Electric Vehicles

Existing fuel market characteristics defining the demand impact of EVs

Background

Going into 2019, Electric Vehicles continue to emerge as a mainstream option for motorists in a growing number of markets. A raft of government incentives, increasing consumer confidence, and the apparent collective acceptance by the automotive industry that the future is at least partially electric continue to drive rapid growth in the sector. Accordingly, expectations are high for a significant shift in the make-up of the global vehicle fleet in the coming decades. However, for most outside the EV manufacturing industry itself, the importance of vehicle fleet electrification is not in the number of new vehicles being deployed, but in their effectiveness in reducing the environmental impact of the road transport sector, mainly in terms of local air pollution and contribution to climate change. Accordingly, while headline forecasts of Electric Vehicle deployment are important, an understanding of the extent to which these vehicles will succeed in reducing the consumption of petroleum-derived fuels – namely gasoline and diesel – is crucial for observers looking either at the outlook for oil markets, or seeking to determine the scale of future emissions.

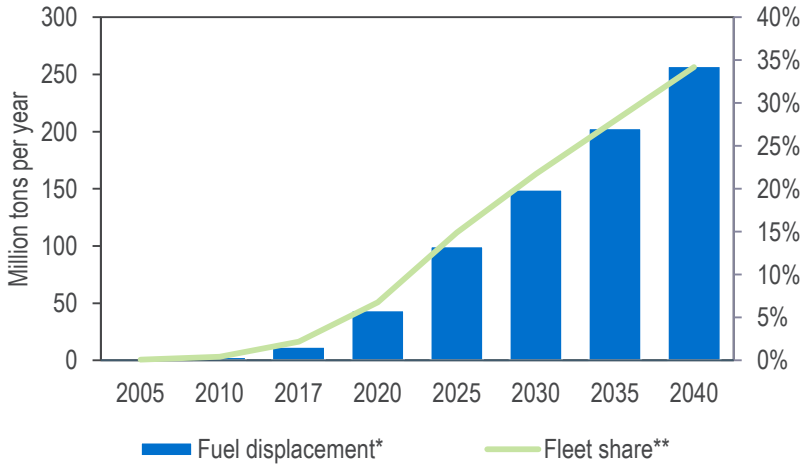
Global EV trend set to dampen gasoline demand growth to 2040

Under Nexant's base case scenario, fully or partially-electric passenger cars (including HEVs, BEVs, PHEVs and LSEVs*) are projected to account for almost 35 percent of the world's passenger cars by 2040. Growth is led by Asia, followed by North America and Western Europe.

These vehicles would displace around 250 million tons of gasoline demand from the market by the end of this forecast period, offsetting underlying transport market trends that would otherwise been likely to have fuelled strong market growth. EVs are also projected to displace diesel consumption, although their impact on global demand will be more limited.

EV passenger car fleet share & fuel displacement

(Nexant base case)



** Gasoline & diesel combined*

***HEVs, BEVs, PHEVs & LSEVS as % of global passenger car fleet*

**HEV: Conventional non plug-in hybrid cars, BEV: Battery Electric Vehicles, PHEV: Plug-In Hybrid Electric Vehicles; LSEV: Low Speed Electric Vehicles (battery-driven small cars used exclusively in China.*

Market characteristics drive disproportionate gasoline displacement in North America, diesel in Western Europe

Understanding the impact Electric Vehicles will have on refined product demand requires analysis of a range of factors beyond the immediate drivers of EV fleet growth. These include the mix of different EV types that are deployed in a given market, and that market's existing characteristics in terms of fuel intensity and product mix.

Electric Vehicles, in this analysis, include any powered road vehicles using an electric motor, either as a primary or secondary propulsion source. Hybrid HEVs are including in this group, on the grounds that they offer significant reductions in liquid fuel use compared to a conventional Internal Combustion Engine (ICE) car, even taking into account ongoing improvements in ICE efficiency.

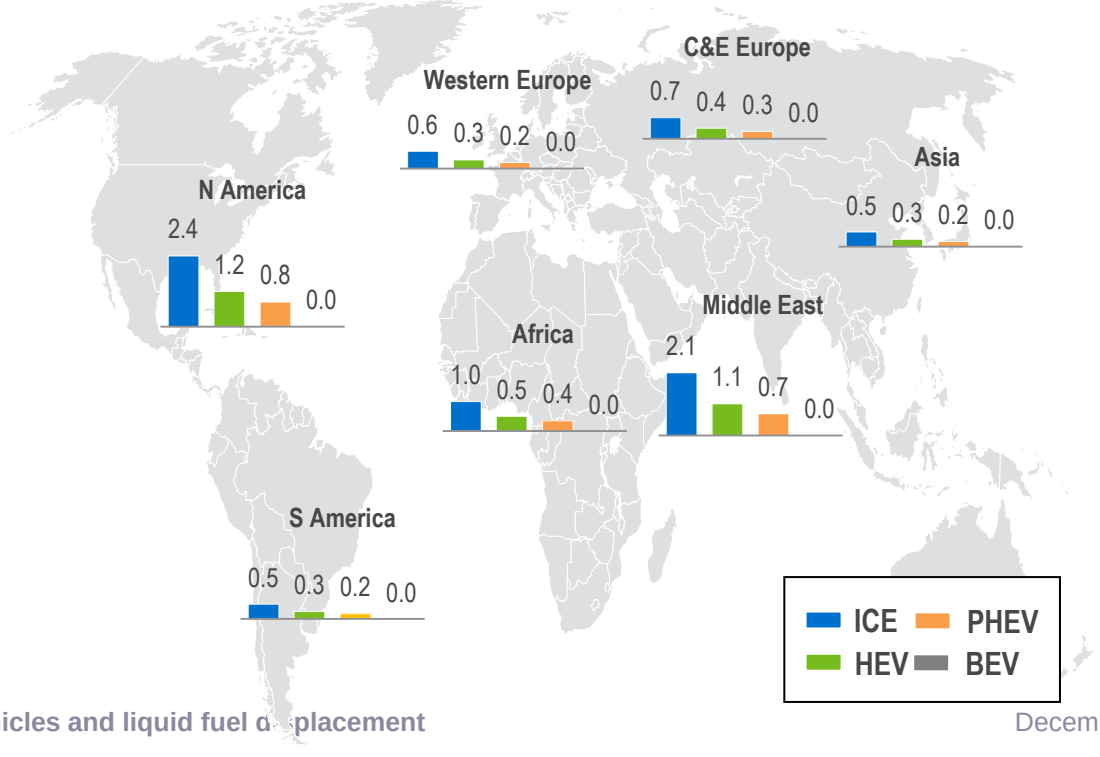
The extent to which different EV types will displace the full average ICE use of liquid fuel varies widely, as follows:

- HEVs are assumed to displace 50 percent of average ICE car fuel use
- PHEVs are assumed to displace 65 percent of average ICE car fuel use
- BEVs & LSEVS are assumed to displace 100 percent of average ICE car fuel use.

Accordingly, the amount of gasoline and diesel demand eliminated by EVs will vary widely, depending on the extent to which motorists choose either battery or hybrid cars. These choices will in part be directed by government incentives, investment in public EV charging infrastructure, the availability and competitiveness of new models, and competing gasoline or diesel prices. In the longer term, the emergence of newer EV types – notably electric buses, which are being deployed in various markets, and heavy trucks – have the potential to further shift the balance of EV fuel displacement, by replacing high mileage, high fuel consuming non passenger car diesel vehicles.

Of potentially greater impact than the eventual mix of EV types deployed in a given market is the existing situation regarding transport fuel use in that market. Simply put, an EV only affects gasoline or diesel demand by displacing an existing (or yet to exist) ICE car from the vehicle fleet. The higher the fuel use of an average ICE in a given market, the greater the volume of fuel that will be displaced by the replacement of that car by an EV. Estimated average per vehicle fuel use varies widely between different markets and regions, meaning that so does the potential for a new EV to contribute to reductions in fuel use and carbon emissions. These disparities are driven by many factors, but are led by fuel prices, often linked to taxation levels, as well as other factors driving average per vehicle mileage.

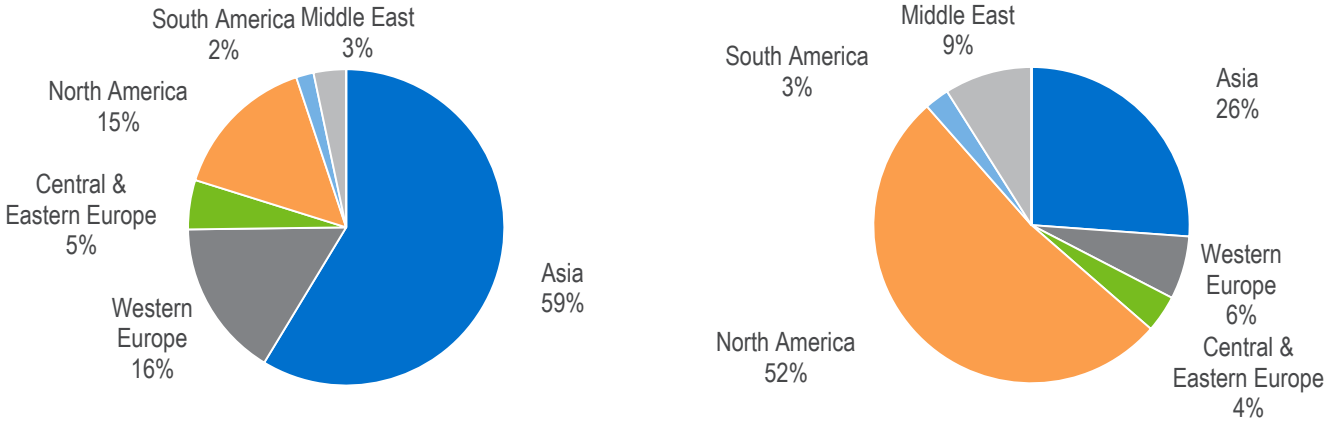
Average gasoline use by region *(estimated 2017; tons per passenger car per year)*



Although Asia will account for almost 60 percent of the word's passenger car EVs in 2040, under Nexant's base case analysis, the region will contribute only 26 percent of estimated global EV displacement of gasoline. Conversely, North America, with around 15 percent of the world's EVs in 2040, will contribute over half of global EV displacement of gasoline.

Electric Vehicles by Region **Electric Vehicle Gasoline Displacement by Region**

(HEVs, BEVs, PHEVs, LSEVS; 2040)



Another factor varying the impact of new EVs between markets is that of passenger car dieselization; in most markets, where gasoline is the dominant ICE fuel, new EVs will mainly displace gasoline cars, and therefore demand. However, in Western Europe, high rates of passenger fleet dieselization mean that new EVs will both diesel and gasoline cars. This potential is increased by recent public and regulatory concern over the public health impacts of diesel cars, with EVs having been seen in many quarters as a way to reduce these acknowledged impacts. As new diesel car sales drop off sharply in many of the most heavily dieselized markets, at the same time as attractive incentives on EVs are increasingly available, it is assumed that, in some parts of Western Europe, EVs will play a significant role in helping to "de-dieselize" the passenger car fleet. Accordingly, Western Europe is projected to account for the great majority of the global volume of road diesel demand displaced from the market by EVs in the coming decades although, as noted, this volume will be very much smaller than the gasoline consumption eliminated by EVs worldwide.

While such an outlook will undoubtedly help urban areas in Western Europe to reduce local air quality issues around diesel-related pollutants such as particulates, Nexant notes that the original environmental and commercial rationale for passenger car dieselisation still stands, namely the fact that diesel cars are more fuel efficient than gasoline cars. Keeping this fact in mind, while the recent scrutiny of diesel cars' impact on air pollution means that EVs in Europe are likely to disproportionately displace diesel cars, this may not be the most efficient means of reducing GHG emissions.

Summary

Whether observers are concerned with reducing carbon emissions from the transport sector, or with assessing the viability of current or planned refining assets, a detailed approach is key to understanding the potential for vehicle electrification to impact refined products demand. Nexant has developed detailed scenarios for individual market deployment of different EV types, resulting in projections for potential disruption by electrification of global refined product markets, which are presented in the special report "Vehicle electrification: Challenges & options for refiners in the face of structural change".

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