

Thirsty Data: Water Use at Data Centers

Dr. Margaret Cook & Dr. Erin Kinney
August 2026



HARC

About HARC

HARC is an independent & nonpartisan nonprofit organization focused on advancing science-backed sustainability solutions.

The motivating force behind all HARC's work is to advance a sustainable future for Texas.

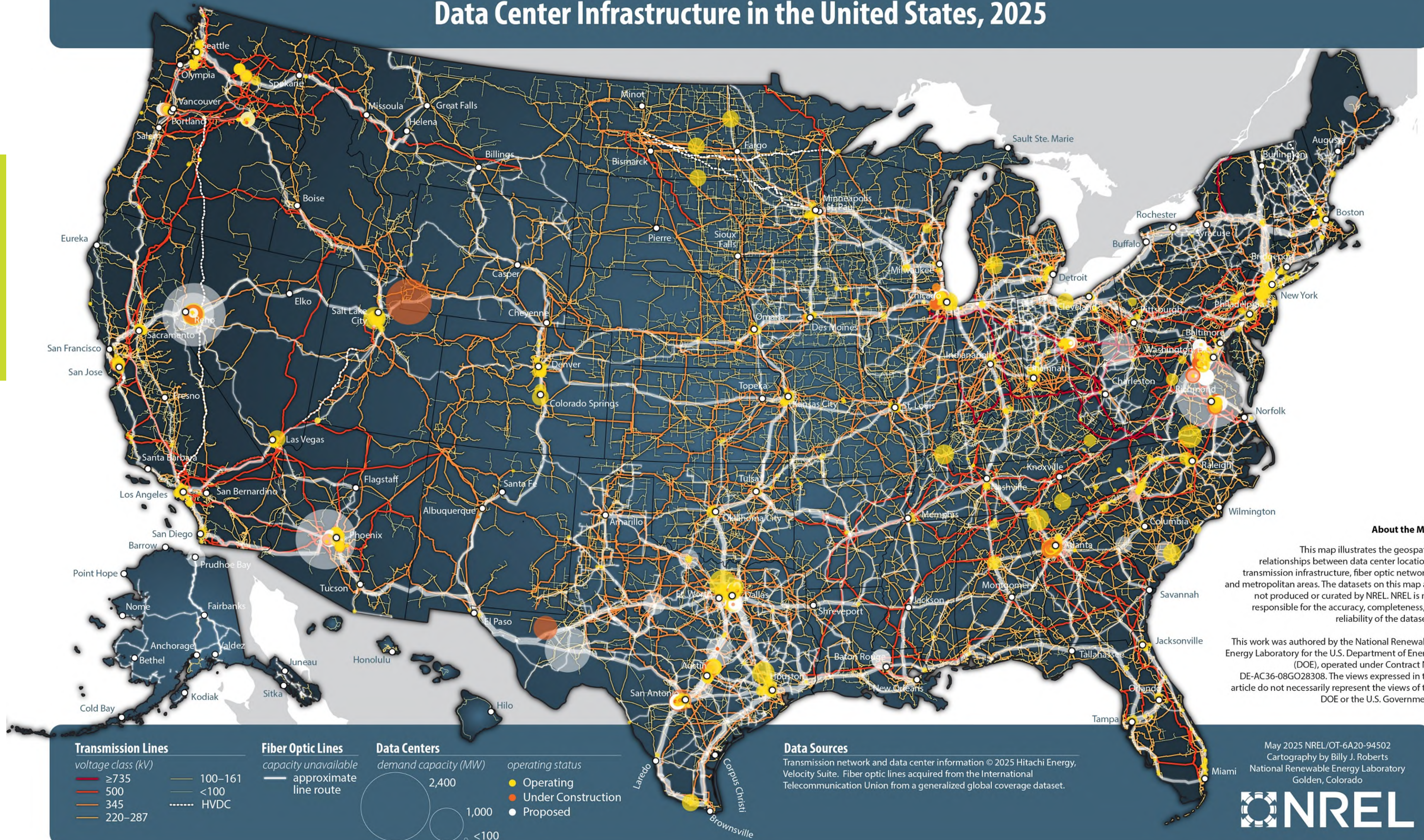
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Data centers house computing infrastructure

Data Center Infrastructure in the United States, 2025

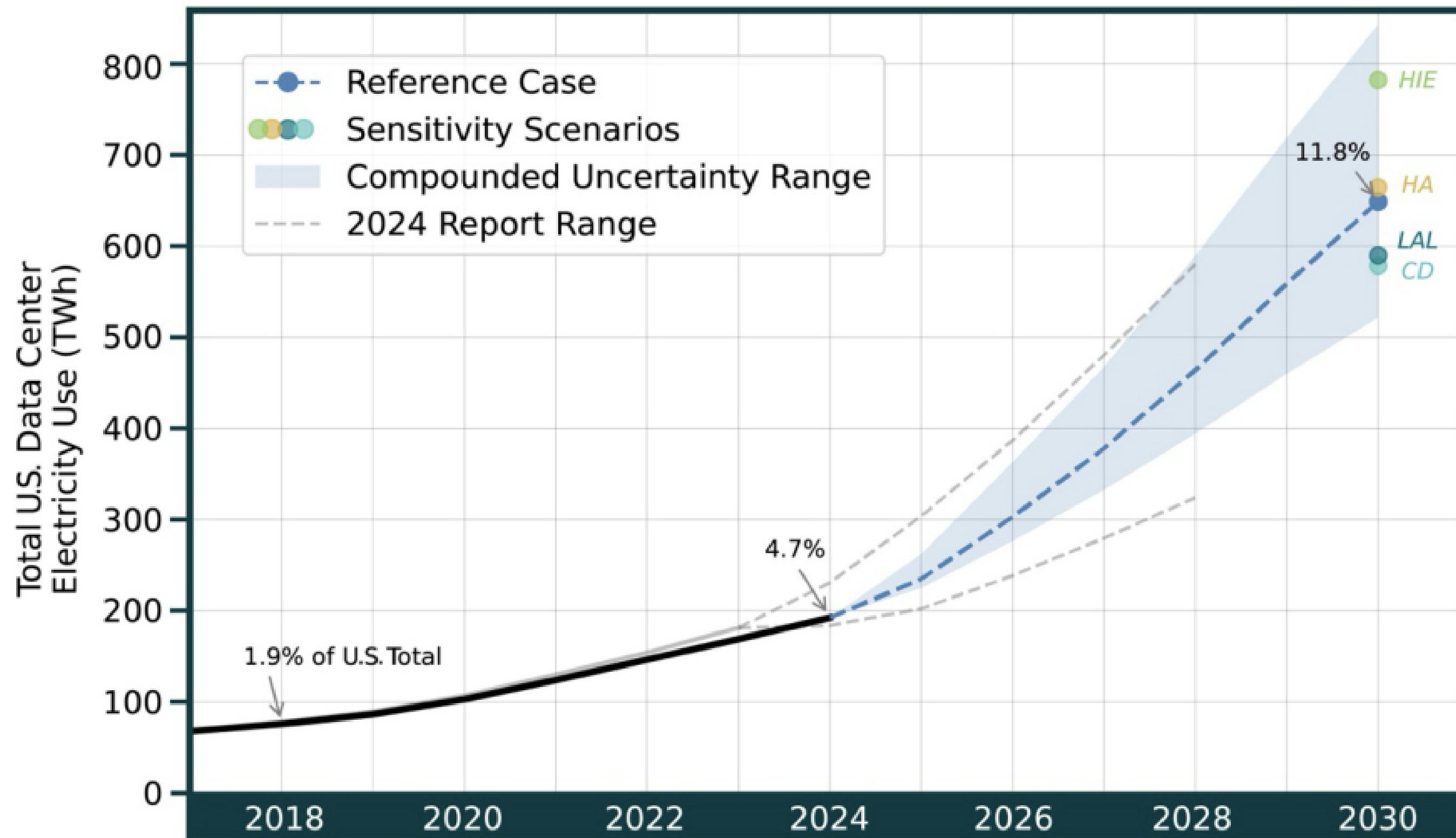




Data center under construction

Siting Decisions

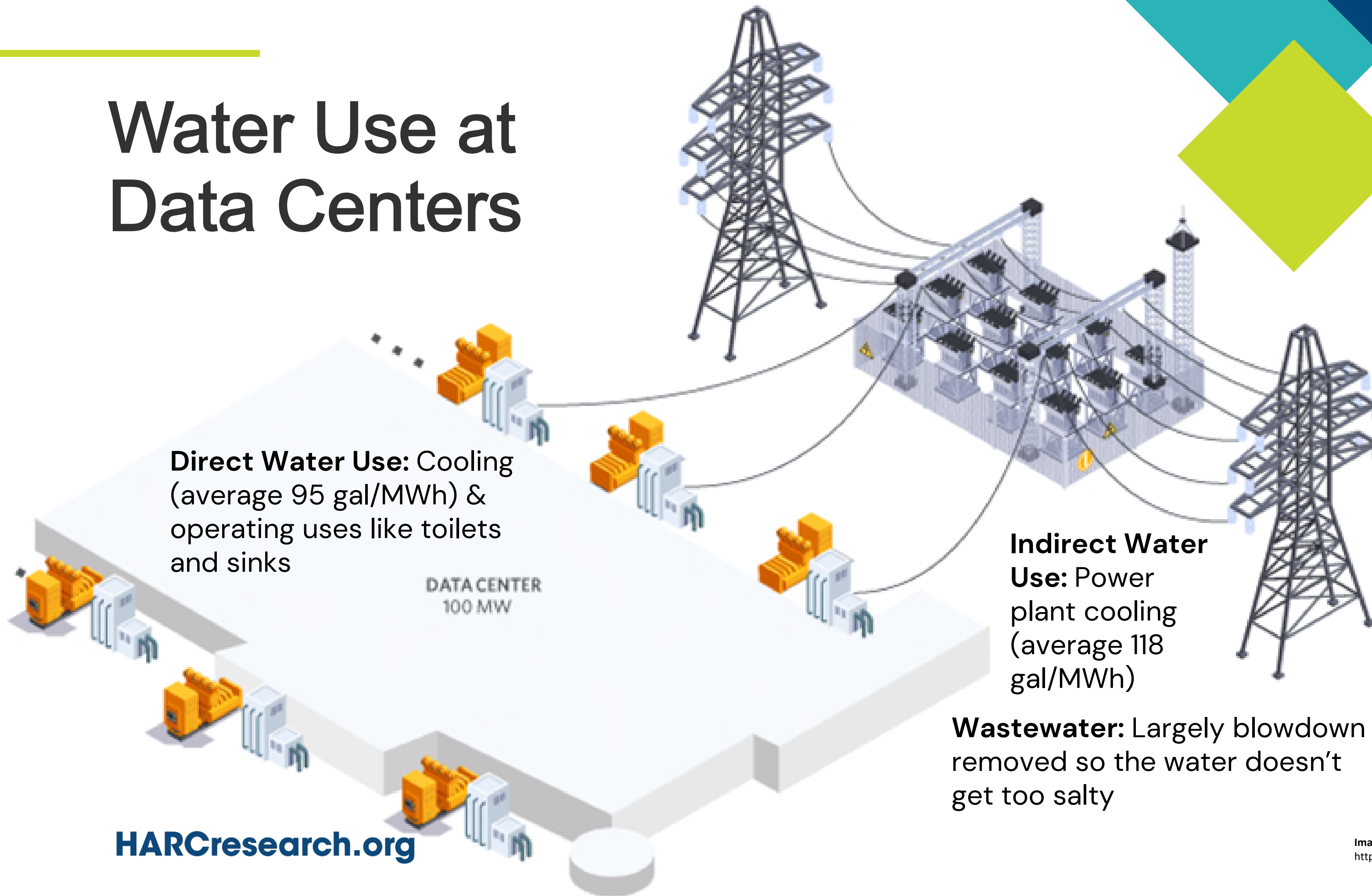
- Land lease
- Power price
- Adjacent to fiber
- Floodplain and other building considerations
- Ability to source water (if needed)
- Proximity to labor force
- Distance from residential and other permitting considerations



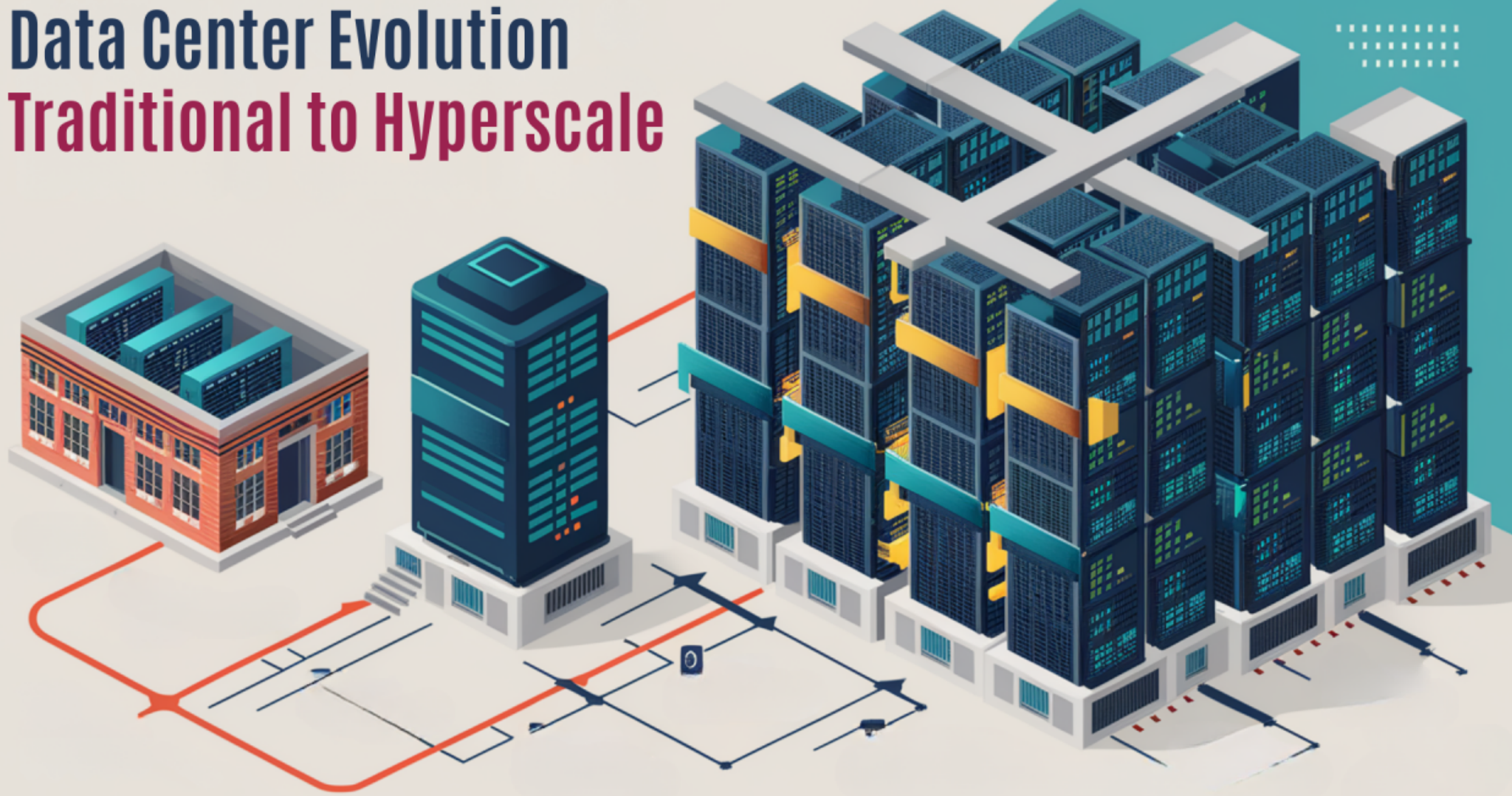
HIE = High Inference Energy, HA = High ASIC,
LAL = Low Accelerator Lifetime, CD = Consolidated Deployment

Figure 1. Total U.S. data center electricity use from 2017 through 2030

Water Use at Data Centers



Data Center Evolution Traditional to Hyperscale

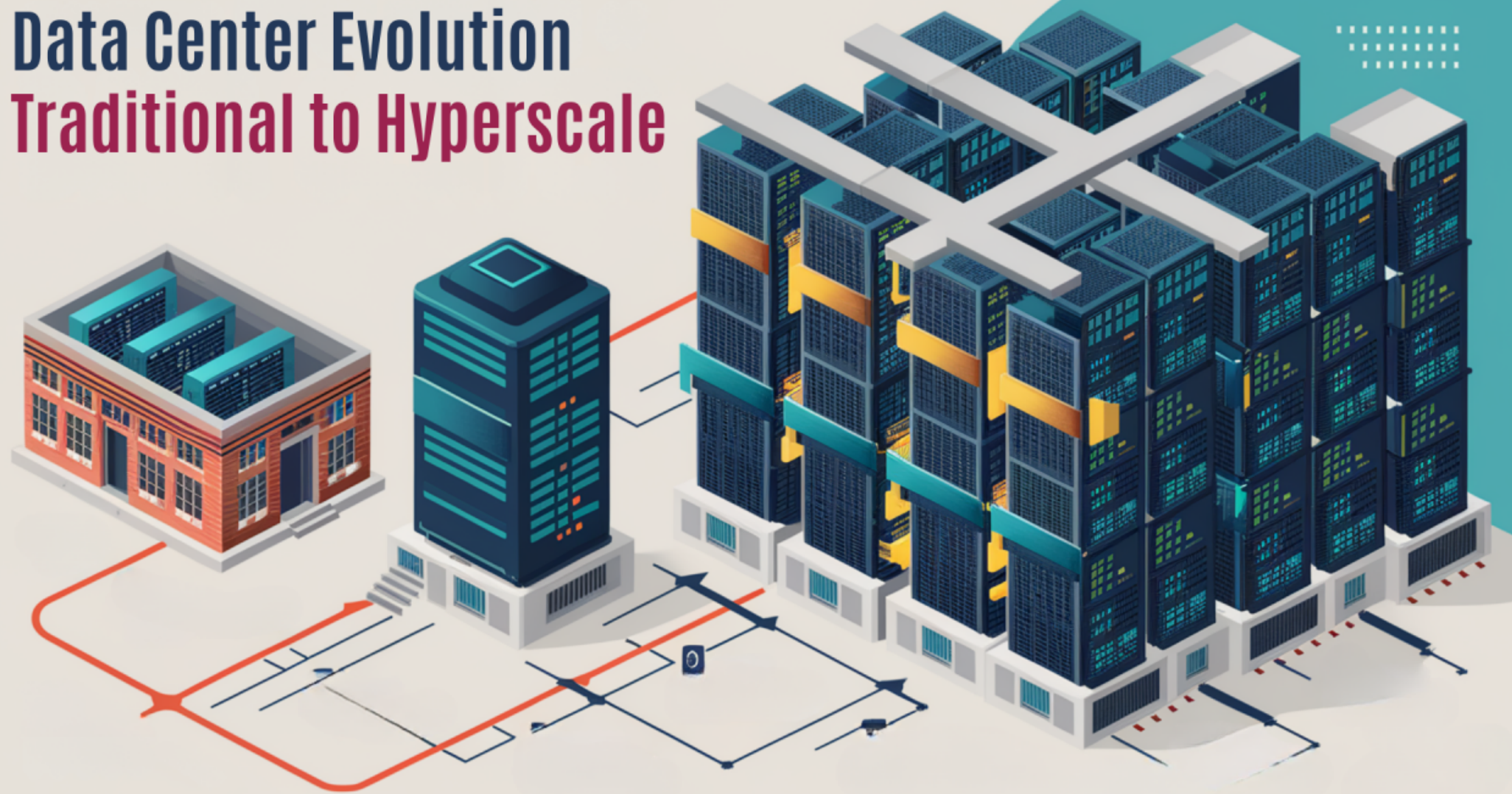


Factors Influencing Water Use

Amount of water use and environmental impacts depend on

- Computing equipment
- Operating choices
- Cooling type
- Type (hyperscaler, co-location, small, midsize, crypto, etc.)

Data Center Evolution Traditional to Hyperscale

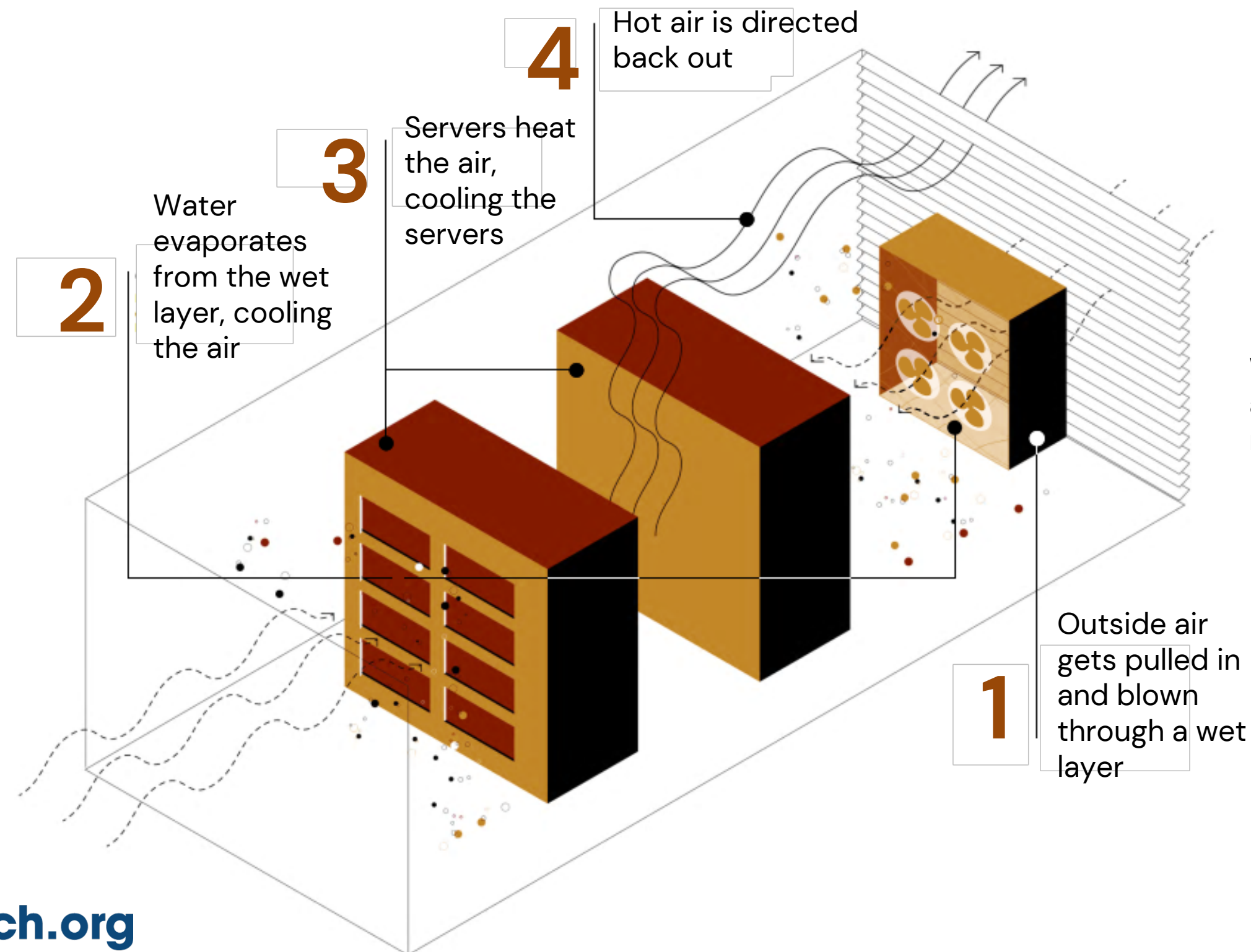


Factors Influencing Water Use

From greatest to least, water use is impacted by:

- Server efficiency
- Choice of power source
- Server utilization level
- Cooling system type
- Infrastructure/operational efficiency
- Climate zone
- Inactive server percentage
- Server refresh cycle

Direct Evaporative Cooling



Water evaporates to cool air. Evaporated water is replaced with new water.

Water Use: 5–185 gallons/MWh
Power Use: Low
(Microsoft, 2023)

Direct Evap

2

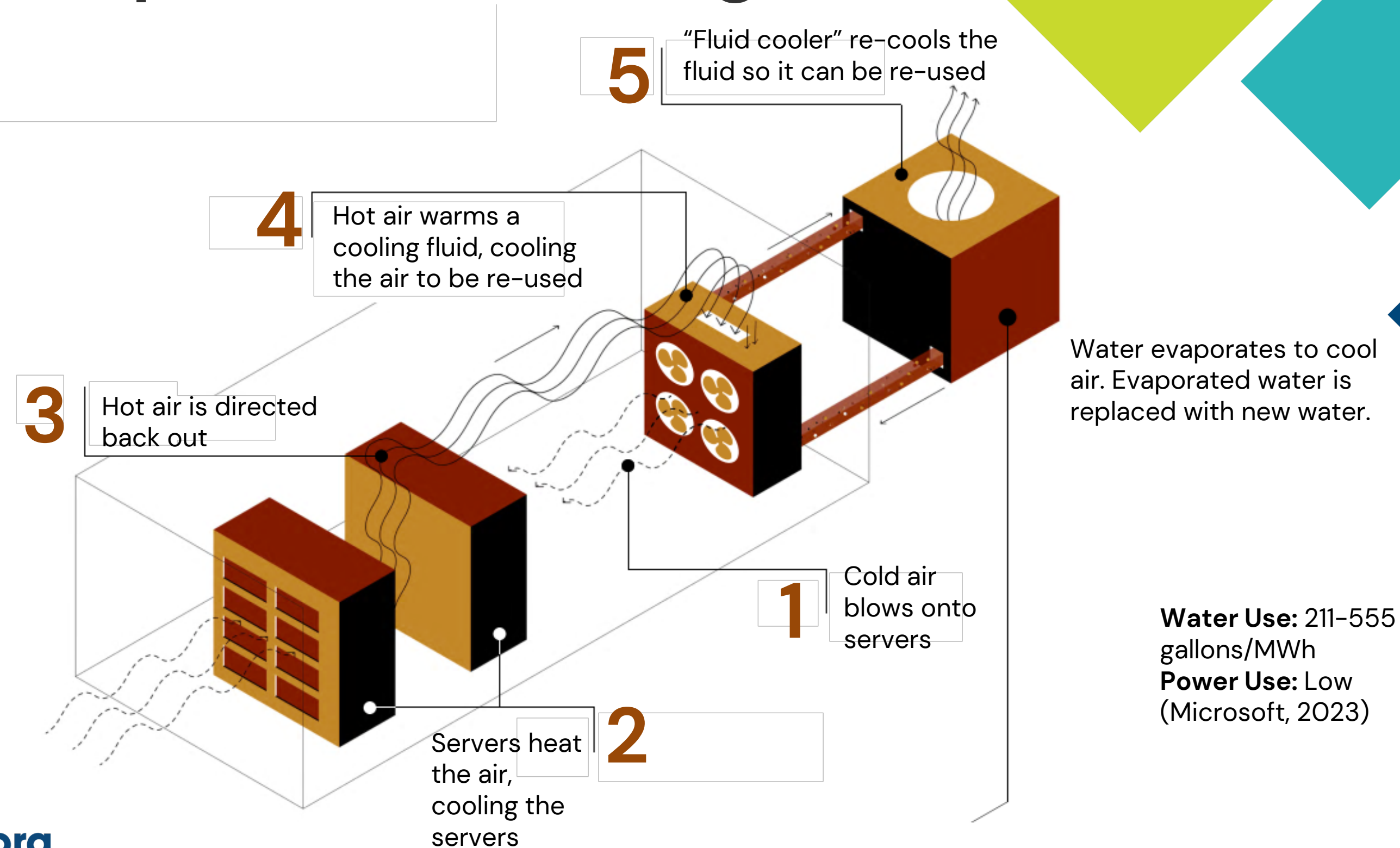
Water evaporates from the surface of the water.



Water evaporates to cool air. Evaporated water is replaced with new water.

Water Use: 5–185 gallons/MWh
Power Use: Low
(Microsoft, 2023)

Indirect Evaporative Cooling



Indirect Eva

3

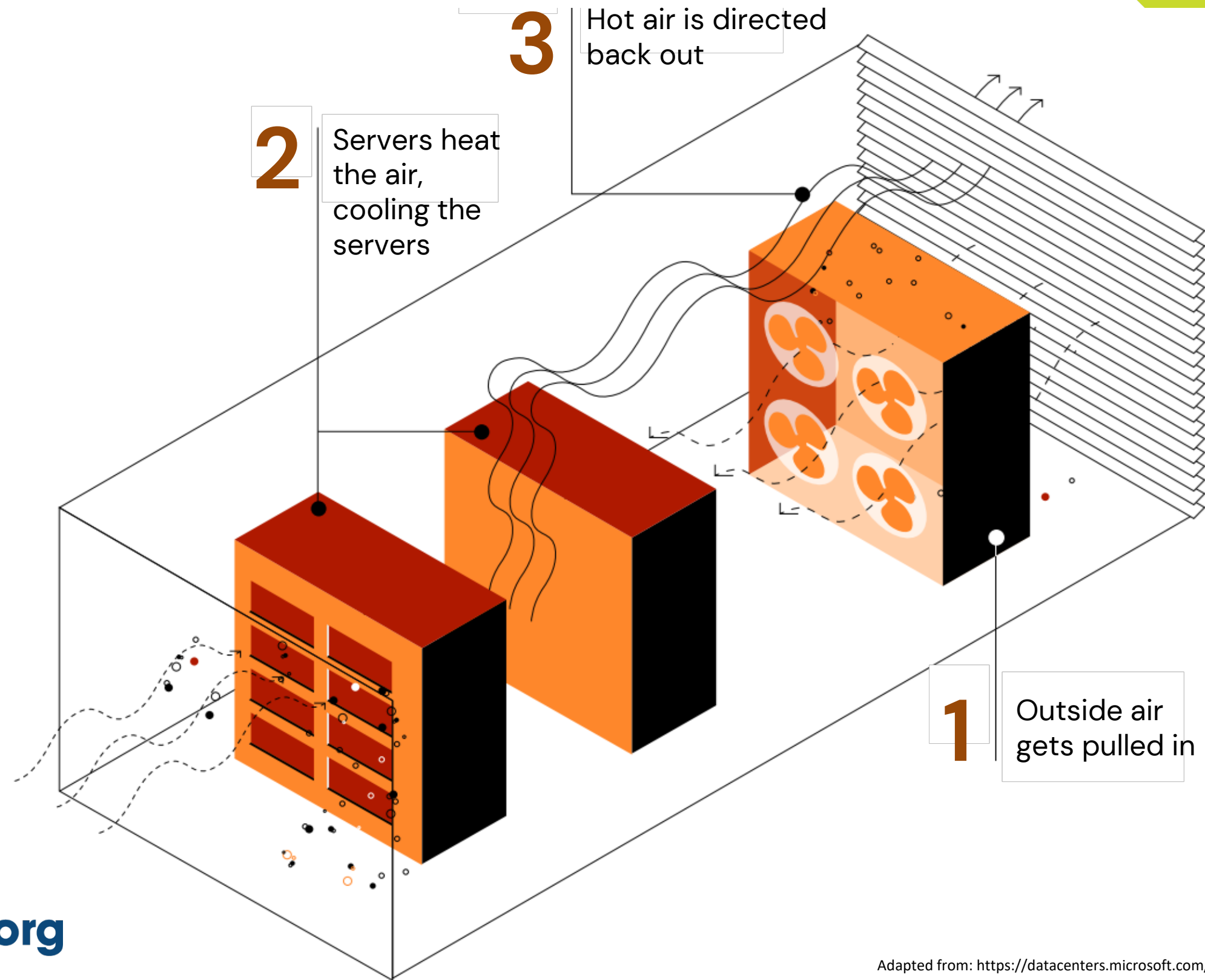


The swamp cooler is in a different room

Water evaporates to cool air. Evaporated water is replaced with new water.

Water Use: 211-555 gallons/MWh
Power Use: Low (Microsoft, 2023)

Free Air Cooling



Water Use: zero, unless air is too dry
Power Use: Low
(Microsoft, 2023)

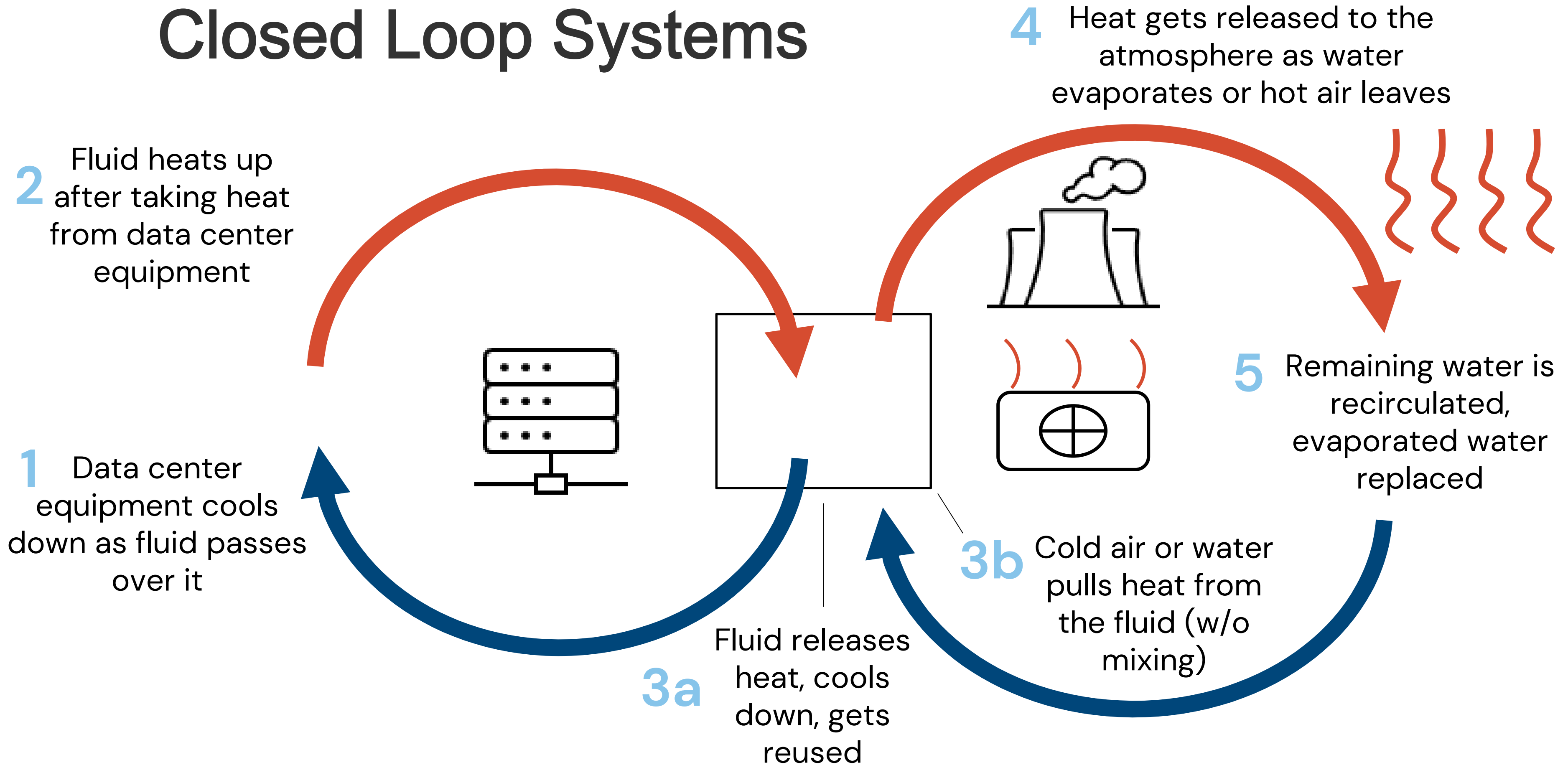
Free Air Cooling



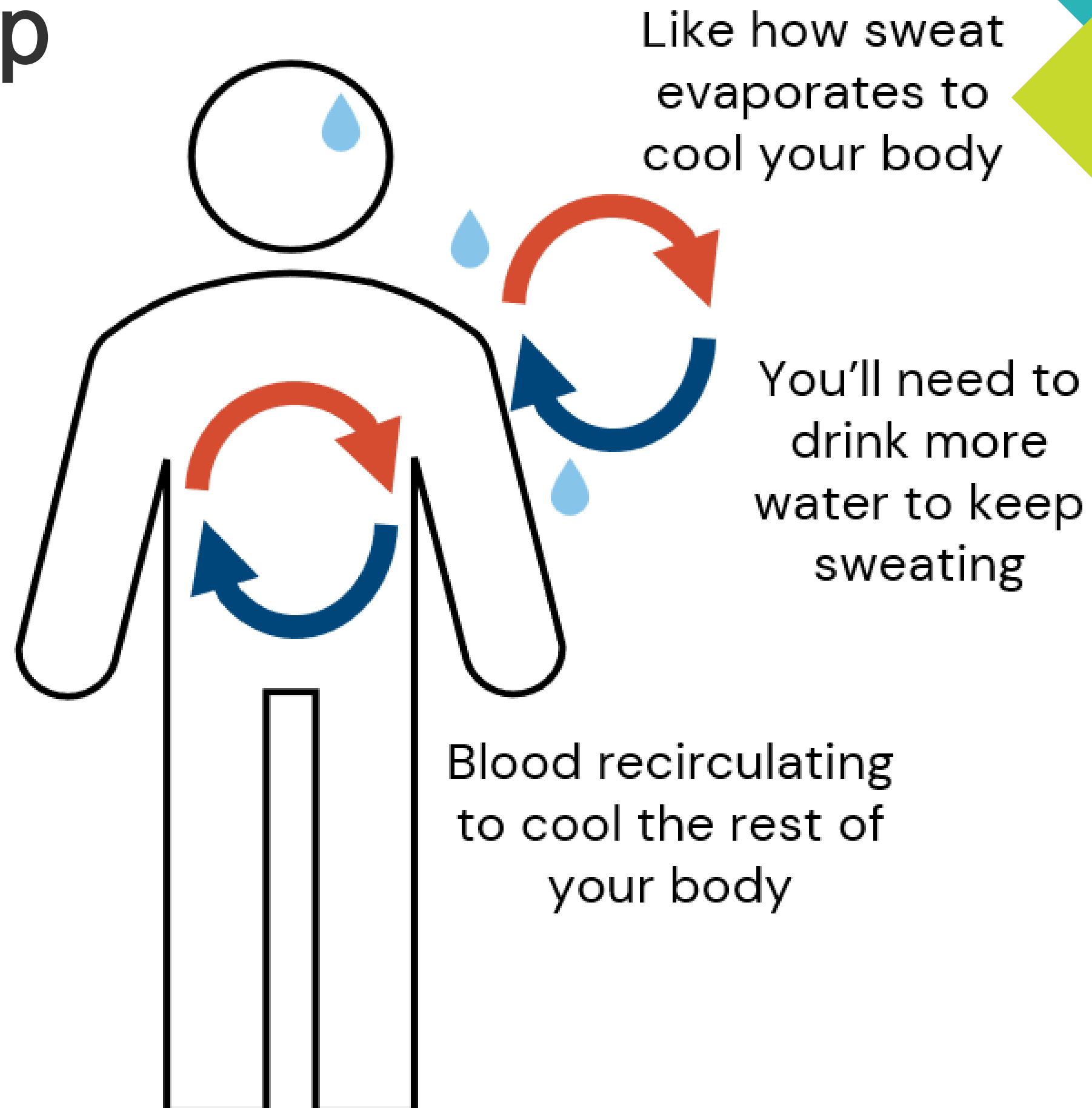
zero, unless air is

Low
(2023)

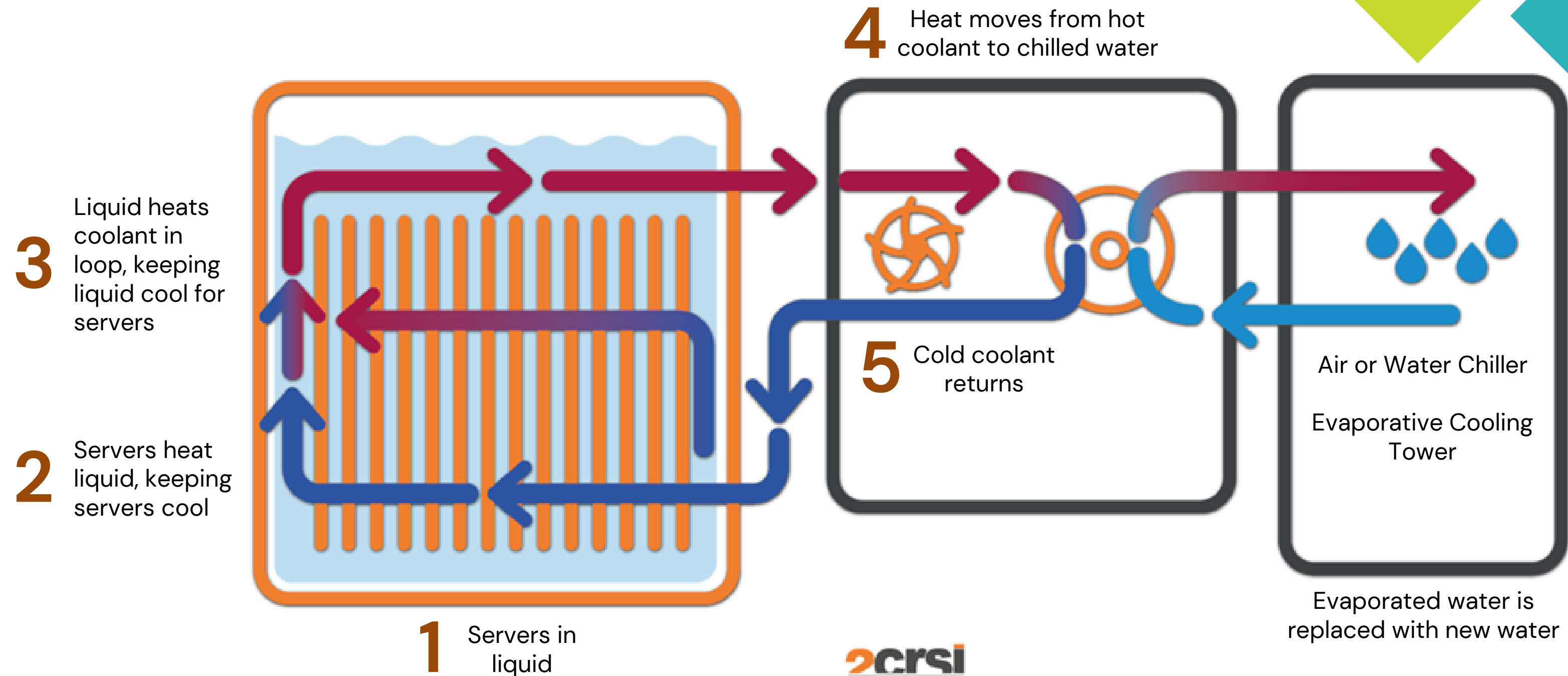
Closed Loop Systems



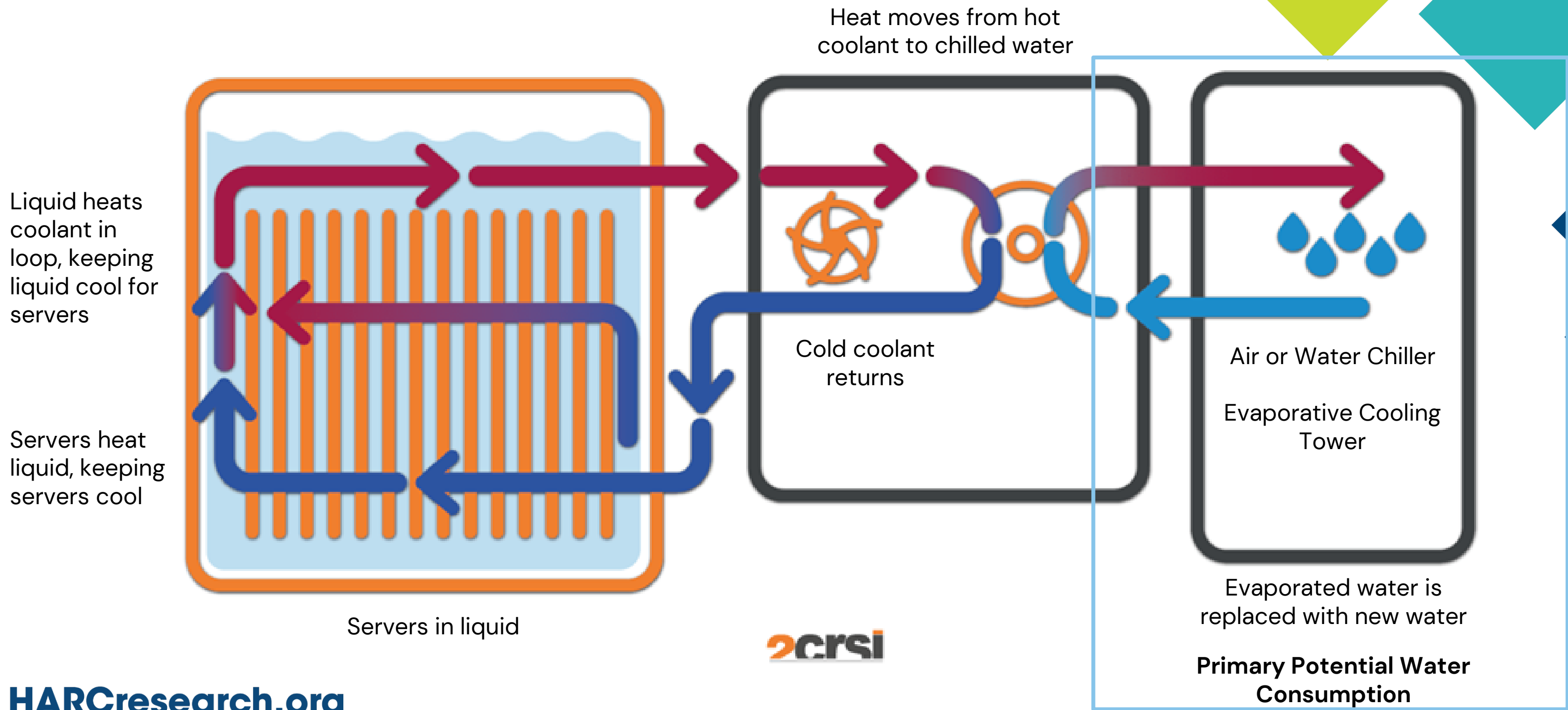
Closed Loop Systems



One-Phase Immersion Cooling

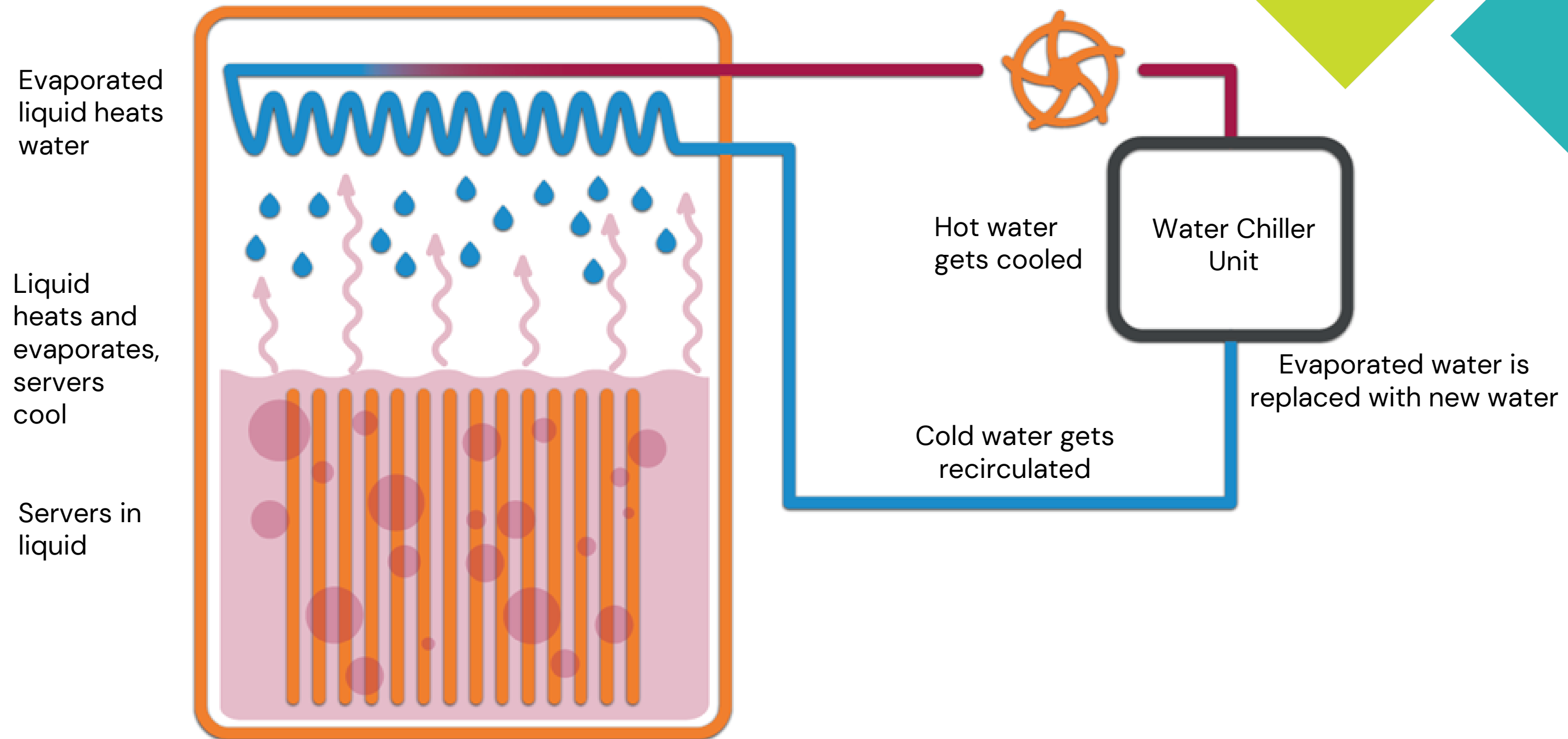


One-Phase Immersion Cooling

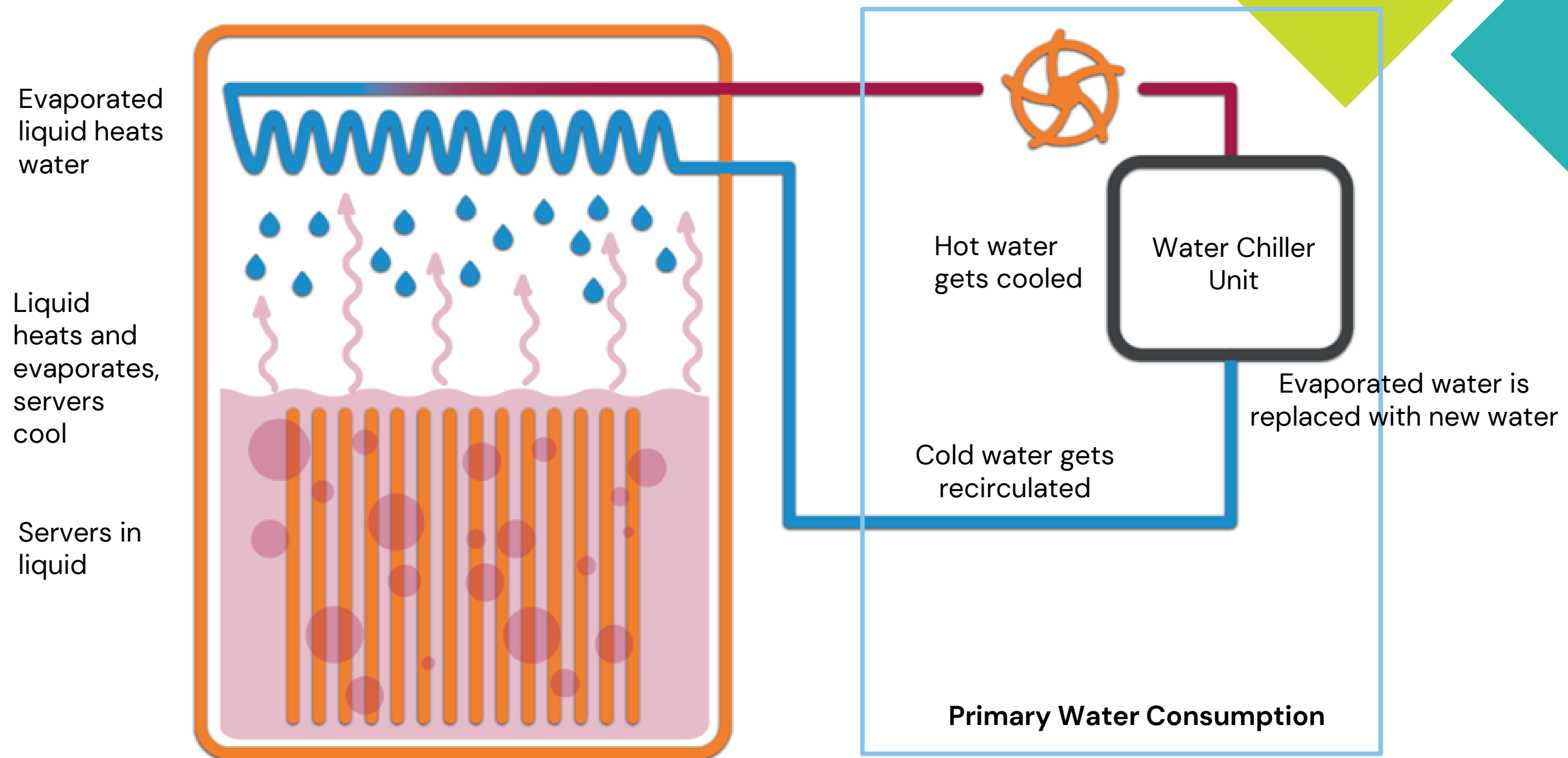


Adapted from: <https://2crsi.com/two-phase-immersion-cooling>

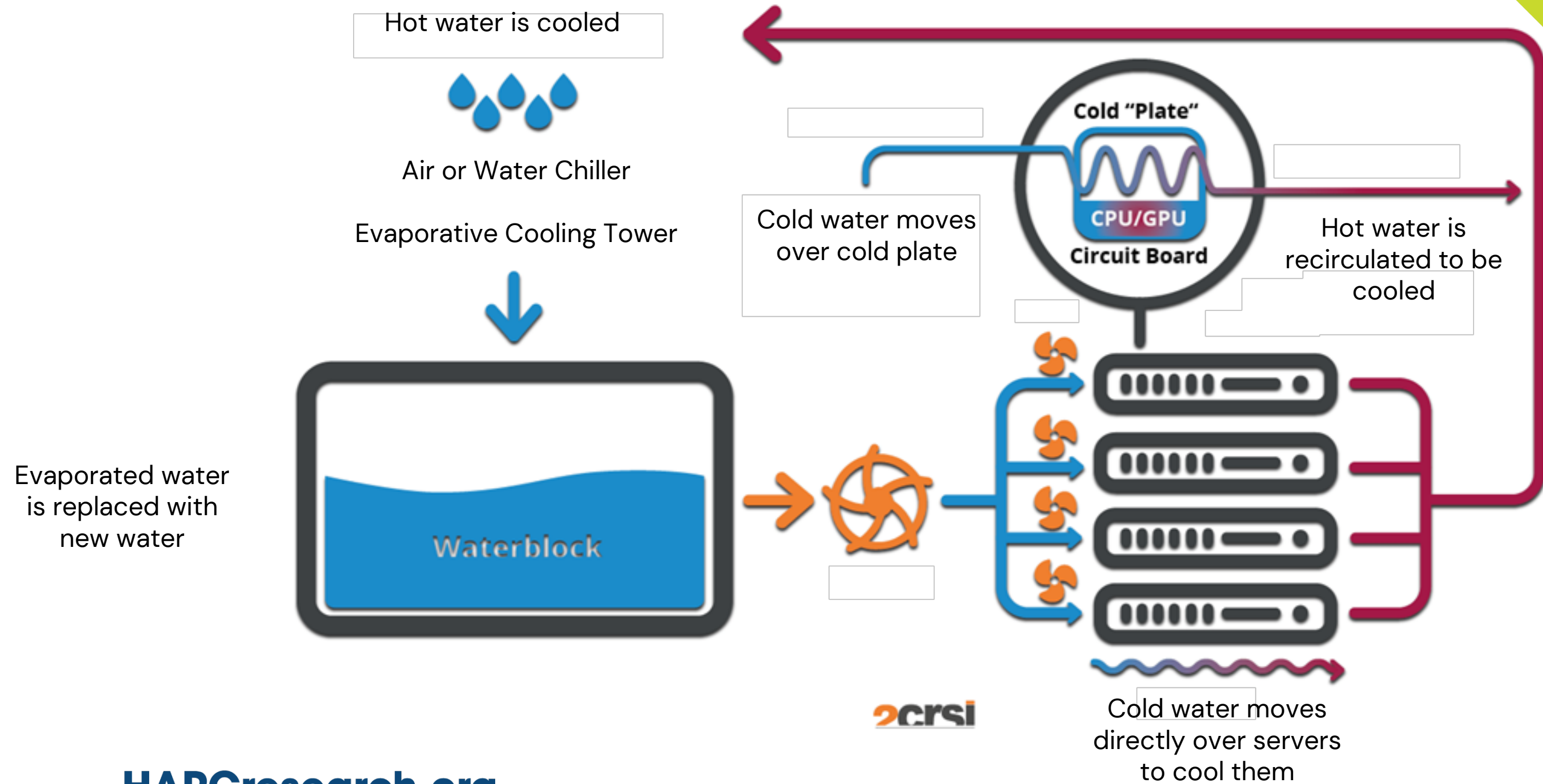
Two-Phase Immersion Cooling



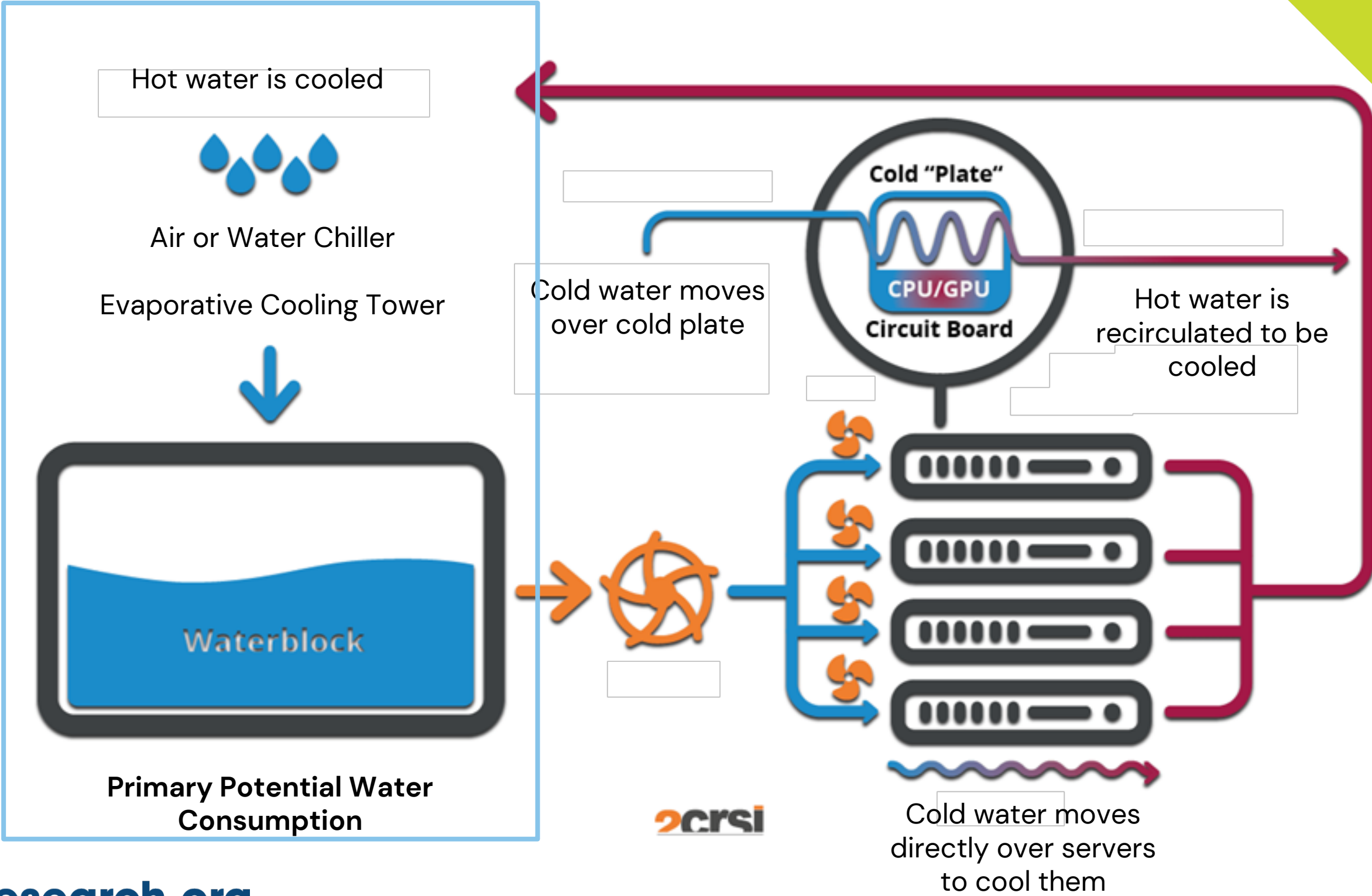
Two-Phase Immersion Cooling



Direct / Cold Plate Cooling



Direct / Cold Plate Cooling



Evaporated water is replaced with new water

Heat Rejection Technologies

Cooling Technology	Facility Size		
	Small	Midsize	Large-scale
Direct expansion	Very Low	Very Low	--
Air-cooled chiller	Very Low	Very Low	--
Dry cooler (air-cooled chiller)	--	Very Low	--
Airside economizer (air-cooled chiller)	--	Very Low	--
Airside economizer & adiabatic cooling (air-cooled chiller)	--	--	Very Low
IT Liquid cooling: dry cooler (air-cooled chiller)	--	--	Very Low
Dry cooler with adiabatic assist (air-cooled chiller)	--	--	Low
Airside economizer & adiabatic cooling (water-cooled chiller)	--	--	Low
IT Liquid cooling: dry cooler with adiabatic assist (air-cooled chiller)	--	--	Low
Airside economizer (water-cooled chiller)	--	Medium	--
Waterside economizer (water-cooled chiller)	--	Medium	Medium
IT Liquid cooling: waterside economizer (water-cooled chiller)	--	--	Medium
Water-cooled chiller	High	High	--

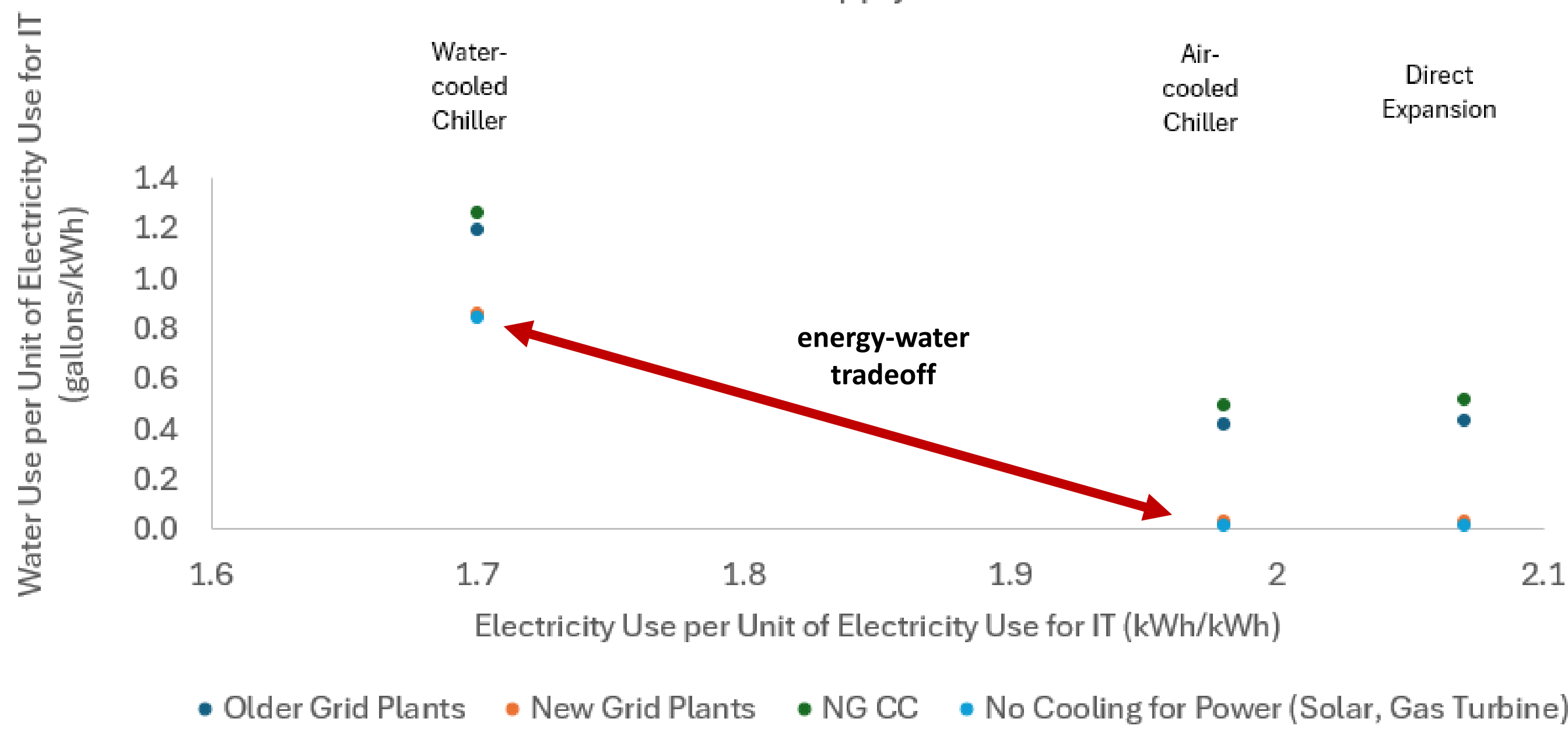
Estimated Water Demands

In 2026, data centers in Nebraska consume an estimated **1.6 million gallons of water annually** or **0.05% of total water use**, direct (742 Mgal) and indirect (922 Mgal).



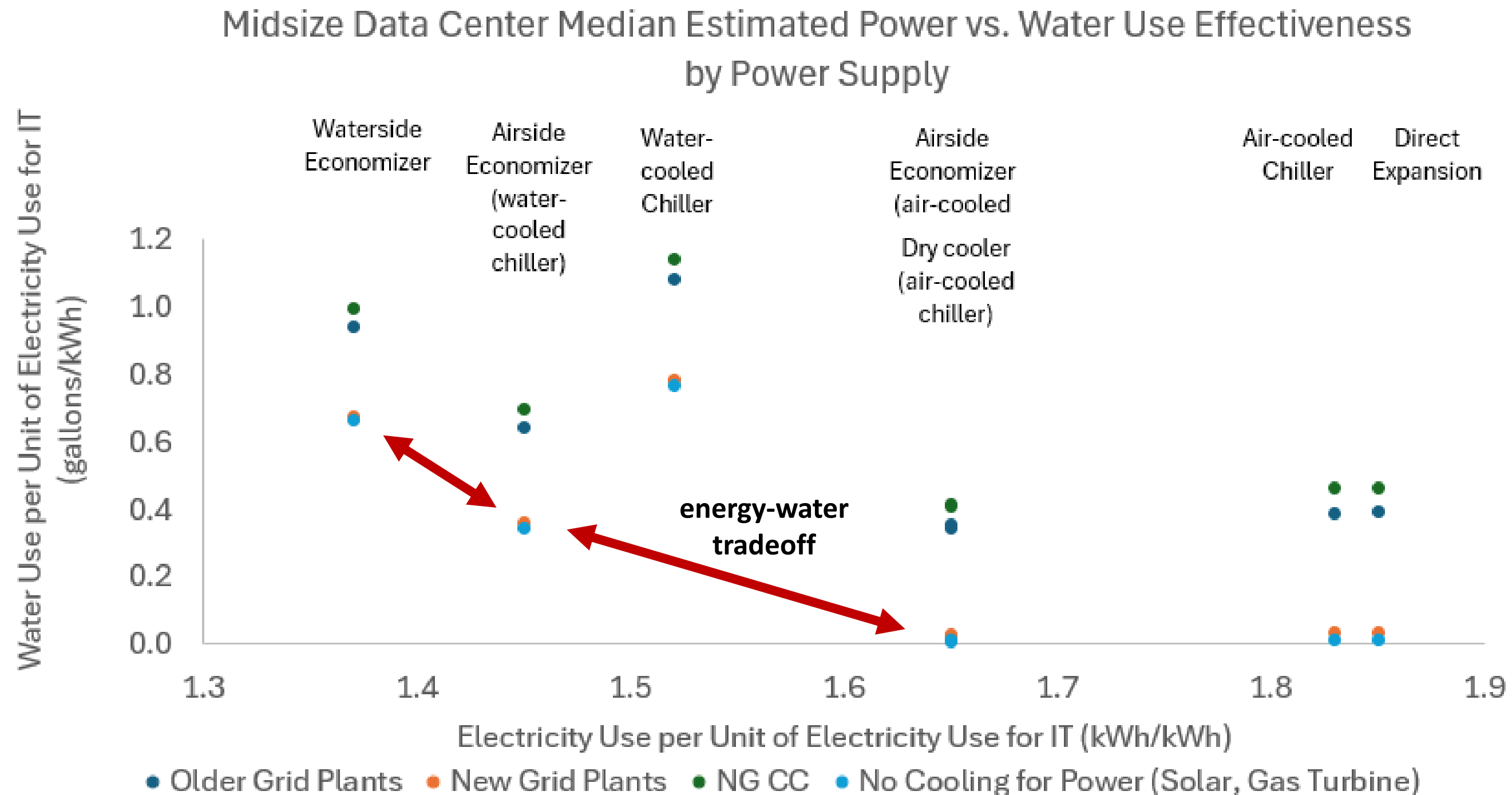
Technology Makes A Difference

Small Data Center Median Estimated Power vs. Water Use Effectiveness by Power Supply



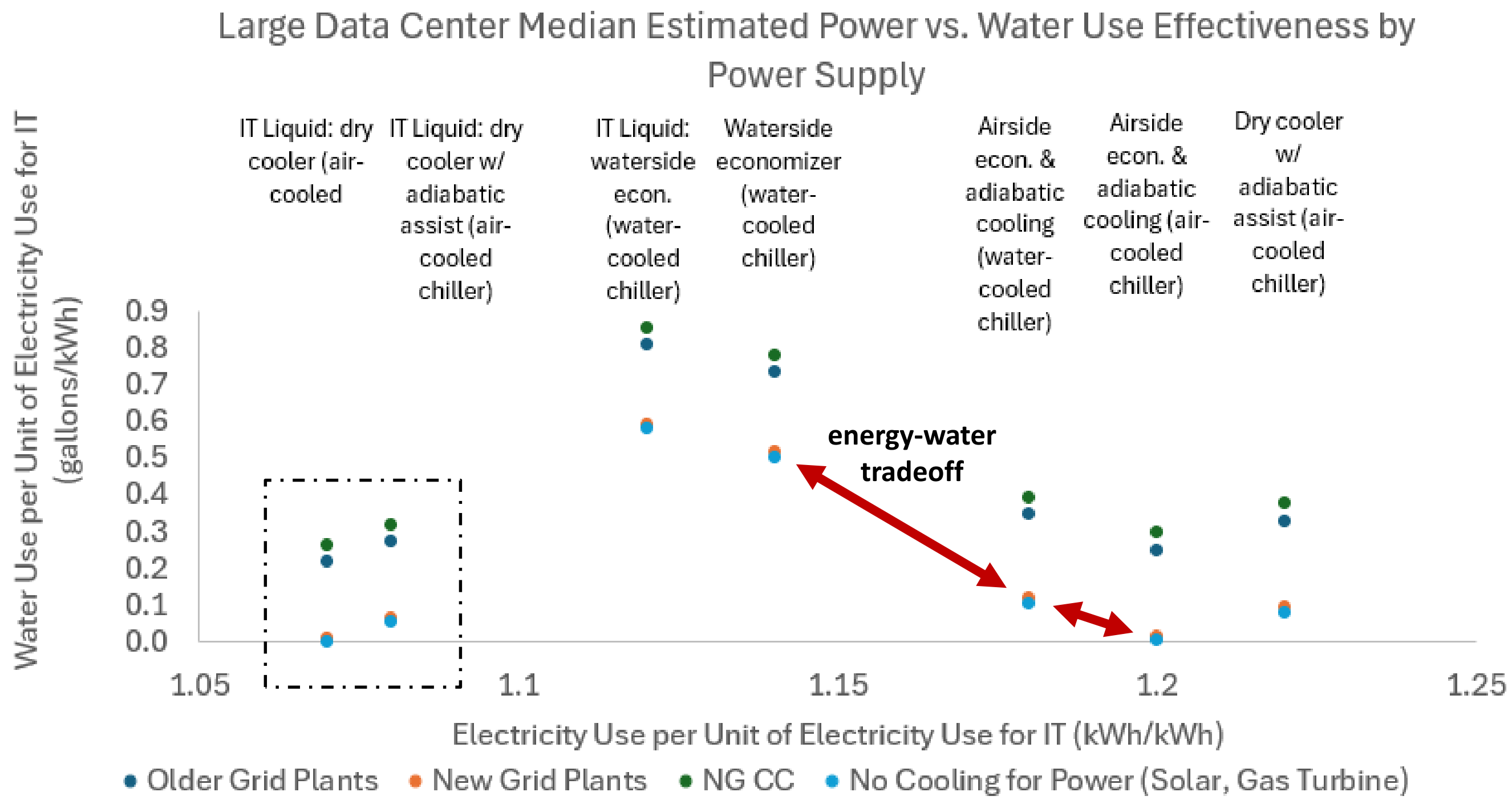
*Based on LBNL 2024. Combined water-use effectiveness includes WUE of data center and power supply

Technology Makes A Difference



*Based on LBNL 2024. Combined water-use effectiveness includes WUE of data center and power supply

Technology Makes A Difference



*Based on LBNL 2024. Combined water-use effectiveness includes WUE of data center and power supply

Reducing Indirect Water Use

Trends toward *more* natural gas could increase water consumption.

Greatest water savings in order

- Power supply w/ no water for cooling required (e.g., solar)
- New grid power under current trends (combo of solar, gas, wind, batteries)
- Grid power under historic trends
- Onsite or direct contracts with NGCC plants

In the West Texas oil patch, companies plan gas power plants to run new data centers

The developer of one project, in Pecos County, calls it the largest power project in the U.S. Data centers are sparking a surge of gas power plant construction in Texas.

BY DYLAN BADDOUR, [INSIDE CLIMATE NEWS](#)

FEB. 2, 2026, 11:00 A.M. CENTRAL

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BUSINESS // ENERGY

A surge in data center development is feeding demand for electricity. Here's why that's a win for natural gas in Texas.

By [Claire Hao](#), Staff writer
Oct 30, 2024

Gift Article   

Data centers are building their own gas power plants in Texas

Not long ago, developers of the massive server farms talked about powering them with wind and solar energy. Now they're bypassing the grid and building their own gas-fired power plants on site.

BY DYLAN BADDOUR AND ARCELIA MARTIN, [INSIDE CLIMATE NEWS](#)

JUNE 5, 2025, 5:00 A.M. CENTRAL UPDATED JUNE 5, 2025, 5:00 A.M. CENTRAL

REPUBLISH ↗

Alternative Water Supplies

- When water use is unavoidable/to continue more energy-efficient evaporative cooling, use nonpotable water
 - Treat onsite to useable quality
 - Brine management (brackish, pw)
- Reclaimed water use examples: Microsoft, Amazon
- Produced water → freshwater treatment pilots
- Brackish water



Image source: Earth Signal

Water Positive Goals

- Company goals to offset water use
- Should be in same basin, ideally same community

How AWS will return more water than it uses by 2030

Getting AWS to be water positive requires new solutions and collaborations involving employees, global nonprofits, local communities, and public utilities—all with the same goal in mind: creating a better future for our planet.

Inside Microsoft's two-decade push to cut water intensity while scaling for growth

Jun 24, 2026 | Judy Priest, CVP and CTO of Cloud Operations & Innovation and Steve Solomon, VP Datacenter Engineering

ENGINEERING

Facebook is committed to being water positive by 2030

BY [SYLVIA LEE](#) AUGUST 19, 2021

Google gives \$3 million to MUD to reduce water use in Omaha

By [Matt Olberding](#) , News director Nebraska Public Media | June 3, 2026, 8:49 a.m. · 2 min read

Google's water stewardship commitments for local communities

Jun 03, 2026 Learn about our water commitments and initiatives.

Challenges of Estimating Water Demands of Data Centers

- Data uncertainty
 - Lack of transparency from data centers
 - Few published studies available
 - How much of this is a bubble? We can't build enough infrastructure to meet this demand this quickly.
- Data center water *growth* is not in our state water plan
- Municipalities don't have the most up-to-date data to make informed choices.
 - Borrowing against future water needs

Reducing Water Demands

- Technology or management changes
- Leverage investment
- Public-private partnerships
- Possible policy drivers
- One Water framing

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Water-Lean Power

Use water-lean energy technologies like solar, wind, and natural gas turbines



Water-Lean Cooling

Use airside/waterside economizers, dry cooling, IT liquid cooling, adiabatic cooling (w/ water-lean energy)



Alternative Water

Use alternative sources of water like municipal reuse

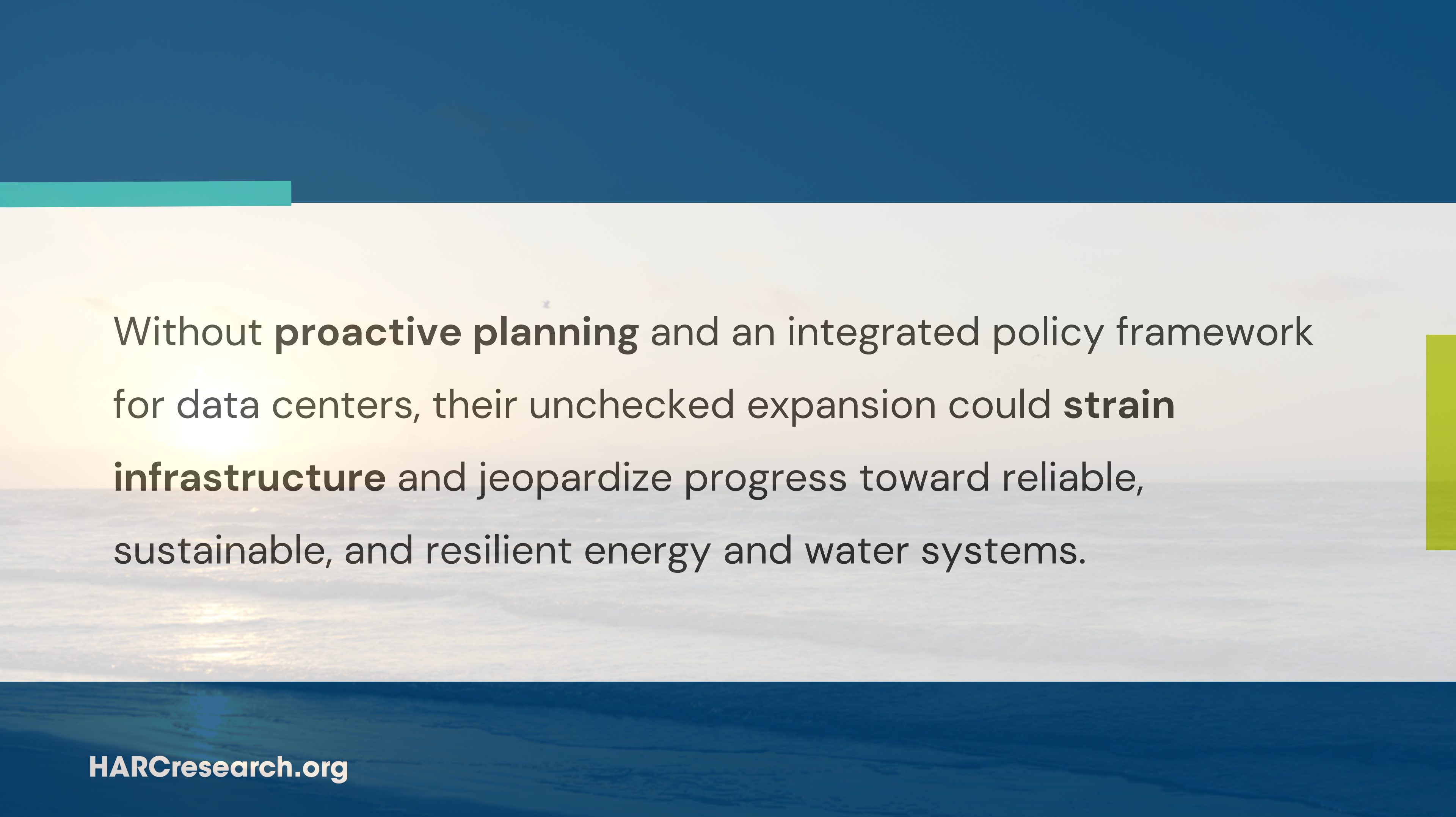


Reduce Energy On-site

Energy-efficient operations (e.g., Energy Star servers, increased server utilization, shorter refresh cycles, remove inactive servers)

Recommendations

- **Transparent Data** – Data centers report expected & actual electricity and water use.
- **Forward Looking Water Planning** – Coordinate w/ data center developers, ensure large water industrial users are captured in planning.
- **Efficiency & Alternatives** – Incentivize data centers to use energy-lean and water-lean technologies (e.g., tie to existing tax abatements), use alternative water supplies when possible.
- **Leverage Infrastructure Investment & Public-Private Solutions** – Seek data center investments that serve the local community, including paying their costs and facilitating water replenishment.
- **Draw from Energy Sector Best Practices** – e.g., track planned water use like planned electricity use/interconnection process



Without **proactive planning** and an integrated policy framework for data centers, their unchecked expansion could **strain infrastructure** and jeopardize progress toward reliable, sustainable, and resilient energy and water systems.

Thank you!

For more information, contact HARC at
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