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KEY FACTORS DEFINING THE E-MOBILITY OF TOMORROW – A focus on the EV charging infrastructure ecosystem and emerging business models

Florent Andrillon[1], Ozlem Bozyurt[2], Piotr Kowalczyk[3]

[1]*Vice President, Head of Energy Transition Global at Capgemini Invent, florent.andrillon@capgemini.com*

[2]*Managing Consultant at Capgemini Invent, ozlem.bozyurt@capgemini.com*

Summary

The development of e-mobility represents a billion-euro opportunity that companies should seize by preparing the future now. The key is to adopt viable business models that enable them to differentiate themselves from competitors in an increasingly crowded market. As the weakness of the electric vehicles market lies in the charging infrastructure, this specific topic is crucial to explore to gain a competitive advantage. This study aims at giving an extensive overview of the charging infrastructure market to date and at providing an in-depth analysis of the ecosystem by understanding the different relations, mapping the players and identifying emerging business models.

Keywords: Electric Vehicles, E-mobility, Charging Infrastructure, Emerging Business Models, Value Chain

1 Foreword

Smart mobility and electrification are reshaping the future of mobility and accelerating the transition to e-mobility. Electric vehicle (EV) sales keep increasing, now more than 1 million units globally, one of the fastest growing segments of the automotive market [1]. While geographic discrepancies are high, the trend is accelerating further, and sales are likely to rise in coming years.

The roll out of an EV charging infrastructure is critical if EVs are to be adopted on a large scale. New infrastructure development, especially charging points, is essential to address customers' range anxiety and further bolster the uptake of EVs. Consequently, the deployment of a charging infrastructure, coupled with EV penetration, is creating new market opportunities and attracting new players.

Assessing who can capture the new value generated by this market is critical. Indeed, business models and development scenarios are constantly reshaped, making it difficult to forecast financial returns and economic benefits for market players.

Despite uncertainties, business opportunities offered by the EV charging infrastructure are real, and numerous players, including car manufacturers, power companies, and facility management companies are currently building their capabilities and have the potential to play a crucial role.

In fact, the complexity of the EV charging infrastructure ecosystem incentivizes all players to create new business models and to develop innovative solutions. As EV penetration increases and EV infrastructure expands, two key questions become salient for companies active in the field:

- **When to invest:** What is "the tipping point" for EVs sales that will make the EV charging market more attractive and enable full industrialization?
- **Where to invest:** Which part of the value chain will concentrate most value and enable the highest margins?

The current mobility shift is pushing players to move along the electrification value chain, to review their investment strategies, and to transform their business models through mergers and acquisitions or internal developments. The transformation imperative becomes even stronger as the ecosystem's complexity increases.

In this research paper, Capgemini Invent has combined its expertise in Energy & Utilities and Automotive to shed light on the EV charging infrastructure's evolving value chain, the opportunities for value creation, and the development pathways. We aim to provide the keys with which to navigate the burgeoning EV charging infrastructure market and help market players chart the e-mobility ecosystem of the future.

2 Executive summary

The EV charging ecosystem has the potential to reshape the mobility of tomorrow

The development of e-mobility represents a billion-euro opportunity that companies should seize by preparing for the future from today. The key is to adopt viable business models that enable them to differentiate themselves from competitors in an increasingly crowded market. As the Achilles' heel of the EVs market lies in the charging infrastructure, this is a crucial avenue to explore in order to gain a competitive advantage.

This study aims to bring new perspectives to the EV charging market for light-duty vehicles. We conducted interviews with industry executives from energy companies to automakers, academics, and representative samples of customers to provide the most encompassing study on the charging infrastructure market to date.

Key findings

1. Electrification is one of the four megatrends reshaping the future of mobility

Four major trends are changing mobility: connectivity, autonomous driving, shared and services, and electric mobility – often summarized in the acronym CASE.

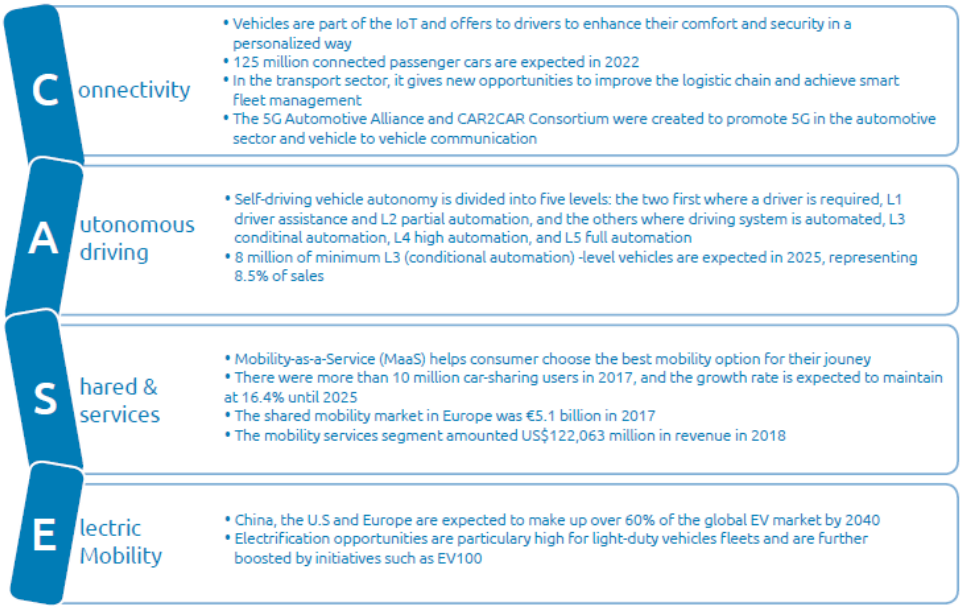


Figure 1: Four major trends are changing mobility

2. E-mobility has recently gained widespread attention and is experiencing momentum; despite high geographic discrepancies, this trend is accelerating

Global EV sales reached one million in 2017 and are expected to continue to increase [1].

3. Access to EV charging infrastructure will soon be the only barrier remaining, to unlock the potential of e-mobility

Growing interest from automakers, including Toyota, Volvo, and Renault, coupled with falling battery prices, will soon bring price-competitive EVs to all major light-duty vehicle segments, even though, without government subsidies, they still remain more expensive than internal combustion engine (ICE) vehicles.

Based on our interviews, consumers rank charging anxiety as the fourth-most-important barrier to EV purchase, behind driving range (range anxiety), diversity of EV models, and price. With declining EV prices, more EV models to choose from, and expanding driving range, access to charging infrastructure will soon be the only barrier remaining. The charging experience is another key issue as the lack of standardization, unclear pricing schemes, and insufficient interoperability between charger providers further complicate customer journeys.

4. Based on scenarios developed by Capgemini Invent, incremental progress is the most likely scenario

The future of the EV charging ecosystem depends on changes along three dimensions: EV charging and autonomous vehicle technologies, changing regulatory environments, and customer expectations. An intermediary scenario, with incremental progress, could lead to a decrease in car ownership as new generations favor new mobility modes and use a limited stock of ICE vehicles to accommodate specific mobility needs. Like 80% of the experts we interviewed, we think that this scenario is the most likely.

5. The EV charging value chain is genuinely new and is likely to evolve further as the market expands and the number of active companies in the field increases

As technologies, policies, and customer preferences are likely to shift according to the incremental progress scenario, the EV charging ecosystem and value chain will change.

The EV charging infrastructure is the product of a new value chain made up of both conventional players and new entrants which comprises three main parts: energy supply, charging infrastructure, and add-on services. Most players are increasing their presence by moving along the value chain, developing new business models through mergers and acquisitions or internal developments.

6. **Seven business models were identified in the current EV charging mobility market, each with unique strengths and potential for further growth**

The rapid evolution of the EV charging ecosystem has led to the multiplication of business models, each of which result from a combination of specific roles within the market and dedicated activities on the EV charging value chain. In fact, some business models are better suited to meet the demands of certain customer segments. Coupling this segmentation with persona analysis enables us to provide a dynamic picture of the ideal positioning of each business model. *(Details of persona analysis are available upon request.)*

7. **No clear leader stands out in this complex EV charging ecosystem yet, but oil and gas (O&G) players are directly threatened and should react fast**

While it is clear that e-mobility business models require managing a complex ecosystem, no leader stands out yet among automakers, utilities, O&Gs, or EV-charging pure players. Automakers and some pure players are better placed to endorse specific business models, thus serving some customer segments better than others thanks to their ability to access user data. Utilities could become the one-stop shop for energy and mobility provision – or be relegated to mere commodity suppliers. O&Gs are definitely the most threatened players and should transform fast to capture a major share of the EV charging market and avoid a significant negative impact. Even though Google, Amazon, Facebook, and Apple (GAFA) are not in the picture yet, they are likely to enter it in the coming years.

8. **Understanding customer preferences – their current and future mobility and charging habits – will be the real game changer for market players**

Overall, data management plays a crucial role in understanding the needs of customers and their links with service providers. This trend is only likely to be reinforced in the future. The company that manages to create a strong connection with its customers will be the real game changer.

9. **Digital and data mastery are critical to win in the EV charging market**

Digital brings companies opportunities to adapt their business model. As an example, using as-a-Service/partnering enables fast set up, with high professionalism and low implementation costs.

3 Development scenarios for the EV charging ecosystem

The accelerating pace of change in the EV ecosystem and its relative fragility makes it challenging to foresee how the EV charging infrastructure could grow over time. Nonetheless, by drawing scenarios it is possible to understand which forces can contribute to sustaining or thwarting the growth observed since the 2010s.

In fact, the future of the EV charging ecosystem hinges on potential changes along three main dimensions: technology (which we chose to split between EV charging and autonomous vehicles), regulatory environments, and customer expectations. We consider that a change in one dimension will create proportionate changes across other dimensions in a domino effect.

For instance, if governments cut investment in EV-related technologies, private companies are likely to lose interest and start shifting to other technologies. This move will eventually stall the development of the entire market. In this situation, customer activism would be insufficient to generate a new dynamic since EV growth relies on the creation of a complex ecosystem. That is the reason why developing countries have been lagging in terms of EV development, although commitments from some governments, such as India, could change the picture [2].

However, as soon as an **e-mobility ecosystem is created, customers will take the driving seat of the e-mobility revolution**. They will reshape the ecosystem based on their EV model preferences, their economic situation, and their charging habits. At this point, we should underline that forecasting the pace of progress becomes challenging, as it is difficult to accurately predict customer behaviour.

Therefore, we foresee three ideal typical scenarios for the development of the EV-charging infrastructure: unachieved dreams, incremental progress, and electric push. According to most of the experts we interviewed, **incremental progress** is **the most likely scenario.**

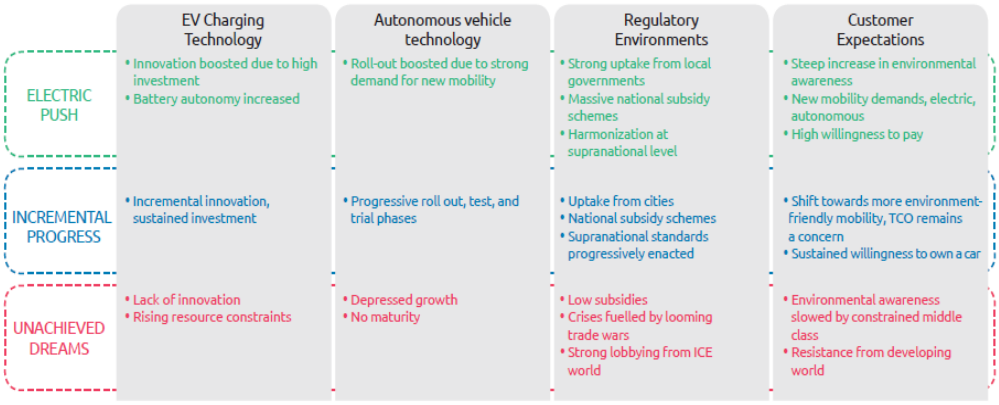


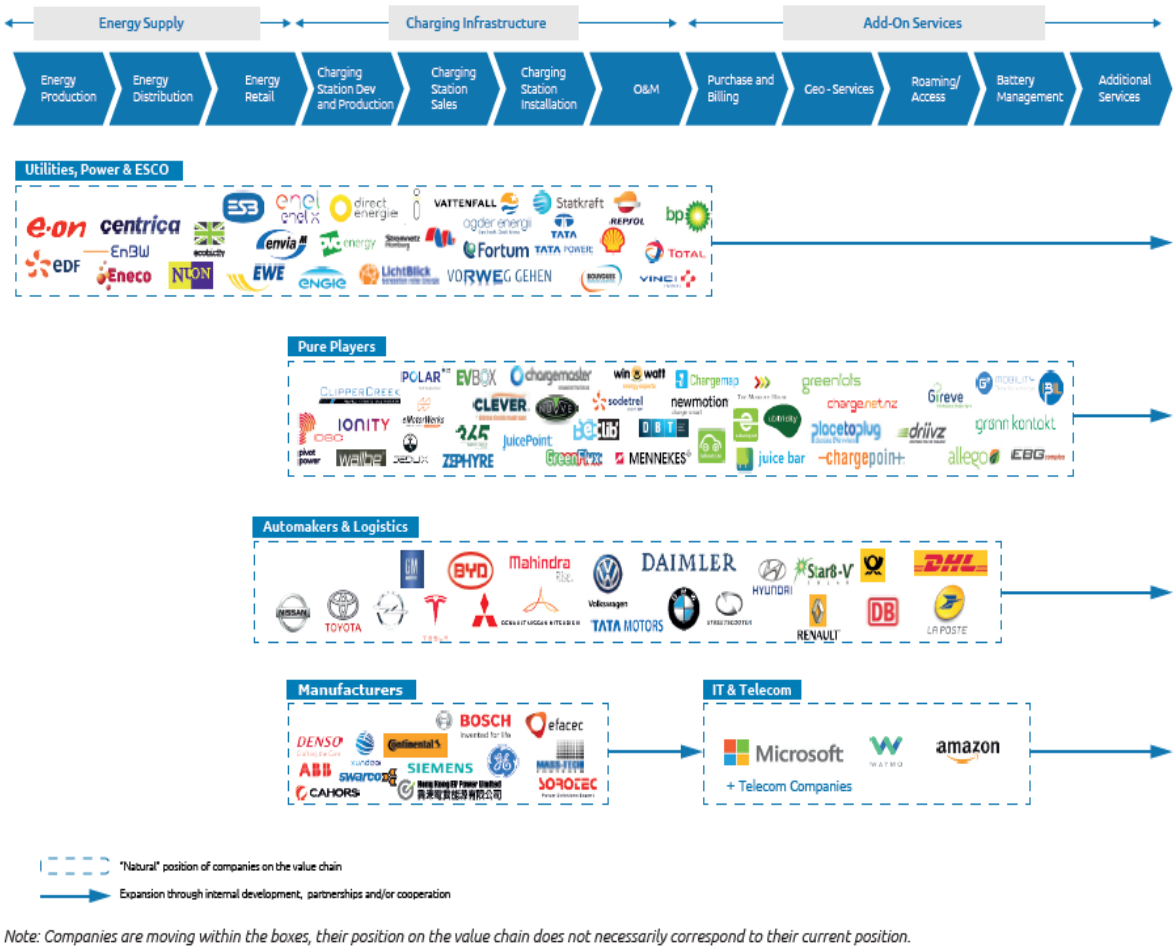
Figure 2: Three typical scenarios for the development of the EV-charging infrastructure

4 EV charging value chain

While technologies, policies, and customer preferences are likely to shift according to the scenarios described, digging further is crucial to get a clearer picture of the existing environment. Indeed, the EV charging infrastructure is the product of a new value chain comprising both conventional players and new entrants. Furthermore, as the market evolves, players move along this value chain and contribute to further complexifying and densifying it. By so doing, they impact other value chains and combine links with different industries, from financial companies to IT and telecom, generating spill overs. *(The demonstration of the links between varying value chains is available upon request.)*

For every challenge that electrification creates, there is an opportunity for the creation of new business models, or the enhancement of existing ones along the value chain. Even though many different business opportunities are covered along the e-mobility value chain – starting with vehicle sales and battery provision, to energy management and value-added services, and ultimately, to the resale of the vehicle or reuse of its components – we specifically focus on the charging angle. We purposefully exclude EV production from the picture and define the EV charging value chain as a combination of three streams:

- **Energy supply**, which involves activities ranging from energy production to distribution and billing end users
- **Charging infrastructure**, which covers all activities ranging from charging station production to sales, installation, operation, and maintenance of chargers and charging stations
- **Add-on services**, which aggregate all activities required or enabled by the development of the EV charging infrastructure, from billing and roaming to battery management.



Note: Companies are moving within the boxes, their position on the value chain does not necessarily correspond to their current position.

Figure 3: the EV charging value chain

Players operate in different segments of the EV charging value chain depending on their position in other, more traditional, value chains.

The ecosystem is also attracting competitors from different industries, including banks, leasing companies, and independent resellers.

Currently, we observe that **utilities, power companies, and energy services companies (ESCOs)** are logically located upstream in the energy-supply segment. **Automakers and logistics** initially developed in the charging infrastructure part as they sought to make it viable to drive EVs or to improve sales. Similarly, **manufacturers** leveraged their core skills and assets to focus on chargers and charging stations production. **IT and telecom companies** started developing add-on services based on their traditional technology and networks offerings.

We have defined **Pure Players** as companies that have been created for, and operate only in, the EV charging infrastructure market. This clustering is thus broad and generic; however, it offers a good understanding of current innovations and market threats to established players present in other groups. Following our terminology, Pure Players can be involved in upward activities, such as EV charging-point manufacturing, or downward ones, such as additional services. Still, most leverage all tools offered by innovative technologies to develop brand-new value proposals.

How energy players are strengthening through mergers and acquisitions and partnerships

OEMs, utilities, and O&Gs are scaling up their activities in the EV charging space.

Utilities and power companies continue to reshape their investment strategies and transform their business models through mergers and acquisitions (M&As) and by partnering in this crowded EV charging ecosystem. Such moves demonstrate that these players are getting ready for future load-balancing challenges stemming from increasing green energy production use.

They are mainly targeting investment areas where they can leverage their know-how. For instance, Engie's ambition to become a fully integrated energy provider is exemplified by its acquisition of EVBox, one of the biggest public charging networks operators in the Netherlands. Another important move came from Shell with their acquisition of Newmotion, to use their charging base for their rolling out of fast charging points at their stations. Additionally, the main industry players – the BMW Group, Ford Motor Company, the Volkswagen Group with Audi and Porsche, and Daimler – have already joined forces to form the joint venture Ionity [3] with the objective of creating a high-powered charging network across Europe by 2020. Lately, Enel X also signed an e-mobility cooperation agreement with Ionity to further spread e-mobility in Italy [4].

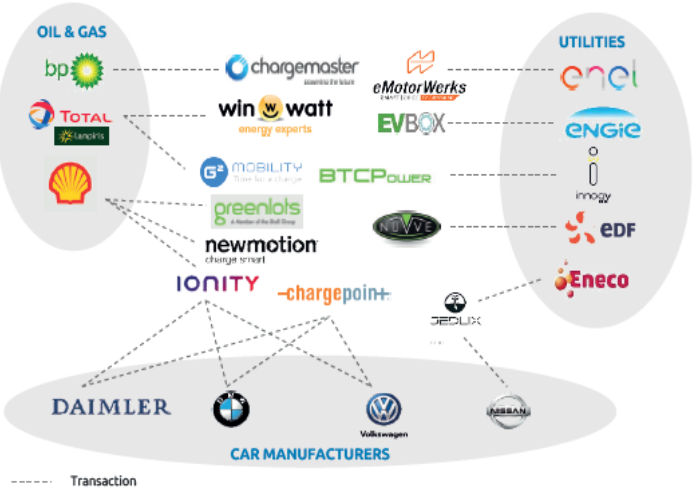


Figure 4: EV ecosystem M&A activities & partnerships

4.1 Market potential based on charging usage preferences

Unearthing customers' mobility and charging habits is a prerequisite to building a competitive advantage in the highly complex EV charging ecosystem

Customers' relationship with their cars is changing radically as explained. Driven by a decrease in ownership and the emergence of autonomous cars, the mobility revolution is at our doorstep, waiting to become part of our daily lives. In fact, shared autonomous electric vehicle (SAEV) is no longer a buzzword [5].

It is thus essential to understand how customers will react to these new mobility modes, and more specifically, how their habits will shape the EV charging ecosystem. We identified four types of charging options, corresponding to different mobility use cases and locations.

We further refined the previous segmentation by adding key characteristics for all four charging locations. From our first analysis, some business models are better positioned to answer specific mobility needs than others. *(Details are available upon request.)*

Table 1: Market segmentation based on customer's charging locations and habits

	Individual charger owners	Shared charger users	Corporate users	Public charger users
Charging locations	Individual house	Collective building	Corporate	Public
Parking lots	Private	Shared or public	Shared	Public
Customer charging habits	Overnight slow charge	Overnight slow charge	Slow charge during the day Overnight slow charge Fast charge for punctual use	Slow charge during the day Overnight slow charge Fast charge for punctual use
Mobility use-cases	Professional use of car for long - & short - distance trips Commuting to work Leisure mobility, holidays, shopping/groceries,...	Professional use of car for long- distance trips Commuting to work Leisure mobility, holidays, purchase	Use of car for sales trips Use of car for delivery	Leisure mobility for holidays (short & long trips) Professional use of car for long-distance trips Functional use, puncutal trips

4.2 Emerging business models in the EV charging ecosystem

The EV charging value chain creates different business models as it is at the intersection of other value chains and involves different players from various industries. Therefore, we found it essential to analyse this ecosystem in two steps: first, understanding all the relations between different players by mapping the ecosystem players, and then identifying emerging business models.

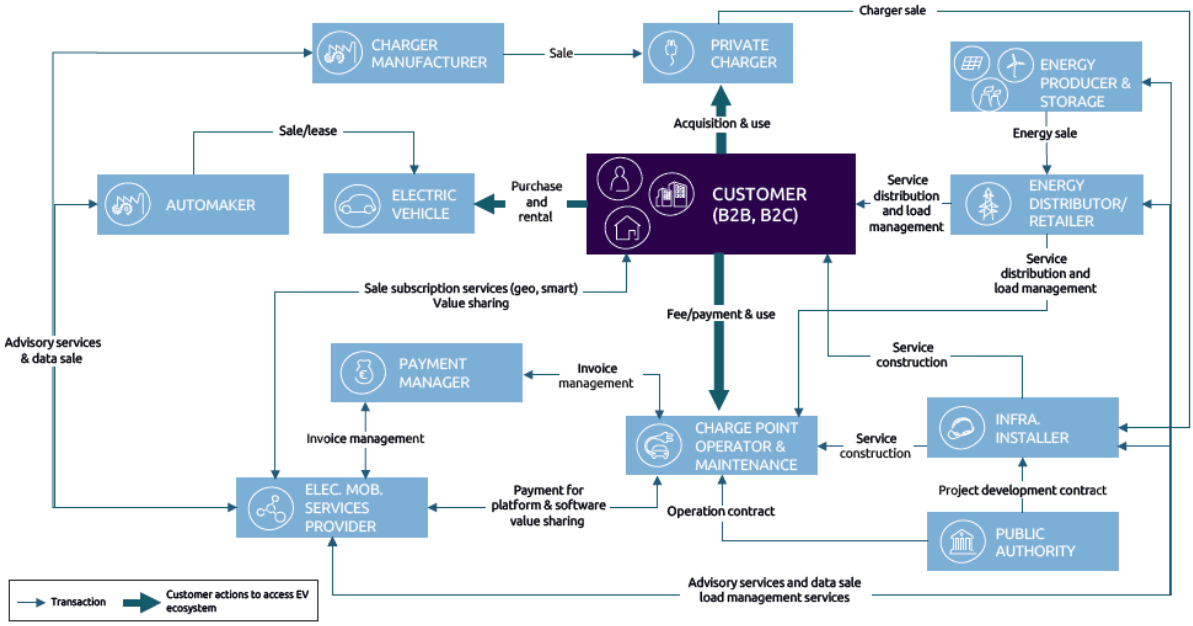


Figure 5: Map of transactions between key players of the EV charging market

Arguably, the picture remains challenging

We thus narrowed down our analysis to isolate specific business models and then mapped each of them in the charging ecosystem to highlight key transactions and roles. Finally, we related each business model to the EV charging value chain, to get both a transactional and dynamic comprehension of them.

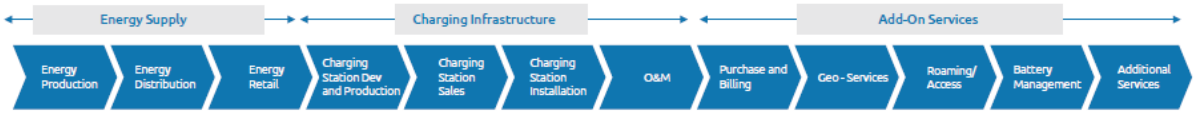


Figure 6: Value chain used for the identification of business models

We identified seven distinct types of business models, classified into four categories that market players adopt during their journey and that bring them varying business opportunities. The position of the players in the EV charging value chain depends on the BMs adopted.

The first three categories – makers, maintainers, and energy masters – correspond to distinct parts of the value chain outlined above. On the other hand, seamless mobility providers are adopting BMs involving stages across the entire value chain, combined in different ways. By so doing, they create entirely new value propositions, with innovative offerings, and unlock new revenue streams.

We highlighted which players are likely to adopt a given BM. In fact, players such as automakers, O&G providers, or electricity retailers that may not compete in other markets, are now adopting the same business models and entering in direct competition. **Boundaries between players are therefore becoming blurred.**

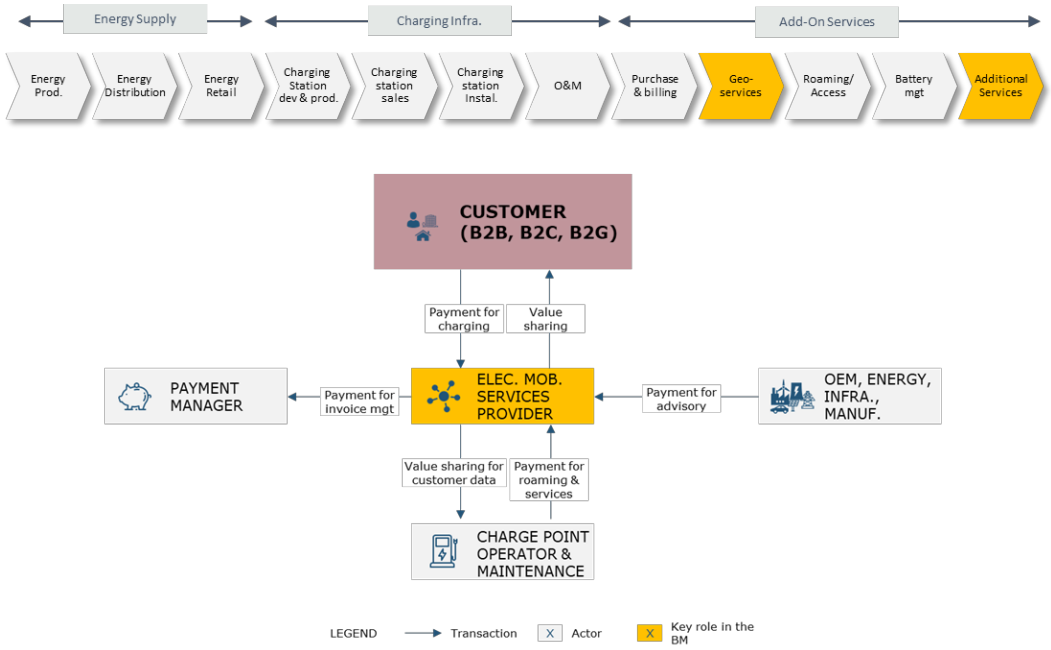
Table 2: Main business models

Classification	BM Name	Value proposition
Makers	BM 1: Manufacturing	DESIGN AND PRODUCE CHARGERS that match both regulatory standards and customer needs
Maintainers	BM 2a: Direct Billing	Operate public charging stations and BILL CUSTOMERS FOR THEIR USE THANKS TO AUTHENTICATION METHODS AND SIMPLE PLATFORMS
	BM 2b: Indirect Billing	Operate public charging stations and BILL A THIRD-PARTY WILLING TO ATTRACT CUSTOMERS OR SUPPORT THE DEVELOPMENT OF EV CHARGING STATIONS
	BM 3: Public Private Partnership (PPP)	DEVELOP, MANAGE PUBLIC SERVICES through concessions granted by local authorities with potential delegating after given period
Energy masters	BM 4a: Smart charging	Use data generated by public and semi-public charging TO DEVELOP SMART SOFTWARE and to provide advisory services
	BM 4b: V2X (V2G, V2B,...)	Leverage the potential of EV batteries, ALLOWING BIDIRECTIONAL CHARGING, to provide storage and supply of energy to public or private electricity networks
	BM 5: End-to-End Energy	Propose END-TO-END ENERGY OFFERS and develop smart services thanks to data collection
Seamless E-mobility	BM 6: Interoperability Platform	Aggregate Charge Point Operators (CPO) through interoperability platforms to maximize network coverage and offer unified authentication methods, shortly ENABLING CUSTOMERS TO ACCESS MULTIPLE CHARGING POINTS OPERATED BY DIFFERENT CPOs
	BM 7: Charging-as-a-Service	Offer a SEAMLESS CHARGING OFFER and cover all electric mobility uses in everyday life

All the details of these BMs – with their detailed value proposition, revenue streams, positioning on the value chain, attractiveness to the business and customer segments concerned - are available upon request.

Example of detailed business model analysis:

BM 4a – Smart charging: Use data generated by public and semi-public charging to develop smart software and to provide advisory services



Attractiveness of the Business Model

- Low competition
- High value capture
- Diverse revenue streams
- Required by most BMs

- High barriers to entry because of IP

Actors likely to adopt this BM

- Automaker
- Energy distributors
- Energy retailers
- Facility mgt & construction
- Manuf. & engineering
- Oil & Gas
- Tech
- Start-up

Customer segments

- B2C – Individuals & homeowners
- B2B – CPOs, Utilities, Fleet managers, Facility managers, Retailers, Local authorities, leasers

Key activities

- Partnership
- Data aggregation and analysis
- Software development
- Customer management
- Advisory

Revenue streams

- Service: subscription to Cloud-based Smart platform ; advisory; data analysis
- Product: software, load-mgt solutions

Cost structure

- OPEX: Cloud, developers, marketing, all covered by Smart charging provider

Details of business models 'analysis are available upon request

A tentative assessment of business models

Assessing identified BMs is a risky and necessarily partial exercise. Given the rapid pace of technological change and the sustained expansion of the market, it is likely that the picture drafted here will rapidly evolve.

Table 3: Assessment of identified business models

	Maturity	Competitive intensity	Growth	Comment
#1 Manufacturing				- High competition and established technologies - Commoditization will severely reduce profits, pushing integration
#2a Direct billing for charge point operation				- Numerous players have adopted this BM with established revenue streams - Long-term perspectives unclear as profitability is not guaranteed
#2b Indirect billing for charge point operation				- Niche players are starting to develop this BM - Durable model, adaptable despite limited revenue potential
#3 Public Private Partnership (PPP)				- Most Charger Points Operators or E--Mobility Service Providers subsidized thanks to this BM, fuelling growth - Concession likely to remain albeit public delegation limits profits
#4a Smart charging				- Maturing with few players trying to develop - Essential to develop renewables and EVs, numerous revenue streams
#4b V2X (V2G, V2B, ...)				- Niche players are started to develop - Market will grow with client acceptance and good demonstrations of current ongoing projects
#5 End-to-End Energy				- Investments being made but low volume and unclear go to market - Questions around go to market likely to remain despite sizeable value
#6 Interoperability platform				- Key to develop infrastructure with established players - Essential BM for the future with sizeable fees
#7 Charging-as-a-Service				- Competition with numerous experimentation and developments - Appeal for businesses and mobility provider will sustain growth

Nascent BM · Maturing BM · Mature BM · Numerous players · Several Players · Few Players · Steady Growth · Exponential Growth

Nonetheless, we believe a few critical factors can already be singled out. We conducted our analysis based on qualitative data derived from interviews with experts, quantitative data obtained from international organizations, and hands-on experience from Capgemini Invent's global teams. This comparison provides a **compass with which to navigate complexity and is a healthy baseline for future assessments.**

When considering **the maturity of business models**, defined by the stability of their value proposition and revenue streams, **four models initially stand out:**

- **Manufacturing** and **PPP with potential delegation** unsurprisingly count among the most stable as they were the first to appear on the market and last to this day.
- **Direct billing for charge point operation** also became a classic feature of EV users' everyday life, much in the same way as **interoperability platforms,** which have established communities and stable revenue streams.
- Nonetheless, **smart charging** (primarily B2B) and **V2X** (both B2C and B2B) appear to be **the most profitable business models**. With very limited costs and an enormous potential opened by technologies like V2H or V2G, as well as load management, they could redraw the TCO of both charging infrastructure and EVs [6].
- On the other hand, **end-to-end energy** is poised to grow. Notwithstanding high initial investment costs, a growing number of players are developing this business model:
  - **O&G players** were the first to redefine boundaries between fuel and electricity supply thanks to an extensive wave of M&A. Total's purchase of Direct Energie, for instance, transformed it in a full-scale utility, able to address all its customers' energy needs.
  - **Automakers** were the second to enter the space and try to exploit opportunities opened by this BM. Tesla is by far the best-known case of bundled energy packages, but Nissan is beefing up its offers as well. Noticeably though, automakers do not aim at directly selling energy to customers. In fact,

they offer a package enabling customers to be self-sufficient: an EV, solar panels, and an additional battery, in the case of Nissan.

Looking ahead

Despite a clearer understanding of the EV charging value chain as well as of associated business models, it remains uneasy to conclude which business models have the highest potential to dominate this ecosystem in the future. Furthermore, players' movements along the value chain and their adoption of different business models make it difficult to understand who is best placed to act as a leader.

Looking more carefully at customers' preferences is therefore necessary to understand which segments are the most promising for which business model. Indeed, customers' expectations will determine who can win, and who will not. The current ecosystem is mature enough to start detailing customers' needs and preferences.

4.3 Personae type with different charging habits

The personae approach enables to:

- Move down on the ladder of abstraction and to visualise charging habits of different profiles
- Understand customer expectations on different segments more in detail
- Provide more refined understanding of sub-segments

Thus, it helps actors to define or shape more appropriate offers/services to address specific personae

Our seven personae overlap with different charging segments as they use a combination of private, corporate and public chargers during their charging journeys. However, some personae have a higher propensity to fall into one segment of the EV charging market given their mobility habits. More details can be found in Appendix.

Figure 6: Identified personae types of EVs charging ecosystem

The following example illustrates how the personae approach can be beneficial in order to understand EV charging habits and to assess which business model is the best suited to answer it.

The daily commuter, who has a private car parking space or garage, will mostly charge at home overnight. They are therefore unlikely to use public chargers, or even corporate chargers, on a regular basis. However, as they park their car at home, they will seek benefits that can be derived from their own car. Hence, **this market segment could be captured using the following business models:**

- Manufacturing and selling chargers adequately answer the need for a power wall installation at the daily commuter's home, be it an individual house or a shared apartment.
- The provision of end-to-end energy offers and smart services seems also particularly suited as it aggregates both energy provision for the home and for the EV.

- **The inner-city car owner** will display strikingly different habits and will therefore seek different offers:
  - An encompassing offer of charging services, appears as the optimal package to access an extensive network of chargers across locations all locations
  - If charging is offered as a PPP supported by local authorities, the inner-city car owner could as well purchase a limited charging service to make the most of local incentive schemes

As the inner-city car owner is likely to use their car for specific trips to shop or travel, they could make the most out of chargers installed by retailers or restaurants while satisfying their shopping needs therefore boosting the associated business model.

5 Identifying winners of the e-mobility of the mobility ecosystem

With the start of the e-mobility era, established companies are trying to understand how to adapt their core business to this changing environment and profit as much as possible from new business opportunities [7]. As competition accelerates, the question remains as to whether any players will take the lead in this complex ecosystem and potentially dominate the industry. For companies willing to enter the leadership race, the priority should be to shortlist business models worth adopting and to define a clear scope of relevant market drivers.

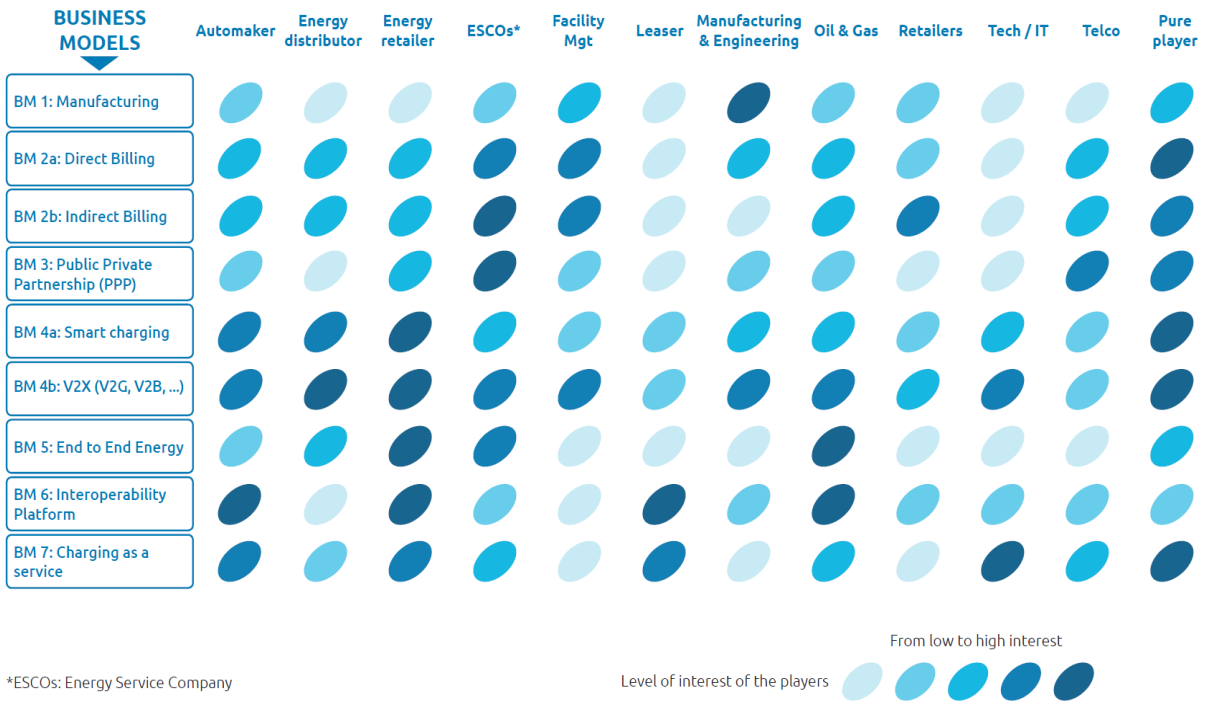


Figure 7: Players level of interest per business models

Throughout this study, we have shown that the EV charging value chain is genuinely new and that players keep moving along it. In doing so, they complexify the existing ecosystem and adopt various business models among the seven that we categorised. Boundaries between players from different sectors are therefore increasingly blurred. Nonetheless, not all value propositions are equally promising, and

we have shown that mobility and charging habits are key to understand which value proposition will cover customers' needs best. The better a company's understanding of customer preferences – in other words its ability to process data and to offer tailored solutions – the more it can profit from this burgeoning industry.

As coalitions and clusters begin to form, it can already be stated that some players will be more successful than others if they adopt given business models.

Utilities could become the one-stop shop for energy and mobility provision – or be relegated to mere commodity suppliers

There are two main avenues for utilities: focus solely on producing energy and increase profits thanks to the demand for greater production capacity or look beyond electricity sales and develop mobility services. As mentioned earlier, utilities could also leverage their knowledge of distributing and transporting energy to develop smart charging and/or V2X-related offers.

By developing end-to-end energy offers with smart charging services, utilities could retain a pivotal role and build a direct link with end customers. More specifically, they could cater to the needs of frequent EV users, especially daily commuters, taxi drivers, or occasional corporate drivers. Utilities could benefit from their established brands, especially when dealing with corporations and older generations of EV owners. Utilities could nonetheless be challenged by O&G giants if they keep diversifying through partnerships and M&As (e.g., Total with Direct Energy) as well as by automakers who have started developing their own energy services (e.g., Nissan or Volkswagen).

Automakers can lead thanks to an exclusive access to data

Although they remain unknown to customers, when it comes to electricity provision, **automakers** have developed strong customer relationships. They could remain the main point of entry into the EV ecosystem for daily commuters, taxi drivers, and inner-city car owners. By so doing, they would be ideally positioned to cross-sell their services, although efforts at diversification have not yet proven to be successful.

Developing interoperability platforms and smart charging solutions could help them retain ownership of data and the associated value. Automakers could also ideally cater to the needs of occasional leisure drivers thanks to interoperability platforms coupled with free-floating offers, modelled after startups such as Ubeeqo, Zipcar, or Renault's Moov'in.

Furthermore, automakers could start buying electricity in advance from utilities, in the form of pre-purchased MWs, and resell them in all-inclusive mobility offers (with parking and insurance for autonomous driving algorithms that they would have designed). Automakers could therefore play a pivotal role in the market by mastering technology and developing encompassing mobility services.

Pure players, providing smart charging solutions, are ideally placed to fulfill the needs of both automakers and utilities

Pure players offer tailored services for the electric mobility space, powered by original intellectual property. They thus boast a native advantage compared to established players trying to enter the space and could directly challenge utilities and automakers in their race to capture customer relationships and margins.

Thanks to encompassing and agile offers, they can cater to the needs of corporate EV drivers and of urban as well as rural drivers. They are also the enablers of end-to-end energy offers, thanks to their native mastery of EV charging data.

In fact, pure players allied to car leasers could prove to be the major disruptors of the EV charging market. Even if they do not produce electricity, they could set up packaged offerings and purchase electricity in bulk to cater to their needs. In so doing, they would in fact act like indirect energy retailers. As such, utilities would remain mere providers of commodities while value generated by additional services would be captured by pure players and leasing partners.

O&G giants are particularly threatened, unless they seize the transformation imperative that EVs represent

O&Gs are particularly well-suited to answer the needs of taxi drivers, holidaymakers, occasional corporate drivers, and service workers thanks to their national coverage and presence along main transportation

networks. They could therefore offer charging services against direct or indirect billing, especially to cover fast charging needs. Their knowledge of customer service and retail as well as their ability to master a necessary transition period during which different types of fuels would coexist could prove to be a strength. By transforming their existing network of petrol stations into rapid charging stations, they could help address the experience anxiety faced by many EV drivers. Still, their inability to provide end-to-end energy offerings or charging as a service in urban areas could prevent them from addressing the mobility needs of entire segments. While Shell, Total or BP seem to have understood the need to diversify, other O&G giants are still lagging and are at risk of seeing their profit shrink from 2022 onward.

The intervention of GAFA et al. is a matter of years

Major tech companies, such as Google, Amazon, Facebook, and Apple, have become famous for their ability to disrupt entire industries in short periods of time. Their success, driven by data mastery and a customer-centric approach, has nonetheless not reached the EV charging market – for now. Indeed, most have focused on artificial intelligence and autonomous driving – for example Alphabet, Google's parent company, and their Waymo unit. Current experiments from Alphabet or Alibaba in the smart city space will necessarily lead them to become relevant in the EV charging ecosystem. Especially since data and platforms are key for its efficient functioning. Waymo's commitment to purchasing 20,000 Jaguar I-Paces could be a move in this direction.

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Authors

Florent Andrillon – Vice President at Capgemini Invent

He serves large clients in the Energy & Utilities industries, helping them on topics such as growth strategy, organisational design and improvement of operations performance, as well as on large transformation programs.

Ozlem Bozyurt – Managing Consultant at Capgemini invent

She advises her clients – leading power companies- in developing new business solutions with innovative/digital technologies. She is helping them creating targeted business development and market energy strategies.