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Route prioritization of urban public transportation from conventional to electric buses: A new methodology and a study of case in an intermediate city of Ecuador

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Abstract

Electric vehicles have attracted increasing interest in recent years owing to their reduced environmental impact. This is particularly so in the case of vehicles for public transportation, such as buses. However, the transition from internal combustion engine buses to electric buses (EBs) is accompanied by new challenges for the power grid, particularly in developed countries. This paper proposes a new methodology to address the transition of urban public transportation from conventional buses to EBs by route prioritization. The scores of each criterion are weighted using a multi-criteria technique. The case study of Cuenca, Ecuador, which is an intermediate Andean city, is considered. The results indicate that the proposed methodology enables the establishment of route prioritization for the transition toward electric mobility. The replacement to EBs of the three best-performing bus lines (50 buses) avoids using 1328 gallons of diesel each day and, thereby, over 13.3 metric tons of CO₂ and other polluting gases into the atmosphere. The economic savings reach 83% with respect the diesel consumption. The methodology is suitable for aiding municipalities in identifying adequate bus lines to start this shift. Its application is feasible in any city since it requires as input data: the technical characteristics of electric and combustion buses, operational details of existing routes, and the number of passengers per route. Furthermore, this tool provides a means to calculate the present fuel costs, emission of CO₂ for each bus line, and the estimated electricity costs. © 2021 Elsevier Ltd


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