Modelling the Electrification of Royal Mail's Diesel Van Fleet.

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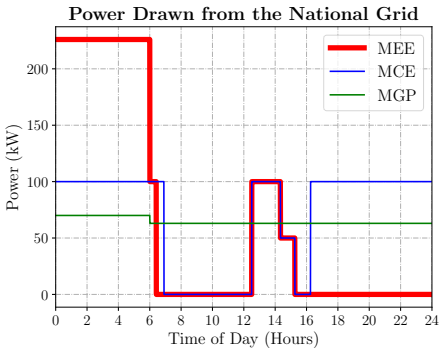
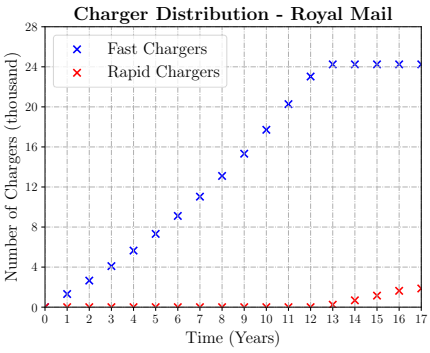
1. The Problem

Royal Mail are a UK based postal service that use small diesel-powered vans to deliver post. To reduce their CO_2 emissions, they are aiming to replace their 37,300 strong diesel fleet with an electrically powered one. Not only are electric vehicles better for the environment, they cost less to maintain and run, cutting Royal Mail's delivery costs. As the number of vans to be replaced is fixed at a minimum of 37,300, the type of charger and time of day when charging are the variables to model. The two types of charger available are fast chargers and rapid chargers. The former takes approximately 6 hours to charge an electric vehicle and costs around £1,000 (including installation). This compares to the rapid chargers that take around 40 minutes to charge a vehicle but cost 15 times more.

2. Charger Implementation





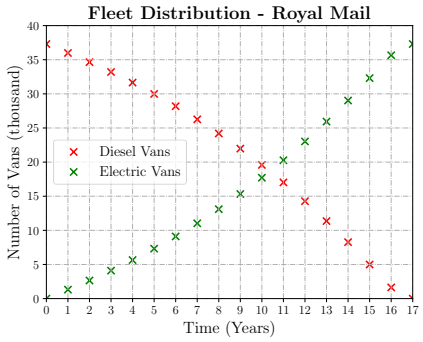
Three models were created:

- **MEE - minimising electricity expenditure.** Uses a combination of fast and rapid chargers to lower electricity costs.
- **MCE - minimising charger expenditure.** Only uses rapid chargers.
- **MGP - minimising grid power.** Increases number of electric vehicles as opposed to increasing number of chargers - more expensive but requires less electricity from National Grid.

Power graph: MEE model takes advantage of Economy 7 - uses electricity at low demand times.
Charger graph: Distribution of charger type needed for 17 year replacement period.

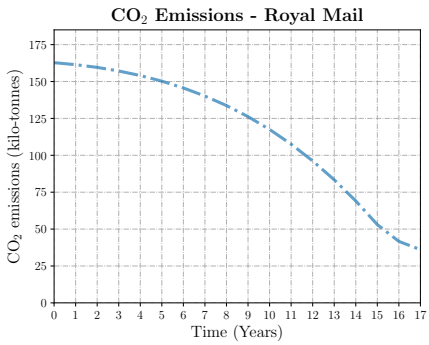
All figures use the minimises electricity expenditure model (MEE) and are for the entire fleet of small delivery vans.

3. Fleet Distribution



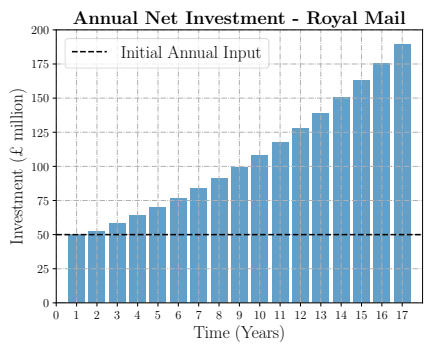
- Assumes current fleet has no electric vans.
- Total number of electric vans (in thousands) increases inversely proportionally to number of diesel vans left in the fleet.
- Over 50% of fleet will be converted to electric vans by year 11.

4. Carbon Dioxide



- Royal Mail's CO_2 emissions from small delivery vans, diesel and electric combined.
- Reduction over 17 year period.

5. Annual Net Investments



- Royal Mail inject £50million/year as initial annual budget for project.
- Savings added to budget each year.

6. Royal Mail Electric Vans

Royal Mail Electric Delivery Vans.

Electric Van Charging Process.

7. Royal Mail Electric Vans

Royal Mail Electric Delivery Vans.

8. Conclusions

The conclusions of the chosen MEE model are:

- It is possible for Royal Mail to convert their entire fleet of small delivery vans in 17 years. This gives Royal Mail 13 years to start this process before the 2050 zero emissions deadline put in place by the UK government.
- The 13 years also allows Royal Mail to adapt the investment model for unforeseen circumstances such as the current COVID-19 pandemic.
- The figures for the MEE model given only show one optimal solution, however the other two models may provide better results for Royal Mail depending on their priorities for this project.