DATA CENTRES & WATER | SPECIAL REPORT

# The Hidden Water Cost of the AI Boom

How data centres are reshaping global water demand — and what the next generation of AI chips will change

TheWaterNetwork.com | AquaSPE AG | May 2026

| US indirect footprint 2023 | Texas projection 2030 | N. Virginia growth | Liquid cooling saving |
|---|---|---|---|
| **800B L** | **1.51B m³** | **+63%** | **up to 95%** |
| equiv. litres (indirect) | state alone | 2019 → 2023 | vs evaporative |

## Introduction

Every time you run an AI query, stream a video, or back up your files to the cloud, water is consumed. Not inside your device — inside the power plants and cooling towers that keep global data infrastructure running. As the artificial intelligence boom drives an unprecedented expansion of data centre capacity, the water sector faces a new and rapidly growing category of demand that most water professionals have barely begun to consider.

The United States alone holds 43% of global installed data centre capacity, growing at nearly 20% per year. In January 2025, an executive order accelerated AI-focused build-out further, while simultaneously offering exemptions to Clean Water Act permits. The collision between digital infrastructure expansion and global groundwater stress is no longer a future scenario — it is happening now.

## How data centres consume water

Data centres use water through two distinct pathways, and understanding the distinction is essential to evaluating any operator's environmental claims.

### On-site evaporative cooling

Traditional facilities use cooling towers that evaporate water to dissipate heat from server rooms — essentially large-scale swamp coolers. This water is consumed outright: it leaves the water cycle as vapour and does not return to local aquifers or surface water bodies. Industry benchmarks measure this as Water Usage Effectiveness (WUE), expressed in litres per kilowatt-hour of IT load. Evaporative cooling typically achieves a WUE of around 1.8 L/kWh — meaning a 100 MW facility consuming one million kWh per day evaporates approximately 1,800 cubic metres of water daily.

### Upstream energy water footprint

This is the larger and almost entirely hidden portion. Thermal power plants — gas, coal, and nuclear — require substantial water for steam generation and condenser cooling. Approximately 80% of a data centre's total water consumption is embedded in the electricity it draws from the grid. The 2024 US Data Centre Energy Usage Report estimated the indirect water footprint of US data centres at roughly 800 billion litres in 2023 alone — a figure that dwarfs on-site consumption and is projected to increase sharply.

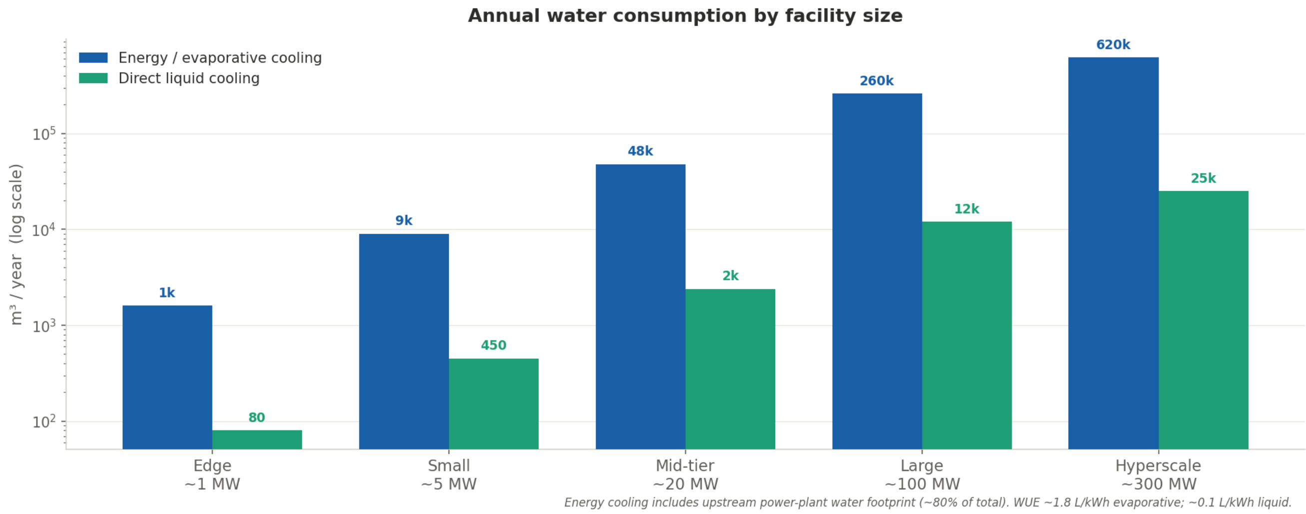


*Figure 1: Annual water consumption (m³/year) by data centre size. Evaporative and energy-embedded water dominate across all facility types. Note logarithmic scale.*

> **"Amazon's claim that its facilities use 'only a small fraction' of a region's water system is technically defensible but misses the point. Adding a massive new consumer to an already stressed system compounds scarcity regardless of relative share."**

## The scale — and the trajectory

The numbers are large and accelerating. Data centres in Northern Virginia — the self-styled 'data centre capital of the world' — consumed close to 2 billion gallons of water in 2023, a 63% increase from 2019. A study by the Houston Advanced Research Center found that Texas data centres will use 49 billion gallons in 2025, rising to 399 billion gallons (1.51 billion cubic metres) by 2030 — equivalent to drawing down Lake Mead by more than 16 feet in a single year.

Groundwater is particularly vulnerable. Many facilities sink on-site wells that tap underground aquifers directly, operating in regulatory environments that provide minimal oversight or community notification. This matters in a broader context: a July 2025 NASA satellite study identified groundwater extraction as the leading driver of sea level rise and a primary cause of land subsidence in 28 major metropolitan regions worldwide.

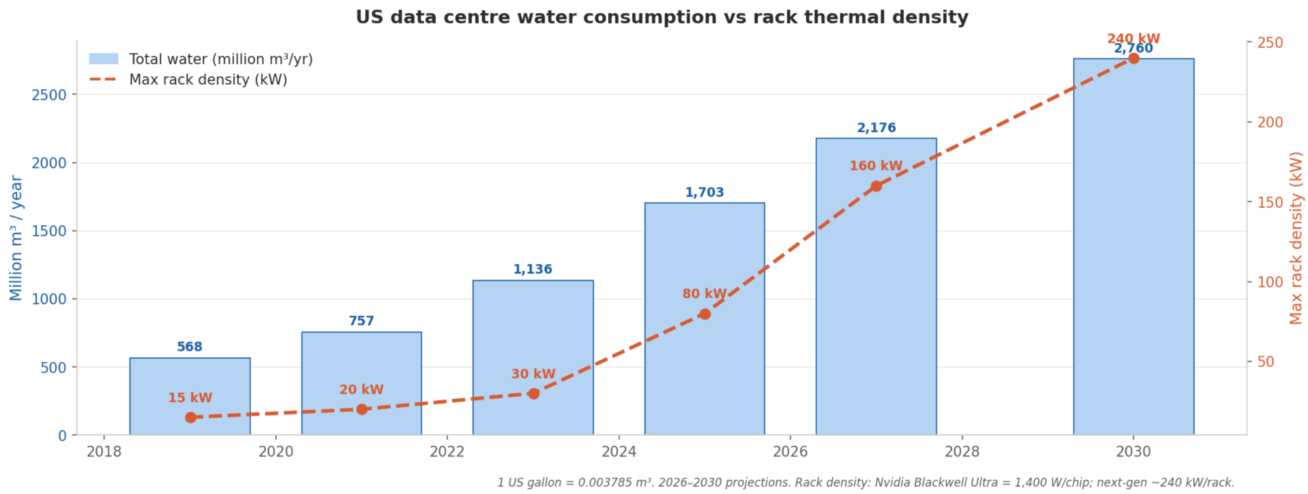


*Figure 2: US data centre total water consumption (million $m^3$/year, left axis) and maximum rack thermal density (kW/rack, right axis), 2019–2030. 2026–2030 figures are projections. Conversion: 1 US gallon = 0.003785 $m^3$.*

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## The new chips: a step change in thermal demand

The trajectory shown above is driven not only by the proliferation of facilities, but by a dramatic increase in heat generation per unit of computing hardware — and this trend is accelerating non-linearly.

A typical dense server rack required 15–30 kW of cooling in 2023. In 2026, high-performance AI computing clusters are reaching 100 kW per rack. The next generation, expected within approximately 12 months, is projected to require 240 kW per rack. Nvidia's current flagship Blackwell Ultra GPU dissipates up to 1,400 watts per chip. At these thermal densities, traditional air cooling reaches a physical limit: it simply cannot remove heat fast enough to prevent silicon degradation.

This creates what the industry now calls the 'Thermal Wall' — a hard constraint that is forcing the entire sector into a rapid, expensive transition to liquid cooling. As of 2026, 38% of data centres have shifted to some form of liquid cooling, a figure projected to exceed 70% by 2027 for new AI-class deployments.

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## The cooling transition — good news and bad news for water

The shift to liquid cooling is the most significant development for water consumption in the data centre sector, and its implications are genuinely mixed.

### The good news

Direct-to-chip (DTC) liquid cooling circulates coolant directly across processor cold plates, achieving a WUE below 0.1 L/kWh — a reduction of up to 95% compared to evaporative systems. Immersion cooling, which submerges entire server boards in non-conductive dielectric fluid, eliminates evaporative water loss entirely. Closed-loop systems can achieve near-zero net water consumption for on-site cooling.

### The bad news

Liquid cooling eliminates on-site evaporative losses but does nothing to address the upstream energy water footprint — which, at 80% of total consumption, is the dominant factor. Only genuine decarbonisation of the electricity grid removes that burden. Furthermore, the absolute scale of new data centre construction is growing so rapidly that even a 95% reduction in per-facility on-site water use is insufficient to reduce total sector consumption — the efficiency gain is overwhelmed by volume growth. This is a textbook case of the Jevons Paradox.

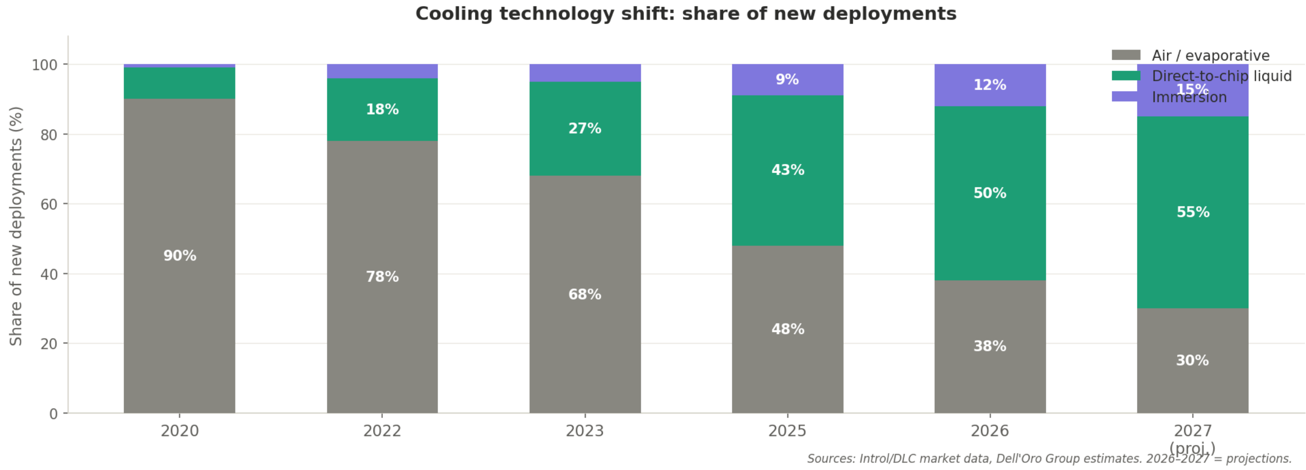


*Figure 3: Share of new data centre deployments by cooling technology type, 2020–2027. Air and evaporative cooling is being rapidly displaced by direct-to-chip liquid and immersion systems as rack densities exceed 30 kW.*

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## Does renewable energy change the picture?

Substantially — in theory. Photovoltaic solar and wind generation use negligible water compared to thermal power plants, which is where the 80% upstream footprint originates. A hyperscale facility currently consuming ~620,000 m³/year (combined on-site and upstream) could theoretically reduce to ~25,000 m³/year with genuine renewable power and direct liquid cooling — a 96% reduction.

However, 'powered by renewables' claims in the data centre industry frequently rely on Renewable Energy Certificates (RECs) or annual Power Purchase Agreements, rather than physical electrons. The actual grid power consumed at 3am during a peak AI inference run may still come from a gas peaker plant. The honest metric — 24/7 Carbon-Free Energy (CFE), pioneered by Google — requires matching every hour of consumption with a zero-carbon source in the same grid region at the same time. Only a small fraction of operators are currently meeting this standard.

Geography adds a further dimension. A solar-powered facility in Arizona eliminates the upstream energy water cost, but may still draw heavily on already-stressed desert aquifers for on-site cooling. Conversely, hydropower-fed facilities in Scandinavia or Iceland achieve near-zero water impact across both dimensions — which explains significant data centre investment in those regions.

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## Implications for the water sector

Data centres are not a peripheral concern for water professionals — they are becoming a primary demand category. Several implications deserve attention:

**Water accounting gaps.** The industry's self-reported WUE metrics cover only on-site evaporative consumption. They systematically exclude the upstream energy footprint, indirect groundwater drawdown from local utilities, and the water embedded in facility construction. Water sector professionals are well-positioned to challenge this accounting.

**Wastewater streams from liquid cooling.** Closed-loop liquid cooling systems generate wastewater that requires treatment before discharge — glycol-based coolants, corrosion inhibitors, and biological growth control chemicals. This is an emerging treatment challenge for municipal wastewater utilities receiving discharge from data centre campuses.

**Reclaimed water opportunities.** Loudoun County's water authority has been forced to supply potable water to data centres because reclaimed water infrastructure was not available. Building treated effluent supply into data centre utility planning is a significant market opportunity for water utilities and water reuse technology providers.

**Heat recovery potential.** US Congress introduced the Liquid Cooling for AI Act of 2025, directing evaluation of waste heat reuse from data centres. District heating schemes using recovered server heat represent an intersection of water, energy, and digital infrastructure that the water sector should be tracking.

**Regulatory vacuum.** The 2025 executive order streamlining data centre permitting, including Clean Water Act exemptions, reduces the regulatory oversight that water authorities rely on. Advocacy for transparent water use reporting, cumulative impact assessment, and groundwater protection is increasingly urgent.

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## Open source & disclaimer



*Disclaimer: This article was researched and drafted with the assistance of Claude AI (Anthropic). Data on water consumption, facility counts, and projections reflects publicly available information from HARC/University of Houston, EESI, IEA, Lincoln Institute of Land Policy, and industry sources as of May 2026. Projection figures (2026–2030) are estimates based on published growth trajectories and should be treated as indicative. Readers should verify current figures with primary sources.*