

Influence of temperature on consumption of electric bus.

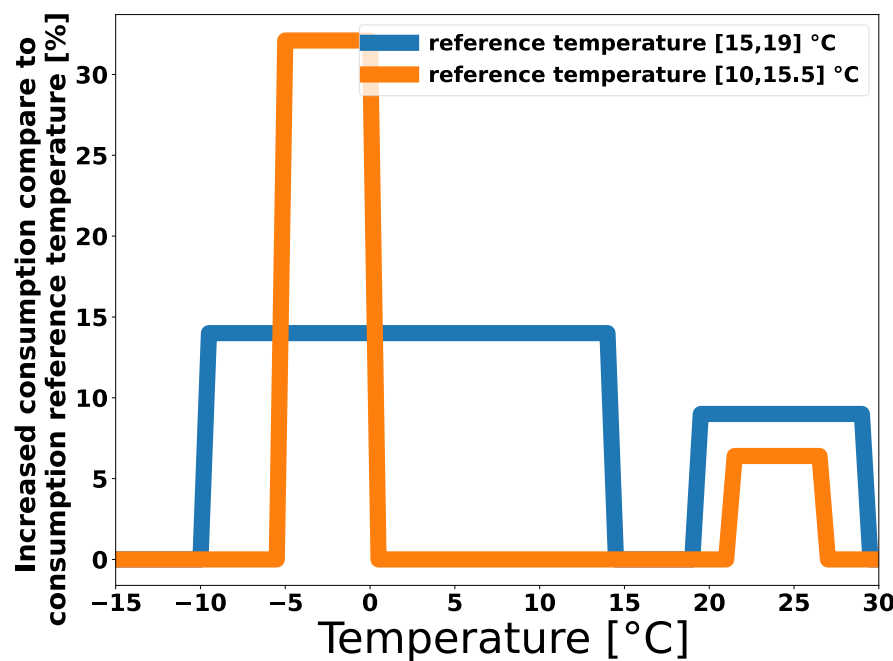
Analysis of the case with midibuses in Brussels

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Abstract— Being able to predict the energy consumption in an accurate way is key for the bus operators, and valuable for the energy utilities and flexibility operators. Multiple variables influences the energy consumption such as the route, passenger load, driving conditions and the temperature. This article focuses on the influences of temperature and is based on measurements taken in Brussels, by STIB/MIVB (the local bus operator) at an interval of 5 seconds from January to mid-April 2022 and June 2021. The results obtained in this study is that at 2.5 °C the energy consumption for a round trip increases by 16% and at 25 °C increases by 30% compared to the lowest energy consumption registered at a reference temperature of 12 °C.

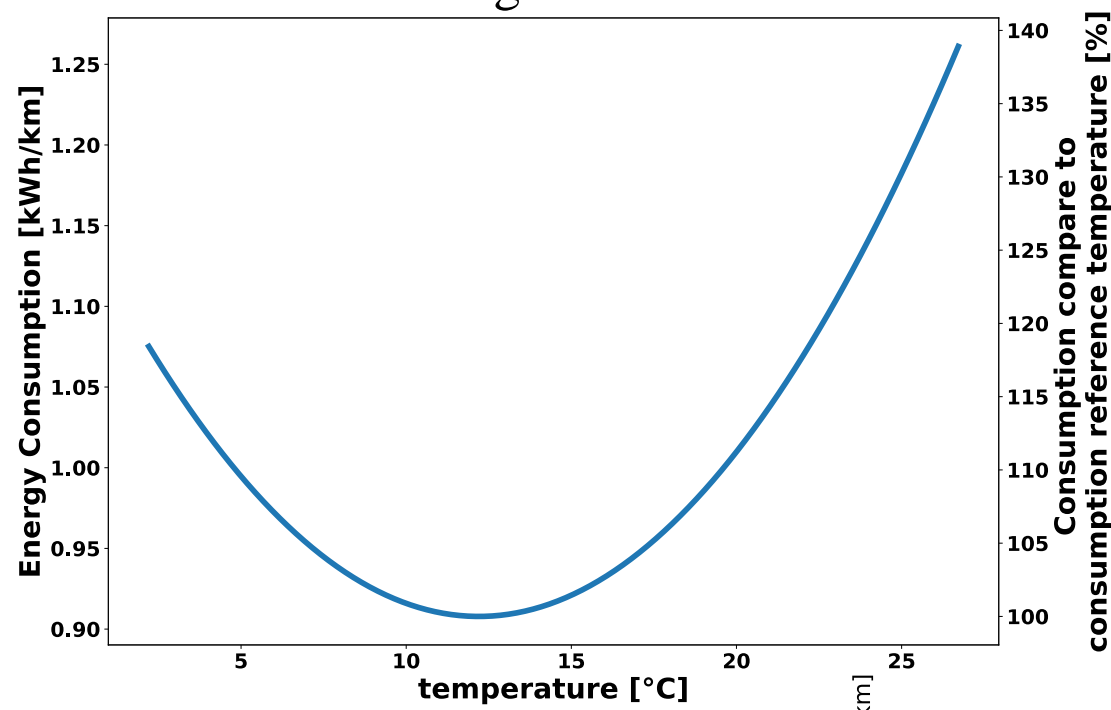
I. Data from the literature



Values are only provided in temperature ranges of daily average temperature classified in cold, reference temperature and hot conditions. Aim is to be more precise and identify the trend

III. Climate Modelling

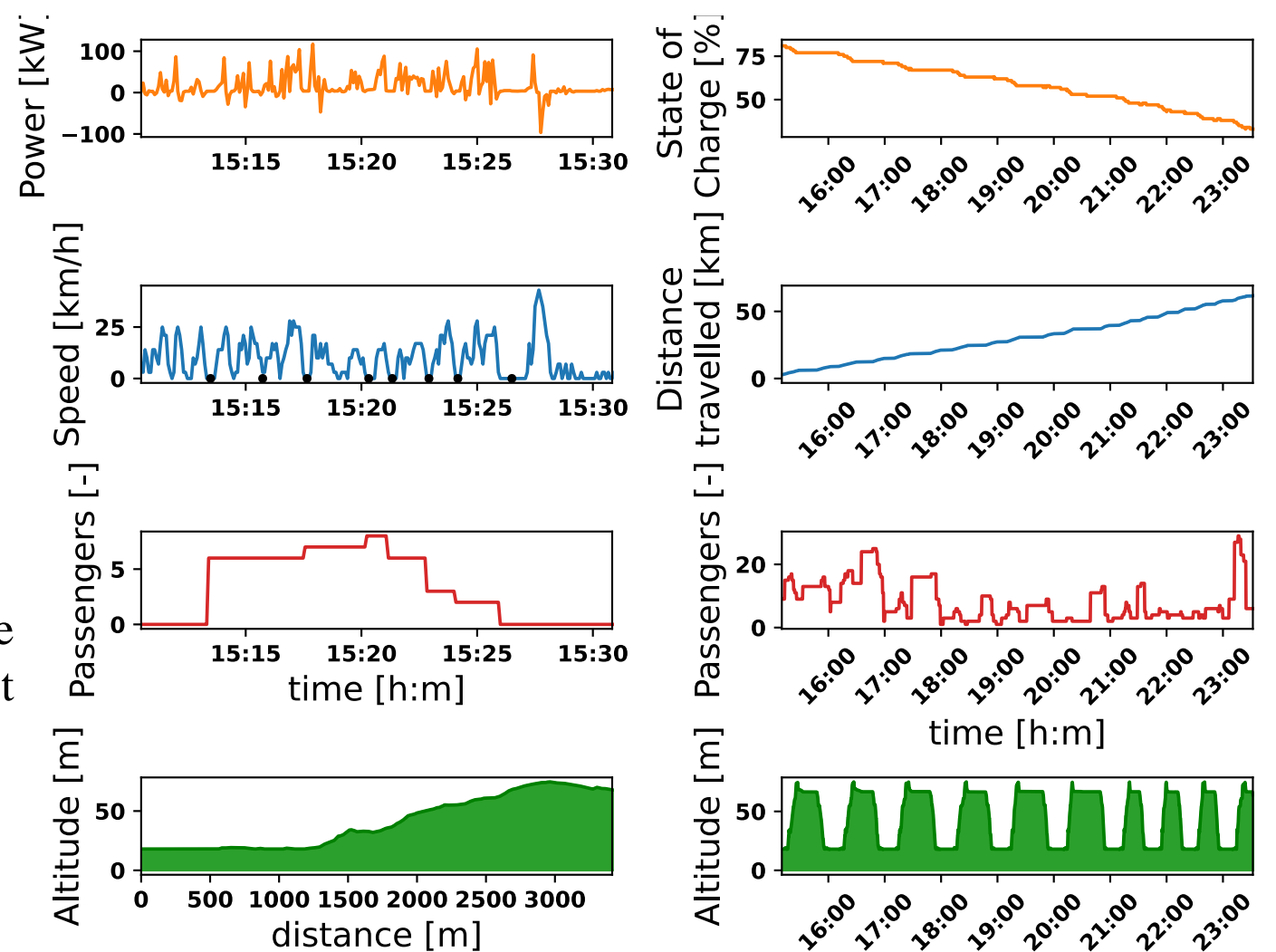
Partial Dependence of energy consumption depending on the temperature with polynomial regression



IV. Conclusions

- Different results than in the literature. Higher increase in consumption in hot conditions than in cold
- The hypothesis of square influence of temperature on consumption of electric buses is verified in the data when separating by route (reduce variability of elevation)

II. Example data for one travel and one shift



Friday 14th January 2022

Ambient temperature measured by the bus is also in the dataset

Machine Learning Algorithms tested (70 % training, 30% test)

- Linear
- Polynomial of degree 2
- K-Nearest-Neighbour

Best model R square score function is 88%

