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## A New Three-Input DC–DC Boost Converter for Hybrid PV/Wind/Battery Power System

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**Abstract:** A new three-input dc–dc boost converter is proposed in this paper. The proposed converter interfaces two unidirectional input power ports and a bidirectional port for a storage element in a unified structure. This converter is interesting for hybridizing alternative energy sources such as photovoltaic (PV) source, wind source, and battery. Supplying the output load, charging or discharging the battery can be made by the PV and the wind power sources individually or simultaneously. The proposed structure utilizes only four power switches that are independently controlled with four different duty ratios. Utilizing these duty ratios, tracking the maximum power of the PV source, setting the wind power, controlling the battery power, and regulating the output voltage are provided. Depending on utilization state of the battery, three different power operation modes are defined for the converter. In order to design the converter control system, small-signal model is obtained in each operation mode. Due to interactions of converter control loops, decoupling network is used to design separate closed-loop controllers. The validity of the proposed converter and its control performance are verified by simulation and experimental results for different operation conditions.