

Evaluation of the impact that the traffic model used in railway electrical simulation has on the assessment of the installation of a reversible substation

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Abstract— Nowadays, one of the strategies that are being applied in DC railway networks to improve energy efficiency is the installation of Reversible Substations or Energy Storage Systems. The assessment of their impact on the network consumption is typically based on simulation. The accuracy of the results provided by the simulations relies on the accuracy of the models used. This paper focuses on the traffic model used in electric railway simulators. A preliminary literature review has shown that, in most cases, the traffic models of electric railway simulators involve too many simplifications that can lead to non-accurate results. This lack of accuracy can have a great impact in the assessment of the infrastructure improvements, reason why a more accurate traffic model is proposed. The proposed traffic model includes different headways, different time shifts at terminal stations, non-constant dwell times, different train speed profiles and a specific module of the traffic regulation system in real time. The energy saving resulting from the installation of a Reversible Substation obtained with both models –the one used in the literature and the one proposed in this paper - has been compared to illustrate the risk of using a too simplified traffic model. The comparison shows that the simplified model used in the literature produces non-accurate enough estimations of the energy saving.

Index Terms— Railway power systems; Railway electrical simulation; Traffic model; Traffic regulator; Reversible Substations

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