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Editorial: Emerging boost converter topologies for renewable energy applications

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Editorial on the Research Topic
Emerging boost converter topologies for renewable energy applications

Introduction

The role of the power electronic converter is crucial for the effective utilization of renewable energy resources. Power electronic converters are used as an interface between renewable energy sources and their utilization, which can be in industrial loads, utility grids, and domestic loads. The main converters used with renewable energy resources are DC/DC converters and DC/AC converters. As the voltage magnitude of most renewable energy resources is low, a boost stage is required between the source and the load. Therefore, a new category of high gain DC/DC converters and DC/AC converters are required with higher reliability and efficiency.

A multilevel inverter (MLI) topology is a matured power converter, and it is most suitable for medium and high voltage applications with renewable energy. Most of the multilevel inverters use isolated DC sources, which limit their applications. By replacing the DC source with capacitors, a significant reduction in the cost and size of the converters can be achieved. This attractive feature has led researchers to develop boost multilevel inverters with fewer switches. The boosting feature enables the use of MLI in photovoltaic (PV)-based applications. Further, the switched capacitor MLI (SCMLI) topologies need further improvement in terms of developing new additional circuits, and control and modulation techniques to balance floating capacitor voltages.

Published articles

This Research Topic is intended to give an insight into the latest studies concerning the design and development of switched-capacitor topologies and other boost inverter topologies and related issues. In this issue, four articles have been accepted. The article by Amrr et al. investigates the use of a new sliding mode control for the output voltage regulation of a boost converter under parametric uncertainties of load resistance and input voltage. The authors also performed stability analysis of the closed-loop system, which guarantees the finite-time convergence of output voltage to the desired value while ensuring robustness against uncertainties. The simulation and hardware results are discussed in the article. The article by Kakar et al. proposes a new seven-level ANPC-type multilevel inverter topology with boost ability. The proposed inverter's maximum efficiency was 97.5% at 1.2 kW-rated power, and the simulation and hardware results have been provided to validate the proposed topology. A sliding mode technique for the speed control of a wind turbine-driven double-fed induction generator is proposed by Ali et al. In this article, the authors present a detailed modeling of DFIG for finite-time stability. A comparison has been provided between the proposed controller and other conventional controllers. In the fourth article, authored by Karn et al., a load-shedding technique has been proposed for the multimachine system. A MATLAB/Simulink environment verifies and tests the method's practicality on an IEEE-10-machine-39-bus system.

Perspectives

The articles published in this Research Topic show the progress in the field of power converters and their use in various applications. Most of the concepts proposed in the articles have been validated experimentally. However, there is a lot of scope for further improvement in the field of power converters and their uses.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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