GTI ENERGY

GTI ENERGY
RAISE
Reliable Affordable Infrastructure for Secure Energy

JUNE 2025

REPORT

Underground Gas Storage in Natural Gas Infrastructure: East Coast Insights

Table of Contents

Table of Tables

Table of Figures

Executive Summary

Underground Gas Storage (UGS) in the East Coast is a critical component of the region's energy system despite being found in only five of 17 states. The two salt caverns, two aquifers, and 98 depleted fields in this region account for 27% of all gas storage facilities in the country. Of the five states with UGS, Pennsylvania has by far the largest working gas capacity (418 Bcf) and highest deliverability (9476 MMscf/day), followed by New York and West Virginia. With UGS facilities exclusively located in the northern half of the region, the southern East Coast and New England area are heavily reliant on interstate transportation pipelines for reliable gas deliveries from the Appalachian Basin and Gulf Coast to keep their energy systems functioning throughout the year, especially when winter heating demands exceed state energy productions. Reflecting this uneven distribution of facilities, many East Coast states have limited UGS regulations, codes, standards and injection well primacy.

The East Coast has a larger total number of facilities than the Gulf Coast, but only about half the amount of working gas capacity due to the greater number of salt dome caverns found in the Gulf. Like the Gulf Coast, UGS in the East Coast can support the storage of low-carbon fuels including hydrogen and may provide a crucial long-term storage solution for renewable energy produced in the region from intermittent sources like wind. This region has challenges to expanding the role of UGS in the future, including regulatory hurdles, barriers to infrastructure expansions, and the proximity of UGS facilities to residential areas. However, UGS in its current role is still an indispensable component of the East Coast's energy infrastructure and provides a reliable supply of natural gas, supports grid resilience, and will likely play a critical role in the region's transition to a sustainable energy future despite regional challenges.

Background

Energy storage plays a critical role in meeting daily and seasonal demand for both natural gas and electric delivery systems in the U.S. and is typically achieved via underground gas storage (UGS) facilities, pumped hydro, and batteries. Of the three common storage types, UGS is most capable of providing both long- and short-term storage with great efficiency. Gas is typically stored underground in three types of formations: depleted reservoirs, salt formations, and aquifers (Figure 1). These

underground facilities are vital for energy price stability while addressing large-scale, seasonal energy demand fluctuations, especially in colder regions facing seasonal demand spikes due to high heating loads.

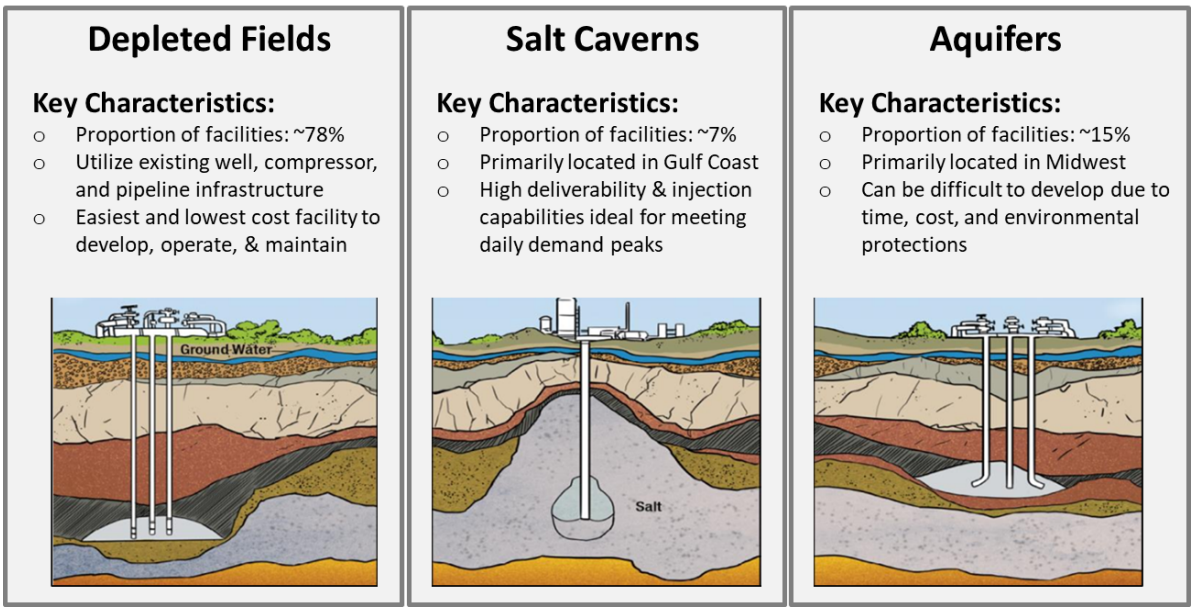

Figure 1: Descriptions of the three primary underground natural gas storage facility types (Source: adapted from Energy Infrastructure)[1]

This report is the second in a series highlighting the value, opportunities, and future role of UGS in maintaining the nation's energy systems on a regional basis and is complementary to RAISE's regional case studies. The first storage report, published in January 2025, provides key information on UGS characteristics, operations, management, and insights into regulations in the Gulf Coast region.[2] This report provides key insights on the role of UGS facilities in the East Coast region and the outlook for their future use.

[1] Energy Infrastructure, 2021. Underground Natural Gas Storage. Source.

[2] NZIP, 2025. Underground Gas Storage in Natural Gas Infrastructure: Gulf Coast Insights. Source.

Natural Gas and UGS in the East Coast

Of the 17 states[3] that make up the East Coast region, only five have active UGS facilities, with the vast majority of facilities being depleted fields. As summarized in Table 1 and Figure 2, both salt caverns and aquifers are quite scarce in the region and most UGS facilities are situated in the eastern part of the region away from the coast.

Table 1. State breakdown of UGS facility types in the East Coast

States	Depleted Field	Salt Cavern	Aquifer	Total
Maryland	1	0	0	1
New York	24	1	0	25
Pennsylvania	45	0	1	46
Virginia	1	1	0	2
West Virginia	27	0	1	28
Total	98	2	2	102

[3] Per the Petroleum Administration for Defense District's region definitions, the East Coast region includes: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Delaware, Maryland, New Jersey, New York, Pennsylvania, Florida, Georgia, North Carolina, South Carolina, Virginia, and West Virginia.

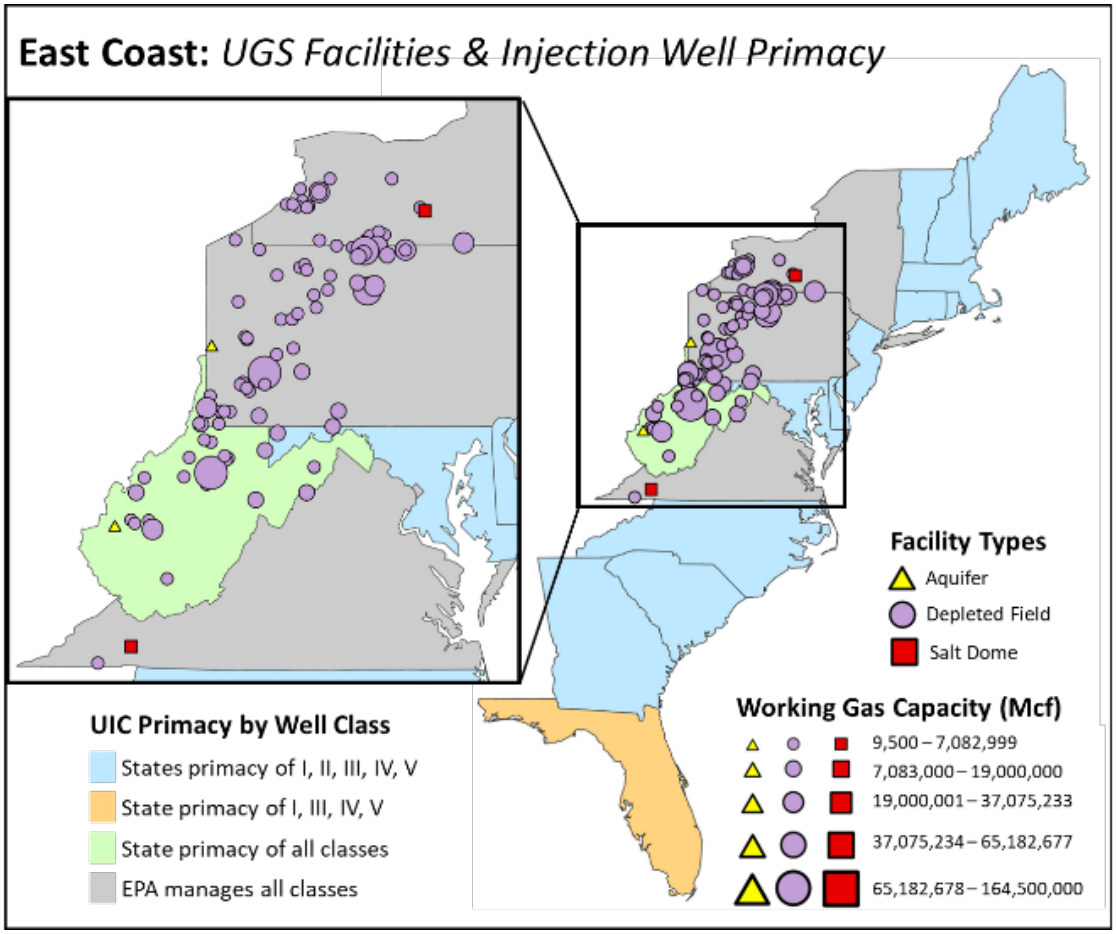

Figure 2: Map of East Coast UGS facilities and state primacy designations. Symbols for aquifer, salt dome, and depleted field facilities are displayed proportional to working gas capacity (Mcf), and states are color coded to display primacy designations.

Pennsylvania has significantly more working gas capacity then any other state in the region at 418 Bcf — nearly three times more than West Virginia. It also has the second largest regional capacity and the fourth largest capacity in the country. A similar trend is observed regarding gas deliverability, with Pennsylvania providing 60% of the region's deliverability capabilities, followed by New York (18%) and West Virginia (17%). A full comparison of state working gas capacities and deliverability from the EIA's Natural Gas Annual Respondent Query System[4] are presented in Figure 3.

[4] EIA, 2024. Natural Gas Annual Respondent Query System. Source

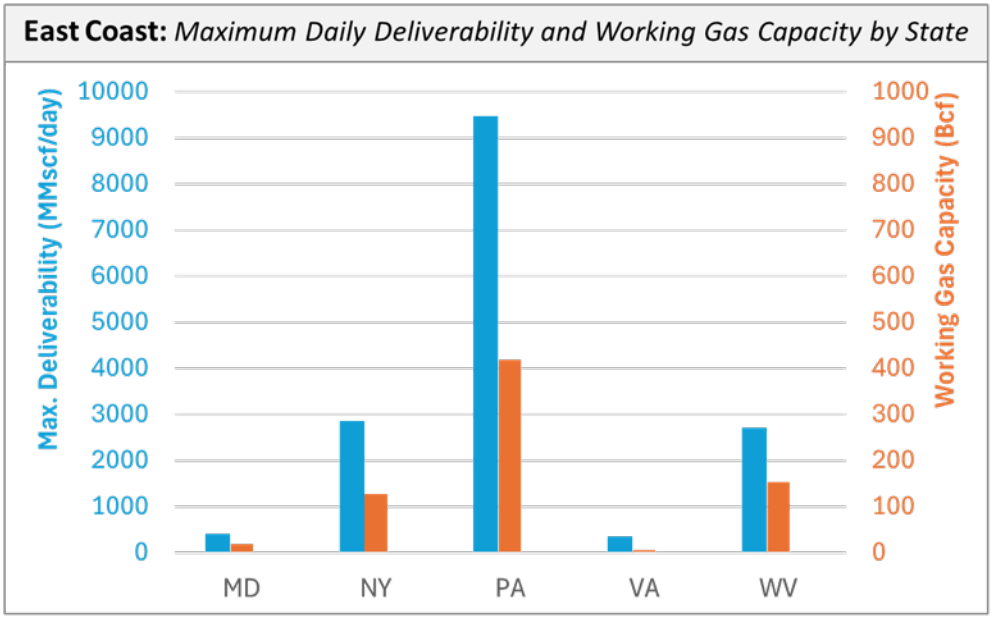

Figure 3. Total UGS working gas capacity and deliverability of states with existing UGS facilities in the East Coast region. The maximum possible daily deliverability (blue) is displayed on the left axis in million standard cubic feet per day (MMscf/day) and the total working gas capacity (orange) is displayed on the right axis in billion cubic feet (Bcf).

In 2015, the Environmental Protection Agency (EPA) published a detailed energy sector risk profile for the East Coast Region that summarizes the region's natural gas infrastructure, a portion of which is shown in Figure 4.[5] In relation to the entire United States, the region contains 26% of all the gas wells and 27% of all storage facilities in the country while having just 4% of the country's processing plants. Additionally, the East Coast's 42,000 miles of interstate pipelines account for only 8% of all interstate pipelines in the U.S. Due to the uneven natural gas production occurring within the region, many of the states in the southern half of the East Coast and in the New England area are particularly reliant on interstate pipelines transporting gas from the Gulf Coast and the Appalachian Basin.

[5] EPA, 2015. East Coast Region Energy Sector Risk Profile. Source

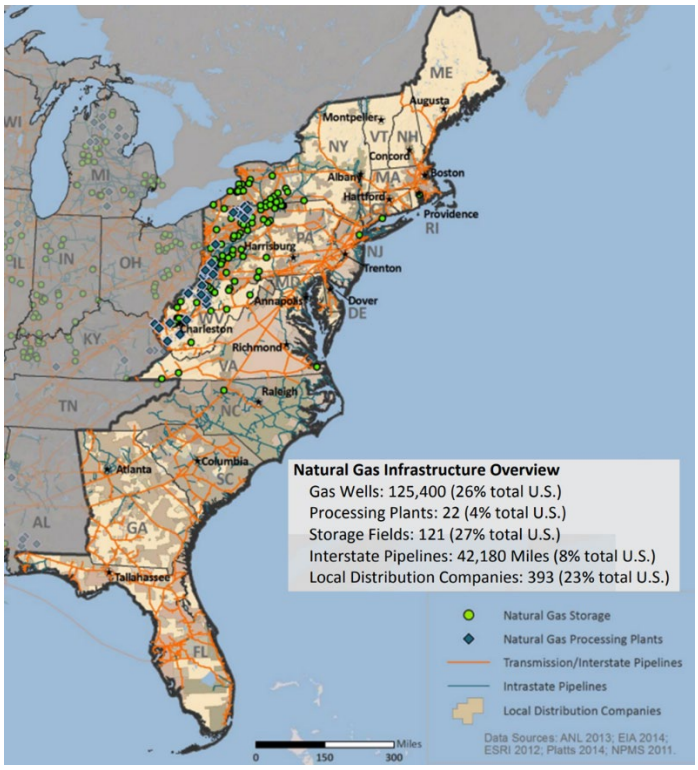

Figure 4: East Coast Natural Gas Infrastructure Overview and Distribution (Source: East Coast Region Energy Sector Risk Profile4)

The Williams-owned Transcontinental Gas Pipeline Co. (Transco) pipeline network is critical to supplying the Carolinas, Georgia, and Florida with natural gas from surrounding production basins, and is comprised of 10,200 miles of transmission pipeline across 13 states from south Texas to New York City. This system recently set a record for transporting 522,000 MMcf of natural gas by volume in January 2025, and was instrumental in meeting widespread, back-to-back demand spikes from power generation loads, heating, and LNG exports. Seventeen of the 20 highest volume days ever recorded on Transco occurred during this month, resulting in a 10% increase in monthly transport form the previous record in January 2022.[6] Transco has also undergone a host of expansions in the last year to prepare for increasing gas demand in the coming decade. One such expansion, the Regional Energy Access project, was even reauthorized by FERC after being suspended due to due to the significant need for gas supply in the Northeast.[7]

[6] Natural Gas Intel, 2025. Record Transco Natural Gas Volumes. Source

[7] Natural Gas Intel, 2025. FERC Reauthorization of Transco REA Expansion. Source

A recent study from the Northeast Power Coordinating Council highlighted upstate New York and New England as being particularly vulnerable to gas shortages during sustained cold snaps.[8] The constrained pipeline network is partly due to challenges obtaining new pipeline infrastructure approvals to transport large volumes of natural gas from the south to meet peak winter demand. Instead, the New England states have tended to import LNG, but in the last few years they have trouble competing economically for nearby suppliers who stand to gain more by shipping to global markets such as Europe.[9] Interestingly, these states cannot be shipped LNG exported from the Gulf of Mexico due to the Merchant Marine Act of 1920, also known as the Jones Act. The act requires goods shipped between U.S. ports to be transported on U.S.-built vessels, which makes it virtually impossible to ship U.S. LNG to other U.S. ports as there are very few U.S.-built LNG tankers. To stave off power shortages, an increasing number of states within New England have been investing in renewable energy as natural gas-fired power plants continue to have trouble operating profitably.[10]

State Perspectives

New York

While New York is the sixth-largest natural gas consumer in the country, most of the gas consumed is produced in other states, with the largest share coming from Pennsylvania. New York has 26 natural gas underground storage facilities with a combined total capacity of about 243 billion cubic feet of gas. New York State initiated its UGS operations in 1916 by converting the Zoar gas field, which became the first storage reservoir in the U.S. By 1961, 14 additional storage fields were established, and between 1970 and 1991, seven more were added. Today, 24 active storage reservoirs in New York have been converted from depleted gas fields, functioning as low-deliverability, base-load storage sites. The state also has one salt cavern storage facility owned by Arlington Gas Storage Company near Seneca Lake. This facility has a working gas capacity of 1,450,000 Mcf and interconnects with Dominion and Tennessee Gas Pipelines. Virtually all major interstate pipelines from the Gulf Coast, Appalachia, and western Canada reach

[8] NPCC, 2025. Northeast Gas/Electric System Study. Source

[9] NRG, 2022. The New England energy market challenges and how they impact your energy purchasing plan. Source

[10] EIA, 2024. New England utility closes import-dependent gas-fired power plant. Source

New York, both to supply in-state customers and to deliver natural gas supplies to New England.[11]

Pennsylvania

Pennsylvania has 46 underground natural gas storage facilities, which is by far the most of any state in the region and the fourth largest total natural gas storage capacity in the nation at approximately 763 billion cubic feet.[12] In 2022, Pennsylvania had about 105 trillion cubic feet in proved shale natural gas reserves, the second largest in the nation after Texas. Forty-five of the state's UGS fields are contained within depleted fields predominantly located in the western half of the state. The state has one aquifer facility owned by Columbia Gas of PA with a working gas capacity of 937,944 Mcf.[13] Most of the natural gas delivered by pipeline from Pennsylvania goes to New Jersey, Ohio, Maryland, New York, and West Virginia. The state also receives natural gas via pipeline from West Virginia and New York. Several pipeline projects in recent years have enabled Marcellus natural gas producers to reach additional markets, and additional pipeline projects are planned or currently under construction. As discussed earlier, the Regional Energy Access Expansion pipeline came online in July 2024, adding 829 million cubic feet per day of new delivery capacity. [14]

Virginia

Virginia's natural gas consumption is nearly eight times greater than the state's production, with most of the natural gas delivered coming from the Appalachian region via interstate pipelines. Gas was primarily delivered to Virginia from North Carolina until 2011, after which gas began to move into the state through Maryland as production in the Marcellus Shale increased in Pennsylvania. Virginia has only two UGS facilities; one depleted field converted in 1990 after construction of the East Tennessee Natural Gas pipeline, and one salt cavern (Saltville) repurposed for gas storage in 1996. Gas storage

[11] EIA, 2025. New York State Profile and Energy Estimates. Source.

[12] EIA, 2025. Pennsylvania State Profile and Energy Estimates. Source.

[13] Pennsylvania Department of Environmental Protection, 2024. Underground Gas Storage Fields in Pennsylvania. Source.

[14] EIA, 2025. Pennsylvania State Energy Profile. Source.

was also attempted in an old railroad tunnel near Charlottesville and in an excavated granite cavern at Ravensworth in Fairfax County.[15]

West Virginia

West Virginia is located within the Utica and Marcellus Shale production regions, one of the largest natural gas-producing areas in the U.S. More natural gas is delivered from West Virginia than consumed in state and is transported to markets in the Northeast, Midwest, and Gulf Coast. Gas primarily enters West Viginia from Kentucky and is delivered to Pennsylvania, Virginia, and Ohio. The state has 31 underground natural gas storage fields with a combined storage capacity of about 533 billion cubic feet, which is nearly 6% of the nation's total underground natural gas storage capacity. The proximity of the state's natural gas storage fields to northeastern markets makes West Virginia a key supplier to the region during the winter months when natural gas demand for heating increases. Because of the many miles of pipeline in the state, much of the natural gas consumed in West Virginia is used for pipeline and distribution use.[16]

Regulations, Codes, and Standards

Overview of Federal Regulations

Federal Energy Regulatory Commission (FERC) oversees UGS facilities owned by interstate pipeline companies or independent operators engaged in interstate commerce, focusing solely on project access and tariff design, not facility design, operation, or maintenance. For safety regulation of underground storage facilities, however, the jurisdiction is not clear. Generally, the responsibility for facility design, safety, operation, and maintenance lies with PHMSA under the PIPES Act of 2016. Table 2 provides an overview of federal regulations, codes, and standards governing UGS development, operation, and maintenance. Additional information on federal UGS regulations can be found in the Gulf Coast Insights Storage Report.[17]

[15] EIA, 2025. Virginia State Energy Profile. Source.

[16] EIA, 2025. West Virginia State Energy Profile. Source.

[17] NZIP, 2025. Underground Gas Storage in Natural Gas Infrastructure: Gulf Coast Insights Report. Source.

Table 2: Overview of federal Regulations, Codes, and Standards governing UGS facilities.

Agency	Responsibility	Codes, Orders, & Acts
FERC	Regulates project access and tariff design of facilities owned by interstate pipeline companies or independent operators engaged in interstate commerce.	Order 636 (1992)[18]
		Order 678 (2006)[19]
PHMSA	Sets requirements for construction, maintenance, risk management, and integrity management for salt and aquifer facilities.	PIPES Act of 2016[20]
		49 CFR 192.12[21]
EPA	Responsible for protecting public health by preventing injection wells from contaminating underground sources of drinking water	Safe Drinking Water Act (1974)

Overview of State Regulations

States are primarily responsible for protecting the environment and drinking-water aquifers from potential risks associated with UGS and may enforce stricter standards for intrastate facilities if they align with federal minimums. Due to the concentrated distribution of UGS facilities in the north, most states in the East Coast do not have specific gas storage regulations. Typically, states with UGS facilities require operators to apply for permits for the construction and operation of underground storage facilities and injection wells. Applicants must demonstrate compliance with federal, state, and local regulations and confirm that the chosen reservoir is safe, prevents resource waste, controls gas leaks, and protects water sources and public safety. Some states include additional requirements in their UGS permitting process. For example, applicants in New York are required to submit a full Environmental Assessment Form (EAF), a Well Status

[18] FERC, 2020. Order No. 636 - Restructuring of Pipeline Services. Source.

[19] FERC, 2006. Rate Regulation of Certain Natural Gas Storage Facilities. Source.

[20] PHMSA, 2023. Protecting Our Infrastructure of Pipelines Enhancing Safety (PIPES) Act of 2016. Source.

[21] Code of Federal Regulations, last updated 2006. § 192.12 Underground natural gas storage facilities. Source.

and Condition Report for each well drilled in the proposed storage area, and a signed affidavit stating the operator has acquired at least 75% of storage rights in the storage area. New York has also notably banned high-volume hydraulic fracking due to the environmental impacts of the technique and passed policies banning natural gas appliances in new buildings starting in 2026. Pennsylvania has a history of introducing additional UGS regulations due to its large number of underground storage sites and has adopted more stringent safety regulations and practices for underground gas storage operations in both the Gas Operations Well-Drilling Petroleum and Coal Mining Act of 1995 and Act 13 of the Oil and Gas Act in 2012. Information on these and other state-level UGS Regulations, Codes, and Standards in the region can be found below in Table 3.

Table 3: Summary of state-level UGS facility and injection well Regulations, Codes, and Standards.

State	Code		Description
NY	Article 23, Title 13	23-1301	Procedure for obtaining UGS permits
		23-1303	Authority to acquire property
		23-1305	Procedure for abandoning storage reservoirs
		23-1307	Ownership of storage gas and storage rights
PA	25.1.C.1.78 H	78.401	Storage well construction
		78.402	Inspections by the gas storage operator
		78.403	Gas storage well integrity testing
		78.404	Maximum storage pressure
		78.405	Emergency repair
		78.406	Recordkeeping
		78.407	Plugging gas storage wells
	Oil and Gas Act (1985)	Act 13 (2012)	Requires the exchange of safety information between operators and DEP, including the locations and condition of wells used in the operation of UGS fields. Adopted enhanced well construction standards for new wells drilled in operating storage fields
VA	Title 4, Agency 25, Chapter 150	Part I	Permitting and technical standards for UGS wells
		Part II	Plugging and abandoning UGS wells
WV	Agency 47, Title 47	47-13-9	Criteria and standards applicable to Class 2 wells, including construction, operating, monitoring, reporting, and abandonment
		47-13-14	Injection well permitting program requirements and procedures

A significant number of states in the East Coast have primacy of Class II wells used exclusively to inject fluids associated with oil and natural gas production, despite not having any UGS facilities. However, of the five states with storage facilities, only Maryland and West Virginia currently have primacy of these wells. All well classes in New York, Pennsylvania, and Virginia are currently regulated by the EPA (Figure 1). West Virginia is also the only state in the region with primacy of Class VI wells, which was granted by the EPA on Feb. 18, 2025.[22]

Regional Comparisons

While UGS provides critical functions and services to both the East and Gulf Coast regional energy systems, notable differences exist in the quantity, distribution, and utilization of these facilities which demonstrates the varied role UGS plays through the United States (Table 4). Both regions have one state with state primacy of all injection well classes, with the rest of states only having primacy of classes 1 through 5 wells. Geographically, storage facilities are distributed relatively evenly throughout the Gulf Coast while the East Coast's storage facilities are primarily situated to the west of the Appalachian Basin as shown in Figure 5. The total number of storage facilities has also increased by over 20% in the Gulf Coast since 1998 but decreased by almost 10% in the East Coast over the same period (Figure 6). The Gulf Coast, which contains the Haynesville, Permian, and Eagle Ford basins, has a high need for storage capacity to account for off-season production, residential demand variations, peak demand for gas-fired power production, and storage for LNG flow interruptions. Despite having far fewer facilities overall, the Gulf Coast has nearly twice the amount of working gas capacity.

[22] EPA, 2025. Administrator Zeldin Approves West Virginia's Class VI Primacy Application. Source.

Table 4. Comparison of UGS statistical profiles in the Gulf Coast and East Coast Regions

Region	State	Depleted Field	Salt Cavern	Aquifer	Working Gas (Bcf)	Max Deliverability (MMscf/day)
East Coast	MD	1	0	0	18.3	400
	NY	24	1	0	127.36	2855.59
	PA	45	0	1	418.39	9476.48
	VA	1	1	0	4.93	345
	WV	27	0	1	152.96	2715.89
Total		**98**	**2**	**2**	**721.94**	**15792.96**
Gulf Coast	AL	1	1	0	33.15	2705
	AR	2	0	0	8.89	212.43
	LA	8	11	0	450.99	15516
	MS	6	5	0	201.99	11294.99
	NM	2	0	0	59.74	450
	TX	19	16	0	544.67	17192.58
Total		**38**	**33**	**0**	**1299.43**	**47371**

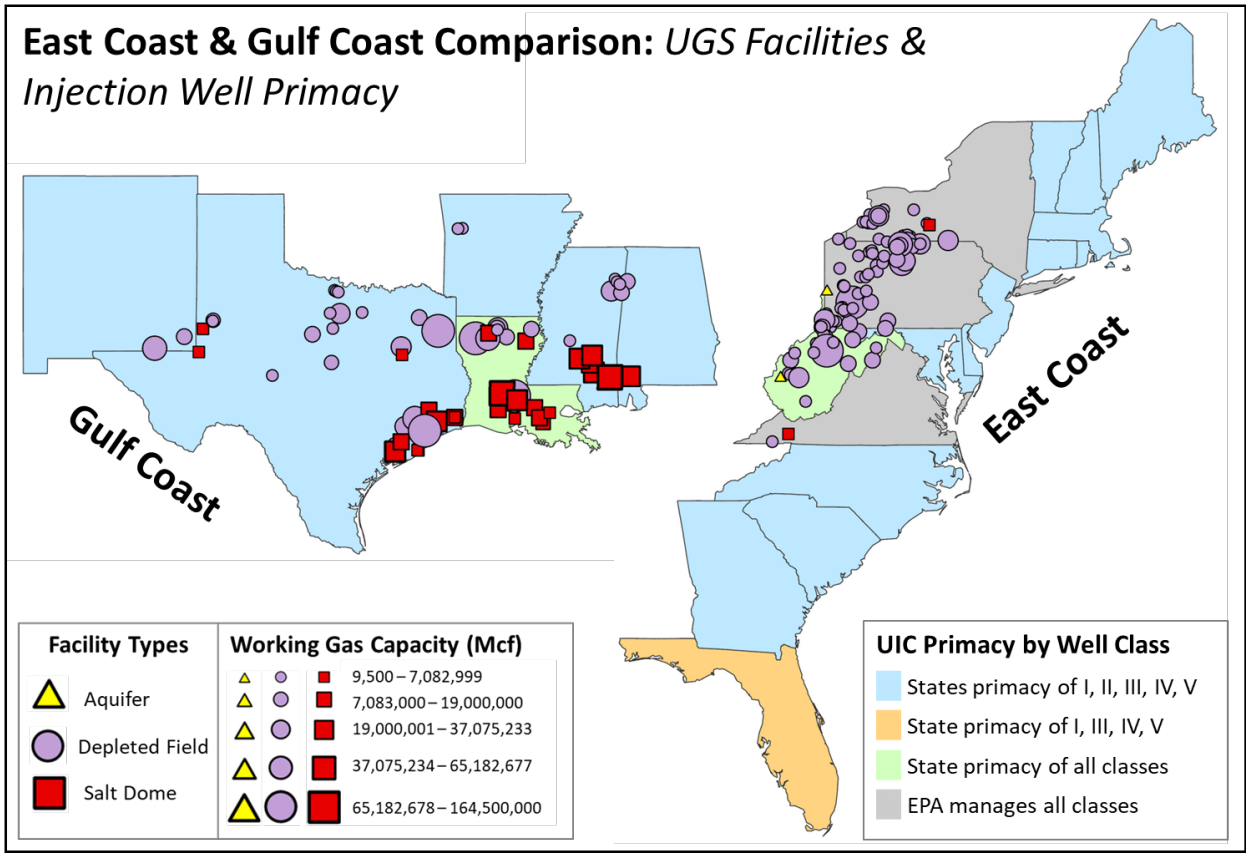

Figure 5. UGS Facility Distribution, Working Gas Capacity (Mcf), and Primacy Designations for the East Coast and Gulf Coast Regions

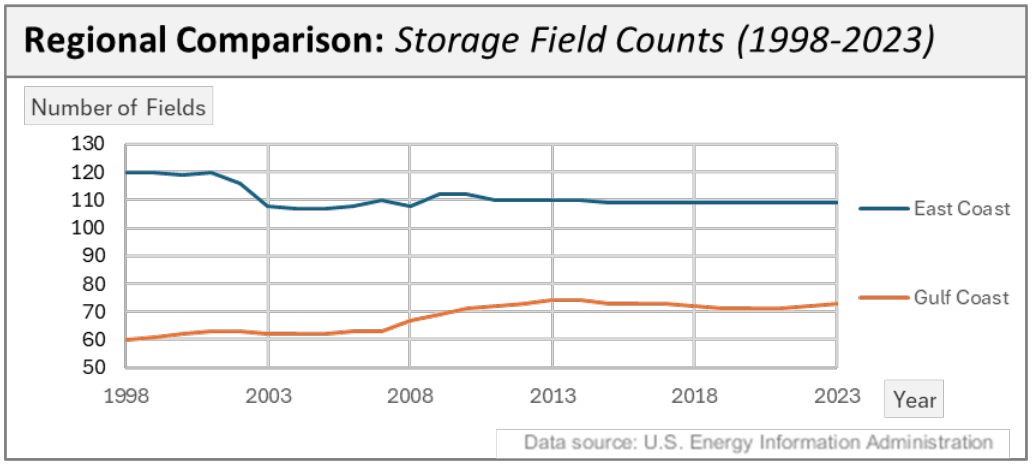

Figure 6: Comparison of the total number of underground storage fields, including depleted fields, salt domes, and aquifers, between the East Coast and Gulf Coast regions.

Common between both regions is the presence of LNG terminals operating as both import and export facilities. The East Coast has two existing terminals with a combined export capacity of around 1.2 Bcf/d in Cove Point, Maryland and Elba Island, Georgia.[23] The Gulf Coast has five export terminals totaling nearly 12 Bcf/d of capacity with at least four additional facilities either approved or currently under construction as shown in Figure 7. All U.S. import terminals operate in the East and Gulf Coasts, with three in Massachusetts, and one each in Maryland and Georgia.[24]

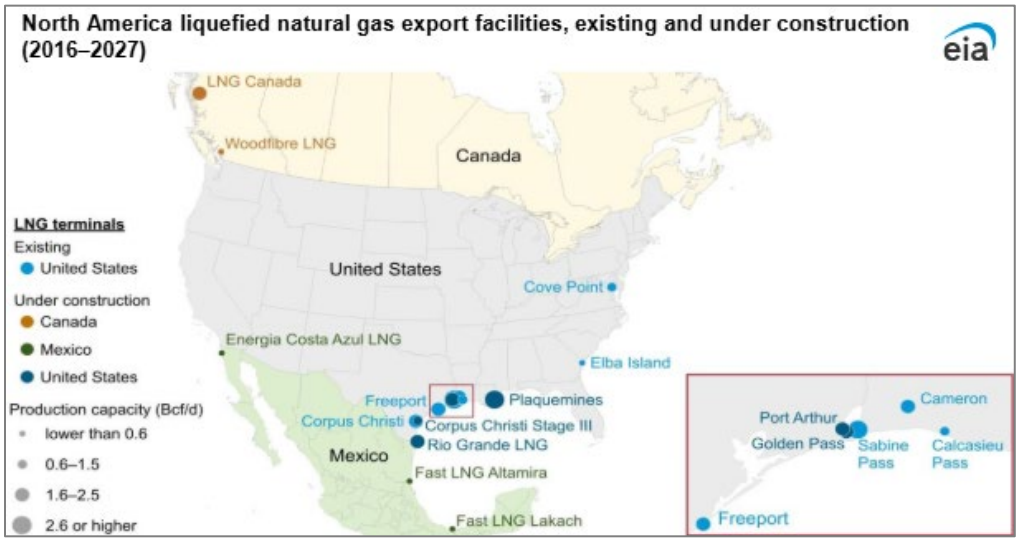

Figure 7. North American LNG export facilities, existing and under construction. EIA, 2023.

[23] Department of Energy, 2022. Existing North American LNG Export Terminals. Source

[24] Federal Energy Regulatory Commission, 2020: North American LNG Import Terminals. Source

A key difference between the two regions is that the Gulf Coast has significantly more salt cavern storage facilities because of the thick salt deposits, known as salt domes, found in the area. These facilities are particularly suitable for quick withdrawal and injection. The difference can be seen quantitatively in the deliverability quantities that Gulf Coast states are capable of, namely Texas and Mississippi (Figure 8, Figure 9). The Gulf Coast can base much of its export economy on this excess deliverability — whether it be domestic, to Mexico, or shipped to global markets by way of offshore LNG.

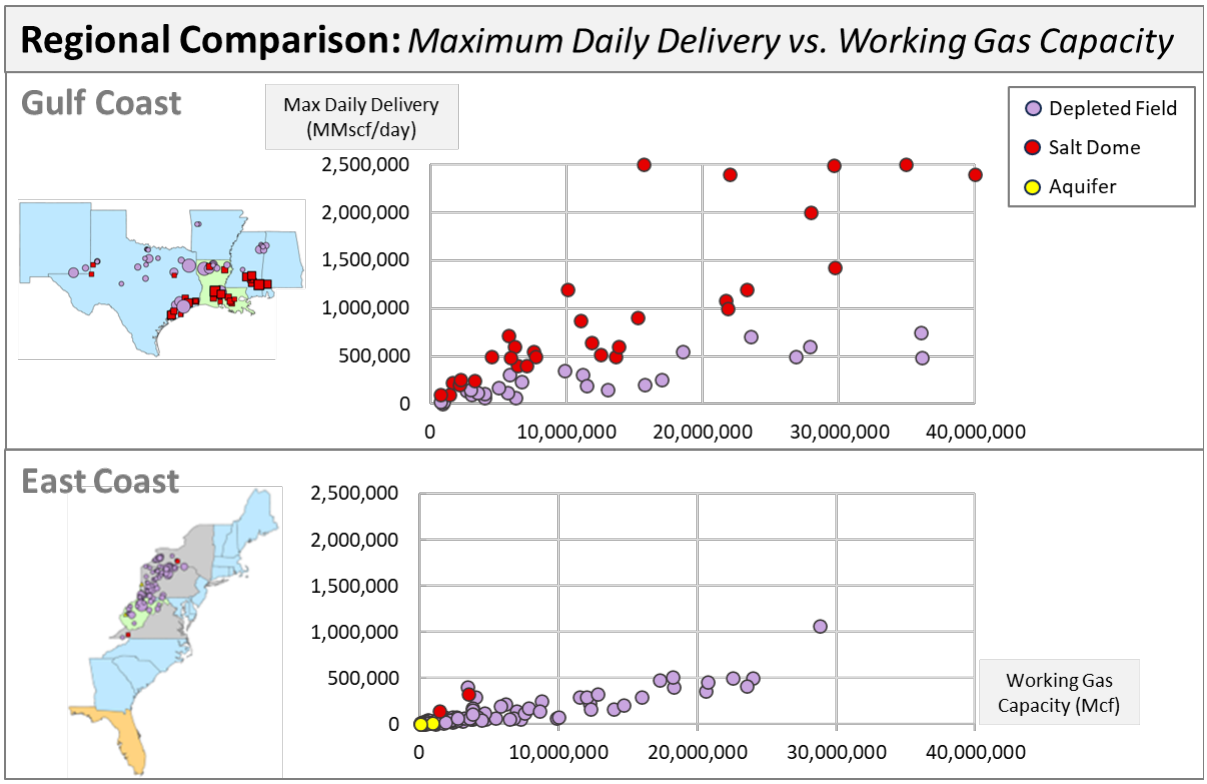

Figure 8: Comparison of maximum daily deliverability (MMscf/day) and working gas capacity (Mcf) of depleted field, salt dome, and aquifer storage facilities in the Gulf Coast and East Coast regions. Depleted fields with working gas capacities over 40,000

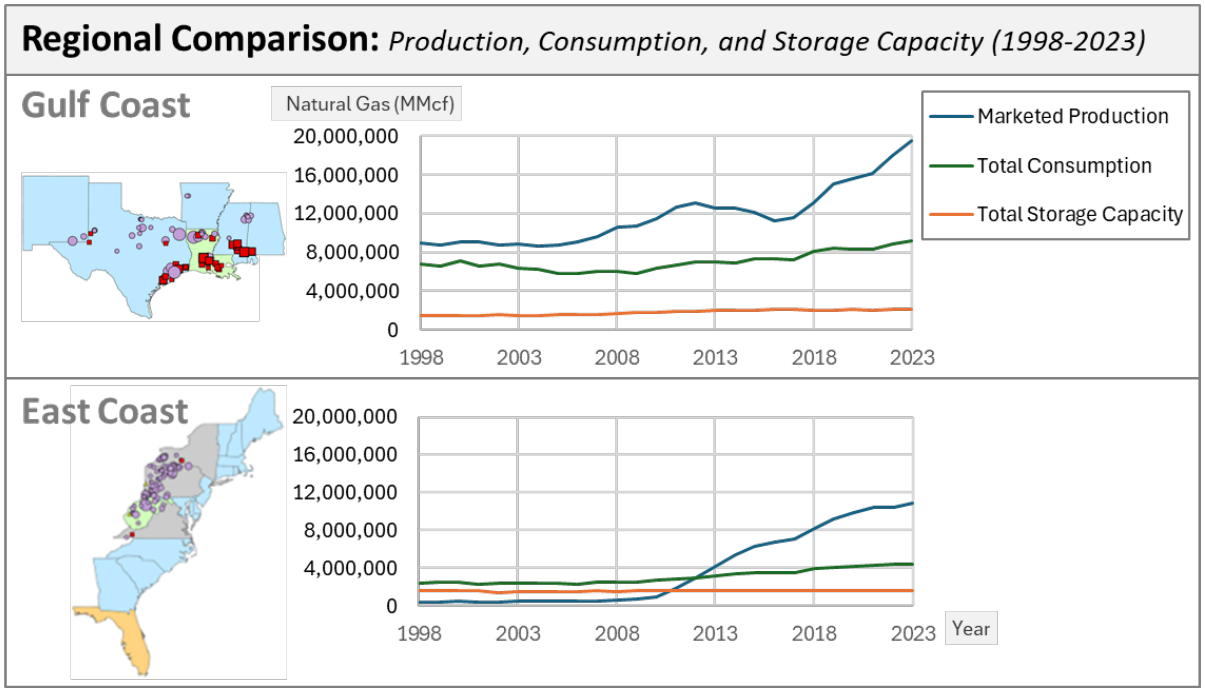

Figure 9: Comparison of natural gas production, consumption, and total storage capacity in MMcf from 1998 to 2023 between the Gulf Coast and East Coast regions.

UGS in the Future Energy System

As discussed in the Gulf Coast Insights report, UGS can play a key role in supporting energy system decarbonization by enabling the large-scale storage of low-carbon fuels and the sequestration of carbon in reservoirs.[25] UGS may be particularly valuable in this region as a long-term renewable energy storage solution and can support renewable integration efforts like the DOE's Atlantic Offshore Wind Transmission Action Plan.[26] This plan is designed to reduce grid congestion and increase system reliability by expanding the interregional transmission network and providing wind-generated energy to high-demand areas. During periods of high renewable electricity generation, low-carbon fuels like synthetic natural gas and hydrogen can be produced using excess electricity via electrolysis and injected into UGS facilities. This process can improve system reliability, resiliency, and flexibility by converting intermittent renewable resources into storable

[25] GTI Energy – RAISE, 2024. Underground Gas Storage in Natural Gas Infrastructure: Gulf Coast Insights. Source.

[26] DOE, 2024. DOE Reports Chart Path for East Coast Offshore Wind to Support a Reliable, Affordable Electricity System. Source.

gas which can be withdrawn later to balance seasonal demand or provide emergency supply during extreme weather events.[27]

Underground storage can support the growth of hydrogen as a long-duration energy storage solution in states like New York, which can experience imbalances in supply and demand as renewable energy generation increases. While short-duration battery storage will be crucial for managing intra-day demand shifts, New York will require a firm, dispatchable resource of at least 17 GW (equivalent to more than 3 Bcf/d of natural gas) by 2040 to compensate for daily, weekly, monthly, and seasonal imbalances.

Pennsylvania is also positioned to utilize UGS for hydrogen storage as the only state in the country to be part of two regional clean hydrogen hub projects. Both the Mid-Atlantic Clean Hydrogen Hub, centered in Philadelphia, and the Appalachian Hydrogen Hub plan to use the state's natural gas access to produce low-cost clean hydrogen with carbon capture. While details for the hubs have not been solidified, they have both announced their intended plans to repurpose historic energy infrastructure.[28]

This solution, however, requires additional infrastructure to enable the transportation and storage of hydrogen at scale. Current storage solutions, such as pressurized vessels, may not be sufficient to meet the long-duration, large-scale hydrogen storage needs due to their limitation in capacity and design. SHASTA, a DOE study assessing the viability, safety, and reliability of underground hydrogen storage, presented a hypothetical use case for the technology in Pennsylvania's Oriskany and Elk geologic formations.[29] The study has recently been extended into 2025 due to a growing need to understand underground hydrogen storage's feasibility as a part of a multi-faceted solution for affordable and secure energy.

Given that there are numerous inactive/abandoned underground storage facilities in the region, some of the fields may be used for carbon sequestration or underground hydrogen storage in collaboration with these hubs. Relatedly, a 2023 abstract to the Geological Society of America highlighted Pennsylvania's potential to provide large-

---

[27] American Gas Association, 2025. Assessing the Value of Natural Gas Storage: A Strategic Asset for Grid Reliability, System Resilience, and Operational Flexibility in a Changing Energy Landscape. Source

[28] Pennsylvania Department of Community and Economic Development, 2023. Pennsylvania to secure two regional clean hydrogen hub projects. Source

[29] DOE, 2024. Underground Hydrogen Storage Assessment Expands Future Opportunities in the Subsurface. Source

scale, long-duration energy storage as part of a hydrogen economy.[30] The authors did concede that more feasibility studies need to be performed on hydrogen storage before being fully implemented but there may be untapped potential for underground storage in a changing energy landscape.

The uneven distribution of UGS infrastructure in the East Coast Region introduces additional energy system considerations not discussed in the previous Gulf Coast report. In this region, states without UGS produce a significant amount of nuclear energy but still consume the greatest proportion of natural gas compared to other energy sources (Figure 10). The system of interstate transmission pipelines connecting the high natural gas producing states of the north and the low production states in the south is therefore crucial to maintaining a reliable supply of natural gas in the region. Having a network of interstate transmission systems improves grid resiliency by allowing states to utilize energy resources from neighboring systems when demand exceeds supply or when disruptions occur due to extreme weather events. Robust transmission systems can be especially beneficial in areas like the East Coast where flooding and hurricanes can pose significant operational and disruption risks. The gas storage facilities currently operating are essential because several states and transmission pipelines depend on reliable deliveries from these facilities to keep their energy systems functioning year-round. This reliance is particularly important during winter, when heating demands often exceed state energy production or imports.

[30] Geophysical Society of America, 2023. Underground Hydrogen Storage Potential in Pennsylvania. Source

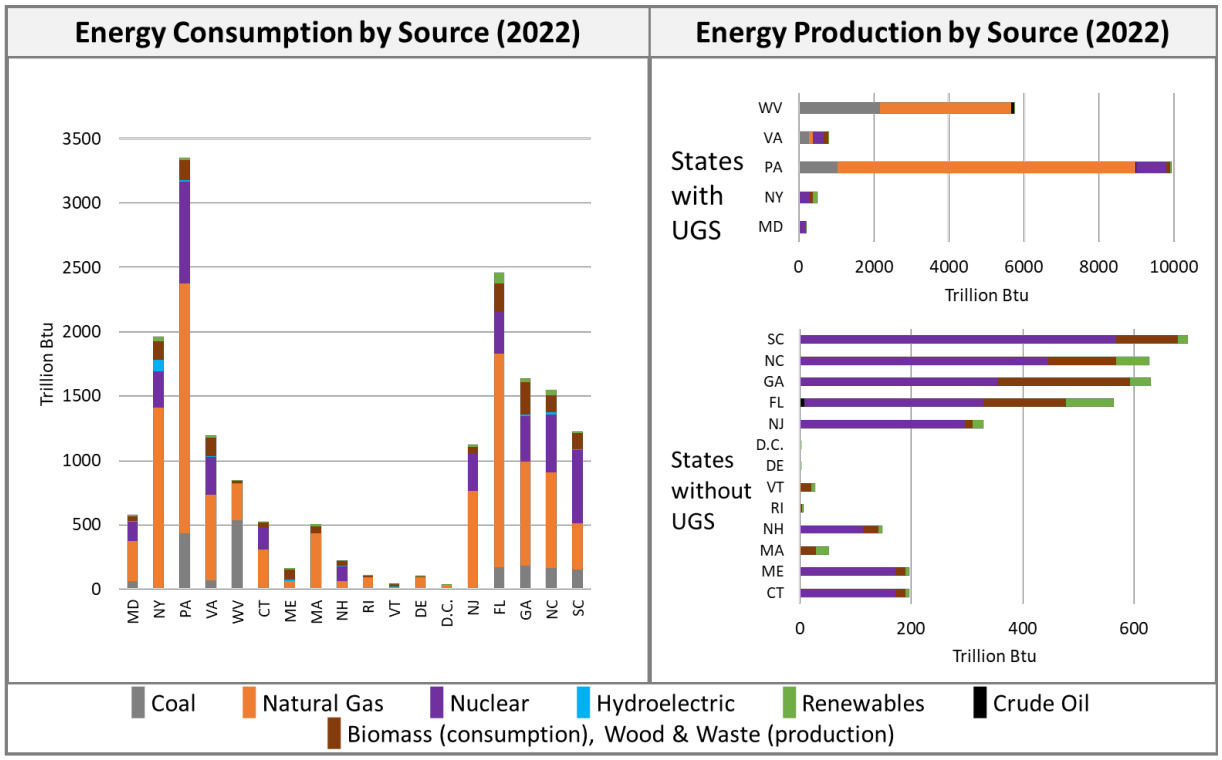

Figure 10: Sources of Energy production and consumption in East Coast States. Data is collected from EIA's State Profiles and Energy Estimates.

Potential Challenges for Expanding UGS

UGS's contribution towards energy reliability in the East Coast is directly linked to the limitations of the interstate transmission pipeline network. Numerous transmission pipeline expansions have been protested, curtailed, or outright cancelled in recent years due to state and residential pushback. Most recently, the Northeast Supply Enhancement Project to expand the Transco pipeline through Pennsylvania, New Jersey, and New York was cancelled in May 2024 due to state-level water permit denials that had been recurring since 2021.[31] The Atlantic Coast Pipeline and PennEast Pipeline projects have also been delayed or canceled in the past five years, in large part due to cost escalations brought along by regulatory compliance and litigation.[32] The Constitution Pipeline, which sought to bring gas from Appalachian shale gas fields to New York, was also abandoned in 2020 due to a water quality permit denial from New York and a host of other legal challenges. The current federal administration has

[31] E&E News, 2024. Pipeline company cancels Northeast gas project. Source

[32] Pipeline & Gas Journal, 2020. Developers Cancel Ong-Delayed Atlantic Coast Pipeline. Source

considered declaring an energy emergency to finish the pipeline's construction with hopes that its completion would lower energy prices in northeastern states.[33]

Expanding the role and benefits of UGS requires targeted and strategic investments in new underground facilities and connections, but the reoccurring curtailment of expansion may make the development of needed additional storage facilities more difficult in the future. Numerous facilities in the region have been abandoned or replaced with transmission pipelines in the last decade with no additional facilities slated to be introduced in coming years. One such facility is the National Fuel Gas Queen Storage facility, which was abandoned by sale in 2017 and replaced with five miles of transmission pipeline, a new regulator station, and two new service taps.[34] For many of these facilities, abandonment is the safest option for reducing future integrity risks on systems that are no longer economically viable. In these cases, failure to adequately plug wells can result in the issuance of violations.[35]

The proximity of UGS facilities to residential areas in the region has also become a source of public safety concerns in recent years. Nearly 65% of the UGS wells initially sited on the outskirts of cities to support supply and demand fluctuations decades ago are now located in residential suburban areas due to population centers expanding outward.[36] Undiagnosed leaks or disastrous blowouts have the potential to emit thousands of metric tons of methane into the atmosphere due to the high operating pressures of UGS wells, and can result in incidents like the 2022 Pennsylvania's Rager Mountain storage facility well leak. This leak was the largest by volume since the Aliso Canyon incident in 2015, and though it reportedly posed no safety concerns, residents reported discomforting odors and noises as far as four miles away.[37]

Despite these challenges, UGS can play a critical role in balancing expected LNG export capacity growth in the future. The EIA projects the LNG market to nearly double to 24.4

---

[33] Financial Post, 2025. Trump Vows Completion of Constitution Pipeline for New Yorkers. Source

[34] FERC, 2017. Environmental Assessment for the Proposed Queen Storage Project. Source.

[35] PA Environmental Digest, 2023. PA Oil & Gas Weekly Compliance Dashboard. Source

[36] Harvard School of Public Health, 2019. Many More People Live Closer To Underground Gas Storage Wells Than Previously Thought. Source

[37] AP News. Leak at Pennsylvania gas storage well spewing methane. Source

Bcf/d by 2028, with ten new projects in development across North America.[38] The Eagle LNG-backed Jacksonville project is one such LNG project, which will construct a small-scale LBG facility in the East Coast by September 2029 to serve customers in the southeast and the Caribbean.[39]

Conclusions

UGS facilities are a cornerstone of the East Coast's energy infrastructure, playing a pivotal role in ensuring reliable energy for heat and power delivery throughout the year. These facilities are particularly crucial during the winter months when heating demand peaks, and in the summer when air conditioning loads exceed local energy production. By storing natural gas in underground formations, UGS facilities help stabilize energy prices and manage large-scale, seasonal demand fluctuations.

The East Coast region, which includes 17 states, relies heavily on a network of UGS facilities, primarily located in depleted fields. Pennsylvania stands out as the leader in the region, boasting the highest working gas capacity and deliverability. This capacity is essential for meeting the energy needs of the region, especially during peak demand periods.

Interstate transmission pipelines are vital for transporting natural gas from high-production areas like the Appalachian Basin and the Gulf Coast to states with lower production. This network enhances grid resilience, allowing states to tap into energy resources from neighboring systems when local supply falls short or during disruptions caused by extreme weather events. Robust natural gas transmission systems are particularly beneficial in the eastern regions, where flooding and hurricanes can pose significant operational risks.

Federal and state regulations ensure the safe and efficient operation of UGS facilities. These regulations focus on environmental protection, safety standards, and compliance with industry codes. The East Coast's regulatory framework is designed to safeguard

[38] EIA, 2024. North America's LNG export capacity is on track to more than double by 2028. Source

[39] Offshore Energy, 2024. Headwinds push Florida LNG project completion back five years to decade's end. Source

public health and the environment while maintaining the integrity of the natural gas infrastructure.

UGS is poised to play a significant role in the evolving energy landscape as the East Coast region moves towards decarbonization and increased reliance on renewable energy. Its capability to store low-carbon fuels and hydrogen will be crucial for balancing supply and demand, enhancing grid reliability, and supporting the integration of renewable energy sources. Coordinated efforts from policymakers, industry stakeholders, and impacted communities can help ensure that UGS remains optimally reliable and safe, and help overcome regional challenges such as regulatory hurdles, reduced infrastructure expansions, and safety concerns due to proximity to residential areas.