

This paper presents a novel active damping method to overcome instability problems of dc microgrids (MGs) caused by constant power loads (CPLs). This method is implemented based on the existing energy storage system (ESS) in the dc MGs. As an indispensable part in the dc MGs, the ESS in this paper is used for more than just compensating the conventional power unbalance in the system, it has taken an additional responsibility and is used for adjusting the system damping to deal with the instability problems induced by the CPLs as well. First, the stability criteria of a simplified dc MG are analyzed. Based on this, an active damping method that aims at virtually reshaping the loads in the dc MG is introduced. With the proposed method, which is realized by a supercapacitor ESS in this paper, the CPLs in the system are virtually reduced and the resistive loads are virtually increased. Therefore, the destabilizing effect of the CPLs in the dc MG is eliminated. Simulations and experiments are conducted and the effectiveness of the proposed method is verified. This method is suitable to be applied in the dc MG with various elements and variable operation modes.

