

Novel hybrid maximum power point tracking algorithm for PV systems under partially shaded conditions

ABSTRACT

Photovoltaic (PV) system has non-linear power-voltage (P-V) characteristic with single maximum power point (MPP) in uniform condition. The P-V curve would be more complicated during partially shaded (PS) conditions (PSCs) when multi-peak powers exist. The point with the highest value of power among the multi-peak powers is called global maximum power point (GMPP). In this paper, a novel hybrid method is proposed to obtain the GMPP in PSCs. In this method, if PS happens after reaching the MPP in uniform condition, the new operating point is specified based on modified linear function to reduce the searching zone and simultaneously the possible MPPs are recognized at the right side of the new obtained operating point. In the case where PS happens before reaching the MPP in uniform condition, the reference point is specified and then the location of GMPP is detected. Finally, after specifying the exact location of GMPP, the modified P&O is used to obtain the GMPP. To evaluate operation of the proposed method, simulation work has been carried out in MATLAB/Simulink where the GMPP is obtained in minimum time with high accuracy and minimum oscillation in power. Moreover, this method is not limited to any specific scenarios of shadowing.

Keyword: Boost converter; Maximum power point (MPP) tracker (MPPT); Partially shaded condition (PSC); Perturb and observation (P&O); Photovoltaic (PV)