



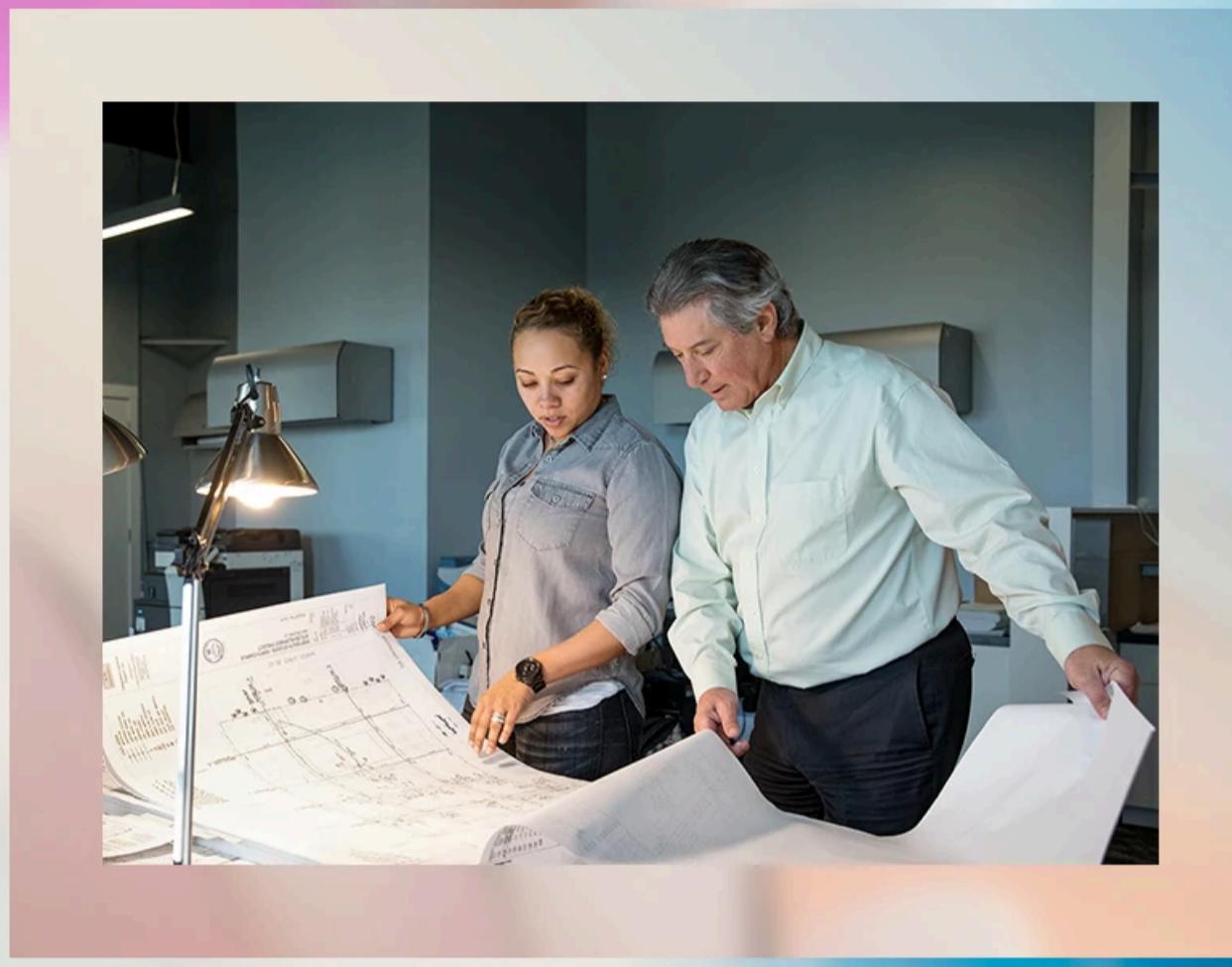
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Sustainable by design: Next-generation datacenters consume zero water for cooling

By [Steve Solomon](#), Vice President, Datacenter Infrastructure Engineering, Microsoft

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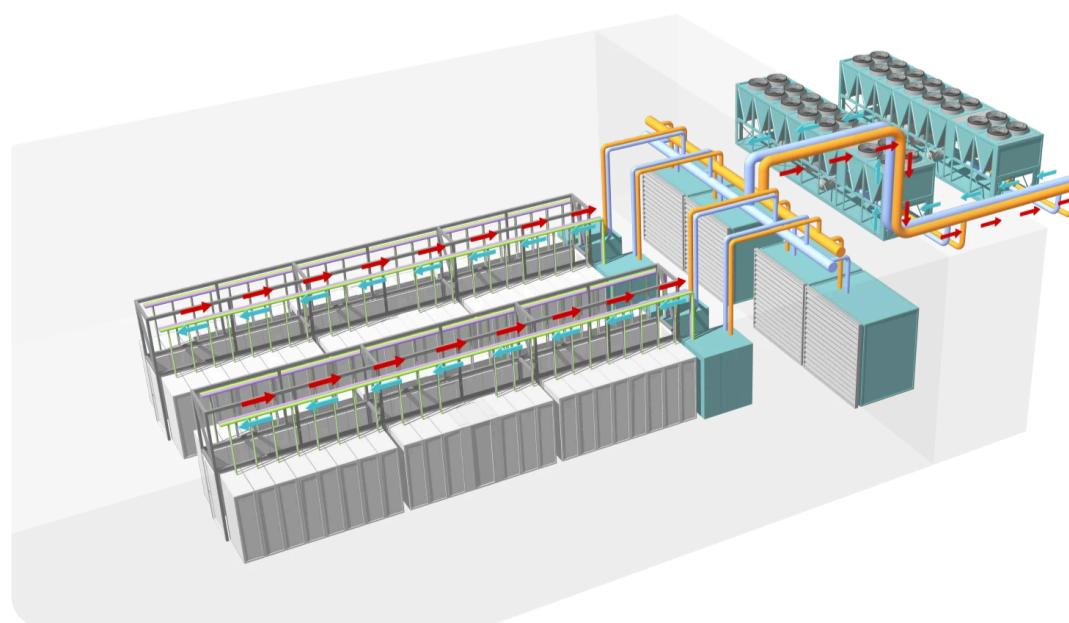


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AI AI transformation

This summer, we released our [Datacenter Community Pledge](#), detailing our commitment to the local economies and communities in which we operate our datacenters. Protecting local watersheds is an important part of this pledge—especially in areas where water stress is growing.

Beginning in August 2024, Microsoft launched a new datacenter design that optimizes AI workloads and consumes zero water for cooling. By adopting chip-level cooling solutions, we can deliver precise temperature control without water evaporation. While water is still used for administrative purposes like restrooms and kitchens, this design will avoid the need for more than 125 million liters of water per year per datacenter.*



This zero-water evaporated for cooling design recycles water through a closed loop system.

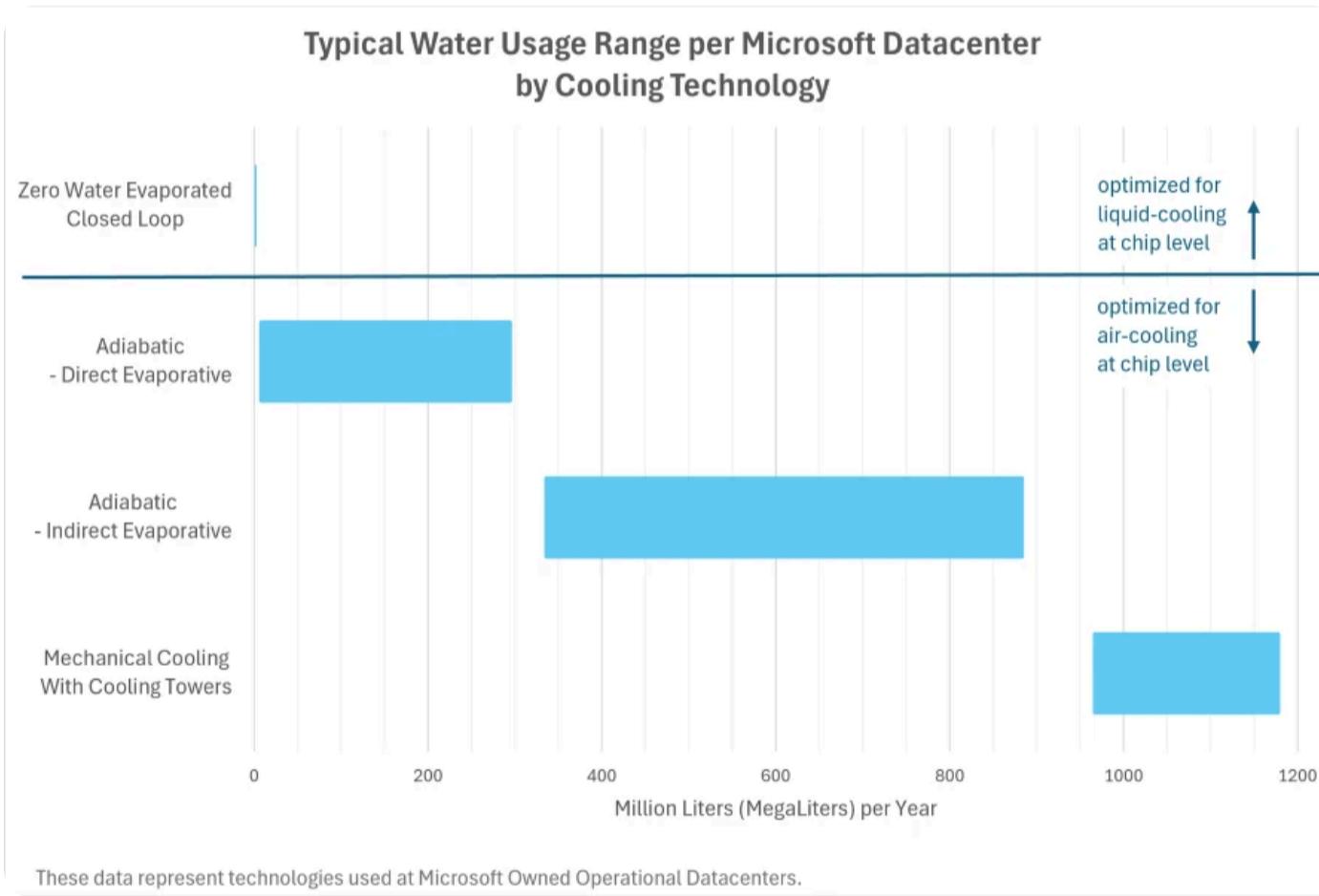
[Read more about Microsoft's Data Community Pledge](#)

Zero-water evaporation and the quest for ultra-low Water Usage Effectiveness

These new liquid cooling technologies recycle water through a closed loop. Once the system is filled during construction, it will continually circulate water between the servers and chillers to dissipate heat without requiring a fresh water supply.

We measure water efficiency through [Water Usage Effectiveness \(WUE\)](#), which divides total annual water consumption for humidification and cooling by the total energy consumption for IT equipment. We are continually investing in improving the design and operation of our datacenters to minimize water use. In our last fiscal year, our datacenters operated with an average WUE of 0.30 L/kWh. This represents a 39% improvement compared to 2021, when we reported a global average of 0.49 L/kWh. This WUE reduction is due to our ongoing efforts to actively reduce water wastage, expand our operating temperature range, and audit our data center operations. We also expanded our use of alternative water sources, such as reclaimed and recycled water, in Texas, Washington, California, and Singapore.

We have been working since the early 2000s to reduce water use and improved our WUE by 80% since our first generation of datacenters. As water challenges grow more extreme, we know we have more work to do. The shift to the next generation datacenters is expected to help reduce our WUE to near zero for each datacenter employing zero-water evaporation. As our fleet expands over time, this shift will help reduce Microsoft's fleetwide WUE even further.



Mitigating energy impacts

Traditionally, water has been evaporated on-site to reduce the power demand of the cooling systems. Replacement of evaporative systems with mechanical cooling will increase our power usage effectiveness (PUE). However, our latest chip-level cooling solutions will allow us to utilize warmer temperatures for cooling than previous generations of IT hardware, which enables us to mitigate the power use with high efficiency economizing chillers with elevated water temperatures.

The result is a nominal increase in our annual energy usage compared to our evaporative datacenter designs across the global fleet. Additional innovations to provide more targeted cooling are in development and are expected to continue to reduce power consumption.

Pilot projects and implementation

Although our current fleet will still use a mix of air-cooled and water-cooled systems, new projects in Phoenix, Arizona, and Mt. Pleasant, Wisconsin, will pilot zero-water evaporated designs in 2026. Starting August 2024, all new Microsoft datacenter designs began using this next-generation cooling technology, as we work to make zero-water evaporation the primary cooling method across our owned portfolio. These new sites will begin coming online in late 2027.

Advancing sustainability: Sustainable by design

Learn more about how Microsoft is advancing the sustainability of cloud and AI through our blog series:

- [Sustainable by design: Advancing the sustainability of AI](#)
- [Sustainable by design: Transforming datacenter water efficiency](#)
- [Sustainable by design: Innovating for energy efficiency in AI, part 1](#)
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*Based on our FY 2024 global average withdrawal WUE of 0.30 L/kWh.

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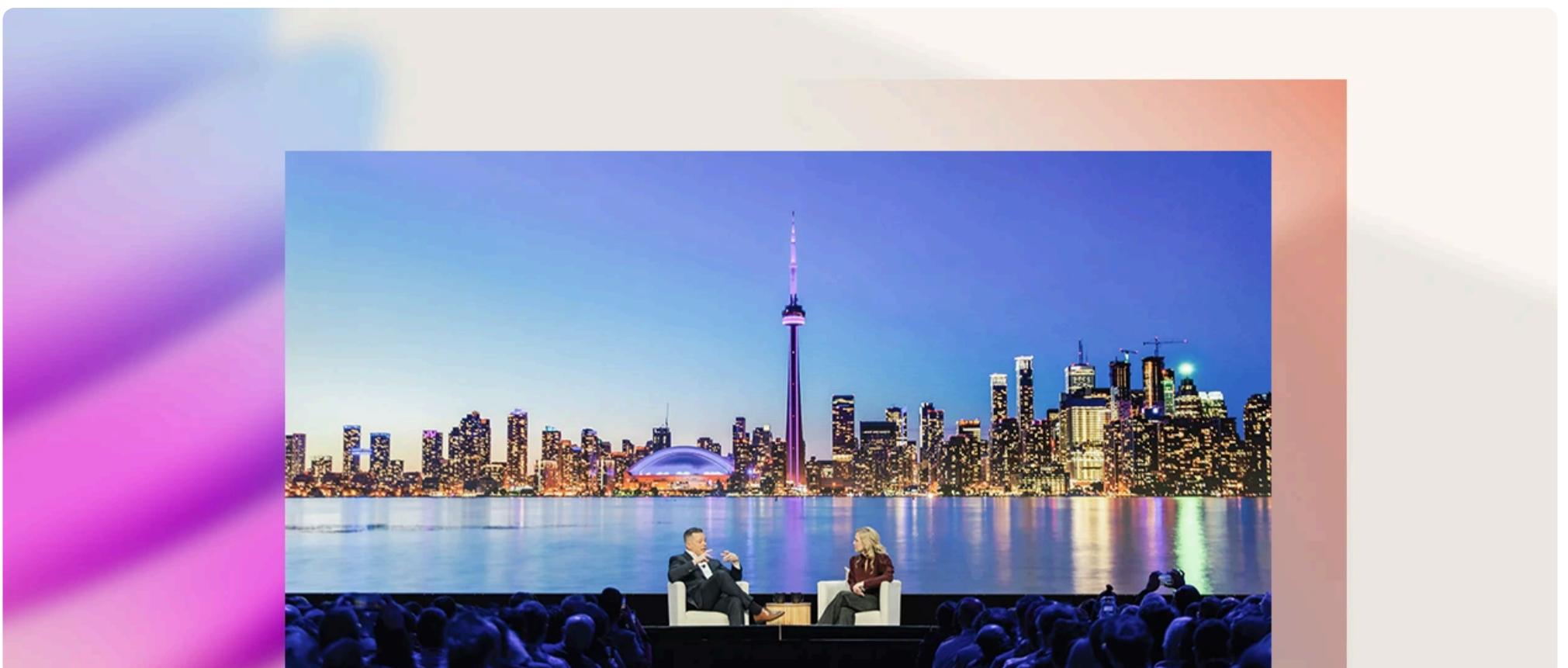
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