Claims

1. A multi-mode charging and discharging control method for charging piles, comprising:

configuring charging pile charging and discharging modes, wherein the charging pile charging and discharging modes comprise a peak mode, a flat mode and a valley mode;

when a preset update period is met, performing a statistics operation on electricity consumption information of a power grid in a preset region in a preset period to obtain a peak value period, a flat value period and a valley value period;

when the power grid is in the peak value period, starting the peak mode, receiving a charging pile discharging requirement in the preset region, executing charging pile bidirectional discharging optimization, and generating a charging pile bidirectional discharging strategy to perform charging pile discharging control;

when the power grid is in the flat value period, starting the flat mode, receiving a charging pile discharging requirement in the preset region, executing charging pile linkage discharging optimization, and generating a linkage discharging strategy to perform charging pile discharging control; and

when the power grid is in the valley value period, starting the valley mode, receiving a charging pile discharging requirement in the preset region, executing charging pile charging optimization, and generating a charging pile charging strategy to perform charging pile charging control.

2. The method as claimed in claim 1, wherein the when a preset update period is met, performing a statistics operation on electricity consumption information of a power grid in a preset region in a preset period to obtain a peak value period, a flat value period and a valley value period comprises:

constructing an electricity consumption fluctuation time sequence curve, wherein the electricity consumption information of the power grid in the preset region comprises an electricity consumption time point table in the preset region;

configuring a peak value electricity consumption range, a flat value electricity consumption range and a valley value electricity consumption range; and

performing period segmentation on the electricity consumption fluctuation time sequence curve according to the peak value electricity consumption range, the flat value electricity consumption range and the valley value electricity consumption range to generate the peak value period, the flat

value period and the valley value period.

3. The method as claimed in claim 2, wherein the constructing an electricity consumption fluctuation time sequence curve, wherein the electricity consumption information of the power grid in the preset region comprises an electricity consumption time point table in the preset region:

extracting a plurality of recorded electricity consumptions at a first time point in the electricity consumption time point table in the preset region;

sorting the plurality of recorded electricity consumptions from small to large to generate a recorded electricity consumption sorting result;

extracting a first recorded electricity consumption with a quarter number from the recorded electricity consumption sorting result, and extracting a second recorded electricity consumption with a three-quarter number from the recorded electricity consumption sorting result;

calculating a deviation between the second recorded electricity consumption and the first recorded electricity consumption to generate an electricity consumption interinterquartile range;

constructing a centralized box line diagram according to the electricity consumption interquartile range, the first recorded electricity consumption and the second recorded electricity consumption, and distributing the plurality of recorded electricity consumptions to obtain a maximum electricity consumption of a centralized box, which is set as an electricity consumption at the first time point; and

determining respective electricity consumptions at multiple unit time points by the above method for determining the electricity consumption at the first time point to construct the electricity consumption fluctuation time sequence curve.

4. The method as claimed in claim 1, wherein the when the power grid is in the peak value period, starting the peak mode, receiving the charging pile discharging requirement in the preset region, executing charging pile bidirectional discharging optimization, and generating a charging pile bidirectional discharging strategy to perform charging pile discharging control comprises:

the charging pile discharging requirement in the preset region comprises a charging pile required discharging capacity and a charging pile initial electricity storage capacity;

obtaining a charging pile redundant electricity storage capacity according to the charging pile required discharging capacity and the charging pile initial electricity storage capacity;

setting at most two-thirds of the charging pile redundant electricity storage capacity as a power distribution network direction discharging capacity; and

executing the charging pile bidirectional discharging optimization according to the power distribution network direction discharging capacity, and generating the charging pile bidirectional discharging strategy to perform charging pile discharging control.

5. The method as claimed in claim 4, wherein the executing the charging pile bidirectional discharging optimization according to the power distribution network direction discharging capacity, and generating the charging pile bidirectional discharging strategy to perform charging pile discharging control comprises:

the charging pile initial electricity storage capacity comprises an initial electricity storage capacity of a charging pile with a first number, an initial electricity storage capacity of a charging pile with a second number, ..., and an initial electricity storage capacity of a charging pile with the Nth number;

extracting charging piles having the initial electricity storage capacity greater than or equal to a preset electricity storage capacity from the charging pile with the first number, the charging pile with the second number, ..., and the charging pile with the Nth number to obtain power distribution network direction discharging charging pile numbers;

equally dividing the power distribution network direction discharging capacity to charging piles with the power distribution network direction discharging charging pile numbers to generate a power distribution network direction discharging strategy;

configuring a user side direction discharging strategy, wherein the user side direction discharging strategy implements real-time discharging of a charging pile energy storage battery based on user requirements; and

according to the power distribution network direction discharging strategy and the user side direction discharging strategy, constructing the charging pile bidirectional discharging strategy to perform charging pile discharging control.

6. The method as claimed in claim 1, wherein when the power grid is in the flat value period, starting the flat mode, receiving a charging pile discharging requirement in the preset region, executing charging pile linkage discharging optimization, and generating a linkage discharging strategy to perform charging pile discharging control comprises:

the charging pile discharging requirement in the preset region comprises a charging pile required discharging capacity and a charging pile initial electricity storage capacity;

extracting a first type of charging piles having the charging pile required discharging capacity greater than the charging pile initial electricity storage capacity;

extracting a second type of charging piles having the charging pile required discharging capacity less than the charging pile initial electricity storage capacity; and

activating a power grid for auxiliary discharging for the first type of charging piles, and executing energy storage battery discharging for the second type of charging piles, as to generate the linkage discharging strategy to perform charging pile discharging control.

7. The method as claimed in claim 1, wherein the when the power grid is in the valley value period, starting the valley mode, receiving a charging pile discharging requirement in the preset region, executing charging pile charging optimization, and generating a charging pile charging strategy to perform charging pile charging control comprises:

configuring a power grid alternating current discharging strategy according to the charging pile discharging requirement in the preset region, wherein the power grid alternating current discharging strategy invokes the power grid based on user requirements for alternating current charging for users through charging piles;

obtaining an initial electricity storage capacity ratio according to a charging pile initial electricity storage capacity in the charging pile discharging requirement in the preset region, wherein the initial electricity storage capacity ratio represents a ratio of a remaining electricity of any charging pile to an electric energy capacity thereof;

extracting a third type of charging piles having the initial electricity storage capacity ratio less than or equal to an electricity storage capacity ratio threshold to configure a power grid charging strategy; and

constructing the charging pile charging strategy according to the power grid alternating current discharging strategy and the power grid charging strategy, as to perform charging pile charging control.

8. The method as claimed in claim 4, further comprising:

when a first charging pile is connected by a charging user, obtaining a model of a battery to be

charged and an electricity to be charged;

when an initial electricity storage capacity of the first charging pile is less than the electricity to be charged, adding a fourth type of charging piles;

when the initial electricity storage capacity of the first charging pile is greater than the electricity to be charged, adding a fifth type of charging piles; and

invoking the fifth type of charging piles for auxiliary charging to the fourth type of charging piles, comprising:

obtaining a lacking charging capacity of any of the fourth type of charging piles, and matching auxiliary charging piles to be scheduled in the fifth type of charging piles, wherein a redundant electricity storage capacity of the auxiliary charging pile to be scheduled is greater than or equal to the lacking charging capacity;

constructing a plurality of scheduling lines corresponding to the auxiliary charging piles to be scheduled, and activating a line loss prediction channel to execute electricity loss analysis to generate electricity loss feature values, wherein the line loss prediction channel has a graph neural network topology structure; and

according to preset number of times, updating the auxiliary charging piles to be scheduled to obtain updated auxiliary charging piles to be scheduled, determining a plurality of scheduling lines corresponding to the updated auxiliary charging piles to be scheduled and electricity loss feature values, and extracting a charging pile scheduling strategy with a minimum electricity loss feature value for auxiliary charging to the fourth type of charging piles.

9. A multi-mode charging and discharging control system for charging piles, the system comprising:

a charging and discharging mode configuring assembly, the charging and discharging mode configuring assembly being configured to configure charging pile charging and discharging modes, wherein the charging pile charging and discharging modes comprise a peak mode, a flat mode and a valley mode;

an electricity consumption information statistics assembly, the electricity consumption information statistics assembly being configured to, when a preset update period is met, perform a statistics operation on electricity consumption information of a power grid in a preset region in a preset period to obtain a peak value period, a flat value period and a valley value period;

a bidirectional discharging optimization assembly, the bidirectional discharging optimization assembly being configured to, when the power grid is in the peak value period, start the peak mode, receive a charging pile discharging requirement in the preset region, execute charging pile bidirectional discharging optimization, and generate a charging pile bidirectional discharging strategy to perform charging pile discharging control;

a linkage discharging optimization assembly, the linkage discharging optimization assembly being configured to, when the power grid is in the flat value period, start the flat mode, receive a charging pile discharging requirement in the preset region, execute charging pile linkage discharging optimization, and generate a linkage discharging strategy to perform charging pile discharging control; and

a charging optimization assembly, the charging optimization assembly being configured to, when the power grid is in the valley value period, start the valley mode, receive a charging pile discharging requirement in the preset region, execute charging pile charging optimization, and generate a charging pile charging strategy to perform charging pile charging control.

10. The system as claimed in claim 9, wherein the electricity consumption information statistics assembly is further configured to:

construct an electricity consumption fluctuation time sequence curve, wherein the electricity consumption information of the power grid in the preset region comprises an electricity consumption time point table in the preset region;

configure a peak value electricity consumption range, a flat value electricity consumption range and a valley value electricity consumption range; and

perform period segmentation on the electricity consumption fluctuation time sequence curve according to the peak value electricity consumption range, the flat value electricity consumption range and the valley value electricity consumption range to generate the peak value period, the flat value period and the valley value period.

11. The system as claimed in claim 10, wherein the electricity consumption information statistics assembly is further configured to:

extract a plurality of recorded electricity consumptions at a first time point in the electricity consumption time point table in the preset region;

sort the plurality of recorded electricity consumptions from small to large to generate a recorded

electricity consumption sorting result;

extract a first recorded electricity consumption with a quarter number from the recorded electricity consumption sorting result, and extracting a second recorded electricity consumption with a three-quarter number from the recorded electricity consumption sorting result;

calculate a deviation between the second recorded electricity consumption and the first recorded electricity consumption to generate an electricity consumption interinterquartile range;

construct a centralized box line diagram according to the electricity consumption interquartile range, the first recorded electricity consumption and the second recorded electricity consumption, and distributing the plurality of recorded electricity consumptions to obtain a maximum electricity consumption of a centralized box, which is set as an electricity consumption at the first time point; and

determine respective electricity consumptions at multiple unit time points by the above method for determining the electricity consumption at the first time point to construct the electricity consumption fluctuation time sequence curve.

12. The system as claimed in claim 9, wherein the bidirectional discharging optimization assembly is further configured to:

the charging pile discharging requirement in the preset region comprises a charging pile required discharging capacity and a charging pile initial electricity storage capacity;

obtain a charging pile redundant electricity storage capacity according to the charging pile required discharging capacity and the charging pile initial electricity storage capacity;

set at most two-thirds of the charging pile redundant electricity storage capacity as a power distribution network direction discharging capacity; and

execute the charging pile bidirectional discharging optimization according to the power distribution network direction discharging capacity, and generating the charging pile bidirectional discharging strategy to perform charging pile discharging control.

13. The system as claimed in claim 12, wherein the bidirectional discharging optimization assembly is further configured to:

the charging pile initial electricity storage capacity comprises an initial electricity storage

capacity of a charging pile with a first number, an initial electricity storage capacity of a charging pile with a second number, ..., and an initial electricity storage capacity of a charging pile with the Nth number;

extract charging piles having the initial electricity storage capacity greater than or equal to a preset electricity storage capacity from the charging pile with the first number, the charging pile with the second number, ..., and the charging pile with the Nth number to obtain power distribution network direction discharging charging pile numbers;

equally divide the power distribution network direction discharging capacity to charging piles with the power distribution network direction discharging charging pile numbers to generate a power distribution network direction discharging strategy;

configure a user side direction discharging strategy, wherein the user side direction discharging strategy implements real-time discharging of a charging pile energy storage battery based on user requirements; and

according to the power distribution network direction discharging strategy and the user side direction discharging strategy, construct the charging pile bidirectional discharging strategy to perform charging pile discharging control.

14. The system as claimed in claim 9, wherein the linkage discharging optimization assembly is further configured to:

the charging pile discharging requirement in the preset region comprises a charging pile required discharging capacity and a charging pile initial electricity storage capacity;

extract a first type of charging piles having the charging pile required discharging capacity greater than the charging pile initial electricity storage capacity;

extract a second type of charging piles having the charging pile required discharging capacity less than the charging pile initial electricity storage capacity; and

activate a power grid for auxiliary discharging for the first type of charging piles, and executing energy storage battery discharging for the second type of charging piles, as to generate the linkage discharging strategy to perform charging pile discharging control.

15. The system as claimed in claim 9, wherein the charging optimization assembly is further configured to:

configure a power grid alternating current discharging strategy according to the charging pile discharging requirement in the preset region, wherein the power grid alternating current discharging strategy invokes the power grid based on user requirements for alternating current charging for users through charging piles;

obtain an initial electricity storage capacity ratio according to a charging pile initial electricity storage capacity in the charging pile discharging requirement in the preset region, wherein the initial electricity storage capacity ratio represents a ratio of a remaining electricity of any charging pile to an electric energy capacity thereof;

extract a third type of charging piles having the initial electricity storage capacity ratio less than or equal to an electricity storage capacity ratio threshold to configure a power grid charging strategy; and

construct the charging pile charging strategy according to the power grid alternating current discharging strategy and the power grid charging strategy, as to perform charging pile charging control.