

Energy efficiency and integration of urban electrical transport systems: EVs and metro-trains of two real European lines

A. Fernández Rodríguez; A. Fernández Cardador; A.P. Cucala García;
M.C. Falvo

Abstract-

Transport is a main source of pollutants in cities, where air quality is a major concern. New transport technologies, such as electric vehicles, and public transport modalities, such as urban railways, have arisen as solutions to this important problem. One of the main difficulties for the adoption of electric vehicles by consumers is the scarcity of a suitable charging infrastructure. The use of the railway power supplies to charge electric vehicle batteries could facilitate the deployment of charging infrastructure in cities. It would reduce the cost because of the use of an existing installation. Furthermore, electric vehicles can use braking energy from trains that was previously wasted in rheostats. This paper presents the results of a collaboration between research teams from University of Rome Sapienza and Comillas Pontifical University. In this work, two real European cases are studied: an Italian metro line and a Spanish metro line. The energy performance of these metro lines and their capacity to charge electric vehicles have been studied by means of detailed simulation tools. Their results have shown that the use of regenerated energy is 98% for short interval of trains in both cases. However, the use of regenerated energy decreases as the train intervals grow. In a daily operation, an important amount of regenerated energy is wasted in the Italian and Spanish case. Using this energy, a significant number of electric vehicles could be charged every day.

Index Terms- urban railways; electric vehicles; regenerated energy; energy efficiency

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