

Electric vehicle charging in the UK and Europe

Which business models will win in this growing multibillion-pound market?

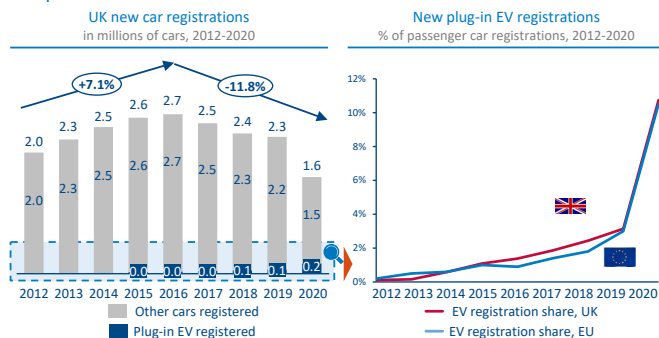


Look at any urban environment in the UK and across Europe and one thing is very apparent: electric vehicles (EVs) have arrived! EVs (both battery electric [BEV] and plug-in hybrid [PHEV]) have evolved from niche technology into a serious alternative to combustion engines. Major manufacturers' future model plans confirm this – EVs are becoming mainstream. They are the auto industry's best bet to combat air pollution and reduce CO2 emissions. The market for EVs is expected to grow massively over the next decade – and with it the demand for EV charging solutions. In the past six months, one in six UK new vehicle registrations have been EVs. The UK is expected to have 10 million passenger EVs on its roads by 2030, with an additional 45 million in all of Europe. This will generate an immense opportunity in EV charging solutions. Tiny charging startups – often backed by utilities and oil & gas majors – have already professionalized and grown into serious companies. The whole industry has been consolidating since 2017, leading to the big question: which companies and business models will come out on top?

COVID-19 and the automotive sector

COVID-19 has hit the UK economy hard and the auto industry is among those sectors most severely affected. While overall new car sales dropped by 30% in 2020, xEV (BEV + PHEV) sales bucked the trend, growing by 140% (see figure below). In March 2021, UK xEV sales hit a new record of 39,000 units and accounted for more than 14% of all registrations. There is a similar trend in Europe overall, with xEV sales in 2020 exceeding 10% of the mix for the first time.

Deep dive on the UK EV market



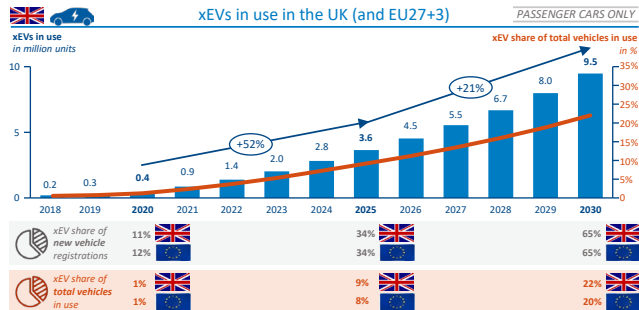
The strong upward trend is expected to continue with the announcement of multiple high-profile EV product launches. As an example, Volkswagen recently unveiled the ID.3 compact EV, while SUV models like Volkswagen's ID.4 and Tesla's Model Y will start selling this year. Meanwhile, Jaguar Land Rover has announced plans to make the Jaguar brand fully electric by 2025. This electrification trend is being "fueled" from two sides:

- Demand side.** Increasing demand for "greener" vehicles, while barriers to purchasing like high price, range anxiety, and poor charging infrastructure gradually disappear. Most crucially, while BEVs still cost around 25% more up front than their internal combustion engine cousins, this differential is narrowing as battery prices fall, and the lower operating costs of BEVs (far cheaper fuel costs, less maintenance) mean that total cost of ownership is now roughly at parity in the UK. The remaining risk of long-term value depreciation for first- and second-generation EVs is mostly covered by the OEMs that are supporting BEVs and PHEVs with attractive leasing offers.
- Supply side.** OEMs must reduce their CO₂ emissions drastically to reach government targets and plan to launch around 400 new BEVs by 2023. Development could accelerate due to recent decisions by the European Commission to further tighten CO₂ reduction targets versus 1990 from 40% to 55% by 2030, while the UK has tightened the 2035 reduction target from 68% to 78%.

As shown in the figure below, we expect 10 million xEVs on Britain's roads in 2030, representing more than one in five of all cars on the road (versus one in seven in Europe as a whole). By 2030, **two out of every three new cars sold will be electrified**. This is challenging news for vehicle OEMs that must transform their businesses even faster, while an enticing prospect for utilities and charging service providers. Recharging the 10 million xEVs in the UK will require an additional electricity supply of approximately 20 TWh in 2030 as well as massive investments

in charging infrastructure, providing the foundation for a multibillion-pound market opportunity.

Rising EV car park triggers demand for EV charging solutions



Source: Arthur D. Little analysis based on ECEA, EAFO, Bloomberg
Note: xEV in use – battery and plug-in hybrid electric vehicles; only showing passenger vehicles

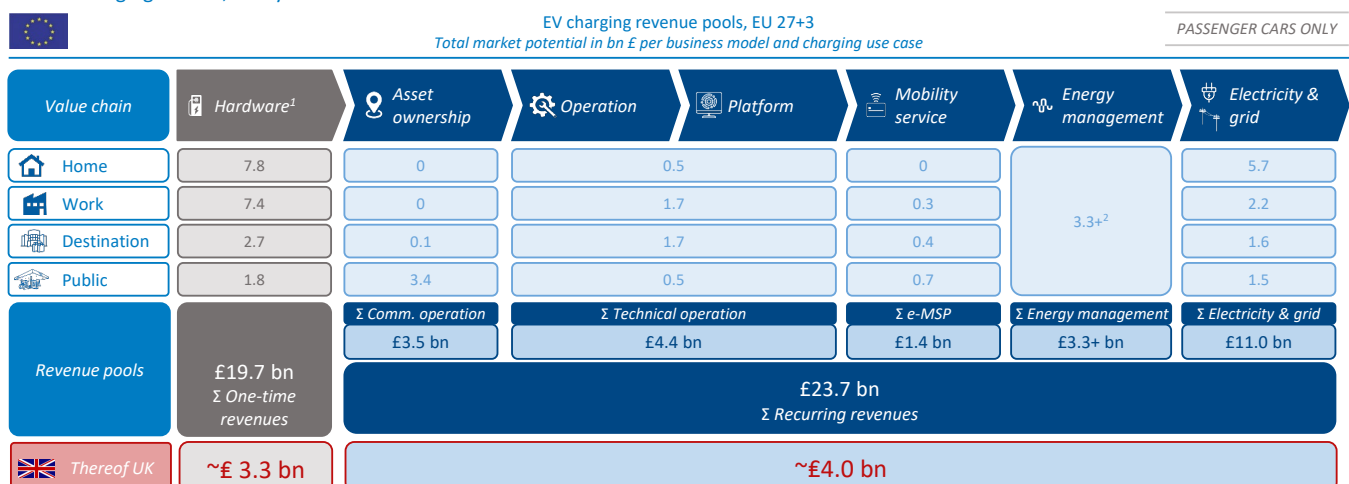
EV charging will become £7 billion UK market

After many years, the patience of early EV charging investors will soon pay off. With more EVs coming to market, revenues from EV charging of passenger cars alone will surge to about £7 billion in the UK and £43 billion across Europe in 2030. This is a sevenfold increase from 2021 at a CAGR of approximately 25%. EV charging opens enormous opportunities. We divide the EV charging market into seven revenue pools (see figure below).

Hardware includes all revenues generated from manufacturing and selling charging hardware. It also comprises fulfillment services required to put the infrastructure in place. Fulfillment refers to all services associated with planning, installing, and commissioning hardware at end-customer premises.

Asset ownership (i.e., commercial operation) accounts for all revenues generated via the sale of charging services by owners of (semi-)public charging infrastructure. In the figure below, we have deducted total electricity and technical operating costs to display only the residual revenue generated in this value chain step.

The EV charging market, today and tomorrow



NB: Analysis covers passenger vehicles only, considering revenue value pools based on bottom-up forecasts (excl. taxes).
Source: Arthur D. Little analysis, 1) includes fulfillment services (planning + installation); 2) potential estimation is limited to services with the car battery only (no additional stationary batteries) – only home and workplace charging use cases in scope for analysis, destination, and public charging use cases represent additional upside.

The “**operations and platform**” category includes all revenues generated via private and public charging infrastructure. Operations usually involves provisioning of charge point management software, technical service hotlines, hardware maintenance, and field service for ad hoc repairs.

The electric **mobility service** revenue pool contains all revenues created by giving EV drivers access to public charging infrastructure. This includes transaction fees paid by customers as well as roaming fees of charging point operators (CPOs) and electric mobility service providers (e-MSPs). (To highlight the value-added of this service, we include only the margin of the e-MSP in the revenue pool.) In the UK, e-MSPs are less relevant than in the rest of Europe as many customers prefer paying by credit card.

Energy management refers to smart charging services (i.e., optimizing the impact of consumers’ charging behavior on power connection levels – peak load shaving, photovoltaic integration, time-based tariffs) and the provision of balancing power to the grid by pooling the EVs connected to it.

Electricity & grid includes the sale of electric power and grid usage fees – used for charging the vehicles – to end customers. These customers can be private households, companies, or operators of public charging infrastructure.

The figure below shows our forecast for 2030 EV charging revenues in Europe, grouped by business model and charging use case. It is important to distinguish between **one-time revenue pools** from infrastructure deployment and **recurring revenues** from operation/usage of the charge points.

Increasing importance of recurring revenues

The EV charging sector is currently in a ramp-up phase.

Recurring revenues will increase from a **20% share today**

to more than 50% in 2030. This represents £1,600-£1,800 for each new car sold in one-time revenues, and £400-£500 in recurring revenues for every car in operation. What does this mean for the market? Certainly, recurring revenues will outgrow one-time revenues in the long run, but even as late as 2030, **hardware and related fulfillment services** will still account for **45%** of the market. Ten years from now, the hardware business will still play a massive role despite its declining share.

Electricity & grid accounts for only 25% of total revenues

Taking a more detailed look at the numbers, we see that **electricity & grid** fees account for only about **25% of total net revenues** in 2030. Most value is simply created elsewhere. EV charging represents a “natural” market opportunity for energy utilities, but is not a given. Utilities eager to surf the EV charging growth wave will likely have to expand their offering across the EV charging value chain.

Hardware will be the largest segment in 2030. While hardware, electricity, and energy management create most value through private charging use cases, asset ownership and e-MSP create most value via public charging solutions.

Highest margins in software-driven activities today

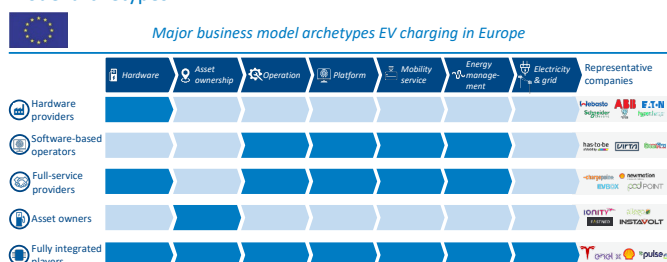
The average profitability of each value pool is as important as the market size. We currently see a **mixed picture in margin levels**. While technical operations, energy management, and asset ownership can often generate gross margins of more than 40%, average margin levels in electricity delivery and mobility services are significantly lower. The hardware business currently sits in-between, with pressure for product innovation and reduction in cost of goods sold to maintain margin levels.

Industry leaders are moving towards integrated business models – “charging as a service”

So what will be the **winning business models of tomorrow**? The figure below illustrates the dominant business models today. Each business model archetype has pros and cons.

From a **scalability** point of view, the **software-based operator** business model’s strong suit is its asset lightness. Margin levels are quite high, but this remains a classic scale game

Leaders in the EV charging market have adopted one of five business model archetypes



Source: Arthur D. Little

with high positive network effect. This will lead to massive consolidation and only a few dominant competitors are expected to succeed in the end – similar to other software plays. National and international regulators may view the industry as akin to “software” and ignore de facto oligopolies, or they may classify it as “energy” and intervene quickly. This may well depend on the identity of the potential dominant firm.

Adopting a **total revenue** perspective, hardware provision and asset ownership appear to be the best bets to 2030. The downside clearly lies in high investment requirements and a potential risk of price regulation. **Hardware providers** will also likely face margin pressure if they can’t keep up with the pace of innovation. **Asset ownership** could be a potential entry point for financial investors as increasing utilization of public charging infrastructure supports profitable operation. We estimate **total investment of about £6 billion** to set up the complete UK public and destination charging infrastructure to 2030. Taking into account that utilities, oil & gas companies, and retailers have multiple priorities to transform their business for the next decades, we could see a similar trend to that in the telecommunications industry, where infrastructure funds are stepping in to finance the expansion of towercos and fiber assets that will allow stable margins in the future.

A **full-service provider** position is well suited to participating in market growth today (hardware) and tomorrow (operation + platform). It also covers several high-margin businesses – bundling multiple products and services together into a “one-stop shop” offer even increases the margin potential. Right now, only **a few actors** in the market can compete across the whole value chain, and these companies face an uphill battle in keeping up with the innovation pace of niche competitors. Inside this group, we also see two different approaches – “closed ecosystem” (ChargePoint) versus “open standards” (EVBox).

It is too early to definitively determine which business model archetype will win. Yet, there is a clear trend among current market leaders in Europe (e.g., Shell, EVBox, Enel X) that are building their charging activities into **integrated business models**. These models are tailored to the needs of corporate fleet customers as they are currently the most attractive segment due to demand for total cost of ownership-focused turnkey solutions. **Charging as a service** meets their needs and relieves customers from high initial investment costs, thus making a strong claim as a future-proof model if one brings the breadth of capabilities to deploy it.

Conclusion

EV charging will become a multibillion GBP business

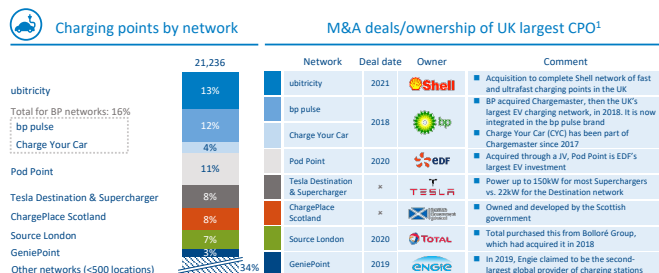
Electric mobility is taking off, even COVID-19 can’t stop it. Indeed, EV sales are shifting up a gear – partly due to generous subsidies in many EU countries – and EV adoption will likely

proceed even faster than previously predicted. As a result, EV charging will evolve from a niche sector into a multibillion-pound market by 2030. Passenger EVs alone will generate a market volume of roughly £7 billion in the UK. This represents a massive opportunity for utilities, big oil, automotive OEMs, and financial investors.

Value pools are big enough for niche competitors and local “top dogs”

EV charging is an embryonic market and has evolved to be highly fragmented with a complex value chain and many small market participants. The sector has been undergoing a consolidation wave, with energy companies, in particular, trying to expand their value share and geographic coverage. The figure below illustrates the ongoing market consolidation for the UK. However, the total market potential is likely big enough for both niche players and regional top dogs to coexist. While niche competitors, such as software platform providers, need to scale their business on a European or even global level to reach a critical mass, regional top dogs like national utilities can build a successful business by covering multiple value pools and offering integrated solutions.

Deep dive on the charging infrastructure value chain



Source: Arthur D. Little analysis
Note: 1) Charging point operator

Set your ambition right; scale is key to succeed!

Market growth alone does not build a successful business. Many substantial companies with deep pockets have entered and are moving aggressively. Consolidation is ongoing and expected to intensify. Some EV charging business models employ classical scale games, and many will fail. Leaving the consolidation phase as a winner requires developing the right strategy and laser-focused implementation – while remaining agile to react to change in a fast-moving industry.

Whoever loses time now will have to pay for it many times over in a few years

The window of opportunity is open, and time is money. Many large competitors have built a strong position to ride the growth wave. Market share gains after 2025 will likely become extremely expensive, and latecomers will pay dearly to fight their way into an occupied market.

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