Electric Vehicles Storage Technologies and Range

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Introduction

Within 8 years all cars sold will be electric and autonomous. This is the view of notewa-able futurist Tony Seba from Stanford University. Not everyone agrees of course, with BP estimating that only 6% of the global car fleet will be electric by 2030, equivalent to 100 million vehicles. To consider the validity of these predictions and hence impacts on electricity grids, it is useful to look at how battery electric vehicles (BEV) compare to internal combustion engine vehicles (ICE) and hydrogen fuel cell vehicles (HFC). The prediction from Tony Seba is based on an exponential uptake of autonomous BEVs, a trend that has resulted in sales of BEVs increasing from 17,000 in 2011, to 780,000 in 2016, Figure 1.

Energy Storage

Recently improvements have slowed and Li-ion battery energy density still lags petrol by a factor of 30. The effective range density of BEVs is only 7 times lower however, due to the more efficient motors and regenerative braking. Figure 2.

Autonomous Advantage

Fully autonomous vehicles may increase the usage of vehicles by a factor of ten, making the marginal cost of vehicles the primary consideration. Autonomous driving is a lot closer than many realise – a large number of cars are already able to drive themselves in a range of conditions. Autonomous vehicles have safety advantages over human driven vehicles, including far more sensors, sensors that are constantly vigilant, and a computer dedicated to the task of driving. Figure 6.

Conclusions

BEVs loom as the only technology that can simultaneously reduce greenhouse gas and small particulate emissions. They will provide lower maintenance and fuel costs, particularly if full autonomy is achieved. Whether this transition is complete by 2025 remains to be seen, but BEVs appear set to dominate car sales in the near future.