IEAGHG Information Paper 2017-IP42; Electric Cars Lead the Transport Charge

There have been a number of developments recently in the promotion of electric vehicles for urban transport.

Volvo recently announced its plans to phase out production of petrol cars and that every Volvo it launches from 2019 will have an electric motor[1].

In France, the new Government announced that it plans to end the sale of petrol and diesel cars by 2040[2]. French car manufacturers now have a period of time to adjust their manufacturing strategy like Volvo. France's reliance on nuclear power stations for 80% of its electricity supply, means that a shift to electric vehicles rather than oil-powered ones would dramatically cut its remaining carbon emissions. Green NGOs who view this announcement as France taking strong climate action following the Paris Agreement have welcomed the move. France has a desire to be carbon neutral by 2050.

Norway is the country with the highest market penetration per capita in the world, also the country with the largest plug-in electric segment market share of new car sales (29.1% in 2016) and, in March 2014, Norway became the first country where over 1 in every 100 passenger cars on the roads is a plug-in electric vehicle. The segment's market penetration climbed to 3% in December 2015, and achieved 5% at the end of 2016[3]. Norway has recently set a target of only allowing sales of 100% electric or plug-in hybrid cars by 2025.

The Times of India suggests that the Indian Government is looking to have an all-electric car fleet by 2030. This will help reduce India's balance of payments by reducing imported fuel costs and help improve air pollution in Indian cities[4].

Bloomberg New Energy Finance (BNEF) have recently produced a very bullish report on electric car sales. BNEF suggest that electric cars will outsell fossil-fuel powered vehicles within two decades as battery prices plunge[5]. The BENEF forecast says adoption of emission-free vehicles will happen more quickly than previously estimated because the cost of building cars is falling so fast. The seismic shift will see cars with a plug account for a third of the global auto fleet by 2040 and displace about 8 million barrels a day of oil production.

They also note that:

- Electricity consumption from EVs will grow to 1,800 terawatt-hours in 2040, or 5 percent of global power demand, from 6 terawatt-hours in 2016,
- Charging infrastructure will continue to be an issue with bottlenecks capping growth in key Chinese, U.S. and European markets emerging in the mid-2030s,
- The world may need the equivalent of 35 of the so-called Gigafactories as the one built by Tesla founder Elon Musk in Nevada[6] over the next 13 years to meet the power demands of electric cars, according to BNEF,
- Graphite demand will soar to 852,000 tons a year in 2030 from just 13,000 tons in 2015,

[1] www.media.volvocars.com/global/en-gb/media/pressreleases/210058/volvo-cars-to-go-all-electric
[2] www.theguardian.com/business/2017/jul/06/france-ban-petrol-diesel-cars-2040-emmanuel-macron-volvo
[3] https://en.wikipedia.org/wiki/Electric_car_use_by_country
[4] http://timesofindia.indiatimes.com/auto/miscellaneous/india-aiming-for-all-electric-car-fleet-by-2030-petrol-and-diesel-to-be-tanked/articleshow/58441171.cms
[5] https://www.bloomberg.com/news/articles/2017-07-06/the-electric-car-revolution-is-accelerating
[6] https://www.tesla.com/en_GB/gigafactory

- Nickel and aluminium demand will both see demand from EVs rise to about 327,000 tons a year from just 5,000 tons in 2015,
- Production of lithium, cobalt and manganese will each increase more than 100-fold,
- Electric cars are intrinsically cheaper than gas or oil fuelled cars because they're simpler and their maintenance is a lot easier.

BNEF also forecast that it will be the world's biggest economies - China, the U.S. and Europe - that will drive demand for battery powered cars over the next 25 years. These governments have already have been the most advanced in providing subsidies and installing charging points, will reap the benefits sooner than other emerging economies like India.

The Dutch Bank, ING, has also recently issued a report[7] that predicts, "*Electric cars are on a breakthrough, and even faster than we thought. The major reservations people still have – charging infrastructure, range anxiety and pricing – will be overcome within the next seven years*".

ING suggests that only electric passenger cars will be sold from 2035 onwards, according to their research estimation.

The National Grid in the UK has also picked up the power demand issue noted in the Bloomberg report. A dramatic growth in electric vehicles on Britain's roads could see peak electricity demand jump in the UK by more than the capacity of the Hinkley Point C nuclear power station by 2030, according to National Grid[8]. This is based on their prediction that the number of plug-in cars and vans could reach 9m by 2030, up from around 90,000 today. The impact of charging so many cars' batteries would be to reverse the trend in the UK in recent years of falling electricity demand, driven by energy efficiency measures such as better refrigerators and LED lighting.

If electric vehicles were not charged smartly to avoid peaks and troughs in power demand, such as when people return home between 5pm and 6pm, peak demand could be as much as 8GW higher in 2030, National Grid said. Shifting the charging of cars to times when demand is lower would reduce the extra peak demand to 3.5GW, a smaller amount but still a similar capacity to the new nuclear reactors being built at Hinkley Point in Somerset.

National Grid acknowledged the cars' batteries could also provide services and return power for the grid at a time when managing the network is becoming increasingly complex as variable sources of wind and solar power grow. However, there is still uncertainty over whether it will become commercially viable to flow electricity from a vehicle back onto the network to provide network services.

Summary

It does appear that there is a lot of political traction behind the deployment of electric vehicles around the globe for reasons that are not purely climate related. Electricity grids around the world have or are adapting to variable renewable electricity - electric vehicle charging represents yet another challenge that needs to be risen too.

From a climate perspective, reducing emissions from the light vehicle sector of the transport sector must welcomed.

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[7] https://www.ing.com/Newsroom/All-news/Electric-cars-will-take-over-threatening-European-car-industry.htm

[8] http://fes.nationalgrid.com/fes-document/

According to the IPCC in AR5 Greenhouse Gas (GHG) emissions from the transport sector have more than doubled since 1970, and have increased at a faster rate than any other energy end-use sector to reach 7.0 Gt CO_2eq in 2010; representing 23% of global greenhouse gas emissions. Around 80% of this increase has come from road vehicles. Greenhouse gas emissions from this sector primarily involve fossil fuels burned for road, rail, air, and marine transportation. Almost all (95% in 2010) of the world's transportation energy comes from petroleum-based fuels, largely gasoline and diesel.

The introduction of electric vehicles could curtail further increases in road transport sector emissions and then significantly cut emissions from the road transport sector, potentially by as high as 5.6GT/CO_2 per year. This, of course, assumes that the electricity supplied comes from low carbon or carbon neutral sources (renewables, nuclear and CCS). Building new unabated fossil fuel plants to meet the growth in electricity demand resulting from electric vehicle deployment will merely transfer emissions from the transport to the power sector and will not allow the Paris target of below 2^{o}C to be achieved.

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