WILL ELECTRIC VEHICLES STUN OIL DEMAND?

Seleho Tsatsi
Investment Analyst

Executive summary

The adoption of the electric vehicle (EV) has the potential to significantly affect energy markets. In this note, we focus on the potential ramifications for oil. We examine three key questions: First, what is the state of the EV market today? We shall argue that EVs are currently a small but rapidly growing sub-section of the car market. Second, what is EV penetration likely to be in future? Here, we estimate that 8% of 2025 car sales will be EVs, based on regulation, battery costs and original equipment manufacturer (OEM) commitments. Finally, and most importantly, what does this outlook mean for oil demand? Our analysis suggests that the oil demand displaced by EV adoption through to 2025 could equate to under 1% of the market. Furthermore, given that the expectation of high EV penetration has resulted in a cautious supply-side response, it may be the case that EVs have actually had a net tightening effect on the oil market. Thus, in our view, EVs are not likely to reduce oil prices, although they are likely to reduce the size of the industry.

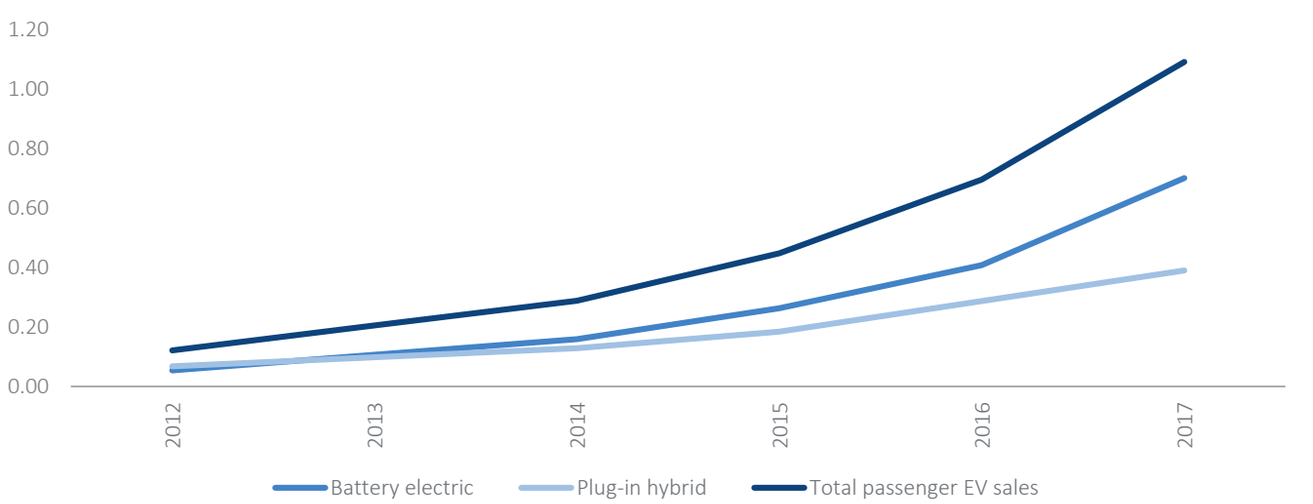
Where does the EV market stand today?

Today, EVs are a small but fast-growing part of global vehicle sales. There were c. 97mn vehicles sold in 2017, of which 71mn were passenger cars and 26mn were commercial vehicles. As Figure 1 illustrates, EVs constituted 1.1mn or 1.5% of 2017 passenger vehicle sales - a small portion. The 55% growth p.a. in EV sales since 2012 is high but starting from a very small base.

It is important to distinguish between battery electric vehicles (BEVs) and plug-in hybrids (PHEVs). A BEV has no internal combustion engine (ICE). Instead, it has an electric motor that uses the battery pack for power. A PHEV is powered by a combination of an ICE and an electric motor. Global BEV passenger sales have grown at 1.6 times the rate of PHEV sales over the past five years.

We outline three scenarios for EV penetration in the year 2025 - a bear case, a base case and a bull case. They are shown in Figure 2. We believe these three factors will be the key drivers of the speed at which EVs penetrate the auto-market - regulation, battery costs and OEM commitments.

Figure 1: Global passenger EV sales by type (mn)



Source: Bloomberg New Energy Finance

Figure 2: 2025 EV penetration scenario analysis

	BEAR	BASE	BULL
2017 EV sales penetration	1,1% (0,7% BEV, 0,4% PHEV)		
2025 EV sales penetration	5%	8%	15%
Drivers	Regulation, battery costs, OEM commitments		

Source: Anchor Capital estimates

Regulation

The 8% base-case scenario is based on 2017 analysis by the California Air Resources Board (CARB). In its mid-range scenario, CARB estimated that an auto manufacturer will need to have about 8% of its 2025-model year, annual sales in California consisting of EVs in order to meet CARB's Zero Emission Vehicle (ZEV) regulation.

CARB's mid-range scenario is used as a base case for a couple of reasons. First, California is the number one state for auto sales in the second-largest vehicle market in the world (the US). Second, thirteen US states have adopted the California standards to date. Other governments, such as that of Québec, have implemented ZEV regulations that largely follow that of California. Thus, although other governments may differ from the California standards, we believe it serves as a useful guideline and starting point.

The 15% bull-case scenario assumes penetration falls slightly higher than halfway between CARB's 8% target and that of China, which is 20%. China is the largest market in the world for automobiles generally and also specifically for EVs.

The Made in China 2025 Initiative is targeting 35mn annual vehicle sales in 2025. The Initiative targets 20% of 2025 annual vehicle sales in China to consist of "new energy vehicles (NEVs)". Other targets in the plan include having 70% of the Chinese market consist of Chinese-branded NEVs by 2020 and having two of the top-ten global NEV firms be Chinese-owned by 2025.

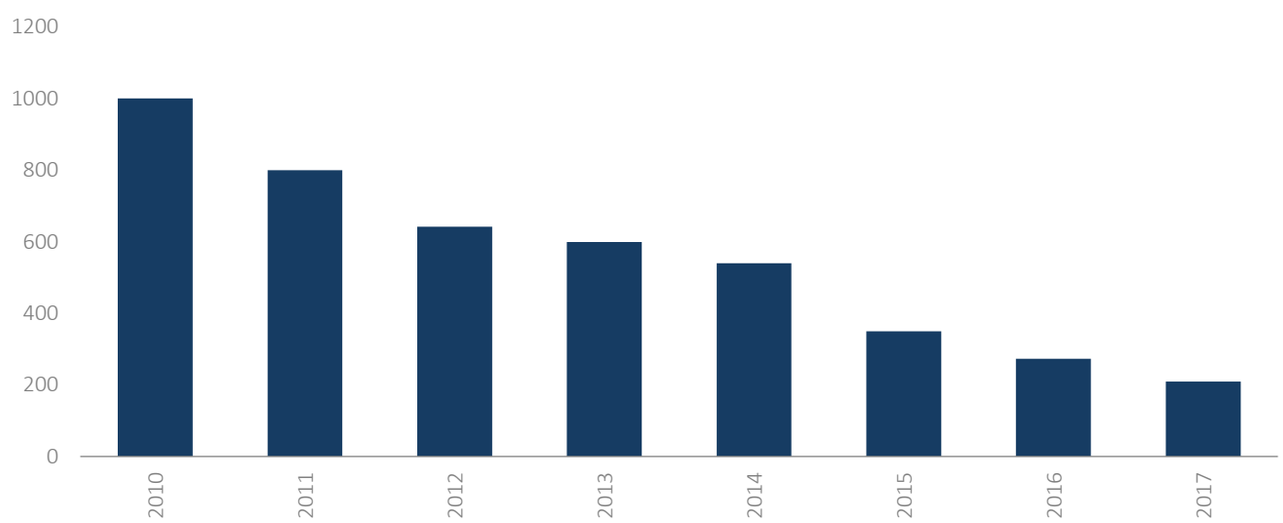
To the extent that other governments have different regulations, 8% may prove to be too high or too low a base-case estimate. Norway is an excellent case study of how governments may accelerate penetration rates. The Norwegian government is targeting no new ICE vehicle sales by 2025. To achieve this, the Norwegian government has incentivised consumers to shift to electric cars through several measures. These include exempting EV drivers from having to pay road tolls or a 25% value-added tax (VAT). As a result, penetration in Norway far exceeds global levels. EVs were 39% of 2017 auto-sales in Norway.

Battery costs

Faster-than-expected declines in battery costs could contribute to higher penetration rates. The single-largest contributor to an EV's cost (relative to an ICE vehicle's cost) is the battery. As battery costs decline, the economic case for automakers to sell EVs strengthens. A battery cost of $100/kwh is estimated to be the battery cost at which most BEVs are cost competitive with ICE vehicles. Average battery costs are estimated to be about $200/kWh at present. McKinsey & Company estimated 2016 average battery costs to be $227/kWh, while Bloomberg New Energy Finance's estimate of the 2017 average battery cost was $209/kWh.

Some OEMs have reported lower costs for their batteries. Tesla indicated a battery cost of about $190/kWh in 2016. Similarly, General Motors (GM) recently said it had a battery cost of $145/kWh that is on its way to $100/kWh

Figure 3: Average EV battery cost ($/kWh)



Source: Bloomberg New Energy Finance

"We have a cell cost per kilowatt hour that's around $145 and that's for the Bolt EV...we're working on a path to get that around $100 or below $100 and we're ahead of the curve on that"

Mary Barra, GM CEO

Source: General Motors 1Q17 earnings call

To the extent that these firms and their peers are able to meet the $100/kWh target faster than the base-case outlined in Figure 2, penetration rates may surprise to the upside.

OEM commitments

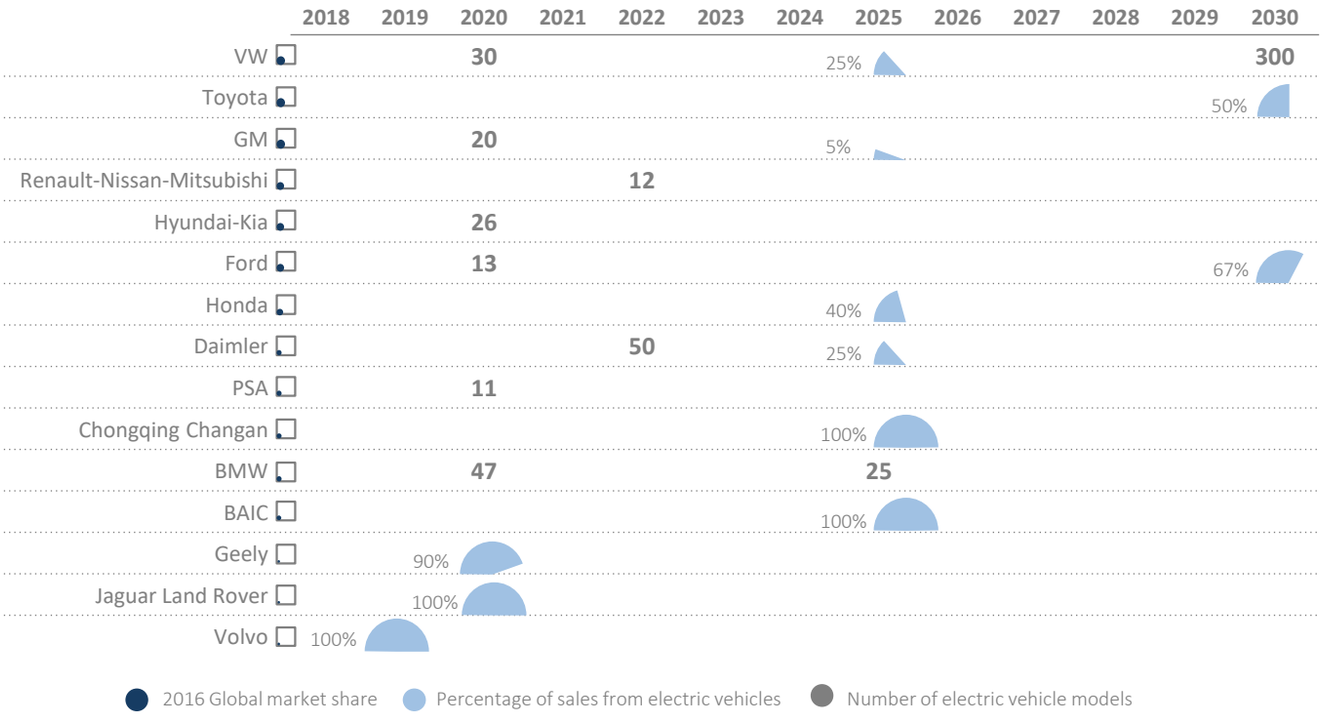
Commitments made by major auto-manufacturers should provide clues as to eventual penetration rates. The 14 auto-manufacturers listed in Figure 4 (on the right-hand side) constituted 77% of 2017 sales globally. Thus, the EV commitments made by this group is likely to be one indication of where the market eventually goes.

Figure 4: OEM by market share

COMPANY	ANNUAL SALES (M)	MARKET SHARE
Volkswagen	10.78	11.1%
General Motors	9.60	9.9%
Toyota	8.96	9.3%
Ford	6.61	6.8%
Nissan	5.77	6.0%
Honda	5.20	5.4%
Hyundai	4.49	4.6%
Fiat Chrysler	4.42	4.6%
Renault	3.76	3.9%
PSA Groupe	3.63	3.8%
Daimler	3.27	3.4%
Suzuki	3.22	3.3%
SAIC Motor	2.97	3.1%
BMW	2.46	2.5%
Tesla	0.10	0.1%

Generally, the OEMs have not made overly specific commitments. Several major auto-manufacturers have not committed to a certain proportion of their future sales being electric or to ending ICE sales by a particular date. This is shown in Figure 5.

Figure 5: EV commitments from automakers



Source: Bloomberg New Energy Finance

GM (the largest US automaker), for example, has left the question of whether it will still be selling gasoline vehicles in 2030 open-ended.

Question: Are you going to be selling gas powered cars by 2030?

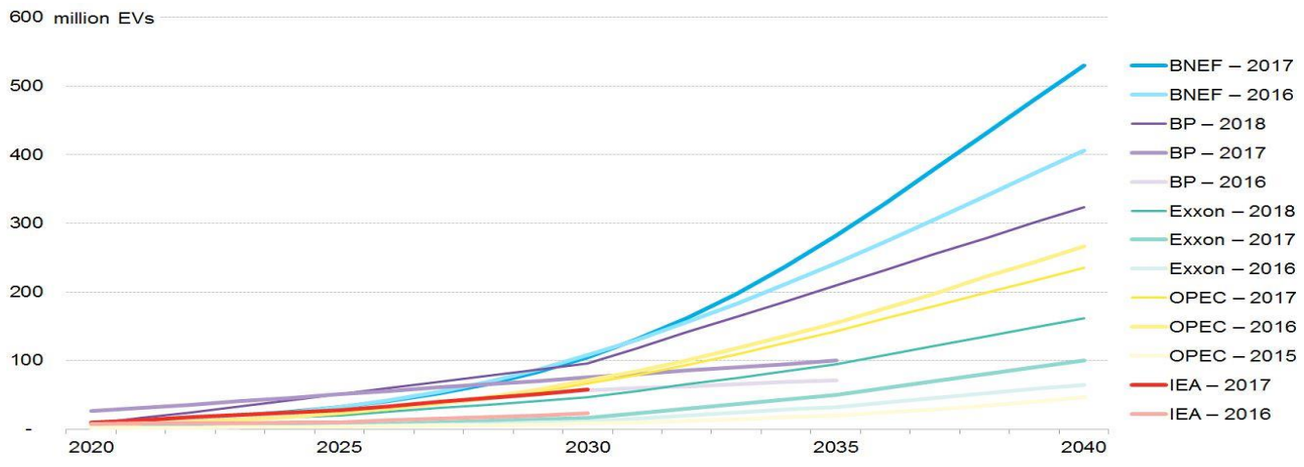
Mary Barra, GM CEO:

We're going to be driven by the customer, I mean when you look at where the market is going, we do believe in an all-EV future but we also are seeing internal combustion engines become more-and-more efficient so we're going to - we have the flexibility to respond to the customer and as we do a new propulsion system for the vehicle whether it's a new ICE or it's adding our electric vehicle - the battery capability and the pack capability, we have tremendous flexibility to do that.

Source: 2017 Barclays Global Automotive Conference

At this stage, it is difficult to glean major insights into potential penetration rates from OEM commitments. Having said that, it remains a vital factor to monitor going forward.

Figure 6: Wide divergence for forecasts of future EV fleet sizes



Source: BNEF, BP, Exxon, OPEC, IEA

Estimation uncertainty

Finally, it is important to acknowledge the wide range of possibilities. Whilst we can say that the world is moving towards an electrified powertrain, a vast amount of factors, some of which are currently "unknown unknowns", will determine penetration rates. This sentiment was recently expressed by Sergio Marchionne, CEO at both Fiat Chrysler and Ferrari.

"These proclamations that we hear about the advent of electrification, artificial intelligence and the inevitable association of artificial intelligence with the electrification, are all things which at best are conjecture. And I start off with a very clear view that most of these things are undoubtedly going to happen directionally. "

Sergio Marchionne, CEO of Fiat Chrysler & Ferrari

Source: NAIAS 2018

The estimation uncertainty over how quickly EVs will be adopted is exemplified in Figure 6. Five reputable entities (BNEF, BP, Exxon, OPEC and IEA) diverge significantly in their forecasts of how quickly the EV fleet will increase over the next two decades. As can be expected, the divergence increases positively with the forecast horizon.

We do believe, however, that it is important and instructive to think through different scenarios and their potential implications.

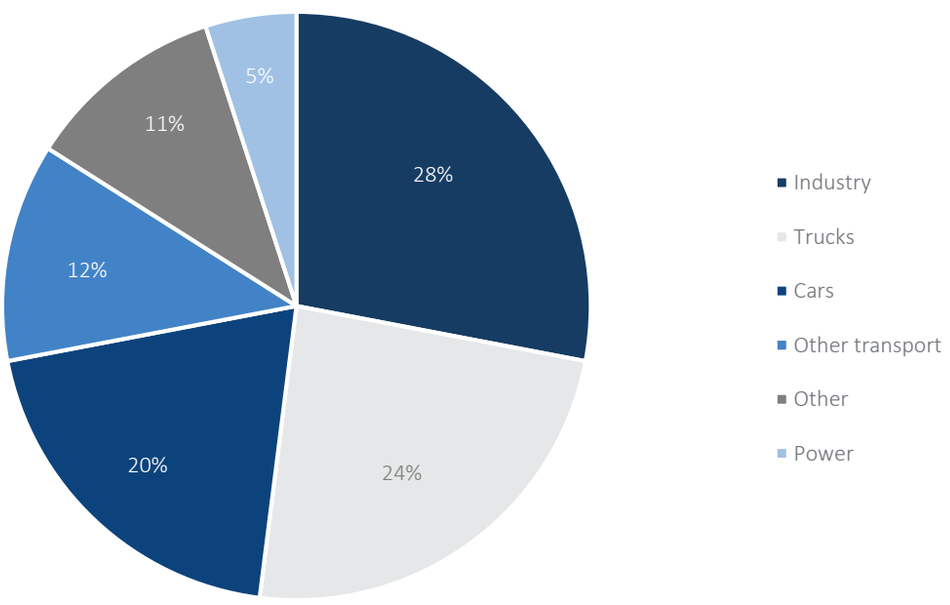
What does this mean for oil?

The emergence of EVs is said to dampen the attractiveness of oil-related assets as investments. Whilst the electrification of the drivetrain will undoubtedly affect oil's long-term demand, we believe the threat of EVs is not material enough to threaten oil demand in the short term. Two reasons underpin this view.

The first is that only about 20% of oil demand comes from cars. Transportation as a whole contributes less than 60% of oil demand. As Figure 7 illustrates, the remaining 40% goes into industry, power generation and other uses. Oil demand from non-auto uses such as petrochemicals is not under threat for displacement by electrification. Cars are most likely to face electrification first due to the large loads and distances involved for trucks.

Second, even if EV penetration surprises to the upside, the current auto-fleet primarily consists of ICE vehicles that will continue to require fuel to operate. Today's global vehicle fleet stands at c. 1bn vehicles. The vast majority (±99%) of that fleet consists of ICE vehicles. These vehicles can operate for over a decade before replacement starts to become necessary.

Figure 7: Oil demand by source



Source: BP

We next examine what the EV penetration scenarios outlined above could mean for oil. The number of barrels of oil displaced is estimated as follows. Based on the 2025 EV sales penetration outlined in each case (bear, base, bull), the 2025 EV fleet is estimated. The number of gallons lost to EVs is approximated by assuming the 2025 EV fleet uses no fuel whatsoever (this is likely overly aggressive as hybrids still require fuel). Approximately 20mn barrels a day (mmbd) of crude oil is required to fuel 1bn cars (the vast majority of which are ICE). This translates to 2 mmbd of crude oil required per 100mn cars. As fuel efficiency gains continue to be made, we believe this number will fall to an estimated 1.8 mmbd per 100mn cars. The number of barrels of oil displaced is thus calculated by assuming 1.8 mmbd is displaced for every 100mn vehicles in the EV fleet.

Our central forecast scenario looks for 8% EV penetration by 2025. We estimate that this will shave 0.78 mmbd off oil demand, under 1% of global oil demand levels in 2017. In our view this is material, but does not pose an existential threat to the oil market. Although we have only focused on oil demand in this note, the expectation of significant EV penetration has also affected oil supply: indeed, in our view, this expectation has accentuated supply-side prudence, such that the future supply contraction due to EVs is greater than the demand reduction. Thus, it may indeed be the case that EVs, and the expectations attached to them, have had a net tightening effect on the market.

In summary

We believe the adoption of EVs will not pose an existential threat to oil demand in the immediate future. We estimate that less than 1% of oil demand would be displaced by EV adoption under a base case of 8% EV sales penetration in 2025. The seemingly low figure is assisted by only 20% of oil demand coming from cars and the current auto-fleet primarily consisting of ICE vehicles that will continue to require fuel to operate. We acknowledge the difficulty of forecasting technology adoption and cite three factors that we believe will drive the size and speed of the adoption - regulation, battery costs and OEM commitments.

Figure 8: Oil displacement from EV adoption

IN MILLIONS	BEAR CASE	BASE CASE	BULL CASE
2017 EV sales penetration		1.10% (0,7% BEV, 0,4% PHEV)	
2025 EV sales penetration	5.00%	8.00%	15.00%
2025 EV Fleet	31.00	43.00	66.00
Barrels Oil per 100m Cars (MMbbl/d)	1.80	1.80	1.80
Barrels Oil displaced (MMbbd/d)	0.57	0.78	1.19

Source: Anchor Capital, BP