

# Executive Summary

## Electric Vehicle Support Infrastructure

### Basic Analysis

The AADF data for major and minor roads for the years 2000-2019 was used for the analysis. [1] The data had considerable null values, which involved data cleaning by removing the minor roads which did not contain their length values followed by calculating the annual miles. [2] Looking at the annual mileage per region, the South East region maintained the highest annual mileage to about 37.5 billion miles in 2019. In case of annual miles per vehicle type, cars and taxis prevailed much higher at about 160 billion miles in 2019. The total annual miles have steadily increased from 2000 to 2019 except for a dip during 2008-2012 which can be assumed due to the economic crisis.

### Regression

ARIMA model was chosen as the regression model since the data was in the form of a time series. ARIMA model is one of the most robust methods for time series forecasting since it uses past trends to predict the future forecast efficiently. After extrapolating the forecast of annual miles for the next 30 years, it was estimated to be about 287 billion miles by the year 2050. However, there are some potential limits to be considered using the ARIMA model which is that it does not include external factors into consideration which might affect the annual miles in the future.

### Research

The percentage of electric vehicles is predicted to rise to 97% by the year 2050. [3] Considering the fact that an average electric vehicle uses 314 Wh/mi [4], this means that electric vehicles will need up to 87.5 TWhr energy by the year 2050 to sustain the number of electric vehicles. UK's electricity demand for the year 2020 was 330 TWhr. [5] UK's electricity supply is also 330 TWhr, where 312 TWhr was generated from UK and remaining was net imports. Since UK matches its supply with its demand exactly, the energy supply needed for electric vehicles in 2050 is the same as that of the demand. Which means that the additional energy required for electric vehicles in 2050 is 87.5 TWhr itself.

### Recommendation

With the use of BEIS levelized technology estimates [6] we can estimate the £/MWh required to build different varieties of energy sources for the year 2040. We can infer that solar energy is the most cost efficient followed by offshore wind and onshore wind. CCGT H class was seen to be the least cost efficient.

However, we need to consider other factors into consideration. Since UK does not have very reliable sunlight, we cannot rely solely on solar energy. Since offshore wind cost efficiency is predicted to be lower by 2040 and offshore winds provide more energy than the onshore counter parts, offshore energy was chosen to be the primary contributor. [7] CCGT H class should be completely eliminated because of low-cost efficiency as well as for global warming reasons, but CCGT+CCS can be used but in smaller amounts because of its higher efficiency. Thus, a ratio of 35% Offshore wind, 20% Onshore wind, 20% Solar, and 15% CCGT+CCS was chosen for the additional energy requirement for electric vehicles in the year 2050.

# Bibliography

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