

Impedance-based Stability Assessment of Self-Synchronising Power Electronics Converter

Abstract

Self-synchronization, which is an unconventional control framework for grid-tied power electronics converters (PECs), uses the internal signals of current regulators instead of direct measurement of ac grid voltages, to obtain ac grid phase information and synchronization with the ac grid. Consequently, the self-synchronization provides various benefits including immunity to grid voltage harmonics and disturbances, and no need of ac voltage sensors. On the other hand, the different synchronization mechanism between the self-synchronization and conventional grid voltage measurement-based synchronization, leads to different harmonic interaction and coupling behaviours. Thus, the impedance-based stability criterion is used to comparatively assess the stability characteristics of the PEC based on the self-synchronization and conventional grid voltage measurement-based synchronization. The simulation and experimental results are clearly validate the effectiveness and feasibility of the theoretical analysis.