CLAIMS

1. An energy router, comprising:

a plurality of ports configured to perform at least one of receiving or sending energy and Power Line Communication PLC data;

energy transmission switches, each of the energy transmission switches is configured to control open and closed states of one port of the plurality of the ports; and

a routing processor configured to determine one energy transmission path according to the PLC data and stored routing information, determine a corresponding port associated with the energy transmission path, and turn on an energy transmission switch which controls the corresponding port, for outputting the energy from the corresponding port,

wherein the routing processor is configured to:

determine a target address according to the PLC data;

determine the energy transmission path based on a shortest path algorithm according to the stored routing information;

determine a next-hop address according to the energy transmission path; and

determine a port connected to the next-hop address as the corresponding port.

2. The energy router according to claim 1, further comprising at least one of the following:

an energy metering processor configured to collect energy

information of each of the ports; or

an energy conversion processor located between the ports, and configured to perform at least one function of alternating current conversion or voltage conversion.

3. The energy router according to claim 1, further comprising:

A trans-voltage conversion processor configured to receive a first message of the PLC data from a port of the plurality of ports and send to the routing processor, and encapsulate the energy transmission path generated by the routing processor into a second message of the PLC data according to an output voltage.

4. The energy router according to claim 1, wherein determining an energy transmission path based on a shortest path algorithm according to the stored routing information comprising:

sending broadcast information to other energy routers through the plurality of ports in the case that the energy transmission path is failed to be determined according to the stored routing information; and

updating the stored routing information according to received path feedback, wherein the energy router that receives the broadcast message feeds back routing information stored therein and associated with the target address; and

determining the energy transmission path according to the stored routing information which is updated.

5. The energy router according to claim 1, further comprising a data processor, the data processor comprising:

an application layer sub-processor configured to generate a

first application data, and analyze a second application data from a transmission layer sub-processor, wherein the first and second application data separately comprise at least one of energy data, control data, state data, or fault data;

the transmission layer sub-processor configured to encapsulate a first transmission layer data packet according to the first application data and a predetermined transmission layer protocol, and analyze a transmission layer data packet from a network layer sub-processor;

the network layer sub-processor configured to generate a first network layer data packet according to the first transmission layer data packet, a Media Access Control (MAC) address and an Energy Internet Protocol (EIP) address, and analyze a second network layer data packet from a link layer sub-processor; and

the link layer sub-processor configured to generate a first message of the PLC data according to the first network layer data packet, and analyze a second message of the PLC data from an energy network.

6. An energy network, comprising:

a plurality of energy routers according to any of claims 1 to 5; and

a plurality of end nodes, each of which is a user node or a power plant node,

wherein each of the energy routers is connected to at least two of nodes from a group consist of other energy routers of the

plurality of energy routers and the plurality of end nodes.

7. An energy transmission method, comprising:

receiving Power Line Communication (PLC) data and energy, wherein the PLC data comprises a target address;

determining one energy transmission path according to the PLC data and stored routing information;

determining a corresponding port associated with the energy transmission path, and turning on an energy transmission switch of the corresponding port; and

outputting electric energy, which is received by the energy router, from the corresponding port, wherein the energy router comprises a plurality of ports,

wherein the determining an energy transmission path according to the PLC data and the stored routing information comprises:

determining a target address according to the PLC data; and

determining the energy transmission path based on a shortest path algorithm according to the stored routing information;

wherein the determining a corresponding port associated with the energy transmission path comprises:

determining a next-hop address according to the energy transmission path; and

determining a port connected to the next-hop address as the corresponding port.

8. The energy transmission method according to claim 7,

further comprising:

metering at least one of a real-time energy output of a source address of the energy or a real-time energy input of a target address of the energy, according to a duration when each port is turned on and an average power during a transmission process.

9. The energy transmission method according to claim 8, further comprising:

performing at least one of alternating current conversion or voltage conversion according to an energy attribute of a port of the plurality of ports which input energy and an energy attribute of a port which output energy, wherein the energy attribute comprises direct current, alternating current, and voltage value.

10. The energy transmission method according to claim 9, further comprising:

extracting application data in a message of the PLC data before alternating current conversion and voltage conversion and after extracting the message of the PLC data from a port of the plurality of ports, to determine the energy transmission path according to the stored routing information; and

re-encapsulating the application data into a message of the PLC data and outputting through a port which output energy.

11. The energy transmission method according to claim 7, wherein

the determining an energy transmission path according to the

PLC data and the stored routing information further comprises:

sending broadcast information to other energy routers through the plurality of ports in the case that the energy transmission path is failed to be determined according to the stored routing information, and updating the stored routing information according to received path feedback, wherein the energy router that receives the broadcast message feeds back routing information stored therein and associated with the target address; and

determining the energy transmission path according to the stored routing information which is updated.

12. The energy transmission method according to claim 7, further comprising generating a message of the PLC data, comprising:

generating application data by an application layer sub-processor, wherein the application data comprises at least one of energy data, control data, state data, or fault data;

encapsulating a transmission layer data packet by a transmission layer sub-processor according to the application data and a predetermined transmission layer protocol;

generating a network layer data packet by a network layer sub-processor according to the transmission layer data packet, a Media Access Control (MAC) address and an Energy Internet Protocol (EIP) address; and

generating a message of the PLC data by a link layer sub-processor according to the network layer data packet.

13. The energy transmission method according to claim 7, further comprising: reading a message of the PLC data, comprising:

obtaining the message of the PLC data from an energy network through a link layer sub-processor;

analyzing a network layer data packet from the link layer sub-processor by a network layer sub-processor;

analyzing a transmission layer data packet from the network layer sub-processor by a transmission layer sub-processor; and

analyzing application data from the transmission layer sub-processor by an application layer sub-processor, wherein the application data comprises at least one of energy data, control data, state data, or fault data.

14. The energy transmission method according to claim 12 or 13, wherein the message of the PLC data comprises:

PLC header information, comprising a PLC communication technology identification;

EIP header information, comprising a source EIP address and a target EIP address;

Energy Information Communication Technology (EICT) header information, including a source MAC address, a target MAC address, a serial number, a protocol type and a check information; and

the application data.

15. An operation control device of an energy router, comprising:

a memory; and

a processor coupled to the memory, wherein the processor is configured to perform the method according to any of claims 7 to 14 based on instructions stored in the memory.

16. A computer-readable storage medium having stored thereon computer program instructions, wherein the instructions, when executed by a processor, implement steps of the method according to any of claims 7 to 14.