Bidirectional DC-DC-AC Three-phase Power Converter

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Abstract

This work proposes a dc-dc-ac three-phase converter in order to interface dc and ac variables allowing a bidirectional power flow. A comprehensive comparison between the proposed and conventional solutions will be addressed highlighting the advantages of the proposed circuit, such as reduced costs and high level of integration. A direct application of this converter is in Vehicle-to-Grid (V2G) system and interfacing dc microgrid with three-phase utility grid. Such power electronics solution guarantees: (i) full controllability at both dc and ac converter sides, (ii) high level of integration with a reduction of one power switch and its drive circuits, (iii) implementation of two functions by using a unique power conversion stage, and (iv) reduction of the capacitor losses. Despite proposing a new power converter solution, this work presents an optimized PWM strategy based on the hybrid PWM concept as well as a suitable control approach.