

An Improved Modular Multilevel Converter Voltage Balancing Approach for Grid Connected PV System

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Abstract : During the last decade, renewable energy sources in particular solar photovoltaic (PV) has gained increased attention. Therefore, various PV converters topologies have emerged. Among this topology, the modular multilevel converter (MMC) is considered as one of the most promising topologies for the grid-connected PV system due to its modularity and transformerless features. When it comes to the safe operation of MMC, the balancing of the Submodules Voltages (SMs) plays a critical role. This paper proposes a balancing approach based on space vector PWM (SVPWM). Unlike the existing techniques, this method generates the switching vectors for the MMC by using only one SVPWM for the upper arm. The lower arm switching vectors are obtained by finding the complement of the upper arm switching vectors. The use of one SVPWM not only simplifies the calculation but also helped in reducing the circulating current in the MMC. The proposed method is varied through simulation using Matlab/Simulink and compared with other available modulation methods. The results validate the ability of the suggested method in balancing the SMs capacitors voltages and reducing the circulating current which will help in reducing the power loss of the PV system.

Keywords : capacitor voltage balancing, circulating current, modular multilevel converter, PV system

Conference Title : ICREERA 2018 : International Conference on Renewable Energy Resources and Applications

Conference Location : Paris, France

Conference Dates : June 25-26, 2018