Claims

1. An electric load network for adjusting an operation frequency of an electricity grid in real time, the electric load network comprising:

a set of computing devices interconnected to perform one or more computing tasks, the set of computing devices being configured to electrically connect to the electricity grid to be powered by the electricity grid in order to perform the one or more computing tasks at a collective operation power;

a site server that is connected to the set of computing devices;

a frequency reader that is connected to the site server, the frequency reader being configured to read from the electricity grid the operation frequency of the electricity grid during an adjustment interval;

wherein the site server is configured to:

obtain from the frequency reader the operation frequency of the electricity grid during the adjustment interval;

determine a frequency difference between the operation frequency and a reference operation frequency; and

instruct the set of computing devices to change the collective operation power of the set of computing devices based on the frequency difference to adjust the operation frequency of the electricity grid.

2. The electric load network of claim 1, wherein each of set of the computing devices includes a set of chips operating at a chipset power, and the site server is further configured to instruct at least one of the set of computing devices to operate at a different chipset power in order to change the collective operation power of the set of computing devices.

3. The electric load network of claim 2, wherein the site server is further configured to change the collective operation power of the set of computing devices by a load change limit at most.

4. The electric load network of claim 3, wherein the reference operation frequency is a minimum operation frequency allowed in the electricity grid, and the site server is further configured to:

determine the frequency difference as a percentage difference that the operation frequency of the electricity grid during the adjustment interval is below the minimum operation frequency;

determine a below proportion of the percentage difference to a maximal below percentage; and

determine the below proportion times the load change limit to be a power reduction value.

5. The electric load network of claim 4, wherein the site server is further configured to:

instruct each of the set of computing devices to reduce the chipset power of each of the set of computing devices in order to reduce the collective operation power of the set of computing devices by the power reduction value.

6. The electric load network of claim 5, wherein the site server is further configured to:

determine a chipset reduction proportion of the power reduction value to a collective chipset power of the set of computing devices; and

instruct each of the set of computing devices to reduce the chipset power of each of the set of computing devices by the chipset reduction proportion.

7. The electric load network of claim 4, wherein the site server is further configured to:

instruct a subset of the set of computing devices to reduce the chipset power of each of those computing devices in order to reduce a collective chipset power of the set of computing devices by the power reduction value.

8. The electric load network of claim 3, wherein the reference operation frequency is a maximum operation frequency allowed in the electricity grid, and the site server is further configured to:

determine the frequency difference as a percentage difference that the operation frequency of the electricity grid during the adjustment interval is above the maximum operation frequency;

determine a above proportion of the percentage difference to a maximal above percentage; and

determine the above proportion times the load change limit to be a power increase value.

9. The electric load network of claim 8, wherein the site server is further configured to:

instruct each of the set of computing devices to increase the chipset power of each of the set of computing devices in order to increase the collective operation power of the set of computing devices by the power increase value.

10. The electric load network of claim 9, wherein the site server is further configured to:

determine a chipset increase proportion of the power increase value to a collective chipset power of the set of computing devices; and

instruct each of the set of computing devices to increase the chipset power of each of the set of computing devices by the chipset increase proportion.

11. The electric load network of claim 8, wherein the site server is further configured to:

instruct a subset of the set of computing devices to increase the chipset power of each of those computing devices in order to increase a collective chipset power of the set of computing devices by the power increase value.

12. The electric load network of any one of the preceding claims, wherein the site server is further configured to:

determine a first financial return assuming the site server keeps changing the collective operation power of the set of computing devices for a period of time;

determine a second financial return assuming the set of computing devices keep performing the one or more computing tasks without changing the collective operation power of the set of computing devices for the period of time; and

instruct the set of computing devices to change the collective operation power of the set of computing devices during the period of time only if the first financial return is greater than the second financial return.

13. The electric load network of any one of the preceding claims, wherein the one or more computing tasks comprise proof of work.

14. The electric load network of claim 12 or 13, wherein the period of time includes one of the following periods of time:

a 6-second period of time;

a 60-second period of time; and

a 5-minute period of time.

15. A computer-implemented method for adjusting an operation frequency of an electricity grid, the electricity grid electrically connecting to a set of computing devices to power the set of computing devices, the set of computing devices are interconnected to perform one or more computing tasks at a collective operation power, the method comprising, at a site server:

obtaining from a frequency reader connected to the electricity grid the operation frequency of the electricity grid during an adjustment interval;

determining, a frequency difference between the operation frequency during the adjustment interval and a reference operation frequency; and

instructing the set of computing devices to change the collective operation power of the set of computing devices based on the frequency difference to adjust the operation frequency of the electricity grid.

16. The computer-implemented method of claim 15, wherein each of set of the computing devices includes a set of chips operating at a chipset power, the method further comprising, at the site server:

instructing at least one of the set of the computing devices to operate at a different chipset power in order to change the collective operation power of the set of the computing devices.

17. The computer-implemented method of claim 16, further comprising, at the site server: changing the collective operation power of the set of computing devices by a load change limit at most.

18. The computer-implemented method of claim 17, wherein the reference operation frequency is a minimum operation frequency allowed in the electricity grid, the method further comprising, at the site server:

determining the frequency difference as a percentage difference that the operation frequency of the electricity grid during the adjustment interval is below the minimum operation frequency;

determining a below proportion of the percentage difference to a maximal below percentage; and

determining the below proportion times the load change limit to be a power reduction value.

19. The computer-implemented method of claim 18, further comprising, at the site server:

instructing each of the set of computing devices to reduce the chipset power of each of the set of computing devices in order to reduce the collective operation power of the set of computing devices by the power reduction value.

20. The computer-implemented method of claim 19, further comprising, at the site server:

determining a chipset reduction proportion of the power reduction value to the collective chipset power of the set of computing devices; and

instructing each of the set of computing devices to reduce the chipset power of each of the set of computing devices by the chipset reduction proportion.

21. The computer-implemented method of claim 18, further comprising, at the site server:

instructing a subset of the set of computing devices to reduce the chipset power of each of those computing devices in order to reduce a collective chipset power of the set of computing devices by the power reduction value.

22. The computer-implemented method of claim 17, wherein the reference operation frequency is a maximum operation frequency allowed in the electricity grid, the method further comprising, at the site server:

determining the frequency difference as a percentage difference that the operation frequency of the electricity grid during the adjustment interval is above the maximum operation frequency;

determining a above proportion of the percentage difference to a maximal above percentage; and

determining the above proportion times the load change limit to be a power increase value.

23. The computer-implemented method of claim 22, further comprising, at the site server:

instructing each of the set of computing devices to increase the chipset power of each of the set of computing devices in order to increase the collective operation power of the set of computing devices by the power increase value.

24. The computer-implemented method of claim 23, further comprising, at the site server:

determining a chipset increase proportion of the power increase value to a collective chipset power of the set of computing devices; and

instructing each of the set of computing devices to increase the chipset power of each of the se of computing devices by the chipset increase proportion.

25. The computer-implemented method of claim 22, further comprising, at the site server:

instructing a subset of the set of computing devices to increase the chipset power of each of those computing devices in order to increase a collective chipset power of the set of computing devices by the power increase value.

26. The computer-implemented method of any one of claims 15 to 25, further comprising, at the site server:

determining a first financial return assuming the site server keeps changing the collective operation power of the set of computing devices for a period of time;

determining a second financial return assuming the set of computing devices keep performing the one or more computing tasks without changing the collective operation power of the set of computing devices for the period of time; and

instructing the set of computing devices to change the collective operation power of the set of computing devices during the period of time only if the first financial return is greater than the second financial return.

27. The computer-implemented method of any one of claims 15 to 26, wherein the one or more computing tasks comprise proof of work.

28. The computer-implemented method of claim 26 or 27, wherein the period of time includes one of the following periods of time:

a 6-second period of time;

a 60-second period of time; and

a 5-minute period of time.

29. A site server for adjusting an operation frequency of an electricity grid in real time, the site server comprising:

a processor;

a bus connected to the processor;

a computer-readable memory connected to the bus, the computer-readable memory being configured to store a set of computer-readable instructions;

a first communication interface connected to the bus, the first communication interface being configured to connect to a set of computing devices; and

a second communication interface connected to the bus, the second communication interface being configured to connect to a frequency reader;

wherein the processor is configured to read the set of the computer-readable instructions from the computer-readable memory and perform the method as defined in any one of claims 15 to 28.

30. A non-transitory computer-readable medium storing a set of instructions that when executed cause a site server to perform the method as defined in any one of claims 15 to 28.