Thirsty Data

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HARC

About HARC

HARC is an independent, nonpartisan nonprofit focused on driving sustainability outcomes grounded in science.

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

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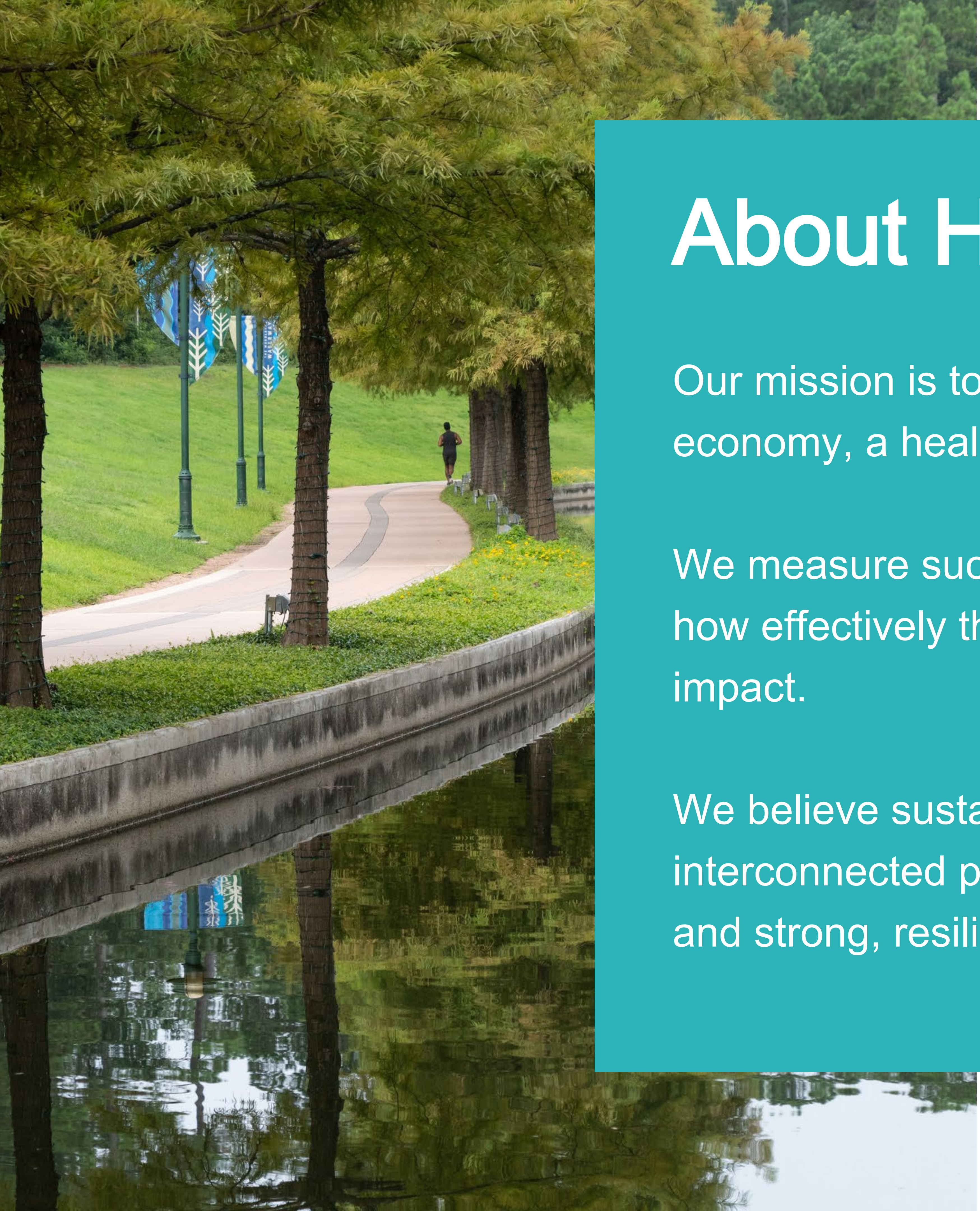


About HARC

Our mission is to accelerate practical solutions for a sustainable economy, a healthy environment, and a high-quality of life for all.

We measure success not by the knowledge we generate, but by how effectively that knowledge is applied to deliver real-world impact.

We believe sustainability rests on three essential and interconnected pillars: a vibrant economy, a thriving environment, and strong, resilient communities.

How We Make an Impact

Interdisciplinary Research & Scientific Analysis

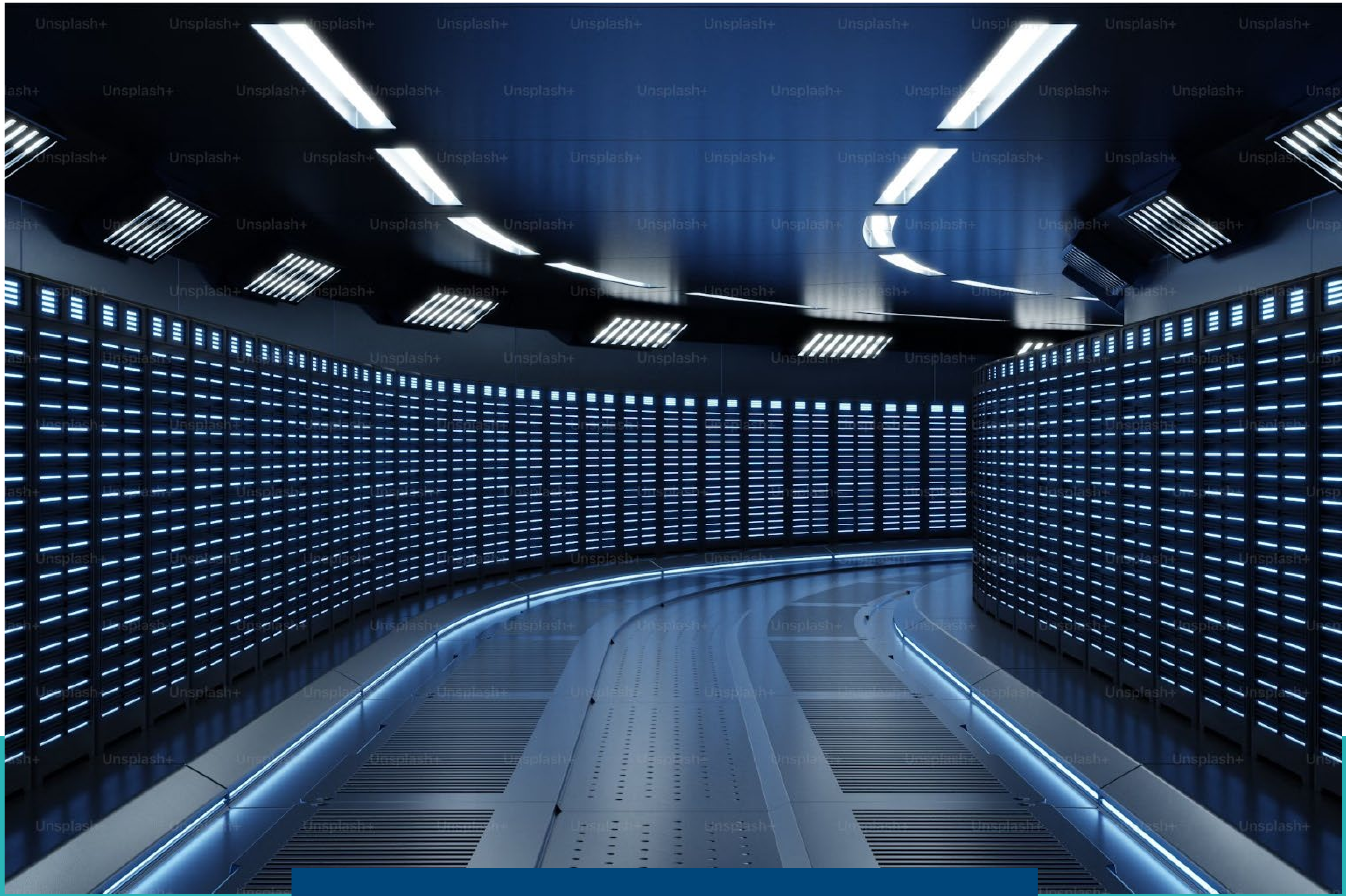
We apply rigorous, independent research and data analysis to understand challenges, evaluate tradeoffs, and design actionable solutions to Texas' most pressing sustainability issues. Drawing on expertise in ecology and environmental science, policy and economics, social sciences, engineering, and technology development, we deliver high-quality insights, tools, and work products that inform real-world decisions.

Collaborative Stakeholder & Community Engagement

We expand our influence by cultivating strong, long-term relationships with communities, industry, academia, and local and state governments. Through clear engagement pathways and knowledge-to-action collaboratives, we bring diverse perspectives together to inform policy, guide investment, support economic development, and reflect local priorities. By communicating clearly and consistently, we build shared understanding, trust, and momentum for sustainable solutions.

Integrated Solution Development & Implementation

We translate ideas into action by supporting technical assistance, project and program development, implementation, and project management, and policy engagement. Working alongside partners, we bring solutions to life—shaping investments, improving planning, increasing resilience, and reducing cost and risk. This integrated approach ensures that scientific insight leads to tangible, measurable benefits for Texans.



Data centers house computing infrastructure

Data Center Infrastructure in the United States, 2025

About the Map

This map illustrates the geospatial relationships between data center locations, transmission infrastructure, fiber optic networks, and metropolitan areas. The datasets on this map are not produced or curated by NREL. NREL is not responsible for the accuracy, completeness, or reliability of the datasets.

This work was authored by the National Renewable Energy Laboratory for the U.S. Department of Energy (DOE), operated under Contract No. DE-AC36-08GO28308. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government.

Transmission Lines

voltage class (kV)

- ≥735
- 500
- 345
- 220–287
- 100–161
- <100
- HVDC

Fiber Optic Lines

capacity unavailable

- approximate line route

Data Centers

demand capacity (MW)

- 2,400
- 1,000
- <100

operating status

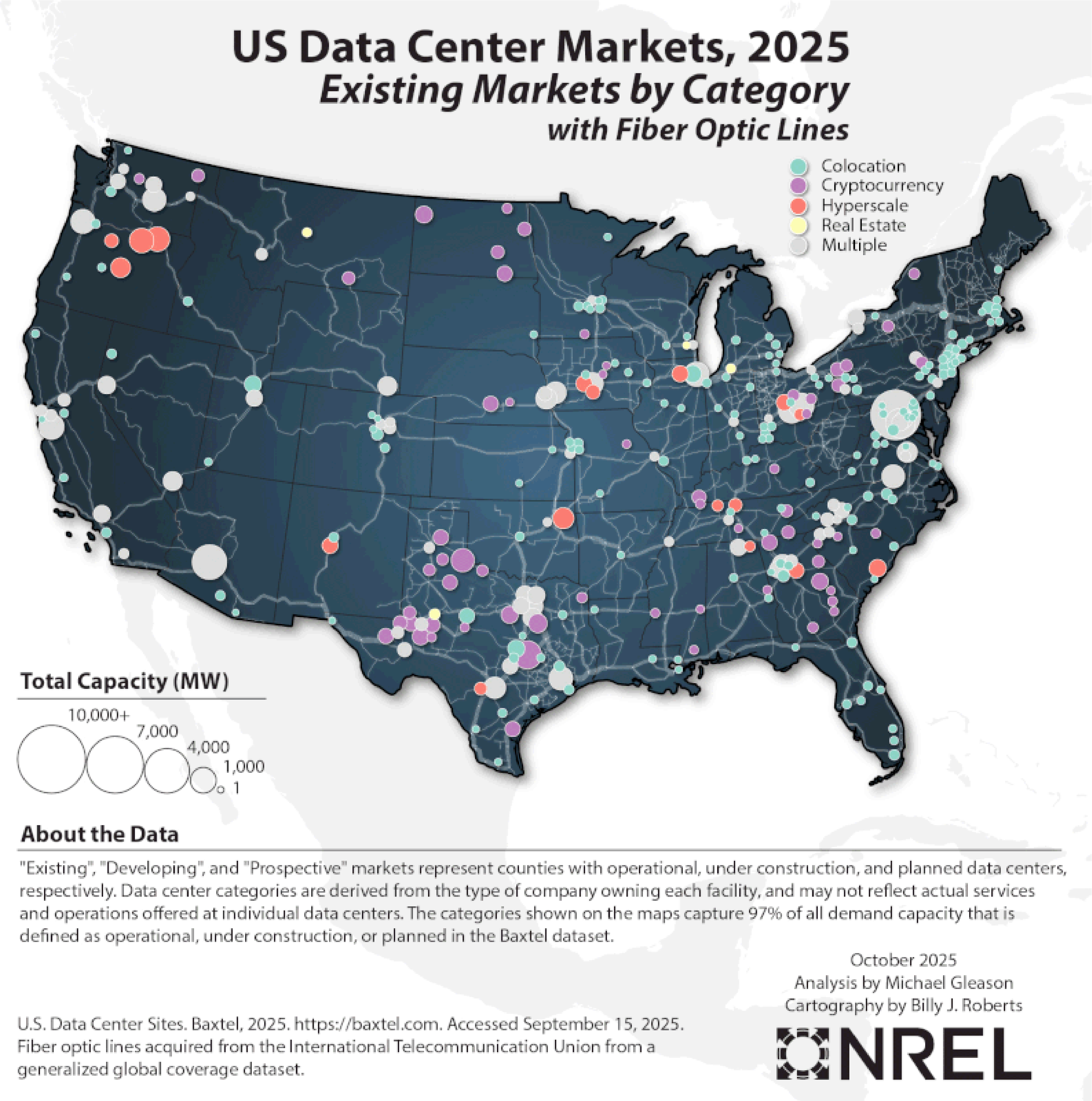
- Operating
- Under Construction
- Proposed

Data Sources

Transmission network and data center information © 2025 Hitachi Energy, Velocity Suite. Fiber optic lines acquired from the International Telecommunication Union from a generalized global coverage dataset.

May 2025 NREL/OT-6A20-94502
Cartography by Billy J. Roberts
National Renewable Energy Laboratory
Golden, Colorado

NREL



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

Casey Keller, Caerus Commodities

Estimated Water Demands

- **Est. water demand** : average **~95 gals/MWh** [LBNL 2024]
- **Direct water use:** evaporation through a chiller or cooling tower – new withdrawals occur to replace vaporized water with freshwater, recirculates
- **Wastewater:** largely blowdown - water removed from cooling supply to prevent excessive concentration of dissolved solids (it gets too briny)
- **Indirect water use:** at power plants for cooling
- **Individually:** water demand may not be large
  - **Collectively:** Rapid growth rate, large localized presence and impacts

Factors Influencing Water Use

Amount of water use depends on

- Cooling type used (right)
- The size of the data center, and
- The type of data center (hyperscaler , crypto, etc.)
- The computing equipment needing cooling

Cold Plate Cooling

Cooling hottest components in non - immersed loop

Dry Cooling

Heat transferred through cool air. Higher energy demand. Not possible for all data center types.

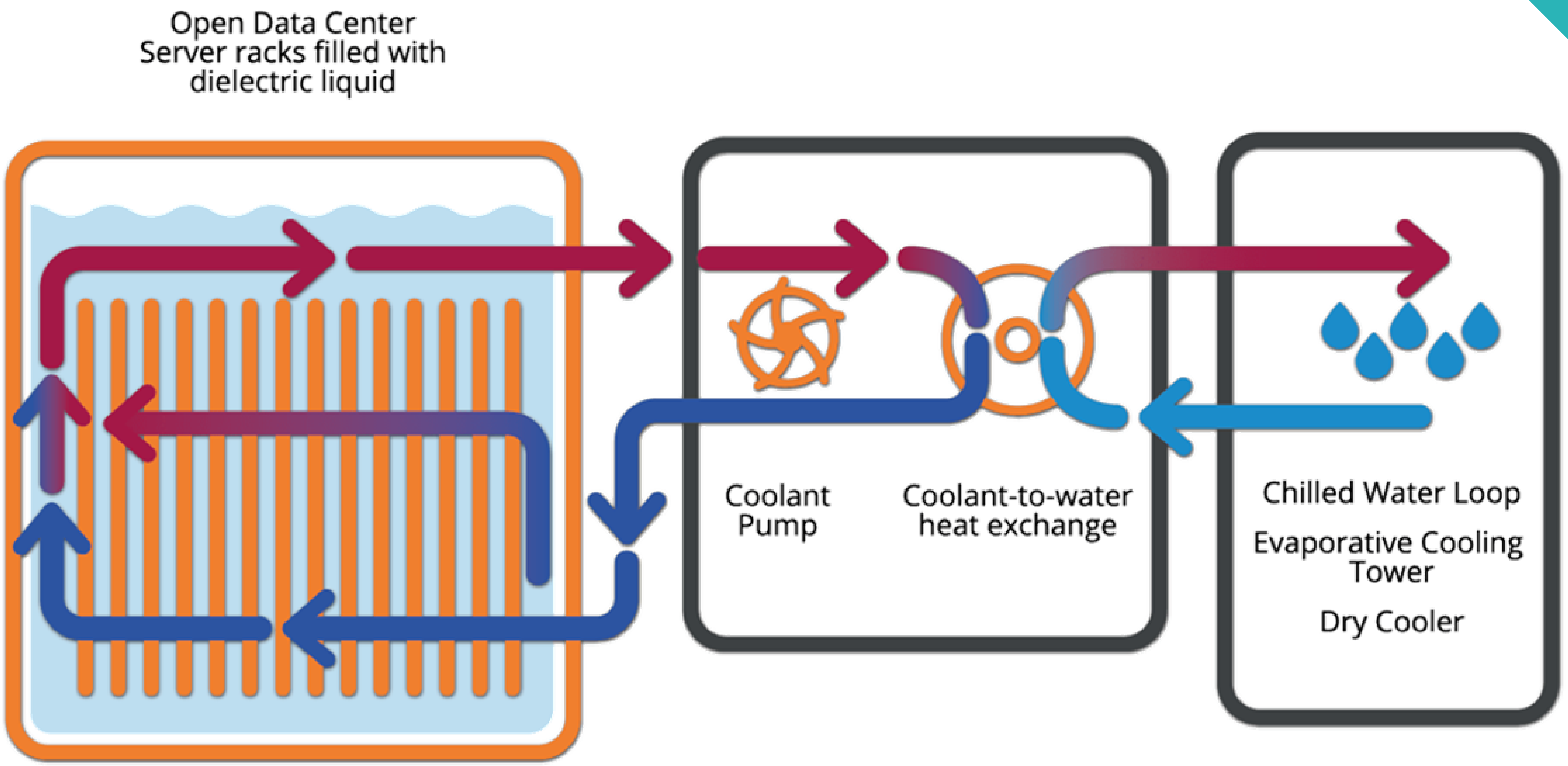
One-Phase Cooling

Servers immersed in oil-based liquid. Heat exchanged to liquid then water. Hot water sent to cooling tower (evaporates).

Two-Phase Cooling

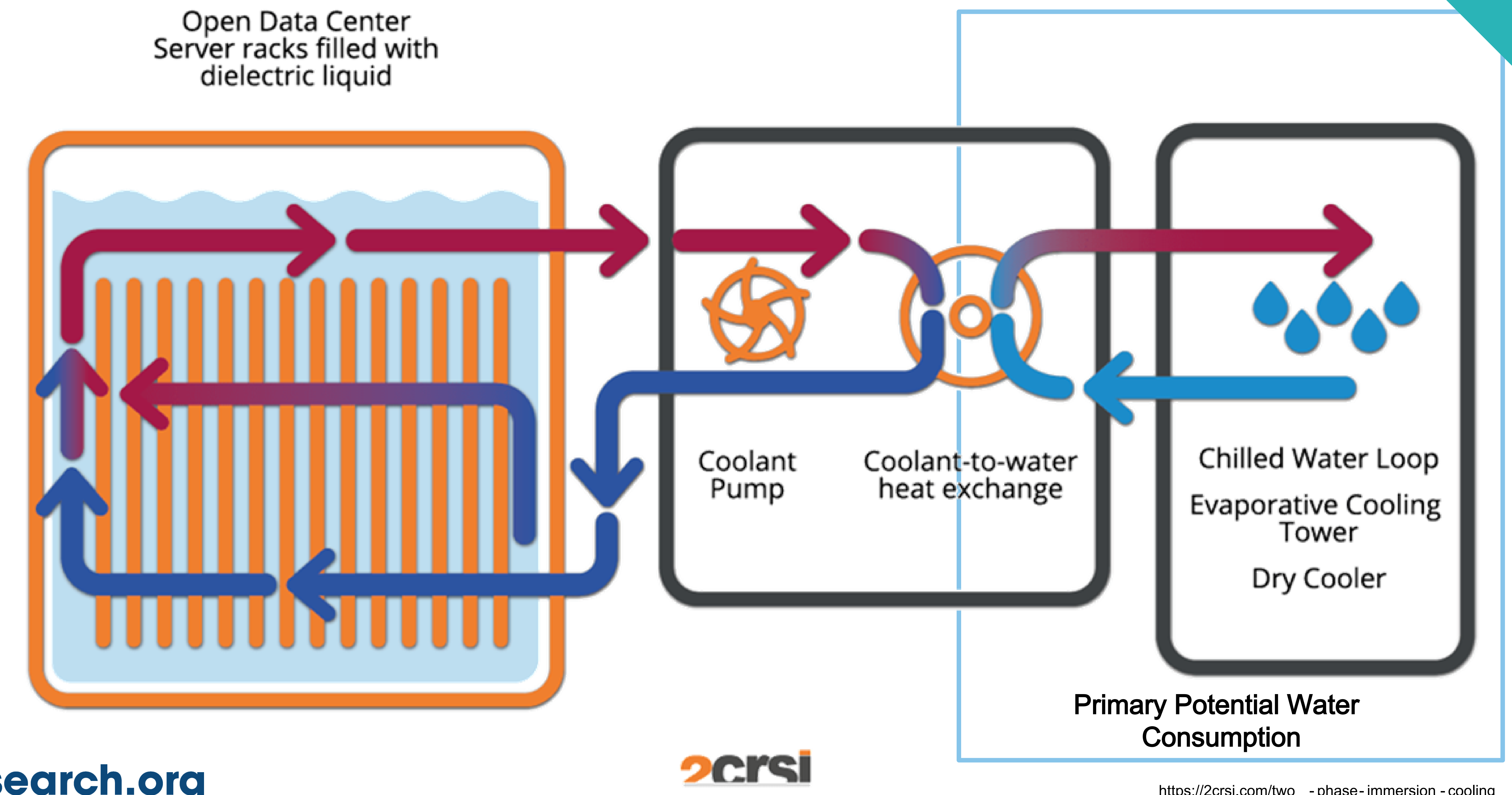
Servers immersed in chemical liquid. Heat causes liquid phase change. Heat exchanged with water.

One-Phase Immersion Cooling



https://2crsi.com/two - phase - immersion - cooling

One-Phase Immersion Cooling



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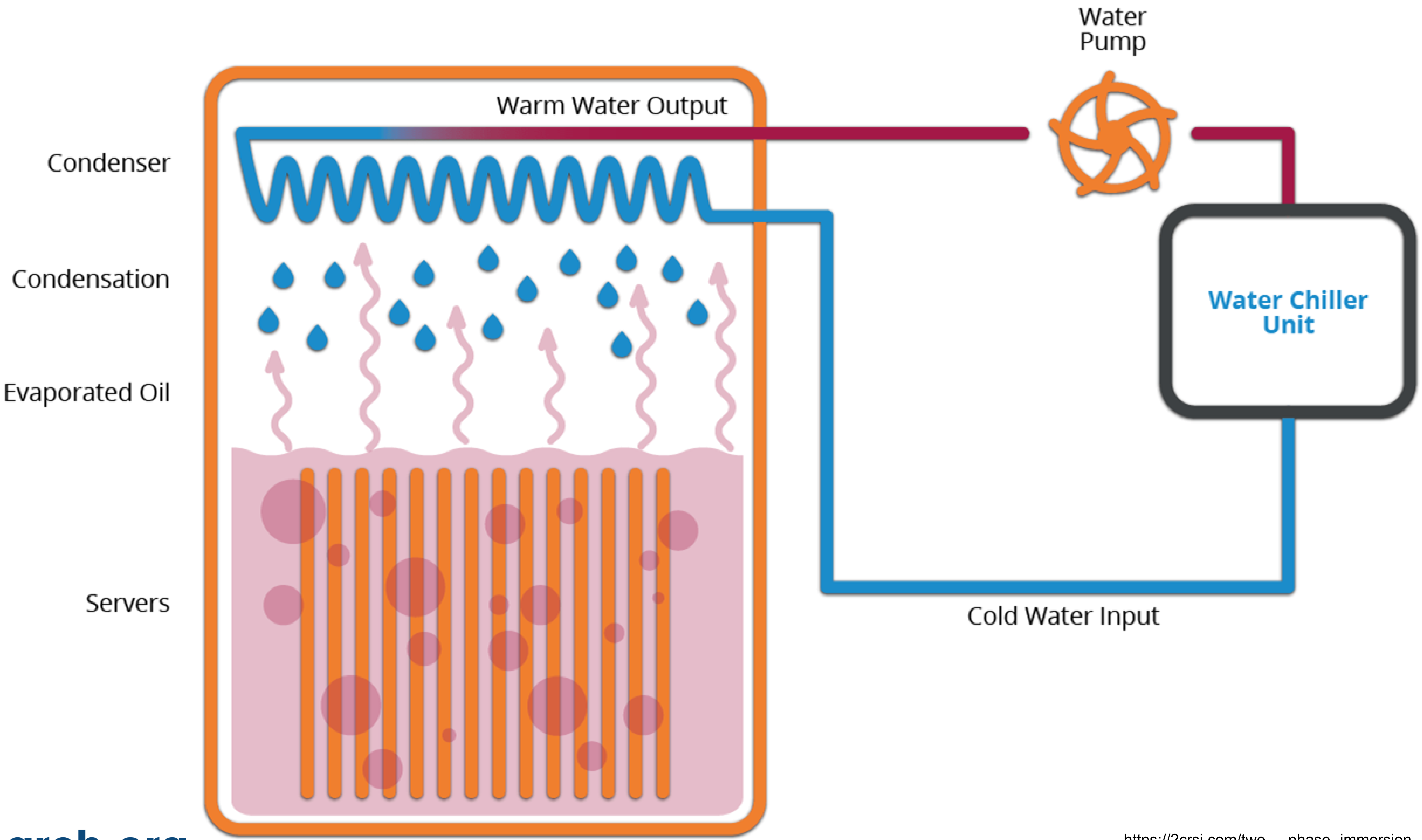
Two-Phase Immersion Cooling



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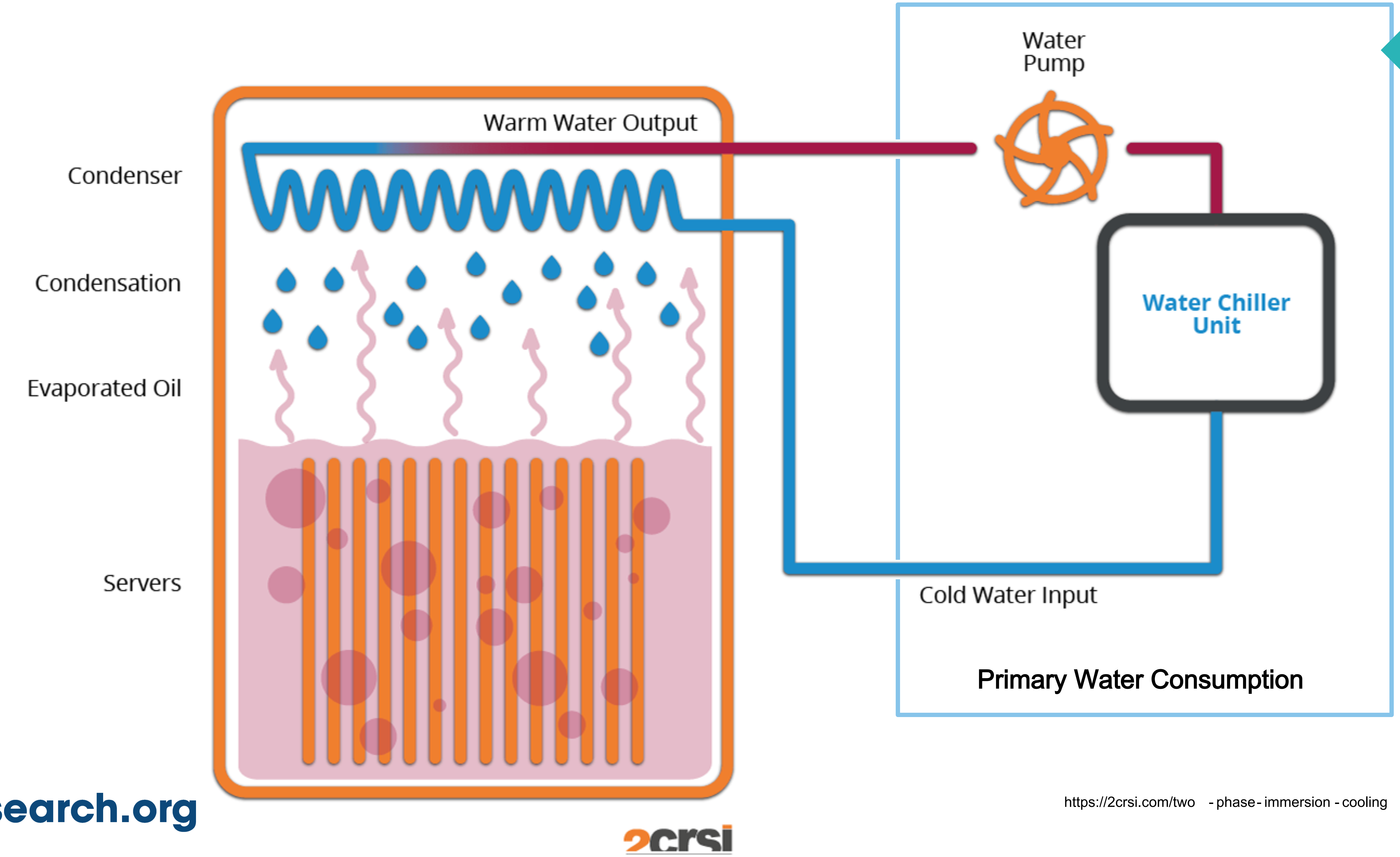
Two-Phase Immersion Cooling



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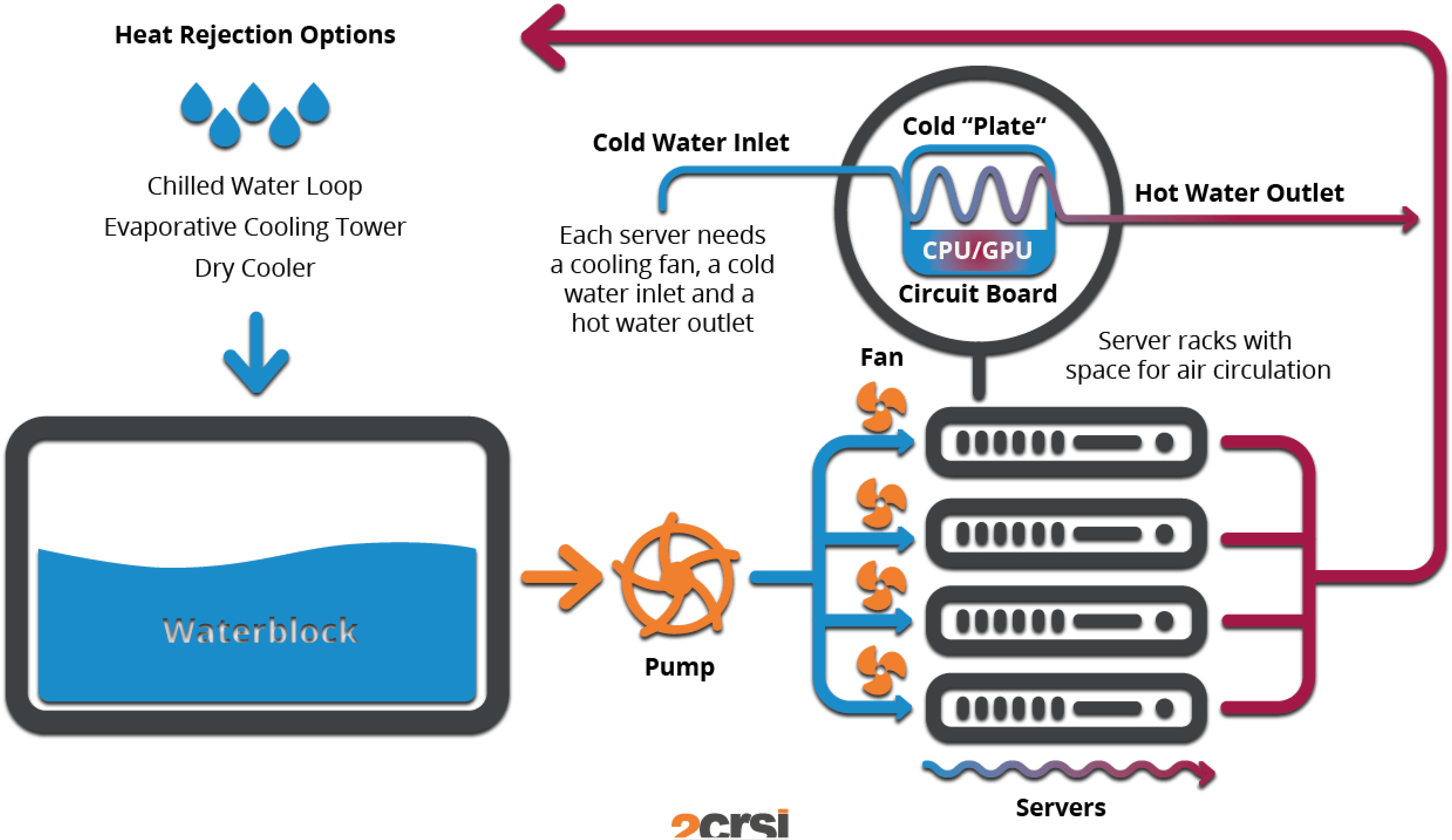
Direct / Cold Plate Cooling



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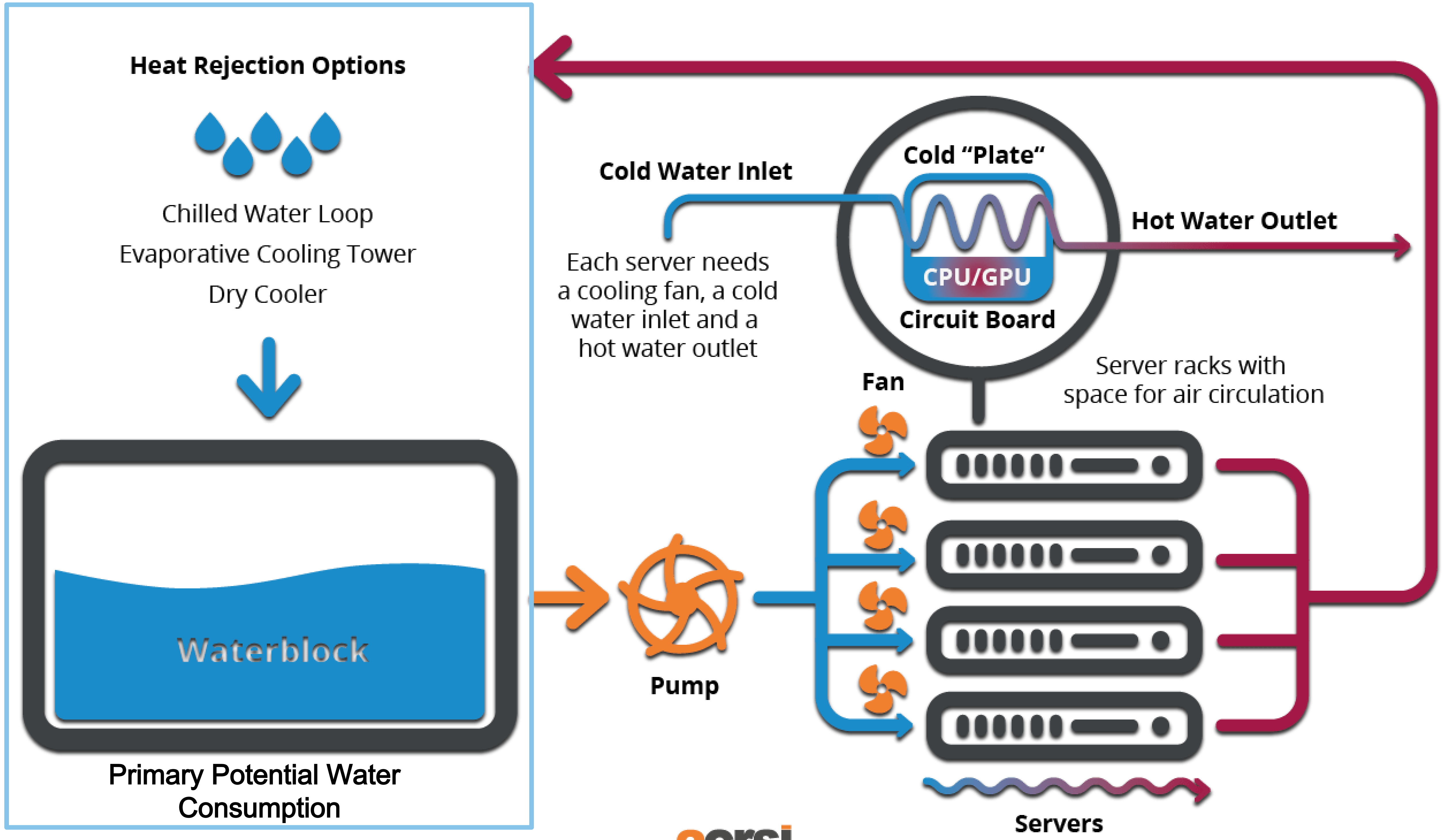
Direct / Cold Plate Cooling



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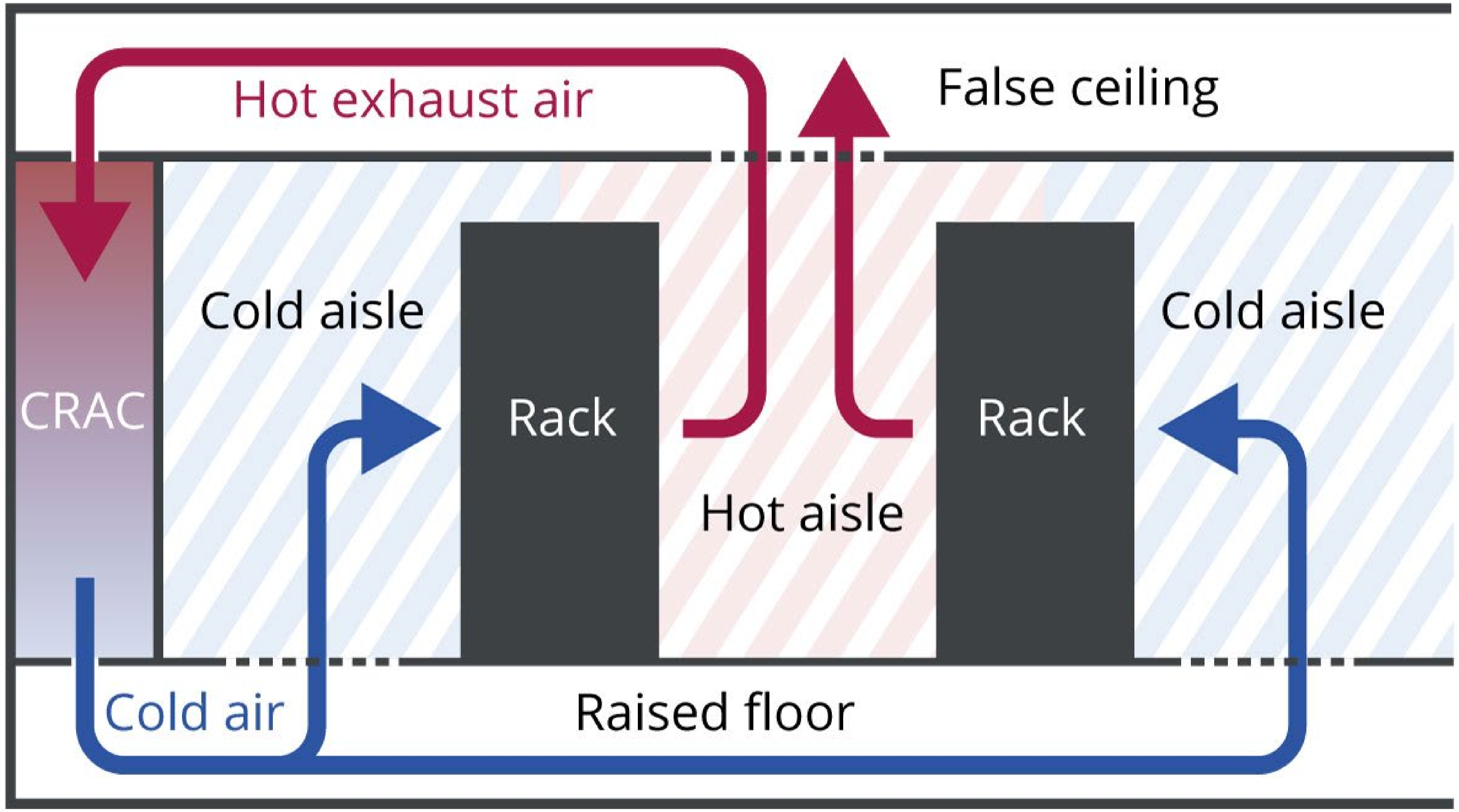
Air Cooling / Dry Cooling



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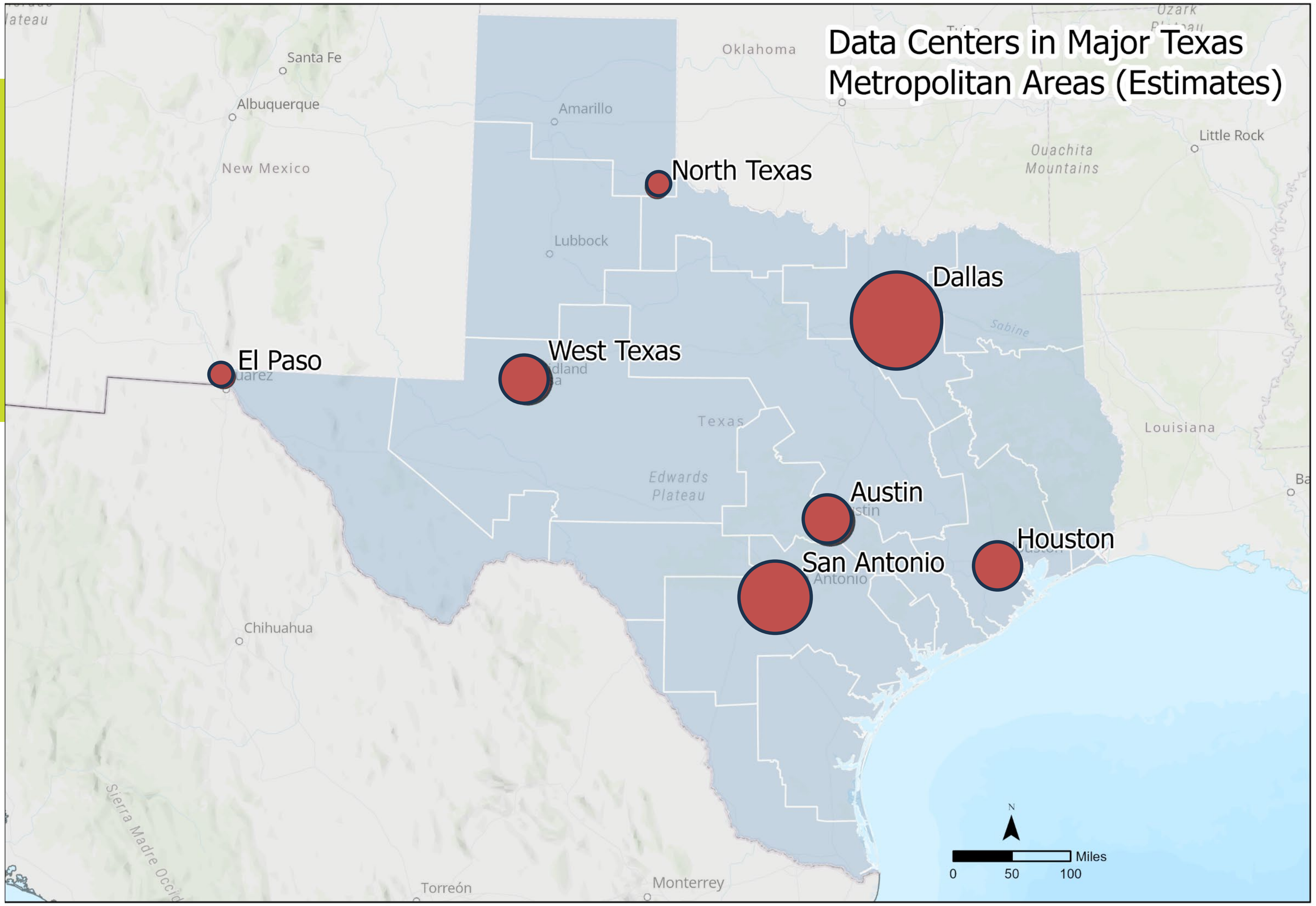
Texas Data Centers



Information on data centers obtained from the Baxtel website. The North Texas location represents an approximate grouping of data centers near Wichita Falls, Pampa, & Dumas. The West Texas location represents an approximate group of data centers between Amarillo, Pecos, Abilene, & Fort Stockton.

As of September 2025, Texas had 464 facilities (according to Baxtel):

- 197 in Dallas Fort Worth (3rd largest market in US)
- 48 in Houston (12th largest market)
- 60 in San Antonio
- 53 in Austin
- 59 in West Texas
- more sites under construction and more in planning and development

Data Center Energy Demands

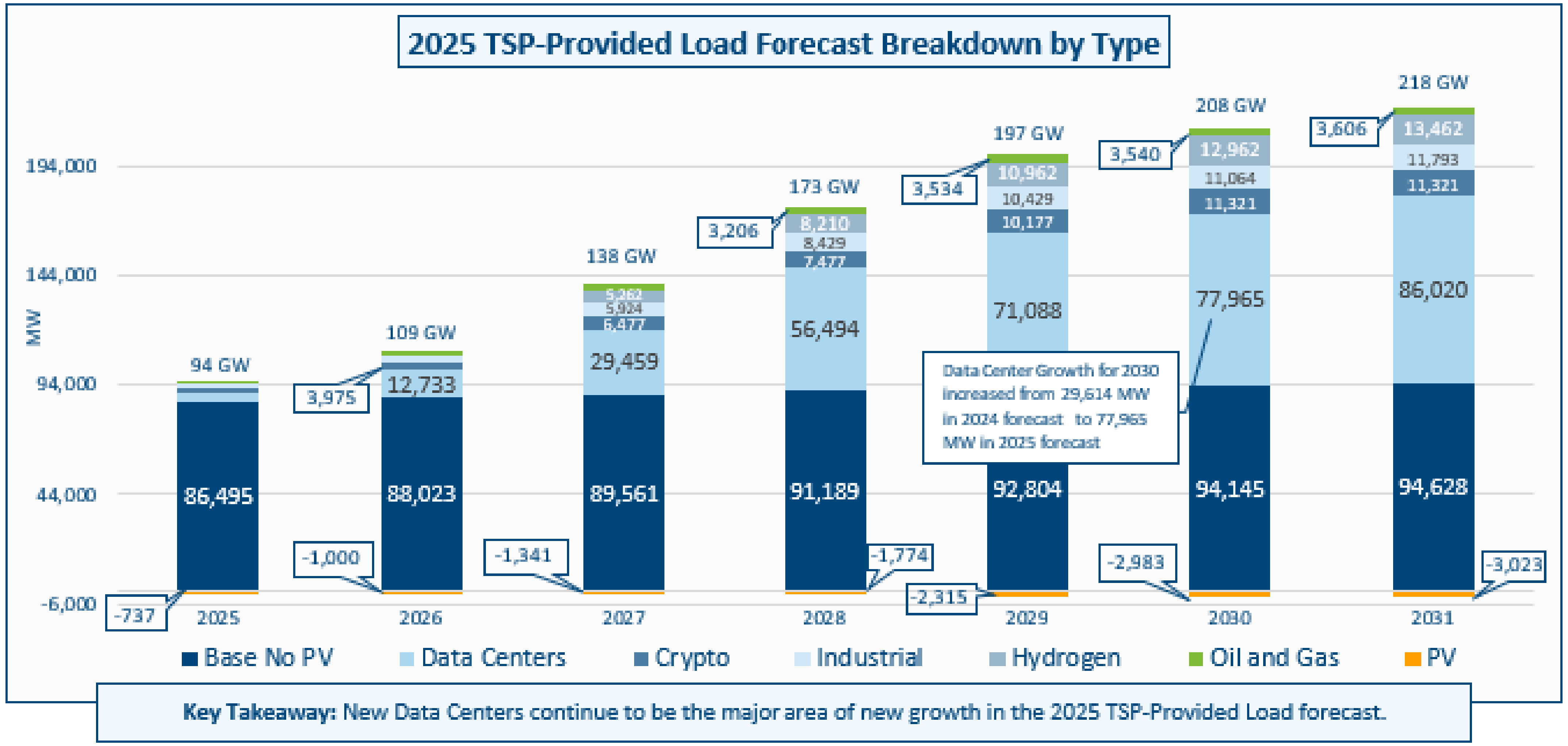


Figure 1 Long-term Load Forecast for 2025-2031 provided by ERCOT on April 7, 2025 shows data centers contributing to major electricity sector demand growth.[13]

*PV is “behind the meter” rooftop photovoltaic solar—solar providing power to a home or business rather than to the grid

Sept. 2025: 9,567 MW

By 2030, ERCOT expects DC growth to increase ~2 - 10x If running at full - steam

Data Centers historically have high water needs for cooling

- Direct at the data center
- Indirect at power plants

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Estimated Water Demands

- 2025 estimated total consumption
  - 34 Bgal water/year for cooling (direct) and 15 Bgal at power plants (indirect)
  - 0.8% of 2020 estimated annual water demand (2022 State Water Plan)

- By 2030
  - Up to 78 GW power consumption – some grid, some onsite
  - Data centers could account for 29 - 161 Bgal (98 - 494 kAF) by 2030 or 0.5 - 2.7% of 2030 estimated annual water demand (2022 SWP)
    - *Localized demands, large local impacts*

Case Study on Stargate, Abilene, TX

OpenAI Stargate facility in Abilene, TX (Data Center Dynamics)

- 1.2 GW hyperscaler w/ natural gas turbines
- Cooling: Closed-loop direct-to-chip (DTC) liquid cooling system recirculates water internally with ***water-cooled chillers*** to get rid of heat
  - Water-cooled chillers: 4.9-7.6 Bgal/year
  - Hybrid water/air chillers: 0.6-1.3 Bgal/year

Casey Keller, Caerus Commodities

Challenges of Estimating Water Demands of Data Centers

- Data uncertainty
  - Lack of transparency from data centers
  - Few published studies available
- Data center water *growth* is not in our current or upcoming 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 (right)
- Leverage investment
- Public-private partnerships
- Possible policy drivers:
  - Incentives for water lean strategies
  - Water saving ordinances
  - Look to the energy sector re large demands – fees and studies required
- One Water framing

Water-Lean Technology

Use water-lean energy technologies like solar, wind, and natural gas turbines; reduce water on-site

Dry Cooling

Use dry cooling at data centers and power plants (energy penalty – use w/ water-lean energy)

Alternative Water

Use alternative sources of water like municipal reuse & onsite grey water

Reduce Energy On-site

Energy-efficient operations and scheduling non-peak demand periods

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

CONTACT US

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