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In renewable energy applications power conversion efficiency is major concern. This is especially true for grid-tie energy storage systems based on bidirectional dc-dc and dc-ac converters where power flows through these system components. Latest developments in power semiconductors technology significantly reduced switching and conduction losses in dc-dc and dc-ac converters allowing efficiencies above 98%. This paper analyzes the efficiency improvement that is achieved by the introduction of SiC power semiconductors in dc-dc and dc-ac converters. The analysis is focuses on fuel cell grid-tie energy storage systems. Results highlight dc-dc conversion efficiencies up to 98.2% with an isolated topology and dc-ac conversion efficiencies up to 97.7%. Overall system efficiency improvements above 1% are achieved compared to traditional Si devices. Results on efficiency improvement are analyzed based on two laboratory converter prototypes of an isolated full bridge boost converter (IFBBC) and a three level T-type inverter (BSNPC)

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