centers were responsible for 1.5% of the total electricity consumption in the United States. Likewise, data centers were estimated to be responsible for .5% of greenhouse gas emissions in the United States in the same year. The amount of greenhouse gas emissions from data centers is also expected to rise in the future. For example, it is projected that greenhouse gas emission from data centers will double from 2007 levels by 2020.

One factor of how much greenhouse gas emission a data center is responsible for is the energy efficiency of the data center. One common measure of data center energy efficiency is power usage effectiveness, or "PUE". As discussed further below, PUE is the ratio of the amount of total system (e.g., data center) power to the amount of power used by the electronic (e.g., information technology) equipment of the system. The average data center in the United States has a PUE of 2.0.

SUMMARY

Embodiments of the present disclosure seek to provide a system for data center cooling and water desalination. In some aspects, the systems include a data center having a water cooling subsystem configured to receive cool water and output warm water and a desalination plant co-located with the data center and configured to receive and desalinate the warm water. Embodiments of the invention also include a method for cooling a data center using a water cooling subsystem and desalinating water with a desalination plant that is co-located with the data center.

According to a first aspect of the present invention, there is provided a data center having a water cooling subsystem configured to receive cool water and output warm water and a water desalination plant co-located with the data center and configured to receive and desalinate the output warm water. In some embodiments, the cool water may be received from an ocean or sea. ~~In some embodiments of the systems, the~~ The desalination plant ~~may be~~is a distillation or a reverse osmosis desalination ~~plant~~facility.

In some embodiments, systems may include a water intake. The water intake may be positioned at a depth of 15 m or more in a water source. In some instances, the water intake is positioned below the photic zone in a water source. The systems may also include a water discharge configured for discharging brine from the water desalination

plant. The water discharge may be, in some embodiments, positioned at a depth of 15 m or more in a body of water (e.g., an ocean or sea). In some embodiments, the body of water in which the water discharge may be positioned may be the same body of water, e.g., ocean or sea, in which the water intake of a system may be positioned.

The power usage effectiveness (PUE) of the data center of the disclosed systems may be 2 or less. In some instances, the PUE of the data center of the disclosed systems ranges from 1 and 1.3. In some instances, the data center and desalination plant of the disclosed systems may be configured to produce fewer carbon emissions as compared to the same data center and water desalination plant operating independently. In some versions of the systems, the data center and water desalination plant may be configured to use less energy per amount of data-center cooling and per volume of water desalinated as compared to the same data center and water desalination plant operating independently.

The disclosed systems may include a power plant co-located with a data center and a water desalination plant. In some instances, the power plant may be operably connected to both of the data center and the water desalination plant. The data center, water desalination plant and power plant may be configured to produce fewer carbon emissions as compared to the same data center, water desalination plant and power plant operating independently. In some versions of the systems, the data center, water desalination plant and power plant may be configured to use less energy per amount of data-center cooling and per volume of water desalinated as compared to the same data center, water desalination plant and power plant operating independently.

Also provided by the present disclosure are methods for cooling a data center and desalinating salt water. According to a second aspect of the present invention, there is provided a method comprising cooling a data center with a water cooling subsystem comprising a cool water intake and a warm water discharge, wherein the water cooling subsystem is configured to absorb heat produced by the data center; and desalinating warm water received from the warm water discharge at a desalination plant that is co-located with the data center. ~~In some instances, the~~ The desalination plant ~~may be~~is a distillation or a reverse osmosis desalination ~~plant~~facility.

In some embodiments of the methods, a water cooling subsystem of a data center may be configured to obtain seawater from a cool water intake. In some instances, a cool water

WHAT IS CLAIMED IS:

1. A system comprising:

(a) a data center comprising a water cooling subsystem configured to receive cool water and output warm water; and

(b) a water desalination plant co-located with the data center and configured to receive and desalinate the output warm water,

wherein the water desalination plant comprises a distillation or a reverse osmosis desalination facility.

2. The system according to Claim 1, wherein the cool water is received from an ocean or sea.

3. The system according to Claims 1 or 2, wherein the water cooling subsystem comprises a water intake.

4. The system according to Claim 3, wherein the water intake is positioned at a depth of 15 m or more in a water source.

5. The system according to Claim 3, wherein the water intake is positioned below the photic zone in a water source.

6. The system according to any of Claims 1 to 5, further comprising a water discharge for discharging brine from the water desalination plant.

7. The system according to Claim 6, wherein the water discharge is positioned at a depth of 15 m or more in a body of water.

8. The system according to Claim 7, wherein the body of water is the same body of water from which the water cooling subsystem receives the cool water.

12. A method of cooling a data center, the method comprising:

(a) cooling a data center with a water cooling subsystem comprising a cool water intake and a warm water discharge; and

(b) desalinating warm water received from the warm water discharge at a desalination plant that is co-located with the data center,

wherein the desalination plant comprises a distillation or a reverse osmosis desalination facility.

13. The method according to Claim 12, wherein the water cooling subsystem is configured to obtain seawater from the cool water intake.

14. The method according to Claims 12 and 13, wherein the desalination plant is a reverse osmosis desalination plant.

15. The method according to any of Claims 12 to 14, wherein the cool water intake is positioned below the photic zone of a water source.

16. The method according to Claim 15, wherein the water source is an ocean or sea.

17. The method according to Claim 16, wherein the method further comprises discharging brine from the desalination plant into the ocean or sea.

18. The method according to Claim 17, wherein the brine is discharged below the photic zone of the ocean or sea.

19. The method according to any of Claims 12 to 18, wherein the method produces fewer carbon emissions as compared to the same data center and water desalination plant operating independently.