# Executive Summary
# Electric Vehicle Support Infrastructure
# Case Study 2

## Basic Analysis

The data analysed for the completion of the further tasks was gathered from the Regional Traffic dataset. [1] After cleaning and trimming the data we got information regarding traffic figures across UK's region for the years 2000 to 2019. Summarizing the raw data, we have observed that through this time period Cars and Taxis had the highest total millage growth with the highest recorded millage being in the South East region. For the annual millage recorded for all motor vehicles we saw a 23.5% overall increase however through 2007 up to 2014 there was a large dip in the annual millage with the probable cause being that the Fuel prices for both petrol and diesel had increased drastically within this time period. [2]

## Regression

Common regression models would not have been suitable in creating good, forecasted results. Choosing the Autoregressive Integrated Moving Average (ARIMA) model being one of most widely used approaches to time series forecasting I was able to analyse the trends and residuals of my data and extrapolate forecasted results for the next 30 years. Predicting a linear increase in millage through this period with a total millage for the year 2050 to increase at around 483 billion vehicle miles. Some potential limits to be considered when using results from this regression analysis is that the model is unable to take into account other external factors that could have a significant impact to the results.

## Research

As UK plans to shift to Zero emission vehicles over the next 30 years there are several factors to incentivise people in making this switch. Factors such as making the availability, affordability and accessibility of owning an electric vehicle better for everyone with other government supporting factors such as established policies, targets and grants. With estimates predicting that over the year 2050 over 97% of the total millage will be electric [3] Considering the electric millage with an average energy consumption of 306 Wh/mi [4] we calculated an estimate on the electricity demand of electric vehicles over the next 30-year period. Then by observing the Supply [5] and Demand [6] of UK's electricity we calculated the margin and found how much additional electricity they would require for this additional demand, comparing it to other independent estimates.

## Recommendation

Finally, using BEIS Levelized technology estimates [7] for the next 20-year period and accounting for time-of-day charging demands [8] and region-specific optimal technology implementations we have created an optimal recommendation on the technologies that should be used to cover the additional energy demand at the lowest possible cost. With 35% offshore wind, 25% onshore wind, 25% Combine Cycle Gas Turbine + Carbon Capture Storage and 15% Large-Scale Solar. We then calculated that for the year 2040, it would cost each region to cover electricity demands using these technologies and amounts an average of 430 billion pounds.

# Bibliography


[1] Roadtraffic.dft.gov.uk. 2019. *Road traffic statistics - Download data*. [online] Available at: https://roadtraffic.dft.gov.uk/downloads [Accessed 16 April 2021].

[2] Mynewsdesk. 2018. *UK petrol and diesel pump prices over time*. [online] Available at: https://media.rac.co.uk/blog_posts/average-uk-petrol-and-diesel-prices-over-time-72742 [Accessed 16 April 2021].

[3] Assets.publishing.service.gov.uk. 2018. *Road Traffic Forecasts 2018*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/873929/road-traffic-forecasts-2018-document.pdf (p. 42) [Accessed 16 April 2021].

[4] EV Database. 2021. *EV Database*. [online] Available at: https://ev-database.uk/cheatsheet/energy-consumption-electric-car [Accessed 16 April 2021].

[5] Assets.publishing.service.gov.uk. 2020. *Chapter 5 Electricity*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904805/DUKES_2020_Chapter_5.pdf (p. 3) (Chart 5.1) [Accessed 16 April 2021].

[6] Assets.publishing.service.gov.uk. 2020. *Chapter 5 Electricity*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904805/DUKES_2020_Chapter_5.pdf (p. 6) (Chart 5.3) [Accessed 16 April 2021].

[7] Assets.publishing.service.gov.uk. 2020. *ELECTRICITY GENERATION COSTS 2020*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911817/electricity-generation-cost-report-2020.pdf (p.35) [Accessed 16 April 2021].

[8] Nationalgrideso.com. 2019. *Future Energy Scenarios*. [online] Available at: https://www.nationalgrideso.com/document/170756/download (p. 91) (Figure 4.28) [Accessed 16 April 2021].