Appendix

Glossary

acre-foot

A unit of volume used to measure water; the amount of water needed to cover one acre of land (43,560 square feet) to a depth of one foot. One acre-foot is equivalent to about 1,233 m^3.

air cooling

A data center cooling method that uses air conditioning systems to circulate cool air over hardware to dissipate heat.

chiller

A machine that removes heat from a liquid coolant through vapor-compression, adsorption refrigeration, or absorption refrigeration cycles.

closed-loop system

A type of cooling system that recirculates the coolant, reducing water use and contamination risk.

colocation center

Sometimes shortened to colo, a type of data center that rents out equipment, space, and bandwidth to retail customers, as opposed to single-tenant hyperscale data centers.

cooling tower

A device that rejects heat to the atmosphere by cooling a coolant stream (usually water) to a lower temperature, using either evaporation or air to cool the fluid.

CRAH

Computer Room Air Handler; an HVAC unit that provides precise cooling and humidity control for data centers and server rooms by circulating cold air, often through connection to an external chilling system.

dielectric fluid

A non-conductive liquid with high resistance to electric current, like synthetic hydrocarbons, esters, and fluorochemicals, often used for immersion cooling.

evaporative cooling

A data center cooling method that passes hot air over a water-saturated pad or through a heat exchanger using a cooling tower, causing water to evaporate and drawing heat from the air to cool the data center.

facility power

The total amount of electricity required by a given data center to run all of its equipment, including IT infrastructure and support systems like cooling and lighting; typically measured in kWh; used to calculate power usage effectiveness.

free cooling

A data center cooling method used in cold climates or locations with access to cold water sources that circulates naturally cool air or water, reducing reliance on mechanical refrigeration.

heat export

The process of capturing waste heat generated by IT equipment and repurposing it for external uses, like heating nearby buildings through a district heating network.

hyperscale data center

An extremely large facility that houses vast numbers of servers and storage systems, designed for extreme scalability and efficiency to meet the data demands of "hyperscale" businesses like large cloud service providers and social media companies.

immersion cooling

A data center cooling method that submerges servers and IT equipment in a dielectric fluid coolant to remove heat.

indirect water use

Water consumed throughout the entire life cycle of producing and supplying energy, like the water used as a coolant to condense steam in thermoelectric power plants.

IT equipment power

The amount of electricity consumed by a given data center to power only information technology infrastructure, like servers and storage systems, without including electricity required for support systems; typically measured in kWh; used to calculate power usage effectiveness and water usage effectiveness.

kWh

A unit of energy representing the amount of energy used by a 1,000-watt appliance running for one hour.

liquid cooling

A data center cooling method that uses water or dielectric fluid to absorb and dissipate heat and circulates cool fluid through a CRAH or directly through computing components.

open-loop system

A type of cooling system that uses water for only one cycle before discarding it, which is more cost-effective in most places based on water prices, increasing water use and contamination risk.

PUE

Power Usage Effectiveness, a ratio that describes how efficiently a data center uses energy by comparing energy use by computing and non-computing equipment, with a higher PUE representing a less efficient data center and a PUE of 1.0 representing maximum efficiency; calculated by dividing a given data center's facility power by its IT equipment power; measured in kWh/kWh.

single-phase immersion cooling

A form of immersion cooling in which servers are submerged in a dielectric fluid that stays in liquid form, transferring heat to an external cooling loop.

subsidence

The sinking and compaction of the land surface due to soil collapse as groundwater is pumped out, often resulting in infrastructure damage, flooding, and potential saltwater contamination.

two-phase immersion cooling

A form of immersion cooling in which servers are submerged in a low-boiling dielectric fluid that evaporates when heated and condenses on a cooled coil, creating a boil condense cycle for heat removal.

WUE

Water Usage Effectiveness; a ratio that describes how efficiently a data center uses water by comparing total water use to energy used by IT equipment, with a higher WUE representing a less water-efficient data center and a lower WUE representing a more water-efficient one; calculated by dividing a given data center's total water consumption in liters by its IT equipment power; measured in L/kWh.

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