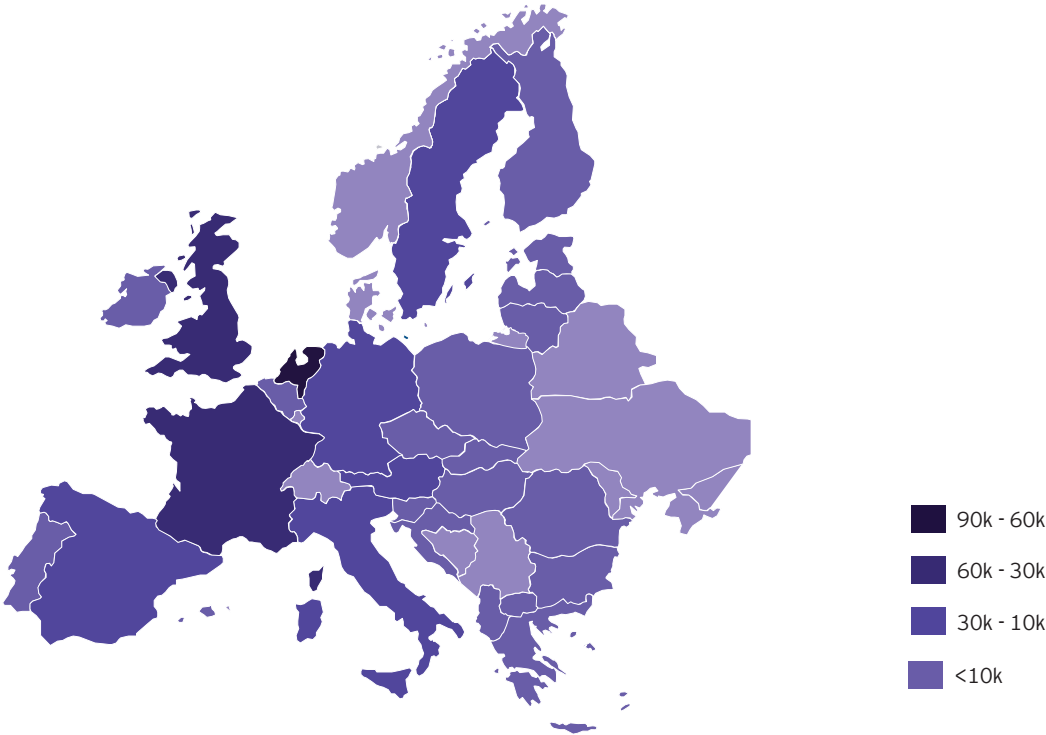
Number of charging points in Europe and UK in 2021

a) Total number of charging points in Europe and UK in 2021 (k)



Source: Interactive map | European Alternative Fuels Observatory (europa.eu), 2021

b) Geographical split of charging points in Europe and UK



Source: Interactive map | European Alternative Fuels Observatory (europa.eu), 2021



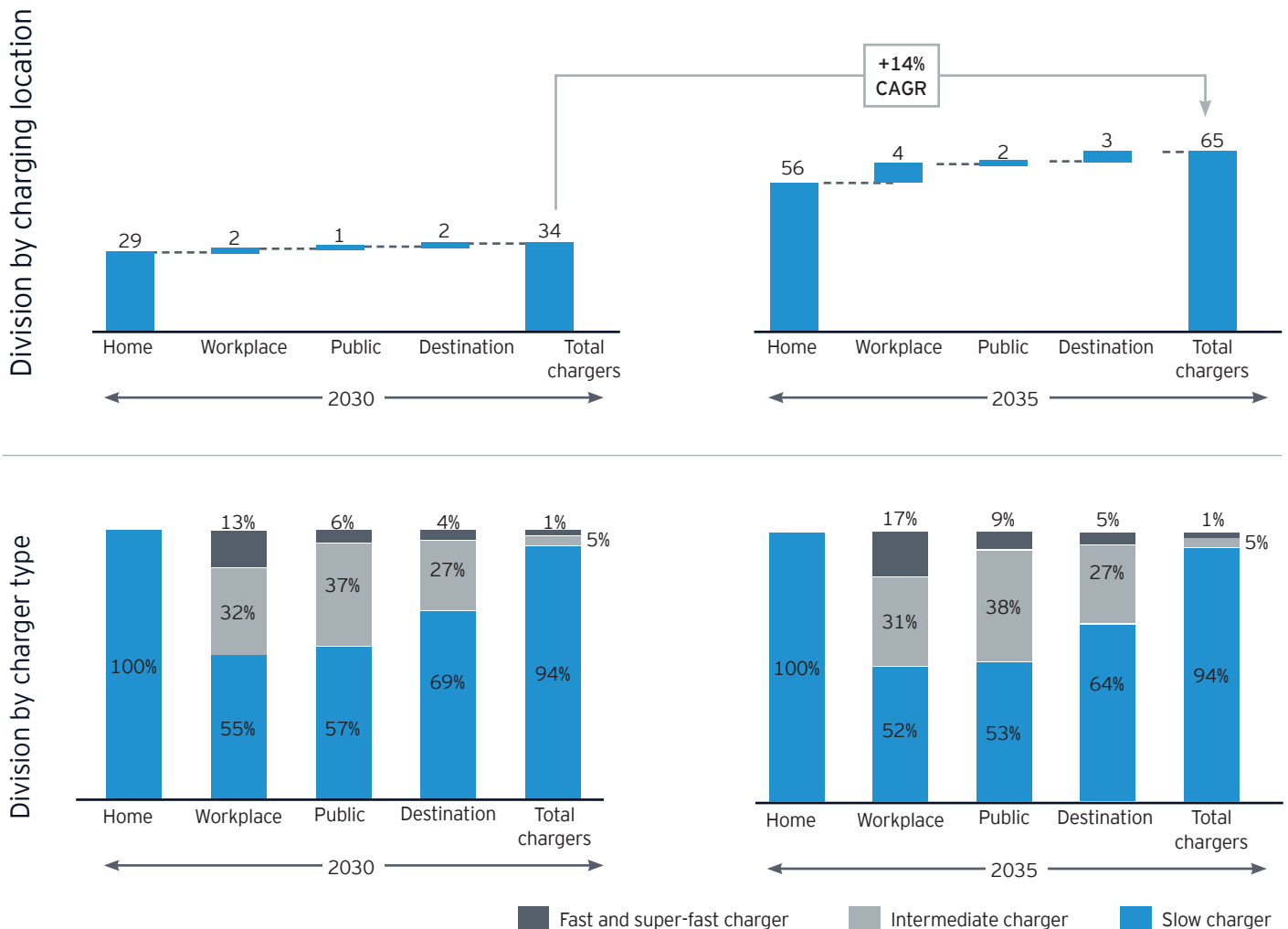
Where EV charging trends are headed

EY forecasts of 27 EU member states, plus the UK, Norway and Switzerland indicate that Europe will need approximately 14m chargers by 2025, increasing to 34m by 2030 and roughly 65 million by 2035.

Chargers for home will lead the way, representing 85% of the overall stock, equivalent to almost 30m chargers by 2030 and 56m by 2035.

Workplace, on-street parking, highway rest stops and destinations will contribute less with a relatively even share of 4% to 6%. Slow chargers will comprise about 94% of required chargers by 2035. Intermediate chargers will make up 5% of the market and super-fast chargers will comprise the remaining 1%. However, despite their low penetration rate, fast and super-fast chargers will require 24% of the estimated US\$127b cumulative investment required for deploying chargers over the 2022 to 2035 period.

Charger stock by charging location and charger type (million)



Source: EY analysis, November 2021

Where the value pools lie

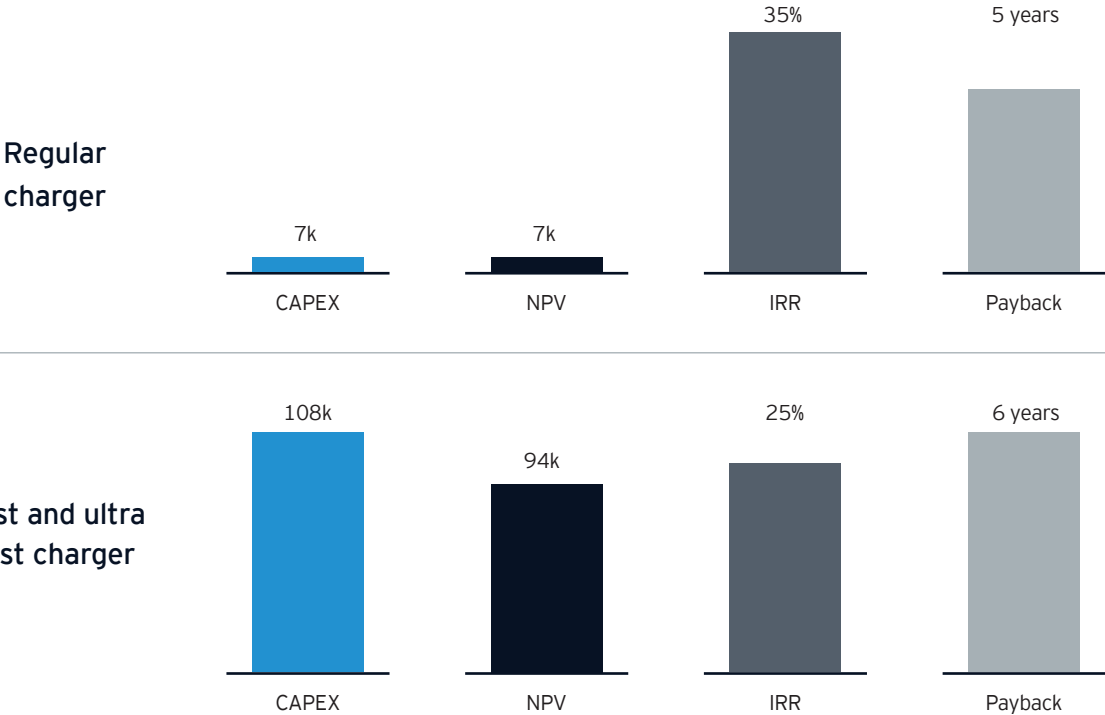
Three years ago, there wasn't a business case to warrant an investment in charging infrastructure. A chicken versus egg conundrum existed where there wasn't enough EV infrastructure to support a mass rollout of EVs. Businesses and investors didn't see a positive return on investment without greater EV uptake by consumers. And consumers as well as other EV purchasers (corporates and public sector) weren't going to buy EVs until there was sufficient charging infrastructure to reduce range anxiety.

Private homes and on-street regular chargers were overrepresented because people would primarily buy an EV as a local runabout with a certainty that they could charge it at home. More recently, there's been a recognition that without proper charging infrastructure, EV production cannot accelerate to its full potential.

Until now, the unprofitable business case of charging infrastructure and the limited consumption volume had private players either staying on the sidelines or only participating marginally for marketing or branding purposes. However, the argument for getting into the EV infrastructure market has reached an inflection point and private investors are stepping up. Additionally, regulations and the increasingly profit-positive business case for regular chargers has spurred infrastructure action at the workplace, as well as at leisure, retail and hospitality locations.

Today, based on an EY-Parthenon analysis, there are enough EVs on the road across the EU to make chargers worth investing in and profitable. Both regular charging and fast charging, if paced adequately, can yield an internal rate of return (IRR) of more than 20% with a payback of four to five years. These returns will only increase over the next 10 years.

Both regular charging and fast charging, if paced adequately, can yield 25-35% IRR but with different Revenues and NPV economics/charging point



Source: EY-Parthenon Analysis, 2021

Adjacent opportunities

The potential for profitability offers several opportunities for a number of interested parties. Some of the satellite activities with the greatest benefit will draw technology asset providers (charger manufacturers), engineering companies (technical project design), EV charger installation companies, turnkey solution providers, power and utilities and downstream operators.

In addition to powering EVs, charging infrastructure will allow companies across the eMobility value chain to explore adjacent opportunities, including:

- ▶ **Battery swapping:** when the price of batteries become more competitive and batteries are more standardized across the industry, there is an opportunity to build out a battery swapping solution that could accelerate charging time for EV owners.
- ▶ **Vehicle-to-grid:** during idle times, EV batteries may be considered a power production point, able to provide energy to the grid when needed (and prices are high).

- ▶ **Fleet electrification and mobility-as-a-service (MaaS):** more than simply installing the charging infrastructure, some industry players are foreseeing the opportunity to convert a company vehicle fleet into an e-fleet. It's an opportunity that becomes more attractive for companies willing to consider outsourcing acquisition of the new EV fleet to the third parties for a usage fee. While still nascent, this business proposition will mature as players with the right combination of financials and technical skills enter the market.

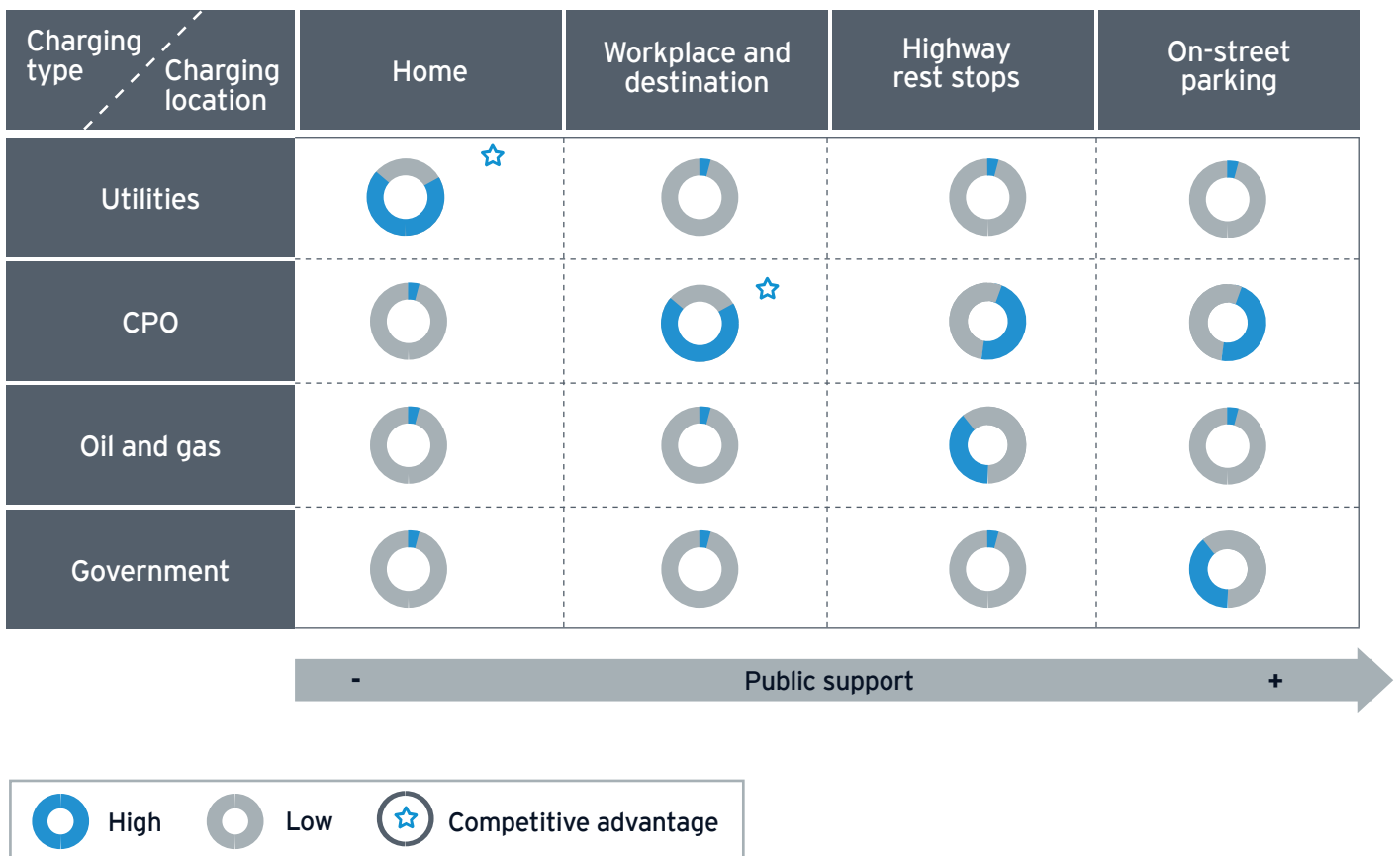
As the eMobility star rises, oil and gas companies whose star is on the wane, stand to benefit. Oil and gas companies are especially well-positioned to draw on their existing operational infrastructures and retail networks as a foundation for the future of mobility. Particular sweet spots include on-street parking and highway rest stops, point of interface and fleet management, which are also among the top eight most attractive value pools for the energy sector.

Chapter 2 Examining the strongest business cases for charging solutions

Different types of charging infrastructure, whether it's home or work, public or destination, have different customer success factors.

They also require various levels of public support. Each application comes with its own set of challenges, particularly for energy companies.

Presence of actors depending on the type of charging infrastructures, the past competitive advantage and the need of public support



Source: EY-Parthenon Analysis, 2021

Home: Utilities can be the big winners in this market

Among the various types of charging infrastructures, home charging is the most overlooked one. But, it will continue to be the most prevalent form of charging. Further, the charging infrastructure can be simple because there is no need to recognize the user or manage separate billing.

Utilities are best positioned to build a strong business case for home charging infrastructure, from brand and operational infrastructure perspectives. Customers already have a relationship with the electricity providers and can get the cost added directly to their utility bill. Also, customers will know whom to call if the infrastructure requires servicing. The competitive advantage for utilities is that they already have a built-in customer base, the charger is standard, easier to supply, and they are accustomed to recruiting and certifying installers that they can dispatch once they've received an order from the customer. By cross-selling this service, utilities stand to benefit from a boost in the lifetime customer relationships and diminished customer churn.

However, utilities will want to keep an eye on charger installers and other new entrants who could prove to be fierce competitors. Installing chargers is relatively simple. Users may choose an alternative solution such as buying and installing the product independently at a more affordable cost.

Workplace and destination: Charge point operators (CPOs) can leverage their flexibility and ability to industrialize

Destination and workplace settings are the most complex segment. Retailers, hospitality, city parking lots and workplace parking lots require professional CPOs. They have the strongest capabilities to manage both the electricity and financial flows. They can keep track of which client has purchased which energy and at what price, as well as who is receiving payment based on the business model (utility, location owner or mobility service provider).



Workplaces and destinations can choose to partner with CPOs in several ways, with revenue sharing splits depending on how the partnership is structured. CPOs, for their part, can provide the one-stop-shop approach that consumers want. They don't want to have contracts with multiple vendors to install, manage and maintain the charging infrastructure.

Highway rest stops: Competition will be fierce between old (oil and gas) and new (CPO) players

For the same reasons CPOs can seize an advantage in workplace and destination value pools. They are equally well-positioned to take a dip into highway charging infrastructure. However, this is also an area where oil and gas companies can excel. At the same time, it's a value pool that requires investors with deeper pockets. Chargers need to be more powerful (to meet consumer demands for shorter charging times) and thus are more expensive.

On the flip side, demand is more guaranteed. Highway rest stop chargers gain a captive audience in drivers who want to "fill up" and go, will pay a premium for the privilege.

On-street parking: Local governments will need to step up

Street charging is the hardest charging option to build a business case, largely given the mismatch between length of stay and duration of charge. It also presents the highest operation and installation costs of all the charging types. Local governments can partner with CPOs or other qualified charging infrastructure professionals to install, manage and maintain the charging infrastructure using concession-like business models.



Chapter 3

Seizing the opportunities that lie ahead

Recognizing the increasingly attractive potential of the EV charging market, large players are entering the fray through a series of acquisitions and partnerships along the EV charging infrastructure value chain in several countries. Utilities, oil and gas companies, private equity players and highway infrastructure companies are the most prominent incumbents to buy their way into the EV charging infrastructure market. These acquisitions are creating an ecosystem that comprises both historical players and CPOs that offer differentiated value to a variety of customer segments.

Utilities and their partners, for example, are focusing on home, workplace and some regular destination chargers. Meanwhile, oil and gas collaborations are zeroing in on workplace and destination chargers including highway rest stop fast chargers. Unsurprisingly, construction players are centering their efforts on on-street and highway opportunities, including fast-charging infrastructure. And then, there are the pure-play CPO ecosystems, which are picking a lane based on their current strengths (regular charging specialists versus fast-charging specialists versus cross-segment players) and racing ahead.

Moreover, there are players that are enlarging the interoperability of existing charging stations, making partnerships with current asset owners and allowing the customers to have simplified access to a richer range of opportunities.

What is clear to many of the market players is the importance of capturing customers at an early stage, when they are still considering a power charging solution and provider. In the B2C market, EV consumers typically choose a charging solution and provider when they buy a new EV; therefore partnering with OEM and their dealer can be a Key Success Factor. Also in a B2B context, players across the spectrum see the advantages of partnering with OEMs who are developing an e-fleet model.

The competitive advantage of building a robust customer base early extends beyond the constant flow of service fees would generate. Early entrants into the EV charging market will gain a strong competitive advantage over the late joiners, have the foundation to make further investments and be able to build opportunities for cross-selling to establish and strengthen long-term stable relationships with their customers.

Chapter 4 Making the case for intervention and coordination

For charging infrastructure to accelerate at the speed at which eMobility is traveling, there is a need for non-negotiable intervention and coordination among a variety of stakeholders. Currently, there are several enablers, the absence of which may be slowing the pace of expansion:

- ▶ Effective local government intervention to make real estate available and fast-track permits for charger installation.
- ▶ Grid connection and power network strengthening. Delays (as long as three years in some European countries) and disagreements on who should bear the cost are hampering progress.
- ▶ Interoperability among charger networks. An absence of common standards (hardware and software) restricts user choice about where to charge and how to pay. Poor reliability on some networks and variable levels of customer service can add to a driver's frustration.

Greater cooperation across supporting ecosystems can address some of these challenges. For example, CPOs should collaborate with city planners, local authorities and administrative functions to make certain that infrastructure is sited in the right locations, where it will get the highest usage, make the greatest environmental return on investment and deliver maximum convenience to the customer.

Distribution system operators (DSOs) and governments need to plan investments in advance to prepare the grid, build resilience and accelerate the process for connection. At the same time, local authorities need to develop an infrastructure plan that oversees a plethora of opportunities, supporting and incentivizing investments where the demand will be high and the charging infrastructure is underrepresented.



Chapter 5

Weighing up the options for investors

The EU is on the verge of reaching critical mass in EV adoption. Industry players, charging infrastructure and the supporting network of services need to come together to keep pace with rising consumer demand. Without acceptable availability and reliability of chargers, and the power to support it, there is a risk of derailing the ambition.

Getting the fundamentals right is critical. The eMobility system we design today needs to serve everyone well into the future. Industry stakeholders need to come together to:

- ▶ **Forecast EV adoption** and demand evolution plus design an infrastructure scheme (in its multiple configurations - home, workplace, destination, highway rest stops and on-street parking - that is efficient and will entice private investors).
- ▶ **Plan and effectively implement** distribution, digital, IT and grid infrastructure investments in ways that promote greater EV adoption.
- ▶ **Simplify local authority approval** processes for installing charging infrastructure.
- ▶ **Promote and facilitate faster** and more cost-effective grid connections for EV chargers.
- ▶ **Enable load balancing** of the grid to maximize available electricity for EV charging.

- ▶ **Collaborate to achieve** interoperability across charger networks.

As we look ahead to mainstream adoption, an ecosystem comprising local governments, local authorities, city/planners, CPOs, eMobility service providers (eMSPs), OEMs /automakers and network companies has a decisive role to play in bringing together multiple components of a nascent sector to better serve the customer.

For utilities and DSOs in particular, real-time data will be vital. It will allow utility companies to provide information to the market on the state of the grid so that the connected ecosystem can manage electricity usage and guarantee reliability for users.

The vision of a fully integrated and automated future of connected eMobility is close to becoming a reality. First movers focused on building a business case for profitable investment in charging infrastructure need to keep one additional thing in mind: the customer. Customers want to be able to charge their EVs with the same ease that they fill up their ICE vehicles with petrol. They want to pay and roam across networks and geographies in the same way they've always done but in a more sustainable manner. It's time for industry players to get together and make it happen.



Authors



Giacomo Chiavari

Partner, EY-Parthenon, EY Advisory S.p.A.
giacomo.chiavari@parthenon.ey.com



Gianluigi Indino

Partner, EY-Parthenon, Ernst & Young Advisory
gianluigi.indino@parthenon.ey.com



Kanv Garg

Senior Manager, EY-Parthenon, EY Consulting
kanv.garg@parthenon.ey.com



Andreas Kirkerod

Senior Manager, EY-Parthenon, Ernst & Young AS
andreas.kirkerod@parthenon.ey.com



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