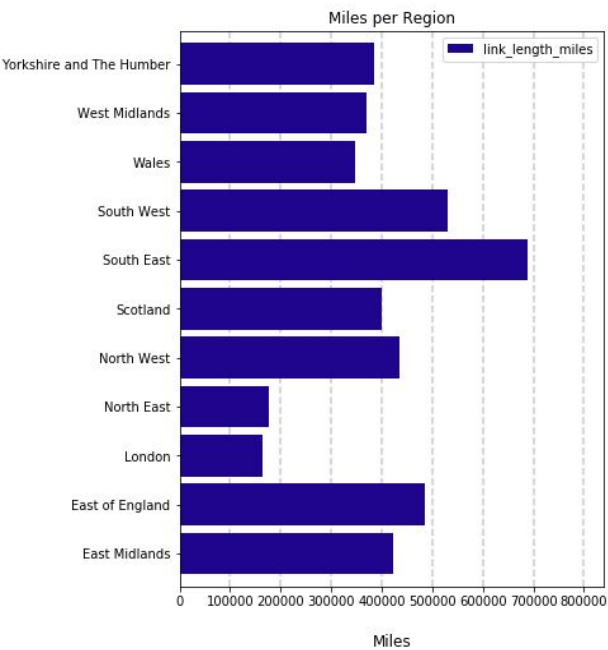


# Electric Vehicles

## Executive Summary

Electric vehicles (EVs) have displayed promising opportunities for the UK to reduce greenhouse gas emissions and become a leading distributor in the automotive sector. If they aim to remain a major player in the global market and achieve a net zero goal by 2050 <sup>(1)</sup> it must shift away from internal combustion engines (ICE) to zero emission vehicles. That said, there are many challenges that arise with this transition such as charging infrastructure, battery capacities, EV costs and most importantly how the UK will manage increased electricity demands. These challenges pivot around the focal message of this report; how can the UK increase the number of EVs on the road whilst simultaneously investing in and developing an electrical infrastructure - both of which are contingent upon each other.

Using statistics from the UK Government website<sup>(2)</sup> we reviewed the average mileage usage of all vehicles across the UK and found that South East had the highest volume, conversely London had the lowest which was anticipated given its mass-transit presence. Additionally when analyzing mileage trends we observed a steady decline over the last 15 years (~ 4% from 2003 to 2018). If EVs were to replace ICE vehicles the mileage expenditure is anticipated to remain the same. If this is the case the UK's current electricity grid will not be able to maintain the EV infrastructure, let alone reach a 2050 net zero goal.



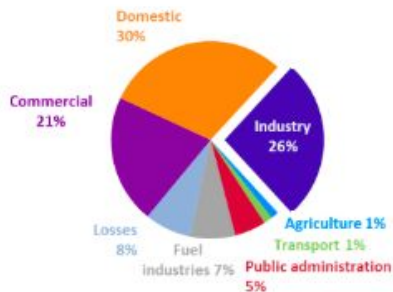
## Electrical Capacity

A mileage comparison was conducted between miles and kWh to forecast and predict the UK's capacity requirements to maintain a sustainable growth model for EVs over the next 10 years. The key findings were:

- Forecasted ICE vehicle mileage far surpassed the current UK electricity capacity (2018 - 2028)
- **1%** UK capacity accounts for Transport which means mileage still surpassed UK's current and forecasted capacity
- **7-8%** growth of electrical capacity, over the next 10 years, is required to maintain EV infrastructure

## Proposed Generative Technologies

Analyzing Consistent time-series data (2003 to 2018) for Regional and Local Authority that covers the amount of generation capacity and sites of generative technologies we identified Hydro, Solar PV, Offshore and Onshore Wind to be the predominant resource technologies throughout the UK. Implementing a cost minimizing algorithm we then identified that **onshore wind turbine farms** are the most cost effective at ~50% the cost of offshore wind turbine farms. Additionally **Scotland** was found to be the optimal location for new onshore wind turbine farms.



(1) Electric vehicles: driving the transition Fourteenth Report of Session 2017-19 HC 383. (n.d.). [online] Available at: <https://publications.parliament.uk/pa/cm201719/cmselect/cmbeis/383/383.pdf>.

(2) roadtraffic.dft.gov.uk. (n.d.). Map Road traffic statistics - Road traffic statistics. [online] Available at: <https://www.dft.gov.uk/traffic-counts/> [Accessed 17 May 2020].

(3) GOV.UK. (n.d.). Regional Renewable Statistics. [online] Available at: <https://www.gov.uk/government/statistics/regional-renewable-statistics> [Accessed 16 May 2020].