

ABSTRACT

This dissertation aims to analyse whether in the current circumstances it is justifiable to introduce electric buses into the Polish urban transport systems. The conducted research proves that in the Polish circumstances conventional buses are characterised by higher financial efficiency cost-wise, as well as the economic efficiency, taking into account the external costs generated by particular types of buses. The results of this research coincide with the results of cost-benefit analyses regarding urban transport services rendered with the use of zero-emission buses; the analyses were conducted in all Polish cities of at least 50,000 inhabitants, and the study of them was presented in this dissertation.

The analysis also included the degree of variation of the costs of operational work and transport activities performed with electric buses using various technologies for traction battery charging systems. It was proved that in the Polish circumstances, the In-Motion Charging buses are the most effective, among all electric buses, regarding their performance of operational work and transport activities. It refers, first of all, to cities with trolleybus systems. Whereas, the least effective, financially and economically, are electric buses with physically-replaced traction batteries.

The conducted analyses also prove that in particular circumstances related to the electric bus operational works the use of electric buses becomes more reasonable cost-wise than the use of conventional buses. Due to lower variable costs of electric bus transport operations compared to the conventional buses, the prerequisite to encounter such situation involves the annual mileage of ca. 80,000 to 100,000 kilometres. Although these days the electric buses are characterised by lower cost-efficiency than the conventional buses, more and more local authorities decide to introduce them into the urban transport systems. This is because the current level of electric bus funding from external sources and lack of possibility to obtain funding for the purchase of conventional buses by local authorities makes the introduction of electric buses a reasonable undertaking from the perspective of local authority transport and budget policy. The main argument supporting the purchase of electric buses by the Polish cities involves lower emission of harmful substances by such vehicles and no local emission of these substances. However, the analyses prove that greater environmental benefits would be brought by investments into the conventional rolling stock meeting the most restrictive emission standards for harmful substances, with the use of similar financial resources that

are necessary for the investments into electric vehicles, planned by the National Centre for Research and Development. The main reason for such situation includes the Polish energy mix and still large number of vehicles, among the conventional ones, that meet the EURO 3 or lower emission standard for harmful substances, as well as the lower purchase cost of conventional buses compared to the electric ones.

The analyses presented in this dissertation prove that the most suitable for electric buses are the lines with high annual mileage of vehicles as well as the routes passing through the densely populated urban areas. In this regard, the dissertation presents numerous criteria which make it possible to aggregate and attribute comparable and measurable values to all factors that determine the intensity of using the fleet of vehicles at a particular bus line. These criteria may be used to select the line scheduled for electric vehicle transport operations, providing possibilities to benefit from the advantages of electric buses to the largest extent possible. Therefore, the character of this dissertation is not only cognitive, but also practical.