

Case Study 2: Executive Summary of Electric Vehicle Support Infrastructure

Basic analysis

The data was gathered from the Raw count data - major and minor roads in Road traffic statistics (Department of Transport) [1]. After pre-processing and summarising the traffic data across UK's region for the years 2000 to 2020, it is observed that cars and taxis had the highest total millage, with the highest recorded millage region being in the South-East part of the UK. For the annual millage recorded for all motor vehicles category, there is an overall decrease between 2009 to 2020, and a massive drop in the millage in the year 2020. The reason for this big drop is that during this time, the COVID-19 lockdown was imposed, and people were encouraged not to travel to the UK[2,3].

Regression

A basic regression model is not sufficient in creating an accurate forecasted prediction. By using the Prophet model, which is widely used by Facebook for producing reliable forecasts[4], I was able to accurately forecast my data and extrapolate the results for the next 30 years. Predicting a logistic decrease in millage through this timeline, the total millage in all motor vehicles would decrease from 300 million in 2020 to around 50 million miles in 2050. Some systematic factors are included in this forecast, where the minimum limit is set to 0, and the maximum value is set to around 300 million. This regression model is unable to take into account other external factors that could have a significant impact on the results.

Research

Under the Road traffic forecast 2018 [5], the UK government plans to shift all vehicles to Zero-emission vehicles over the next 30 years. Within this change, there are many plans created in an attempt to encourage people in making this switch. This includes factors such as reducing the cost of buying and maintaining EVs through grants, adding more charging stations, increasing the number of parking spaces for electric vehicles etc. With the estimate that 97% of the total mileage will be electric in 2050[5] and the average EV energy consumption of 314 Wh/mi [6], an estimate of the electricity demand for electric vehicles over the next 30-year period has been calculated. By observing the Supply and Demand [7] of the UK's electricity, the margin and the additional electricity required to meet this demand have been calculated. The forecast has also been compared with an independent estimate.

Recommendations

The BEIS electricity generation cost report (2020)[8] estimates the next 20 year period and accounts for the time-of-day charging demands and the region's optimal technology implementations. An optimal recommendation for these technologies has been suggested to cover the additional energy demand with the lowest possible cost: 35% offshore wind, 25% onshore wind, 25% Combine Cycle Gas Turbine + Carbon Capture Storage and 15% Large-Scale Solar. Recommendation costs to cover additional energy requirements for the year 2040 in every region would require an average of £358 million.

References

- [1] Road traffic statistics - Download data n.d. <https://roadtraffic.dft.gov.uk/downloads> (accessed April 24, 2022).
- [2] Baker C, Kirk-Wade E, Brown J, Barber S. Coronavirus: A history of English lockdown laws 2022.
- [3] When did lockdown begin in the UK? Full Fact 14:21:17+00:00. <https://fullfact.org/health/coronavirus-lockdown-hancock-claim/> (accessed April 24, 2022).
- [4] Prophet. Prophet n.d. <http://facebook.github.io/prophet/> (accessed April 24, 2022).
- [5] Road traffic forecasts 2018. GOVUK n.d. <https://www.gov.uk/government/publications/road-traffic-forecasts-2018> (accessed April 24, 2022).
- [6] EV Database. EV Database n.d. <https://ev-database.uk/cheatsheet/energy-consumption-electric-car> (accessed April 24, 2022).
- [7] Digest of UK Energy Statistics (DUKES): electricity. GOVUK n.d. <https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes> (accessed April 24, 2022).
- [8] Energy generation cost projections. GOVUK n.d. <https://www.gov.uk/government/collections/energy-generation-cost-projections> (accessed April 24, 2022).