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An energy storage system, connected with a photovoltaic system and a power grid, may include a plurality of DC/DC converters for controlling a plurality of battery racks, a power conversion system for controlling power in connection with the plurality of DC/DC converters and the photovoltaic system, and a power management controller for determining operating modes and outputting references of the power conversion system and the plurality of DC/DC converters according to a state of the photovoltaic system.

