

Analysis of the demand charge in DC railway systems and reduction of its economic impact with energy storage systems

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Abstract— In addition to energy consumption, DC railway operators must also pay for the demand charge. This term of the electricity bill has not been studied in detail in the literature and penalizes power peaks. The big fluctuations on the power demand which characterize railway systems make the demand charge important for railway operators. This paper studies the impact of the demand charge on DC railway systems and proposes a solution based on Energy Storage Systems (ESSs) to reduce it. An analysis of the main parameters of the ESS regarding the reduction of the demand charge is provided, as well as an explanation of the effects of different control strategies on the system performance. Most of the savings obtained with the installation of ESSs come from the reduction in the energy consumption; nevertheless, the savings coming from the reduction in the demand charge are significant and contribute to the economic viability of the investment.

Index Terms— Railway power systems; Demand charge; Power peaks; Load levelling; Energy Storage Systems

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