

Improving the traffic model to be used in the optimisation of mass transit system electrical infrastructure

A.J. López López; R. Rodríguez Pecharromán; A. Fernández Cardador;
A.P. Cucala García

Abstract-

Among the different approaches for minimising the energy consumption of mass transit systems (MTSs), a common concern for MTS operators is the improvement of the electrical infrastructure. The traffic on the lines under analysis is one of the most important inputs to the studies devoted to improving MTS infrastructure, since it represents where and how frequently it is possible to save energy. However, on the one hand, MTS electrical studies usually simplify the traffic model, which may lead to a misrepresentation of the energy interactions between trains. On the other hand, if the stochastic traffic is rigorously modelled, the size of the simulation problem could grow excessively, which in turn could make the time to obtain results unmanageable. To cope with this issue, this paper presents a method to obtain a reduced-size set of representative scenarios. Firstly, a traffic model including the most representative stochastic traffic variables is developed. Secondly, a function highly correlated with energy savings is proposed to make it possible to properly characterise the traffic scenarios. Finally, this function is used to select the most representative scenarios. The representative scenario set obtained by the application of this method is shown to be sufficiently accurate with a limited number of scenarios. The traffic approach in this paper improves the accuracy with respect to the usual traffic approach used in the literature.

Index Terms- stochastic traffic model; mass transit systems; electrical infrastructure; reversible substations; energy saving; energy efficiency

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Citation:

López López, A.J.; Pecharromán, R.R.; Fernández-Cardador, A.; Cucala, A.P.

"Improving the traffic model to be used in the optimisation of mass transit system electrical infrastructure", Energies, vol.10, no.8, pp.1134-1-1134-18, August, 2017.