

Distributed Control Strategy for Dispersed Energy Storage Units in the DC Microgrid Based on Discrete Consensus

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Abstract : The SOC (state of charge) based droop control has limitations on the load power sharing among different energy storage units, due to the line impedance. In this paper, a distributed control strategy for dispersed energy storage units in the DC microgrid based on discrete consensus is proposed. Firstly, a sparse information communication network is built. Thus, local controllers can communicate with its neighbors using voltage, current and SOC information. An average voltage of grid can be evaluated to compensate voltage offset by droop control, and an objective virtual resistance fulfilling above requirement can be dynamically calculated to distribute load power according to the SOC of the energy storage units. Then, the stability of the whole system and influence of communication delay are analyzed. It can be concluded that this control strategy can improve the robustness and flexibility, because of having no center controller. Finally, a model of DC microgrid with dispersed energy storage units and loads is built, the discrete distributed algorithm is established and communication protocol is developed. The co-simulation between Matlab/Simulink and JADE (Java agent development framework) has verified the effectiveness of proposed control strategy.

Keywords : dispersed energy storage units, discrete consensus algorithm, state of charge, communication delay

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