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Modeling and Simulation of Grid-Connected Photovoltaic Array System Using MATLAB/SIMULINK

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ABSTRACT

Renewable energy sources development is increasing rapidly to decrease CO₂ emissions and use of fossil fuels. Solar power (PV) is example of intermittent renewable production. PV becomes more interesting source of renewable energy for distributed power generation because of their relatively small size, high power capability per unit of weight and longer life with little maintenance. This paper presents modeling and simulation of PV grid-connected microgrid system in MATLAB/Simulink environment to study the behaviors of the system during steady state and changing irradiation. The proposed microgrid system consists of solar PV array, power electronic converter, ultra capacitor (UC) and AC loads. UC system is used to support the PV panel during periods of reduction in solar irradiance whereas, Maximum Power Point Tracking (MPPT) is used to ensure the output of photovoltaic power generation at the maximum power output as possible. The proposed system is validated by means of simulation results. It is observable that the distributed generation operates stably and control works as expected.

Keywords: Photovoltaic (PV) – MPPT algorithm – Energy Storage System –Converters– Inverter.