DATA CENTER GROWTH IN TEXAS:

ENERGY, INFRASTRUCTURE, AND POLICY PATHWAYS

A White Paper on the Future of Digital Infrastructure and Energy Sustainability in Texas

Prepared by
Bureau of Economic Geology (BEG),
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About This Report – A Message from the Bureau of Economic Geology

The Bureau of Economic Geology at The University of Texas at Austin undertook this report to provide an independent, cross-sector assessment of how data center growth intersects with Texas' energy systems, natural resources, workforce, and policy frameworks. As a multidisciplinary research institute with deep expertise in energy, environment, and infrastructure, the Bureau is uniquely positioned to bridge technical analysis with strategic planning.

Our goal is to inform public and private decision-makers about the opportunities and challenges associated with this fast-evolving sector and to help shape pathways that align economic competitiveness with environmental stewardship and regional resilience. By bringing together insights across geology, power systems, water planning, land use, and economics, this report reflects the Bureau's commitment to supporting sustainable digital infrastructure growth that meets the needs of both industry and Texas communities.

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Bureau of Economic Geology

Executive Summary

The rapid expansion of data centers has become a foundation of the global digital economy, facilitating advancements in artificial intelligence (AI), cloud computing, high-performance computing (HPC), and a wide range of digital services that support modern industries [1, 2]. In 2024, global data generation surpassed 149 zettabytes (trillions of gigabytes) of data. To put this vast quantity into perspective: if each gigabyte were a single-page document, the resulting stack of paper could reach the Moon and back $\sim$20 times. This immense scale reflects the proliferation of connected devices, AI-driven analytics, and cloud-based services, all of which rely on data centers for real-time processing and storage [3, 4].

The United States leads global data center operations, accounting for 40% of total capacity worldwide [5, 6]. However, this expansion comes with rising electricity demands, nearly tripling from 60 terawatt-hours (TWh) to 176 TWh in 2023 [7]. As AI, HPC, and blockchain technologies continue to evolve, this trend is expected to accelerate, potentially increasing electricity demand by an additional 150 - 400 TWh by 2028 [8]. Traditionally, markets such as Loudoun County, Virginia and Silicon Valley, California, have been key data center hubs due to their infrastructure and connectivity. However, these locations now face land scarcity, rising costs, and, in some cases, restrictions on new developments due to energy, permitting, and other constraints.

At the same time, it's important to recognize that data centers are not all built the same. Their power demands, latency needs, and location requirements vary significantly depending on their function. High-performance AI training centers, for instance, require immense energy and computing power but can often be located in remote areas with ample, low-cost electricity [9, 10]. In contrast, AI inference workloads—the application of trained models to perform real-time tasks such as natural language processing, autonomous vehicle navigation, or personalized content delivery—require low-latency responses. As a result, inference-based data centers are typically located closer to end users to ensure fast and reliable performance. These functional distinctions are playing an increasingly important role in shaping the geographic distribution and infrastructure strategies of data center deployments across the U.S.

Against this backdrop, Texas has emerged as a leading alternative due to its energy resources, pro-business policies, and strategic geographic positioning [11]. The state produces 30% of the nation's primary energy and holds 40% of the country's proven crude oil reserves, while leading in electricity generation from natural gas, wind, and solar [12, 13, 14, 15]. These advantages, along with ample land and expanded industrial infrastructure, make Texas an attractive destination for data center investments [16, 17, 18].

Yet developing data centers in Texas is not without complexity. Success depends not only on energy access but also on coordinated planning across transmission infrastructure, land use, water availability, and workforce readiness. Understanding these interdependencies is essential to ensure that data center growth supports – not undermines – broader state goals around energy resilience, resource planning, responsible operations, balanced growth, and economic development.

This report provides a comprehensive overview of the evolving data center landscape in Texas and outlines strategies to align digital infrastructure development with the state's long-term priorities. Organized across six chapters, the report examines key drivers including energy demand, interconnection, infrastructure capacity, environmental considerations, community engagement, and policy frameworks to guide sustainable investment in Texas' digital future.

Chapter 1 – A Primer on Data Centers introduces the functions and business models of data centers and outlines their role in supporting global cloud computing, AI, HPC, and other digital services. It highlights the strategic advantages that position Texas as a leading location for future growth, including a large land base, abundant energy resources, and a fiber optic infrastructure.

Chapter 2 – The Energy-Data Nexus: Why Data Centers and Energy Systems Must Align examines the critical alignment between data center development and Texas' evolving energy system. While the state's energy-only market structure and diverse generation mix have positioned Texas as a competitive location for large-scale digital infrastructure, the Texas grid faces challenges in meeting rapid load growth across sectors. The chapter discusses recent regulatory responses, including the Texas Energy Fund and the approval of new transmission corridors. It also explores strategies to procure reliable power for data centers through off-grid power solutions and the integration of emerging energy technologies, such as geothermal and nuclear energy.

Chapter 3 – Economic and Infrastructure Impacts of Data Center Growth in Texas explores how data centers shape regional economies, labor markets, and infrastructure strategies. The chapter highlights the importance of workforce training and public-private partnerships to broaden access to high-quality jobs and ensure local benefits. Additionally, the chapter addresses the reuse of industrial sites and energy assets for data center development and the growing role of fiber networks and Internet Exchange Points (IXPs) in enabling both connectivity and equitable regional access.

Chapter 4 – Sustainability and Environmental Considerations explores the water, land, and ecological impacts of data center operations. Water-intensive cooling systems, particularly in arid and semi-arid parts of Texas, raise concerns about long-term supply reliability. The chapter calls for the adoption of closed-loop cooling, wastewater reuse, and transparent water use reporting in coordination with the Texas Water Development Board. On land use, the expansion of large data center campuses can lead to habitat fragmentation and biodiversity loss if not planned carefully.

Chapter 5 – Policy, Regulation, and Public-Private Collaboration outlines how coordinated state action can guide sustainable data center growth in Texas. It calls for scenario-based load forecasting and stronger electricity–natural gas planning to address rising demand from large-load users and suggests enhancing resilience through energy storage and grid-interactive operations. It further discusses strategy, including targeted workforce programs, and recommends public investment in fiber and IXPs to ensure community-focused economic growth.

Chapter 6 – Strategic Recommendations synthesizes the findings into four strategic priorities for Texas that reflect the interdependencies between energy system, infrastructure development, community integration, and environmental resources.

In conclusion, Texas is uniquely positioned to shape the next era of digital infrastructure. If guided by thoughtful planning and policy, data center expansion can drive innovation and economic growth while also protecting environmental resources and supporting local communities.

1. A Primer on Data Centers

Data centers serve as the essential infrastructure for the digital economy, enabling cloud computing, storage, real-time processing, AI, e-commerce, and numerous digital applications essential to modern business operations. They contain significant computing power, network storage, and data processing capabilities, allowing for real-time connectivity between businesses and consumers.

The Data Center Value Chain and Key Players

The data center industry encompasses a complex value chain that includes infrastructure providers, technology vendors, cloud service providers, and financial investors. At the core of the sector are the following key players:

- **Enterprise Data Centers** – Large corporations maintain private data centers to manage proprietary digital operations, including banks, healthcare organizations, and telecommunications firms.
- **Hyperscale Cloud Providers** – These large-scale operators deliver elastic computing power and cloud-based storage solutions to support AI, high-performance workloads, and data-intensive applications. Companies such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud operate massive cloud-based data centers that power global digital services.
- **Colocation Data Centers** – These facilities provide secure, scalable data center space and services to enterprises that need robust IT infrastructure without building and managing their own. Colocation centers support multiple tenants and offer high levels of connectivity, power redundancy, and operational reliability.
- **Edge Data Centers** – Smaller, distributed facilities located closer to end-users or data sources, edge data centers support low-latency processing and real-time applications. They are critical for decentralized computing architectures and enable services like autonomous vehicles, IoT, and content delivery, often operating in conjunction with larger cloud or colocation providers to offload demand from centralized data centers.
- **Infrastructure, Hardware, Network, and Software Providers** – This group includes chip manufacturers (e.g., NVIDIA, Intel); networking and interconnection companies (e.g., Cisco, Juniper Networks); and fiber and connectivity providers (e.g., Zayo, Lumen) that enable data transmission between data centers and end users. It also includes specialized facility operators and vendors (e.g., Vertiv, Schneider Electric) that manage the physical environment, power, cooling, and security systems essential for data center uptime and performance. While hardware is foundational, the software orchestration layer—such as virtualization platforms, container management systems, and cloud infrastructure tools

(e.g., VMware, OpenStack, Kubernetes)—is equally critical for efficiently allocating compute resources, automating operations, and supporting scalable cloud environments.

- **Energy, Utilities, Real Estate Developers, and Real Estate Investment Trusts (REITs)** - These actors play a central role in enabling the physical and financial growth of the data center sector. Partnerships with utility companies, land developers, and energy providers are critical to data center operation. Real estate developers identify and prepare sites for construction, often managing zoning, permitting, and utility access. The REIT structure directly incentivizes rapid acquisition and development of data center facilities, turning digital infrastructure into a scalable real estate asset class. Leading REITs such as Digital Realty and Equinix manage over 300 facilities globally, illustrating how capital market access and long-term lease revenue models drive data center footprint expansion [19, 20].

The Business Model, The Growth Trajectory, and Emerging Uncertainties

The business model of data centers depends on long-term contracts with cloud providers, enterprises, and hyperscale tenants. Data centers generate revenue by offering colocation services, cloud storage, and computing capacity on a subscription or lease basis. Due to high upfront capital requirements, often in the hundreds of millions or billions of dollars, financial backing is critical for sustained growth. The return on investment for data centers depends on several factors, including energy costs, data storage demand, lease agreements, and operational efficiencies.

Thus far, the data center sector is experiencing rapid expansion, with global investment surpassing $300 billion in 2024. While industry estimates vary, many project a sustained compound annual growth rate near 10% over the next five to ten years, driven by rising consumer and enterprise demand for seamless connectivity, scalable data storage, and real-time analytics [21, 22, 23].

Yet despite this strong momentum, questions remain about the long-term durability of current growth patterns [21]. Much of the sector's financial outlook is now tied to AI-driven demand—an area of great promise but also a considerable risk. If revenue from AI workloads fails to scale as projected, some data center investments may struggle to deliver expected returns. Industry analysts caution that a shortfall in AI-related growth could cool investor enthusiasm and slow the pace of digital infrastructure development.

The geographic distribution of AI workloads is expected to significantly influence where future data centers are built. AI model training requires massive computing power but is relatively latency-insensitive, allowing it to be located in remote areas with abundant, low-cost electricity. In contrast, inference workloads—used in real-time applications—are latency-sensitive and benefit from proximity to end users. This distinction is prompting a shift: energy-intensive training centers are increasingly being sited in rural or industrial regions, while edge and micro data centers are proliferating in urban areas to support inference-driven services like IoT, analytics, and immersive media [24, 25].

More broadly, this reflects a shift from traditional centralized computing toward a more decentralized architecture. Historically, hyperscale data centers dominated the landscape by offering economies of scale and centralized efficiency. As demand for real-time processing and data localization grows, decentralized models—such as edge computing and distributed cloud infrastructure—are reshaping investment patterns. These forces together are expanding the geography of digital infrastructure beyond major metros, drawing attention to underutilized regions with favorable energy, permitting, and transmission profiles [26].

Data Centers in Texas

Historically, primary markets such as Virginia and California have dominated the data center industry due to their well-established infrastructure, robust connectivity, and access to enterprise clients [27]. However, these locations now face mounting challenges. In Northern Virginia's "Data Center Alley", the proliferation of data centers has led to increased electricity consumption and rising concerns about the strain on local power grids and environmental sustainability [28]. Similarly, the substantial energy demands of data centers have, in some regions, contributed to the extended operation of existing fossil-based power plants [29]. In some cases, local governments are re-evaluating data center development policies to address these community concerns and ensure sustainable growth [30, 31, 32]. As a result, data center operators and cloud service providers are actively seeking alternative locations that offer more affordable real estate, favorable tax incentives, and reliable access to resilient energy sources [33].

Texas offers a robust energy landscape and abundant land, combined with a competitive electricity market structure and flexible power procurement options, making it an attractive location for data center development. The state's diverse energy mix, well-established infrastructure, and expertise in managing large-scale industrial operations provide data centers with scalable, efficient, and resilient operations, creating a strong platform for digital infrastructure. The transformative impact of data centers on Texas communities is evident in projects such as the upcoming 200 megawatt Crusoe facility in Abilene within the Lancium Clean Campus, set to be energized in 2025, along with Microsoft's SAT 82 center in San Antonio, one of the largest and most advanced facilities in the region [34]. These investments have boosted local economies, created jobs, and improved technological infrastructure, particularly in rural areas [35, 36].

Figure 1 illustrates the current fiber-optic network and data center footprint across Texas, including newly announced data center projects, showing high-density fiber-optic networks that benefit from low-latency connectivity and established digital infrastructure [37]. Although the dense clustering of the data centers offers network efficiency, they also challenge local resource management, electricity demand, and sustainable expansion strategies. One notable observation is that proximity to primary energy sources is not always the priority for site selection, at least not yet. For instance, even though West Texas is rich in energy resources, there is currently no clear clustering of data centers (Figure 2). Unlike established data center markets in urban areas, these energy-abundant regions remain relatively undeveloped in terms of digital infrastructure. However, recent media reports and announcements indicate growing interest in areas like the Permian Basin, the East Texas Oil Field, and the Eagle Ford Shale Region, where lower land costs and access to renewables are attracting prospective developments [38].

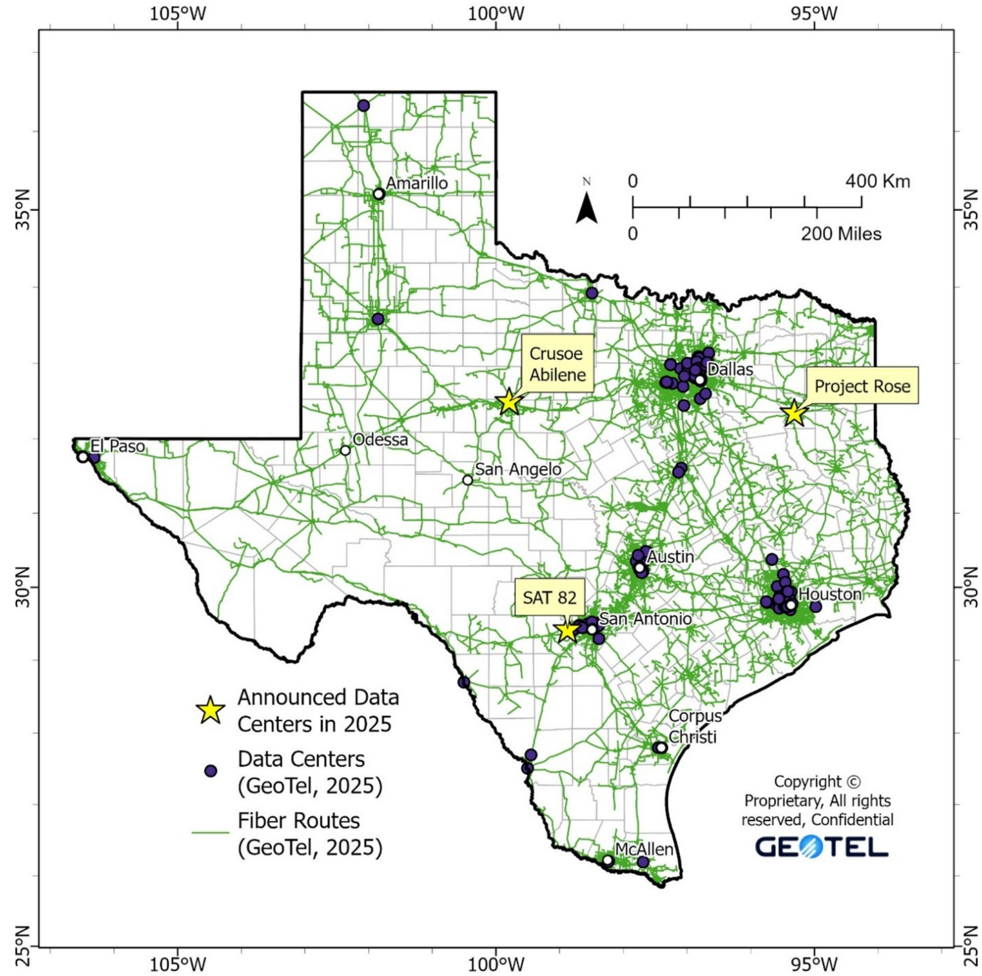


Figure 1: Fiber Optics and Data Center Infrastructure (existing and announced) throughout the State of Texas, 2025 [37]

Despite some uncertainties about the future, there is a consensus that data centers will continue to expand in both urban areas and remote communities. As a result, their energy requirements, resource consumption, and infrastructure needs must be strategically managed to ensure long-term sustainability and operational reliability.

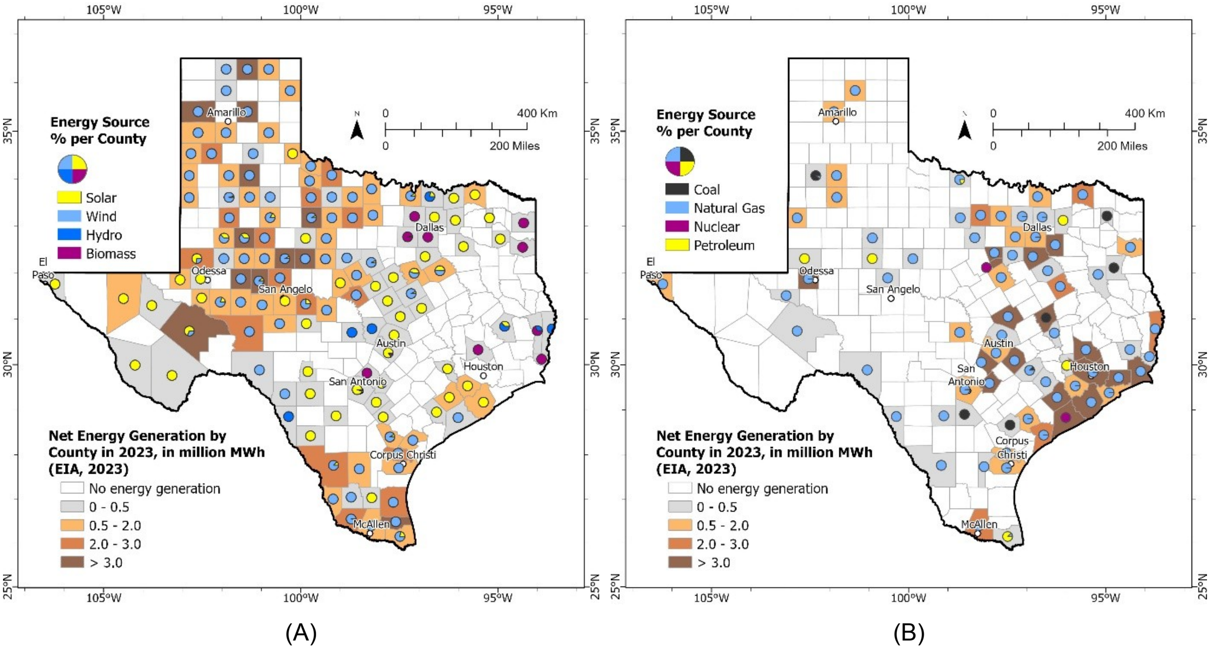


Figure 2: Net electric energy generation by county in Texas, categorized by (A) Renewable energy sources – including wind, solar, hydroelectric, and biomass, and (B) Thermal energy sources – including coal, natural gas, nuclear, and petroleum [39]. The net energy generation is aggregated by county and visualized using a color gradient from gray to light orange to brown, with darker shades indicating higher net energy generation. Additionally, each county with available generation data features a pie chart depicting the percentage contribution of each energy source.

2. The Energy-Data Nexus: Why Data Centers and Energy Systems Must Align

The increasing computational requirements for AI training and inference workloads have fueled a wave of capital deployment, with an estimated 50 gigawatt (GW) of new data center capacity added to the global development pipeline in 2024 alone. As a result, the rapid expansion is driving unprecedented demand for power, with global data center electricity consumption projected to more than double within the next decade [21]. Hence, access to electricity is the top concern shaping the growth of digital infrastructure. Understanding how Texas can align its energy infrastructure with the evolving needs of the data center sector is essential to maintaining the state's competitive advantage in digital infrastructure development.

The Texas Electricity Market And Its Design

Texas leads the nation in electricity generation, utilizing a diverse energy mix of natural gas, coal, nuclear, wind, and solar (Figure 2). The Electric Reliability Council of Texas (ERCOT) operates a stand-alone grid that serves approximately 90% of the state's load. Unlike other U.S. markets that use capacity payments to ensure future reliability, ERCOT runs an energy-only wholesale electricity market, where power generators are compensated mainly for the electricity they deliver to the grid, with reliability incentivized through scarcity pricing and ancillary service markets. ERCOT's market design, historically associated with competitive wholesale electricity prices, particularly before 2021, has also attracted significant investment in new generation resources, notably wind and solar, which now often constitute over 30% of the state's generation output [40]. In recent years, however, wholesale prices have become more volatile and have generally increased.

Furthermore, energy-only market design also presents challenges in ensuring long-term grid reliability, particularly as data centers emerge as major energy consumers, along with other traditional industrial loads, including chemicals, refining, manufacturing, and oil and gas field operations [41]. The state's transmission network has struggled to keep pace with rising electricity demand, with a booming economy, particularly in high-growth regions like North Texas and West Texas, where grid congestion and infrastructure bottlenecks are increasingly common [42]. Since grid stability and rising electricity demand are some of the most pressing concerns for data center operators, the future development of the ERCOT grid will shape how data centers procure and utilize electricity.

Texas Grid Meeting The Rising Demand

In July 2024, ERCOT projected that summer peak electricity demand could reach 153 GW by 2033, nearly double the peak of 85.5 GW in 2023, driven by expected growth in data centers, industrial electrification (particularly in oil and gas), and cryptocurrency mining [43, 44]. ERCOT also projected that the peak electricity demand could surpass available supply by 6.2% in 2026, with the deficit potentially widening to 32.4% by 2029 [45].

However, it is crucial to recognize that these long-term demand projections are subject to considerable uncertainty due to several key factors. First, the electrification of oil and gas operations is on the rise [46]; however, economic volatility may hinder investment [47]. Second, advancements in data center energy efficiency, including advanced cooling technologies and AI-driven optimization, have the potential to alleviate some of the anticipated load growth. Additionally, companies are also investing in dedicated renewable energy projects or private microgrids to reduce their dependency on ERCOT's grid [48]. With that being said, it remains clear that there is an urgent need to meet growing electric demand in Texas, and data centers will play a central role in shaping ERCOT's future power landscape.

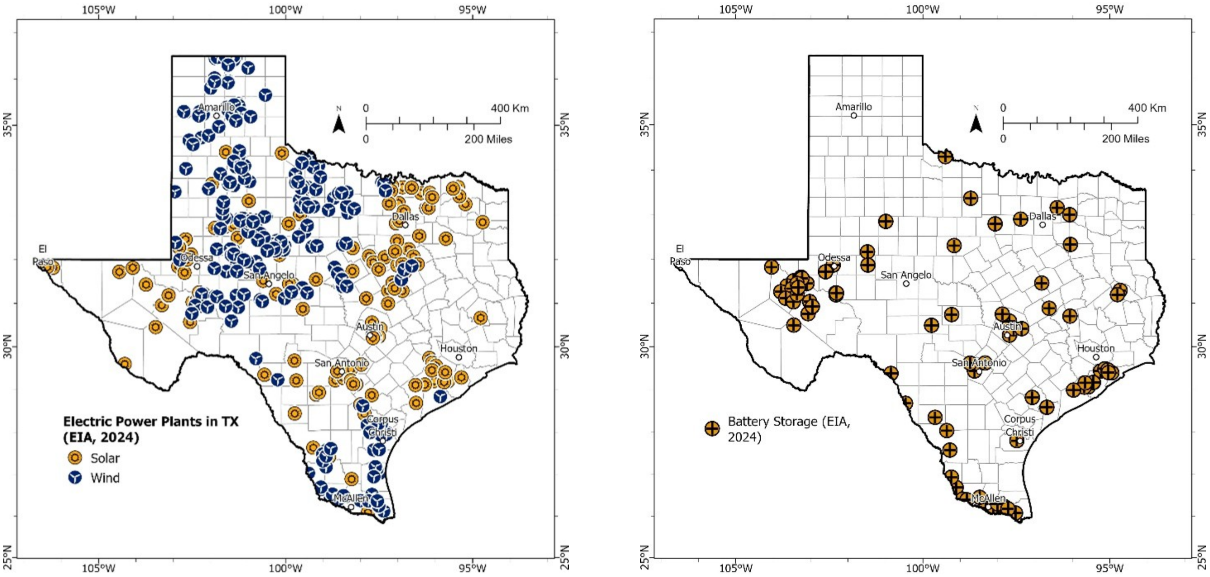
It is imperative to proactively address grid reliability via capacity and infrastructure development [49]. Texas Energy Fund (TEF), a $5 billion program initiated in 2023, aims to boost grid reliability by incentivizing the development of nearly 10 gigawatts of new dispatchable power generation, primarily natural gas-fired plants [50]. With a significant portion of the projected near-doubling of electricity demand by 2030 expected from Permian Basin operators, it's notable that 4 of the 17 power plant projects first selected for funding were strategically located in the Permian Basin to utilize local natural gas resources [51, 52]. Although the implementation of the TEF has faced a slow start with several companies reportedly withdrawing their loan applications due to permitting constraints and long-term financial viability, the TEF remains a crucial instrument in Texas' multifaceted approach to enhance grid reliability [53].

The majority of data centers' operations require continuous, non-interruptible electricity with little tolerance for power interruptions. This demand places them in direct competition for limited transmission capacity with other incremental load growth across Texas' expanding economy and communities [40]. ERCOT's 2024 Regional Transmission Plan identifies a surge in large-load interconnection requests, many of which come from data centers and other energy-intensive users. This growing queue reflects rising demand across industrial sectors, including the electrification of oil and gas production [54, 55], a trend highlighted by the Bureau of Economic Geology's 2022 West Texas Load Study [56]. In regions like the Permian Basin, grid access delays have emerged as a significant barrier to operations. A 2024 Dallas Fed Energy Survey found that 29% of oil and gas firms cited grid interconnection delays as a key obstacle to electrifying their operations, highlighting broader concerns about energy infrastructure readiness across the state [57].

While large-scale transmission projects can take between 3 to 10 years to complete due to permitting, siting, and construction complexities, industrial facilities like data centers and cryptocurrency mining farms can be deployed in under a year. This mismatch often leads to grid congestion, localized price spikes, and delayed service for high-priority loads [58]. Hence one of ERCOT's most pressing planning challenges lies in the disconnect between the pace of infrastructure development and the rapid growth of industrial energy demand. In April 2025, Texas regulators approved a major transmission upgrade - the state's first extra-high-voltage 765-kilovolt transmission corridors - as part of ERCOT's Regional Transmission Plan (RTP), to alleviate growing congestion in high-demand regions such as West Texas and the Gulf Coast. This multi-phased, over $30 billion infrastructure plan marks a significant milestone in Texas to modernize its electric grid and accommodate the long-term growth of large-load industries such as data centers [59].

In the meantime, some developers are leveraging existing Competitive Renewable Energy Zones (CREZ) in areas like Abilene and Sweetwater to develop data centers for proximity to wind and solar farms and access to underutilized substations [60]. Furthermore, given the challenges of grid access, many data center operators are exploring private power solutions, including on-site renewable generation, battery storage, and hybrid systems. In West Texas, some are pursuing locating data center projects close to oil and gas operators, sharing similar power reliability requirements [61, 62].

Furthermore, the significant volume of interconnection requests has raised questions about balancing the needs of mission-critical infrastructure like data centers with more speculative or flexible energy users. Texas Senate Bill 6 proposes new cost-allocation rules for transmission infrastructure to ensure that large-load users contribute equitably to system upgrades [63]. In parallel, ERCOT is actively scaling up its Large Flexible Load (LFL) program as a key demand-side management tool, although its current registration requirements primarily focus on flexible loads like cryptocurrency mining and do not apply to the continuous demand of data centers [64, 65].



(A) (B)

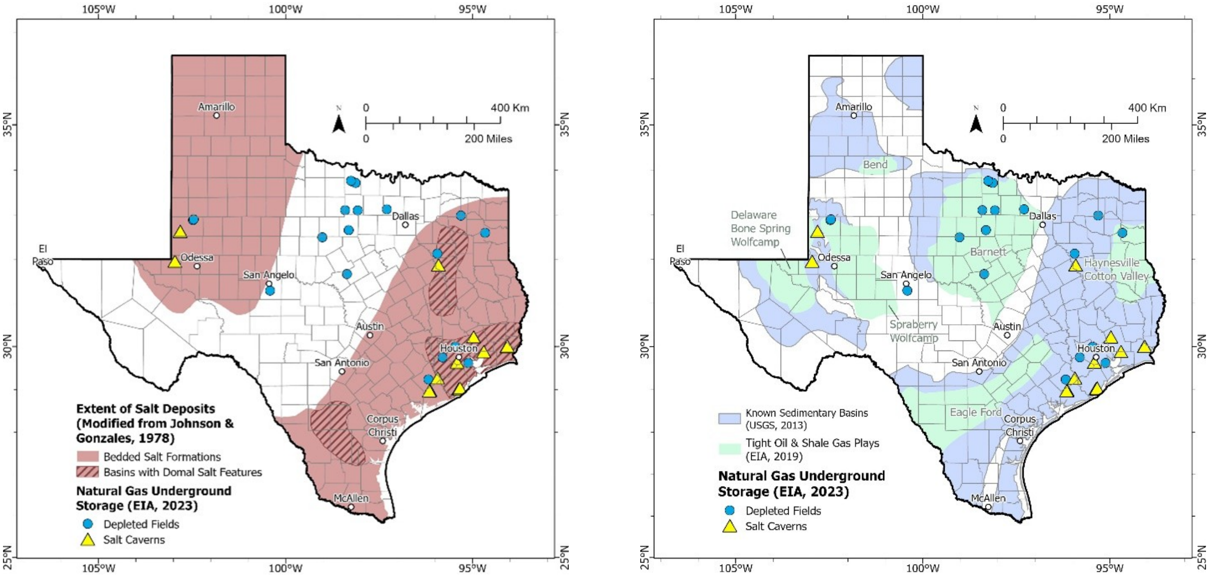
Figure 3: (A) Existing wind and solar facilities and (B) existing battery storage facilities across Texas [67] ensure grid resilience and energy security for data centers.

Securing Reliable Power For Data Centers

Texas benefits from substantial natural gas reserves and a well-developed infrastructure, establishing it as a readily available and reliable baseload power source for energy-intensive industries like data centers. The state's commitment to this resource is further evidenced by initiatives like the TEF, which supports new natural gas power plant projects to improve grid reliability. Locating data centers near energy-producing regions like the Permian Basin, can offer strategic advantages. While these generation projects still need to be connected to the ERCOT grid rather than dedicated to specific loads, their proximity to emerging data center hubs can reduce transmission congestion, lower delivery costs, and improve system efficiency.

Besides dispatchable load, Texas also offers significant and growing renewable energy capacity, particularly in wind and solar, with increasingly competitive pricing [40, 66]. Figure 3 maps these wind and solar power plants across the state. Many major technology companies with data center operations in Texas have already invested in long-term power purchase agreements (PPAs) for wind and solar power, seeking to reduce their carbon footprint and meet corporate sustainability targets [66]. However, the inherent intermittency of wind and solar necessitates energy storage solutions to provide backup power for data centers.

Besides battery storage (Figure 3), hydrogen energy solutions, pumped hydro energy storage (PHES), and large-scale geological storage (Figure 4) [68, 69, 70]. For example, Bloom Energy has partnered with Equinix, deploying over 100 megawatt (MW) of fuel cell capacity across 19 data centers, demonstrating the ability of solid oxide fuel cells to provide resilient and sustainable on-site energy [68]. Additionally, PHES offers a large-scale energy storage solution by storing excess renewable energy as gravitational potential energy and converting it back to electricity when needed, like Rye Development's Kentucky PHES project, a 287 MW facility



(A) (B)

Figure 4: Active natural gas underground storage in either depleted fields or salt structures [71] overlaid by (A) salt deposits extents [72] and (B) known sedimentary basins [73] and tight oil and gas plays [74] across Texas. The sedimentary basin layer acts as a proxy for the distribution of porous geologic formations across the state, highlighting the potential for underground hydrogen storage, natural gas storage, and carbon capture and storage (CCS) sites.

funded by an $81 million U.S. Department of Energy grant [69]. When the data center size scales close to 1 GW or higher, geological storage becomes an economically viable solution for medium to long-term at-scale storage. The extensive geological storage capacity of Texas with salt caverns and depleted porous media reservoirs can offer high volume, low-cost energy storage potential, providing a strategic reserve to balance peak loads and stabilize the power supply (Figure 4) [70]. While hydrogen storage in similar formations is technically feasible and gaining interest as part of long-term decarbonization efforts, natural gas remains the dominant and most economically viable fuel for underground storage today.

Besides storage solutions, distributed and adaptive solutions are also important in maintaining operational continuity in critical infrastructure like data centers. Technologies such as microgrids and intelligent energy management systems provide localized energy independence, enable multi-source power procurement, and optimize energy consumption, thereby reducing reliance on the broader grid, especially during disruptions and extreme weather events, which are increasingly prevalent in Texas [75]. Weather-related power outages have accounted for 80% of all reported major outages in the United States between 2000 and 2023, with Texas experiencing more events than any other state—210 weather-related outages alone [76]. In response, ERCOT has strengthened grid resilience by implementing weatherization standards across generation and transmission assets [77], expanding battery energy storage integration with real-time visibility tools [78], and conducting biennial assessments of system reliability under extreme weather scenarios [79].

Emerging Energy Technologies: SMRs and Geothermal Solutions

Texas also explores new strategies to support long-term energy stability and sustainability. Emerging technologies such as small modular reactors (SMRs) and next-generation geothermal energy are gaining traction for data centers. SMRs represent a new generation of nuclear technology, offering a low-carbon energy source for high-demand industries with constant, 24/7 power [80]. Unlike traditional nuclear plants, SMRs are compact, deployable in phases, can be located close to high-density data center clusters as a decentralized energy solution [58, 81]. The current and first deployment of SMRs is still expensive to build, with a cost of $95 per megawatt-hour, 50% higher than larger nuclear reactors; future models are predicted to converge to be comparable to other reliable energy sources [81]. Last Energy, a Washington, D.C.-based startup, has announced plans to construct 30 microreactors on a 200-acre site in Haskell County, Texas, with a total of 600 megawatts of electricity for data centers [82]. Similarly, The Texas A&M University has partnered with private companies to attract data centers in Bryan, Texas [83].

In addition, Texas has significant untapped geothermal energy potential, particularly in regions where oil and gas drilling infrastructure already exists, such as the Gulf Coast and East Texas [84, 85]. Geothermal energy offers continuous generation and could serve as a stable, long-term base load for data centers. A few geothermal pilot tests and feasibility projects for power generation and energy storage are happening in various parts of Texas. The Texas Railroad Commission has recently issued the first permit for a deep geothermal well to Sage Geosystems for their 3 MW energy storage facility in South Texas [86]. In 2023, the State of Texas timely passed a bi-partisan bill (Texas SB 785) clarifying heat ownership and the regulating entity, which would accelerate further commercial development of geothermal in the state. Behind-the-meter installations of either Enhanced Geothermal Systems (EGS), which involve injecting water into deep, hot rock formations to generate heat, and Closed-Loop Geothermal Systems (CLGS), which circulate a working fluid through sealed underground pipes to capture thermal energy, or geothermal energy storage, can meet a large share of demand when located with new hyperscale data centers [87].

The integration of SMRs and geothermal energy into Texas' power system would provide additional resilience to ERCOT's grid and support the growth of energy-intensive digital infrastructure.

3. Economic and Infrastructure Impacts of Data Center Growth

According to PricewaterhouseCoopers (PwC), the U.S. data center industry's total contribution to GDP grew by 105% from 2017 to 2023, more than doubling over the period and substantially outpacing the overall economy's growth rate, showcasing the sector's increasing role in economic resilience [88].

Economic and Employment Impacts

Data centers play a crucial role in local economic growth, particularly in regions transitioning from traditional industries. Although these facilities require a highly specialized workforce, their presence stimulates secondary economic activity, including construction, maintenance, and local business expansion. The industry provides direct employment in IT, engineering, cybersecurity, and facility management, while also driving demand for utilities, real estate, and support services.

In Texas, the data center industry supported 47,604 jobs and $1.9 billion in wages during Q3 2024 [89, 90]. For example, the Crusoe Energy Systems 200-megawatt data center in Abilene, part of the $3.4 billion Lancium Clean Campus, is projected to expand up to 1.2 gigawatts and create 100 high-skilled jobs in its first phase, attracting state and local infrastructure support [91].

The economic impact of data processing and related services in Texas is often assessed using employment multipliers from the U.S. Bureau of Economic Analysis (BEA) through the Regional Input-Output Modeling System (RIMS II) and models such as IMPLAN. These tools estimate a total employment multiplier—encompassing direct, indirect, and induced jobs—between five and six for the state [92, 93]. However, it is essential to interpret these figures in the context of how data centers actually operate. As capital-intensive facilities, data centers rely heavily on third-party providers for specialized functions such as cooling system management, sustainability initiatives, and security, rather than employing large in-house teams. Accordingly, this reliance on contracted services may lead to an economic footprint that is not fully captured in traditional employment metrics that emphasize direct job creation.

Additionally, while state-level employment multipliers provide useful insight into broader economic contributions, their applicability to individual communities, particularly rural areas in West or East Texas, can be limited [92]. Specialized jobs generated by data centers are often filled by firms or individuals based elsewhere, reducing the direct local employment impact. Thus, the actual economic effect on host communities may be more diffuse, even though the multiplier suggests meaningful statewide benefits, especially where local labor or supplier ecosystems are underdeveloped.

Beyond employment, data centers generate growing public revenue. In the U.S., annual tax contributions from the industry rose from $66.2 billion in 2017 to $99.6 billion in 2021—a 50% increase [90]. If Texas' data center industry follows a similar trajectory, it could substantially enhance funding for public services, broadband expansion, and workforce training initiatives. Virginia's data center industry has already demonstrated how tax contributions can fully support local and state programs, providing a model for Texas to leverage data center growth to boost public investment [89].

Workforce Training and Community Integration

Strategic workforce development initiatives are essential to maximize local economic benefits. Partnerships between universities, technical schools, and community colleges equip workers with critical skills for data center operations, networking, and energy management.

The Texas Association of Community Colleges, in collaboration with AWS, launched a statewide initiative to train, upskill, and certify 50,000 Texans over three years, part of the Texas Reskilling and Upskilling through Education (TRUE) initiative [94]. In addition, Houston Community College and the Alamo Colleges District offer Google Career Certificate programs, providing self-paced training in cloud computing, data analytics, and IT [95]. AWS also partners with Texas universities to offer courses in cybersecurity, cloud infrastructure, and data management [96]. In San Antonio, Microsoft has funded local infrastructure and education programs to support the regional tech workforce and partnered with the San Antonio Water System (SAWS) to implement advanced water conservation measures, ensuring its data centers minimize local resource impact [97, 98]. Additionally, Microsoft launched STEM education grants for local schools, preparing students for technology-driven careers in the growing data center sector [99]. These examples illustrate how educational institutions and employers are already working together to train data center talent and reflect the growing momentum behind localized workforce strategies through practical training and corporate investment.

For data centers to gain public acceptance, transparent engagement with local communities is essential. Regular town hall meetings and advisory groups provide a platform for residents to voice concerns about land use, infrastructure, and environmental impact [100]. Some communities have introduced Community Benefit Agreements (CBAs)—legally binding commitments that ensure data center developers invest in workforce training, sustainability initiatives, and public services [101, 102]. Additionally, prioritizing local hiring commitments ensures that the economic benefits of data center expansion are equitably distributed within host communities. By integrating job creation, infrastructure investment, and sustainable development practices, data centers can strengthen regional economies by fostering long-term community support.

Strategies to Mitigate Potential Environmental and Social Impacts

Data center development brings substantial economic benefits, and it is crucial to ensure that local communities share in this growth rather than face unintended negative consequences. Large-scale data centers, particularly in rural and semi-urban areas, can raise property values, increase housing demand, and alter land-use patterns, potentially displacing existing residents or businesses. To address these concerns, proactive planning and development strategies must be integrated into data center expansion efforts.

Collaborative land-use planning with local zoning officials can help avoid disruptive land acquisitions and ensure fair compensation for landowners, particularly in areas where large data center projects may reshape the landscape. Additionally, it is critical to ensure that infrastructure investments, such as in broadband, water supply, and transportation networks, are designed to benefit both data centers and surrounding communities. When infrastructure upgrades serve shared needs, they not only support digital growth but also foster inclusive economic development and reduce the risk of communities being overshadowed by industrial-scale consumption.

Besides land, another local impact of data center growth is electric load balancing with other industries in key economic regions. An example is North Texas, where more than half of the data centers in Texas are located in the DFW area, with about 0.565 GW of data center inventory as of 2023 [103]. The rising power demand from data centers is competing with semiconductor manufacturing, oil refining, and other industrial operations, creating concerns over grid strain and power allocation, and leading to higher electricity costs and operational uncertainties [104]. Establishing energy-sharing agreements in regions where data centers and manufacturing hubs operate in proximity is an increasingly important aspect of local integration for data center development.

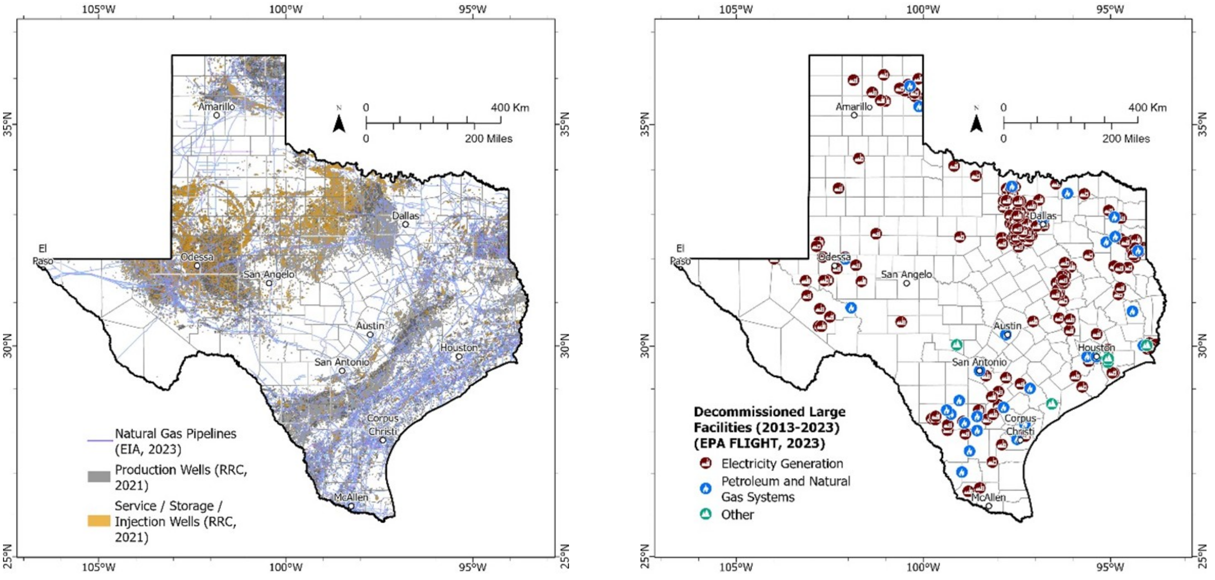
Social impact assessments should be conducted before development begins to identify potential risks and proactively address concerns related to housing displacement, water resource management, and land-use conflicts [105]. Engaging community stakeholders early in the planning process can also help align development goals with local priorities, ensuring that data center projects contribute positively to their host regions. Texas needs thoughtful policies that integrate community engagement, responsible land use, and economic investment, which will ensure that technological progress benefits all stakeholders without marginalizing existing communities.

Strategic Infrastructure: Reuse and Development

Repurposing underutilized or decommissioned industrial sites represents a strategic approach to data center development, offering substantial economic and infrastructure benefits and contributing to regional development goals. Across the state, legacy energy infrastructure, including decommissioned processing plants, refineries, and other industrial sites—many of which are already zoned for heavy infrastructure—can be transformed into data center campuses. This reuse model maximizes the life cycle value of these assets and simultaneously creates new economic opportunities for the region.

One prominent example is the transformation of the Alcoa aluminum smelter site in Rockdale, Texas. Once a major industrial hub, the 31,000-acre site became largely dormant after smelting operations ceased [106]. Recognizing its potential, Bitmain and later Xebec Holdings LLC acquired portions of the property to develop a data center and an Advanced Manufacturing and Logistics Campus, respectively, leveraging the site's existing transmission infrastructure and industrial zoning [107]. Such conversions demonstrate how legacy energy infrastructure can be directly repurposed to support digital industries and diversify regional economies.

The integration of widely spread oil and gas assets with modern data center requirements



(A) (B)

Figure 5: (A) Existing oil and gas infrastructure in Texas, showcasing natural gas pipelines [108], production wells, and injection wells [109]. (B) Decommissioned large facilities (emits $>$ 25 kt CO_2e/yr) categorized by electricity generation, petroleum and natural gas systems, and others [110]. Electricity generation consists of stationary fuel combustion sources such as coal and natural gas power plants. Petroleum and natural gas systems include suppliers of natural gas and natural gas liquids, onshore natural gas transmission compression, underground natural gas storage, transmission compression, etc. Other industries encompass metal-related facilities, waste management, and hydrogen production sites.

offers an opportunity to repurpose existing energy infrastructure to meet the needs of the digital economy. Across the state, decommissioned processing plants, refineries, and other industrial sites—many of which are already zoned for heavy infrastructure—can be repurposed into data center campuses (Figure 5). These sites offer potential values, including access to high-voltage transmission lines, existing permitting footprints, abundant land, and, in some cases, on-site water or cooling infrastructure. Additionally, stranded natural gas and associated gas from oil production, especially in the Permian Basin, can be redirected to power data centers as a local fuel source. This strategy could potentially reduce methane emissions and enhance supply flexibility.

Importantly, data centers are not the only energy-intensive load growing in West Texas. Oil and gas operations themselves require increasing amounts of electricity, particularly for water handling, artificial lift, carbon capture, and electrified drilling and processing. However, as the 2022 West Texas Load Study shows, oil and gas loads are resource-constrained and location-fixed—they cannot be easily relocated to places with better grid capacity [56]. This creates a fundamental tension and opportunity: both sectors need large, reliable power, but only one (data centers) has location flexibility. In this context, co-locating data centers near existing or planned oil and gas loads, particularly where transmission is being expanded or where new generation is coming online, could offer mutual benefits. Oil and gas companies have shown interest in collaborating with data center operators on infrastructure development. Aligning the locations of data centers with electrified field operations presents energy producers with the chance to share substation upgrades, negotiate shared interconnection routes, and jointly support specific transmission projects. This creates an emerging synergy where upstream resource developers and digital infrastructure providers can gain from shared reliability assets, complementary load profiles, and collaborative energy procurement strategies.

Similar industrial-to-digital conversions are occurring worldwide. In Leeds, United Kingdom, two decommissioned coal-fired power plants—Eggborough and Skelton Grange—are being repurposed into data centers, with Microsoft planning to begin construction on the Eggborough site by 2027 [111]. In Portland, Oregon, the 15-story Union Bank Tower is undergoing conversion into a data center, exemplifying how urban commercial buildings are being adapted for cloud computing and digital storage [112]. In Stockholm, Sweden, an underground nuclear bunker, Pionen, has been transformed into a highly secure data center, leveraging its subterranean design for temperature control and structural resilience [113].

Though much focus has been placed on repurposing buildings, Texas' pipeline infrastructure presents a strategic opportunity for clean energy integration in multiple ways. Pipelines that once transported natural gas and oil can, in some cases, be repurposed for hydrogen transport, particularly for hydrogen blending with natural gas in existing infrastructure (Figure 5). Additionally, pipelines may facilitate the movement of natural gas liquids (NGLs) or renewable fuels, supporting a broader energy transition and maintaining grid reliability. This transition could enable data centers to source low-carbon energy via hydrogen pipelines, reducing their reliance on fossil fuel-powered electricity grids. Given that underground storage for natural gas already exists in Texas' salt caverns and porous rock formations, this infrastructure could also serve as a long-term hydrogen storage solution, ensuring data centers have access to reliable, low-carbon power even during peak demand periods.

Though not yet widespread, the concept of repurposing underground mining or energy extraction sites for data centers is under active exploration. These subterranean facilities offer unique advantages: naturally low ambient temperatures for energy-efficient cooling, high physical security, and insulation from surface climate events. Some concepts also propose co-locating data storage with underground utility infrastructure or energy storage systems, particularly in geologically stable regions. These characteristics make them attractive for mission-critical operations, government workloads, and emerging AI workloads where resilience is paramount.

In addition to energy infrastructure, digital connectivity assets such as fiber optic networks and Internet Exchange Points (IXPs) are becoming key siting considerations for data centers. Fiber backbones not only ensure high-bandwidth, low-latency connectivity between facilities, but also enhance service delivery to surrounding communities and institutions [114]. Texas has seen rapid expansion in its fiber footprint, with providers like FiberLight building over 10,000 miles of high-capacity transport lines and LOGIX Fiber Networks upgrading routes to 400 gigabits per second at key data center hubs in Dallas [115, 116]. This trend reflects a growing understanding of the co-benefits that fiber infrastructure offers not only to hyperscale facilities but also to local businesses, schools, and healthcare providers [117]. Complementing this fiber buildout is the emergence of strategically located IXPs, which improve network resilience and reduce transit costs by allowing local data exchange. Texas now hosts several such facilities, including DE-

CIX Dallas—which recently surpassed 1 Terabits per second of peak traffic, and MEX-IX in El Paso, which improves cross-border interconnectivity and edge service delivery to underserved regions [118, 119]. IXPs allow networks to interconnect directly, shortening data paths and improving both performance and security [120].

As data centers are deployed in increasingly diverse geographies throughout Texas, including Tier II locations such as Abilene and Sweetwater, coordinated investment in fiber and IXPs will be critical to enabling digital infrastructure expansion and, at the same time, delivering shared value to surrounding communities.

4. Sustainability and Environmental Considerations

The expansion of data centers in Texas presents an opportunity to align digital infrastructure growth with the state's energy leadership and economic development. As data centers continue to expand, considerations regarding water consumption, land use, carbon footprint, and energy efficiency have become crucial for sustainability.

Water Usage and Land Impact for Data Centers

Cooling systems account for nearly 40% of total data center energy consumption, and in water-scarce regions like Texas, these demands can exacerbate resource shortages. According to the Texas Water Development Board's (TWDB) 2022 State Water Plan, certain areas are projected to face severe water shortages by 2040, as shown in Figure 6. This makes sustainable cooling solutions essential for long-term operational viability.

In many data centers that use evaporative cooling towers, water is consumed to cool air by evaporating a portion of the water, which can lead to major water losses. In contrast, liquid cooling and direct-to-chip cooling systems typically operate in closed-loop configurations, meaning they circulate coolant without relying on evaporation, hence reducing the overall demand for municipal water supplies. Additionally, wastewater recycling captures and repurposes greywater (wastewater generated from household activities such as bathing, washing dishes, and laundry) and rainwater for non-potable cooling applications, further limiting dependence on freshwater resources.

One effective measure to improve water management in Texas is to establish a more transparent data reporting process for water withdrawal and usage by data centers. The TWDB has been actively surveying data centers and bitcoin mining facilities to better understand their water usage patterns. This initiative could help incorporate the water usage trends of data centers into the future State Water Plan, facilitating better coordination between the facilities and local communities in managing water resources.

Beyond improving cooling efficiency within data centers, there are also opportunities to utilize

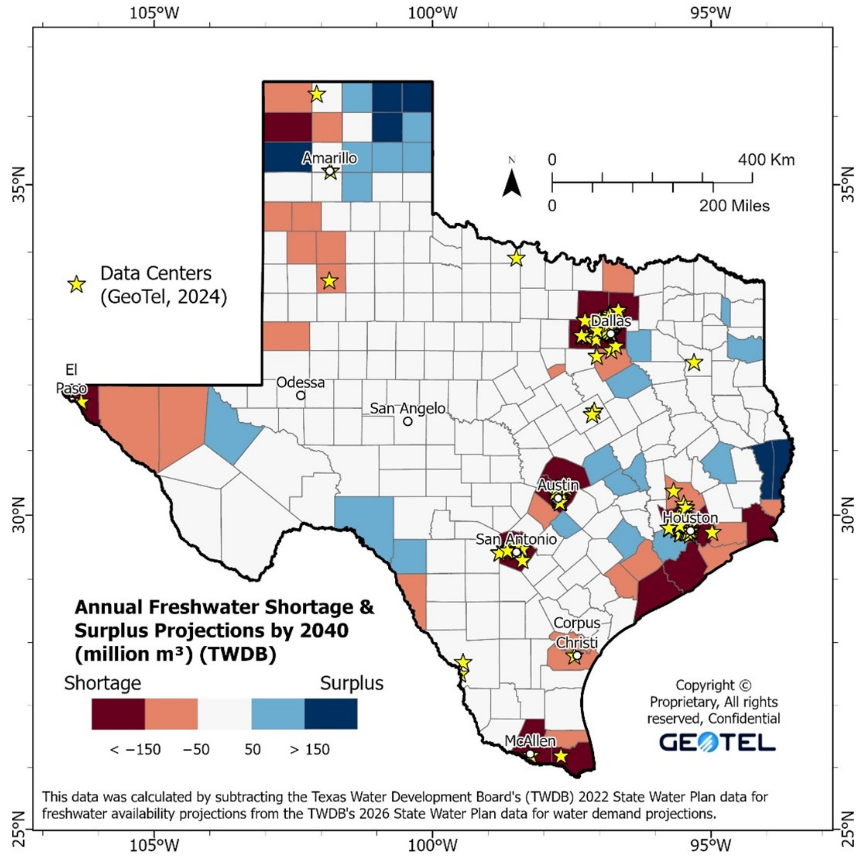


Figure 6: Projected annual freshwater needs in Texas (in terms of millions of cubic meters of shortage or surplus) per county by 2040. Shades of red indicate regions expected to experience water shortages, while shades of blue represent areas with projected water surpluses. Modified from [121]. Darker shades signify more extreme deficits or excesses. Water supply projections were derived from the TWDB's 2022 State Water Plan [122], the demand projections were sourced from the TWDB's 2026 State Water Plan [123]. This is due to the 2026 projection data not yet being available at the time of the analysis.

the waste heat generated by these systems. Data centers generate significant waste heat, which can be a valuable resource for other applications. The waste heat from data centers can be used directly, such as district heating and Heating, Ventilation, and Air Conditioning (HVAC) systems, in some cases, depending on local needs and techno-economics. For example, the Tallaght District Heating Scheme in Tallaght, South Dublin, Ireland, uses waste heat from the nearby AWS data center to provide low-carbon heat to public buildings, commercial spaces, university campuses, and apartments [124]. The project resulted in 3,770 MWh of heat distributed as well as 1,100 tons of CO_2 saved in the first year of operation. In addition, waste heat can be captured for power generation, which might be theoretically possible but requires conversion of energy form, increasing the chance of energy loss and additional power input, and it might not be cost-effective [125].

When sited in rural or ecologically sensitive areas, data center expansion can pose considerable land-use and ecological risks. These facilities often require extensive land to accommodate server halls, cooling systems, substation infrastructure, and physical security buffers, which can lead to habitat fragmentation, biodiversity loss, and long-term ecological disturbance if not planned with environmental safeguards in place. Research shows that land conversion for infrastructure, including data centers, can contribute significantly to ecosystem degradation and reduced biodiversity if development occurs without integrated conservation planning [126]. Habitat fragmentation caused by large-scale development interrupts wildlife corridors, affects species migration patterns, and reduces the resilience of local ecosystems [127]. Although data centers themselves may have a lower direct emissions footprint compared to some industrial activities, their indirect ecological impact through land transformation and infrastructure sprawl is increasingly recognized as an important component of their environmental footprint [128]. As data center deployment accelerates across Texas, future growth must be guided by strategic siting frameworks that incorporate ecological screening and regional planning coordination. At the site level, adopting nature-positive design strategies—such as permeable pavement, green roofs, ecological buffer zones, and native landscaping—can reduce environmental disturbance and enhance climate resilience. But these solutions cannot stand alone. Land and water resource management must be coordinated across state, regional, and local agencies.

Renewable Integration and Sustainability Goals

Texas leads the nation in renewable energy production, with nearly 70 GW of installed renewable capacity and over 10 GW of energy storage. ERCOT projections indicate continued growth in both wind and solar installations of close to 14 GW by 2027 [129]. Besides the installed capacity growth, Texas continues to demonstrate the scalability and maturity of its renewable sectors through increasing role in meeting summer demand and improving grid reliability. In 2024, ERCOT reached an all-time high of 27,881 MW of wind generation on June 17 and surpassed California ISO's solar record with 21,667 MW on September 8 [130].

Policy frameworks also support this momentum. The PUCT continues to administer the Renewable Energy Credit (REC) trading program, which incentivizes investment in new renewable capacity and helps entities demonstrate compliance with voluntary sustainability goals [131]. Data centers have multiple pathways to procure renewable energy, each offering different levels of control, flexibility, and impact. One widely adopted option is entering into long-term PPAs, which allow operators to secure renewable electricity—typically from wind or solar projects—at a fixed price over 10 to 20 years. These agreements can be physical (delivering power directly) or virtual (structured as financial hedges tied to market prices). Alternatively, data centers may pursue broader direct renewable procurement strategies. These include participating in utility green tariff programs, installing on-site solar or wind generation systems, purchasing bundled or unbundled RECs or investing directly in renewable assets. Green tariffs offer shorter-term flexibility but may come at a premium, while on-site generation can reduce transmission losses and enhance visibility. The choice of procurement strategy depends on factors such as load profile, site constraints, regulatory environment, and corporate sustainability goals.

Integrating Data Centers with Low-Carbon Energy Infrastructure: CCS and Hydrogen

The integration of carbon capture and storage (CCS) technology can be used to capture emissions from natural gas-fired power plants that supply electricity to data centers, effectively reducing their carbon footprint. Texas is emerging as a national leader in CCS deployment, supported by favorable geology, policy momentum, and infrastructure. Directly aligned with data center interests, Frontier Carbon Solutions and Baker Hughes are co-developing the Sweetwater Carbon Storage Hub in West Texas. This project is designed to provide open-access storage for emitters and includes plans for integrated power generation tailored to energy-intensive infrastructure such as data centers. The partnership explicitly targets synergies between low-carbon electricity generation, CO_2 transport and storage infrastructure, and large-scale digital operations [132].

For data centers, integration with CCS offers several potential advantages. First, it enables access to lower-carbon power portfolios — a critical consideration as AI and high-performance computing workloads increase baseline demand. Second, participation in or proximity to CCS infrastructure may create pathways for carbon credit generation or procurement, providing flexibility in reducing corporate Scope 2 emissions – the indirect greenhouse gas (GHG) emissions associated with purchased electricity [133]. According to EPA Scope 2 emissions reflect the emissions intensity of an organization's power supply, even if the emissions themselves occur off-site and include all emissions generated at the facility where the purchased electricity, steam, heating, or cooling is produced, and must be accounted for in the buyer's emissions inventory [133]. Finally, locating with CCS-enabled energy hubs may reduce power procurement risks by ensuring that future emissions-related regulations or penalties do not compromise the operational viability of natural gas-fired generation.

In parallel with CCS, hydrogen is also gaining traction as a low-carbon energy solution, especially in Texas, where both renewable-based electrolysis and natural gas reforming with CCS are actively being developed. For data centers, hydrogen presents a compelling opportunity for decarbonized backup power and long-duration energy storage. Hydrogen fuel cells, for example, can serve as an alternative to diesel generators for backup systems, offering cleaner and more scalable power with minimal emissions. Low-carbon intensity hydrogen, whether produced from wind- or solar-powered electrolysis or from natural gas with carbon capture, can also contribute to reducing the lifecycle emissions of power used for data center operations. As hydrogen transport infrastructure expands—through pipelines or regional hubs—co-location opportunities with data centers could create synergies for energy resilience, flexible power sourcing, and shared infrastructure planning.

As CCS and hydrogen technologies scale and mature, data center developers have the opportunity to align with energy-sector innovations that reduce life cycle emissions, enable compliance with climate-aligned procurement goals, and unlock long-term resilience benefits. In Texas, where both carbon storage potential and hydrogen production capacity are significant, collaborating with energy producers, pipeline operators, and carbon credit markets could establish data centers not only as digital infrastructure but also as key participants in the state's evolving low-carbon economy.

Energy Efficiency in Data Centers

Energy efficiency is a critical component of sustainable data center development. Implementing high-performance building materials, optimized facility layouts, and intelligent energy management systems under sustainable building standards, such as Leadership in Energy and Environmental Design (LEED) certification, can reduce energy demand and improve reliability [134]. Furthermore, advancements in cooling technologies—such as liquid cooling, direct-to-chip cooling, and free air cooling—can reduce reliance on traditional air conditioning systems, which account for up to 30-40% of data center energy consumption [135]. These technologies enable more efficient heat dissipation while minimizing mechanical load on HVAC systems. Additionally, AI-driven energy optimization is emerging as a critical tool for maximizing efficiency. AI systems can analyze real-time data to optimize cooling strategies, reducing overall energy consumption while maintaining operational reliability. Google's DeepMind AI, for example, has reduced its data center cooling energy use by 40% by dynamically adjusting ventilation and temperature controls [136].

5. Policy, Regulation, and Public-Private Collaboration

A well-coordinated policy framework is necessary to foster sustainable growth, address energy demands, and environmental concerns in data center operations. Such policy frameworks require a strategic approach that integrates clean energy solutions, industrial infrastructure, workforce development, and technological innovation. These policies need to be designed not only to meet the immediate needs of data centers but also to support long-term sustainability and resilience.

Energy Policy: Prioritize High Load Growth and Grid Resilience

Large-load sectors—including digital infrastructure, upstream oil and gas electrification, and advanced manufacturing—drive unprecedented electricity demand across Texas. Maintaining grid resilience will require a more proactive and integrated approach to align load growth, infrastructure expansion, and operational coordination.

Texas will need to transition from legacy flat-load assumptions toward scenario-based planning that reflects the pace and intensity of large-load interconnections, which includes regularly updating reserve margin targets and prioritizing the buildout of strategically located high-voltage transmission segments to accommodate anticipated demand [137]. To better inform long-term infrastructure planning and regional investment decisions, Texas would need a dedicated, scenario-based, and locational load forecasting initiative that incorporates major large-load sectors, including major industrial growth of upstream oil and gas electrification, advanced manufacturing, and digital infrastructure such as data centers. While each sector faces distinct growth drivers, they increasingly compete for shared power delivery infrastructure in Texas. The Bureau of Economic Geology's prior work on load growth from oil and gas electrification in West Texas provides a model for this approach [56]. A broader statewide effort could integrate additional sectoral forecasts and transmission modeling constraints to help align grid investments with the geographic reality of load growth.

Maintaining grid reliability amid accelerating demand will require more deliberate coordination between Texas' electricity and natural gas systems, particularly as new large-load customers, including data centers, become significant offtakers of natural gas-powered electricity. These growing electricity loads increasingly compete with other major gas consumers such as LNG export terminals and industrial feedstock users, placing additional strain on the state's gas transport and storage infrastructure. While ERCOT has taken initial steps [137], a broader initiative is needed—one that engages pipeline operators, generators, LNG exporters, and industrial load developers to coordinate system planning. Such a task force could facilitate critical data sharing, such as pipeline outage schedules, generator fuel contract visibility, and load forecasts tied to new data center and industrial expansions—to improve short-term reliability and market responsiveness. Over the long term, this coordination could also support investment prioritization for new pipeline corridors, intrastate gas storage development, and dual-fuel generation to alleviate regional supply bottlenecks as the grid evolves.

Furthermore, Texas should prioritize investing in a diverse array of energy storage solutions to enhance the system's resilience, including large-scale battery systems and geological storage. Large-scale battery systems provide rapid response capabilities, while geological storage offers longer-duration energy reserves at scale. It is worth noting that recent advancements have led to significant cost reductions in energy storage technologies. Global average turnkey energy storage system prices have fallen by 40% from 2023 to 2024, reaching approximately $165 per kilowatt-hour [138]. This cost trajectory supports a range of deployment models, from utility-scale batteries to geological and long-duration storage tailored to regional needs [139]. In support of system flexibility, Texas could also initiate pilot programs that support grid-interactive data center operations, including integrating battery systems for frequency response, shifting non-critical computing loads during peak periods, and supporting dispatchable flexibility services. Such efforts would align with ERCOT's system planning goals and create early models for how digital infrastructure can support—not just consume—grid stability [140]. Integrating these measures with strategic investments in energy storage can enhance cost efficiency and unlock new value streams for both data centers and the grid.

Community Development Policy: Ensuring Inclusive Economic Growth

While the economic potential of data center expansion is significant, translating that potential into sustained regional development will require proactive policy coordination that goes beyond traditional hiring strategies. Public-private partnerships can help align the objectives of data center operators, local governments, and workforce institutions to ensure these projects benefit a broad base of communities. Rather than relying on ad hoc or one-off training initiatives, Texas would benefit from a coordinated statewide strategy that sets workforce benchmarks, supports credential transferability across institutions, and targets investment toward regions in economic transition.

Many high-value jobs in the data center sector require technical certifications in fields like energy systems, cloud operations, and cybersecurity. Without targeted workforce development, rural areas and historically energy-dependent communities risk being left behind as the digital economy scales. Programs like the TRUE initiative have laid a foundation for rapid credentialing and reskilling, but sustaining long-term economic mobility will require scaling and institutionalizing these efforts.

Texas Workforce Commission (TWC) grants support targeted reskilling programs, helping displaced oil and gas workers transition into high-tech industries, and has launched several new tools that can serve as the building blocks for a future-ready digital workforce [141, 142]. The Upskill Texas program, launched in 2023, provides grants ranging from $150,000 to $500,000 for large employers—including technology and infrastructure firms—to train existing employees in high-demand technical fields such as IT, cloud infrastructure, and energy systems [143]. Similarly, the Lone Star Workforce of the Future Fund, established through House Bill 1755, offers up to $250,000 in grants to public colleges, technical institutions, and nonprofits to develop industry-aligned training programs. Each participant may receive up to $7,500 in direct support, making this fund particularly useful for building local talent pipelines in regions transitioning from traditional energy industries to sectors like digital infrastructure and advanced energy management [144]. These workforce development tools should be integrated into a broader economic strategy that links local hiring incentives, permitting frameworks, and infrastructure planning. Doing so will help embed data centers into the long-term economic fabric of host communities, particularly those in rural areas and regions navigating structural transitions.

Infrastructure linked to data center development must be planned to generate long-term value for both industry and communities. In addition to power and roads, expanding high-capacity fiber-optic networks is critical to enabling digital services across regions. Fiber infrastructure supports the bandwidth needs of data centers while also improving connectivity for local residents, schools, hospitals, and small businesses. Furthermore, investing in regional Internet Exchange Points (IXPs) can reduce latency, improve bandwidth efficiency, and attract content and cloud providers by enabling local interconnection. As Texas continues to scale its digital infrastructure, coordinated development of fiber and IXPs will be key to ensuring that the benefits of data center investment extend to surrounding communities and strengthen the state's broader digital economy.

Coordinating Natural Resource Policy and Partnerships

As data center development scales across Texas, its intersection with land use, water availability, and ecological integrity requires more deliberate attention from state policymakers. While these environmental concerns are often addressed at the project level, a cohesive policy and regulatory framework is essential to align infrastructure investment with Texas' long-term natural resource goals. Texas has a strong foundation of institutional capacity that can be leveraged to support sustainable digital infrastructure development. The TPWD, for example, maintains critical datasets on ecologically sensitive areas and habitat corridors, which can be integrated into siting frameworks for data centers. A voluntary consultation process through the TPWD's Environmental Review Team (ERT) offers developers of large-scale facilities, particularly those in rural or ecologically sensitive areas, an opportunity to submit project plans for ecological review and receive recommendations on avoiding or minimizing impacts to sensitive habitats and protected species [145]. Incorporating this early-stage consultation into the siting process can help data center developers proactively address biodiversity concerns, align with conservation best practices, and reduce permitting uncertainty associated with environmental compliance.

Similarly, the TWDB has taken important steps toward improving transparency in industrial water use, including efforts to survey and assess the water footprint of data centers and cryptocurrency operations. However, data reporting remains limited. Strengthening collaboration between TWDB, the Bureau of Economic Geology, and local utilities could enable a more accurate, statewide accounting of water demand in the digital infrastructure sector. This would inform regional water planning, drought contingency strategies, and groundwater management district coordination, which are particularly critical in West Texas and other water-constrained regions.

6. Strategic Recommendations

Texas stands at the forefront of global digital infrastructure development, with the opportunity to lead not only in data center deployment but also in the integration of resilient energy systems, community development, and environmental sustainability. To capitalize on this moment, the following strategic priorities are recommended.

1. Prioritize growth and resilience for grid development to ensure reliable power access to data centers

Texas should shift toward a proactive approach to electricity and fuel system planning. To support grid reliability and sustainable load growth:

- Establish a statewide locational load forecasting initiative that accounts for sectoral growth in data centers, industrial electrification, and manufacturing, directly aligned with transmission and gas infrastructure expansion plans.
- Prioritize diverse energy storage deployments, including batteries and geological storage, to manage variable loads and backup needs.
- Support grid-interactive data center models, including demand-side flexibility and storage-backed resilience capabilities.

2. Invest in Digital and Physical Strategic Infrastructure

To enable data center scaling without overburdening communities or the grid, Texas should:

- Expand fiber-optic network reach and support new regional IXPs to reduce latency, support edge services, and enhance statewide connectivity;
- Direct public broadband and infrastructure funds toward regions with both economic need and data center interest;
- Encourage the reuse of decommissioned industrial sites, power plants, and pipeline corridors as data center campuses to reduce permitting time, land impacts, and upfront infrastructure costs;
- Align land reuse with existing permitting footprints and co-location opportunities to accelerate time to market.

3. Integrate Land and Water Resource Stewardship in Development Planning

To ensure data centers support long-term environmental goals:

- Promote adaptive reuse and smart siting to minimize habitat disruption and land consumption with early consultation on ecological review during site selection;
- Support adoption of water-efficient cooling systems, closed-loop and greywater reuse technologies.
- Working with TWDB and local utilities to improve data transparency on water usage across industrial and digital facilities and integration with local water planning.

4. Expand Workforce Development and Regional Economic Integration

To ensure that data center growth creates opportunity across communities:

- Scale and align programs to train workers in data center operations, IT, and energy systems;
- Prioritize workforce investments, especially in rural communities, with public-private partnerships between employers, technical schools, and regional governments;
- Ensure community participation through local hiring frameworks, credentialing pathways, and integration with permitting or infrastructure incentives.

By implementing these strategic initiatives, Texas can solidify its leadership in digital infrastructure while ensuring energy security, economic resilience, and environmental sustainability. A coordinated effort among policymakers, industry leaders, and communities will be essential to maximizing the benefits of data center expansion and maintaining long-term growth and competitiveness.

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