

ENERGY STORAGE SYSTEM AND METHOD OF CONTROLLING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-2009-0130023, filed on Dec. 23, 2009, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND

[0002] 1. Field

[0003] Aspects of embodiments according to the present invention relate to an energy storage system and a method of controlling the same.

[0004] 2. Description of the Related Art

[0005] Due to problems like environmental destruction and depletion of natural resources, systems for storing electricity and effectively utilizing the stored electricity are attracting more attention than before. Furthermore, the importance of new renewable energies, such as photovoltaic electricity, is increasing. Especially, since renewable energies are derived from virtually inexhaustible natural resources, such as sunlight, wind, and tides, and do not create pollutions during energy consumption, methods of utilizing renewable energies are being actively researched and developed.

[0006] By applying information technology to a conventional power grid, it can become a smart grid system that improves or optimizes energy efficiency by exchanging information between a power supplier and a consumer.

[0007] Furthermore, a photovoltaic system, in which photovoltaic technology and an uninterruptible power supply (UPS) are connected, has been introduced.

SUMMARY

[0008] One or more embodiments of the present invention are directed to an energy storage system and a method of controlling the same for utilizing power stored in a battery at improved efficiency even in case of an abnormal operation of a grid (e.g., power interruption).

[0009] Additional aspects of embodiments according to the present invention will be set forth in part in the description which follows and, in part, will be apparent from the description.

[0010] According to one or more embodiments of the present invention, an energy storage system includes a maximum power point tracking (MPPT) converter for converting power generated by a renewable energy generating system and outputting the converted power to a first node; a bi-directional inverter coupled between the first node and a second node, a grid and a load being coupled to the second node, the bi-directional inverter for converting a first power input via the first node to a second power and outputting the converted second power to the second node, and converting power provided by the grid to the first power and outputting the converted first power to the first node; a battery for storing a third power; a bi-directional converter coupled between the battery and the first node, the bi-directional converter for converting the third power output by the battery to the first power and outputting the converted first power to the bi-directional inverter via the first node, and converting the first power output by the bi-directional inverter via the first node to

the third power and storing the converted third power in the battery; and an integrated controller for providing the third power to the load based on a priority order.

[0011] The integrated controller may be configured to provide the third power stored in the battery to the load based on an amount of the third power stored in the battery and the priority order of the load.

[0012] The integrated controller may be configured to selectively provide the third power to the load based on the priority order of the load, if a power interruption signal is received.

[0013] The energy storage system may further include a first switch coupled between the bi-directional inverter and the load; and a second switch coupled between the second node and the grid.

[0014] The integrated controller may be configured to turn off the second switch when the power interruption signal is received.

[0015] The load may include at least two loads, and the energy storage system may further include at least two switches coupled between the second node and the at least two loads, the at least two switches for controlling power to be provided to the at least two loads, respectively, wherein the integrated controller is configured to control the at least two switches based on an amount of the third power stored in the battery and a priority order of the at least two loads.

[0016] The integrated controller may further include a monitor for monitoring an amount of the third power stored in the battery; a user setup unit for setting up the priority order of the at least two loads; a computer for determining the amount of the third power stored in the battery and the priority order of the at least two loads; and a control signal generator for generating control signals for selectively providing the third power stored in the battery to the at least two loads under the control of the computer.

[0017] The energy storage system may further include a battery management system (BMS) for managing charging/discharging the third power stored in the battery under the control of the integrated controller, wherein the integrated controller further includes a BMS controller for controlling the BMS.

[0018] The energy storage system may further include a DC linking unit for maintaining a voltage level of a DC voltage of the first node at a DC linking level.

[0019] The renewable energy generating system may include a photovoltaic system.

[0020] According to one or more embodiments of the present invention, an energy storage system includes a first power converter for converting power generated by a renewable energy generating system to a first power; a second power converter for converting the first power to a second power and storing the second power in a battery and for converting the second power stored in the battery to the first power; a third power converter for converting the first power and outputting the converted first power to a load or a grid and for converting power provided by the grid to the first power; and an integrated controller for controlling the first through third power converters, so that power is selectively provided to the load based on an amount of the second power stored in the battery and a priority order of the load.

[0021] According to one or more embodiments of the present invention, a method of controlling an energy storage system coupled to a renewable energy generating system, a load, and a grid, the energy storage system including a maxi-