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Review of V2G and G2V Bidirectional Converter

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Abstract: *In response to climate change, which is caused by the increasing pollution of the environment and leads to the deterioration of human health, future electricity generations should reduce reliance on fossil fuels by growing the use of clean and renewable energy generation sources and by using clean vehicle technologies. Battery storage systems have been recognized as one of the most promising approaches for supporting the renewable energy generation sources and cleanly powering vehicles instead of burning gasoline and diesel fuel. However, the cost of batteries is still a prominent barrier for their use in stationery and traction applications. As a rule, the cost of batteries can be decreased by lowering material costs, enhancing process efficiencies, and increasing production volume. Another more effective solution is called Vehicle-to-grid (V2G) application. In V2G application, the battery system can be used to support the grid services, whereas the battery is still in the vehicle. To make a battery system economically viable for V2G/G2V applications, an effective power-electronics converter should be selected as well. This converter should be supported by an advanced control strategy. Therefore, this article provides a detailed technical assessment and review of V2G/G2V concepts, in conjunction with various power-electronics converter topologies. In this paper, modeling and detailed control strategies are fully designed and investigated in terms of dynamic response and harmonics. Furthermore, an extensive design and analysis of charging systems for low-duty/high-duty vehicles are also presented.*

Keywords: electric vehicle; Grid-to-Vehicle (G2V); Vehicle-to-grid (V2G); control strategy; charging methodologies; power-electronic converters

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