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OPTIMAL CHARGING OF MULTIPLE ELECTRIC VEHICLES IN SMART NETWORKS

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ABSTRACT

Electric vehicles (EVs) have a huge development, which lead to decrease the fuel consumptions, emissions, and help in keeping the environment clean but, this development has an impact on distribution systems operation in case of the plug-in electric vehicles (PEVs) which may not well managed. Subsequently, it is critical to select the ideal charging/discharging methods. A fuzzy logic controller (FLC) system is proposed to decide the charging/discharging priority level of each EV based on the associated state-of-charge (SOC) level of the battery. The FLC is utilized to control the EV charging/discharging process to achieve the benefits of the electricity network and EVs owners, as well. The benefit of the electricity network is related to improving the voltage profile.

Subsequently, it is essential to evaluate the power flow management methodology at the Powertrain design stage in order to minimize component sizing, cost, and the vehicle fuel consumption for a given driving cycle. The simulation results show the effectiveness of the FLC strategy for hybrid energy storage in distributing power flow between the ultra-capacitors and the batteries.

To realize the impact of removing harmonics and smoothing the power curve, a parallel active power filter (APF) with direct power control system for active control helps to minimize the total harmonic distortion in current (THD_i) and a double tuned passive filter is considered also to minimize the total harmonic distortion in voltage (THD_v). The proposed strategy ensures the best charging and discharging power effect and increases the power efficiency of electric vehicles, according to simulation results.

Generally, the presented results indicate that the PSO can find the optimal fitness function and prove its effectiveness in finding optimal parameters kp and ki for the DC-link voltage-HAPF controller.