Power and current limiting strategy based on droop controller with floating characteristic for grid-connected distributed generations

ABSTRACT

The Grid-Connected Droop-Controlled Distributed Generations (GCDCDGs) are widely used in power systems. However, their power flow is very sensitive to the Upstream Grid (UG) frequency and voltage magnitude fluctuations. This paper focuses on the power and current limiting of inverter-interfaced GCDCDGs under UG frequency and/or voltage magnitude drops. GCDCDG output power and current increase under the UG frequency drop, and if this increase exceeds the maximum of them, current limiters are saturated and according to $P \sim \omega$ droop characteristic the GCDCDG frequency does not track the UG frequency, and this frequency difference leads to power oscillation between DG and UG and the system becomes unstable. In this paper, a new strategy based on the droop-control method is proposed to limit the output power and current of GCDCDGs without using a current limiter that realizes a stable operation under the mentioned conditions. In the proposed method instead of increasing the droop coefficients to limit P and Q at their constraints, the droop curves move down after powers and currents exceed maximum values, using two supplementary control signals. The performance of the proposed method is demonstrated with simulation results using MATLAB/Simulink environment under several case studies.