Akin

EV charging: a new asset class and a spectrum of different business models

March 2023

Introduction

The International Energy Agency's (IEA) Global EV Outlook 2022 forecasts that, under current government policy plans, 200 million electric vehicles (EVs), both full battery and plug-in hybrid, will be on the roads globally by 2030. This represents over 20% of sales and a 12-fold increase on the current global stock of 16.5 million EVs. It is a substantial growth curve, but still falls well short of the numbers needed to achieve net zero CO2 emissions by 2050, which the IEA forecasts would need EVs to reach 60% of vehicles sold by 2030 with a total global electric car stock of almost 350 million vehicles.

These EVs will need access to power through a network of millions of chargepoints1 and a smart new EV charging ecosystem that manages the impact of that charging demand on national electricity networks, particularly at times of system stress and peak.

We don't yet have a complete picture of when, where and how those EVs will charge. That charging footprint will also evolve as our driving habits change over time, for example as we commute less and work more from home, as we shop more online reducing personal vehicle miles and increasing last mile delivery mileage and as we transition to increased ride-sharing models and autonomous vehicles (AVs), both of which should dramatically increase mileage for some vehicles and require different charging solutions.

This article provides an overview of the different market segments in the EV charging market, the current and emerging revenue models, current key market challenges and the key risks faced by EV charging businesses.

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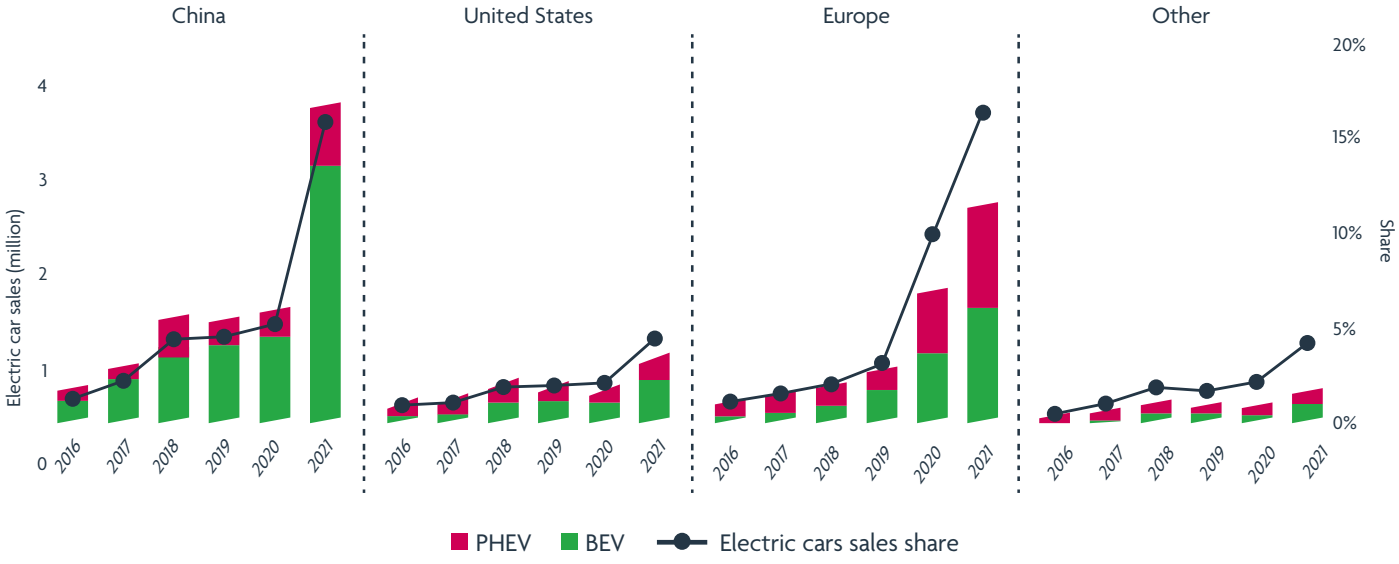
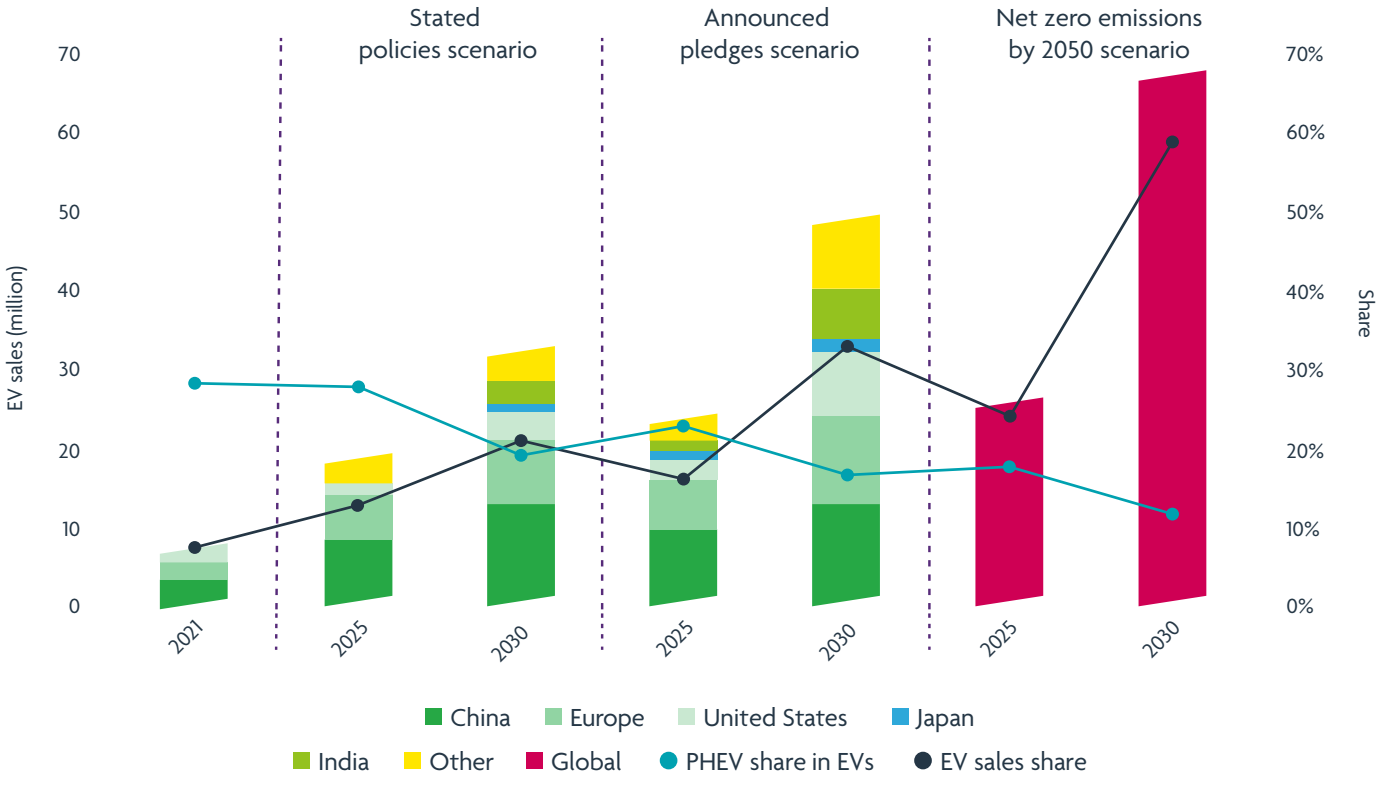
Electric car registrations and sales share in selected countries/regions 2016-2021



Source: Global EV Outlook 2022

Global EV sales by scenario, 2021-2030



Source: Global EV Outlook 2022

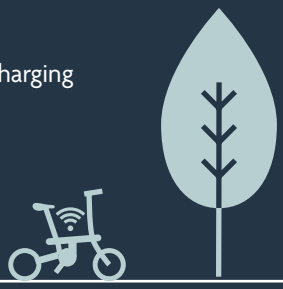
Market Segments

Home

Off-street parking at residential homes and flats, with charging speeds of 3-11 kW2.

Workplace

Corporate and office car parks, with charging speeds of typically 7-22 kW3.



Destination

Including supermarket, shopping center, hotel, public car park, rail and airport charging and public charging solutions away from the home, with charging speeds of typically 7-50 kW.

En route

Located on or close to motorways and key trunk roads or at dedicated EV charging stations or retrofitted at existing gas/petrol stations with rapid and ultra-rapid charging speeds of 50-150 kW+.

Revenue models

The current and emerging EV charging business models seek to access and optimize different combinations of the following potential revenue or income streams depending on the location, infrastructure and market segment of the solution provider:

Chargepoint sales revenue

Direct sales of EV chargepoints to e.g., third party installers and property developers.

Chargepoint sales and installation revenues

Sales and installation of EV chargepoints for residential and commercial/corporate customers – these sales may be direct to end customers (e.g., online) or via preferred referral networks such as automotive original equipment manufacturer (OEM) dealerships.

Electricity sales revenue

On a capacity and/or time basis.

Chargepoint sales, install, operation and maintenance, electricity supply and energy as a service (EaaS) revenues

Which may also include revenue streams linked to customer or grid energy efficiency through the use of smart charging and load management solutions.

Subscription revenues

Which are designed to drive customer stickiness and loyalty, but which, like personal gym memberships, operate as fixed standing charges/revenues that are generated regardless of charging volumes.

Retail services sales revenues

Retail sales revenues both directly from traditional sales to customers or indirectly (e.g., with the solution provider sharing in revenue upside from a co-located supermarket, pub, café or r etail outlet that benefits from increased footfall due to the presence of the charging infrastructure).

Data/digital sales revenues

New digital revenue streams that seek to monetize the increased vehicle dwell time during charging, through the provision of technology and data-driven personalized services.

Demand Side Response (DSR), Vehicle to Grid (V2G) or Vehicle to "X" (V2X) revenues

Through the sale of power and/or power flexibility services to the grid (at either the transmission or the distribution level) or to nearby corporates.

Fiscal or government incentives/subsidies

Which may apply at the point of chargepoint sale or otherwise and which operate to reduce the costs or increase the revenues of the charging solution provider.

Key challenges in the current market

Leaving aside those with access to the Tesla super-charger network, the on-the-ground, day-to-day experience for early and second mover EV adopters needing to access public charging infrastructure is one marked by friction and frustration, caused by a range of factors including:

Reliability issues
Chargepoint infrastructure suffering outages and connection and reliability issues.

Connection issues
A "heavy" user interface with customers often required to download different apps and enter personal and payment details to access charging.

Credit balance issues
Requirements to maintain customer credit balances to access charging.

No pre-booking
Inability to pre-book a charging window in advance (even at a price premium).

Cost and price comparison issues
Cost variability between different chargepoint providers and difficulties in easily comparing pricing in the way that customers are used to doing between gas/petrol stations.

Access issues
Chargepoint cables being heavy, difficult to handle and often located at a height making them difficult for users with mobility issues.

Availability issues
Chargepoints being used by other customers or blocked by internal combustion engine (ICE) vehicles.

Speed issues
Charging speeds not matching advertised output, particularly when more than one vehicle is charging at the same time.

Time limits
On maximum charge duration (e.g., 90 minutes).

Information issues
Inadequate (or out of date) app information about chargepoint availability and outage status.

Rural and remote issues
Limited charging provision in remote and rural areas.

Safety issues
Chargepoints in locations that are isolated or feel potentially unsafe, particularly at night (e.g., at the back of pub cark parks).

Key risks

EV charging solutions are exposed to a range of key risks, which may or may not be mitigated by the chosen business model, including:

1. Demand risk
2. Location and land right risks
3. Grid connection risks
4. Ownership/ control risks
5. Supply chain risks
6. Legislative and regulatory compliance
7. Change in law / change in technical standards
8. Political risks
9. Wholesale electricty price risk
10. Ability to scale
11. Exit
12. V2G and V2X specific risks
13. Other notable risks, such as product liability, intellectual property and data protection

1) Demand risks

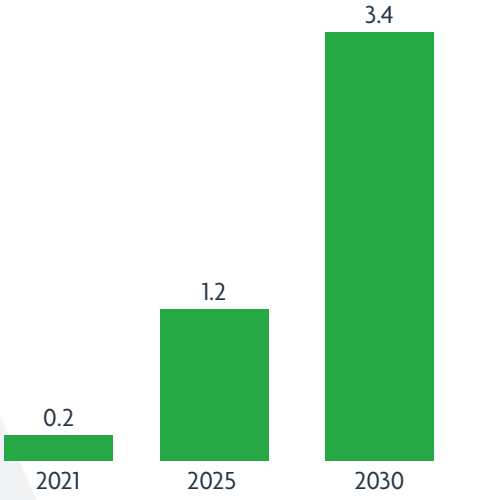
EV chargepoint demand risk is typically the biggest risk affecting EV chargepoint operators.

EV charging infrastructure can be capital intensive and the market is continuing to look for creative solutions to remove or reduce demand risk and enable businesses to raise finance and scale, through (i) securing a "hard" contractual demand underpin from a credit worthy off-taker (e.g., a commercial EV or ride-sharing fleet company) or through "softer" demand underpinnings such as (ii) location exclusivity (such as motorway service stations); (iii) regulatory exclusivity (e.g., linked to the award of a commercial bus franchise); and (iv) subscription4 rather than "pay as you go" revenue models; or (v) preferred rate arrangements with well correlated or co-located fleets. However, the majority of EV charging solutions remain exposed to merchant revenue risk.

EV chargepoint demand is affected by a number of variables including:

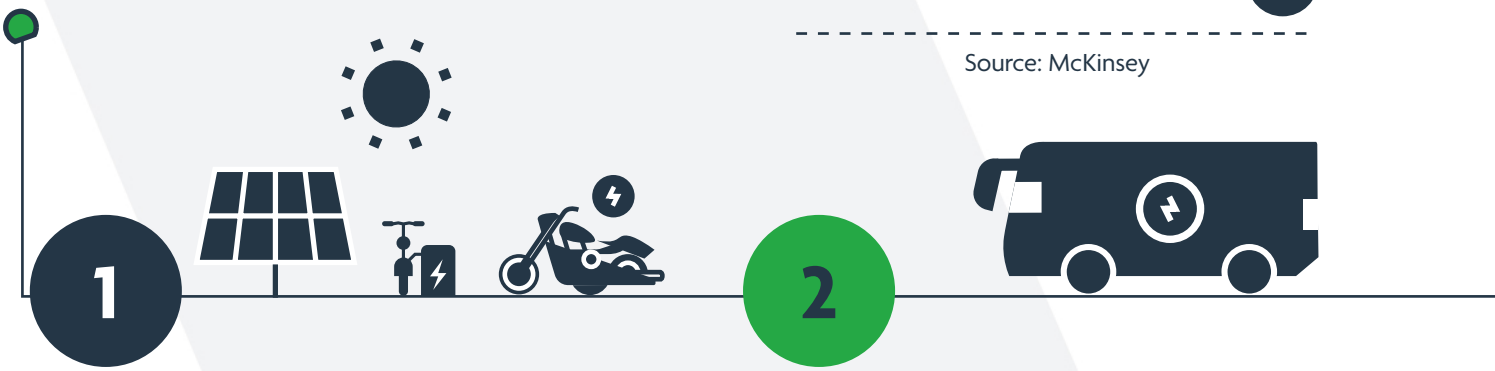
Public EV-charging infrastructure

charging points (millions)



Cumulative investments until 2023 (€bn) **40**

Source: McKinsey

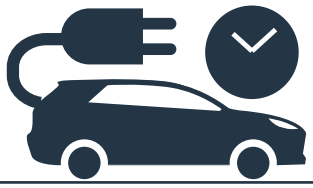


EV uptake

The rate of switching to passenger and commercial EVs, which can be affected by macroeconomic conditions, consumer sentiment (particularly around range or charging availability or reliability), supply chain constraints and vehicle lead times, cost (in particular the upfront price premium between EVs and conventional ICE vehicles) and the presence or absence of government fiscal incentives and subsidies.

Range

Range (or range anxiety) is a perceived barrier to EV adoption, but vehicle range also directly affects charging habits in terms of frequency, location and type of charging. In very simple terms, for example, the higher the vehicle range, the lower the volume of public charging a vehicle is likely to need.



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EV charging hierarchy

The balance of when and where EVs will charge continues to evolve in light of factors such as vehicle type, vehicle range, location, charging cost, charging infrastructure availability, customer demographic and vehicle use case. Over time, the proportion of charging across each of the home, workplace, destination and en route segments of the market is likely to settle and become predictable. At this still early stage in the market's evolution, however, there remain material uncertainties in modelling future EV charging demand across these market segments, which needs to take account of a range of factors including how charging demand:

- varies between different urban, rural and remote areas, particularly in light of (i) evolving commuting and working patterns, (ii) access to off-street parking and therefore home charging and (iii) the increase of online shopping and the resulting reduction in personal vehicle miles and corresponding increase in commercial vehicle and last mile delivery mileage;
- is likely to change over time in response to (i) increased availability of different charging solutions, potentially at significantly different costs, and (ii) the growth in EV ride-sharing fleets and the transition to autonomous EVs, both of which are expected to have significantly higher mileage profiles with correspondingly different locational and speed charging requirements.

4

Location (and co-location benefits)

Location is a critical factor in driving EV chargepoint demand – see the section below for our thoughts on the benefits of location and co-location.

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Speed

Faster chargepoint speeds, in the same locations and at the same (or similar) pricing are likely to be more attractive to customers and therefore to impact customer demand for charging infrastructure. This presents a demand risk for chargepoint operators, which may be less significant if distinct market price points emerge for different charging speeds; also relevant here are vehicle limitations on maximum charging speeds which can be lower than available chargepoint speeds and any applicable charging time limits that may push users towards slower charging infrastructure with longer dwell times. Charging speeds (for both chargepoints and vehicles) continue to increase, so obsolescence is a key risk factor here as chargepoint speeds or solutions that are "best in class" today may become slow or uncompetitive as the market evolves and better solutions are deployed.

6

Cost

Cost is a key factor in determining EV charging demand. In the traditional ICE gas/petrol station market, consumers are used to comparatively narrow (but still influential) cost differentials of c.10-20% between different fueling options, such as supermarkets, brand name retailers and major trunk road/ motorway service stations and between different qualities of fuel in the same forecourts. In the EV charging market, charging costs can vary much more significantly (by as much as a factor of 10-15x), between the home, workplace, destination and en route segments, with some EV charging still provided for free (to attract footfall and dwell time), some provided at very low cost e.g., 7 pence per kW for an overnight tariff and public destination and en route charging reaching as much as £1 per kW. It remains to be seen how the pricing differentials across each market segment will settle and how influential this will be in driving consumer demand between these market segments.

7

Electricity Prices

If electricity prices are low in absolute terms, this may reduce consumer incentives and motivations to shop between different charging providers on the grounds of cost. If prices increase (or remain at the current historic highs), the motivation to price shop increases. It is also not yet clear how wholesale electricity price volatility and cost increases will be passed onto customers and whether this will follow a price pass-through model similar to current petrol pump prices or whether customers will see more gradual and periodic resetting of EV charging tariffs to reflect underlying wholesale market movements.

In reality, different EV market segments may adopt different approaches with home charging continuing to (more or less) follow existing retail electric price models and en route charging solutions being faster to pass through electricity price increases. The approach taken may depend on the extent to which EV charging operators are able to put in place effective and affordable hedging to mitigate this risk. EV charging solution providers that are able to provide smart charging and load management solutions may be able to offer customers solutions that mitigate the impact of this volatility.

8

Brand

Over time, brand is likely to emerge as a key driver of demand, as consumers favor charging operators with which they are familiar and those with (perceived or real) advantages in terms of better availability, reliability, ease of use, user experience and/or a more attractive additional services offering.

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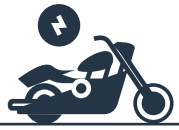

Presence of competitor solutions

Demand for individual EV charging solutions will be affected by the presence or otherwise of available alternatives, with demand likely to reduce if there are alternative charging solutions nearby offering faster or cheaper charging, a better location, better co-located services, better availability or reliability, better brand recognition, more seamless contactless access and/or longer (or no) maximum time limits.

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COVID-19 and changes to working patterns

The pandemic, the resulting adverse macroeconomic conditions and a return to more flexible working patterns, may reduce demand for EVs and commuting mileage resulting in reduced demand for EV charging (generally and specifically in the workplace and en route segments). Conversely, the pandemic has also demonstrated the benefits of "contact-free" charging from home and current high energy prices can also make the whole-life cost savings of switching to an EV more attractive.

2) Location

As noted above, location is a critical factor in driving EV chargepoint demand. Optimal locations vary depending on charging speed and market segment; preferred locations from a vehicle "footfall" perspective need to be triangulated against land cost, grid connection costs and constraints and the value of co-location with retail/other services (such as supermarkets, fast food restaurants or pubs). Optimal locations may change over time as competitor solutions are deployed, as driving habits change (for example, as we commute less and work more from home) and as we transition to increased ride-sharing and AVs, both of which should dramatically increase mileage for some vehicles and require different charging solutions.

3) Land rights risks

EV chargepoint providers often seek to secure locations on a site-by-site basis or through one or more portfolio transactions. The following land rights risks and issues are likely to be key:

(i) **tenor**: operators will need to determine (and negotiate) whether to secure short, medium or long-term land rights and whether (and on what terms and at what cost) those rights can be extended to allow for re-powering or continued operation post expected asset life;

(ii) **exclusive possession**: operators may need exclusive possession of key sites (via, for example, a lease) to provide them with greater assurance of their interest in the land, to allow them to register security against that interest, to better protect themselves in the event of landlord insolvency and/or to better enable them to control/prevent usage of the site by non-customers;

(iii) **exclusivity**: operators will need to evaluate the value of securing an exclusive right to deploy EV charging infrastructure on the site or sites;

(iv) **revenue sharing and rent review:** operators will also need to understand (and negotiate) any applicable revenue sharing arrangements linked to EV charging revenues or footfall and any applicable periodic rent review regime;

(v) **termination risk**: operators will need to understand the extent to which domestic law provides for security of tenure and in what circumstances their land rights could be terminated or not renewed (e.g., on the insolvency of the landlord);

(vi) **accidental damage and vandalism**: this is likely to be an operator risk supported by insurance; and

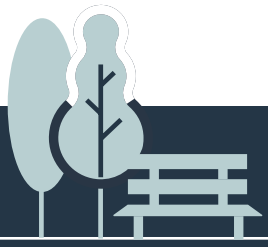
(vii) **change of use/ownership/control**: the parties will need to agree the extent to which the land rights are impacted by a change of use of the broader site or a change of ownership or control of the operator or the landlord.

In addition, charge point operators (CPOs) will need to consider how localized parking restrictions or actions by the host landowner (such as unexpected building works at the site or in the car park) may disrupt EV user access, often with negative brand impact.

The decision whether to seek a lease or a license on a third party site remains an ongoing debate in the industry.

Historically, long-term (15-25 year) leases were sought (giving security of tenure and exclusivity of possession), but leases are generally slower and more costly to put in place. Depending on the CPO's financing model, the tenor of the transaction and the identity of the landlord, exclusivity of possession over the charging bay may not be viewed as essential and a site license may well suffice and be more attractive to landowners, with a faster and lower cost of rollout and with security of tenure risk mitigated by the CPO across its aggregated portfolio.

For high capex or highly valuable strategic sites, the additional cost, time and complexity of obtaining a lease may, however, remain justified. The scope of the demise is also highly relevant. Does the CPO want to control (and be responsible for) maintenance of the charging bay or should this sit with the host landlord? Equally, do the access and land rights contain sufficient flexibility to accommodate the potentially inflexible requirements of the regulated grid network operators who may be responsible for some or all of the site grid connection works.



4) Grid connection

Depending on the jurisdiction involved, securing a suitable grid connection can be an area of material cost and timetable uncertainty for public or high-capacity EV chargepoint solution providers.

Securing the grid connection may require network reinforcement works to be undertaken by the network operator or an authorized third party, the costs of which may be passed on to the operator (or shared between the operator and other users seeking to connect to the network in the same time frame). Grid connections can also be granted subject to a risk of constraint due to potential resilience issues on the network. These constraints will need careful consideration. The EV chargepoint solution provider will also need to determine whether to "right-size" the grid connection for its current charging infrastructure needs or whether to "over-size" the grid connection to allow for the uprating of its charging infrastructure over time.

Co-locating EV charging infrastructure with static battery storage may be an attractive alternative to alleviating a (potential) grid constraint and may also open up additional ancillary services revenue streams for the operator.

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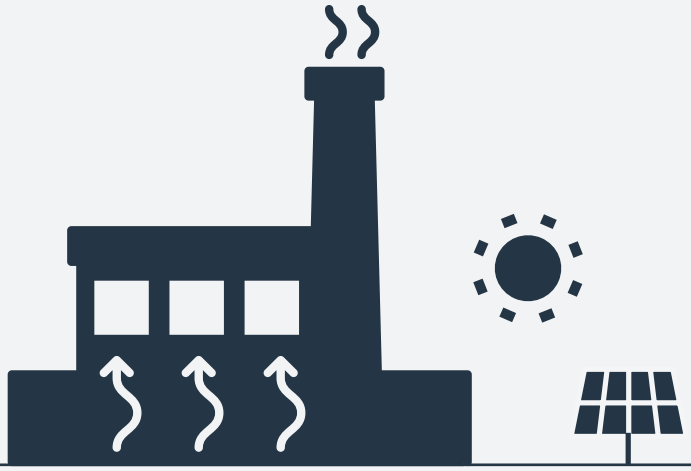
5) Ownership control risks

EV charging infrastructure can either be owned by the CPO or by the host customer (e.g., the carpark owner, corporate or tenant). There are reputational risks for a CPO when a third party host customer has control over its CPO branded chargepoint. The host customer may want to determine (and change) pricing, or energy supply arrangements and may also have the right to switch off or deny access to the chargepoints, or to relocate them at their own cost. This can create inconsistency of service levels and performance across a CPO network which may adversely affect brand and user experience.



6) Supply chain risks

Supply chains represent a major source of risk for EV chargepoint solution providers, many of whom have key dependencies on particular contractors that may:

(i) result in overly supplier friendly terms,

(ii) make it difficult to scale up chargepoint rollout quickly or

iii) be difficult to replace if the supply chain counterparty defaults or falls into distress or insolvency. Global supply chain issues may also result in delayed deliveries and missed contractual milestones which could cause loss to the EV chargepoint operator.

The industry is currently experiencing long lead times (with demand outstripping supply) combined with poor quality technology and service provision, but these issues should improve as the industry matures. These issues could potentially be mitigated by building up retained inventory/stock. Counterparty credit strength and contractual protection via supply contract risk allocation, remedies for delay and liability caps will be key. A supply chain with single point reliance on a key manufacturer is at particular risk here. Supply chain risk may also result from other factors such as data breach or data processing issues, intellectual property claims from third parties, modern slavery and labor issues.

7) Legislative and regulatory compliance

An EV chargepoint operator will need to take account of existing and proposed legislation, regulation and guidance in relation to a range of issues including (i) EV chargepoint and site health and safety, (ii) planning requirements, (iii) parking bay conversion, (iv) consumer protection in respect of payments, (v) data protection, (vi) competition law, (vii) government grants for EV charging, (viii) electricity licensing, (ix) trade and import/export controls and (x) modern slavery and human rights.
To give a recent UK example, the Competition and Markets Authority (CMA) opened an investigation in July 2021 into whether certain long-term exclusivity arrangements entered into by participants in the market for the supply of EV charge points on or near motorways amounted to either anticompetitive agreements or abuses of dominance in breach of UK competition rules. The investigation was settled in March 2022, with no decision being made as to whether the relevant conduct in fact amounted to a breach, by the relevant market participants agreeing to certain commitments to not enforce some of those exclusive rights and not to take any action that would undermine or seek to circumvent those commitments.

8) Change in law/technical standards

Change in law (and related technical standards) is a material risk for EV chargepoint operators. Some changes may be capable of being dealt with via "over the air" software updates, but others may require hardware modifications and/or increase capex or opex costs. Examples of changes that have applied or been proposed in different jurisdictions to date include:

(i) standardizing the pricing framework (e.g., cost per kWh) for all users;

(ii) introducing minimum standards for payment methods;

(iii) the introduction of new resilience and reliability standards;

(iv) new interoperability and data sharing requirements;

(v) new smart charging requirements;

(vi) new weatherproofing, lighting and signage requirements; and

(vii) accessibility changes designed to make using EV chargepoints easier for customers with mobility and disability issues.

EV chargepoint operators will also need to understand and evaluate the extent to which new planning, consumer protection or electricity licensing requirements or guidelines may be introduced over time in respect of their chargepoints. Change in law risk can ultimately lead to EV chargepoint infrastructure becoming obsolete if the costs or difficulty of upgrading the solution outweigh the likely economic benefits of doing so.

9) Political risk

EV chargepoint operators are exposed to macroeconomic and environmental, social and governance (ESG) related political risks, which may result from, for example:

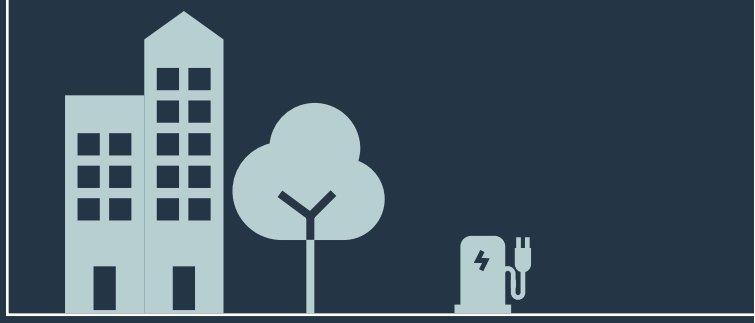
- the high cost of energy,

- changes in a country's commitments to decarbonization or the phasing out of ICE vehicles,

- the impact of tax or tax incentives or grants on EV and EV chargepoint sales or the costs of owning and operating an EV,

- the introduction (or otherwise) of ultra-low emission or congestion charging zones (and any related EV discounts or exemptions) and/or

- the introduction of road pricing or other revenue raising powers designed to replace existing fossil fuel tax and duty revenues.

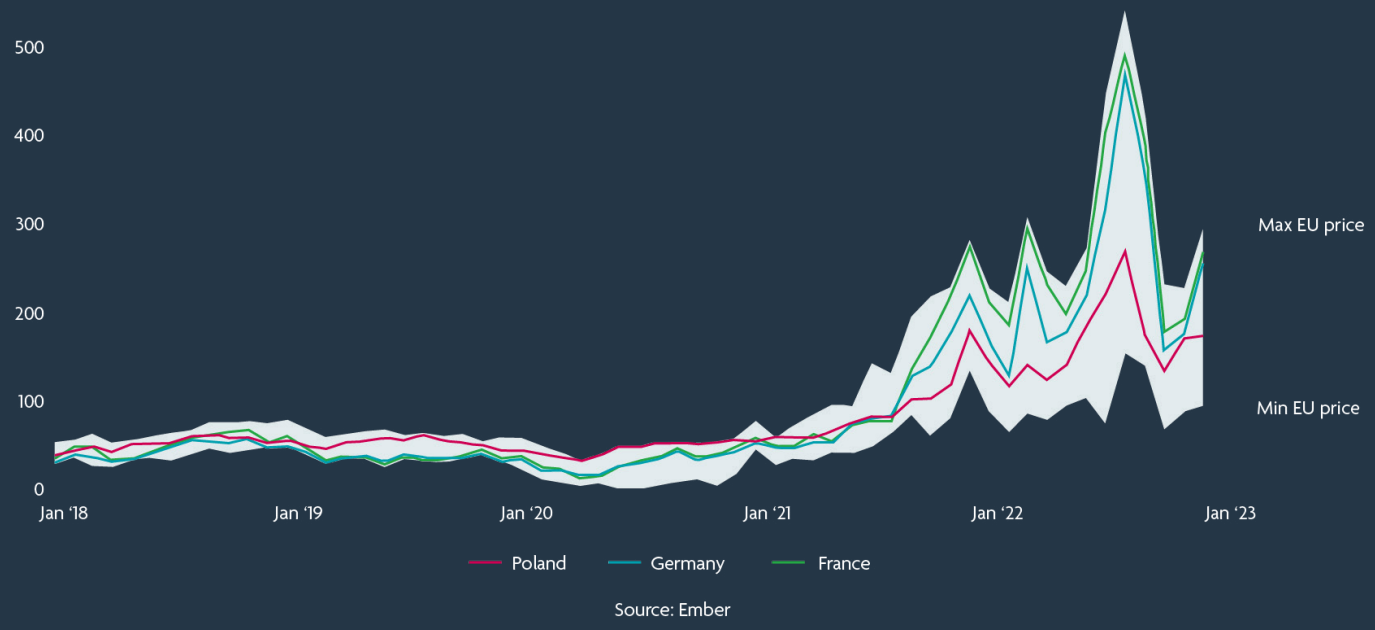


10) Wholesale electricity price risk

As noted above, it remains to be seen how volatility and price increases in the wholesale electricity price market will be passed through to EV charging customers and whether this will follow a price pass-through model similar to current petrol pump prices or whether customers will see more gradual and periodic resetting of EV charging tariffs to reflect underlying wholesale market movements. EV charging operators may also seek to use hedging to mitigate this risk. In reality, different EV market segments may adopt different approaches with home charging continuing to (more or less) follow existing retail electric price models and en route charging solutions being faster to pass through electricity price increases. As noted above, electricity prices may also directly impact demand for EV charging infrastructure: if electricity prices are low in absolute terms, this may reduce consumer incentives and motivations to shop between different charging providers on the grounds of cost; if prices increase (or remain at the current historic highs), the motivation to price shop increases. EV charging solution providers that are able to offer smart charging and load management solutions may be able to mitigate the impact of this volatility.

It remains to be seen how volatility and price increases in the wholesale electricity price market will be passed through to EV charging customers and whether this will follow a price pass-through model similar to current petrol pump prices.

Wholesale electricity prices in Europe



Source: Ember

11) Ability to scale

Depending on the business model, scaling an EV charging network is likely to be capital intensive and ability to scale is likely to depend on a range of factors such as:

(i) access to funding and finance (and the challenges of raising finance given the increasing cost of capital and the nature of the demand/utilization risk faced by CPOs);

(ii) ability to identify good EV charging locations and manage the increasing competition for the best sites to obtain required land rights, planning permission and grid connections;

(iii) ability to secure key strategic partnerships which can directly or indirectly facilitate routes to market such as with automotive OEMs, fleets, energy majors, supermarkets and other retail chains, corporates and/or government entities;

(iv) ability to manage key supply chain dependencies, such as single source dependencies for equipment manufacturing;

(v) ability to absorb loss leaders to reach critical mass;

(vi) ability to retain key personnel, particularly from moving to competitors;

(vii) ability to build brand and create customer stickiness; and/or

(viii) ability to monetize revenue streams beyond wholesale electricity sales.

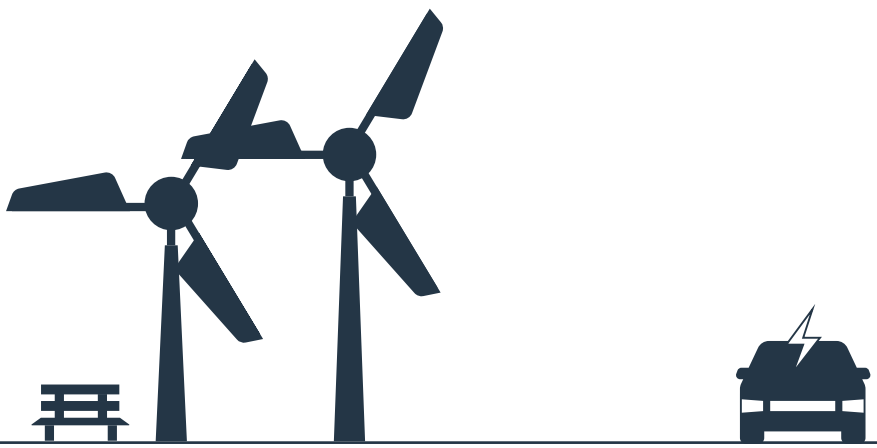
12) Exit

Financial investors in EV charging solutions will want to understand their likely exit strategies, which could involve typical exit routes such as a sale or listing but also potential alternative options such as the sale of portfolios of chargepoints to third party investors and the transition of the business from asset installer/owner/operator to asset installer and operator only.

13) DSR, V2G and V2X

DSR, V2G or V2X solutions create potential additional revenue streams by using an EV battery (or an aggregated pool of EV batteries) to provide energy or energy flexibility services to the grid, at either the transmission or the distribution level, or behind the meter to homes (as part of a wider energy as a service solution) or to corporates or similar entities (for example, to reduce exposure to peak electricity prices and/or system costs). They do this by modulating when and how vehicles charge in response to grid system stress events and price signals. These energy or ancillary services solutions are likely to be exposed to merchant revenue risk or secured under short-term contracts. They are optimal where vehicle dwell time is expected to be long (e.g., at home or at all day or long-term car parks such as those at railway stations and airports) or where the potential size of the aggregated pool is predicable even if individual vehicles are entering and leaving the pool at various times.

The key issues in providing these services include (i) the contractual relationship between the EV chargepoint and the EV owner (i.e., the terms of service for the chargepoint will need to allow the EV to be used for DSR, V2G or V2X solutions); (ii) the impact of DSR, V2G and V2X solutions on battery lifecycle and degradation and the level of compensation (if any) being provided to the EV owner for this impact; (iii) the interaction between the DSR, V2G and V2X solutions and the EV battery warranty (i.e., will the cycling profile invalidate or reduce the cover under the EV battery warranty) and (iv) (for V2G and V2X solutions) vehicle, chargepoint and meter capability to accept bi-directional charging.



Other notable risks

Product liability

Product liability may create risks for EV charging operators in relation to product defects, failure and recalls, warranty claims and/or litigation if a product failure results in damage to property, personal injury or death. Insurance may be able to mitigate the impact on the business of some of these risks.

Intellectual property

An EV charging solution provider will need to determine whether and how to protect any intellectual property in its solution and to ensure that it has secured all rights to, for example, use and modify any third party intellectual property needed to operate its business. An EV charging operator may need to bring or defend claims to protect its own intellectual property or to defend claims for alleged infringement of third party intellectual property.

Data protection and cyber security

Data driven services are a key potential driver of additional revenue for EV charging solution providers, but the solution provider will need to ensure that in seeking to collect, use and/or monetize that data it is complying with all relevant legislation and regulation (as well as its agreed contractual obligations) in respect of data collection, processing and sharing, as well as complying with any requirements to share data in support of improving the consumer experience.

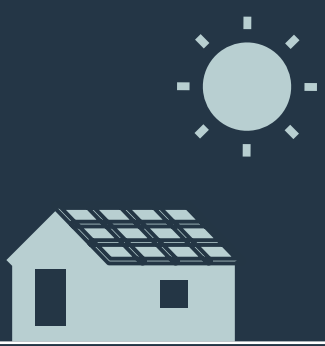
Cybersecurity is also a critical business risk given the levels of personal data held by CPOs on customers and the digital payment and top-up wallet features of chargepoints and their user apps. CPOs are both a direct target and a potential conduit for cyberattacks through to other systems and organisations, which increases the potential magnitude of this risk for CPOs.

Conclusion

The battle for EV charging market share is being fought between traditional fueling retailers, such as oil majors, energy utilities, technology companies, automotive OEMs, pure play EV chargepoint operators, strategic investors and EaaS solution providers.

The market is characterized by different business models targeting different EV users and usecases and the emergence of a new EV charging asset class for investors and lenders.

Success is likely to depend on ability to scale and differentiate in order to build customer volumes, track record and stickiness over time and on a business's ability to manage wholesale electricity price risk and generate and stack multiple revenues streams.



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