

United States Natural Gas Storage Market Segmented By Underground Storage (Depleted Reservoirs and Aquifers), By Above-Ground Storage (Liquefied Natural Gas (LNG) Facilities and Gas Holders), By Location-Based (Regional Storage and Salt Cavern Storage), By Region, and By Competition, 2018-2028

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Abstracts

United States Natural Gas Storage Market has valued at USD 41.58 billion in 2022 and is anticipated to project robust growth in the forecast period with a CAGR of 4.82% through 2028. During the winter months, there is a substantial increase in the demand for natural gas due to heating purposes. Residential, commercial, and industrial users rely on natural gas for space heating, which drives up consumption. To meet this heightened demand, natural gas storage facilities are crucial. Suppliers inject natural gas into storage during lower-demand periods (e.g., summer and early fall) to ensure there is enough supply to meet the winter heating demand.

Key Market Drivers

Growing Energy Demand and Supply Volatility

One of the key drivers for the United States Natural Gas Storage Market is the increasing demand for natural gas, driven by its versatile applications in electricity generation, heating, industrial processes, and as a cleaner energy source. The United States relies heavily on natural gas to meet its energy needs, with a significant portion of electricity being generated from natural gas-fired power plants. This growing demand for natural gas is further fueled by the transition towards cleaner energy sources, as natural gas is considered a relatively cleaner fossil fuel, emitting fewer greenhouse

gases compared to coal and oil.

The energy landscape is becoming increasingly volatile, with various factors influencing the supply and demand for natural gas. Natural disasters, geopolitical tensions, and sudden shifts in weather patterns can disrupt the supply of natural gas. Additionally, the increasing use of intermittent renewable energy sources, such as wind and solar, requires flexible natural gas power plants to balance the grid, leading to a need for reliable gas supply during peak demand periods.

To mitigate supply disruptions and manage these fluctuations in demand, natural gas storage facilities play a critical role. Underground storage facilities, including depleted gas reservoirs and salt caverns, are essential for storing surplus natural gas during periods of low demand and ensuring a steady supply during peak demand. These facilities provide a buffer that helps stabilize natural gas prices, ensuring affordability for consumers and maintaining energy security.

Regulatory and Environmental Factors

Another crucial driver for the United States Natural Gas Storage Market is the evolving regulatory landscape and environmental considerations. The natural gas industry is subject to an array of federal and state regulations, impacting the development and operation of storage facilities. Regulations such as those set by the Federal Energy Regulatory Commission (FERC) and the Department of Transportation (DOT) play a pivotal role in ensuring the safe and efficient operation of storage facilities. Compliance with these regulations is not only mandatory but also essential for maintaining the integrity and reliability of natural gas storage systems.

Furthermore, environmental concerns are pushing the industry towards more sustainable and eco-friendly practices. Natural gas storage facilities must adhere to stringent environmental regulations, especially those related to emissions and land use. The industry is under pressure to reduce methane emissions, a potent greenhouse gas, during natural gas extraction, transportation, and storage. This has led to technological advancements in leak detection and repair, as well as the development of greener storage methods.

Moreover, as the world transitions towards a low-carbon economy, natural gas storage is playing an increasingly important role in supporting intermittent renewable energy sources. Natural gas peaker plants and storage facilities are vital for balancing the grid during times when renewable energy sources are unavailable. This integration of

natural gas storage with renewable energy is a growing trend, driven by environmental concerns and the need to reduce reliance on fossil fuels.

Technological Advancements and Infrastructure Investment

Technological advancements and infrastructure investment are driving innovation and growth in the United States Natural Gas Storage Market. Over the years, there have been substantial improvements in the design, monitoring, and management of storage facilities. Advanced automation, real-time data analytics, and predictive maintenance technologies are enabling operators to optimize storage operations, improve safety, and reduce costs.

In addition, the development of high-efficiency compression and injection techniques has enhanced the performance of storage facilities. Enhanced reservoir modeling and geospatial analysis tools are aiding in the selection of optimal storage sites and the expansion of existing facilities. These technological advances are increasing the capacity and flexibility of storage facilities, making them more valuable assets in ensuring a stable energy supply.

Infrastructure investment is another critical driver. As natural gas continues to play a significant role in the energy mix, there is a growing need for expanding and modernizing storage infrastructure. New storage facilities are being constructed, and existing ones are being upgraded to meet the demands of a changing energy landscape. Infrastructure investments are also helping to connect storage facilities with pipelines and transportation networks, facilitating the efficient movement of natural gas across the country.

In conclusion, the United States Natural Gas Storage Market is being driven by growing energy demand and supply volatility, regulatory and environmental factors, as well as technological advancements and infrastructure investment. These drivers reflect the dynamic nature of the natural gas industry and its critical role in meeting the nation's energy needs while addressing environmental concerns and ensuring energy security.

Key Market Challenges

Infrastructure Modernization and Expansion

One of the significant challenges facing the United States Natural Gas Storage Market is the need for infrastructure modernization and expansion. Many existing natural gas

storage facilities were built decades ago and may not meet the demands of today's energy landscape. The aging infrastructure poses several challenges, including safety concerns and limited storage capacity.

The natural gas storage network requires substantial investment to upgrade aging facilities and construct new ones in strategic locations. This is essential to ensure the reliability and efficiency of natural gas storage operations. The challenge lies in securing the necessary funding and regulatory approvals to undertake these capital-intensive projects. Moreover, expanding storage infrastructure while adhering to environmental regulations and land-use restrictions can be a complex and time-consuming process.

As the United States transitions to cleaner and more sustainable energy sources, there is also a need to integrate renewable energy with natural gas storage facilities. This integration necessitates modifications and investments in storage infrastructure to accommodate the intermittent nature of renewables and to ensure a seamless transition to a low-carbon energy future.

Regulatory and Environmental Compliance

The natural gas storage industry is subject to a complex web of federal and state regulations, which can pose a significant challenge for operators. Compliance with regulations from agencies such as the Federal Energy Regulatory Commission (FERC), the Department of Transportation (DOT), and the Environmental Protection Agency (EPA) is imperative for the safe and efficient operation of storage facilities.

The regulatory landscape is continually evolving, and storage operators must remain vigilant to stay in compliance with changing requirements. This includes addressing safety and environmental concerns, ensuring the integrity of storage facilities, and mitigating methane emissions. Failure to meet regulatory standards can result in costly fines, legal liabilities, and disruptions in operations.

Environmental concerns, especially related to methane emissions, present a pressing challenge. The industry must develop and implement technologies and practices to reduce emissions and minimize the environmental impact of natural gas storage. Balancing regulatory compliance with environmental stewardship is a complex task that requires ongoing innovation and investment.

Market Uncertainty and Price Volatility

The United States Natural Gas Storage Market faces ongoing challenges related to market uncertainty and price volatility. Natural gas prices are influenced by a multitude of factors, including supply and demand dynamics, geopolitical events, weather patterns, and global energy trends. The resulting price volatility can have a significant impact on the economic viability of storage operations.

Market uncertainty can make long-term planning and investment decisions challenging for storage operators. A sudden oversupply of natural gas, changes in production levels, or disruptions in supply can lead to rapid price fluctuations. These fluctuations can affect the profitability of storage facilities, making it difficult for operators to anticipate and manage financial risks.

Natural gas storage is vital for ensuring a stable energy supply, particularly during periods of peak demand or supply disruptions. However, the economics of storage operations can be precarious when natural gas prices are low, as operators may struggle to cover operational costs and generate a return on investment. As a result, storage facilities may face financial pressures, leading to uncertainties in maintaining and expanding storage capacity.

In conclusion, the United States Natural Gas Storage Market faces several challenges, including the need for infrastructure modernization and expansion, the complexity of regulatory and environmental compliance, and the inherent market uncertainty and price volatility. Addressing these challenges will require careful planning, innovative solutions, and collaboration among industry stakeholders to ensure the reliability and sustainability of natural gas storage operations.

Key Market Trends

Electrification of Transportation and the Rise of Electric Vehicles

Expansion of Renewable Integration

A significant trend in the United States Natural Gas Storage Market is the increasing integration of renewable energy sources, such as wind and solar, with natural gas storage facilities. This trend is driven by the nation's commitment to reducing greenhouse gas emissions, mitigating climate change, and transitioning to cleaner and more sustainable energy solutions.

As the United States seeks to decarbonize its energy sector, natural gas storage

facilities are playing a pivotal role in supporting the intermittency of renewable energy sources. Wind and solar power generation can be variable, dependent on weather conditions, and may not align with peak energy demand periods. Natural gas storage acts as a flexible and reliable backup, enabling grid operators to balance supply and demand efficiently.

One of the most notable applications of this trend is the development of hybrid power plants, often referred to as 'peaker plants.' These facilities combine natural gas-fired generators with energy storage technologies, allowing for rapid responses to fluctuations in renewable energy production. During periods of low renewable generation, natural gas power plants can quickly ramp up to meet demand, reducing the need for less eco-friendly energy sources.

Moreover, innovations like power-to-gas technology, which converts excess renewable electricity into hydrogen or synthetic natural gas, are being explored to store renewable energy efficiently. The generated gas can then be stored in existing natural gas infrastructure, further highlighting the synergy between renewable energy and natural gas storage.

The expansion of renewable integration within the natural gas storage market is not only contributing to a cleaner energy mix but also positioning the sector as a critical player in the evolving energy landscape. As this trend continues, we can expect to see increased investment in hybrid power plants, energy storage solutions, and innovative technologies to facilitate the seamless integration of renewables with natural gas storage.

Transition to Advanced Storage Technologies

Another prominent trend in the United States Natural Gas Storage Market is the transition to advanced storage technologies, which are enhancing the efficiency, safety, and flexibility of natural gas storage facilities. These technologies are reshaping the industry and enabling operators to address evolving energy needs and environmental concerns.

Advanced Compressed Air Energy Storage (CAES):

CAES technology is experiencing a resurgence, as it provides a promising solution for large-scale energy storage. In CAES, surplus electricity is used to compress air and store it in underground caverns. When needed, the compressed air is released to

generate electricity. Advanced CAES systems are more energy-efficient and have a smaller environmental footprint, making them a viable option for supporting grid stability and renewable integration.

Innovative Leak Detection and Emission Reduction:

As environmental regulations become stricter, natural gas storage operators are investing in cutting-edge leak detection technologies to minimize methane emissions. Drone-based infrared cameras, remote sensing technologies, and machine learning algorithms are being deployed to identify and repair leaks swiftly, ensuring compliance and reducing the industry's environmental footprint.

Enhanced Energy Management Systems:

The adoption of advanced energy management systems is optimizing the operation of natural gas storage facilities. These systems use real-time data and predictive analytics to optimize injection and withdrawal schedules, maintain inventory levels, and reduce operational costs. Operators can respond more efficiently to market conditions and ensure a stable gas supply.

Underground Storage Innovation:

New developments in underground storage are improving the capacity and efficiency of storage facilities. Enhanced reservoir modeling and 3D seismic imaging technologies are helping identify optimal storage sites. Innovative materials and construction methods are extending the life and safety of storage wells and salt caverns.

These advanced storage technologies are facilitating the transition to a more sustainable and flexible energy system. They enable natural gas storage facilities to operate more efficiently, reduce environmental impact, and adapt to changing energy demands. As the trend towards advanced storage technologies continues, the natural gas storage market will play a crucial role in ensuring the reliability and resilience of the nation's energy supply.

Segmental Insights

Underground Storage Insights

The Aquifers segment emerged as the dominant player during 2022. Aquifer storage is

a type of geological storage method, which involves injecting natural gas into underground porous rock formations called aquifers and then withdrawing it when needed. In the United States, aquifers have gained prominence as a viable storage option for natural gas due to their extensive underground porous formations. The flexibility and capacity of aquifer storage have led to increasing utilization for gas storage. It allows for the storage of large volumes of natural gas, providing a reliable source during peak demand periods and supply interruptions.

Monitoring and safety measures are critical for aquifer gas storage. Continuous monitoring of pressure, temperature, and gas composition within the aquifer is essential to ensure the integrity of the storage and prevent leaks. Advanced technologies, such as fiber optic sensors, are being employed for real-time monitoring. Safety protocols, including leak detection and response plans, are part of the segment's analysis.

The increasing integration of renewable energy sources, like wind and solar, with natural gas storage in aquifers is a noteworthy trend. As renewable energy production is intermittent, aquifer storage can complement these sources by providing a backup during low renewable energy output. The analysis should consider how aquifers are being leveraged to support the transition to a cleaner and more sustainable energy mix.

In conclusion, the analysis of the aquifers segment in the United States Natural Gas Storage Market highlights the increasing utilization of aquifers for gas storage, the geological suitability, regulatory and environmental considerations, safety measures, cost-efficiency, integration with renewable energy, and the geographical distribution of suitable aquifers. As the energy landscape evolves, aquifers are likely to play a significant role in ensuring reliable and flexible natural gas storage.

Above-Ground Storage Insights

The Liquefied Natural Gas (LNG) Facilities segment is projected to experience rapid growth during the forecast period. LNG facilities in the United States play a crucial role in the natural gas storage market. These facilities are a key component of the gas supply chain, allowing for the liquefaction, transportation, and regasification of natural gas. LNG terminals serve multiple functions, including peak shaving, balancing supply and demand, and ensuring energy security.

One of the primary functions of LNG facilities in the domestic market is peak shaving. During periods of high demand, such as cold winters or heatwaves, LNG terminals can regasify stored LNG and inject it into the pipeline network. This helps meet peak

demand and stabilizes natural gas prices.

LNG facilities can act as seasonal storage units. In preparation for high-demand seasons, natural gas can be liquefied and stored during times of lower demand. This provides a strategic reserve that can be regasified and injected into the pipeline network when needed.

The LNG storage segment is influenced by various market dynamics. Natural gas prices, both domestic and international, can impact the economic viability of storage and the competitiveness of LNG terminals. Furthermore, the availability of LNG import and export terminals can affect the supply and demand dynamics in the United States Natural Gas Storage Market.

To meet the growing demand and changing market dynamics, LNG facilities are expanding and innovating. Infrastructure investment is critical to expand the capacity and efficiency of these facilities. Advanced liquefaction and regasification technologies are being developed to enhance the performance of LNG terminals.

Regional Insights

South US emerged as the dominant player in the United States Natural Gas Storage Market in 2022, holding the largest market share. Analyzing the South's natural gas storage market involves assessing the capacity and utilization rates of existing facilities. Understanding how much gas can be stored and how effectively it is utilized is crucial in assessing the region's energy security and supply reliability. Key demand drivers for natural gas in the Southern United States include electricity generation, industrial processes, and residential and commercial heating. The region experiences hot and humid summers, necessitating substantial electricity generation for air conditioning, and natural gas plays a significant role in meeting this demand.

The South is home to several natural gas production regions, such as the Gulf of Mexico and the Haynesville Shale. An analysis should consider the proximity of storage facilities to these production areas and their role in ensuring the efficient movement of natural gas from wellheads to consumers. The regulatory framework governing natural gas storage in the South can vary from state to state. An analysis should consider the role of state regulatory bodies and how federal regulations, particularly those from the Federal Energy Regulatory Commission (FERC), impact the operation of storage facilities.

The South is experiencing a growing interest in renewable energy sources, such as solar and wind power. The analysis should explore how natural gas storage facilities in the region are adapting to accommodate intermittent renewable energy generation, ensuring grid stability and balancing supply and demand. Environmental concerns and compliance with emissions regulations are vital in the Southern United States, where air quality and environmental sustainability are increasingly important. Evaluating how natural gas storage facilities are addressing these concerns, including methane emissions reduction measures, is essential.

Key Market Players

Dominion Energy

Sempra Energy

Energy Transfer

Kinder Morgan

Southern Company

Duke Energy

Cheniere Energy

UGI Corporation

Enbridge Inc.

Tallgrass Energy

Report Scope:

In this report, the United States Natural Gas Storage Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

United States Natural Gas Storage Market, By Underground Storage:

Depleted Reservoirs

Aquifers

United States Natural Gas Storage Market, By Above-Ground Storage:

Liquefied Natural Gas (LNG) Facilities

Gas Holders

United States Natural Gas Storage Market, By Location-Based:

Regional Storage

Salt Cavern Storage

United States Natural Gas Storage Market, By Region:

South US

Midwest US

North-East US

West US

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the United States Natural Gas Storage Market.

Available Customizations:

United States Natural Gas Storage Market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

United States Natural Gas Storage Market Segmented By Underground Storage (Depleted Reservoirs and Aquifers),...

Detailed analysis and profiling of additional market players (up to five).

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