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Title: Power Flow Algorithm in the Fast EV Charging System with Energy Storage and Photovoltaics

Abstract:

This work contains a description of the functionality and an algorithm for managing the power flow in an electric vehicle (EV) fast charging system equipped with battery energy storage (ES) and photovoltaics (PV). The system consists of a grid converter, isolated DC/DC converters for EV charging, and non-isolated DC/DC converters: one interfacing the energy storage and another for the PV system. In the presented system, all converters, except the photovoltaic one, can operate with bidirectional energy flow, which provides many possibilities for effective energy management. The work proposes a control algorithm based on signals determining the current state of the system, which is presented in the form of a block diagram. This work will discuss exemplary operating modes of such a system in order to finally show an experimental model of such a scalable system rated for a nominal 1200V DC-link voltage and 20 kW power.