Investing in Future Mobility: From Electric, Autonomous, Connected and Shared — How Investors Can Take Part in the First Megatrend

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Abstract

Transport is undergoing its greatest transformation since the horse carriage gave way to the motor car: in 2025 one in four new cars sold worldwide was electric, driverless taxis complete roughly half a million paid rides a week in American metropolitan areas, and software is turning the vehicle from a product of mechanical craftsmanship into a computer on wheels. This paper — the first of six devoted to the great megatrends — orders the field of future mobility along its five arenas: decarbonisation and alternative drive systems, autonomous driving, connectivity, shared mobility, and the urban transformation including micromobility.

The paper examines market positions and timetables: battery prices have fallen by more than 90 per cent since 2010 (2025: USD 108 per kilowatt-hour), five-minute charging is series production reality in China, driverless lorries have been running in Texas since 2025, and the robotaxi market could grow to more than USD 400 billion by 2035 — while the privately owned Level 4 car is, by broad agreement, unlikely before the 2030s and will dominate the vehicle fleet only decades later. For investors, the paper names listed companies along the entire value chain — large and mid caps exclusively — with their business ideas and trading venues, and identifies two ETFs that pass the selection checklist developed in the text.

The investment conclusion cuts both ways: the megatrend is real, but its returns are unevenly distributed and have historically flowed to the suppliers of scarce key

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technology rather than to the car brands. Thematic ETFs launched near peak sentiment have lost roughly 30 per cent in risk-adjusted terms over their first five years. Whoever wants to take part therefore diversifies across the value chain, weights platform and technology leaders above hopeful newcomers, avoids naming small specialists, and measures success in decades, not quarters.

Keywords: Future mobility · Electric vehicles · Autonomous driving · Battery technology · Software-defined vehicle · Mobility-as-a-Service · Thematic ETFs · Megatrends.

JEL codes: G11, L62, O33, R40.

Non-Technical Summary

Whoever buys a car today buys a different product from ten years ago: in 2025 one in four new cars worldwide was electric, 96 per cent of Norway's new registrations ran purely on batteries, and in a dozen American metropolitan areas people order a taxi by app in which nobody sits at the wheel — with Waymo, Google's sister company, roughly half a million paid rides a week. Mobility is thus no longer a topic of the future but an ongoing transformation shifting trillions in value: away from pistons, tanks and gearboxes, towards batteries, computing power and software.

This paper — the first in a series of six on the great megatrends — explains the five arenas of that transformation: the farewell to the combustion car together with battery and charging technology, autonomous driving from the robotaxi to the driverless lorry, the connection of the vehicle with its surroundings, shared mobility from a single app, and the remaking of cities with e-bikes, cargo bikes and delivery robots. For each arena it names the state of play, the timetable, and the question of who earns from it.

For investors, the paper translates the trend into concrete choices: a selection of listed companies along the value chain — from the world's largest battery maker through the chip manufacturers to the platforms — deliberately confined to large and mid caps, plus a checklist for thematic ETFs: physical replication, fund size of at least EUR 0.2 billion, sustainability classification, costs, the currency question, issuer, UCITS framework and exchange trading. Two ETFs pass the test.

The most important lesson up front: megatrends do not make investors rich by themselves — those who bought the right future (the internet) in the late 1990s still lost money with the wrong shares. The returns of a trend flow to the few companies that occupy scarce key positions; thematic funds launched at peak sentiment disappoint with regularity. Whoever wants the remaking of transport in a portfolio therefore needs diversification across the whole value chain, patience across market cycles — and the willingness not to buy the loudest names.

Contents

1 Introduction

Few industries move as much capital as the building of vehicles: the automotive industry turns over around three trillion US dollars a year, employs millions and shapes entire economies — Germany's above all. When such an industry changes its core technology, reinvents how its product is operated and shifts its business model from selling a product to delivering a service, the result is what the investment world calls a megatrend: a structural, decades-long shift largely independent of the business cycle. Future mobility is such a megatrend — and the first to which this series devotes six papers.[2]

What makes 2026 different is the simultaneity of the upheavals. The change of drive systems is a mass market: roughly 20 million electric cars were sold in 2025 by the count of the International Energy Agency — one in four new cars worldwide. Autonomous driving has become everyday life — not everywhere, but with growing matter-of-factness where it is licensed: in large American cities, ordering a driverless taxi is as casual as ordering a conventional ride. And value creation is migrating into software: consultancies put the value that software-defined vehicles can create by 2030 at more than USD 650 billion. Taken together, these three movements show that this is not a product being improved — it is an industry being founded anew.[3]

Economic research supplies the tools for reading such upheavals. Schumpeter (1942) described capitalism as a process of creative destruction in which new technologies replace old structures rather than complement them; Rogers (2003) showed that innovations spread along an S-curve — slowly at first, then in a rush, finally saturating; Perez (2002) added the financial half: technological revolutions begin with a speculative installation phase, bubble included, and only afterwards enter the golden age of broad deployment. All three patterns are already on display in electric mobility — the bubble included: whoever bought young EV shares at their 2021 peaks still sits on heavy losses; whoever spread the trend across the value chain does not.[4]

The paper is structured as follows. The first chapter serves as an introduction. Chapter 2 orders the megatrend and its five arenas. Chapter 3 covers decarbonisation and alternative drive systems, chapter 4 the key question of battery and charging technology. Chapter 5 examines autonomous driving with timetables for cars, lorries and buses, chapter 6 connectivity from the software-defined vehicle to the car as a power store, and chapter 7 shared mobility, micromobility and urban logistics. Chapter 8 presents listed companies along the value chain, chapter 9 tests ETFs on the megatrend against a list of criteria,

[2] This paper opens a series of six working papers on the great megatrends; it builds on the market report by Rupprechter and Rupp (2026) on electric mobility.

[3] IEA (2026), Global EV Outlook 2026: 20 million electric cars sold in 2025, a 25 per cent market share; BCG (2023): value potential of software-defined vehicles above USD 650 billion by 2030.

[4] Schumpeter (1942); Rogers (2003); Perez (2002). On the concentration of equity returns in a few winners, Bessembinder (2018).

chapter 10 condenses the lessons for investors, and chapter 11 concludes with an outlook. All market data are as of the end of August 2026; older figures are dated.[5]

2 One Megatrend, Five Arenas

2.1 What carries the remaking of transport

Three forces drive the transformation, and none of them is a fashion. The first is climate policy: fleet emission limits in the EU together with the agreed end of new combustion cars from 2035, quotas for new-energy vehicles in China, blending mandates for sustainable aviation fuels. The second is the cost curve: batteries became more than 90 per cent cheaper within fifteen years — a law that Wright (1936) discovered in aircraft manufacturing: with every doubling of cumulative output, unit costs fall by a stable percentage. The third is computing power: only powerful processors and learning software make vehicles driverless, connected and updatable over the air. Policy can waver — the second and third forces know no reverse gear.[6]

That the transition is not smooth is part of the pattern. Christensen (1997) showed why successful market leaders in particular fail at new technologies: they serve their best customers too well to switch in time to an initially inferior but faster-learning innovation — the parallel to the German car industry, which built the world's best combustion cars and long side-stepped electric mobility, suggests itself. Arthur (1989) and David (1985) add the economics of path dependence: where economies of scale and networks operate, early moves decide decades — whoever occupies the charging networks, the cell factories and the software platforms first is later hard to dislodge. That is precisely what the race between China, America and Europe is about.[7]

2.2 The five arenas at a glance

The umbrella term future mobility bundles five arenas that reinforce one another. First, the decarbonisation of drive systems: battery-electric vehicles in the car market, hydrogen and electricity-based fuels where batteries reach their limits — in heavy haulage, at sea, in the air. Second, autonomous driving: software takes over the driving task, from the robotaxi through the driverless lorry to the self-driving shuttle. Third, connectivity: vehicles exchange data with traffic lights, control centres and one another, receive over-the-air updates, and feed power back into the grid as mobile storage. Fourth, shared

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[5] Methodological note: market capitalisations, fund volumes and operating figures are snapshots of late August 2026 and change continuously.

[6] EU: fleet limits and the end of new combustion-car sales from 2035 (review clause 2026); Wright (1936), Journal of the Aeronautical Sciences 3(4), pp. 122-128.

[7] Christensen (1997); Arthur (1989), Economic Journal 99(394), pp. 116-131; David (1985), American Economic Review 75(2), pp. 332-337.

mobility: apps bundle rail, ride services, hire bikes and e-scooters into one journey — use replaces ownership. Fifth, the urban transformation: cities redistribute street space, micromobility takes over short trips, delivery robots and drones the last mile. Table 1 orders the arenas by maturity and investor relevance.[8]

Table 1: The five arenas of the future mobility megatrend

Arena	**Core**	**Maturity in 2026**
1. Decarbonisation	Electric drive; hydrogen and e-fuels for haulage	Mass market: 25% of new cars electric
2. Autonomous driving	Robotaxis, driverless lorries, shuttles	Commercial in US and Chinese metros
3. Connectivity	Software-defined vehicle, V2X, V2G	Emerging; revenue models forming
4. Shared mobility	Ride services, sharing, Mobility-as-a-Service	Established; platforms profitable
5. Urban transformation	Micromobility, city logistics, delivery robots	Growing; consolidation completed

Source: Own classification; maturity per the market data documented in chapters 3 to 7.

For investors the distinction between the arenas is more than tidiness, for maturity determines the risk profile. The first arena is a volume business with known quantities — cost leadership and scale decide. The second is a technology race with few leaders and high stakes — safety records and fleets decide. The third and fourth are platform businesses in which network effects concentrate the profits, as Katz and Shapiro (1985) described: the value of a service rises with the number of its users, which is why a few providers win almost everything. The fifth arena, finally, is small-scale and municipal — investable mainly through the platforms that bundle it. Chapters 3 to 7 work through the arenas in turn.[9]

How large is the prize? A sum of the figures already cited gives the feel: an industry with around three trillion US dollars of annual revenue renewing its entire drive and production technology; a software value pool of more than USD 650 billion by 2030; a robotaxi market that could grow beyond USD 400 billion by 2035; plus battery factories, charging networks and grid expansion worth hundreds of billions. No other megatrend combines so large an incumbent industry with so many new businesses — which also explains why the lists of winners and losers are likely to become as long as they were in the passage from carriage to car. The following five chapters take the arenas one by one.[10]

[8] Classification follows the common ordering of mobility research; see also Milakis, van Arem and van Wee (2017) on autonomous driving.

[9] Katz and Shapiro (1985), American Economic Review 75(3), pp. 424-440.

[10] Sums from chapters 1, 5 and 6: BCG (2023); Goldman Sachs (2026); industry revenue: common industry estimate.

3 Decarbonisation and Alternative Drive Systems

3.1 The drive transition in numbers

Electric mobility has crossed the threshold from niche to mass market. Around 20 million battery-electric vehicles and plug-in hybrids were sold worldwide in 2025 — a quarter of all new cars and a fifth more than the year before; for 2026 the International Energy Agency expects 23 million and the market researchers of Rho Motion almost 24 million. The market is extremely unevenly distributed: China, with almost 13 million vehicles sold, accounts for a good half of the world market and already electrifies more than every second new car; Europe grew by a third in 2025 to 4.3 million; North America shrank for the first time in seven years, and with the end of US purchase incentives the decline accelerated in 2026. Figure 1 shows the span of market shares.[11]

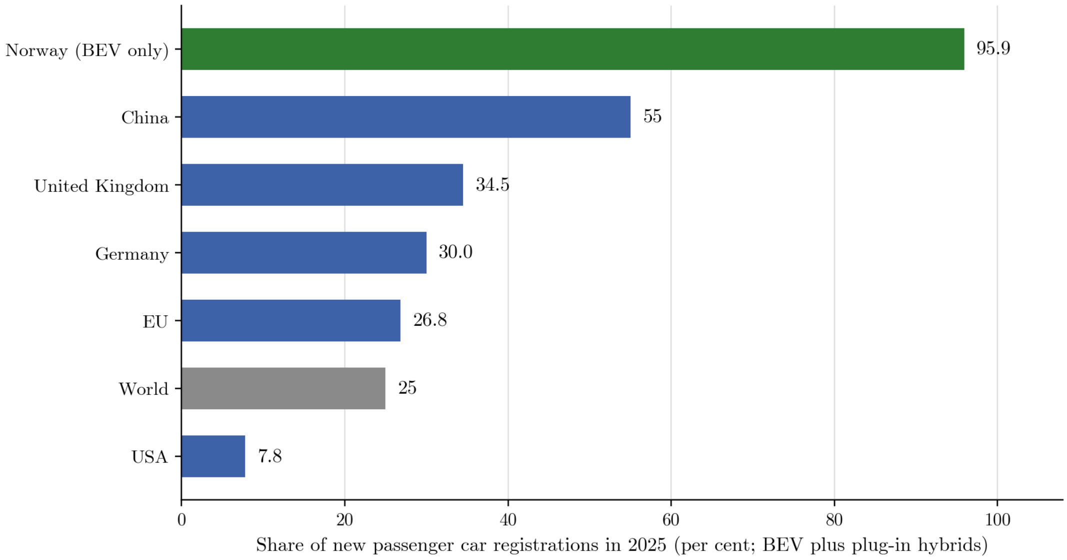

Figure 1: Share of electric vehicles (BEV plus plug-in hybrids) in new passenger car registrations in 2025, selected markets, in per cent; Norway: battery-electric vehicles only. Source: IEA (2026); ACEA (2026); KBA (2026); SMMT; OFV; Cox Automotive (2026); own presentation.

Behind the shares stand very different stories. Norway shows the endgame: 95.9 per cent of 2025 registrations were purely battery-electric — the combustion car has practically vanished there within fifteen years, carried by consistent tax exemption of electric cars. China shows industrial policy: a decade of targeted support for cell production, charging networks and manufacturers has created the world's largest car industry, which now dominates exports as well. Germany shows the catch-up: after the end of purchase subsidies in late 2023 the market slumped; 2025 brought recovery to almost 30 per cent market share

[11] IEA (2026): 20 million, 25 per cent share, forecast 23 million for 2026; Rho Motion (2026): 20.7 million (+20 per cent), China 12.9, Europe 4.3, North America 1.8 million; first half of 2026: +2 per cent worldwide, Europe +27 per cent, North America −20 per cent.

including plug-in hybrids, and in the first half of 2026 pure battery cars grew by 48 per cent to a quarter of new registrations. The USA, finally, shows vulnerability to politics: no federal support, a share below eight per cent, shrinking sales.[12]

With the drive transition, the competitive map of manufacturers shifts as well. Through electric mobility, China has for the first time built a world-class car industry: it accounts for a good half of global EV demand, hosts the two largest battery makers, and exports in growing volume to Europe, South-East Asia and Latin America — with cost advantages rooted in scale, cell proximity and short model cycles. For the incumbents this means a war on two fronts: at home they must electrify their own fleets, in the growth markets they meet suppliers who can do it more cheaply. The consolidation that every young industry undergoes — from dozens of contenders to a handful of survivors — still lies ahead of China's EV sector itself; that too belongs on the risk map of chapter 8.[13]

Economically the transition rests on the cost curve, and that curve has known only one direction for fifteen years. Nykvist and Nilsson (2015) showed early that battery costs were falling by roughly 14 per cent a year — faster than most forecasts assumed; Ziegler and Trancik (2021) traced the decline to research and scale, putting the learning rate of cells above 20 per cent per doubling of output. The result: a kilowatt-hour of battery cost more than USD 1,100 in 2010 and an average of 108 in 2025 — for Chinese iron-phosphate packs barely more than 80. Chapter 4 goes deeper; for this chapter the conclusion suffices: the combustion car's price advantage melts year by year, and in China electric cars are already cheaper to buy in many segments.[14]

An honest balance also states the limit of the argument. Holland, Mansur, Muller and Yates (2016) showed that the environmental benefit of an electric car depends on the power mix: in coal-heavy grids it can be small or negative, in hydro-, wind- and nuclear-based grids it is substantial. As grids grow cleaner year by year, the climate advantage of the electric drive grows with every vintage — but it is a promise resting on grid development, not a property of the vehicle alone. For investors the point is different: the transformation is happening because regulation, costs and industrial policy pull in the same direction — not because every single tonne of carbon dioxide is saved immediately.[15]

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[12] Norway: OFV, 95.9 per cent BEV share in 2025; Germany: KBA (2026), full-year 2025: 19.1 per cent BEV and 30.0 per cent including plug-in hybrids; CAM: first half of 2026, 368,000 BEV, +48 per cent, 24.8 per cent share; USA: Cox Automotive (2026), 7.8 per cent.

[13] IEA (2026): China around 55 per cent of the world market; SNE Research (2026): CATL and BYD together 55.6 per cent of drive batteries; model-cycle assessment per Rupprechter and Rupp (2026).

[14] Nykvist and Nilsson (2015), Nature Climate Change 5(4), pp. 329-332; Ziegler and Trancik (2021), Energy & Environmental Science 14(4), pp. 1635-1651; BloombergNEF (2025): USD 108 per kilowatt-hour, LFP 81.

[15] Holland, Mansur, Muller and Yates (2016), American Economic Review 106(12), pp. 3700-3729.

Table 2: Electric car sales in 2025 by region and the outlook for 2026

Region	Sales 2025 (m)	Change	Outlook 2026
China	12.9	+17%	Growth; transition to market maturity
Europe	4.3	+33%	Fleet limits carry demand; +27% in H1
North America	1.8	−4%	Decline after subsidy end (−20% in H1)
Rest of world	1.7	+48%	Catching up from a small base
World total	20.7	+20%	23-24 million expected (IEA, Rho Motion)

Source: Rho Motion (2026), count including light commercial vehicles; IEA (2026): 20.0 million on a narrower definition; own compilation.
Notes: BEV plus plug-in hybrids. First half of 2026 worldwide +2 per cent: pull-forward effects in China, subsidy withdrawal in the USA.

3.2 Hydrogen and e-fuels: the niche within the niche

Where batteries fail on weight and charging time, hydrogen and electricity-based fuels are meant to step in — so runs the division of labour invoked for years. The reality of 2026 is more modest. Hyundai, the pioneer of the fuel-cell lorry, has 228 vehicles in service worldwide; Daimler Truck will build its hydrogen lorry from late 2026 in a small series of 100 units and aims for volume production only in the early 2030s. Electricity-based fuels stand further back still: the Chilean flagship plant Haru Oni produces around 750,000 litres a year instead of the planned 55 million — one per cent of target — and volume production has been pushed to 2029. The battery drive has won the race on the road for now; even in heavy long-haul transport, lorries now charge faster than hydrogen can be fuelled and distributed.[16]

Hydrogen and e-fuels remain serious where batteries are physically ruled out: at sea and in the air. Shipping is ordering methanol-capable container vessels — Mærsk has the first, the “Laura Mærsk”, in service and 19 more on order — and aviation has been under an EU blending mandate for sustainable fuels since 2025, rising from two per cent through six per cent in 2030 to 70 per cent in 2050. For investors this means: the field is real, but its horizon is long and its listed pure plays are rare — it is most investable through the large industrial gas groups, which would supply any hydrogen economy anyway. Chapter 8 names them.[17]

3.3 Can the German manufacturers close the gap?

For German-speaking investors one question deserves its own section: are the home manufacturers keeping up? The technical answer of 2026 is friendlier than the mood. Porsche, Audi, Mercedes and BMW have caught up with the world's best on charging time

[16] Hyundai (February 2026): 165 XCIENT in Europe, 63 in North America; Daimler Truck (January 2026): NextGenH2 small series from late 2026, range above 1,000 kilometres; HIF Haru Oni: around 750,000 litres of e-methanol a year, expansion pushed to 2029.
[17] Mærsk: 19 methanol container ships ordered (as of 2023), “Laura Mærsk” in service since September 2023; ReFuelEU Aviation: SAF quota 2 per cent from 2025, 6 per cent 2030, 70 per cent 2050.

and efficiency with their 800-volt platforms; BMW's Neue Klasse has struck a nerve — the new iX3 gathered close to 100,000 orders within months, more than production can deliver for now — and Mercedes reports the most successful electric model launch in its history with the electric GLC and CLA. Volkswagen, in turn, is filling the decisive entry segment: the ID.Polo at prices from 25,000 euros has been open for orders since the summer of 2026, and the group's European electric order book stood half above the prior year at mid-year.[18]

The commercial answer is more double-edged. In Europe, German electric sales are growing again — BMW's battery cars gained 38 per cent there in the second quarter of 2026 — but the two other world regions are falling away: in the USA the VW group's electric deliveries fell by more than two thirds after the subsidy stop, and in China its electric sales have almost halved because local suppliers deliver faster, cheaper and with stronger software. The market report underlying this paper names the conditions for closing the gap: own software and vehicle architecture, battery sovereignty through own cell plants, halved model cycles, entry segments taken seriously, and competitive prices even at the cost of temporary margin compression. Technically the gap is closed; whether that translates into market share will be decided in the next 24 months — and with it the investment case for the German names of chapter 8.[19]

4 The Key Question: Batteries and Charging

4.1 What to expect from battery development

The battery is the heart of the transformation — it sets price, range and charging time, and it decides who earns in the new car industry. The market is highly concentrated: China's CATL, the world market leader, supplied a good 39 per cent of all drive batteries in 2025, its compatriot BYD a further 16 per cent — together more than 55 per cent of the world market. The Korean suppliers LG Energy Solution, SK On and Samsung SDI have been losing share for years, having bet on the dearer nickel chemistry while the market migrated to the cheap lithium iron phosphate (LFP) cell. Whoever wants to invest in the megatrend through batteries cannot get past this ranking.[20]

The price decline of cells is perhaps the most reliable cost curve of modern industry. Figure 2 shows the annual averages of the BloombergNEF survey: from USD 209 per kilowatt-hour in 2017, through the interim rise of the 2022 commodity year, to USD 108 in 2025 — at pack level, and 99 for pure vehicle packs. For comparison: in 2010 the figure

[18] Rupprechter and Rupp (2026); BMW: around 100,000 iX3 orders by mid-2026, deliveries from spring 2026; VW: ID.Polo from 24,995 euros, European electric order book +50 per cent (July 2026).

[19] VW H1 2026: BEV worldwide −6 per cent (Europe +8.4, USA −68.8, China −47.9 per cent); BMW H1: 204,295 BEV (−7.4 per cent, Q2 +5.2 per cent, Europe Q2 +38 per cent); Mercedes Q1: BEV +11 per cent; Rupprechter and Rupp (2026).

[20] SNE Research (2026), calendar year 2025: CATL 39.2 per cent, BYD 16.4, LG Energy Solution 9.2, Panasonic 3.7, SK On 3.7, Samsung SDI 2.4 per cent.

stood above 1,100. For the coming years the specialists expect no reversal but continuation along the learning curve: more LFP, larger factories, thinner cell-maker margins — and hence electric cars that compete with combustion cars without subsidy. That is precisely the precondition for the second half of the S-curve.[21]

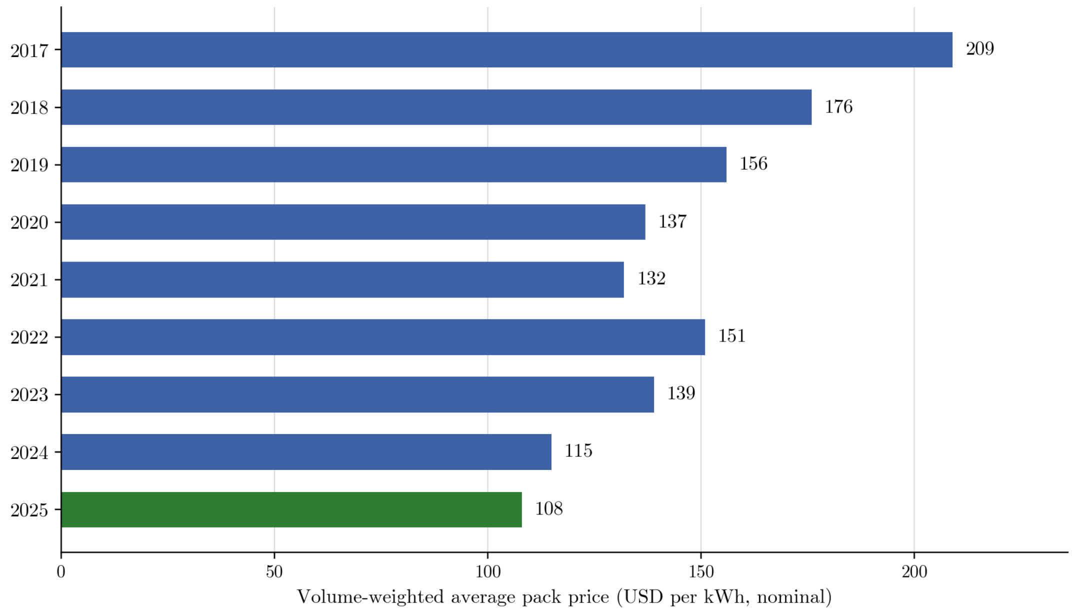

Figure 2: Average prices of lithium-ion battery packs (volume-weighted, nominal, USD per kilowatt-hour), 2017 to 2025. Source: BloombergNEF (2025), Battery Price Survey; own presentation.

In the technology itself, four developments lie ahead, and they can be dated soberly. First, the iron phosphate cell: cheap, durable, slow to burn — it already dominates volume models and keeps pushing costs down. Second, the sodium-ion battery: it replaces lithium with unlimited sodium, reaches up to 175 watt-hours per kilogram at CATL, and enters volume production in 2026 — first for entry-level vehicles and stationary storage. Third, the high-energy nickel cell with 280 to 300 watt-hours per kilogram for long-range and premium models. Fourth, the solid-state battery, the industry's most-promised future piece: Samsung SDI plans production from the second half of 2027, Toyota names 2027/28, CATL and BYD speak of pilot production in 2027 — but CATL's founder himself expects the mass market “not before 2030”. Table 3 orders the chemistries.[22]

[21] BloombergNEF (2025), survey of 9 December 2025: USD 108 per kilowatt-hour volume-weighted average, vehicle packs 99, LFP 81, China average 84; 2010: above 1,100.

[22] CATL Naxtra: up to 175 watt-hours per kilogram, volume production 2026; Samsung SDI: production target second half of 2027; Toyota: 2027/28; CATL: pilot 2027, mass market not before 2030; solid-state costs currently USD 400 to 600 per kilowatt-hour.

Table 3: Battery technologies compared (as of 2026)

Technology	Energy density (Wh/kg)	Strength	Status / outlook
Iron phosphate (LFP)	160-210	Cost, longevity, safety	Dominates volume models
Nickel-based (NCM/NCA)	280-300	Range, power	Premium and long-range models
Sodium-ion	up to 175	No lithium needed, cold-proof	Volume production from 2026 (CATL)
Solid state	target 400-500	Density, fire safety	Pilot 2027; mass market ~2030

Source: SNE Research (2026); manufacturer statements by CATL, Samsung SDI, Toyota; BloombergNEF (2025); own compilation.
Notes: Energy densities at cell level, rounded ranges; solid-state costs currently USD 400-600 per kilowatt-hour.

One technical leap deserves its own mention because it concerns battery and charging point alike: the 800-volt architecture. Doubling the on-board voltage against the classic 400 volts halves the current at equal power — cables become lighter, losses and charging heat smaller, charging power higher: premium models such as the Porsche Taycan charge from 10 to 80 per cent in around 18 minutes, BMW's new iX3 in around 21. Silicon-carbide power semiconductors make it possible, cutting a large share of the losses of conventional silicon — and their value per vehicle multiplies with the move to 800 volts. For investors this is the least conspicuous but most direct lever of the chapter: every market-share point of 800-volt technology migrates as revenue to the chip makers of chapter 8.[23]

4.2 Charging: from bottleneck to battleground

The second half of the key question is whether charging keeps pace with driving. The answer of 2026 is a double yes with a footnote. First, quantity: more than seven million public charging points stood worldwide at the end of 2025, a third more than the year before — though some two thirds of them in China, which also supplied three quarters of the additions. Germany counted a good 209,000 public charging points on 1 July 2026, a quarter of them fast chargers; ultra-fast chargers beyond 300 kilowatts grew by 44 per cent within a year. Second, power: the average power of newly installed public points keeps rising — the build-out keeps pace not only in numbers but in capability.[24]

The footnote concerns the top of the power scale. China brought five-minute charging into series production in 2025/26: BYD's 1,000-kilowatt platform adds 400 kilometres of range in five minutes, CATL's second-generation Shenxing cell even 520 — and BYD erected 10,000 of its own ultra-high-power charging stalls within six months, 55 a day on

[23] Rupprechter and Rupp (2026): charging times 10-80 per cent from around 18 minutes (Taycan) to around 21 minutes (BMW iX3); series peak charging power of around 320 to 440 kilowatts.
[24] IEA (2026): more than 7 million public charging points at the end of 2025 (+33 per cent), China 4.7 million (of which 2.2 million fast chargers); Bundesnetzagentur (2026): 209,605 charging points on 1 July 2026; more than 17,000 points above 299 kilowatts (+44 per cent).

average. In Europe the limit is less the technology than the grid connection: charging many vehicles at megawatt power simultaneously requires connections of factory size, and permits take time. The operators' answer is buffer storage at the charging park — batteries that fill slowly and discharge fast; the first German sites already work this way. Charging thus keeps pace with the battery, but it does so faster in China than in Europe, and it does so where the grid plays along.[25]

For heavy haulage a standard of its own is emerging: the Megawatt Charging System (MCS) with one megawatt of charging power and, in prospect, 1.5 to 3 megawatts. The technical norm was published in early 2026, more than 40 chargers beyond the megawatt mark already operate in Europe, and the new electric lorry generations of Daimler Truck and Volvo are prepared for it — the eActros 600 charges its 621 kilowatt-hours from 20 to 80 per cent in around 30 minutes. With that, the last technical argument against the battery lorry on long haul falls; what remains is the economics of grid expansion along the motorways. Investors will find the beneficiaries less among charging-network specialists — the listed pure plays are small and loss-making — than among the electrical groups that supply transformers, rectifiers and grid equipment.[26]

4.3 The network economics of charging

Economically, charging is a textbook case of indirect network effects: more charging points make electric cars more attractive, more electric cars make charging points more profitable — a self-reinforcing loop that Li, Tong, Xing and Zhou (2017) quantified for the American market: expanding the charging network moves electric-car demand more strongly than an equally expensive purchase subsidy. Springel (2021) confirmed the mechanism with Norwegian data. For policy this means: infrastructure support beats purchase support. For investors it means: charging infrastructure is no sideshow but the lever on which the speed of the whole megatrend turns — and its winners are the grid suppliers, not necessarily the operators.[27]

There remains the raw-material side. Lithium, nickel and the rare earths of electric motors are the bottleneck goods of the transformation; Albemarle, the largest Western lithium producer, expects demand growth of 15 to 40 per cent for 2026 — driven not only by vehicles but increasingly by stationary storage. Two developments ease the picture over time: the sodium-ion battery, which needs no lithium at all, and battery recycling, which will return meaningful volumes from the 2030s as the first large electric-car vintages leave

[25] BYD: 400 kilometres in 5 minutes, 10,000 flash-charging stations by late August 2026 (target 20,000); CATL Shenxing 2nd generation: 520 kilometres in 5 minutes; buffer-storage charging parks: among others Electra, Berlin, around 20 megawatt-hours of storage planned for 2026.

[26] MCS: IEC TS 63379 published (February 2026); IEA (2026): more than 40 chargers above 1 megawatt in Europe; Daimler Truck: eActros 600 with 621 kilowatt-hours, MCS charging 20-80 per cent in around 30 minutes.

[27] Li, Tong, Xing and Zhou (2017), Journal of the Association of Environmental and Resource Economists 4(1), pp. 89-133; Springel (2021), American Economic Journal: Economic Policy 13(4), pp. 393-432.

the road. For investors, the raw-material names are thus the most cyclical part of the value chain: high leverage on the build-out, but price swings that can cost whole years of profit — the lithium slump of 2023-2025 showed as much.[28]

5 Autonomous Driving: from Promise to Timetable

5.1 The levels and the state of play

Few terms are used as loosely as autonomous driving; the SAE J3016 norm brings order in six levels. Up to Level 2 the system assists and the human supervises continuously — most new cars can do this today. From Level 3 the system performs the driving task in defined conditions and the human need only respond to a takeover request; from Level 4 the vehicle drives entirely without human takeover within a defined service area — the level of the robotaxis. Level 5, the car that drives itself everywhere, remains theory. Table 4 summarises the levels. Decisive for investors is the insight that between Level 2 and Level 4 lies not a gentle ramp but a leap in technology, liability and licensing — which is why the business models differ fundamentally.[29]

Table 4: The six levels of autonomous driving under SAE J3016

Level	Designation	Who drives?	Examples 2026
0	No assistance	Human drives entirely unaided	Legacy vehicles
1	Assistance	System keeps distance or lane	Adaptive cruise control
2	Partial takeover	System keeps distance and lane; human supervises	Most new cars; Tesla FSD
3	Conditional takeover	System drives; human takes over on request	Mercedes Drive Pilot (95 km/h)
4	Driverless in service area	System drives without human in defined area	Waymo, Zoox, Apollo Go; Aurora lorries
5	Driverless everywhere	System drives under all conditions	Not in sight

Source: SAE International (2021), J3016_202104; descriptive rendering; examples per chapters 5.2 and 5.3.

5.2 Robotaxis: the first mass business of Level 4

In the large metropolitan areas of the USA, driverless taxis are everyday life in 2026. Market leader Waymo — born of the Google project, today part of Alphabet — carries paying customers in around a dozen metro areas, among them Phoenix, San Francisco, Los Angeles, Austin, Atlanta, Miami, Dallas and Houston, completing roughly half a million paid rides a week — twice as many as in the spring of 2025, with one million targeted by

[28] Albemarle (investor presentation, March 2026): 15 to 40 per cent lithium demand growth in 2026; cf. Rupprechter and Rupp (2026).
[29] SAE International (2021), standard J3016_202104.

year-end. Booking is as easy as it sounds: through the company's own Waymo One app in most cities, and in Austin and Atlanta exclusively through the Uber app — an exclusivity that ends in early 2028. The fleet of around 3,500 vehicles has covered more than 200 million driverless miles; in the latest funding round of USD 16 billion, investors valued the company at 126 billion. For 2026 the leap overseas is announced: London as the first city outside the USA, Tokyo in testing.[30]

The robotaxis' strongest selling point is the safety record. The peer-reviewed evaluation of 56.7 million driverless Waymo miles counts 79 per cent fewer crashes with injuries, 81 per cent fewer airbag deployments and 85 per cent fewer serious injuries than human drivers on the same roads; a study of insurance claims conducted with reinsurer Swiss Re reaches similarly clear results (Di Lillo, Gode, Zhou, Atzei, Chen and Victor, 2024). Kalra and Paddock (2016) had shown early that reliability cannot be proven by test drives alone — depending on the safety benchmark, hundreds of millions to hundreds of billions of miles would be needed; it is commercial fleet operation that now actually delivers those miles. Fagnant and Kockelman (2015) estimated the possible economic benefit — fewer accidents, smoother traffic, mobility for older people — at hundreds of billions of US dollars a year for the USA alone.[31]

Behind Waymo a chasing pack has formed, of very uneven maturity. Tesla launched its robotaxi service in Austin in June 2025 and extended it to half a dozen metro areas, but still operates partly with safety attendants and last reported only 42 registered vehicles in Texas — the gap to the market leader is wider than the headlines suggest. Amazon's Zoox has been charging for rides in Las Vegas since August 2026 in its purpose-built cabins without driver controls. In China, Baidu's Apollo Go operates in more than 20 cities with over 17 million cumulative rides and is expanding into the Middle East; Pony.ai aims to run more than 3,000 robotaxis by the end of 2026 and, in partnership with Uber, will bring more than 2,000 vehicles to Europe from 2026/27. General Motors, by contrast, closed its Cruise programme at the end of 2024 — a billion-consuming lesson that even giants drop out of this race.[32]

Economically the robotaxi stands or falls with two quantities: vehicle cost and utilisation. The driver, the largest cost block of the classic taxi, disappears; in his place come depreciation, remote supervision, cleaning and insurance. That is why the market leader is pushing vehicle costs down — Waymo's new purpose-built robotaxi van from a

[30] Waymo (2026): around 500,000 paid rides a week (mid-2026), target 1 million by year-end; fleet around 3,500 vehicles; funding round February 2026: USD 16 billion at a 126 billion valuation.

[31] Study of 56.7 million miles: Kusano, Scanlon, Chen, McMurry, Gode and Victor (2025), Traffic Injury Prevention 26(Sup1), pp. S8-S20; insurance claims study with Swiss Re: Di Lillo, Gode, Zhou, Atzei, Chen and Victor (2024), Heliyon 10(14), e34379; Kalra and Paddock (2016); Fagnant and Kockelman (2015).

[32] Tesla: Texas registration data June 2026, 42 vehicles; Zoox: paid rides in Las Vegas since 10 August 2026; Baidu Apollo Go: over 17 million cumulative rides and around 250,000 rides a week (October 2025), around 300,000 a week since February 2026; Pony.ai and Uber: agreement of 14 August 2026 on more than 2,000 robotaxis for Europe.

Chinese partner is markedly cheaper than the converted luxury cars used so far — and why density counts: the more vehicles per city, the shorter approach and idle times, the better utilisation and price. It is the same network logic that once sorted the ride-hailing platforms — with the difference that this time the capital for the fleet sits with the operator. That explains why the race has narrowed to a few very well-funded houses.[33]

5.3 Timetables: cars, lorries, buses

Is there a reliable timetable? Yes — but it differs sharply by segment, and it is more sobering than the prospectuses sound. For the private car, Level 3 is licensed — Mercedes may drive conditionally driverless in Germany up to 95 kilometres per hour — but demand stayed so thin that BMW withdrew its Level 3 offering in early 2026 for lack of buyers, and Mercedes is pausing its US expansion; for now the future of the private car lies in ever better Level 2. The privately owned Level 4 car is expected by observers such as S&P Global no earlier than the 2030s; Litman (2023), in his continuously updated forecasting study, reckons that only around 2045 will half of new cars drive autonomously and only around 2060 half of the fleet — vehicle technology has always taken decades, not product cycles, to penetrate fleets.[34]

Commercial transport is different. For the lorry the economics are compelling — the driver accounts for a good third of operating costs, and driver shortage is chronic — which is why Level 4 earns money here first: Aurora has run driverless long-haul freight in Texas since May 2025, has tripled its network to ten routes and aims to operate more than 200 lorries by the end of 2026; Daimler Truck with its Torc unit and Kodiak target commercial driverless operation in 2027. The yardstick stays sober: measured against millions of heavy lorries in North America alone, these are pre-series numbers; noticeable shares of long-haul freight are realistic only towards the end of the 2020s and the early 2030s. Buses and shuttles, finally, stand at the beginning: in Hamburg, VW's MOIA service has carried paying passengers in autonomous minibuses since July 2026, in Atlanta May Mobility drives for Lyft — while for the classic scheduled city bus no reliable timetable exists yet. Table 5 sums up the schedules.[35]

[33] Waymo: purpose-built robotaxi van unveiled in late May 2026, regular passenger service from August 2026; on platform network logic, Katz and Shapiro (1985).
[34] Mercedes Drive Pilot: 95 kilometres per hour (Germany); BMW: withdrawal of the Level 3 offering, February 2026; Litman (2023), Victoria Transport Policy Institute.
[35] Aurora: driverless since May 2025, ten routes, 250,000 driverless miles (early 2026), target of more than 200 lorries by the end of 2026; MOIA: passenger operation in Hamburg since 15 July 2026.

Table 5: Autonomous driving: status and realistic timeline by segment

Segment	Status 2026	Realistic expectation
Robotaxi	Commercial: Waymo around 12 US areas, Apollo Go 20+ cities	Scaling; ~1m vehicles worldwide by 2030
Private car, Level 3	Licensed (Mercedes 95 km/h); thin demand	Niche; BMW and Mercedes (USA) retreats
Private car, Level 4	Not available	2030s at the earliest; half the fleet ~2060
Long-haul lorries	Aurora driverless in Texas; 10 routes	Commercial 2027/28; relevant share from ~2030
Buses and shuttles	Pilot operation (MOIA Hamburg, May Mobility)	No reliable timetable for scheduled buses
Delivery robots, drones	Commercial (Zipline, Wing, Starship)	Rapid growth on the last mile

Source: Chapters 5.2 and 5.3; Goldman Sachs (2026); Litman (2023); company statements; own assessment.

How large the prize may be, the investment houses now quantify concretely: Goldman Sachs expects a robotaxi market of a good 400 billion US dollars a year by 2035 and a world fleet growing from a few thousand vehicles today to around one million in 2030 and six million in 2035. Such figures are scenarios, not promises — but they explain why Alphabet, Amazon, Uber and the Chinese platforms are pouring billions into a business that still runs at a loss. Investors seeking exposure will find listed routes through the parent companies and suppliers — chapter 8 names them.[36]

A word on regulation, for it sets part of the pace. In 2021 Germany became the first country in the world to give Level 4 driverless operation in defined areas a statutory basis, and the EU followed in 2022 with a uniform approval framework — the legal ground is prepared; what is missing are the fleets. The United Kingdom laid out a path to 2027 with its 2024 act and has admitted pilot services since May 2026; Waymo's London launch is the first test. In the USA the individual states decide — around 30 permit driverless services — which explains the rapid spread across Sun Belt metros. The lesson of Auer and Claessens (2018) from the crypto markets applies here in kind: not every form of state attention works alike — what moved prices there were purpose-built, light legal frameworks, while bans and classification under a strict existing regime pushed prices down. Investors should therefore take regulatory news in this sector more seriously than product news — and watch the kind of rule, not merely its existence.[37]

[36] Goldman Sachs (2026), analysis of 30 April 2026: robotaxi market of USD 415 billion by 2035; fleet of around 1 million (2030) and 6 million (2035).
[37] Germany: statute on autonomous driving of 28 July 2021; EU: Implementing Regulation 2022/1426; United Kingdom: Automated Vehicles Act 2024, pilot regime since 15 May 2026.

6 Connectivity: Software Defines the Vehicle

6.1 The software-defined vehicle

The quietest upheaval is the deepest: the vehicle is becoming a computer on wheels. In the software-defined vehicle, a few central processors replace the dozens of distributed on-board computers of yesterday, and the car's capabilities grow after purchase through over-the-air updates: better assistance, more range, new functions by subscription. Tesla demonstrates what the business model yields — 1.3 million paying customers for its FSD package and more than half a billion US dollars of recurring annual subscription revenue — and the consultancies put the industry-wide value potential of vehicle software at more than USD 650 billion by 2030. For the incumbents this is curse and opportunity at once: software is not their heritage, but without it they become contract manufacturers for the platform groups.[38]

Who earns from it? Teece's (1986) answer is more current than ever: the profits of an innovation flow not necessarily to its inventor but to whoever controls the scarce complementary assets. In the software-defined vehicle these are the high-performance processors and their chips — the field of NVIDIA, Qualcomm and Mobileye —, the power semiconductors of the drive — the domain of Infineon, STMicroelectronics, onsemi and NXP — and the driving software itself, over which carmakers and technology groups wrestle. Value creation migrates from sheet metal to silicon: depending on trim, an electric car today carries semiconductors worth well over a thousand US dollars, and rising — the chip is the new displacement.[39]

6.2 V2X and the car as power store

Connectivity does not end at the vehicle's edge. Under the label V2X — vehicle-to-everything — vehicles exchange data with traffic lights, roadworks and one another to avoid accidents and smooth the flow; the technology is standardised, but its spread follows the chicken-and-egg pattern of all network goods and advances only with fleet renewal. More tangible is the car as power store: in bidirectional charging — vehicle-to-grid — the electric car feeds power back into the grid in expensive hours and charges in cheap ones. Kempton and Tomić (2005) calculated the potential early: even a small share of the vehicle fleet could replace the balancing power of entire power-station parks, for cars stand still 23 hours a day. France has the first retail offering: drivers of a Renault 5 have charged

[38] Tesla (Q1 2026): 1.3 million paying FSD customers, USD 546 million recurring subscription revenue; BCG (2023): value potential above USD 650 billion by 2030.
[39] Teece (1986), Research Policy 15(6), pp. 285-305.

bidirectionally there since late 2024, on average at half price according to the provider; Germany still lacks the regulatory framework.[40]

For investors, connectivity is the hardest of the five arenas to grasp because its revenues accrue mostly inside existing groups: at the carmaker as a subscription, at the chip group as higher content per vehicle, at the energy group as flexible storage. Pure V2G or V2X shares of meaningful size do not exist — whoever wants the arena in a portfolio holds it through the chip and electrical-equipment groups of chapter 8. That is not a weakness of the investment idea but its core: connectivity makes existing business models more valuable instead of creating new stock-market darlings.[41]

7 Shared Mobility, Micromobility and City Logistics

7.1 From ownership to use

The fourth arena shifts the question from “Which car do I own?” to “How do I get there?”. Under the label Mobility-as-a-Service, apps bundle rail, ride services, hire bikes and e-scooters into one journey with one booking and one payment; at mobility hubs, travellers switch between modes. Shaheen and Cohen (2019) ordered the shared services systematically and documented their potential to reduce mileage and congestion — provided they complement public transport rather than cannibalise it. Commercially the field has sorted itself after years of subsidy battles: a few platforms with network effects make money, the rest has vanished or been absorbed.[42]

The measure of the sorted industry is Uber. The platform arranged 3.9 billion rides in the second quarter of 2026 — over 40 million a day —, earned USD 14.2 billion in revenue and 2.4 billion in net profit, and for the first time generated more than ten billion US dollars of free cash flow over twelve months. Remarkable is the strategic turn: Uber no longer builds its own autonomy but makes its app the marketplace for other companies' robotaxis — Waymo in Austin and Atlanta, Pony.ai in Europe to come — alongside stakes in delivery robots and in the micromobility leader Lime. The platform is thus positioned for both futures: earning from the human driver today, from the driverless vehicle tomorrow.[43]

[40] Kempton and Tomić (2005), Journal of Power Sources 144(1), pp. 268-279; Mobilize/Renault: vehicle-to-grid offering in France since October 2024.
[41] Assessment based on chapters 6.1 and 8; on network goods, Katz and Shapiro (1985).
[42] Shaheen and Cohen (2019), Transport Reviews 39(4), pp. 427-442.
[43] Uber (Q2 2026): 3.9 billion rides, USD 58.0 billion gross bookings (+24 per cent), 14.2 billion revenue, 2.4 billion net profit.

7.2 Micromobility: small, electric, consolidated

On short trips the battery replaces the car altogether. E-bikes, at almost 70 billion US dollars of annual revenue, have long been a larger market than the headlines suggest, and cargo bikes are taking over family and delivery traffic in European city centres. The rental business in e-scooters and bikes has its shake-out behind it: the one-time high-flyer Bird went insolvent at the end of 2023, the European providers Tier and Dott merged — and market leader Lime, almost a quarter owned by Uber, made the leap to Nasdaq in July 2026 on almost 900 million US dollars of annual revenue from 230 cities. The industry's lesson in one sentence: even in the smallest vehicle segment, the winner is whoever masters density, utilisation and operating costs — not whoever scatters scooters fastest.[44]

7.3 The last mile: robots and drones

Urban logistics, finally, tries doing without the human twice over: on the ground and in the air. Pavement robots from Starship have completed more than eight million deliveries, Alphabet's Wing more than one million drone flights, and Zipline — the world's largest delivery-drone operator — passed two million deliveries in early 2026 and raised 600 million US dollars of fresh capital; together with Uber it aims at one million deliveries a day by 2029. These are still rounding errors in the parcel market, but unit costs are falling along the same learning curve that once brought down battery prices. Little of this is listed — the operators are private or small — but the beneficiaries very much are: the platforms that broker deliveries, and the retailers whose delivery costs fall.[45]

The frame of all this is the remaking of the cities themselves. Municipalities from Paris to Vienna are redistributing street space — fewer parking spots, more bike and bus lanes, mobility hubs at the nodes — and they do it not from fashion but from lack of space: a private car stands still 23 hours a day on average while occupying public space that is scarce and expensive in growing cities. Shared, small and driverless vehicles promise more transport per square metre of street — that is the real municipal incentive behind Mobility-as-a-Service and micromobility. For investors the urban remake itself is barely investable, but it is the tailwind carrying the platforms of this chapter: every parking squeeze and every low-emission zone makes the alternative to the private car a little more attractive.[46]

Taken together, chapters 3 to 7 show a pattern investors should take seriously: the future mobility megatrend is not a single market but a mesh of volume businesses (drive systems, batteries), technology races (autonomy), platform economies (ride services,

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[44] Grand View Research: e-bike market USD 69.7 billion (2025); Lime: IPO 1 July 2026, revenue USD 886.7 million (2025), Uber stake 24 per cent; Bird: insolvency December 2023; Tier/Dott merger 2024.

[45] Starship: more than 8 million deliveries; Wing: more than 1 million; Zipline: more than 2 million (January 2026), funding of over USD 600 million; target with Uber: 1 million deliveries a day by 2029.

[46] On the standstill time of vehicles, Kempton and Tomić (2005); classification of shared services per Shaheen and Cohen (2019).

software) and municipal small-scale change (micromobility, urban redesign). Each sub-field has its own profit mechanics, its own timeline and its own risks — which is precisely why the trend suits not a single hero share but a diversified position along the value chain. The two following chapters build that position: first with single names, then with funds.

8 Single Names along the Value Chain

8.1 Selection principles

Before names are named, three principles. First: this paper names exclusively large- and mid-capitalisation companies — market value above ten billion US dollars (large caps) or two to ten billion (mid caps). Small caps deliberately remain unnamed: in the mobility sector especially, numerous one-time stock-market darlings — charging-network operators, sensor makers, battery hopefuls — have fallen to fractions of their value or slid into insolvency; their total-loss risk does not belong in an investor's register. Second: named is whoever runs a clearly identifiable business in the megatrend — no mere side exposure. Third: naming is stock-taking, not a recommendation to buy or sell; valuation questions remain outside, and the selection claims no completeness.[47]

The most important principle, though, comes from capital market research. Bessembinder (2018) showed that the entire excess return of the US equity market since 1926 stems from just four per cent of all shares — the majority of single names lagged Treasury bills. Applied to megatrends this means: the right diagnosis of the future guarantees no investment success, for within the right theme the returns are distributed extremely unevenly across few winners. The internet bubble demonstrated it, the EV euphoria of 2021 likewise. Whoever picks single names therefore spreads across several links of the value chain and several regions — and accepts that even then individual positions will fail.[48]

8.2 Manufacturers and platforms

Table 6 assembles the vehicle makers and mobility platforms. Among the manufacturers, four constellations stand out. Tesla remains by far the world's most valuable carmaker — valued, of course, no longer as a carmaker but as a bet on autonomy and robotics. BYD is its Chinese counterpart: vertically integrated from cell to vehicle, cost leader, export champion. The German premium makers — BMW, Mercedes-Benz, Porsche — have caught up technologically; their 800-volt platforms charge in under half an hour, and BMW's Neue Klasse records orders above plan. Toyota, finally, embodies the multi-path

[47] Size classes by common convention: large cap above 10, mid cap 2 to 10 billion US dollars of market value; figures of late August 2026.
[48] Bessembinder (2018), Journal of Financial Economics 129(3), pp. 440-457.

approach of hybrid, battery and fuel cell — the most cautious and, so far, most profitable strategy. Among the platforms stand Uber as the marketplace of mobility and Alphabet as parent of robotaxi leader Waymo.[49]

Table 6: Manufacturers and platforms: large and mid caps in the megatrend (late August 2026)

Company	USD bn	Business idea in the megatrend	Trading venue
Alphabet	4,193	Parent of Waymo (robotaxi market leader)	Nasdaq
Tesla	1,377	EVs, storage, FSD software, robotaxi	Nasdaq
Toyota	230	Multi-path: hybrid, BEV, fuel cell	Tokyo; ADR NYSE
Uber	161	Marketplace for rides, delivery, robotaxis	NYSE
BYD	ca. 120	Vertically integrated EV cost leader	Shenzhen; Hong Kong
Xiaomi	91	Electronics group with EV unit (SU7)	Hong Kong
GM	78	US volume maker, Ultium platform	NYSE
Hyundai	76	E-GMP BEV platform; fuel-cell lorries	Seoul
Mercedes-Benz	52	Premium BEV; Level 3 pioneer (Drive Pilot)	Xetra
Porsche AG	48	Electrified sports cars (Taycan, Macan)	Xetra
Volkswagen pref.	45	Volume BEV (ID family, ID.Polo from EUR 25k)	Xetra
BMW	43	Neue Klasse: 800-volt, software-defined	Xetra
Rivian	23	Electric pickups, delivery vans (Amazon)	Nasdaq
Stellantis	20	14-brand volume maker in transition	Milan, Paris, NYSE
Li Auto	12	Chinese family SUVs, range extender	Nasdaq; Hong Kong
XPeng	11	Chinese smart EV, own driving software	NYSE; Hong Kong
Aurora	11	Driverless lorry technology (Texas network)	Nasdaq

Source: Market capitalisations (rounded) of late August 2026; main and secondary listings; own compilation.
Notes: No recommendation to buy or sell; selection without claim to completeness.

A word on access, for in a field this globally spread it is part of the investment decision. US names and the Xetra stocks trade through any bank without difficulty; the Chinese champions are easiest to reach through Hong Kong — BYD through its H-share, CATL through the secondary listing of May 2025 — and the Korean and Japanese names through their home exchanges or depositary receipts. What remains to be weighed are the political risks of these routes: depositary receipts of Chinese companies have been removed from US exchanges before, and sanction and tariff disputes can hit individual names overnight. Whoever prefers not to carry such risks singly leaves the weighting to the fund wrapper of chapter 9 — there the Chinese names are included, but capped.[50]

[49] Market capitalisations of late August 2026; assessment of the German makers per Rupprechter and Rupp (2026).
[50] CATL: Hong Kong secondary listing since May 2025; on the diversification logic, chapter 9.

8.3 Chips, batteries, raw materials, infrastructure

The second table belongs to the suppliers of the scarce goods — and thus to the quiet winners of the transformation. In semiconductors the value chain runs from NVIDIA, on whose processors the driving software of almost every Western autonomy programme runs, through Qualcomm and Mobileye, to the power semiconductors of Infineon, STMicroelectronics, onsemi and NXP, whose silicon-carbide technology makes the 800-volt car possible in the first place. In batteries no road leads past CATL — listed in Hong Kong as well since May 2025 and thus easier for Western investors to access — or past LG Energy Solution, Panasonic and Samsung SDI. In raw materials stand the lithium producers Albemarle and SQM; in charging infrastructure the electrical groups ABB, Siemens, Schneider Electric and Eaton, which supply grids, transformers and fast chargers; Air Liquide and Linde cover the hydrogen path. Table 7 orders the names.[51]

[51] On the role of complementary assets, Teece (1986); CATL secondary listing in Hong Kong since May 2025.

Table 7: Technology, batteries and infrastructure: large and mid caps (late August 2026)

Company	USD bn	Business idea in the megatrend	Trading venue
NVIDIA	5,253	Processors and software for autonomous driving	Nasdaq
Siemens	262	Charging technology, grids, rail	Xetra
CATL	254	World market leader in drive batteries (39%)	Shenzhen; Hong Kong
Linde	226	Industrial gases; hydrogen infrastructure	NYSE; Frankfurt
Schneider Electric	197	Energy management, charging infrastructure	Paris
ABB	179	Electrification; high-power chargers	Zurich
Qualcomm	175	Snapdragon vehicle computing, connectivity	Nasdaq
Eaton	162	Power distribution for charging parks, grids	NYSE
Air Liquide	126	Industrial gases; hydrogen path	Paris
Infineon	86	No. 1 in automotive chips; silicon carbide	Xetra
Panasonic	64	Battery cells (Tesla partner), 4680 format	Tokyo
LG Energy Solution	63	Battery cells for GM, Hyundai and others	Seoul
NXP	56	Automotive chips: radar, networks, computing	Nasdaq
STMicroelectronics	44	Silicon-carbide power semiconductors	Paris, Milan; NYSE
Daimler Truck	42	Electric lorries (eActros 600), hydrogen, Torc	Xetra
Denso	30	Electrification and sensor supplier	Tokyo
onsemi	28	Silicon carbide for drive and charging	Nasdaq
SQM	23	Lithium from Chilean brine	NYSE (ADR); Santiago
Traton	22	Commercial vehicles (MAN, Scania, Navistar)	Xetra
Knorr-Bremse	20	Braking and safety systems, rail and lorries	Xetra
Albemarle	16	Largest Western lithium producer	NYSE
Grab	15	South-East Asia's mobility super-app	Nasdaq
BorgWarner	13	Electric motors, inverters, charging	NYSE
Samsung SDI	12	Battery cells; solid-state roadmap 2027	Seoul
Aptiv	10	Vehicle architecture, wiring, software	NYSE
Schaeffler	8	Electric drives, chassis, bearings	Xetra
Mobileye	7	Camera-based assistance and autonomy	Nasdaq
Lyft	7	US ride service no. 2; robotaxi partner	Nasdaq
Aumovio	4	Vehicle electronics (Continental spin-off)	Xetra
Lime	2	World's largest micromobility provider	Nasdaq (since July 2026)

Source: Market capitalisations (rounded) of late August 2026; own compilation.
Notes: No recommendation to buy or sell. Deliberately unnamed: small caps among charging-network, sensor and solid-state specialists.

Three observations on the table. First, geography: the megatrend's value creation splits across three blocs — American software and chips, Asian cells and manufacturing, European electrical engineering and premium vehicles; a credible megatrend portfolio is necessarily global. Second, the order of magnitude: the most valuable name in the value chain is not a carmaker but a chip group — the stock market has long since repriced the hierarchy of value creation. Third, the gaps: charging-park operators, sensor pioneers and solid-state hopefuls are missing from the table not by oversight but because their listed representatives have shrunk to small caps or failed — the field itself grows while its pure plays have mostly disappointed. Precisely this discrepancy — growing market, shrinking specialists — is the chapter's most important warning.[52]

9 ETFs on the Megatrend

9.1 What to look for in thematic ETFs

Whoever prefers not to pick single names reaches for the exchange-traded index fund. Yet precisely with thematic ETFs, selection is more demanding than with the broad world index, for launch and marketing follow attention: Ben-David, Franzoni, Kim and Moussawi (2023) showed that specialised thematic ETFs are on average launched near the sentiment peak of their industry and lose roughly 30 per cent in risk-adjusted terms over their first five years — not because ETFs are poor vehicles, but because the theme tends to be packaged when it is dearest. The first test question is therefore not “Which ETF?” but “Is the entry point hype-driven?”. After the price declines of many mobility names since 2021/22, that concern is smaller today than it was then — it has never vanished.[53]

The craft check follows a fixed list, summarised in Table 8. A thematic ETF should replicate its index physically — actually holding the shares — rather than mirroring it through swap agreements with a bank: synthetic replication saves fractions in cost but adds a counterparty risk that a long-term thematic investment does not repay. Fund size should be at least EUR 0.2 billion: smaller funds are unprofitable for the provider and are strikingly often closed or merged — a nuisance in tax and time. The fund should sit within the European UCITS framework (segregated assets, held apart from the provider's balance sheet), trade continuously on a major exchange such as Xetra, and come from an established house whose product range is not pruned annually.[54]

Three items on the list deserve sentences of their own. Costs: thematic ETFs charge 0.35 to 0.50 per cent a year in management fees — five to ten times a world ETF; that is the price of specialisation and, over decades, a tangible drag justified only if one credits

[52] Cf. the cycle of young technology stocks in Perez (2002) and the return concentration in Bessembinder (2018).
[53] Ben-David, Franzoni, Kim and Moussawi (2023), Review of Financial Studies 36(3), pp. 987-1042.
[54] On the closure propensity of small thematic funds, Ben-David et al. (2023); UCITS: the European framework for undertakings for collective investment in transferable securities.

the theme with excess return. Currency: thematic ETFs on global indices carry dollar, yen, won and yuan risk; currency-hedged share classes do not currently exist for the mobility ETFs, so investors carry the currency swings — bearable over a long horizon, but worth knowing. The sustainability profile: the funds examined here are mostly classified under Article 8 of the EU disclosure regulation, promoting environmental characteristics; whoever applies stricter standards checks the exclusion lists in the prospectus — the label alone is no seal of quality, as Rupprechter (2026b) argues at length.[55]

Table 8: Checklist for thematic ETFs on future mobility

Criterion	Recommendation	Reasoning
Replication	Physical	No counterparty risk from swap deals
Fund size	At least EUR 0.2 bn	Small funds are often closed
Management fee	Below 0.50% p.a.	Costs reduce returns permanently
Currency hedging	Accept unhedged	Hedged classes not available
Sustainability	Article 8 or stricter	Green minimum profile; check prospectus
Issuer	Established major house	Continuity of the product range
Legal framework	UCITS	Segregated assets, EU investor protection
Trading	Xetra and others, continuous	Tight spreads, exit at any time

Source: Own compilation; criteria per chapter 9.1.

9.2 The market: two funds pass the test

The range of mobility ETFs under European law is small — and thinning, for several products sit below the size at which a fund pays its way for the provider. Two funds pass the test of chapter 9.1. The iShares Electric Vehicles and Driving Technology UCITS ETF from market leader BlackRock covers around a hundred names of the EV and driving-technology world with a good half a billion euros of assets, physical replication, a 0.40 per cent fee and an Article 8 classification; its emphasis is noteworthy — the largest positions are not carmakers but semiconductor and electronics groups: the fund buys the supply chain, not the badges. The L&G Battery Value-Chain UCITS ETF concentrates a good 700 million euros on the battery value chain from raw materials through cell makers to storage integrators, nearly equal-weighted across a good 50 names — more broadly spread, somewhat dearer at 0.49 per cent. Table 9 sets both against the smaller competitors.[56]

[55] Rupprechter (2026b) on green investing and the limits of the Article 8 classification.

[56] iShares (IE00BGL86Z12): around EUR 510 million, TER 0.40 per cent; L&G (IE00BF0M2Z96): around EUR 710 million, TER 0.49 per cent; figures of late August 2026.

Table 9: Future mobility ETFs under European law compared (late August 2026)

ETF (short name)	Assets (EUR m)	Fee p.a.	Replication	SFDR	0.2bn met?
iShares Electric Vehicles & Driving Technology	510	0.40%	physical	Art. 8	yes
L&G Battery Value-Chain	710	0.49%	physical	Art. 8	yes
Xtrackers Future Mobility	180	0.35%	physical	—	no
Amundi MSCI Smart Mobility	165	0.45%	physical	Art. 8	no
WisdomTree Battery Solutions	161	0.40%	physical	—	no
Global X Autonomous & Electric Vehicles	11	0.50%	physical	Art. 6	no

Source: Issuer data and fund databases, late August 2026; iShares: IE00BGL86Z12, Xetra ticker IEVD; L&G: IE00BF0M2Z96, ticker BATT; all funds UCITS-compliant, accumulating, continuously tradable on Xetra and in London, Milan and Zurich.
Notes: No currency-hedged share classes available; "—": classification not clearly disclosed, check the prospectus before buying.

Practice, finally, includes execution. Both recommended funds trade continuously on Frankfurt's Xetra as well as in London, Milan and Zurich; the management fee — 0.40 and 0.49 per cent a year respectively — is deducted daily from fund assets, and the purchase adds the bid-ask spread and the bank's order fee. Whoever buys in instalments or by savings plan smooths the entry point — in the most swing-prone part of the equity market no detail, but half of risk control. And whoever notes the funds' accumulating design knows: income is reinvested within the fund, and taxation follows the rules of the investor's country of residence — a point for the tax adviser, not for this paper.[57]

Two caveats belong to honesty. First, neither of the two recommended funds covers the whole megatrend: the iShares fund is a technology and supplier basket, the battery ETF a chain around the cell; robotaxi platforms, ride services and micromobility appear in both only at the margin — whoever wants Waymo needs Alphabet, and whoever wants Uber buys Uber. Second, the warning of Ben-David and co-authors stands: even the best thematic ETF is a concentrated sector investment with correspondingly higher swings than a world index. As the core of a portfolio it will not serve — as a measured addition of a few per cent, with which an investor adds a deliberate mobility tilt to the world portfolio, it serves very well.[58]

[57] Trading venues and fees per issuer data, late August 2026; on the instalment logic see also chapter 10.
[58] Cf. Ben-David, Franzoni, Kim and Moussawi (2023); on the addition logic also Markowitz (1952).

10 What Investors Learn from All This

At the end of the tour through five arenas, the lessons for investors condense into six sentences. First: a correct trend is not a correct purchase. Diffusion follows the S-curve of Rogers (2003), valuation the sentiment cycle of Perez (2002) — whoever buys in the rush of the installation phase pays for the enthusiasm; whoever buys after its disillusion gets the same trend more cheaply. The EV names have run through this cycle since 2021 in exemplary fashion: the market grew every year, and many shares still fell by half or more. Trend strength and share returns are two different quantities — that is perhaps the most important lesson of this paper.[59]

Second: the return sits in the chain, not on the badge. Of the transformation's value creation, more flows by experience to the suppliers of scarce key goods — cells, power semiconductors, computing, grid equipment — than to the brands on the bonnet; Teece (1986) described the mechanism forty years ago, and the market capitalisations of chapter 8 spell it out. Third: size protects. This paper's restriction to large and mid caps is no formality — the list of failed or fraction-of-former-value small caps in this sector is long, and Bessembinder (2018) reminds us that the majority of all shares fail to beat short-dated US Treasury bills over their lifetime. Whoever bets small and concentrated in a megatrend speculates; whoever holds large and spread out invests.[60]

Fourth: timetables are to be read asymmetrically. The experience of the mobility transition teaches that mass market penetration almost always takes longer than promised — Litman (2023) counts in decades for the autonomous private car — but that where economics compel, deployment comes faster than expected: robotaxis and driverless lorries earn money today because they replace wage costs. Investors should therefore weight forecasts not by their boldness but by the economic compulsion behind them. Fifth: costs and craft matter. A thematic ETF charging half a per cent a year must earn that fee first, every year; physical replication, sufficient size and the UCITS framework are not niceties but basic equipment (chapter 9).[61]

Sixth and last: the megatrend belongs in the portfolio, but in measured dose. Future mobility is a decade-scale event with unusually broad value creation — and at the same time a sector investment with political, technological and fashion risks, as the American subsidy stop of 2025/26 is currently demonstrating. In the logic of Markowitz's (1952) portfolio theory it is an addition to the broadly diversified world portfolio: a few per cent, deliberately chosen, regularly trimmed when price gains push the weight above target. Whoever wants more should take not more capital but more patience — the second half of the S-curve belongs to those who endured the first.[62]

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[59] Rogers (2003); Perez (2002); on the gap between market growth and share returns also Ben-David et al. (2023).
[60] Teece (1986); Bessembinder (2018).
[61] Litman (2023); checklist in Table 8.
[62] Markowitz (1952), Journal of Finance 7(1), pp. 77-91.

From the six sentences follows a simple set of rules for practice. Stage the entry in instalments or by savings plan, so that no single date decides the outcome; write down the target weight and cut the position back to it after strong rises — thus the theme's sentiment cycle becomes an ally, because one mechanically sells dear and adds cheap; and tie the review to milestones rather than prices: are the fleets growing, are battery prices falling, are the safety records holding? As long as the milestones deliver, price declines are entry opportunities; if they break, retreat is not weakness but discipline. Whoever proceeds this way needs no forecasting gift — only book-keeping and patience.[63]

11 Conclusion and Outlook

The opening question of this paper — how investors can take part in the remaking of transport — can be answered soberly after ten chapters. The remaking itself is no longer a forecast but a market fact: a quarter of new cars electric, battery costs in free fall, half a million paid robotaxi rides a week at the market leader alone, driverless lorries in regular Texan service, software as the manufacturers' new revenue model. At the same time the remaking is slower, more uneven and more capital-hungry than the prospectus language suggests: the private Level 4 car remains a project for the 2030s, hydrogen and e-fuels fill niches, and governments can accelerate or choke whole sub-markets with subsidies and tariffs — America is demonstrating the latter as we write.

For the portfolio there follows the architecture that chapters 8 to 10 developed: a diversified position along the value chain — platforms and chips, cells and grid equipment, plus selected manufacturers —, exclusively in large and mid caps, complemented or replaced by one of the two funds that passed the test, capped at a few per cent of liquid wealth and held across market cycles. Whoever proceeds this way needs neither the best entry day nor the one winning share — he lets the megatrend's learning curves, network effects and economies of scale work for him while limiting the damage when individual bets fail.

The outlook: the coming years should bring three decisions. First, the consolidation of the manufacturers — not every one of China's roughly one hundred EV makers and not every Western brand will survive the decade; the cost curve knows no mercy. Second, the robotaxis' passage from urban novelty to means of transport: if the fleets multiply tenfold while the safety record holds, a market of several hundred billion US dollars emerges by 2035 — and with it pressure on driving professions, insurers and private car ownership. Third, Europe's answer: whether the continent that invented the car finds its way back to shaping cell production, software and charging networks, or becomes a sales market. This

[63] Rules in the spirit of the investment principles of the earlier papers in this series; cf. Rupprechter (2026b) and Rupprechter (2026f).

paper was the first of six on the great megatrends; the coming papers in the series will order further of these decade-scale shifts for investors.[64]

[64] The megatrend series continues; on technology waves once more Perez (2002), and Rupprechter (2026f) on the youngest institutional asset class.

References

Preliminary note: Market, holdings and fund data without a separate reference are drawn from the cited reports of the IEA, Rho Motion, BloombergNEF, SNE Research, ACEA, KBA and Bundesnetzagentur and from company statements; as of late August 2026.

ACEA (2026). New car registrations 2025. European Automobile Manufacturers' Association, Brussels, 27 January 2026.

Arthur, W. B. (1989). Competing technologies, increasing returns, and lock-in by historical events. Economic Journal, 99(394), 116-131.

Auer, R. and Claessens, S. (2018). Regulating cryptocurrencies: Assessing market reactions. BIS Quarterly Review, September 2018, 51-65.

BCG (2023). Rewriting the rules of software-defined vehicles. Boston Consulting Group, 7 September 2023.

Ben-David, I., Franzoni, F., Kim, B. and Moussawi, R. (2023). Competition for attention in the ETF space. Review of Financial Studies, 36(3), 987-1042.

Bessembinder, H. (2018). Do stocks outperform Treasury bills? Journal of Financial Economics, 129(3), 440-457.

BloombergNEF (2025). Lithium-Ion Battery Price Survey. BloombergNEF, 9 December 2025.

Bundesnetzagentur (2026). Charging point register, as of 1 July 2026. Bonn.

Christensen, C. M. (1997). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business School Press, Boston.

Cox Automotive (2026). Q4 2025 EV sales report. Atlanta, 13 January 2026.

David, P. A. (1985). Clio and the economics of QWERTY. American Economic Review, 75(2), 332-337.

Di Lillo, L., Gode, T., Zhou, X., Atzei, M., Chen, R. and Victor, T. (2024). Comparative safety performance of autonomous- and human drivers: A real-world case study of the Waymo Driver. Heliyon, 10(14), e34379.

Fagnant, D. J. and Kockelman, K. (2015). Preparing a nation for autonomous vehicles: Opportunities, barriers and policy recommendations. Transportation Research Part A: Policy and Practice, 77, 167-181.

Goldman Sachs (2026). Robotaxis to become a 400 billion dollar market in 2035. Goldman Sachs Research, 30 April 2026.

Holland, S. P., Mansur, E. T., Muller, N. Z. and Yates, A. J. (2016). Are there environmental benefits from driving electric vehicles? The importance of local factors. American Economic Review, 106(12), 3700-3729.

IEA (2026). Global EV Outlook 2026. International Energy Agency, Paris, May 2026.

Kalra, N. and Paddock, S. M. (2016). Driving to safety: How many miles of driving would it take to demonstrate autonomous vehicle reliability? Transportation Research Part A: Policy and Practice, 94, 182-193.

Katz, M. L. and Shapiro, C. (1985). Network externalities, competition, and compatibility. American Economic Review, 75(3), 424-440.

KBA (2026). New passenger car registrations by drive type, full-year 2025. Kraftfahrt-Bundesamt, Flensburg, January 2026.

Kempton, W. and Tomić, J. (2005). Vehicle-to-grid power fundamentals: Calculating capacity and net revenue. Journal of Power Sources, 144(1), 268-279.

Kusano, K. D., Scanlon, J. M., Chen, Y.-H., McMurry, T. L., Gode, T. and Victor, T. (2025). Comparison of Waymo Rider-Only crash rates by crash type to human benchmarks at 56.7 million miles. Traffic Injury Prevention, 26(Sup1), S8-S20.

Li, S., Tong, L., Xing, J. and Zhou, Y. (2017). The market for electric vehicles: Indirect network effects and policy design. Journal of the Association of Environmental and Resource Economists, 4(1), 89-133.

Litman, T. (2023). Autonomous Vehicle Implementation Predictions: Implications for Transport Planning. Victoria Transport Policy Institute, Victoria (continuously updated).

Markowitz, H. (1952). Portfolio selection. Journal of Finance, 7(1), 77-91.

Milakis, D., van Arem, B. and van Wee, B. (2017). Policy and society related implications of automated driving: A review of literature and directions for future research. Journal of Intelligent Transportation Systems, 21(4), 324-348.

Nykvist, B. and Nilsson, M. (2015). Rapidly falling costs of battery packs for electric vehicles. Nature Climate Change, 5(4), 329-332.

Perez, C. (2002). Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages. Edward Elgar, Cheltenham.

Rho Motion (2026). Global EV sales 2025 and outlook 2026. Rho Motion / Benchmark Mineral Intelligence, London, January and February 2026.

Rogers, E. M. (2003). Diffusion of Innovations. 5th edition, Free Press, New York.

Rupprechter, R. (2026b). How much green is enough? Green investing between regulation, returns, and impact. Working Paper, R&B Wealth Management.

Rupprechter, R. (2026f). Digital gold and programmable money: Which cryptocurrencies suit which investor. Working Paper, R&B Wealth Management.

Rupprechter, R. and Rupp, B. (2026). After the latest technology leap, the future of the private car is electric. Market report, R&B Wealth Management, 28 April 2026.

SAE International (2021). Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles. SAE Standard J3016_202104.

Schumpeter, J. A. (1942). Capitalism, Socialism and Democracy. Harper & Brothers, New York.

Shaheen, S. and Cohen, A. (2019). Shared ride services in North America: Definitions, impacts, and the future of pooling. Transport Reviews, 39(4), 427-442.

SNE Research (2026). Global EV battery market share 2025. SNE Research, Seoul, February 2026.

Springel, K. (2021). Network externality and subsidy structure in two-sided markets: Evidence from electric vehicle incentives. American Economic Journal: Economic Policy, 13(4), 393-432.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. Research Policy, 15(6), 285-305.

Waymo (2026). Safety impact data. Waymo LLC, Mountain View (continuously updated publication; for the analysis of 56.7 million miles see Kusano et al., 2025).

Wright, T. P. (1936). Factors affecting the cost of airplanes. Journal of the Aeronautical Sciences, 3(4), 122-128.

Ziegler, M. S. and Trancik, J. E. (2021). Re-examining rates of lithium-ion battery technology improvement and cost decline. Energy & Environmental Science, 14(4), 1635-1651.

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