

## U.S. Data Center Cooling Market Landscape 2024-2029

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#### **Report description:**

The U.S. data center cooling market is expected to grow at a CAGR of 11.65% from 2023 to 2029.

#### KEY TRENDS

Rising Adoption of AI Will Drive Demand for Advanced Cooling Technologies

- The AI industry is set to significantly increase the size of hyperscale data centers. Even though the current AI investments haven't fully compensated for the growth in hyperscale data centers, the capacity of these data centers, especially for AI workloads, is expected to almost triple in the next six years.

There is an increasing interest in Artificial Intelligence (AI), especially in financial applications based in New York. The New York
Department of Financial Services is acquiring a supercomputer to comprehend financial use cases and prepare for the necessary
regulations.

- Liquid cooling is becoming important due to the rising adoption of AI workloads. The increased rack density of data centers leads to increased heating and liquid immersion, a reliable method of cooling down powerful computers and dense hardware setups.

Growing Rack Power Density

-[]As data centers incorporate advanced technologies such as AI, Machine Learning (ML), and data analytics, they have to deal with higher power demands, sometimes exceeding 20 kW to 80 kW per rack, which generate more heat.

- The cooling needs of AI or HPC deployment depend on their specific density. The power density demands for AI and HPC can be 5-10 times greater than typical data center applications, which usually range from 5-8 kW per rack.

-[Advancements in computing hardware may allow power densities to exceed 100 kW per rack by 2024, with peak densities in data centers potentially reaching 150 kW per rack in the coming years.

-[Equinix, a colocation provider, is investing in this technology and views it as the future of data center cooling. They conducted trials with ZutaCore's direct-on-chip system at a New York facility and reported a 50% improvement in energy efficiency compared

to traditional enterprise data centers.

Strategic Partnerships Leading to Higher Market Share and Growth

-[]As data centers rise with the increasing demand for efficient cooling solutions, many operators are turning to innovative technologies like direct-to-chip and immersion cooling solutions in the U.S. data center cooling market.

-[Industry mergers and Acquisitions (M&A) have significantly facilitated the adoption of these advanced cooling methods in the U.S. data center cooling market. These strategic moves facilitate the integration of advanced cooling solutions, essential for managing the increased heat output from high-performance computing and dense server configurations.

Data center operators leverage these partnerships to access cutting-edge cooling technologies, improve energy efficiency, and enhance their facilities' overall performance and reliability.

- Consequently, the U.S. data center cooling market is witnessing a growing trend towards these innovative cooling methods as operators strive to meet the escalating demands for computing power while minimizing environmental impact.

## Adoption of Liquid-Cooling Techniques

- Several vendors recently introduced their liquid immersion cooling solutions for data centers in the U.S. data center cooling market. This new technology involves submerging computer servers in a special liquid that helps keep them cool.

- Data centers can run more efficiently and use less energy than traditional air-cooling methods. It's becoming a popular solution because it reduces costs and is better for the environment.

-[]Over 30 years, the server and data center market has grown quickly due to the rising demand for AI technologies and better GPUs and CPUs.

- The new liquid cooling systems are ready to tackle these challenges directly. They're designed to support powerful CPUs and GPUs with high heat levels.

- Uptime Institute revealed that enhancing data center cooling is the primary contributor to overall colocation sustainability. By adopting direct-chip-liquid cooling, the data center can effectively manage dense and high-performance server clusters while simultaneously curbing power usage and water consumption.

- The growing demand for liquid cooling has led to a broader range of options, possibly driving down costs and increasing accessibility like never before. Using liquid cooling in data centers helps companies save money by using less energy, which lowers their electricity bills.

## SEGMENTATION INSIGHTS

-[]Numerous innovative power and cooling systems have recently been launched in the U.S. data center cooling market, emphasizing sustainability. Infrastructure providers are increasingly concentrating on developing products that minimize environmental impact.

-[In recent years, data center operators have been implementing new, energy-efficient cooling systems intended to reduce power consumption by up to 50%. This trend is expected to continue in the forecast period as market vendors continually invest in developing more efficient products.

- The market for liquid immersion and direct-liquid cooling solutions is experiencing strong growth in the U.S. data center cooling market owing to the increased deployment of artificial intelligence and machine learning workloads during the forecast period. - The adoption of CRAC and CRAH is increasing in the U.S. data center cooling market; between 2020 and 2023, the growth of CRAH and CRAC was around 64% in the US due to the increased demand for technology and data centers.

-[]Air-based cooling techniques in data centers comprise DX-based CRAC units, free cooling technique solutions, air-cooled chiller-based cooling, and dry coolers.

- Many data centers have water-based cooling techniques and will likely use on-site water treatment plants to conserve water. These plants, coupled with energy-efficient infrastructure, provide additional water-saving opportunities.

- Some major adopters of direct-liquid cooling and liquid immersion solutions are data centers with supercomputing facilities and rack power density of over 100 kW. These cooling techniques are expected to grow steadily in the U.S. data center cooling market during the forecast period.

Segmentation by Facility Type - ∏Hyperscale Data Centers - Colocation Data Centers -[Enterprise Data Centers Segmentation by Infrastructure - Cooling Systems Other Mechanical Infrastructure Segmentation by Cooling Systems - CRAC & CRAH Units - Chiller Units - Cooling Towers, Condensers, and Dry Coolers - Economizers & Evaporative Coolers - Other Cooling Units Segmentation by Cooling Techniques - Air-based Cooling Techniques - Liquid-based Cooling Techniques Segmentation by Tier Standards -[]Tier I & II -∏Tier III Tier IV

## REGIONAL ANALYSIS

-[U.S. data centers are super-advanced buildings with all the right cooling setups. They are designed to store computer servers and network gear. Northern Virginia, California, Illinois, Texas, Arizona, Georgia, Oregon, New York, and New Jersey are among the primary destinations for data center development in the U.S.

- Northern Virginia, a major data center hub in the Americas, reached new heights in terms of its operational and under-developed power capacity this year. With the rising interest in Artificial Intelligence (AI), data center developments are expected in other states, such as West Virginia and North Carolina. The market continues to account for a substantial pipeline of projects, including growth in established areas and emerging clusters in surrounding regions.

-[The adoption of cooling technologies in data centers across the Southeastern U.S. is driven by the region's warm and humid climate, which poses challenges to maintaining optimal operating temperatures in data centers. Here are some cooling technologies that data centers adopt.

- The region supports free cooling, leading to the adoption of chillers with evaporate cooling solutions.

-[The western U.S. region supports free cooling, which will reduce power and water consumption in cooling data center facilities. The market witnessed several investments from colocation and hyperscale operators, whose facilities have minimum N+1 redundant cooling systems.

- Microsoft partnered with Wiwynn to test deploying a two-phase immersion-cooled server at a data center in Washington. - The growth of the data center market in New York and New Jersey is primarily driven by the continuous demand for data center space, positioning the area as a key connectivity hub within the heart of New York City's financial center.

- The Midwestern U.S. experiences various temperatures, from cold winters to hot summers. This variability necessitates flexible and efficient cooling systems that can adapt to changing weather conditions.

- Several states, such as Ohio, Iowa, and Michigan, have less dependency on water owing to the support of passive free colling throughout the year. The region mainly adopts CRAH units, chillers, and waterside and airside economization with N+1 redundancy.

Segmentation by Geography -[South Eastern U.S. -[South Western U.S. -[Mid-Western U.S. -[North Western U.S. -[Western U.S.

#### VENDOR LANDSCAPE

-[The U.S. data center cooling market hosts various active vendors offering different types of solutions. Those vendors that provide innovative and advanced technologies stand a better chance of securing a larger market share throughout the forecast period. -[Some prominent cooling infrastructure providers in the U.S. data center cooling market include Carrier, Delta Electronics, Johnson Controls, STULZ, Schneider Electric, and Vertiv. Other prominent vendors in the market include Rittal, 3M, Asetek, Daikin Applied, Condair, and others.

- Some prominent cooling infrastructure providers operating in the U.S. data center cooling market include Rittal, Schneider Electric, AIREDALE INTERNATIONAL AIR CONDITIONING, Vertiv, and STULZ. Some other prominent vendors in the U.S. data center cooling market include Asetek, Chilldyne, CoolIT Systems, Coolcentric, Cooler Master, LiquidCool Solutions, and others. - Many colocation operators are adopting advanced cooling technologies in their data centers in this market. This new technology involves submerging computer servers in a special liquid that helps keep them cool. This will lead to increased opportunities for vendors offering advanced cooling solutions to increase their revenue share in the market. For instance, In May 2024, Digital Realty introduced a new liquid-to-chip cooling colocation service. The company announced a direct liquid cooling (DLC) solution in 170 data centers worldwide.

-[In September 2023, Sabey Data Centers acquired 60 acres of land in Umatilla, Oregon, aiming to build a data center campus with over 100MW capacity. The company has partnered with JetCool Technologies to test its liquid cooling technology, which uses microjets to cool chip hotspots.

Prominent Cooling Infrastructure Providers

- Carrier - Delta Electronics - Johnson Controls - Schneider Electric - STULZ - Vertiv

Other Prominent Cooling Infrastructure Providers

-[]3M -[]AAON -[]Airedale -[]AIRSYS -[]Alfa Laval -[]American Cooling Tower

-[]Aquila -[]Asetek - Aspen Systems -[Chilldyne -[]Condair - Coolcentric - Cooler Master - CoolIT Systems - Daikin Applied Degree Controls -∏DUG -[]ebm-papst - EVAPCO - General Air Products - Green Revolution Cooling - Kyoto Cooling - Lennox International - LiquidCool Solutions - Mee Industries - Midas Immersion Cooling - Mitsubishi Electric -[]Motivair Munters - Nortek Air Solutions -[]nVent -[]OptiCool -[Rittal - SPX Cooling Technologies - Stellar Energy Swegon -[]Systecon -[]Trane United Metal Products - Upsite Technologies -[]Vigilent - Wakefield Thermal - Wiwynn -[]Zutacore

## KEY QUESTIONS ANSWERED:

1. What is the growth rate of the U.S. data center cooling market?
 2. Which region holds the most significant U.S. data center cooling market share?
 3. How big is the U.S. data center cooling market?
 4. How many MW of power capacity is expected to reach the U.S. data center cooling market by 2029?
 5. What are the key U.S. data center cooling market trends?

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