

## ELECTRIC VEHICLES



# Powering up

**What is the likely impact of electrification of vehicles in terms of energy demand, power requirements, timeline, and reshaping of the oil sector? Brian Davis reports.**

**E**lectric vehicles (EVs) will outsell diesel or petrol cars sooner or later. According to some experts it could be within a decade, and all agree that significant transformation of the transport market is on the close horizon. EVs that were once considered to be a niche market are set to become a central part of the strategy of virtually all major motor manufacturers, along with new entrants.

The drive for change is a mix of improving technology, rapidly falling battery costs and the call for improvement of air quality in numerous cities worldwide, as well as demands to cut carbon dioxide (CO<sub>2</sub>) emissions in line with COP21 targets. Batteries account for a third of the cost of an EV and prices are estimated to fall from \$240/kWh to \$100–\$160/kWh by 2035, depending on EV uptake.

There is no uniform view on the timeline for change. But in the

words of the Scouting movement it makes sense to 'be prepared' at all points of the value chain.

BP's latest *Energy Outlook 2035* forecasts growth in EVs over the next two decades from 1.2mn today to around 100mn by 2035 (6% of the global fleet). While the total global fleet is expected to double to 1.8bn by that date. Around a quarter of these EVs will be plug-in hybrids (PHEVs), which run on a mix of electric power and petrol or diesel, and three-quarters will be pure battery EVs.

According to analysis by Bloomberg New Energy Finance (BNEF), the 2020s will be the decade of the electric car. It forecasts that by 2040, long-range EVs will be cheaper than internal combustion engine (ICE) cars and cost less than \$22,000. Bloomberg predicts 35% of new cars worldwide will be electric. Today, plug-ins make up merely 1% of the car fleet.

There are plenty of new entrants to the EV market. The latest is Dyson, with plans to introduce an EV by 2020, following on the heels of Tesla, Volvo, Jaguar Land Rover, BMW and many others. Volvo and Jaguar Land Rover say all their new cars will be electrified from 2019 and 2020 respectively, well ahead of UK government plans to ban the sale of new conventional petrol and diesel cars and vans by 2040.

#### International plans

France, the UK, India, and Norway

have all announced plans to ditch petrol and diesel cars in favour of cleaner vehicles. France plans to ban petrol and diesel cars from 2040. The New Delhi government aspires that every vehicle sold in the country should be powered by electricity by 2030, in a bid to tackle the acute air quality problem in its main cities. Under the banner of the C40 Climate Leadership Group, 90 of the world's leading cities are focused on reducing greenhouse gas emissions in line with the COP21 agreement and cutting pollution in urban environments.

Furthermore, the average CO<sub>2</sub> target that carmakers in Europe will have to achieve is 95g/km CO<sub>2</sub> by 2021. According to the International Energy Agency (IEA), at least 10 other countries have set EV sales targets in place – Austria, China, Denmark, Germany, Ireland, Japan, the Netherlands, Portugal, South Korea and Spain. Today China accounts for more than 40% of the EVs sold worldwide. In addition, although the US doesn't have a federal policy, at least eight states including California have set out goals to promote the take-up of EVs.

BNEF predicts that by 2020, some of these EVs will cost less and perform better than their petrol or diesel counterparts, with long-range EVs in the \$30,000 range. Tesla's Model S outsells its competitors in the large luxury class in the US, while at the smaller end of the spectrum over 300,000 Nissan Leaf EVs have been sold worldwide.

BP makes the point that a key driver of the pace at which EVs will penetrate the global car fleet will be dictated by the extent to which fuel economy standards are tightened. EV penetration will also depend on a number of other factors including the pace at which battery costs continue to fall; the size and durability of subsidies and other government policies supporting EV ownership; consumer preferences, given the current cost differential of EVs; and the speed at which the efficiency of conventional vehicles improve. Consumer concern about air quality is considered an additional key driver for change.

The world currently consumes 95mn b/d of oil, with the global car fleet accounting for 19mn b/d – around one fifth of the total. Bloomberg estimates that EVs could displace oil demand of 2mn b/d as early as 2023.

Meanwhile, in the IEA's '450

Electric vehicles are set to form a significant foundation for a lower carbon future

Source: Electric Nation

Scenario' the agency assumes there will be 450mn EVs on the road by 2035, more than envisaged in BP's *Energy Outlook*. BP's Chief Economist Spencer Dale suggests: 'In this scenario, growth in oil demand would be almost 5mn b/d. This will dampen oil demand to some extent, but won't stop it increasing overall. Bearing in mind that 80% of oil demand comes from other parts of the transport sector and industry which are likely to continue to expand demand.'

BP also sees improved efficiency as a key factor, which could boost a typical car range from 30–35 mpg today to 50 mpg over the next 20 years, with a huge potential saving in oil consumption of up to 15mn b/d – compared to a prospective 1–5mn b/d drop in demand due to EVs.

EVs are set to form a significant foundation for a lower carbon future, but Dale maintains: 'It would be wise for us to pay as much attention to improving car efficiency and using more gas and less coal in power generation. These two factors could generate carbon savings many times greater over the next 20 years than those associated with the expansion of low carbon vehicles.'

Facts Global Energy forecasts that the majority of the world's cars will remain powered by petrol for at least the next two decades. The energy consultancy estimates that only 10% will be accounted for by electric cars and a further 20% by hybrids. This may sound conservative, given the volume of press reports about new EV launches and the enthusiasm around Tesla.

Many analysts forecast a structural decline in oil consumption. They point to the impact of government subsidies which play a large part in boosting EV sales today. In Norway, for example, it is common to buy an EV

in addition to a petrol car for daily use, to save money. The subsidy is important, given that sales of EVs in Denmark plunged 80% in 2016 from the previous year, when a similar incentive was removed.

#### Power changes

The National Grid's Future Energy Scenario predicts that all cars in the UK will be electric by 2050. Today there are 30mn cars in the UK, of which 100,000–300,000 are EVs or hybrids. Despite concerns in the press about the impact of plug-in cars and vans on power consumption, the National Grid says the growth in demand should be manageable.

Speaking at a recent conference on the 'Future of Transport Fuel' by the National Resources Forum, Marcus Stewart, Head of Energy Insight for the National Grid, said EVs are expected to add 35 TWh of demand by 2050 – just over 10% of today's demand. Meanwhile, non-transport demand (industrial, commercial, residential) is expected to rise by about 10%, from around 300 TWh today to 333 TWh by 2050.

'The issue is not how much energy is required, but when it is required and how it is charged,' he said. 'If there was an unconstrained charging profile, there would be an 18 GW increase on the current peak by 2050. But there would only be a 5 GW increase on the current peak if EVs were charged smartly to avoid peaks and troughs in power demand, such as when people return home between 5pm and 6pm.'

By 2030, EVs are expected to contribute about 3.5 GW to peak demand, a similar capacity to the new reactors being built at Hinkley Point. National Grid also acknowledges that car batteries could return power to the grid (as

highlighted in our sister publication *Energy World's*

November issue – see [bit.ly/2hDaFQ5](http://bit.ly/2hDaFQ5)). However, there is still debate whether it will be commercially viable to flow electricity from a vehicle back to the network to provide network services.

Erik Fairbairn, CEO of Europe's leading supplier of EV supply equipment POD Point is very bullish. He anticipates that: 'EVs will account for 90% of new car sales in Europe by 2030. There will be mass uptake, this is a very disruptive technology.'

Both the new generation of Nissan Leaf and Chevy Bolt will have about 200 miles range, which is considered plenty for most urban car use. EVs will also reach parity with the internal combustion engine (ICE) on whole life cost and eventually manufacture, as the EV is a significantly simpler device with 300 moving parts compared with 3,000 in the ICE, and battery cost is plummeting.

#### Tipping point

'Though electrification is still a very modest part of the car fleet today, the momentum of shift is inexorable and accelerating,' says Robert Turner, Partner at PwC. 'The oil industry accepts that a shift is happening and is seeking solutions to address the change downstream.'

New initiatives, like Shell's first installation of rapid charging points in several service stations in London, Surrey and Derby, signals a move in this direction. Turner suggests: 'The oil industry sees electrification as a disruptive technology and there is an increasing emphasis on new partnerships and joint ventures downstream, recognising the importance of the non-oil/convenience store offering in most sites.'

Indeed, some service stations make more from their sandwiches than the low margin on fuel. 'The majors see themselves selling mobility. At the moment that means petrol or diesel, but in due course could become electricity as well as the non-oil offerings,' says Turner. 'Maybe the longer charge time will be an opportunity to sell the customer more!' ●

Over 300,000 Nissan Leaf electric vehicles have been sold worldwide

Source: Nissan



Source: POD Point

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**Erik Fairbairn, CEO, POD Point**

