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Part 2

Data Centers and the Water-Energy Nexus

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The first column in this series introduced three primary metrics for benchmarking water use in data centers: water usage effectiveness (WUE) for direct site consumption, WUE_{source} for the upstream water consumed in power generation and water usage impact (WUI) for incorporating regional water scarcity. Together, these metrics, developed by The Green Grid, show that the water-energy nexus extends well beyond the utility meter. Cooling system selection, power supply and geographic location all influence life-cycle water use. However, benchmarking alone does not produce better water conservation outcomes.

This column posits that to drive water conservation, replenishment and stewardship, a market-based framework that incentivizes water conservation should be considered. It studies the existing efforts of industry water conservation initiatives and evaluates some examples of market-based solutions for natural resources. It also introduces a market-based framework called water use credits (WUCs), which incentivizes reductions in water use through conservation, replenishment and technology improvements.

Industry Case Studies

To better understand water conservation techniques used by industry, this column will examine three data center hyperscalers (*Table 1*) with respect to their stated water conservation efforts. All three companies have similar approaches, but it should be noted that

company-reported metric values such as WUE may differ from The Green Grid's or ISO's definitions. Unless specifically included, energy-source water consumption (WUE_{source}) may not be addressed. In addition, some phrases such as "water positive" do not have universal definitions, and thus are defined by each company's methodology.

Amazon/AWS

Amazon's cloud computing platform, AWS, has made a corporate commitment to be water positive by 2030,¹ meaning they expect to return more water to the environment than they will be using in their offices and data centers. Their plan has three parts: (a) using real-time water use data to identify leaks, pilot new treatment technologies and continuously

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improve efficiency; (b) using sustainable water sources such as recycled/reclaimed water and allowing third parties to directly reuse spent cooling water in applications such as irrigation; and (c) supporting replenishment projects (watershed restoration, water sanitation and hygiene [WaSH] and water efficiency) that deliver water back to the communities and ecosystems.²

Amazon reports supporting 45 of these projects across 14 countries and nine U.S. states, with seven in water quality, 20 in water supply reliability, six in water access, six in aquatic habitat restoration and six in land conservation and restoration.³

In addition to Amazon's water positive initiative, the company cofounded the Water-AI Nexus Center of Excellence, which brings together water utilities, technology companies and researchers to advance sustainable water practices for AI infrastructure. It leverages the power of artificial intelligence to address the challenges in water sustainability and AI infrastructure operations⁴ and aims to reduce global WUE at AWS facilities from 0.25 to 0.15 over four years while expanding the projected use of recycled water in the United States from 24 locations in 2024 to more than 120 locations by 2030.¹

Google

Google focuses its water stewardship strategy in three areas: (a) reducing operational (in-house) water use, (b) offsetting water use by improving watershed health and supporting water-stressed communities and (c) developing water monitoring tools. These goals aim to support Google's commitment to replenish 120% of the water it consumes by 2030.⁵ Google's fleet of data centers is mostly adiabatically cooled, while approximately 30% are either fully air-cooled or use non-potable water for cooling.⁶ As of 2026 the company reports to have supported 165 water projects across 21 countries and 21 U.S. states to offset the water consumption of their facilities. This includes 29 projects in land conservation and restoration, 68 in water supply reliability, 11 in water sanitation and hygiene, 34 in aquatic habitat restoration and 23 in water quality.^{7,8} In addition, they have helped

TABLE 1 Summary of public water stewardship commitments by data center hyperscalers.

COMPANY	INITIATIVE NAME	LOCATION	IMPLEMENTATION EXAMPLES	TIMELINE
Amazon	Water Stewardship ^{1,2,3,4}	Global	Operational efficiency, replenishment, industry think tank	2030
Google	Water Replenishment Projects ^{5,6,7,8}	Global	Operational efficiency, replenishment, software tools	2030
Microsoft	Water Positive By 2030 ^{13,14,15}	Global	Operational efficiency, replenishment, public policy	2030

develop water resource monitoring tools, including the United Nation's Sustainable Development Goals' 6.6.1 Freshwater Ecosystem Explorer,⁹ the OpenET tool,¹⁰ Global Water Watch with DeltaRes¹¹ and the open-source BlueConduit tool.¹²

Microsoft

Microsoft's Community-First AI Infrastructure Plan focuses on lowering facility water demand and achieving net-positive replenishment in the communities where it operates. Its strategy includes reducing cooling water use, replenishing more water than its data centers consume, improving transparency with local communities and supporting public policy that reduces water use. By 2030, Microsoft targets a 40% reduction in water intensity across its owned data center portfolio.¹³ It plans to do this by balancing air-cooled and water-cooled systems based on operating needs and local conditions and by deploying chip-level cooling designs that avoid evaporative water use.^{14,15}

Microsoft's water projects span 17 countries and 11 U.S. states. This includes restoring the historic Oxbow Wetlands in the Midwest to support groundwater recharge and partnering with utilities in Phoenix and southern Nevada to detect and repair leaks in aging water systems. To increase transparency, Microsoft plans to report water use and replenishment progress by data center region. It also supports water conservation policy and more water-efficient data center development, including broader use of reclaimed and recycled water to reduce pressure on municipal supplies.

Defining Water Use Credits

For the purposes of this column, WUCs are grouped into three categories of investment: conservation, offset and technology. *Table 2* summarizes each category, its purpose and representative use cases.

Water demand offset and conservation programs

already exist in many water-stressed regions in the United States and are thriving in many municipalities. In 1997 the City of Sante Fe, New Mexico, initiated a water conservation program that has since reduced water use by 56 gallons (212 L) per capita, per day.¹⁶ The program uses a mix of rebates for water-reduction retrofits (WUC-T) and water demand offsets (WUC-C and WUC-O) to meet this goal.

In Los Angeles, the SoCal Water \$mart Rebate Program offers \$5/ft² (\$54/m²) for residential customers to replace grass landscapes for low water use turf. This rebate is \$6/ft² (\$65/m²) for commercial and multifamily rate codes.¹⁷ Southern Nevada Water Authority goes further to offer cash rebates for removing turf grass and replacing it with desert landscapes.¹⁸ Table 3 provides additional examples of existing water incentive programs.

Company commitments already produce results, but broader benefits may require more standardized water conservation approaches. Water use credits (WUCs) are a flexible framework for creating

economic incentives for water stewardship. They could take the form of utility incentives for on-site efficiency, regulatory penalties for exceeding water-use caps or cap-and-trade systems tied to metrics such as WUI or WUE_{source}, with trading limited to local areas such as shared watersheds. A key challenge is avoiding tradable credits for actions already covered by existing programs. Still, with coordination among industry, conservation groups, regulators and financial institutions, WUCs could help reward measurable water stewardship and create broader shared benefits.

This conservation approach stems from ecosystem service market (ESM) strategy, which creates an economic link between resource users and conservation groups through financial institutions with regulatory oversight. Successful ESMs typically rely on four features: clear regulatory standards, simple and flexible baselines, strong monitoring and automatic penalties or similar enforcement. The U.S. Environmental Protection Agency outlines

similar principles in its water quality trading guidance, while also noting that a single restoration project may generate credits for multiple markets and that financing can help deploy nonpoint land-use practices.¹⁹ Similar market structures have proven effective for carbon, renewable energy and water quality credits in the United States. Table 4 shows representative examples already in use.

Conclusion

This column argues that benchmarking water use, while necessary, is not sufficient to advance long-term water stewardship in the data center industry. The case studies of Amazon, Google and Microsoft demonstrate that leading industry hyperscalers are already pursuing combinations of efficiency improvements,

Continued on page 14

TABLE 2 Proposed water use credit categories and example applications.

CREDIT	DEFINITION	EXAMPLE CASES
WUC-C: Conservation	Avoiding or eliminating end-use potable water demand (design phase)	Rebate for: non-irrigated landscapes, water reclamation, process water elimination
WUC-O: Offset	Replenishment; returning water to the local impacted watershed or community	Cap-and-trade for: aquifer recharge, watershed restoration, municipal reuse investment
WUC-T: Technology	Reduction of water use through improved efficiency, controls or metering, as measured at the facility boundary (post-construction retrofit)	Rebate for: low flow fixtures, hybrid cooling, blowdown recovery systems

TABLE 3 Examples of existing water incentive programs and their alignment with proposed WUC categories.

PROGRAM	WUC	MECHANISM
Santa Fe, N.M. Water Offset Program	WUC-C/WUC-T	New projects must offset demand through conservation credits or water-right transfers; the city manages a water bank and rebate credits.
LADWP/Metropolitan Water District Turf Rebates	WUC-C	Replace grass with turf: \$5/ft ² residential, \$6/ft ² commercial, \$7/ft ² public agency.
Southern Nevada Water Authority Water Smart Landscapes	WUC-C	Replace turf with desert landscaping: \$5/ft ² for the first 10,000 ft ² , plus tree incentives.
Lower Colorado River Authority (LCRA) Firm Water Conservation Cost-Share (Texas)	WUC-C/WUC-T	Established conservation program offering grants up to \$100,000 for leak detection, metering, irrigation efficiency and other projects. ²⁰
Colorado River Compensated Conservation (Arizona)	WUC-O	Agreements pay entities to conserve water and leave it in Lake Mead; 18 Arizona agreements targeted up to 984,429 acre-feet through 2026.

Continued from page 10

recycled and reclaimed water strategies, replenishment projects, transparency and community engagement to reduce their water footprint and advance water-positive goals. These efforts demonstrate both the urgency of the issue and the limits of relying solely on voluntary action. This column introduces water use credits (WUCs) as a flexible, market-based framework that could connect water conservation, replenishment and technology improvements to clearer economic incentives. Drawing lessons from ecosystem service markets, water quality trading and existing rebate and offset programs, WUCs offer a conceptual pathway for improved alignment of data center growth with freshwater stewardship.

The third and final column in this series will build on this foundation by focusing on implementation: how water may be valued, how a cap-and-trade structure for water use could be designed, how baselines and credit categories might be defined and what limitations or trade-offs must be addressed, including the boundaries of water-use metrics and the relationship between water priorities and carbon reduction goals.

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TABLE 4 Representative ecosystem service credit markets and governing authorities.

ECOSYSTEM SERVICE	MARKET INSTRUMENTS/ CREDITS AVAILABLE	TYPICAL GEOGRAPHY	MAIN AUTHORITIES
Water Resources	Wetland/stream mitigation; aquatic resources; nutrient, sediment, temperature, and stormwater credits; restoration; instream flow	Watershed-, basin-, or service-area based	USACE, EPA, state agencies, watershed/ stormwater districts
Carbon/Climate	Forest carbon; improved forest management; avoided conversion; re/afforestation; soil, grassland and blue carbon	Project-based; forests, farms, rangelands, coasts	Carbon registries, California ARB, USDA/ NRCS
Species & Habitat	Conservation banks; habitat exchanges; biodiversity markets; habitat uplift; easements	Species range or habitat service area	USFWS, NOAA Fisheries, state wildlife agencies
Wetlands & Coastal	Wetland mitigation; floodplain restoration; living shorelines; blue carbon; coastal habitat and water quality credits	Coastal zones, estuaries, floodplains	USACE, EPA, NOAA, state coastal/wetland agencies
Urban Green Infrastructure	Stormwater retention; green infrastructure; urban forestry carbon; runoff reduction	Cities and municipal stormwater districts	Local governments, stormwater utilities, EPA
Agriculture & Working Lands	Soil carbon; nutrient and sediment trading; grassland conservation; irrigation/water conservation; habitat markets	Agricultural watersheds and rangelands	USDA/NRCS, EPA, state agriculture and environmental agencies
Forests & Woodland Ecosystems	Forest carbon; watershed protection; biodiversity markets; habitat conservation; reforestation	Forested regions nationwide	Carbon registries, USDA Forest Service, state forestry agencies
Biodiversity/ Ecosystem Condition	Biodiversity and nature markets; ecosystem restoration; habitat uplift	Mostly voluntary, project-based	Private standards groups, NGOs, state/federal resource agencies

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