CLAIMS

1. A management device comprising:

a vehicle information receiver configured to receive from a vehicle configured to travel by power, vehicle information relating to travel of the vehicle;

a power information receiver configured to receive from a local power management device configured to control power supply to a power network in each area, power information relating to power for the power network;

a charging information estimator configured to estimate, for each vehicle, an area in which the vehicle performs charging of power the next time, based on the vehicle information; and

a local power consumption estimator configured to estimate a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information.

2. The management device according to claim 1, further comprising:

a local charging amount estimator configured to estimate the total amount of power consumption for the power network in each area, the power consumption being caused by the charging of power to the vehicle,

wherein the local power consumption estimator is configured to estimate a power consumption amount for the power network in each area, based on a result of estimation by the local charging amount estimator and the power information.

3. The management device according to claim 1 or 2, further comprising:

a complementary information generator configured to estimate a surplus or

shortage of a power supply amount for the power network in each area, based on the result of estimation by the local power consumption amount estimator and the power information, the complementary information generator being configured to generate complementary information for instructing to distribute a part of all of power supply to a power network in an area estimated to have a surplus in the power supply amount, to a power network in an area estimated to be short of the power supply amount; and

a complementary information transmitter configured to transmit the complementary information to the local power management device.

4. The management device according to claim 1 or 2, further comprising:

a travel range estimator configured to estimate, for each vehicle, a travel range that the vehicle travels by the time at which the vehicle performs the charging of power the next time;

a surplus estimator configured to estimate a surplus or shortage of a power supply amount for the power network in each area, based on the result of estimation by the local power consumption amount estimator and the power information;

a power stand database configured to store information indicating a position of a power stand at which the charging of power to the vehicle is performed and a power network to be supplied with power; and

a reporter configured to search from the power stand database, a power stand to be supplied with power from the power network that is present in the travel range and estimated by the surplus estimator to have a surplus of the power supply amount, the reporter being configured to report information of the power stand to the vehicle.

5. A management method comprising:

a step of receiving from a vehicle configured to travel by power, vehicle information relating to travel of the vehicle;

a step of receiving from a local power management device configured to control power supply to a power network in each area, power information relating to power for the power network;

a step of estimating, for each vehicle, an area in which the vehicle performs charging of power the next time, based on the vehicle information; and

a step of estimating a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information.

6. A computer program causing a computer to execute:

a step of receiving from a vehicle configured to travel by power, vehicle information relating to travel of the vehicle;

a step of receiving from a local power management device configured to control power supply to a power network in each area, power information relating to power for the power network;

a step of estimating, for each vehicle, an area in which the vehicle performs charging of power the next time, based on the vehicle information; and

a step of estimating a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information.

7. A management system comprising:

a management device;

a local power management device configured to control power supply to a power network in each area; and

an in-vehicle device configured to be mounted on a vehicle configured to travel by power,

wherein the in-vehicle device comprises:

a vehicle information acquirer configured to acquire vehicle information relating to travel of the vehicle; and

a communication unit configured to transmit the vehicle information to the management device,

the management device comprises:

a vehicle information receiver configured to receive the vehicle information;

a power information receiver configured to receive power information relating to power for the power network;

a charging information estimator configured to estimate, for each vehicle, an area in which the vehicle performs charging of power the next time; and

a local power consumption estimator configured to estimate a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information.

8. The management system according to claim 7, wherein the management device further comprises:

a travel range estimator configured to estimate, for each vehicle, a travel range that the vehicle travels by the time at which the vehicle performs the charging of power the next time;

a surplus estimator configured to estimate a surplus or shortage of a power

supply amount for the power network in each area, based on the result of estimation by the local power consumption amount estimator and the power information;

a power stand database configured to store information indicating a position of a power stand at which the charging of power to the vehicle is performed and a power network to be supplied with power; and

a reporter configured to search from the power stand database, a power stand to be supplied with power from the power network that is present in the travel range and estimated by the surplus estimator to have a surplus of the power supply amount, the reporter being configured to report information of the power stand to the vehicle.

9. The management system according to claim 8, wherein the in-vehicle device further comprises an output unit configured to output information to a crew of the vehicle,

the communication unit is configured to receive information of the power stand from the management device, and

the output unit is configured to output the information of the power stand received by the communication unit.

CLAIMS

1. A management device comprising:

a vehicle information receiver configured to receive from a vehicle configured to travel by power, vehicle information relating to travel of the vehicle;

a power information receiver configured to receive from a local power management device configured to control power supply to a power network in each area, power information relating to power for the power network;

a charging information estimator configured to estimate, for each vehicle, an area in which the vehicle performs charging of power the next time, based on the vehicle information;

a local power consumption estimator configured to estimate a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information;

a travel range estimator configured to estimate, for each vehicle, a travel range that the vehicle travels by the time at which the vehicle performs the charging of power the next time;

a surplus estimator configured to estimate a surplus or shortage of a power supply amount for the power network in each area, based on the result of estimation by the local power consumption amount estimator and the power information;

a power stand database configured to store information indicating a position of a power stand at which the charging of power to the vehicle is performed and a power network to be supplied with power; and

a reporter configured to search from the power stand database, a power stand to be supplied with power from the power network that is present in the travel range and estimated by the surplus estimator to have a surplus of the power supply amount, the reporter being configured to report information of the power stand to the vehicle.

2. The management device according to claim 1, further comprising:

a local charging amount estimator configured to estimate the total amount of power consumption for the power network in each area, the power consumption being caused by the charging of power to the vehicle,

wherein the local power consumption estimator is configured to estimate a power consumption amount for the power network in each area, based on a result of estimation by

the local charging amount estimator and the power information.

3. The management device according to claim 1 or 2, further comprising:

a complementary information generator configured to estimate a surplus or shortage of a power supply amount for the power network in each area, based on the result of estimation by the local power consumption amount estimator and the power information, the complementary information generator being configured to generate complementary information for instructing to distribute a part of all of power supply to a power network in an area estimated to have a surplus in the power supply amount, to a power network in an area estimated to be short of the power supply amount; and

a complementary information transmitter configured to transmit the complementary information to the local power management device.

4. A management method comprising:

a step of receiving from a vehicle configured to travel by power, vehicle information relating to travel of the vehicle;

a step of receiving from a local power management device configured to control power supply to a power network in each area, power information relating to power for the power network;

a step of estimating, for each vehicle, an area in which the vehicle performs charging of power the next time, based on the vehicle information;

a step of estimating a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information;

a step of estimating, for each vehicle, a travel range that the vehicle travels by the time at which the vehicle performs the charging of power the next time;

a step of estimating a surplus or shortage of a power supply amount for the power network in each area, based on the estimated power consumption amount and the power information;

a step of storing information indicating a position of a power stand at which the charging of power to the vehicle is performed and a power network to be supplied with power; and

a step of searching from the power stand database, a power stand to be supplied with power from the power network that is present in the travel range and estimated to have a

surplus of the power supply amount, and reporting information of the power stand to the vehicle.

5. A computer program causing a computer to execute:

a step of receiving from a vehicle configured to travel by power, vehicle information relating to travel of the vehicle;

a step of receiving from a local power management device configured to control power supply to a power network in each area, power information relating to power for the power network;

a step of estimating, for each vehicle, an area in which the vehicle performs charging of power the next time, based on the vehicle information;

a step of estimating a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information;

a step of estimating, for each vehicle, a travel range that the vehicle travels by the time at which the vehicle performs the charging of power the next time;

a step of estimating a surplus or shortage of a power supply amount for the power network in each area, based on the estimated power consumption amount and the power information;

a step of storing information indicating a position of a power stand at which the charging of power to the vehicle is performed and a power network to be supplied with power; and

a step of searching from the power stand database, a power stand to be supplied with power from the power network that is present in the travel range and estimated to have a surplus of the power supply amount, and reporting information of the power stand to the vehicle.

6. A management system comprising:

a management device;

a local power management device configured to control power supply to a power network in each area; and

an in-vehicle device configured to be mounted on a vehicle configured to travel by power,

wherein the in-vehicle device comprises:

a vehicle information acquirer configured to acquire vehicle information relating to travel of the vehicle; and

a communication unit configured to transmit the vehicle information to the management device,

the management device comprises:

a vehicle information receiver configured to receive the vehicle information;

a power information receiver configured to receive power information relating to power for the power network;

a charging information estimator configured to estimate, for each vehicle, an area in which the vehicle performs charging of power the next time;

a local power consumption estimator configured to estimate a power consumption amount for the power network in each area, based on a result of estimation by the charging information estimator and the power information;

a travel range estimator configured to estimate, for each vehicle, a travel range that the vehicle travels by the time at which the vehicle performs the charging of power the next time;

a surplus estimator configured to estimate a surplus or shortage of a power supply amount for the power network in each area, based on the result of estimation by the local power consumption amount estimator and the power information;

a power stand database configured to store information indicating a position of a power stand at which the charging of power to the vehicle is performed and a power network to be supplied with power; and

a reporter configured to search from the power stand database, a power stand to be supplied with power from the power network that is present in the travel range and estimated by the surplus estimator to have a surplus of the power supply amount, the reporter being configured to report information of the power stand to the vehicle.

7. The management system according to claim 6, wherein the in-vehicle device further comprises an output unit configured to output information to a crew of the vehicle,

the communication unit is configured to receive information of the power stand from the management device, and

the output unit is configured to output the information of the power stand received by the communication unit.