Title: A Novel Extendable MLI Topology on Minimizing Number of Switches

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Abstract: An essential factor in modern power electronics applications involves the use of a power converter that combines efficiency with affordability. The advancement of mature medium-power self-converting switching devices has led to the emergence of multilevel inverters (MLIs) as a favorable solution for high-power medium-voltage applications. Here we introduce an innovative asymmetric expandable type multilevel inverter specially designed for medium and high voltage applications through a switch reduction technique. The proposed multilevel inverter achieves a high-quality power output while utilizing a reduced number of power electronics switches. Our novel configuration incorporates 10 switches, resulting in 13 voltage levels. Through asymmetric adjustment of the voltage ratio in this configuration, various voltage levels are achieved and expressed through a generalized equation. To display its sustainability, we compare our proposed topology with expandable and non-extendable multilevel inverter configurations. Our proposed equation enables us to determine the maximum level achievable for the total power electronics switches. For instance, to attain a 21-level output, a total of 12 switches would be required in this scenario. Furthermore, we evaluate the Total Harmonic Distortion of our proposed topology through MATLAB simulation.

Keywords: Total harmonic distortion, Renewable energy sources, Switches, Medium voltage, Multilevel inverters, Mathematical models, Topology

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