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Too early to write off oil – EVs will be an evolution not a revolution

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While there may be a lot of talk in the media about peak oil demand, it's far too early to be thinking about the demise of fossil fuels in the near term. Elements of the energy transition are upon us, but despite some straight-line correlations to desired outcomes, this transition is likely to be far more complex and provide us with many surprises to both the upside and downside along the way.

Uncertainty around future oil demand

Three years of low oil prices have stimulated strong sales of new cars, with a shift towards larger passenger vehicles (SUVs and light trucks), rather than the small economical (in terms of miles per gallon) cars which had dominated sales during the period of high oil prices pre-2015. Up until this point, oil demand for passenger vehicles had been steadily declining, as the vehicle fleet became increasingly efficient (see the figure opposite above). In 2016, this trend reversed in the OECD, with demand increasing for the first time in 11 years. Interestingly, most of the demand has not been due to the larger vehicles (although this arrested declines) but has been due to an increase in vehicle miles travelled per capita, partly as a consequence of the rise of rideshare. While car ownership may no longer be the priority for many, the growth of 'Mobility as a Service' has made road transport more accessible and affordable to a growing middle class – benefiting from the convenience of transport that picks you up and drops you off wherever and whenever you want, compared with the 'inconvenience' of public transport (such as buses and trains).

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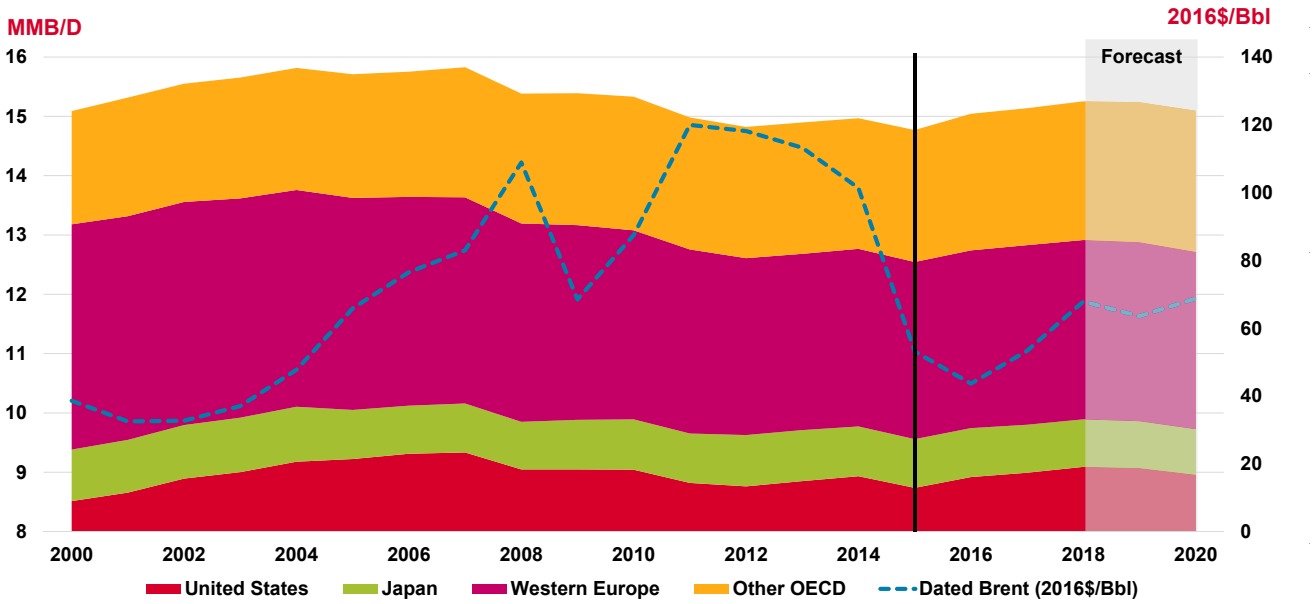
With the ever growing population of middle-income earners, air travel continues to grow year on year (4.9 per cent) and the demand for goods and services has seen shipping and commercial road transport demand increase year on year by 3.6 per cent and 2.2 per cent respectively. With growing urbanization and a buoyant global economy, this trend is likely to



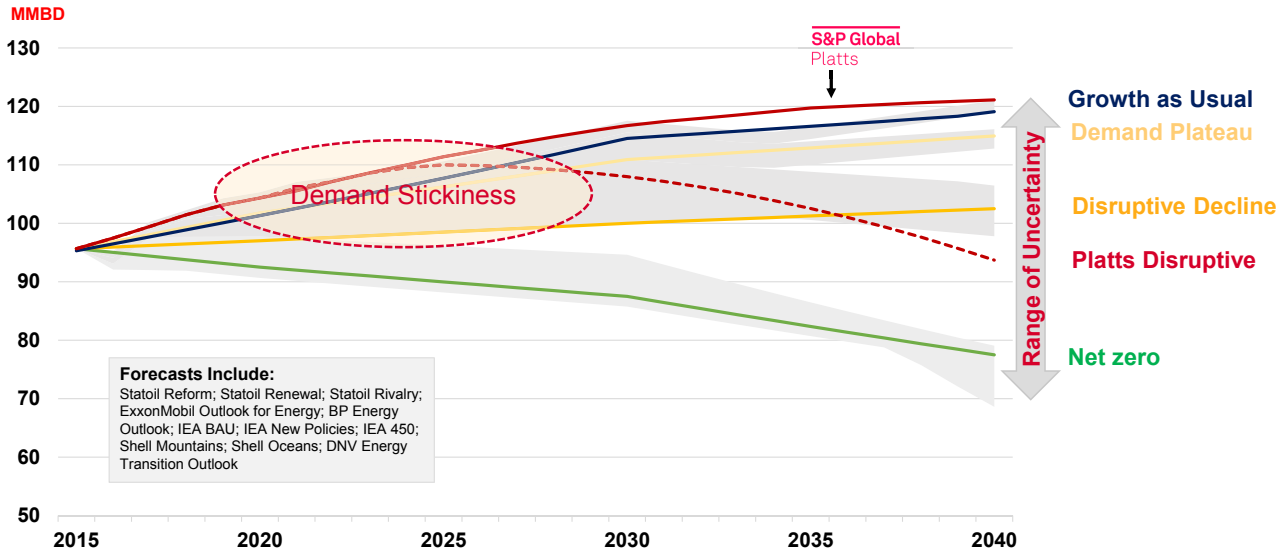
OECD passenger car oil demand (2000–20)

Source: S&P Global; MI/SNL; Platts.

continue providing strong 'demand stickiness' for fossil fuels in the near term, which many commentators have failed to factor in when considering the future trajectory for oil demand (see the figure below). The range of uncertainty in future demand has grown substantially, making planning for the future and investments far more challenging across the industry.

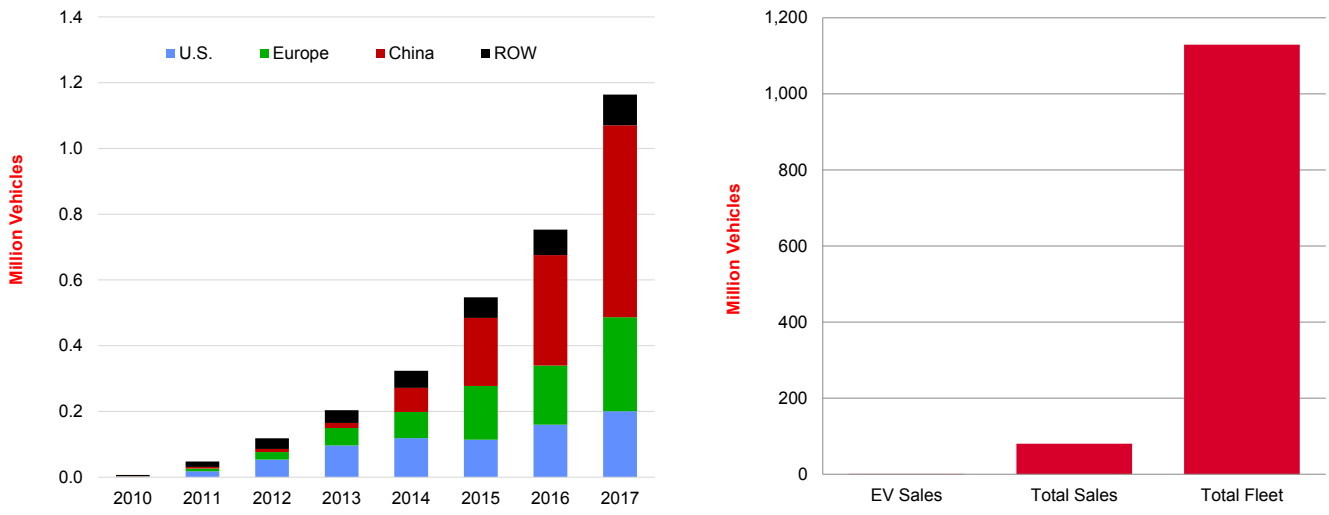
Efficiency standards and electric vehicles

Sixty per cent of oil demand comes from transportation, with the predominant focus being on passenger vehicles, which make up just 25 per cent of that demand. Today, dozens of countries have fuel efficiency standards for passenger vehicles, while just a handful have them for heavy duty commercial trucks. In the passenger vehicle sector all the hype is around electric vehicles (EVs), yet despite a 55 per cent growth in EV sales last year, overall sales amount to less than 2 per cent of new car sales, and less than 0.2 per cent of the total fleet (see the figure overleaf). Today's 3 million EVs displace less than around 60,000 b/d, or less than 0.06 per cent of total global demand.



Forecasts of oil demand

Source: S&P Global; MI/SNL; Platts.



Electric vehicle sales, including plug-in electric hybrid vehicles (PHEVs) and battery electric vehicles (BEVs) (left); total vehicle sales and total vehicle fleet in 2017 (right)

Source: S&P Global; MI/SNL; Platts.

Unlike the transition in the early 1900s from the horse and buggy (when it took just 13 years for the Internal Combustion Engine to wipe out almost all the buggies), EVs do not represent the same marked improvement in convenience or quality of life, and in fact have drawbacks in costs, range, and ease of refuelling (charging). Momentum is certainly building around EVs and hybrid variants of the technology as viable alternatives to the future of mobility. Plug-in ranges are increasing and charging times are falling.

EVs have fed anxiety over the future of oil as the world's primary source of transport fuel. However, EVs are likely to remain a small part of the overall global vehicle fleet unless the technology improves significantly and the cost of production falls. The cost of batteries has certainly come down significantly over the last seven years (from $1000 per kilowatt hour (kWh) to around $200/kWh) but at the same time demand for the key metals lithium and cobalt above tripled (see the figure opposite top), thus increasing the cost of the raw materials from 10 per cent to 40 per cent of the battery pack. In some countries with high oil prices, battery costs may come down to compete with internal combustion engines. However, as battery prices decrease, the cost of metals is likely to increase in line with demand, resulting in the raw materials' cost increasing to around $75/kWh (see the figure opposite top). This represents a floor price which will limit the competitiveness of batteries unless manufacturers can dramatically improve energy density (therefore reducing the amount of metals required).

Government policies

Government subsidies have, in some countries, helped to give massive upsurges in demand for BEVs. However, this has hit the treasury coffers twice: through the cost of subsidies, and in the loss of revenues from duties on fuels. It has been seen that the swift removal of such subsidies has resulted in an equally swift decline in sales. Addressing the budget balance (the UK generates $30 billion per annum from road taxes and duties) is one issue, but if governments are serious about EVs they need to be investing in the charging infrastructure not in subsidies.

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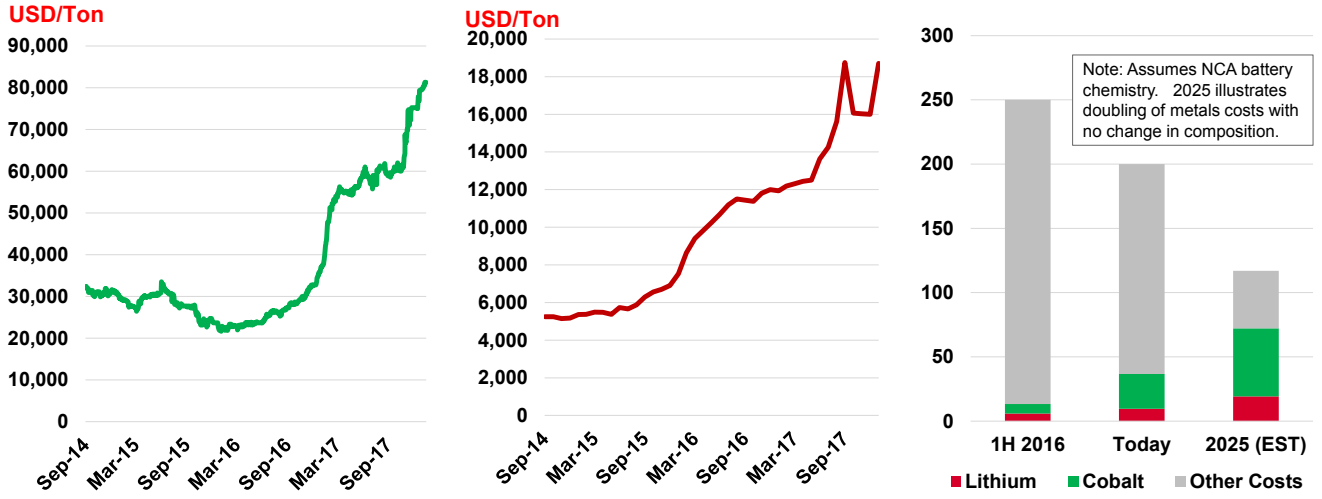
In reality, governments have become increasingly focused on air quality. Following the VW scandal, diesels have been marred by bad press. While old diesels have high NO_x and particulates emissions (damaging to health) it is worth noting that new Euro 6 diesels have emissions comparable to EVs. With less acceleration and being lighter (not carrying the battery weight), they also create less stirring up of road dust and less tyre and brake degradation. The debate on air quality should not be about new car sales but about removing the old fleet; scrappage schemes would have a far greater impact on air quality and fuel efficiency than any bans on internal combustion engines kicked down the road to 2040!

With new cars being much cleaner, the focus should move to the greenhouse gases (GHG) footprint – which would be greatly superior for EVs powered on 100 per cent renewables. However,

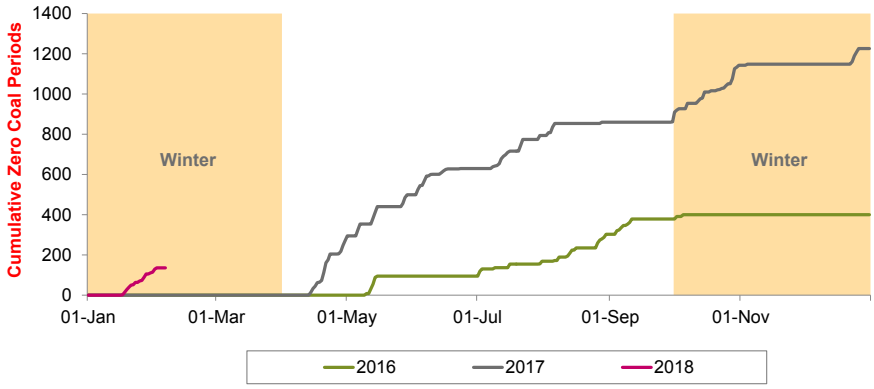


Global average LME cobalt cash price (left); global average lithium carbonate price (centre); battery pack price (USD/kWh) (right)

Source: S&P Global; MI/SNL; Platts.

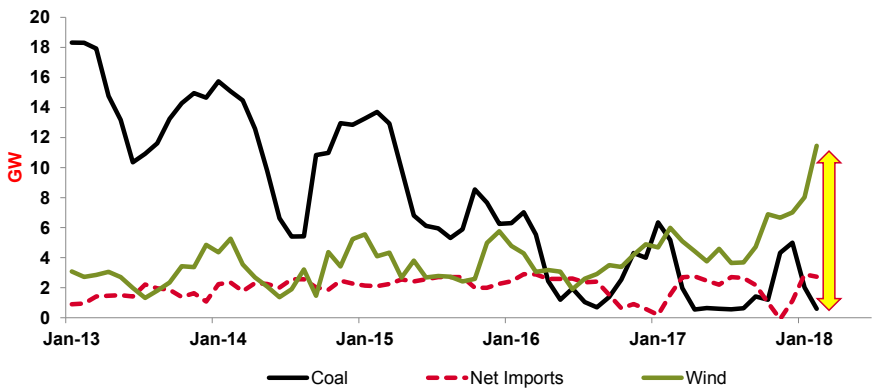
charging infrastructure and habits are unlikely to be conducive to taking advantage of renewable peak electricity production and may often pull 'dirty electrons' from marginal coal-generated electricity, resulting in a much higher CO_2 emissions/km than conventional vehicles. While the UK has had far more zero coal hours in 2017 than since coal generation was introduced, it has also seen generation peak at 8 GW in the same months, as it has been called on to export electricity to France due to nuclear outages (see figures to the right and overleaf). Therefore, governments must find ways to decarbonize the grid and find solutions to energy storage to manage the intermittency of renewable supply.

In places like China, where a larger proportion of car sales are to first-time buyers, the change may be far more dramatic especially as China Inc. sees the opportunity to leapfrog the technology and take the lead in the development of batteries, EVs and, furthermore, autonomous vehicles (AVs). The impact of the uptake of AVs is complex. Vehicle miles travelled are likely to increase, but quicker fleet turnover could hasten ultimate efficiency gains.



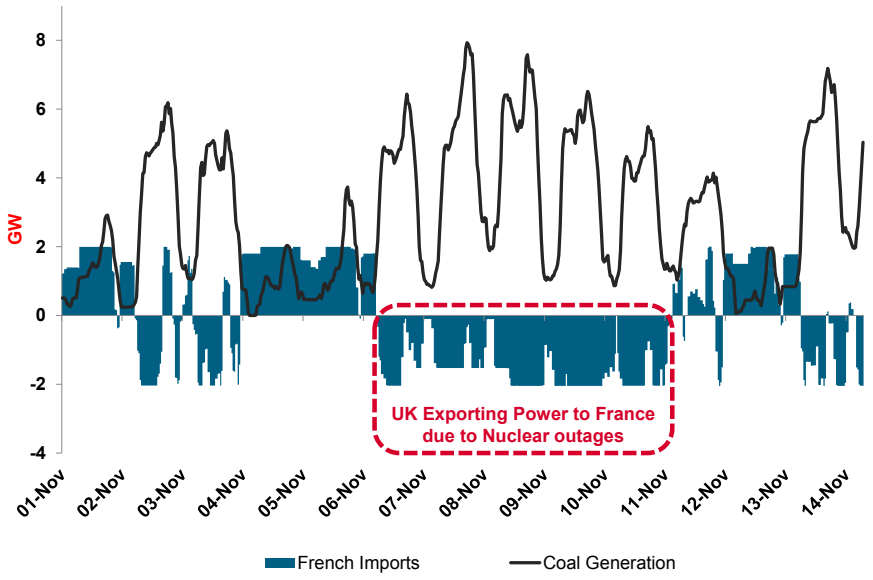
UK cumulative zero coal running periods by year

Source: S&P Global; MI/SNL; Platts.



UK monthly generation mix (GW)

Source: S&P Global; MI/SNL; Platts.



Coal helps fuel UK exports to France (November 2017)

Source: S&P Global; MI/SNL; Platts.

Future oil demand and alternatives

S&P Global Platts Analytics' projections are that oil production will have to increase in order to meet rising demand from road transport for years to come – from around 100 million b/d today to just under 125 million b/d in 2040 (under the S&P Global Platts Analytics 'most likely' reference case). Even with aggressive penetration of EVs it will take until late in the next decade before an inflection point in oil demand is observed, with most demand destruction in the next 10 years coming from fuel efficiency rather than EV displacement.

However, while all the focus is on passenger vehicles, we believe commercial road transport could be the game changer with faster turnover of the fleet. Heavy-duty trucks and long-distance coaches are infeasible for EVs and these travel the largest proportion of road miles in their sector. There are a number of options and pathways for this sector. Dual-fuel engines provide the opportunity to greatly improve efficiency – using diesel when the torque is needed to accelerate or go up hill, but using LNG, gasoline, or ethanol when cruising (most likely 85 per cent of the time). To get closer to zero emissions, the LNG or ethanol would need to be sourced from 100 per cent renewable sources, such as renewable natural gas from biodigestors/landfill and second-generation ethanol, which would be challenging.

'… OIL PRODUCTION WILL HAVE TO INCREASE IN ORDER TO MEET RISING DEMAND FROM ROAD TRANSPORT FOR YEARS TO COME …'

Alternatives for this sector could involve the use of fuel cells and hydrogen; this could become the biggest disruptor, not only enabling the commercial fleet to turn over quickly but also providing a clean option for passenger vehicles, and one which also has the benefits of range and fast recharging. Distributed hydrogen, produced at small scale in retail sites, could solve issues of distribution cost and energy storage by utilizing low-cost electrons during low-demand periods to produce the hydrogen. In a hydrogen mobility study by the Intistut für Elektrochemische Verfahrenstechnik (IEK-3), it was identified that hydrogen infrastructure would be cheaper once the passenger vehicle fleet hit one million – this would happen much faster if commercial road transport went first and retailers provided distributed solutions.

Other potentially significant disruptors could come in aviation and chemicals. Public and corporate pressure (moral regulation) may force airlines to decarbonize by using a drop-in (or straightforward replacement) fuel produced from renewable biofuels/gas or from a conversion of renewable power to liquid form. The rapidly rising awareness of the current plight of our oceans (caused by plastic waste) is encouraging increased corporate action (self-regulation) in the use of recycled plastics and reductions in packaging.

Conclusions

There is no denying that we are at the start of a transition. Big oil companies are already adapting rapidly by investing heavily into the production of cleaner fuels (including liquefied natural gas) and by installing charging points into their service station networks. Some are going a step further by investing in power generation, distribution, and battery storage. To achieve the objectives of the Paris Agreement, we are going to need to focus our minds not just on electric mobility but on more disruptive areas – including the other 80 per cent of oil demand!

(The data and analysis in this article is based on the author's article in Changing Lanes, recently published by S&P Global Platts.)