Assessment of electric vehicle projections and infrastructure

Executive Summary

Historical Traffic Trends

Over the past 20 years, the national mileage has been steadily increasing[1,2], but did experience a significant decrease in 2008, most likely due to the financial crisis. Vehicle types were each affected differently due to financial crisis, with bicycles seeing a large increase, but buses and coaches a large decrease in mileage.

30 Year Mileage Predictions

Using a SARIMAX forecasting model, the 2050 mileage was predicted to be just over 550 billion miles, however this predicted is flawed in that it extrapolates over a larger time period than we have historical data for, making it unreliable.

30 Year Electric Vehicle Mileage Predictions

Electric vehicle (EV) mileage is affected by various factors, including the availability of charging points[5], cost[5,13] and general population increases[5]. The Climate Change Committee[4] predicts 55% of all vehicles will be electric by 2032, and 100% by 2050, which when combined with Accenture's prediction[3] of exponential EV growth up to 2040 informed by mileage prediction. *Figure 1* presents the mileage prediction, which has been calculated from predicted EV numbers under the assumption of the average vehicle mileage remaining at 9.4km/year, with mileage at 225 billion miles by 2050. *Figure 2* shows the predicted annual energy consumption, calculated from the above mileage assuming EV energy efficiency remains as the current average of 0.3kWh/mile[6]. Energy consumption is predicted to reach 155TWh by 2050, with 125TWh from cars and taxis – 25% more than the National Grid's 100TWh prediction[7].

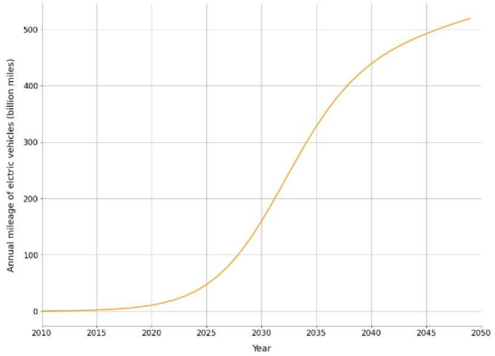

Figure 1 – *Annual EV mileage prediction*

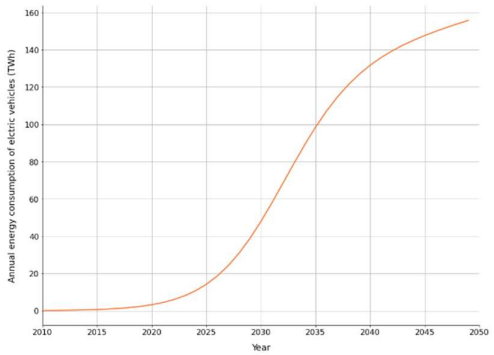

Figure 2– *Annual EV energy consumption prediction*

Energy Generation Strategies

EV charging could push the time of peak energy demand from 5.30pm[7] to during the night, energy generation technologies need to be able to cope with this shift. To reduce the magnitude of peak demand, smart charger could be used[7]. Solar is the cheapest technology[9] but would be unable to generate energy at night, so the best option would be to use large-scale wind power for a more consistent power generation[7]. However, to account for the unreliability of wind power, the high storage capability of nuclear power should be incorporated[7], bridging the supply shortfall during peak demand.

References

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