

CASE STUDY

AWS DFW101 and DFW103 Data Centers



Executive Summary / Elevator Story

AWS DFW101 and DFW103 exemplify Amazon Web Services' strategic investment in the Dallas-Fort Worth (DFW) metroplex, delivering Hyperscale cloud infrastructure optimized for the explosive growth of AI, machine learning, and enterprise cloud workloads in the South-Central United States. These facilities, part of AWS's expanding DFW presence (including Local Zones and physical campuses), combine cutting-edge **direct-to-chip liquid cooling, hybrid air/liquid architectures**, and renewable energy matching to achieve a global AWS Power Usage Effectiveness (PUE) benchmark of 1.15 while supporting rack densities essential for modern GPU/Trainium clusters.

AWS is turning the DFW region's abundant power, land availability, and central connectivity into a low-latency, sustainable powerhouse that helps customers launch AI applications faster, with up to 46% lower mechanical cooling energy and no increase in water usage compared to prior generations. For Enterprises and Hyperscalers in Texas and beyond, DFW101/103 represent reliable, future-proof infrastructure that balances performance, cost, and environmental responsibility in one of North America's fastest-growing data center markets.

Background

AWS has steadily expanded its physical footprint in the DFW area to support the region's booming digital economy, proximity to major enterprises, and favorable power grid conditions under ERCOT. Publicly disclosed projects include the Ezell Drive Campus in DeSoto, Texas (a ~30,000 sq ft facility completed around 2024 on a 9-acre site), along with broader Texas investments such as the codenamed "Project Spectrum" campus in Somervell County near the Comanche Peak nuclear plant for potential clean-energy-powered capacity. DFW101 and DFW103 are understood to be specific buildings or data halls within AWS's DFW campus portfolio, consistent with AWS's internal naming conventions (e.g., similar to IAD-103 in Virginia).

These facilities were developed amid surging demand for AI Training and Inference, which require high-density compute far beyond traditional cloud workloads. DFW's central location offers **sub-20ms latency to major Texas metros**, strong fiber connectivity, and access to scalable Oncor utility power - key advantages over more saturated markets like Northern Virginia. Construction timelines for similar AWS Texas sites typically span 18–36 months, emphasizing modular, scalable designs that allow rapid capacity additions.

Location and Site Advantages

Situated in the DFW metroplex, these facilities benefit from:

- **Power Availability:** Access to the robust ERCOT grid with potential nuclear-adjacent clean energy sourcing in broader Texas projects.
- **Climate Considerations:** Hot, humid summers necessitate highly efficient cooling strategies—AWS's innovations address this directly.
- **Connectivity:** Proximity to multiple carrier networks and AWS Direct Connect options.
- **Land Scalability:** Large greenfield or brownfield sites (often 50–300+ acres for full campuses) enable multi-building expansion.

The DeSoto/Ezell Drive example and planned campuses illustrate AWS's preference for southern Dallas County and adjacent areas for their balance of infrastructure and community support.

Power Infrastructure

AWS DFW facilities follow the company's standard N+1 or 2N redundant design with:

- ✓ Dual utility feeds from dedicated Oncor substations (often 100+ MW per campus).
- ✓ Multiple diesel generator backups for extended outages.
- ✓ UPS systems for seamless bridging.
- ✓ Extensive renewable energy matching via Power Purchase Agreements (PPAs) and Renewable Energy Certificates to support AWS's 100% renewable energy goal by 2030.

Texas's deregulated market enables flexible procurement, including direct nuclear off-take in select projects, reducing carbon intensity for AI workloads.

"In energy markets, an "off-take" simply means a committed purchase of a power plant's output. "Direct nuclear" specifies that the buyer contracts straight with the nuclear generator (not through a utility or grid intermediary) for dedicated, firm, 24/7 baseload power"

Cooling Infrastructure (Core Focus)

Cooling is one of the most innovative aspects of AWS DFW101/103, tailored for both traditional air-cooled servers and high-density AI/GPU racks (often exceeding 100 kW per rack). AWS employs a hybrid, configurable cooling architecture that combines:

- ✓ Air-Based Systems: Free air cooling and direct evaporative cooling (where climate permits) to minimize mechanical refrigeration. Hot/cold aisle containment and advanced CRAC/CRAH units handle baseline loads efficiently.
- ✓ Liquid-to-Chip (Direct-to-Chip) Cooling: Custom AWS-designed systems with cold plates on CPUs/GPUs, In-Row Heat Exchangers (IRHX), and closed-loop secondary fluid loops. These support seamless retrofits in existing halls and deliver up to 12% more compute capacity while cutting mechanical energy consumption by as much as 46% during peak cooling—without increasing water usage.
- ✓ Flexible Hybrid Design: Data halls can run air-only, liquid-only, or mixed modes. Secondary loops with valves/taps allow customers to transition from air to liquid cooling as GPU densities rise. This is critical in DFW's hot summers, where traditional air-cooling struggles with high ambient temperatures.
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- ✓ Efficiency Metrics: Contributes to AWS's industry-leading global PUE of 1.15 (2024) and low Water Usage Effectiveness (WUE). Advanced controls, AI-optimized pumps/fans, and leak-detection systems ensure reliability.

Compared to legacy facilities, these designs reduce total cooling energy dramatically while enabling the dense, power-hungry racks needed for Trainium/Inferentia and partner AI accelerators. No immersion cooling is publicly confirmed for these specific halls, but the liquid-to-chip focus aligns with AWS's documented innovations for AI-ready infrastructure.

Security and Operations

AWS applies a layered security model: perimeter fencing, biometric access, 24/7 on-site guards, and infrastructure-layer protections (redundant power/cooling paths). Facilities meet stringent compliance standards (SOC (Security Operations Center), ISO, FedRAMP where applicable). Operations leverage AWS's "embrace failure" philosophy with automated monitoring, predictive maintenance, and global operations centers for rapid incident response.

Sustainability Initiatives

- ✓ Global PUE 1.15 and ongoing design improvements.
- ✓ Water-efficient cooling (no net increase in usage despite higher densities).
- ✓ Renewable matching and potential nuclear integration for carbon-free operations.
- ✓ Modular construction and circular economy practices (reuse/recycle servers and equipment).

AWS's DFW sites support the company's broader 2030 sustainability goals while addressing local grid and water constraints in Texas.

Challenges Addressed and Outcomes

Key challenges in DFW include high summer heat/humidity, rapid AI-driven density growth, and power procurement timelines. AWS mitigates these through:

- ✓ Innovative cooling that scales without proportional water or energy spikes.
- ✓ On-site substation and modular power designs for faster deployment.
- ✓ Strategic siting near clean generation sources.

Results

These facilities deliver reliable, high-performance cloud services with lower operational costs, reduced environmental impact, and the flexibility to support both current and next-generation AI workloads. They strengthen AWS's position in one of the top five U.S. Data Center markets and provide customers with sustainable, low-latency infrastructure tailored to Texas's growth trajectory.

Conclusion and Future Outlook

AWS DFW101 and DFW103 stand as prime examples of how Hyperscale providers are evolving Data Center design for the AI era, prioritizing efficiency, density, and sustainability in high-growth markets like DFW. As demand for cloud and AI continues to surge, these facilities (and future expansions) will play a pivotal role in powering innovation across finance, energy, healthcare, and logistics in the South-Central U.S. AWS's ongoing investments in Texas signal a long-term commitment to the region's digital infrastructure needs.