
# SPECTRUM

## Electric vehicles: An accelerating trend?

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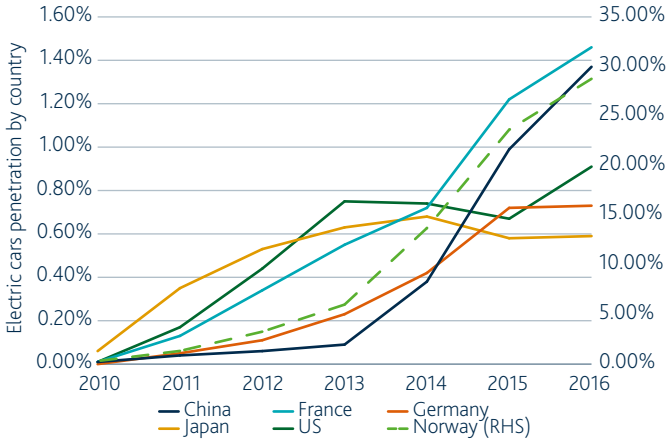
**Concern about climate change and air pollution is driving an increasing focus by governments on the environmental impact of the automotive sector. Regulation has become a key driver of innovation, accelerating the move away from the long-dominant internal combustion engine (ICE), with fully electric vehicles (EVs) rapidly emerging as the key alternative.**

For credit investors, this represents a step-change for traditional automotive manufacturers with important implications both in the short and longer term. In our view, the evidence suggests that GM, one of the biggest global auto companies, is better positioned for this transition than a long-standing rival, Ford, presenting an investment opportunity.

## KEY POINTS

- Regulation is driving rapid innovation in the automotive sector
- EVs are leading the race to replace petrol and diesel cars
- Traditional manufacturers that are not investing now in an electric future may be left behind

**Figure 1.** With the exc**eption of Norway, EV usage remains small but has accelerated quickly**




Source: International Energy Agency as at 2017.

## A SHORT HISTORY OF (EV)ERYTHING

Although EVs are seen by many as a new technology, the first commercially available models date from the 19th century (in 1900, electric vehicles accounted for around two-thirds of vehicles on the road in the US[1] before cheaper technology and even cheaper fuel led to the dominance of the ICE).

A false dawn occurred for EVs in the 1990s, after the US state of California passed the zero-emissions vehicle (ZEV) mandate. This legislation required the seven major US auto manufacturers to offer electric vehicles in order to continue sales of petrol vehicles in the state. However, pressure from lobbying groups resulted in the repeal of the law and the withdrawal of EVs from sale, a story examined in the documentary *Who Killed The Electric Car?*

Since then, while petrol-electric hybrid vehicles (PHEVs) have captured a small but increasing share of the global market, EVs have remained little more than an automotive sideshow. While Tesla and its charismatic CEO Elon Musk have garnered plenty of media attention, actual EV market penetration has remained minimal: global sales of EVs were still below 2% of the market in 2016[2].

## REGULATION: IN THE DRIVING SEAT

Recently however, environmental concerns have led to regulation once again becoming a key driver towards alternative fuels, this time on a global scale. Air pollution is a major issue not only in the West but also in emerging markets, including India and most significantly China, which produced 43% of global EVs in 2016 and overtook the US for having the highest number of EVs on the road[3].

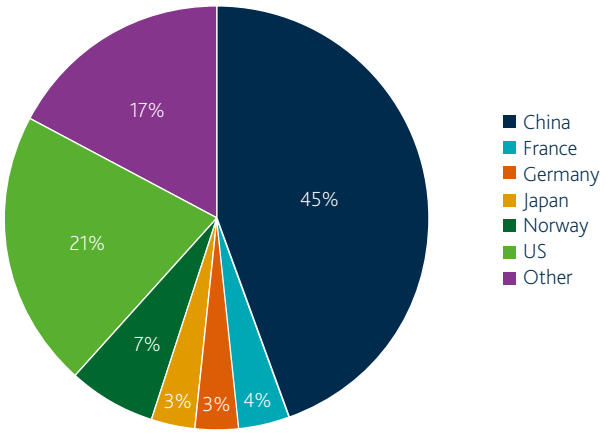
China has rolled out incentives and regulations including consumer grants and subsidised charging stations, as well as a requirement for any manufacturer producing or importing more than 30,000 cars to make EV sales 10% of their total in 2019 (rising to 12% in 2020)[4].

The European Union (EU) has the strictest rules governing the use of ICEs, which are responsible for more than 10% of $CO_2$ emissions across the bloc. In response, the EU has set incremental targets designed for gradually reducing toxic emissions, with the next deadline falling in 2021. It specifies that a maximum of 95g of $CO_2$ per kilometre, a progression from the 130g target in 2015 must be the fleet average for all cars.

[1] "The history of the electric car," published by the US Department of Energy in September 2014
[2] "Global plug-in sales for 2016," published by ev-volumes.com. Accessed in February 2018
[3] "China's electric vehicle market plugs in," published by McKinsey & Co. in July 2017
[4] "China's new energy vehicle mandate policy (final review)," published by the International Council of Clean Transportation in January 2018

Meanwhile, Norway leads the world in terms of market penetration, with plug-in vehicles comprising just over 39% of sales in 2017, and is currently scheduled to be the first country to ban ICE sales, in 2025[5,6]. And California has returned to its ZEV approach, with a goal of 1.5m EVs on the road by 2025 and a total ICE ban by 2040[7,8].

**Figure 2.** EVs: market share by new registration, 2016




Source: International Energy Agency as at 2017.

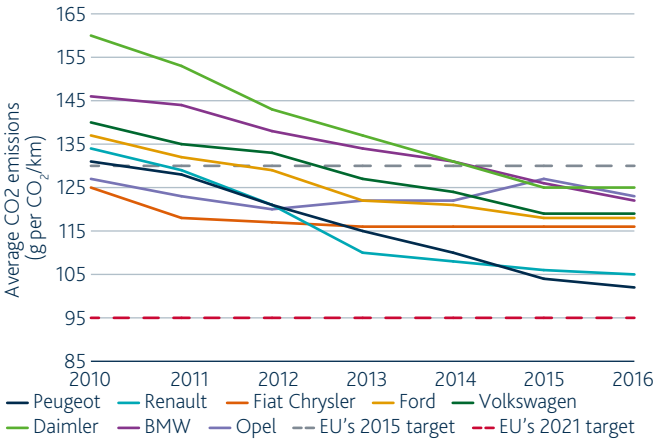
Adding to the effect, municipalities are also turning to EVs as a solution to local pollution issues, with cities across the globe introducing low-emission zones, as well as measures including dedicated parking spaces, subsidised charging stations and tax incentives designed to boost EV uptake.

## THE EV TIPPING POINT

Until recently, many producers remained focused on improving the efficiency of their ICE vehicles in order to reduce their average fleet emissions. However, several factors are combining to make this approach less tenable even in the medium term.

In Europe, the popularity of diesel cars – once encouraged by the EU as a more fuel-efficient alternative to petrol – is being undermined both by the aftermath of the VW emissions scandal and increasing concerns over air pollution (diesel emissions have much higher levels of harmful particulates than petrol, and are therefore no longer considered as a greener alternative). Diesel sales in Europe – which have historically been far higher than in the US and China – are now predicted to drop from 50% of the market in 2016 to 30% in 2025, while global sales are set to plummet from 13.5% to 4%[9]. This threatens manufacturers' ability to meet the EU 2021 regulation for average fleet emissions, and elevates EVs as a more viable means of achieving the target and avoiding large fines.

**Figure 3.** The EU's emissions-reduction targets for 2015 and 2021




Source: European Environment Agency as at 2017.

In addition, new regulation mandating that diesel-car emissions tests are performed on the road instead of a laboratory. (The controlled environment of a lab allowed VW to install the infamous 'defeat devices' that enabled its diesel cars to cheat emissions tests.) This scrutiny, plus the growing awareness that diesel cars are no longer considered more environmentally friendly, should further incentivise manufacturers to invest in electrified motoring.

Furthermore, the lower oil price and auto dealers' sales incentives have helped sustain the long-running consumer trend for SUVs 'crossovers' – cars which combine the look and feel of SUVs with better road manners and less focus on four-wheel-drive and off-road ability – thereby impeding manufacturers' ability to reduce emissions across their fleets.

As a result of these factors, the tipping point for EV, which once appeared far down the road, looks to be drawing rapidly closer: estimates vary considerably but the general trend is significantly up: in 2017 Exxon Mobil revised its figures from 65m to 100m EVs on the road by 2040, while OPEC raised its from 46m to 266m. Meanwhile the International Energy Agency more than doubled its central forecast for EVs, raising its 2030 EV fleet size estimate to 58m from 23m[10].

[5] "Norway powers ahead (electrically): over half new car sales now electric or hybrid," by Camilla Knudsen and Alister Doyle. Published by Reuters on 3 January 2018
[6] "Norway to phase out petrol and diesel cars by 2025," by Sam Sheehan. Published by Autocar on 27 February 2017
[7] "ZEV action plan: an updated roadmap toward 1.5 million zero-emission vehicles on California roadways by 2025," published by the Office of Governor Edmund G. Brown Jr in October 2016
[8] "California bill seeks ban on fossil-fuelled vehicles by 2040," by Ryan Beene. Published by Bloomberg on 3 January 2018
[9] "America's diesel car market gets even smaller," by Ryan Beene. Published by Bloomberg on 10 May 2017
[10] "Big oil just woke up to threat of rising electric car demand," by Jess Shankleman. Published by Bloomberg on 14 July 2017

# OFF-ROAD: ASSESSING THE BROADER IMPACT OF EVs

## Oil: driving down demand?

The limited market penetration of EVs has resulted in a negligible impact on global oil demand so far. However, three factors should be considered in order to assess the potential future impact of greater EV use:

- Transportation is the biggest end-use of oil, accounting for 50% of demand, with 35% of this coming from small vehicles and commercial trucks, which could be substituted for EVs in time
- EV uptake is expected to grow significantly
- The slump in oil prices in 2014-16 was triggered by a relatively modest imbalance between supply and demand of around 1.5%

Multiple estimates of the impact of EVs on oil demand exist. Barclays Commodities Research forecasts that EV uptake and increased fleet fuel efficiency could reduce oil demand by about 3.5mb/d by 2025 (approximately 3% of total demand), and EV market penetration of 33% by 2040 could affect oil demand by about 9mb/d (8% of total demand)[1]. If these projections turn out to be true, oil prices will likely come under pressure. In a lower price environment, higher cost, oil-leveraged exploration and production issuers are likely to be affected most and 10s30s curves for higher quality companies could steepen.

In an environment where US refined product demand tips over, this could also rearrange the decades-old business risk rankings for midstream issuers – the companies that store, process or transport oil and gas – and place the infrastructure for refined products at greater risk of displacement.

## Utilities: future generation

The growth of EVs has the potential to reverse the declining trend in power consumption driven by energy efficiency measures and, in developed markets such as the UK, the period of deindustrialisation prior to that. In the UK, the National Grid projects that 54% of car sales will be EVs by 2050. Whether this level of uptake proves to be entirely accurate, the sweeping impact on utilities is undeniable, with forecasts that a 7%-10% increase in generation compared to 2017 will be required to meet demand by 2030.

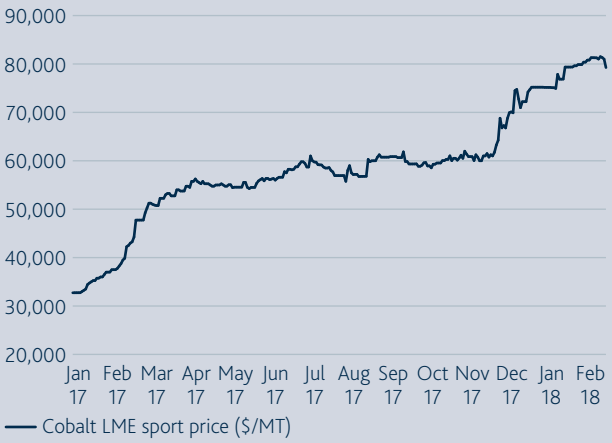
Moreover, EV uptake will have far-reaching implications for the planning and organisation of power grids. Overnight charging schedules, investment in domestic-property charging connections, roadside infrastructure and low-voltage grid investments will significantly alter the daily electricity demand curve. Circumventing the enforcement of charging schedules (to avoid pressure on peak demand) would also create potential growth opportunities for the development of electricity storage facilities.

From an environmental perspective, ongoing efforts to reduce society's overall carbon footprint will require a move towards more efficient forms of electricity generation to power EVs. We expect combined cycle gas turbines and renewable sources of energy generation to play a significant role in enabling greater EV uptake. In our view, the additional generation capacity required to be a significant catalyst for the utilities sector, with renewable energy and storage players likely to be the largest beneficiaries of the growing EV market.

## Cobalt: cost and controversy

Currently, the dominant EV-battery technology is reliant on large amounts of cobalt. With demand expectations surging, the LME spot price of the metal has increased by 122% in the last year to $79,253/MT as of 20 February 2018.

**Figure 4.** The climbing cost of cobalt




Source: Bloomberg as at 22 February 2018.

What's more, the concentration of production in the Democratic Republic of Congo gives cause for concern over supply. The political situation in the DRC is unstable and the government there has recently announced plans both to double the tax on cobalt and to force the renegotiation of all mining contracts[2,3].

Added to this are human rights issues around cobalt mining[4]. The good news is that international pressure on so-called artisanal mining is starting to have an impact, leading to the introduction of standards like the Responsible Cobalt Initiative (RCI), to which Apple, Huawei, Samsung and Sony are all signatories.

Finally, it should be remembered that cobalt is a finite resource, which has cost and sustainability implications for the EV industry and investors.

[1] "EVs and oil: agree to disagree (but someone is wrong)," published by Barclays Research on July 28 2017
[2] "Congo may more than double tax on critical cobalt supply," by William Clowes and Thomas Wilson. Published by Bloomberg on 10 January 2018
[3] "DRC mining co to renegotiate all contracts within next year," by John Aglionby and Neil Hume. Published by the Financial Times on 6 February 2018
[4] For more on this topic, read "Modern slavery: the true cost of cobalt mining," by Hermes Investment Management on 16 January 2018

## MANUFACTURERS CHANGE GEAR

Behind the Tesla-driven headlines, mainstream manufacturers such as Renault-Nissan, Honda, Toyota and BMW have long been pursuing the development of alternative power sources for their vehicles. However, regulatory change and consumer pressures are causing a step-change in approach.

Confronted by the potential cost in terms of regulatory fines – and the reputational damage such breaches will incur – the more forward-looking mainstream producers are making significant bets on EVs.

Most dramatically, in 2017 Volvo announced its range would go 'all electric' in 2019, although by this they actually mean all their cars will have an electric element to their propulsion systems, rather than that they will no longer produce ICE vehicles at all[11]. Virtually every major manufacturer is trumpeting a commitment to EVs: in the US, GM plans to introduce 20 EV models by 2023 and Ford has announced an $11bn investment in the technology and aims to launch 16 EV models by 2022; while in Europe, VW aims for EVs to account for 20-25% of its total sales by 2025 and Daimler has announced that Mercedes will put 10 EV models on the road by 2022[12,13]. This mass-market momentum, driven by ongoing reductions in the cost of producing pure EVs, is critical to the growth of the market.

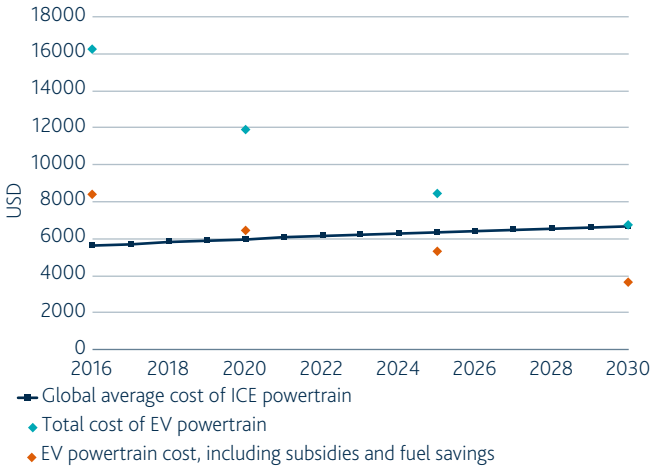
## ROAD BLOCKS? BARRIERS TO EV UPTAKE

While EVs should develop strongly in the long term and could achieve significant market share within the next 10 years, there remain some significant barriers to domination.

A significant barrier, but also the most likely to be removed in the medium-term, is the cost issue. EVs remain relatively expensive compared to their ICE counterparts, even when costs are mitigated by government subsidies, and even then it is currently unclear whether sales are profitable (in the short term, costs could rise even higher due to increased taxes on cobalt[14]). However, analysis from McKinsey indicates that the price of a complete automotive lithium-ion battery pack could fall from the current cost of $500-600 per kWh to about $160 per kWh by 2025 – cheap enough to make EVs a mass-market, rather than premium, product[15].



**Figure 5.** Cost parity between ICE cars and EVs could occur in the early 2020s




Source: Bank of America Merrill Lynch Global Research estimates as at October 2017.

The other major impediments to greater EV use are the twin issues of range anxiety and charging. While a current typical EV range of 100-200 miles is acceptable for city use, charging times make longer journeys impractical, so that EVs are unviable as the main car for many families, particularly in larger countries such as the US.

However, several factors may combine to significantly reduce this issue in the near term. First, advances in battery technology are rapidly improving range; for example, Tesla quotes a maximum range of 335 miles for its top-spec Model S, while Nissan claims a range of more than 300 miles for the 2018 Leaf[16,17]. Second, charging times are coming down almost as fast as range is going up: Tesla claims that its superchargers can replenish 170 miles of range in half an hour, while California-based ChargePoint quotes up to 1,590 miles of range per hour from its express DC charging stations[18].

One possible impediment remains the development of an adequate charging network: it is currently unclear who will be the provider of charging facilities, although a number of options are emerging, including independent providers, local authorities, businesses such as hotels and office parks, joint ventures between OEMs and utilities companies, and even the big oil companies, with BP recently announcing the trialling of electric charging on their station forecourts[19]. The most likely answer is that a mature network will involve a combination of all of these.

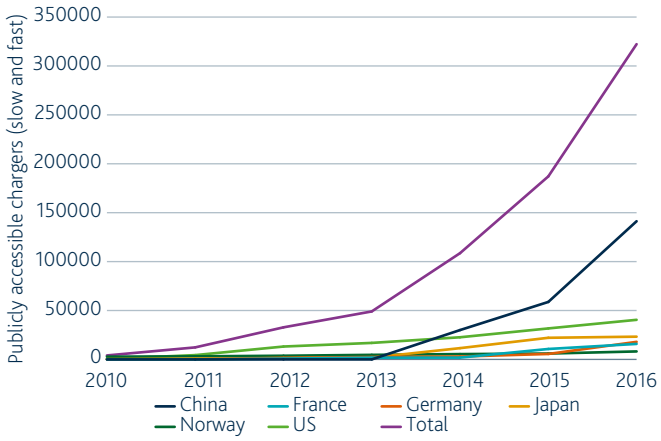
A side issue to this is that standards for charging stations have not yet been established globally (it is worth noting that Tesla's proprietary network is deliberately designed only to work with their own vehicles). International charging standards do exist (under IEC62196) but a single universal standard is unlikely to emerge due to differences in the

[11] "Volvo cars to go all electric," published by Volvo Car Group on 5 July 2017
[12] "GM plans 20 all-electric models by 2023," by David Welch. Published by Bloomberg on 2 October 2017
[13] "Ford plans $11 billion investment, 40 electrified vehicles by 2022," by Nick Carey and Joseph White. Published by Reuters on 14 January 2018
[14] "DRC mining co to renegotiate all contracts within next year," by John Aglionby and Neil Hume. Published by the Financial Times on 6 February 2018
[15] "Battery technology charges ahead," by Russell Hensley, John Newman and Matt Rogers. Published by McKinsey & Company in July 2012
[16] "The 10 electric cars with the most driving range," by Zachary Shahan. Published by CleanTechnica on 24 December 2017
[17] "Nissan throws down gauntlet to Tesla on electric car range," by Peter Wells. Published by the Financial Times on 6 September 2017
[18] Source: Chargepoint as at February 2018
[19] "BP will install electric vehicle chargers at UK forecourts," by Martin Saarinen. Published in Auto Express on 31 January 2018

electrical grids of different countries . However, this is not stopping EV manufacturers from investing in charging infrastructure to support larger fleets.

Despite this, most analysts predict a strong increase in the number of charging stations within the next two or three years – for example an IHS Automotive report puts the number of charging stations globally at over 12.7m by 2020, compared to around 1m in 2014[20].

**Figure 6.** Number of publicly available charging stations in selected countries




Source: International Energy Agency as at 2017.

Assuming the above issues are addressed, the key remaining factor becomes the question of significantly increased electricity demand: this has implications both in terms of overall environmental impact and for the planning and organisation of electricity supply. Battery disposal costs and toxicity risks are also a concern, although recycling is likely to become cheaper and thus more viable over time as reprocessing technology improve.

## HYDROGEN: THE ALTERNATIVE ALTERNATIVE

While EVs are grabbing the headlines, electricity is not the only potential alternative to ICE. Most manufacturers are carrying out at least some research into vehicles powered by hydrogen fuel cells. Sceptics argue against hydrogen vehicles on the basis that they are less efficient than EVs – the gas has to be extracted and compressed to be stored, then turned into electricity before it can power a car's motors. Initial uptake is also being hampered by the lack of a widespread refuelling network. However, hydrogen has one major advantage over any other fuel: it is incredibly clean, with the only emission being water. For this reason, Japanese manufacturers Toyota and Honda see a strong future for hydrogen-powered vehicles alongside EVs in the global vehicle fleet, and are encouraged by the domestic government's commitment to having 40,000 fuel-cell vehicles on the road by 2020.

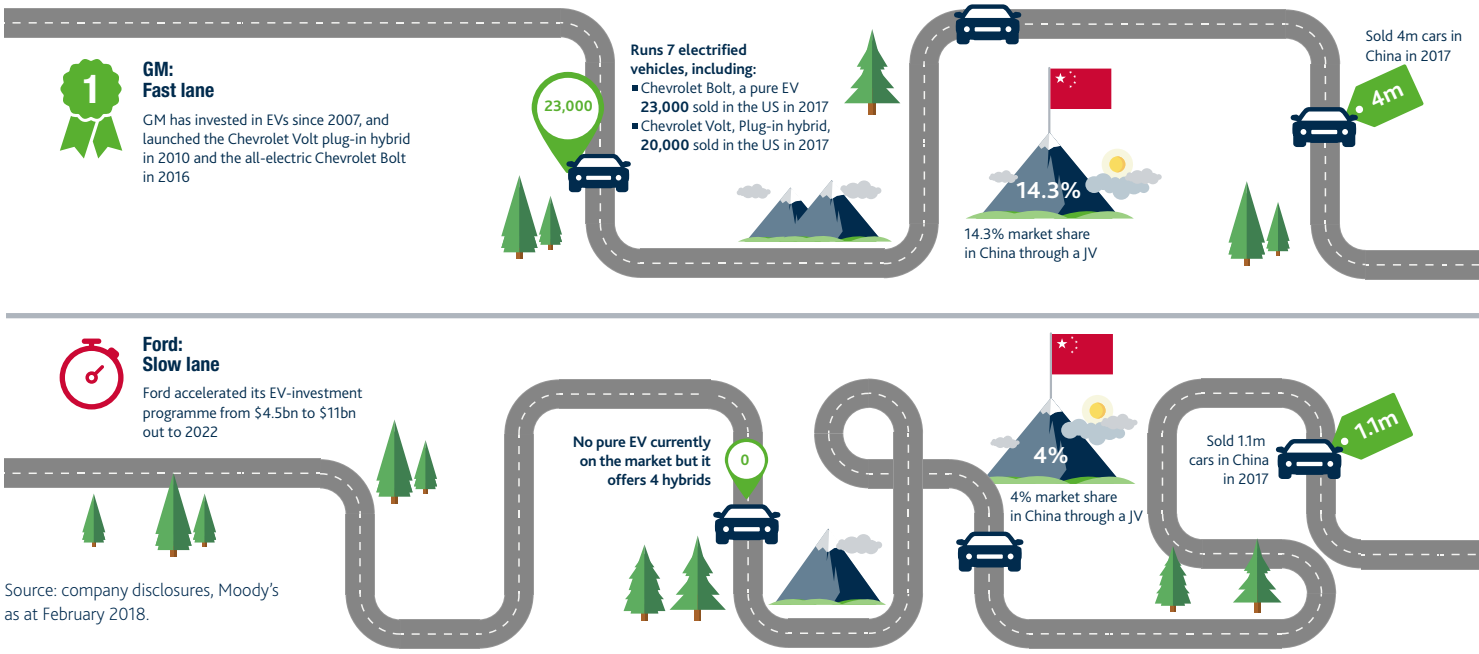
## THE ROAD AHEAD

In the short term, the barriers to EV uptake in terms of economics and convenience may still tend to trump any environmental rationale for most buyers. However, the expected shifts in the landscape we have outlined, coupled with the declining cost curve and financing structures such as battery leasing which reduce upfront cost, are likely to change consumer behaviour in the near-to-medium term.

## IMPLICATIONS FOR HERMES CREDIT

There are significant synergies between EVs, autonomous driving, shared mobility and connectivity. These need to be considered in tandem to enable a deeper understanding of how the automotive market will evolve. We have seen a significant acceleration in

**Figure 7.** GM is in the EV fast lane




Source: company disclosures, Moody's as at February 2018.

[20] "Global EV charging stations to skyrocket by 2020, IHS report says." Published by BusinessWire on 8 May 2015

investment plans and dialogues about EVs from OEMs and auto parts suppliers recently; companies involved in the sector must position themselves now or risk being left behind, so this topic needs to be taken into account by credit investors.

In the US auto industry we tend to favour General Motors (GM) over Ford, and hold GM credit in our portfolio. GM has recovered from bankruptcy in 2009 to become an investment-grade company, and now has a deeper exposure to motoring trends and stronger geographical diversification than Ford. It already has a mass-market EV, the Chevy Bolt, on the road, which was the second-most-popular EV in the US behind Tesla in 2017.

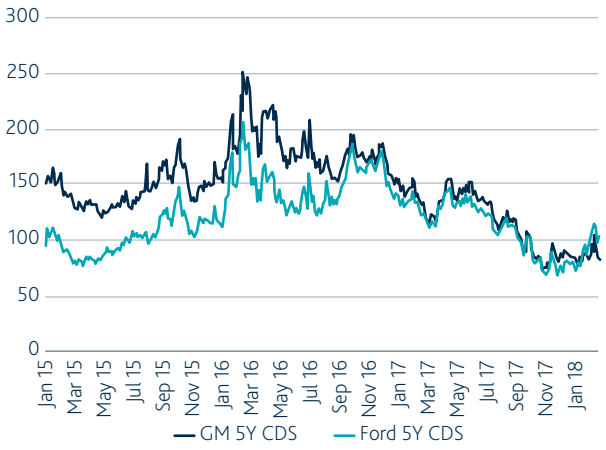
At an investor day in November 2017, GM announced significant progress on reducing battery cost, thereby increasing EV profitability. GM also has a more robust market position in China than Ford and has exited its weak European operations (it sold Opel to Peugeot in 2017), relieving it of the pressure of meeting EU regulatory targets.

In contrast, Ford seems to be in GM's rear-view mirror. While its new CEO announced a significant boost in EV investment at the Detroit Auto Show in January 2018 (up from the previous figure of $4.5bn to $11bn from now until 2022), we still need to see how Ford delivers on this promise given its limited experience in producing EVs. Ford also remains exposed to the challenging EU market, and has a weaker foothold in China.

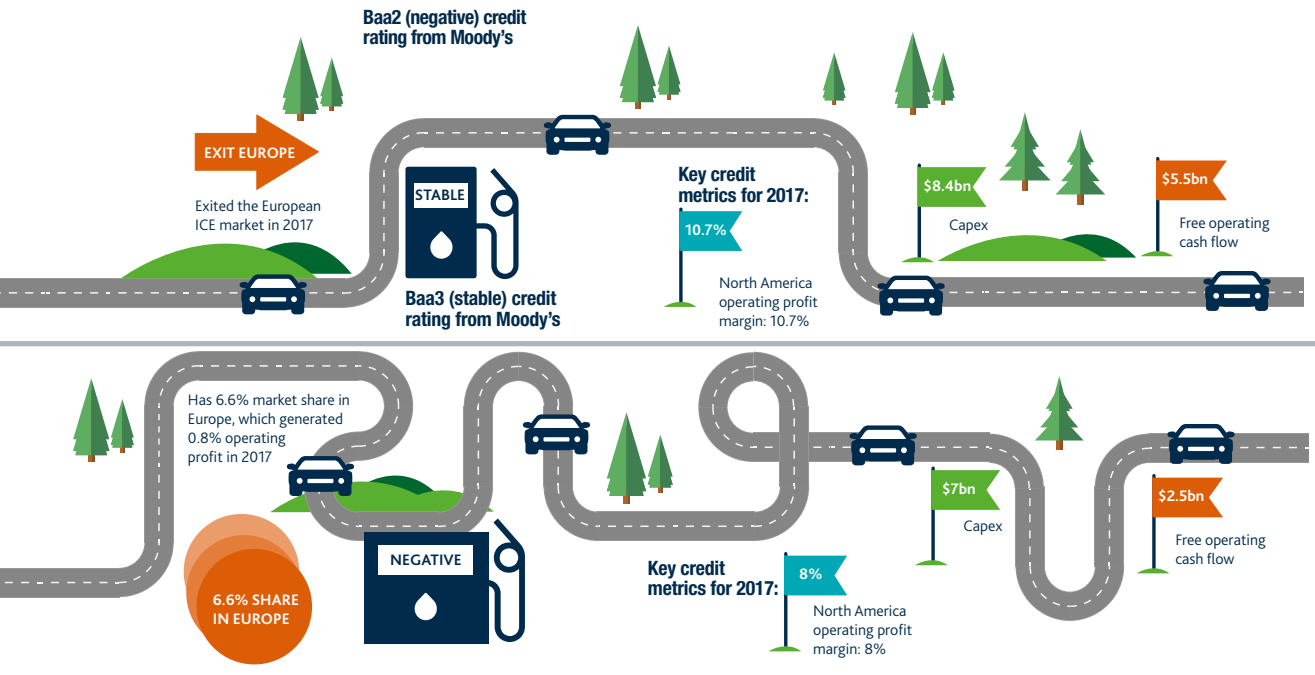
Credit profiles for the two companies are broadly comparable: both have significantly lowered fixed costs since the financial crisis, reducing the sales volumes required to reach break-even, while also achieving investment-grade ratings and net cash positions in their industrial divisions, which are supported by robust liquidity. While cash generation from both companies is healthy, it is typically consumed by capital expenditures and some distributions to shareholders. Even if this regard, however, GM seems more robust with a stronger operating margin and free cash flow generation.

Overall, we prefer GM's long-term strategy and commitment to future mobility. Until very recently, Ford seemed to have been thinking more medium-term and, as a consequence, may struggle to catch up. Until the Detroit Auto Show in mid-January, GM CDS was trading wider relative to Ford despite its stronger business and financial profile, but this trend has now reversed after GM announced better-than-expected Q4 2017 and 2018 guidance and Ford's 2018 expectations were disappointing. We believe this trend will persist, and GM should continue to trade inside Ford.

**Figure 8.** GM v Ford: CDS spread differential




Source: Bloomberg as at 21 February 2018.



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