WILL E-CARS CHARGE ON?

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All the euphoria about the demise of diesel and the rise of the e-car deserves a closer look, says Reinhold M. Karner.

The global trend setting European car industry would have had plenty of time to develop ecological and sustainable technologies in full throttle. For some reason it did not and instead focused on the interests of its shareholders, often being oil producers, maximising shareholder value. This has done them, us and the climate a disservice. The solutions we need so desperately are missing and they could have possibly existed already and in use today.

Let’s consider objectively speaking about the situation with the development of the propulsion technologies in the near future.

First, nitrogen oxides and fine dust. The emissions problem continues to be brought up time and again: carbon dioxide, nitrogen oxides and fine dust are the key culprits here. Of course, such emissions do not just stem from the internal combustion engines that our cars emit but also from domestic coal and fuel, manufacturing, aviation and shipping industries which all contribute massively to this pollution.

Moreover, perpetrators of the emissions in road transport also stem from the abrasion coming from tires and brakes - particularly in cities. This particulate matter also exists with e-cars. If you put an old Mini Cooper, first built in 1959, and the current Mini next to each other, you have the obvious evidence of the next pollutant: our demand for larger, heavier cars, which is becoming more obstructive in cities and parking, resulting in traffic and a general waste of space, known as space pollution.

Of course, engines need power - the more fuel an engine consumes, the higher the resulting emissions. Us consumers are increasingly demanding more powerful engines, yet have little regard for how engine displacement and power affect emissions. This despite the complete contradiction that the engine power gets ever larger and the achievable speeds in the day-to-day use are decreasing due to the increasing traffic density and speed limits. In fact, we actually need less power.

How is diesel rated nowadays? First off, in general, the diesel engine will be retained. This is because of the high level of diesel efficiency in trucks and excavators. Even modern diesel technologies, which meet the latest Euro 6-d-TEM standard specifications, will probably continue to exist. All the more thanks to the future developments and improved emission control systems. Therefore, diesel has a high probability to remain in service, especially in larger or heavy passenger cars. Also, a diesel engine consumes 15 per cent less petrol than petrol, which in turn benefits the global climate.

There’s another point: diesel engines now meet the nitrogen oxide limits of petrol engines, albeit costing more. Also, the highly equipped direct-injection petrol engines produce more ultrafine dust than its diesel counterpart. After all, more petrol engines on the road inevitably means higher carbon monoxide emissions versus the diesel engine counterpart.

Of course, we need alternatives, not just for the sake of the environment, but also for energy diversity for the transmission industry and its need to move away from oil-dependency. Diesel itself, at least the most modern versions, should not be demonised. Having said that, it also should not be a credo for diesel, as petrol in general is still better off with regards to emissions. True that there is a serious problem with older diesel engines. And retrofits, even for Euro 5 with existing particulate filters, are considered sceptical for several reasons. However, carmakers like Fiat and Toyota have already announced their departure away from diesel production and sales in the future. Volvo will undergo a full conversion to electric from 2019. The entire industry is thus focusing on the electric car.

However it is important to understand the differences. Which car are we talking about? A purely accumulator-based one and therefore only rechargeable at the recharging unit, a battery only electric vehicle, a plug in hybrid car which operates in addition to an internal combustion engine also with a rechargeable battery based electric drive that is rechargeable at the charging station via power supply, a hybrid vehicle that changes their battery partly or totally via the combustion engine, or cars which partially rely and change energy via brake energy?

The big question is, where does the current electric energy come from? Because even the still very expensive lithium ion battery ultimately generates electrical energy. At first, it sounds quite tempting to believe that there is currently no more efficient way to generate electricity than electric. Let’s look at the numbers. To get a mechanical kilowatt hour into a vehicle, just 1.4 kilowatt hours are needed from for example a photovoltaic power station. A loss of only 30 per cent of energy to the wheel is considered to be extremely low. The problems lies elsewhere. Generally speaking, an electric car boom would make electricity more expensive.

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Between desire and reality...
Increasing the energy capacity evolves at a small’s pace. One can only look at the many challenges of high-voltage transmission lines in the financially strong country of Germany. The Norwegian example shows the electric car hype is not a thoroughly thought through revolution. In that sense, in the long term, only a technology with hydrogen will really solve our problems around clean energy and energy storage sustainably. In light of this, it is understandable why Toyota and Hyundai has offered for quite some time hydrogen vehicles and remain undeterred in their strategy to continue to invest heavily in this technology.

The problem with hydrogen is that an electric vehicle with a fuel cell for hydrogen consumes about twice as much output power as a battery-based electric car. Fuel cells are different from batteries in requiring a continuous source of fuel and oxygen (usually from the ambient air) to sustain the chemical reaction for producing electricity. As long as the energy for liquid or gaseous hydrogen production and hydrogen distribution network is expensive, it is impossible to use hydrogen fuel cell cars on a large scale.

With this technology solution one could for example predominantly drive in cities – where such a hydrogen gas service station network would be easier and cheaper to set up – and hereby largely reduce emissions and still use petrol for a long range trips.

As a welcomed side-effect, the automotive supply industry would not be in such dire straits, particularly because a car with an internal combustion engine consists of around 2,500 parts, but an electric car is well below 1,000 parts. A car’s internal combustion engine consists of around 2,500 parts, whereas that of an electric is around 17 years, whereas that of an electric car is probably half that. This is due to more electronics and the need for faster recycling process or a pollutive disposal follows. At best, there could be an intermediate stage, where the precious resources found in these batteries can continuously be cycled. Another challenge for the e-car lies in waiting: the average lifespan of a car with a combustion engine is around 17 years, whereas that of an electric car is probably half that. This is due to more electronics and the need for faster technology updates. As a result, significantly more new electric vehicles must be produced to sustain the demand.

That may make the car industry happy, but it is hardly sustainable. According to BP Energy Outlook 2018, the number of cars will double by 2040 to around two billion, particularly due to the rising prosperity in developing economies; the current number of 84 million new vehicles produced per year will increase to an estimated 100 million by the year 2030.

Finally, imagine that almost every used e-car has to park several hours at a charging station on a daily basis. Here the question arises of whether our power grids and plants have the capacity to withstand this gigantic increase in energy demand. In Norway, the country with the largest electric cars market share worldwide, thanks to government funding, the electricity motors lobby advised the general public not to purchase e-cars since September 2017, unless one would have a charging station at home. This caused an energy capacity problem.