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GLOBAL GAS AND LNG OUTLOOK 2026–2050: STRUCTURAL TRENDS, GEOPOLITICAL RISKS, AND IMPLICATIONS FOR QATAR

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Executive Summary

By the mid-2020s, the global gas and LNG sector entered a phase of profound structural transformation rather than a cyclical adjustment. Natural gas has lost its status as merely a "transition fuel" and has become a key element of a broader architecture of energy security, geoeconomic competition, and climate policy. After the 2021–2022 energy crisis and the war in Ukraine, gas and, especially, LNG has firmly established itself as a system-forming mechanism for balancing global energy markets, enabling the compensation of regional shocks, the reconfiguration of trade flows, and the growing share of variable renewable energy sources.

The analysis shows that in the late 2020s the global LNG market is highly likely to face a temporary supply surplus, driven by the simultaneous commissioning of large-scale capacities in the United States, Qatar, Canada, and Africa. However, this "glut" is selective in nature: it accelerates the displacement of high-cost and carbon-intensive projects, strengthening the positions of producers with low production costs, resilient logistics, and a favorable environmental profile. In the medium term (the 2030s), market balance will increasingly be determined by demand growth in Asia, South Asia, and Africa against the backdrop of structural gas consumption decline in Europe and parts of the developed world.

The climate agenda is transforming from an external constraint into a key filter for market access. The tightening of methane emission requirements, the development of carbon pricing systems, and the potential expansion of cross-border climate mechanisms mean that gas competitiveness is determined not only by price but also by the carbon intensity of the entire supply chain. In this context, CCUS technologies, methane leak reduction, digitalization, and the development of low-carbon derivatives (hydrogen, ammonia, synthetic gases) are becoming necessary conditions for the long-term viability of the gas sector.

Against this backdrop, Qatar occupies a special position as one of the most resilient and adaptive players in the global LNG market. The large-scale expansion of Qatari capacities in the 2020s represents a strategy of managing uncertainty rather than a bet on a single future demand scenario. Low production costs, early market lock-in through long-term contracts, investments in fleet and logistics, as well as the integration of CCUS and environmental standards, allow Qatar to maintain competitiveness both under conditions of sustained demand and in a contracting market.

In the long term (up to 2050), the fate of gas and LNG will depend on the depth and speed of the global energy transition. Under inertia-based scenarios, gas retains a significant role until mid-century; under strict implementation of climate goals, it transforms from a fuel into a feedstock for low-carbon energy chains. In all scenarios, survival will primarily be ensured by producers with

low costs, high reliability, and a minimal carbon footprint. For Qatar, this means not only preserving its position in the short and medium term, but also the potential to remain one of the "last standing" players in the global gas market under conditions of deep decarbonization.

Overall, the study confirms that the next 10–15 years represent a critical window of opportunity for gas exporters. The use of this period for technological modernization, diversification of export products, and adaptation to climate requirements will determine whether natural gas in the long term becomes a "fuel of the problem" or a "fuel of the solution" in the global energy system.

Key Analytical Takeaways

- The global gas and LNG sector has entered a phase of structural transformation in which gas has ceased to be a "temporary bridge" and has become an element of energy security, geoeconomic influence, and the strategic resilience of states.
- After 2022, energy security and the energy transition are no longer viewed as alternative agendas. They are increasingly institutionally and politically intertwined, forming a new logic of decision-making.
- LNG has become a mechanism for adapting the global energy system to market fragmentation, sanctions, conflicts, and the growing share of unstable renewable generation.
- The expected LNG surplus in the late 2020s should be interpreted not as a crisis of overproduction, but as a moment of market selection, redistributing shares in favor of low-cost and institutionally resilient suppliers.
- The regional demand structure is becoming asymmetric and politicized: Europe is consolidating as a market of security and regulation rather than sustained growth; Asia and South Asia remain anchors of long-term demand but demonstrate high price and macroeconomic sensitivity; Africa is acquiring a dual role—as a potential source of demand and a new export competitor.
- Long-term contracts are regaining strategic significance, performing the function of insurance against volatility rather than merely price fixation.
- Gas and LNG are increasingly embedded in the logic of "hard" security: route reliability, supplier resilience, and political predictability are becoming key criteria for partner selection.
- Sanctions, conflicts, and risks related to maritime chokepoints (Hormuz, Bab el-Mandeb) have transformed gas trade into an instrument of managing strategic risks, not merely commercial flows.
- As a result, a multi-layered architecture of gas alliances is emerging, where energy is used as a tool of geoeconomic alignment of key regions.
- Environmental parameters of gas have evolved from a reputational factor into a condition of market access, especially in the EU, Japan, and the Republic of Korea.

- Methane standards, CCUS, carbon reporting, and digital emissions verification are becoming de facto trade barriers that reshape the structure of competitive advantages.
- The future competitiveness of gas is determined less by its price than by the "quality of the molecule"—the combination of carbon intensity, traceability, and compliance with ESG regimes.
- Qatar's strategy of large-scale LNG capacity expansion in the 2020s represents a rational response to radical uncertainty rather than an excessive bet on demand.
- Low production costs, resource concentration, and contractual market lock-in enable Qatar to use the future LNG surplus as a mechanism of structural strengthening, displacing less competitive players.
- The development of trading and spot operations complements the contractual base, enhancing strategic flexibility in a fragmented market environment.
- Regardless of the energy transition scenario, gas is moving from the role of fuel to that of feedstock and infrastructural service (hydrogen, ammonia, power system balancing).
- CCUS and hydrogen value chains function not as an alternative to gas, but as mechanisms for extending its economic relevance under conditions of decarbonization.
- In stringent climate scenarios, survival will be ensured only by those exporters capable of integrating gas into low-carbon energy systems rather than resisting them.
- The future of gas is determined not by the volume of reserves, but by the ability of states and companies to embed gas into the new logic of energy security and decarbonization. In this sense, gas is not a disappearing resource, but a transforming institution of the global political economy.

1.Introduction

The global gas sector is undergoing a period of dynamic change driven both by market fluctuations, the potential LNG supply surplus by 2030, and geopolitical crises, as well as by technological and climate-related agendas. After the shocks of recent years—from the pandemic to the restructuring of energy markets under the impact of Russia's invasion of Ukraine—the global gas industry is returning to growth, but under conditions of heightened uncertainty. On the one hand, demand for natural gas shows a positive trend, and global gas trade (combined pipeline and LNG segments) has recovered to pre-pandemic volumes (Chow, 2026). On the other hand, pressure from decarbonization processes associated with the Fourth Energy Transition and the development of alternative energy sources is increasing, calling into question the long-term role of gas in the energy balances of various countries and regions, including China, on which gas producers and LNG exporters previously placed significant hopes as a key driver of demand growth (Howe, 2026).

At the same time, technological innovations—from LNG infrastructure development to digitalization—are transforming natural gas consumption patterns and reshaping the gas value chain (International Energy Agency, 2025a). Geopolitical factors have also come to the forefront. Sanctions and conflicts have led to a large-scale reconfiguration of gas flows: Europe has sharply reduced its dependence on Russia as an energy supplier but significantly increased demand for more expensive U.S. LNG, while Asian economies, conversely, are expanding imports of Russian oil and gas, and China is concluding new long-term agreements capable of altering the dynamics of its energy cooperation with Middle Eastern countries.

In turn, the securitization of energy security in most countries following the outbreak of the war in Ukraine in 2022 has changed the logic of consumer behavior in energy markets. Consumers no longer rely solely on market considerations when choosing partners and suppliers based on the traditional "four A's" paradigm (availability, affordability, accessibility, and acceptability). Instead, they increasingly assess the reliability and resilience of suppliers to military-political challenges, bringing issues of traditional "hard" security—such as the safety of maritime energy transport—to the forefront and, in some cases, leading them to disregard clear economic rationality.

Within these global processes, the countries of the Gulf Cooperation Council (GCC), and Qatar in particular, occupy a position of special importance. Possessing vast gas reserves and being one of the world's leading LNG exporters, Doha inevitably faces the need to adapt its energy strategy, both in terms of production and LNG exports. The Gulf states must take into account new trends—from the transition of key markets toward low-carbon economies to intensified competition and rising ESG requirements—in order to preserve and strengthen their positions in global gas markets.

This report examines global trends in gas trade (primarily LNG and the prospect of a potential supply surplus), analyzes technological transformations (LNG infrastructure, low-carbon technologies, digitalization, decarbonization), and explores geopolitical dimensions (sanctions, energy security, trade conflicts, demand shifts). Particular attention is devoted to how these factors affect the strategic interests of the GCC states and their energy policies. The report concludes with concrete policy-strategic recommendations for the countries of the region—from export diversification to participation in the hydrogen economy—drawing on global practices and forecasts from leading analytical institutions.

2. The Global Gas and LNG Sector: Key Challenges and Opportunities by 2026

By the mid-2020s, the global natural gas and liquefied natural gas (LNG) markets entered a phase of profound structural transformation. The shocks of recent years—above all the 2021–2022 energy crisis, the war in Ukraine, sanctions confrontation, and the escalation of geopolitical instability in key production and transit regions—have fundamentally altered the principles governing global energy markets. Gas and LNG are no longer perceived solely as market commodities or as a "transition fuel" on the path toward a low-carbon economy; they are increasingly viewed by states as instruments of national security, strategic resilience, and geoeconomic influence (International Energy Agency, 2026b).

By early 2026, LNG in particular has become the central mechanism for adapting the global gas market to this new reality. Its flexibility, mobility, and ability to rapidly redirect supplies across regions made it possible to compensate for the sharp decline in pipeline flows—above all from Russia to Europe—and to prevent a more severe energy collapse. At the same time, this triggered an unprecedented acceleration of investment in LNG infrastructure—both on the export side (United States, Qatar, East Africa) and on the import side (Europe, Asia)—laying the foundations of a new architecture of global gas trade for the 2026–2030 horizon.

At the same time, current market dynamics reveal the contradictory nature of gas sector development. On the one hand, gas demand has recovered following the 2022 downturn, and LNG has firmly established itself as the primary balancing mechanism of the global energy system. On the other hand, consumption growth is slowing, regional divergences are intensifying, and high price volatility together with geopolitical risks continue to constrain demand in price-sensitive economies, particularly in Asia. In parallel, the tightening of climate policies in major economies is transforming the environmental parameters of gas and LNG from a secondary consideration into a key condition for market access.

This chapter analyzes the current state and key trends shaping the global gas and LNG market as of early 2026, with particular attention to the interaction between market dynamics, geopolitical factors, and the energy transition. It examines changes in the structure of supply and demand, the role of LNG in ensuring energy security, the impact of sanctions and regional conflicts on global gas flows, as well as the technological and environmental challenges that determine the medium-term competitiveness of producers and exporters. Special emphasis is placed on the emergence of a new map of global LNG trade and the strategic implications of these developments for both importers and exporters amid the ongoing fragmentation of the global energy system.

2.1. Growth in Gas Demand and the Recovery of Trade amid the Expanding Role of LNG.

After the downturn in 2022, global gas consumption has resumed growth, although at a slower pace. In 2024, a solid recovery was recorded at 4.12 trillion cubic meters (an annual increase of 1.9%), driven by the rebound in overall economic activity (International Gas Union, 2025). However, in 2025 demand increased only marginally—by about 1%, according to the International Energy Agency (2026b). The underlying drivers vary across regions. In Europe and North America, colder weather and disruptions in renewable generation led to higher gas consumption, whereas in Asia demand was constrained by high prices and economic difficulties. For example, in Europe gas consumption in the first half of 2025 rose by 6.5% year-on-year, supported by increased gas-fired power generation amid weak wind and hydropower output. At the same time, Asia experienced a decline: gas demand in China fell by around 1% in the first half of 2025, while China's LNG imports dropped by more than 20% due to elevated prices. India also reduced gas consumption by 7% (January–May 2025), mainly because of lower industrial demand. Thus, the Asia-Pacific region, previously the main engine of global gas demand growth, delivered one of its weakest performances in recent years in 2025 (International Energy Agency, 2025b; 2026b).

Changes on the supply side in 2025 may, however, prove far more consequential for the gas market and the LNG industry. Above all, they can be interpreted as an early signal of the anticipated substantial increase in global LNG production capacity over the 2026–2029 period. Global LNG output and exports in the first half of the year grew by only about 4% (approximately +12 bcm). This growth was driven primarily by the commissioning of new capacity in the United States. In particular, the Plaquemines LNG plant (Louisiana) began operations at the end of 2024 and accounted for roughly two-thirds of the total increase in global LNG exports in the first half of 2025 (International Energy Agency, 2025b).

As a result, the United States further consolidated its position as the world's largest LNG exporter: by the end of 2025, it had supplied approximately 111 million tonnes of LNG (around 152 bcm) to global markets, becoming the first country to exceed the threshold of 100 million tonnes of LNG production per year. This was nearly 20 million tonnes more than Qatar exported and 23 million tonnes more than U.S. exports in 2024. The growth in U.S. exports (+24% year-on-year) was made possible by high utilization rates at all terminals and the rapid ramp-up of new projects. Overall, in 2025 roughly one quarter of global LNG supply was provided by the United States, marking a fundamental shift in the structure of the market over the past few years (Williams, 2026).

These developments also reflect another major market trend—the structural shift in supply in favor of LNG. In recent years, the role of liquefied natural gas in global markets has expanded significantly. LNG technology has effectively turned gas into a global commodity, reducing dependence on pipeline geography. At the same time, an unprecedented expansion of global LNG production capacity is projected by 2030. The cumulative addition of new liquefaction plants could reach around 300 bcm per year (in natural gas equivalent), primarily driven by projects in the United States and Qatar. This "LNG wave" is expected to strengthen energy security and ease price pressures for fuel importers. New projects—including Plaquemines LNG, the Corpus Christi expansion in the United States, LNG Canada, and Qatar's North Field East—will significantly boost the export capacities of the United States, Canada, and Qatar (International Energy Agency, 2025b; 2026b). Under these circumstances, LNG trade is set to continue rapidly increasing its share within the global gas supply system.

Despite the gradual market rebalancing following the 2022 shock triggered by Russia's invasion of Ukraine, gas prices in 2024–2025 remained elevated (Casey, 2025). In the first half of 2025, European gas hubs and Asian spot prices were on average 40% and 28% higher, respectively, than a year earlier. Such price levels restrained demand in price-sensitive Asian markets, where some countries switched to cheaper fuels or reduced consumption (International Energy Agency, 2025b). At the same time, high export margins encouraged suppliers to maximize LNG shipments whenever possible.

International LNG trade became even more flexible: the share of contracts without strict destination clauses has been increasing and, according to the IEA, is expected to exceed 50% of total volumes by 2030 (Casey, 2025). This indicates the emergence of a more liquid and adaptable global gas market capable of reallocating resources in response to regional shocks. For example, after Europe reduced LNG imports in summer 2024—amid full storage facilities and higher renewable generation—European companies resumed active purchases by the end of the year. The cold winter of 2024/25 and the termination of Russian gas transit through Ukraine from January 2025 forced Europe to ramp up LNG procurement (Shell plc., 2025). In the first half of 2025, LNG imports into Europe jumped by 25% compared to the same period in 2024, reaching 92 bcm—a record half-year volume. Meanwhile, declining pipeline supplies (from both Russia and Norway) combined with active storage injections created a tight supply–demand balance in early 2025, supporting high price levels. By early 2026, the situation began to ease somewhat due to increased LNG supply and a relatively mild autumn–winter season. However, volatility remains a serious concern: any geopolitical or natural force majeure—from conflict in the Middle East to extreme cold spells—could trigger another price spike (International Energy Agency, 2025b; 2026b).

The experience of 2024–2025 confirmed that natural gas retains a critical role in ensuring power system reliability. For instance, when wind and hydropower generation in Europe declined in the first half of 2025, gas-fired power plants promptly compensated for the shortfall and prevented blackouts. Similar dynamics were observed in other regions during extreme weather events (droughts, heatwaves, etc.), when the flexibility of gas generation helped stabilize grids (International Energy Agency, 2025b). Natural gas remains the most scalable and rapidly deployable source of energy for meeting peak demand and balancing variable renewables—a role widely recognized by many countries. In developing economies across Asia and Africa, gas is viewed as a means of quickly meeting rising electricity demand and replacing more polluting fuels (coal, fuel oil) with relatively cleaner combustion. Nevertheless, the long-term role of gas is increasingly questioned by decarbonization policies, as discussed below.

From a geographical perspective, gas demand is shifting from West to East. The European market, after peaking in the 2010s, has entered a phase of structural decline under the influence of climate policy and energy efficiency improvements. Although European gas consumption unexpectedly increased by around 6.5% in the first half of 2025—due to colder weather and lower renewable generation—this trend is considered temporary (International Energy Agency, 2025b). Strategically, the EU aims to reduce its dependence on gas: the deployment of renewables, hydrogen, heat pumps, and other solutions is accelerating in line with REPowerEU objectives. Gas demand in the EU is expected to decline by 2030—although, according to Shell, the gap between the EU's green energy ambitions and actual capacity additions implies that Europe will maintain substantial LNG import needs through the end of the decade (Shell plc., 2025).

The growing importance of LNG for Europe is also linked to its decision to phase out Russian pipeline gas. Before the 2022 crisis, Europe sourced up to 40% of its gas from Russia; by 2024–2025, these volumes had declined to marginal levels (Bland, 2025). Russian pipeline exports to the EU fell by a further 45% year-on-year in the first half of 2025 (–6.5 bcm), due to the termination of transit via Ukraine and the broader sanctions regime. At the same time, Norway—the second-largest pipeline supplier to Europe—also reduced exports in 2025 due to field maintenance (–3 bcm, or –4.5% in Q2). The shortfall in pipeline gas was replaced by LNG: European LNG imports reached a record 92 bcm in the first half of 2025 (+25% year-on-year). Europe has effectively become a premium market, attracting substantial LNG volumes that were previously directed toward Asia (International Energy Agency, 2025b). In 2024, for instance, 55% of total U.S. LNG exports were shipped to Europe, as the continent actively sourced gas from the United States and Qatar to compensate for the loss of Russian pipeline supplies (Bland, 2025).

In Asia, by contrast, demand continues to grow at a faster pace. China, India, and Southeast Asian countries are expanding gas infrastructure—building LNG terminals and extending distribution networks—to meet the rising needs of millions of consumers. Forecasts indicate that Asia will be the main driver of global LNG demand growth in the medium term. According to Shell, global LNG demand is projected to increase by around 60% by 2040, with the bulk of this growth driven by economic expansion in Asia and decarbonization efforts in industry and transport (2025). Already in 2024, China increased LNG imports to 79 million tonnes (close to the record level of 2021), taking advantage of moderate prices in the first half of the year. India boosted LNG purchases by 20% in 2024, reaching a record 27 million tonnes to meet peak electricity demand during the hot season (Shell plc., 2025).

Thus, the balance of demand is shifting: in the short term, Europe and Asia compete for limited LNG volumes on the spot market—strengthening the linkage between TTF and JKM price benchmarks—while in the long term, market dynamics will be shaped by Asian demand growth and Europe's decarbonization policies (Bland, 2025).

2.2. Geopolitical Dimensions: Sanctions, Security, Conflicts, and Demand Shifts

By 2025, the political conflicts of recent years had significantly reshaped the map of global gas flows. The most far-reaching impact stemmed from sanctions imposed on Russia in response to the events in Ukraine: European countries introduced restrictions on Russian gas imports, while Russia, in turn, reduced or halted supplies along several routes. As a result, Russia's share in EU gas imports declined from around 40% (prior to 2021) to less than 13% in 2025 (Bland, 2025; Council of the European Union, 2025). By early 2025, the transit of Russian gas through Ukraine had virtually ceased, and the Nord Stream 2 project remained frozen under U.S. and European sanctions pressure. These developments forced the European market to undertake an unprecedented diversification of supply sources. Russian pipeline volumes were replaced by LNG from the United States, Qatar, and West Africa (see Table 1), as well as by increased pipeline flows from Norway, North Africa, and Azerbaijan (Bland, 2025).

Table 1. EU LNG Imports by Partner in 2021 - 2024 (%)

Quarter	United States	Russia	Algeria	Qatar	Nigeria
Q1 2021	24.1	21.2	15.4	14.8	15.4
Q2 2021	29.0	21.2	12.3	18.0	11.5
Q3 2021	27.8	16.7	11.1	24.3	12.0
Q4 2021	31.4	21.7	7.7	18.5	5.9
Q1 2022	48.6	18.1	4.3	10.4	6.5
Q2 2022	48.7	15.3	4.7	11.7	4.2
Q3 2022	41.4	11.9	3.6	19.8	3.2
Q4 2022	39.3	10.5	4.2	17.0	2.9
Q1 2023	40.7	12.7	6.2	14.4	4.0
Q2 2023	46.7	11.9	9.3	12.3	4.9
Q3 2023	48.5	9.4	10.1	12.8	5.1
Q4 2023	50.2	13.0	9.9	10.8	3.7
Q1 2024	50.1	17.1	9.4	8.8	3.9

Q2 2024	49.5	15.6	10.5	11.1	4.4
Q3 2024	40.7	17.9	13.5	10.0	4.2
Q4 2024	40.3	19.3	10.2	11.9	5.0

Source: Eurostat

The United States rapidly emerged as the dominant supplier after Russia's invasion of Ukraine, with its share jumping from roughly one-quarter of EU LNG imports in 2021 to around 40–50% throughout 2022–2024, underscoring Washington's central role in Europe's short- and medium-term gas security. Russia's LNG share, while sharply reduced compared to pre-war levels, proved more resilient than often assumed, stabilizing in the mid-teens by 2024 and illustrating the practical limits of a full decoupling in a tight global gas market. Qatar maintained a flexible but strategically important position, with its share fluctuating in response to market stress and contract structures, reinforcing its role as a balancing supplier rather than a dominant one. Algeria and Nigeria remained secondary but systemically relevant contributors, providing diversification and regional stability at the margins. Overall, the data point to a post-2022 LNG regime defined less by full substitution than by managed diversification, flexibility, and a greater tolerance for residual dependencies in the name of market stability.

The war in Ukraine triggered the first truly global energy crisis, prompting the International Energy Agency (IEA) to reposition energy transition strategies as core components of energy security rather than solely climate-driven policies. Prior to 2022, LNG and gas were often discussed as bridge fuels toward renewables, but the crisis made clear that security of supply must be managed simultaneously with decarbonization. IEA analysis shows that the loss of Russian pipeline gas to Europe forced policymakers to rapidly diversify energy sources, contributing to higher renewable deployment and diversified gas sourcing as dual pillars of resilience in energy systems. This reframing (where security and transition are inseparable objectives) is a defining legacy of the Ukraine war on global energy frameworks (International Energy Agency, n.d.).

Within this new paradigm, the IEA's assessments portray LNG not merely as a transitional stopgap but as a structural companion fuel that stabilizes systems with high shares of variable renewables. The IEA's Gas Market Reports highlight how rapid increases in LNG imports filled critical gaps when piped gas flows declined, with regasification terminals running near full capacity to balance grids and maintain affordability. This role of LNG, providing flexibility, seasonal balancing, and dispatchable capacity, supports renewable integration while cushioning against supply shocks, underscoring its continuing relevance in energy portfolios navigating both decarbonization and security goals (International Energy Agency, 2025c).

The IEA's broader energy security mandate, historically centered on oil and market disruptions, has evolved in the post-Ukraine context to emphasize resilience through diversification of fuels, suppliers, and delivery modes. Its work on energy security demonstrates that diversified LNG sourcing enhances "supply optionality" and reduces exposure to geopolitical coercion characteristic of concentrated pipeline reliance. In this view, secure energy systems combine renewables, diversified gas supplies including LNG, and infrastructure flexibility to absorb demand spikes or geopolitical shocks, marking a substantive shift from traditional supply security toward a resilience-oriented framework (International Energy Agency, 2026a).

Ultimately, the IEA's recent analyses embed the idea that energy security and transition must be managed as integrated policy objectives. The war's aftermath strengthened the narrative that renewables alone cannot guarantee uninterrupted supply during systemic stress without complementary dispatchable resources like LNG and robust infrastructure. In IEA scenarios, achieving reliability and affordability alongside emissions targets requires a diversified energy mix and significant investment in both clean technologies and flexible fuels like LNG that "accompany" the transition rather than simply bridge to it. This integrated approach redefines energy security in the fourth energy transition era as the capacity to simultaneously decarbonize, diversify, and buffer against geopolitical and market volatility (International Energy Agency, 2024a).

For importing countries, gas has become not only a commodity but also an instrument of national security. After 2022, the European Union rapidly implemented an "Energy Security First" strategy. Regulatory requirements were introduced to ensure gas storage facilities are filled to at least 90% ahead of the heating season, coordination of LNG purchases was strengthened, and intergovernmental agreements were concluded with alternative suppliers (the United States, Qatar, Norway, Algeria, and Azerbaijan). For example, Germany and France signed new long-term LNG supply contracts with the United States for 15–20 years, and also supported the conclusion of a 27-year contract between QatarEnergy and German companies for the supply of 2 million tons of LNG per year (Buli, 2024). China, seeking to shield itself from spot market volatility (especially after the 2021–2022 price shock), also concluded a number of record-breaking contracts: Chinese companies Sinopec and CNPC signed 27-year LNG purchase agreements with Qatar for 4 million tons annually each, making them the longest contracts in the history of the industry. India, Japan, Bangladesh, and other major importers likewise intensified their search for long-term deals amid growing competition with Europe.

At the same time, many Asian states are attempting to develop their own resources where possible in order to reduce import dependence: China has increased its domestic shale gas production (Zheng, 2025), Pakistan is trying to develop offshore gas resources (Shahid, 2025, December 5), and Bangladesh has resumed field development (Atik, 2024). Nevertheless, the structural gas deficit in Asia will persist, and import needs will only grow—making Gulf energy critically important for these countries. It is also worth noting the emergence of the term "electrostates," used by BP's chief economist Spencer Dale: some countries may increasingly rely on local renewable power generation (electricity instead of gas imports) (Almeida, 2025). However, during the transition period, most importers have opted for supplier diversification rather than a complete rejection from gas.

2.2.1. Going beyond Ukraine: Trade Conflicts, Geopolitical Tensions, and Tariffs.

Beyond the already mentioned war in Ukraine, the escalation of tensions in the Middle East in 2023–2025 (the armed conflict in Gaza and heightened tensions around Iran) triggered short-term spikes in LNG prices, as investors feared a potential expansion of the conflict into strategically important production regions and supply routes (International Energy Agency, 2025b). Any escalation in the Persian Gulf, the Red Sea, or around the Strait of Hormuz poses a threat to the uninterrupted transit of LNG tankers from Qatar, the UAE, and Oman. Other potential "chokepoints" — the Suez Canal and the Strait of Malacca — are also under close scrutiny, although major incidents have so far been avoided. Importers, particularly in Europe, are discussing the creation of strategic LNG reserves and coordinated purchasing mechanisms (similar to those used in the oil market) to mitigate price spikes. Global energy security has become a high-level issue — from the G7 and G20 to multilateral energy forums — where calls are growing for greater market transparency, data sharing on inventories, and mutual assistance in emergencies. The IEA emphasizes that despite the expected improvement in market balance with the commissioning of new LNG capacity, complacency is unacceptable: only coordination between producing and consuming countries can prevent new crises (Casey, 2025).

In global gas trade — previously relatively free from protectionism — elements of trade disputes are beginning to emerge. A clear example was the U.S.–China trade confrontation in 2018–2019, when China imposed import tariffs on U.S. LNG in response to U.S. measures. This temporarily reduced U.S. LNG shipments to China until a trade agreement was reached. In early 2025, according to analysts, a new factor emerged in the form of tariff-related uncertainty: the U.S. government discussed potential measures to restrict LNG exports in order to protect domestic prices, while some trading partners threatened retaliatory actions (Bland, 2025). Although a full-scale tariff war did not materialize, the very discussion of such measures increased market uncertainty.

In addition, climate-related regulatory measures sometimes function as "indirect tariffs." For example, from 2024 the European Union included maritime transport (including LNG tankers) within the scope of the EU Emissions Trading System (ETS), requiring shipping companies to purchase CO_2 allowances (Bland, 2025). This increases the cost of delivering LNG to Europe relative to other destinations and can be interpreted as a carbon-related trade barrier affecting supplier competitiveness. The EU is also developing a Carbon Border Adjustment Mechanism (CBAM), which in the future could affect imported gas (through the assessment of associated methane and CO_2 emissions). Such measures compel exporters, including Gulf countries, to adapt to new "rules of the game" by certifying their gas as cleaner or investing in mitigation and offset projects.

Gas infrastructure is highly vulnerable to geopolitical conflicts, particularly in key transit zones. In October 2023, the military crisis in the Middle East (the escalation of the conflict around Israel and the Gaza Strip) triggered a surge in gas price volatility, as investors feared potential supply disruptions from the region. The market reacted especially sharply to the risk of a closure of the Strait of Hormuz, through which around 20% of global LNG trade passes (International Energy Agency, 2025b; 2026b).

In June 2025, renewed tensions between Iran and Israel led to a temporary halt in production at Israel's offshore gas fields (Leviathan and Karish) and the suspension of Israeli gas exports to Egypt and Jordan. This, in turn, affected the regional electricity market and fertilizer prices (as feedstock supplies to nitrogen plants in Egypt were reduced) (International Energy Agency, 2025b). The episode highlighted the deep interconnection between energy and food security: gas supply disruptions in the Eastern Mediterranean immediately impacted fertilizer production (International Energy Agency, 2025b; 2026b).

Beyond Hormuz, another vulnerable chokepoint is the Bab el-Mandeb Strait (between Yemen and Djibouti), through which LNG shipments from the Persian Gulf transit en route to Europe. In 2024, attacks by Yemeni rebels created temporary risks for shipping through Bab el-Mandeb, prompting Qatar to redirect some LNG cargoes from Europe to Asia (U.S. Energy Information Administration, 2025).

Overall, geopolitical tensions have made the gas market more volatile: any news of conflict or sanctions is immediately reflected in prices. Importing countries are compelled to hedge against risks — through stockpiling and the diversification of routes — while exporting countries seek more stable alliances to safeguard their markets. A direct consequence of these dynamics has been the emergence of a new map of global LNG flows.

2.2.2. The New Map of Global Flows.

As previously noted, by 2025 the United States had emerged as the leading player in the global gas market. U.S. LNG exports have become a factor of global geopolitics: Washington supported its European allies by rapidly increasing deliveries after the reduction of Russian gas supplies, thereby strengthening transatlantic ties. In December 2025, Europe accounted for around 80% of monthly U.S. LNG exports (Shalal, 2026). At the same time, the United States expanded pipeline gas exports to Mexico, supplying its neighbor with affordable fuel for power generation and industry. Domestically, relatively low gas prices (significantly below European and Asian benchmarks) provide a competitive advantage to U.S. industry (chemicals, metallurgy) and encourage investment in new LNG projects. In 2025, the United States set a record: more than 80 bcm per year of new LNG capacity was sanctioned in a single year — more than ever before in such a period (Casey, 2025). This demonstrates market confidence in long-term demand. In international relations, gas has provided Washington with additional leverage: discussions include U.S.–EU cooperation on LNG pricing and U.S. support for infrastructure projects in Eastern Europe and the Balkans to enhance regional energy independence. At the same time, LNG exports have become a topic of domestic political debate in the United States — proposals periodically arise to limit exports to lower domestic prices, although as of early 2026 such measures appear unlikely given the strategic benefits of export expansion.

Asia remains the largest aggregate gas-importing region, but its internal supplier balance is evolving. Seeking greater energy security, China has concluded several long-term LNG deals: with Qatar (27-year contracts) and with U.S. independent producers (20+ year contracts signed in 2023–2024). Simultaneously, China is increasing pipeline gas imports via the Power of Siberia from Russia (deliveries exceeded 15 bcm in 2025, with a target of 38 bcm by 2030) and is discussing network expansion through the proposed Power of Siberia-2 project via Mongolia, potentially by the end of the decade. India continues to diversify its gas and LNG import structure. Alongside traditional Middle Eastern suppliers (primarily Qatar), Indian state-owned and private companies are expanding their participation in international energy projects and strengthening long-term ties across global supply markets, including interest in assets and contracts beyond the Middle East, such as in the United States and other regions, as part of its energy security strategy. At the same time, India has increased its use of the LNG spot market: in 2024, imports reached a record 27 million tons, supported by relatively low global prices in the first half of the year and a flexible procurement strategy (CID Bureau, 2025). This approach continued in 2025 — combining long-term contracts with opportunistic spot purchases, while expanding LNG regasification infrastructure to raise total import capacity above current demand, as part of a transition toward a more balanced and resilient gas policy (Verma, 2025). Against this backdrop, most of the growth in global gas consumption through 2030 is expected to occur in Asia, prompting regional competition for resources and the formation of alliances. Asian LNG trading hubs (Singapore, Shanghai) are gaining prominence, and countries are discussing joint procurement mechanisms (Casey, 2025).

Traditional exporters from the Persian Gulf and North Africa are also strengthening their positions. Qatar is implementing the world's largest LNG expansion projects (North Field East and North Field South), significantly increasing capacity by the end of the decade. Doha is actively signing contracts with both Asian and European clients, positioning itself as a reliable long-term supplier. Other Middle Eastern producers are likewise active: Oman, the UAE, and Saudi Arabia are investing in increased gas production — partly for domestic use to substitute oil in power generation, and partly for export in the form of LNG or pipeline gas to neighboring countries (Casey, 2025).

In North Africa, Algeria and Egypt are strengthening cooperation with Europe. Algeria has signed new supply agreements with Italy, is expanding pipeline capacity, and is developing fields in partnership with foreign companies. Egypt, for its part, is seeking to preserve its LNG export position, although in 2023–2024 it faced gas shortages that limited its ability to fulfill export contracts and was forced to import LNG from the United States to meet domestic demand (Williams, 2026). Nigeria — the largest LNG supplier in West Africa — is attempting to overcome internal challenges (instability, leakages, and gas theft) while advancing the Bonny LNG Train 7 expansion project to increase export capacity.

In East Africa, significant developments are underway. In Mozambique, following an improvement in the security situation in 2025, TotalEnergies announced its readiness to restart the Mozambique LNG megaproject, which had been suspended since 2021 (EcofinAgency, 2025). At the same time, the Coral Sul floating LNG facility has been operating successfully (its first cargo was shipped in late 2022), and a second floating unit, Coral North, is planned to come online by 2026. Off the coasts of Mauritania and Senegal, construction of the Greater Tortue Ahmeyim (GTA) project (led by BP and Kosmos) — the first LNG facility in this part of Africa — was nearing completion in 2024–2025 (Hollands, 2025).

Overall, Africa possesses vast gas reserves that could contribute significantly to the global supply balance. However, the pace of development depends on investment conditions, infrastructure availability, and international support. African countries are increasingly asserting their right to utilize gas both for domestic energy development and for export, pointing to the dissonance between the climate ambitions of developed countries and the urgent need to ensure energy access for millions. This political argument shapes their negotiating stance: while they call for financial support for clean energy transitions, they remain prepared to develop gas as a pragmatic compromise between economic growth and environmental responsibility.

2.3. Environmental Factors and the 4th Energy Transition

Climate challenges are significantly shaping the development strategy of the gas sector. On the one hand, natural gas is recognized as a cleaner fossil fuel compared to coal or oil: when combusted, it emits roughly 50% less CO_2 than coal and produces almost no particulate matter or SO_2, thereby improving air quality. For this reason, gas is often described as a “transition fuel” for a low-carbon economy. Many countries include gas in their emissions reduction strategies as a rapid means of replacing coal in power generation and achieving short-term CO_2 cuts. A striking example is the coal-to-gas switch in the United States and the United Kingdom in the 2010s, which led to record declines in national emissions. China, India, and other countries are also planning to shift industry and transport from coal and fuel oil to gas in order to reduce smog and lower the carbon intensity of growth (International Gas Union, 2025).

On the other hand, natural gas remains a fossil fuel, and achieving the goals of the Paris Agreement (limiting warming to 1.5–2°C) implies a long-term reduction in gas consumption. According to the International Energy Agency’s Net Zero 2050 scenario, global gas demand must peak within the next few years and then decline by more than 50% by 2050, with gas-fired power generation nearly phased out unless equipped with carbon capture. Such benchmarks place pressure on financial institutions: investors and banks are increasingly reluctant to finance new gas fields and infrastructure due to the risk of “stranded assets” in the context of the energy transition.

Climate policy in major economies directly affects the gas sector. In the European Union, regulations have been introduced or are planned that complicate gas use: stricter methane leakage standards are being implemented from 2025, gas boilers in new buildings may be banned from the 2030s, and carbon pricing under the EU ETS increases the cost of burning gas. The EU has legally committed to reducing emissions by 55% by 2030, which inevitably implies a decline in gas consumption (Chateau et al., 2023; Council of the European Union, n.d.; European Commission, 2025). In the United States, the 2022 Inflation Reduction Act (IRA) promotes clean technologies, indirectly dampening future gas demand (for example, through subsidies for heat pumps instead of gas furnaces) (U.S. Congress, 2022). At the same time, methane control regulations have tightened, with companies facing penalties for excessive emissions (U.S. Environmental Protection Agency, 2024).

China and India, by contrast, have not imposed significant restrictions on gas use; rather, they continue to support it as a substitute for coal (Bakshi, 2026; Sandalow & Meidan, 2022). However, both countries have long-term goals to expand renewable energy, which could constrain the growth of gas-fired generation after 2030 (Evans, 2026), as discussed further below. Developing countries in Africa and Asia argue in climate negotiations that they will use gas to support development but require financing to deploy cleaner technologies (Rowling, 2022). International financial institutions such as the World Bank and the EBRD have become increasingly selective: they are willing to finance gas projects only if they align with the objectives of the Paris Agreement — for example, replacing a coal-fired power plant with a high-efficiency gas facility (World Bank, 2024).

The industry is responding to the environmental challenge by advancing concepts of low-carbon gas. Some LNG cargoes are now marketed as "carbon-neutral," with suppliers claiming that they have offset the associated emissions through the purchase of carbon credits (such as afforestation projects or investments in renewables). While such transactions have taken place, they have also faced criticism regarding their real environmental effectiveness (Rose, 2021).

A more substantive approach involves biogas and biomethane. The combustion of biomethane is effectively CO_2-neutral, and chemically it is identical to conventional natural gas (International Energy Agency, 2025d). Europe aims to produce up to 35 bcm of biomethane by 2030, while the United States is expanding projects in renewable natural gas (RNG) derived from agricultural and municipal waste. Although these volumes currently account for less than 5% of total gas consumption, the segment is growing rapidly (International Energy Agency, 2025d).

Hydrogen represents another key element of the transition landscape. It can be produced from natural gas with carbon capture (so-called "blue hydrogen") or via electrolysis powered by renewables ("green hydrogen"). Blue hydrogen could absorb a significant share of gas production but requires the large-scale deployment of CCUS infrastructure (Global CCS Institute, 2025). Some gas companies — for example, Equinor — see their long-term role not in supplying natural gas itself, but hydrogen derived from gas, thereby preserving their relevance in a decarbonized energy system (Equinor, 2026). The European Union is developing regulatory frameworks to enable hydrogen blending and eventual substitution in gas transmission networks, although current hydrogen volumes remain limited.

In sum, the environmental agenda has become an integral part of strategic planning in the gas sector. Any new gas project must now consider its compatibility with future low-carbon demand. In other words, the opportunity for gas lies in positioning itself as part of the solution — by replacing more carbon-intensive fuels, integrating with CCUS, and supporting the development of "green gases." The risk, however, is the potential loss of significant market share if the global transition toward carbon-free energy accelerates. As of 2025, actual trends still show global gas demand growth, albeit at a slower pace, and in some regions (Europe, and possibly soon North America) demand appears close to peaking. Gas companies are increasingly rebranding themselves as diversified "energy" companies, investing in renewables and hydrogen to remain relevant in a transforming energy landscape.

2.4. Technological Transformations: LNG, Low-Carbon Solutions, and Digitalization

Technological progress plays a dual role for the gas industry. On the one hand, innovation increases efficiency and reduces the costs of production, transportation, and utilization of gas; on the other hand, it helps lower the sector's environmental footprint, enhancing its compatibility with emission reduction goals. The key technological trends of recent years are outlined below.

2.4.1. Expansion of LNG Infrastructure.

New technological solutions are accelerating the development of the LNG value chain. The rapid deployment of floating LNG production units (FLNG) and floating storage and regasification units (FSRUs) has enabled swift access to gas in regions lacking pipeline infrastructure. Between 2022 and 2025, several FSRU terminals were commissioned across Europe, made possible by standardized ship-based technologies and fast modular installation. On the production side, companies are adopting modular LNG plant designs — for example, U.S.-based Venture Global has relied on prefabricated assembly modules, significantly accelerating capacity ramp-up. As a result, in 2025 the United States brought online a record volume of new LNG capacity, with one facility (Plaquemines LNG) reaching 16.4 million tons of output less than a year after start-up. Additional large-scale projects are expected to come online in 2026–2027 (including Golden Pass LNG in the United States, new LNG trains in Qatar, and capacity expansions in Africa), equipped with the most advanced technologies in terms of efficiency and safety.

Technological shifts are most visibly reflected in the rapid expansion of LNG infrastructure worldwide. Exporting countries are investing heavily in new liquefaction plants, while importing countries are urgently constructing regasification terminals. As a result, recent events — particularly the European energy crisis — have triggered a genuine LNG boom. The European

Union, historically reliant on pipeline gas, managed within a record timeframe to deploy substantial new LNG import capacity (see Table 2).

Table 2. LNG Regasification Terminals Commissioned in Europe After 2021

Country	Terminal	Type	Start-up Year	Nominal Capacity (bcm/year)	Approx. Capacity (MTPA)
Germany	Wilhelmshaven (Höegh Esperanza)	FSRU	2022	~5.0	~3.7
Germany	Brunsbüttel (Höegh Gannet)	FSRU	2023	~8.0	~5.7
Germany	Lubmin / Deutsche Ostsee (FSRU Neptune)	FSRU	2023	~5.0	~3.7
Germany	Stade (Energos Force)	FSRU	2024	~5.0	~3.7
France	Le Havre (FSRU Cape Ann)	FSRU	2023	~5.0	~3.7
Italy	Piombino (FSRU Golar Tundra)	FSRU	2023	~5.0	~3.7
Italy	Ravenna (FSRU BW Singapore)	FSRU	2025	~5.0	~3.7
Finland	Inkoo (FSRU Excelerate Exemplar)	FSRU	2023	~6.0	~4.8
Greece	Alexandroupolis	FSRU	2024	~5.5	~4.0
Spain	El Musel (Gijón)	Onshore	2023	~7.0	~5.1
Netherlands	Eemshaven LNG	FSRU / FSU hub	2022	~8–10	~6–7.5

Source: GIIGNL

For example, Germany — which previously had no LNG terminals of its own — commissioned several FSRUs in less than two years in Wilhelmshaven and Brunsbüttel. Other EU countries — including the Netherlands, France, Italy, Greece, and Poland — have also expanded their regasification capacity, removing infrastructure bottlenecks that had previously constrained the replacement of pipeline gas. Europe’s rapid expansion of LNG regasification capacity after 2021 reflects a deliberate crisis-driven shift toward speed, flexibility, and risk management rather than long-term infrastructure lock-in. The bulk of new capacity—approximately 65–75 bcm per year—has been delivered through floating storage and regasification units (FSRUs), allowing governments to replace lost Russian pipeline gas within months rather than years. This approach minimizes upfront capital costs, preserves optionality in the context of decarbonisation and uncertain gas demand, and enables future decommissioning or redeployment if gas consumption declines. At the same time, the scale of the build-out has structurally strengthened Europe's ability to absorb global LNG flows, increased its exposure to spot and short-term markets (notably US LNG), and entrenched LNG as a central instrument of European energy security—even as policymakers continue to frame these assets as transitional and potentially temporary.

Among exporters — in North America, Qatar, East Africa, and Australia — a new generation of LNG liquefaction projects is being implemented, with increasing attention to efficiency and environmental performance. For example, Canada's LNG Canada project, scheduled to start operations in 2025, will use hydropower to supply the plant and is positioned as having one of the lowest carbon intensities among major LNG terminals — reportedly around 60% below the global average for emissions (Bland, 2025). Qatar, in launching the large-scale expansion of the North Field (North Field East and North Field South projects), is likewise integrating advanced emission-reduction technologies — from electrification of compressors (powered in part by solar energy) to the capture of CO_2 from process streams. The new Qatari LNG facilities will incorporate carbon capture and storage (CCS) systems designed to sequester up to 9 million tons of CO_2 per year by 2030. As a result, the technological benchmark for new LNG projects is rising: competitiveness is increasingly determined not only by production costs, but also by the "carbon footprint" of the product (QatarEnergy LNG, n.d.).

2.4.2. Low-Carbon Technologies and the Decarbonization of Gas.

In response to climate change challenges, the gas industry is implementing solutions to reduce greenhouse gas emissions across the entire value chain — from production and processing to end use. One of the key directions is carbon capture and storage (CCS). The primary technological response to the climate challenge lies in reducing the carbon footprint of gas through CCUS (carbon capture, utilization, and storage) and the development of low-carbon gaseous energy carriers. In 2025, the International Energy Agency (IEA) specifically highlighted the potential of deploying carbon capture technologies at all stages of the LNG value chain to curb emissions (Casey, 2025).

Several new LNG projects are already integrating CCUS. In particular, Qatar's North Field expansion implies capturing and reinjecting part of the CO_2 generated during processing — QatarEnergy is embedding CCS across all LNG expansion projects, targeting a capacity exceeding 11 million tons of CO_2 per year and reducing emissions by roughly one-quarter compared to similar facilities without CCS. This makes these projects among the least carbon-intensive globally (George, 2025). In parallel, Norway is developing large-scale CCS infrastructure (Northern Lights), led by state and corporate actors, creating a foundation for energy decarbonization and potential "blue LNG" supply chain models (Buli, 2025).

At the same time, the gas industry is investing in biomethane (produced from biomass waste) and "green" hydrogen, which can be blended with natural gas or transported through existing infrastructure. In Europe, policy programs support scaling up biomethane production for grid injection (in France, Germany, and other countries), while several states are discussing the feasibility of blending 5–20% hydrogen into gas pipelines (European Clean Hydrogen Alliance, 2025). Although these solutions remain far from replacing fossil gas at scale, technological improvements — including more efficient electrolyzers, lower-cost renewable electricity, and CO_2 methanation into synthetic methane — could make them a meaningful market segment by the 2030s (Casey, 2025).

Technologies aimed at reducing methane emissions — the primary component of natural gas and a potent greenhouse gas — have become a research and policy priority. Innovative detection and mitigation systems (such as advanced mobile sensors, drones equipped with infrared cameras, and satellites like GHGSat) now enable the identification of even small leaks that were previously undetectable (International Energy Agency, 2025e). One notable breakthrough has been the development of systems that capture flare gas and convert it into useful products (for example, experimental projects transforming flared methane into hydrogen and graphene). Overall, according to the IEA, between 2019 and 2024 the average methane intensity of oil and gas production declined by roughly 10% due to such measures (International Energy Agency, 2025e).

However, the mitigation potential remains far from exhausted. It is estimated that around 40% of current methane emissions in oil and gas production could be eliminated at no net cost to companies — through measures that effectively pay for themselves via the value of the captured gas (International Energy Agency, 2025e). Advances in gas capture equipment and improved operational practices (such as LDAR — leak detection and repair programs) are expected to expand significantly in the coming years, partly under regulatory pressure, as the EU, the United States, and other jurisdictions introduce stricter methane standards.

2.4.3. Digitalization and Innovation.

One of the “invisible” drivers of efficiency in the gas sector is digital transformation. Through artificial intelligence (AI), big data analytics, automation, and the Internet of Things (IoT), companies are increasing productivity while reducing costs and emissions. The large-scale adoption of AI is already affecting roughly half of energy enterprises: according to a DNV survey, nearly 50% of energy company executives plan to integrate AI solutions into operations within the next year (Genier, 2024).

In the oil and gas industry, this is reflected in the use of digital twins for fields and processing plants, predictive analytics for maintenance, and optimization of gas supply logistics. Saudi Aramco, for example, has launched its Integrated Gas Advanced Program, applying machine learning algorithms and big data analysis to enhance gas recovery rates and improve process energy efficiency. At Aramco’s gas facilities, drones and robotic systems are deployed for monitoring and inspection. At the Uthmaniyah gas processing plant, the use of drones reduced inspection time by 90% and improved emergency response speed by 5% (Aramco, n.d.). Such technologies not only lower operational expenditures but also reduce the risks of accidents and methane leaks, thereby contributing to environmental objectives.

Digitalization is also transforming gas trading. Electronic trading platforms are emerging where gas and LNG contracts can be concluded online using advanced hedging algorithms. Major gas hubs (TTF, JKM, Henry Hub, and others) are increasingly supported by derivatives markets and analytical services that allow market participants to manage price volatility risks more flexibly. In this context, technological modernization — from large-scale hardware infrastructure projects to “soft” innovations in digital systems and management practices — is becoming a critical condition for the long-term competitiveness of the gas industry in the decades ahead.

Technological improvements are taking place not only “at the wellhead,” but also on the demand side of the gas value chain. Modern gas turbines for power generation now achieve efficiencies exceeding 60%, while new models are being developed that can operate both on natural gas and hydrogen — so-called hydrogen-ready turbines — extending their economic lifespan under a future hydrogen transition. In the residential and commercial sectors, high-efficiency condensing boilers with efficiencies of around 95% are becoming widespread, alongside smart heating systems that optimize gas consumption without compromising comfort. These technologies contribute to lower fuel use and reduced emissions while maintaining reliability. In transport, the fleet of LNG-fueled vehicles and vessels is expanding. In maritime shipping, a growing number of large vessels — including tankers and container ships — are switching to LNG as fuel to reduce sulfur and CO_2 emissions. According to Shell’s projections, demand for LNG as a marine fuel could reach 16 million tons per year by 2030. The use of gas in heavy-duty road transport is also stimulating the development of lighter and more energy-dense cryogenic fuel systems, improving vehicle range and performance (Shell, 2025, p. 6).

2.5.Conclusions

The outcomes of 2025 confirm that the global gas and LNG market has entered a phase of structural rather than cyclical transformation (Table 3). The slowdown in demand growth, combined with persistently high price volatility, signals a shift from a logic of market expansion to one centered on risk management and resilience. Gas and LNG are no longer perceived solely as “transition fuels,” but are increasingly embedded in the architecture of national energy security — particularly amid geopolitical instability and the fragmentation of global markets. For exporters, this implies a strategic shift away from simply maximizing volumes toward ensuring reliability, predictability, and the political neutrality of supply.

Table 3. 2025: What Has Fundamentally Changed?

Before (pre-2022)	**By 2025**

Gas as a *bridge fuel*	Gas as a pillar of energy security
Europe as a demand-driven market	Europe as a stabilization market
Asia as the unquestioned growth driver	Asia as highly price-sensitive
LNG as a supplement	LNG as the backbone of supply
Environment as a important, but relative issue	Environment as a condition for market access

Source: author's assessments

The regional dynamics observed in 2025 further reinforce market differentiation. Europe has consolidated its position as an energy security market, where LNG demand is shaped less by purely economic considerations and more by strategic and regulatory factors, including climate policy. Asia, by contrast, remains the principal anchor of long-term demand, yet it demonstrates high sensitivity to price levels and macroeconomic conditions, as well as growing elements of energy import securitization. In this context, long-term contractual arrangements — particularly with Asian consumers — remain the primary instrument for LNG exporters to mitigate risk and underpin investment stability.

The competitiveness of LNG producers is increasingly determined not by price alone, but by a combination of factors — life-cycle cost efficiency, environmental performance, logistical reliability, and resilience to geopolitical shocks. The tightening of climate regulation in the EU and the United States has transformed the environmental dimension from an optional attribute into a prerequisite for market access, thereby amplifying the importance of investments in methane abatement, CCUS deployment, and transparent carbon reporting.

Taken together, the outcomes of 2025 (Table 4) suggest that over the next 10–15 years the global market will continue to require stable LNG supplies to replace more carbon-intensive fuels and ensure the energy security of importing countries. Maximizing benefits during this period will require a proactive rather than reactive strategy — strengthening long-term contracts, maintaining a selective yet strategic presence in the European market, positioning the LNG industry as a benchmark of reliability and low-carbon performance, and integrating maritime security and geopolitical resilience into broader national energy policy frameworks.

Table 4. Outcomes of 2025 for the Global Gas and LNG Market

Dimension	Key Outcomes in 2025	Strategic Significance
Global gas demand	Growth resumed but slowed (<2%); Europe – weather-driven volatility; Asia – weaker than expected	Gas is no longer a high-growth market but retains a systemic role
LNG vs. pipeline gas	LNG definitively became the main market-balancing instrument	LNG is a structural pillar of energy security

Europe	Record LNG imports, but a strategic course toward reducing gas consumption	Europe is a security-driven market, not a long-term growth engine
Asia	Long-term demand remains, but high price sensitivity	Asia remains the key market through 2040
United States	Consolidated position as the largest LNG exporter; high supply flexibility	Intensified competition and increased market liquidity
Prices and volatility	Persistent volatility, strong sensitivity to geopolitics	Energy as a factor of national security
Climate policy	Stricter methane and emissions regulations in the EU and U.S.	Environment as a condition for market access
Technology	Rapid LNG capacity additions, CCUS deployment, digitalization	Technology as a competitiveness driver
Geopolitics	Securitization of energy, rising importance of reliability	Energy as a geopolitical asset
Maritime security	Hormuz and Bab el-Mandeb remain systemic risks	Transit routes as structural vulnerabilities

Source: author's assessment

Under these circumstances, new strategic gas outlooks are increasingly diverging depending on energy transition scenarios. Under more "inertial" trajectories, gas consumption could remain elevated well into mid-century. For example, according to BP's updated Current Trajectory scenario, global gas demand could reach around 4,806 bcm per year by 2050 — only slightly below current levels and even higher than the previous year's estimates. This scenario implies that global carbon neutrality targets will not be fully achieved by 2050 (i.e., the world would not remain on a +2°C pathway) (Almeida, 2025). By contrast, in accelerated decarbonization scenarios — such as the IEA's Net Zero scenario or BP's Below 2°C pathway — global gas demand is expected to plateau already in the 2020s and then decline significantly by 2040–2050. In such a context, the role of gas would transform: from a fuel supporting economic growth to a transitional energy source and feedstock for hydrogen production.

Notably, BP observes that a slowdown in the pace of transition is already visible: geopolitical shocks (Ukraine, Middle East conflicts) and rising protectionism (trade tariffs) have pushed energy security to the forefront of national policy agendas, at times taking precedence over climate objectives (Almeida, 2025). Many countries are now seeking to expand domestic energy production (including gas) or secure long-term supplies from reliable partners, even if this complicates the achievement of stringent climate targets. For Gulf gas exporters, this creates a 10–15 year "window of opportunity." The global market continues to require their gas to substitute more carbon-intensive fuels (coal and oil) and to ensure the energy security of importing countries. At the same time, tightening environmental standards necessitate an evolution of gas export strategies — incorporating ESG principles and potentially offering "low-carbon" or emissions-compensated gas to maintain competitiveness in an increasingly regulated global marketplace.

3. Global Challenges and Opportunities for the Gas and LNG Sector: Outlook to 2028, 2035, and 2050

As demonstrated in the previous chapter, the global natural gas and liquefied natural gas (LNG) market is entering a decisive phase, characterized by the simultaneous growth of demand and large-scale efforts toward energy transition. This underscores the dual role of gas: on the one hand, it remains a critical resource for ensuring energy security and supporting economic growth; on the other hand, it faces mounting pressure from the climate agenda and decarbonization requirements.

This chapter examines the key global trends, challenges, and opportunities facing the gas and LNG sector as of early 2026, with projections across three time horizons: short term (to 2028), medium term (to 2035), and long term (to 2050). The analysis focuses on global demand and supply dynamics, technological advancements, geopolitical factors, and environmental and climate constraints. Particular attention is devoted to the rapid expansion of data centers and the implications of their rising electricity consumption for natural gas and LNG markets.

3.1. Global Gas and LNG Market Trends Shaping Development After 2025

Global demand for natural gas in the coming years is expected to remain resilient, although its geographical structure is shifting. Developing countries in Asia, Africa, and the Middle East are emerging as the primary drivers of consumption growth, while in Europe demand is stagnating or declining due to climate policies and structural industrial changes. The global population continues to expand (projected to grow by approximately 1.8 billion people by 2050, mainly in Africa and South Asia), and urbanization is intensifying energy needs, particularly electricity demand in urban centers (PetroEdge Asia, 2025). In this context, natural gas is viewed as an accessible and relatively clean fuel for electricity generation, heating, and industry — especially in regions where it can replace coal and biomass, thereby improving environmental conditions. For example, in parts of South Asia, programs promoting the transition from traditional fuels (firewood, coal) to gas for cooking and heating not only improve living standards but also reduce local air pollution. At the same time, several Middle Eastern countries (such as Saudi Arabia) are shifting power generation from oil products to gas, freeing up crude oil for export (International Energy Agency, 2025, October 27).

In Europe and, to some extent, East Asia, gas demand is being constrained. The EU has committed to a “green transition,” aiming to reduce fossil fuel consumption in line with climate and energy security goals. Improvements in energy efficiency, the expansion of renewables, and partial deindustrialization (the relocation of energy-intensive industries outside Europe) suggest that

Europe will likely remain the only major region where gas consumption by 2030 and beyond stays below 2020s levels (PetroEdge Asia, 2025). In countries such as Japan and the Republic of Korea, plans also envisage a gradual reduction in the role of gas in power generation after 2030, as hydrogen, ammonia, and renewables gain ground. Nevertheless, even in advanced economies, gas is expected to retain a significant role for an extended period as a balancing fuel for power systems and as feedstock for the chemical industry.

Forecasts diverge regarding when global gas demand will reach its peak. According to baseline scenarios from industry analysts and exporters, global natural gas consumption could continue rising through 2050 without a clearly defined peak. Some projections anticipate a 32% increase in global gas demand by 2050 compared to today, with growth in all regions except Europe (PetroEdge Asia, 2025). By contrast, more climate-aligned outlooks suggest that global demand may plateau in the 2040s (O'Connor, 2024). In such cases, declining gas use in power generation (due to renewables expansion) would be partially offset by continued demand in the chemical and industrial sectors, where substitution is more difficult. Moreover, as new LNG capacities come online and prices moderate, demand could receive renewed momentum.

In this context, one of the key drivers of market transformation is the rapid expansion of liquefied natural gas (LNG) trade. The share of LNG in global gas trade continues to rise, providing importers with greater flexibility in supplier choice. In 2024, global LNG trade reached approximately 407 million tons (around 560 bcm), although year-on-year growth was minimal due to limited new supply (Shell plc., 2025). However, a genuine "wave" of new LNG projects lies ahead. According to the International Energy Agency (IEA), by 2030 total global LNG export capacity is expected to expand by roughly 300 bcm per year — a record increase driven primarily by projects in the United States and Qatar (International Energy Agency, 2025, October 27). In 2025 alone, more than 80 bcm of new LNG capacity was formally sanctioned in the United States — an unprecedented volume reflecting strong investor confidence in long-term demand. Overall, the projected global LNG expansion could increase available supply by around 50% by 2030, strengthening energy security and moderating prices compared to the 2022 peak levels (Twidale, 2025).

With the commissioning of new LNG plants in North America, the Middle East, and Africa, price pressures are expected to ease. As the market becomes better supplied, global gas prices may decline relative to the crisis levels of 2021–2023, offering relief to importers. The IEA notes that, absent major disruptions, supply growth of approximately 250 bcm per year by 2030 (net of project retirements) could outpace demand growth, creating a more buyer-friendly market toward the end of the decade. Under the IEA's baseline scenario, global gas demand is projected to grow by around 1.5% annually in 2024–2030 (adding roughly 380 bcm in annual terms), with about half of this increase coming from the Asia-Pacific region (primarily China, India, and Southeast Asia), and roughly 30% from the Middle East (International Energy Agency, 2025, October 27).

However, if new capacity leads to a sharper decline in prices, demand growth could accelerate to around 1.7% annually, adding up to an additional 65 bcm per year above the baseline by 2030. In such a “high-demand” scenario, the market could tighten again after 2030, as excessively low prices in the late 2020s may discourage investment in new projects, potentially creating future supply gaps. Maintaining a balance between affordable gas for consumers and sufficient investment incentives for producers will become a delicate challenge for the industry (International Energy Agency, 2025, October 27).

The expansion of LNG trade is also accompanied by evolving contractual structures. Traditionally, LNG deliveries were governed by long-term contracts with strict destination clauses. By 2030, however, more than half of global LNG volumes are expected to be traded under flexible contracts without rigid destination restrictions. The growth of spot and short-term trading enhances market liquidity and adaptability: LNG cargoes can be redirected quickly to regions with the highest demand or prices, mitigating localized shortages. For importers — particularly in Europe and South Asia — this means greater diversification of supply sources, while for exporters it implies increased exposure to spot price volatility and competition under more flexible commercial terms (International Energy Agency, 2025, October 27).

Beyond the United States and Qatar — which are leading the expansion of LNG supply — new exporters are entering the market. Canada is preparing to launch its first large-scale LNG terminal on the Pacific coast (LNG Canada) in 2026. Mozambique, after prolonged delays, has begun exports from a small floating LNG facility and is preparing large-scale onshore projects for the late 2020s. Senegal and Mauritania are developing offshore gas fields, while in the Eastern Mediterranean (Israel, Cyprus, Egypt) various export options are under consideration, although regional instability and investment risks remain constraining factors.

At the same time, some traditional exporters may face challenges in maintaining volumes. Field depletion and rising domestic consumption could reduce the export potential of countries such as Indonesia, Malaysia, Algeria, and Egypt by 2040, creating space for new suppliers. This implies that even maintaining current export levels over the long term will require substantial investment in upstream production and infrastructure (Shell plc., 2025).

The gas market in the 2020s has experienced sharp price fluctuations — from record lows in 2020 to crisis-level highs in 2022. Volatility is likely to remain a defining feature, particularly during the transition period. Short-term factors — such as winter severity, storage levels, or supply disruptions (for example, outages at LNG plants or pipelines) — can temporarily drive prices upward even within an overall softening trend. High gas prices are especially painful for importers: in 2022–2023, several developing Asian countries were forced to reduce LNG purchases due to affordability constraints, switching back to coal or biomass with negative environmental consequences.

Ensuring price affordability and predictability therefore remains an important objective of international energy cooperation. As LNG becomes increasingly priced against market hubs (such as TTF, Henry Hub, and JKM), gas pricing formulas are moving further away from oil indexation. This strengthens the correlation between gas prices and actual supply-demand balances in the gas market itself. For importing countries, developing hedging mechanisms and maintaining strategic reserves can help smooth price spikes, while exporters remain interested in long-term contracts that provide revenue stability and investment predictability (International Energy Agency, 2025, October 27).

3.2. Geopolitical Factors

Geopolitics will continue to play a decisive role in shaping gas and LNG markets, with effects that are not exclusively negative. In a geopolitically unstable environment, importing countries increasingly seek long-term contracts with reliable suppliers. China, drawing lessons from spot market volatility, signed record LNG contracts in 2022–2023 for up to 27 years with Qatar, the United States, and other exporters. Such agreements enhance energy security for importers while guaranteeing stable offtake for exporters, thereby reducing investment risk (Mills & El Dahan, 2023).

Geopolitics also influences pricing mechanisms. Traditionally, many exporters relied on oil-indexed pricing formulas, which suited Asian buyers during periods of relative stability. However, the 2022 crisis demonstrated that rigid indexation — whether to high oil prices or volatile spot benchmarks — could become burdensome for importers. After 2022, several Asian buyers (including Bangladesh and Pakistan) were forced to request preferential terms from Qatar, as market LNG prices exceeded their purchasing capacity (El Dahan & Paul, 2023, May 30; Shahid, 2025, November 4). In response, new contract models are emerging: indexation to gas benchmarks (such as JKM — Japan-Korea Marker) or hybrid pricing formulas (Pande & Yeo, 2025). China and India are also developing their own gas trading hubs to reduce dependence on Western benchmarks (Twidale, 2026). In Europe, debates periodically arise about reforming the TTF pricing mechanism, which proved highly volatile during the speculative phase following 2022 (Twidale et al., 2022). Pricing diplomacy is becoming part of broader strategic arrangements: Gulf states increasingly combine upstream investment opportunities with guaranteed long-term supply commitments under mutually acceptable pricing formulas (for example, Chinese participation in Qatar's North Field East project tied to long-term LNG deliveries to China).

As traditional markets evolve, gas exporters are increasingly turning toward Africa and South Asia — regions with low gas penetration and rapidly growing electricity demand. In these areas, gas is viewed not only as an energy source but also as a tool to address energy poverty and replace biomass. Russia, having lost a significant portion of its European market, is seeking to strengthen its presence in South Asia and has substantially expanded its role in China. In early September 2025, Moscow and Beijing signed several documents to boost Russian oil and gas exports to China and strengthen cooperation in liquefied natural gas (LNG). These deals can alter the balance of power in Asian energy markets, directly affecting Gulf Cooperation Council (GCC) countries that rely on Asia as a key export region.

In 2025, Gazprom and CNPC agreed to launch the Power of Siberia-2 (PoS-2) pipeline, designed to deliver up to 50 billion cubic meters (bcm) of gas annually to China. Although no firm timeline is set, PoS-2 is expected online after 2030–31. Russia and China also decided to expand flows through existing pipelines: by 2028, Power of Siberia-1's capacity will rise from 38 to 44 bcm, and the "Far Eastern" route (to be put online in 2027) from 10 to 12 bcm. Russia likewise plans to ramp up LNG exports to China via the new Arctic LNG-2 project and the existing Sakhalin-2 plant. Despite sanctions, China received its first Arctic LNG-2 cargo in late August 2025 (with several more by the end of September), becoming the sole major buyer of this sanctioned gas and effectively keeping the project alive (Shah, 2025).

Russian hydrocarbons offer notable advantages for Beijing: coming at steep discounts (offsetting sanctions-related risks) they are closer to China geographically and, in some respects, less risky import than Iran's sanctioned oil. However, China's choice to deepen energy ties with Russia is driven more by geopolitics than economics. Thus, some estimates suggest China's already existing gas contracts will cover almost all its import needs in the short- and mid-run (until the mid/late 2030s), potentially making projects like PoS-2 and other Russia's supply expansions of little immediate importance to Beijing (Downs, Losz, & Mitrova, 2024). Yet there are caveats. On the one hand, China takes into account the increased regional risks in the Middle East: according to some media, the growth of Beijing's interest in the PoS-2 was caused by the Iran–Israel war. Concerns arose in China regarding the reliability of energy supplies from the Gulf states (Kantchev & Wei, 2025). In this regard, Beijing decided to consider alternative supply options, a step that fits into its overall strategy of minimizing external risks to its own energy security and diversifying supply sources. On the other hand, an economic confrontation is unfolding between the US and China, where Beijing seeks to be less dependent on hydrocarbon supplies from countries close to the US, and China is also actively reducing imports of oil and gas resources from the United States themselves. In this regard, the risk hedging is naturally achieved through the increase in oil and gas supplies from Russia.

On the gas market, the potential strengthening of Russia may also affect the interests of the GCC countries and, above all, Qatar. The Russia–China agreements mean that China will increase imports of Russian gas through pipelines, potentially reducing the need for LNG. The smaller growth in China's demand for LNG is already reflected in forecasts: according to the IEA, China's LNG imports in 2025 may even slightly decrease due to increased domestic production and pipeline supplies (Nakano & Palti-Guzman, 2025).

No doubts that Qatar's positions at the Chinese market are stronger than that of the other LNG suppliers. In 2022, Qatar managed to conclude a record 27-year contract for the supply of 4 million tons of LNG per year with China's Sinopec, and in 2023 – similar deals with CNPC. These agreements are intended to secure Qatari gas in China's energy balance until the 2050s. Yet, the potential for increasing Qatar's spot deliveries to China might appear somewhat limited as a result of increased Russia's exports. Moreover, by the end of the decade, cheap Russian pipeline gas will restrain prices for LNG from the Gulf in China. In addition to that, if PoS-2 is put into operation around 2030, Russia will be able to export more than 100 bcm of gas per year to China in total, which is comparable to one fifth of China's forecasted gas demand by 2030 (Nakano & Palti-Guzman, 2025). Under such conditions, the role of LNG in the Chinese market may become auxiliary, since the share of pipeline gas imported from Russia and other directions will exceed the share of imported liquefied gas. This is a direct challenge for Qatar (as well as other LNG exporters), which plans to almost double its own LNG production in the coming years and intends to push a significant part of the new volumes to Asia.

3.3. Environmental and Climate Factors

Alongside geopolitics, the environmental agenda is becoming decisive for the future of gas. As a fossil fuel, natural gas is inevitably subject to increasingly strict constraints. However, its comparatively lower CO_2 emissions (around half those of coal) and the technical potential to reduce methane leakage provide gas with an opportunity to remain relevant during the transition period.

Meeting the goals of the Paris Agreement (limiting global warming to 1.5–2°C) requires near-complete decarbonization of the energy system by mid-century. For the gas sector, this implies a significant reduction in unabated gas combustion by 2050, except where carbon capture is applied. Alternative scenarios — such as the IEA's Stated Policies Scenario or reference cases by McKinsey — are less stringent, allowing for continued growth or only gradual decline in gas demand into the 2040s, particularly in countries where climate commitments are only partially implemented. For example, the IEA's 2025 current policies outlook suggests that gas demand could continue growing through 2050 without reaching an early peak (Twidale, 2025). This divergence between ambitious decarbonization pathways and "business-as-usual" scenarios creates substantial strategic risks: if global climate action accelerates, many gas infrastructure projects could face underutilization — so-called "stranded carbon assets." Conversely, insufficient climate action could result in severe long-term environmental consequences (Twidale, 2025).

At the same time, the IEA emphasizes that more than 75% of current methane emissions from oil and gas operations can be reduced using existing technologies at relatively low cost — in many cases approaching near-zero emissions (International Energy Agency, 2024b). The Global Methane Pledge, endorsed by dozens of countries, aims to reduce global methane emissions by 30% by 2030 compared to 2020 levels. The EU is preparing regulations requiring energy importers to provide data on methane emissions across the entire supply chain. In 2024, the European Parliament approved a methane regulation banning routine flaring and mandating strict leak monitoring within the EU, while also considering measures targeting imported gas with high emission intensity (European Commission, 2025). For gas producers, this is a clear signal:

investments in methane monitoring equipment, compressor upgrades, and personnel training are not only environmental measures but also conditions for maintaining market access. Many companies have joined initiatives such as the Oil & Gas Methane Partnership 2.0 to enhance transparency. Addressing methane emissions can significantly improve the carbon profile of natural gas and strengthen its status as a transitional fuel (Oil & Gas Methane Partnership, n.d.).

An increasing number of countries are introducing carbon pricing mechanisms (taxes or emissions trading systems). From 2026 onward, the EU will gradually implement the Carbon Border Adjustment Mechanism (CBAM) on imports of carbon-intensive goods. While natural gas itself is not directly covered, electricity and fertilizers are, indirectly affecting the attractiveness of gas if associated emissions remain high. Major LNG markets — the EU, China, the Republic of Korea, and Japan — have announced carbon neutrality targets for 2050–2060. This implies that new gas-fired power plants or heating systems in these regions must either be CCUS-ready, capable of switching to hydrogen or biomethane, or face early retirement before 2050. These pressures are driving innovation: from electrification of LNG plant processes using renewable energy to the marketing of "carbon-neutral LNG" through offsets, though standards for such certifications remain heterogeneous. By 2030, carbon standards and full supply-chain emissions tracking ("from well to burner tip") may become industry norms, redistributing competitive advantages toward low-methane and low-carbon projects, while high-emission gas risks exclusion from premium markets without decarbonization investments (International Energy Agency, 2023).

In the broader context of the global energy transition, natural gas is often described as a "bridge" from coal to cleaner energy. However, exporting countries increasingly argue that gas is not merely a temporary bridge but a structural component of the future energy system (PetroEdge Asia, 2025). When deployed effectively, gas can complement renewable energy by providing reliability and flexibility. Gas-fired plants can act as backup capacity during periods of low solar or wind output, ramping up quickly to stabilize grids. In developing economies, gas enables reductions in energy intensity and improvements in environmental quality without undermining economic growth — unlike some higher-cost renewable solutions deployed prematurely. Moreover, gas serves as feedstock for hydrogen, ammonia, and other energy carriers that are likely to be central in a low-carbon economy.

Ultimately, however, the decisive factor will be the integration of clean technologies. Without CCUS deployment and effective methane control, the role of gas could decline sharply by mid-century. With them, gas may remain part of the solution rather than becoming part of the problem (PetroEdge Asia, 2025).

3.4. Technological Advances and Innovation

Technological shifts are simultaneously expanding the potential uses of natural gas and reducing its carbon footprint — a critical factor for the sector's long-term future. By 2026, several key technological trends have clearly emerged.

First, carbon capture, utilization, and storage (CCUS) technologies are gaining momentum as a central pathway for decarbonizing natural gas use. By 2030, the global portfolio of CO_2 capture projects could exceed 500 million tons per year (International Gas Union, 2025). Large-scale deployment of CCUS has the potential to significantly reduce the carbon intensity of gas, enabling it to remain compatible with low-carbon energy systems. However, important barriers persist: high capital costs, the need to develop CO_2 transport and storage infrastructure, and the requirement for strong policy incentives (carbon pricing or tax credits). Political support is nevertheless increasing, with more countries — including the United States and the EU — integrating CCUS into national energy and climate strategies (International Energy Agency, 2025, October 27).

Second, low-carbon hydrogen is likely to play a significant role in the future energy landscape. Technologies for producing hydrogen from natural gas with carbon capture ("blue" hydrogen) and via electrolysis powered by renewables ("green" hydrogen) are advancing rapidly. For the gas industry, hydrogen presents two strategic opportunities: (1) as a new demand market — a portion of natural gas production could be redirected toward hydrogen production for use in transport, industry, and energy storage; and (2) as a demand-risk mitigation tool — hydrogen can substitute for direct gas combustion, particularly in hard-to-abate sectors such as steel, cement, and aviation. In the medium term, blue hydrogen appears more economically viable, especially where carbon pricing and CCS infrastructure are in place, potentially making it competitive with conventional hydrogen. In the longer term, falling renewable energy costs may increase the share of green hydrogen. However, the development of a hydrogen economy will require substantial infrastructure upgrades (pipelines, storage facilities) and internationally harmonized standards — including carbon footprint certification — which may themselves pose significant barriers.

Third, improvements in efficiency and digitalization continue to shape the industry. The gas sector is leveraging digital technologies (big data analytics, artificial intelligence) to enhance efficiency in production, transport, and processing. Machine learning algorithms are already being applied to optimize well performance, enable predictive maintenance of compressor stations, and improve tanker route planning.

Technological responses are also emerging in reaction to geopolitical challenges. As previously noted, following the reduction of Russian pipeline gas flows to Europe in 2022, the EU rapidly deployed floating storage and regasification units (FSRUs), allowing for swift expansion of LNG import capacity. Floating LNG (FLNG) technology enables the development of remote offshore fields without extensive onshore infrastructure. Small-scale LNG projects are also being deployed to supply island states and remote regions. In addition, LNG use as a transport fuel continues to expand (Shell plc., 2025).

At the same time, in transport and heating, natural gas faces partial substitution by electricity and biogas. Improvements in insulation, heat pump deployment, and the rise of electric vehicles are likely to reduce future gas demand, particularly in urban areas of advanced economies. However, in heavy transport segments — including maritime shipping and long-haul trucking — LNG and compressed natural gas (CNG) are expected to remain important transitional fuels in the coming years, offering lower CO_2 and pollutant emissions compared to fuel oil and diesel.

At the same time, emerging technologies that are only beginning to take shape may have a profound impact on the sector's future. Foremost among these is the rapid expansion of data centers and their growing influence on gas demand as an independent structural factor. Data centers already account for a noticeable share of global electricity consumption, and their appetite for energy is expected to increase further — indirectly affecting gas markets through the power sector.

As of early 2025, data centers are estimated to consume around 1.5% of global electricity, with this share projected to rise to approximately 1.7% by 2025–2026. Particularly energy-intensive are facilities dedicated to artificial intelligence (AI) workloads: a single large AI-focused data center can consume as much electricity as a city of 100,000 residents (International Gas Union, 2025). Globally, electricity demand from the IT sector (servers, storage, networks) is growing by 10–30% annually. Although improvements in hardware efficiency partially offset this growth, absolute electricity consumption continues to rise. Rystad Energy projects that in the United States alone, total installed data center capacity could reach roughly 73 GW by 2035, equivalent to around 650 TWh of annual electricity consumption under typical utilization. A similar boom is underway in Asia (China, India, Southeast Asia) and Europe. This additional load on power systems has become a structural driver of electricity demand, comparable in scale to transport electrification or industrial expansion (International Gas Union, 2025).

Importantly, data centers generate continuous rather than cyclical electricity demand. Their defining feature is a 24/7 load profile and the critical importance of reliable power supply: outages are unacceptable due to the substantial financial losses they entail. During peak demand periods and extreme heat events (when cooling loads increase), data centers can create significant localized stress on power grids. For energy systems, this implies the need for adequate dispatchable reserve capacity. In this context, natural gas plays a crucial role as a flexible generation source: gas-fired power plants can ramp up output rapidly in response to surging loads from data centers. The rapid expansion of AI-driven facilities has already strained grids in some regions, compelling system operators to rely on flexible and reliable generation sources — primarily gas-fired plants — to stabilize operations (International Gas Union, 2025).

As the share of renewables in electricity generation increases, gas provides backup capacity during periods of low wind or solar output — an especially important function given the uninterrupted power requirements of data centers. In effect, gas is becoming a form of "insurance" for the digital economy, supporting grid stability for energy-intensive server infrastructure. Reports by the IEA and GECF highlight the rapid diffusion of AI and the expansion of data centers as a new driver of electricity demand and, indirectly, natural gas demand for power generation. The IEA projects that rising electricity consumption from data centers and AI technologies will contribute to increased gas demand in the power sector in many countries, particularly under current policy scenarios (Twidale, 2025).

An emerging and notable trend is the search for autonomous power solutions by data center operators themselves. In several cases, on-site electricity generation — the so-called *behind-the-meter* approach — is being considered in order to reduce dependence on the central grid. For example, in parts of Australia where large data centers are planned, proposals include building dedicated local power plants combining on-site renewables (solar panels, small wind turbines) with backup gas turbines. In the United States, some major data center operators are exploring the installation of mobile gas turbines or natural gas–fired combined heat and power (CHP) units, and in the longer term even small modular nuclear reactors (SMRs) directly at data center sites (International Gas Union, 2025).

While only a limited number of such projects have been implemented so far, the interest itself is indicative. Gas microturbines can provide reliable base or backup power with relatively lower emissions compared to diesel generators. Most data centers, however, remain grid-connected and rely primarily on centralized generation. Traditionally, diesel generators have been the standard for emergency backup. Yet decarbonization goals are pushing operators to consider cleaner alternatives — including gas-fired generators or gas-based fuel cells — as more environmentally acceptable backup solutions.

The information technology sector is also attempting to mitigate its carbon footprint. Leading data center operators (Google, Microsoft, Amazon, among others) have committed to sourcing 100% renewable electricity for their facilities. Many new data centers are being located in colder climates (Scandinavia, Canada) to reduce cooling costs and near abundant sources of clean energy (hydropower, renewables). Nonetheless, at the global level, data centers will remain partially dependent on fossil-based generation for years to come, particularly during evening and nighttime hours when renewable output declines. Their continuous 24/7 demand profile inherently supports baseline fossil fuel generation.

Moreover, rising data center loads reduce spare grid capacity and complicate the integration of intermittent renewables. Grid operators increasingly warn that the rapid expansion of data centers presents challenges to system stability (International Gas Union, 2025). One solution may involve situating computing capacity closer to abundant clean energy sources — Iceland, for instance, attracts data centers due to its geothermal and hydropower resources. However, the largest facilities continue to be built where digital demand and infrastructure are concentrated (the United States, Europe, Asia), intensifying concerns about reliable energy supply.

In this context, electricity demand from the digital sector is indirectly supporting natural gas demand in power generation. Analysts note that in the United States, gas-fired generation is already increasing to meet new data center loads. As artificial intelligence, immersive digital platforms, autonomous transport systems, and other computation-intensive applications expand, the impact of data centers on energy systems — and indirectly on gas markets — is likely to grow significantly in the coming decades (International Gas Union, 2025).

3.5. Short-Term Outlook to 2028

In the short-term perspective (2026–2028), the global gas market is expected to move from the extreme tightness observed in 2022–2023 toward a period of relative easing. By 2028, the majority of LNG projects currently under construction will be commissioned: new volumes from the United States, Qatar, Australia, Canada, Russia (Far East projects), and potentially Mozambique could collectively add hundreds of billions of cubic meters of export capacity. For the first time in many years, this may create seasonal oversupply — particularly during summer months — contributing to price stabilization. Importers will be able to refill storage without panic buying, and competition for buyers is likely to intensify (Casey, 2025).

Futures curves and analyst projections suggest that a probable price range in Europe may settle around $10–20 per MMBtu in normal years (compared to the extreme $60 per MMBtu recorded in late 2022), with Asian prices moving within a similar range (Chow & Saba, 2026; Patterson, 2025). Lower and more stable prices are likely to stimulate deferred demand: South Asian countries that withdrew from the LNG market during the price spike may return, and industrial gasification projects could resume. The IEA forecasts global gas demand growth of around 1% annually over the next several years (Casey, 2025). While modest compared to earlier decades, this still represents growth, driven primarily by new power plants and industrial users in Asia and the Middle East.

A short-term challenge for Europe remains the replacement of residual Russian imports (Shell plc., 2025). European regasification capacity now comfortably exceeds projected winter needs, even under scenarios of reduced pipeline flows from Algeria or Norway. At the same time, European gas demand is unlikely to return to pre-crisis levels. High prices have accelerated structural changes: energy efficiency measures, heat pump deployment, and partial fuel switching in industry. For the global market, this implies that Europe in "normal" years will import somewhat less LNG than during the 2022–2023 peak, potentially ceding its position as the largest LNG importer to China. However, Europe will remain a premium market — effectively the buyer of last resort. In times of tight supply, European buyers are willing to outbid Asian counterparts, as demonstrated in 2022. This willingness is driven by the critical importance of gas for winter heating and the limited short-term alternatives (coal and nuclear capacity reductions, and insufficient renewable output during winter months). Consequently, European price benchmarks will continue to serve as global reference points.

In Asia, short-term demand growth will concentrate in China, India, and developing ASEAN economies. After a weak 2022, China has resumed LNG import growth, motivated by both economic recovery and air quality improvements through coal-to-gas switching. By 2028, Chinese gas imports are expected to continue rising, albeit at a more moderate pace due to slower economic growth. India may expand its regasification capacity and increase LNG imports by an additional 30–50% by 2028, particularly if abundant LNG supply keeps prices attractive (Shell plc., 2025). Several Southeast Asian countries — including Thailand, Bangladesh, Vietnam, and the Philippines — will also contribute to incremental demand as they commission new LNG terminals and secure long-term contracts. Many of these countries view gas as a transitional fuel: for example, Vietnam's updated power strategy envisages several gigawatts of new gas-fired capacity by the end of the decade to reduce coal dependence. Pakistan and Bangladesh, which were heavily affected by high LNG prices, are securing long-term contracts (with Qatar and Oman LNG) to ensure supply stability and may re-enter the spot market if prices moderate. Japan and South Korea are expected to maintain relatively stable demand in the short term: despite long-term ambitions to reduce gas use through hydrogen, ammonia, and renewables, delays in nuclear restarts and renewable deployment mean that substantial LNG imports for power generation will continue through the late 2020s.

By 2028, the United States is expected to firmly consolidate its position as the world's largest LNG exporter. The commissioning of projects along the U.S. Gulf Coast — including Corpus Christi Stage III, Driftwood LNG, Plaquemines LNG, and others — could lift U.S. export capacity to more than 150 bcm per year (International Energy Agency, 2025b). The United States benefits from structurally low domestic gas prices, supported by sustained shale production. Qatar is also set to complete the North Field expansion by 2027–2028, adding approximately 45 bcm per year of additional export capacity. Meanwhile, the first cargoes from new African projects — particularly in Mozambique (and potentially Tanzania, depending on final investment decisions around 2023) — may enter the market in 2026–2028. Russia remains a factor of uncertainty: LNG projects such as Arctic LNG-2 and Far Eastern initiatives face delays due to sanctions. However, Russian gas exports may partially shift toward increased pipeline deliveries to China. Overall, competition among exporters will intensify. For the first time, the three leading LNG suppliers — the United States, Qatar, and Australia — will compete on nearly equal footing for global market share. This rivalry may manifest in pricing strategies and greater contractual flexibility, benefiting importers through improved negotiating leverage.

In the short term, the global impact of data centers on total gas demand remains relatively modest (a fraction of global electricity generation). However, localized effects are already visible. In some regions, the commissioning of large data centers has required utilities to build additional gas-fired capacity or reinforce grid infrastructure. Between 2026 and 2028, electricity demand from data centers is expected to grow by roughly 10–15% annually (International Gas Union, 2025). This trend is particularly pronounced in the United States (where major technology campuses are concentrated) and China.

At the federal level in the United States, there are currently no restrictions on energy consumption by data centers; in fact, several states actively compete to attract investment by promising reliable power supply. Under an administration supportive of technological expansion, continued rapid construction of data centers is likely, alongside a favorable stance toward gas as a reliable energy source. By 2026, annual global investment in data centers may exceed $580 billion — more than $40 billion higher than global upstream oil investment (Twidale, 2025). This highlights the scale of the digital sector: it has become as capital-intensive as the traditional oil and gas industry, and ensuring its energy supply is emerging as a strategic priority.

Until 2028, most additional data center demand will be absorbed by existing grids and generation capacity, albeit near operational limits. In specific hubs — such as Silicon Valley in California or Northern Virginia — electricity loads may approach supply constraints, requiring the activation or construction of reserve gas-fired plants to prevent outages.

Risks through 2028 include geopolitical and climate-related disruptions. Escalation of conflicts in the Middle East or new sanctions could affect exports from certain producers (e.g., Iran or Nigeria). In the United States, political shifts could influence LNG permitting, although projects already under development are unlikely to be halted before 2028. A global recession could temporarily weaken industrial gas demand. Climate extremes — unusually cold winters or intense heat waves — could drive seasonal demand beyond forecasts.

Despite a more balanced supply outlook, localized tightness remains possible. For example, a severe winter in Asia in 2027–2028 could once again prompt China or Japan to compete aggressively for spot LNG cargoes, pushing prices upward. Another risk is delays in commissioning new LNG facilities. Several U.S. projects are already facing schedule slippages due to financing or contractor challenges. If fewer projects come online than anticipated by 2027, market tightness could persist and prevent prices from declining as expected. For Europe and Asia, maintaining high storage levels — close to full capacity before winter — will remain a crucial buffer against potential shocks.

Overall, the short-term outlook to 2028 appears moderately positive from a supply security perspective: new production is catching up, supply diversification is improving, and prices are likely to stabilize at more sustainable levels. The key task for policymakers will be to use this period of relative relief to strengthen infrastructure resilience (including storage, backup capacity, and cross-border interconnections) while maintaining momentum toward emissions reductions. Otherwise, short-term stabilization could give way to renewed tension in the 2030s if underinvestment or delayed decarbonization creates new structural imbalances.

3.6. Medium-Term Outlook to 2035

In the medium term (the late 2020s through the first half of the 2030s), the gas sector enters a phase of more structural and heterogeneous transformation, shaped simultaneously by climate policy, shifts in the investment environment, and technological change. By the early to mid-2030s, long-term trends will become more clearly visible — trends that will largely determine the role of natural gas through the middle of the 21st century.

In baseline scenarios reflecting policies in place as of 2025–2026 and already sanctioned investment decisions, global gas consumption continues to grow over the next decade, although the pace of growth slows, and by the 2040s demand may approach a plateau (International Energy Agency, 2024a). Many reports even project continued growth in global gas demand through 2050 without a clearly visible peak (Aggarwal et al., 2024, January 24; GECF, 2024, p. 3). At the same time, LNG is expected to account for around 64% of total internationally traded gas volumes, effectively ending the historical dominance of long-distance pipeline trade (GECF, 2024, p. 4).

In accelerated energy transition scenarios and under tighter climate policies, the global demand peak shifts closer to the late 2020s, followed by gradual decline in the first half of the 2030s (International Energy Agency, 2024a). This contraction primarily affects the power sectors of advanced economies, where rapid renewable deployment, energy storage development, efficiency measures, and stricter emissions regulation reduce the role of gas-fired generation. In Europe, gas consumption has already shown structural decline after 2022, and most current forecasts suggest demand will not return to pre-crisis levels; by the mid-2030s, consumption could be 25–35% below late-2010s levels (International Energy Agency, 2025b). Similar dynamics, albeit with a time lag, are expected in Japan and the Republic of Korea. In the United States, gas retains a stronger position due to the scale of the domestic market and the flexibility of the power system. However, after 2030, expanding renewables — supported by federal and state-level incentives, including the Inflation Reduction Act — begin to constrain further growth in gas-fired generation, particularly under stricter carbon policy scenarios.

Against this backdrop, the center of gravity in global gas demand growth increasingly shifts toward developing regions. South and Southeast Asia, the Middle East, and Africa collectively account for the bulk of incremental demand in the 2030s, offsetting decline or stagnation in OECD economies (International Energy Agency, 2025b). India continues to view gas as a tool for enhancing energy security and reducing the carbon intensity of its economy relative to coal and biomass. Its strategic objective of raising the share of gas in the energy mix to double-digit levels during the 2030s remains in place, although actual progress will depend on infrastructure expansion and affordability (International Energy Agency, 2026b). In China, gas demand growth in the late 2020s gradually moderates: within the framework of carbon neutrality by 2060, gas is increasingly treated as a transitional fuel. After 2030, demand may approach saturation, followed by stabilization or moderate decline in the 2030s as zero-carbon generation expands.

Thus, by the 2040s the global gas market may enter a “gas plateau” phase: continued growth in developing economies is balanced by sustained decline in advanced countries, keeping overall global consumption relatively stable. Under these conditions, the future of gas will depend less on absolute demand volumes and more on the quality of demand — including requirements for low carbon and methane intensity, contractual flexibility, and the ability of suppliers to adapt to an increasingly differentiated and competitive global market.

The LNG market, meanwhile, is likely to move from a phase of surplus toward a new equilibrium. Around 2030 — when the majority of already sanctioned LNG projects are scheduled to come online — the market may experience a temporary oversupply. However, by 2035, the balance could tighten again if new final investment decisions (FIDs) are not taken in the 2025–2030 window.

According to projections, global LNG trade could reach approximately 880 bcm by 2035 (up from roughly 560 bcm today), implying growth of around 50% within a decade (Twidale, 2025). This expansion will be largely driven by projects already under development. Beyond 2030, however, capacity additions may increasingly serve to offset natural decline in mature fields, rising domestic consumption in exporting countries, and moderate demand growth, rather than generating sustained surplus.

Warnings are already emerging: the current investment boom — fueled by the 2022 energy crisis — may be followed by an “investment gap” if prolonged low prices discourage new project approvals. Such underinvestment could result in renewed supply shortages in the mid-2030s (International Energy Agency, 2025, October 27). To avoid this scenario, producers will need to strike a delicate balance: maintaining gas competitiveness, including through environmental improvements, so that buyers remain willing to commit to long-term contracts even amid accelerating decarbonization.

By the mid-2030s, it should become clearer how the gas sector integrates into the broader energy transition. The following factors are expected to shape this trajectory by 2035:

1. CCUS Deployment at Gas Facilities. By the mid-2030s, a number of LNG plants and large gas-fired power stations may operate with carbon capture systems. Projects involving CO_2 capture from LNG process streams (e.g., initiatives in Qatar and elsewhere) or from power plant flue gases (pilot projects in the United States and Norway) could begin scaling. If economically viable, such projects may result in the capture of tens of millions of tons of CO_2 annually at gas facilities by 2035. However, before 2030, most CCUS expansion is expected in industry and hydrogen production, with the power sector following more gradually.

2. Hydrogen Blending and Transition. Starting in the early 2030s, some gas-fired power plants may gradually introduce hydrogen blending into methane streams. Nevertheless, large-scale hydrogen volumes are unlikely before 2035 (except in localized projects), so the overall market impact will remain limited. Still, these early deployments are strategically important, as they establish the technological and regulatory foundation for broader post-2035 gas substitution.

3. Biogas and Biomethane Expansion. Biomethane production — upgraded biogas fully compatible with existing gas networks — is expected to increase significantly. Europe aims to reach up to 35 bcm annually by 2030, with North America targeting comparable volumes. In an optimistic scenario, biomethane could supply 5–10% of Europe’s gas demand and 3–5% of global demand by 2035, partially displacing fossil gas and reducing lifecycle emissions (International Gas Union, 2025). Beyond energy supply, biomethane provides additional benefits by utilizing agricultural waste, landfill gas, and wastewater streams. Importantly, biomethane represents a dispatchable renewable gas, complementing intermittent wind and solar generation.

4. Energy Efficiency and Electrification. By 2035, a substantial portion of urban heating may shift toward electric heat pumps, while certain industrial processes transition to electric furnaces where feasible. Electric vehicle adoption will reduce refinery activity and potentially limit natural gas use in downstream sectors. These trends modestly constrain long-term gas demand. However, in hard-to-abate sectors — steel, cement, aviation — gas (directly or via hydrogen) will likely remain essential due to limited mature alternatives.

5. The Environmental Imperative. By 2035, stringent methane leakage standards are likely to be implemented across most major producing countries, either domestically or under pressure from importing markets. Enhanced monitoring and transparency will make high-emission gas production economically disadvantageous. Addressing methane emissions improves the climate profile of natural gas and strengthens its comparative advantage over coal, particularly if supply chains approach near-zero leakage levels.

6. A New Map of Gas Trade. By 2035, Europe will be fully integrated into the global LNG market, functioning as a hybrid importer reliant on both pipeline gas (from Norway, North Africa, Azerbaijan) and LNG from diverse sources. LNG may account for 50–60% or more of European imports. Developments in the Eastern Mediterranean (Israel, Cyprus) could contribute additional flows, depending on political and infrastructural feasibility. Asia will remain the dominant LNG destination. China can potentially import over 150 bcm annually (including re-exports), while India may reach 50–60 bcm. Emerging Southeast Asian markets (Vietnam, the Philippines, Thailand) will become increasingly significant. Simultaneously, Asian buyers may introduce stricter "green gas" requirements, demanding low-carbon or offset-certified LNG.

7. The United States as a Structural Leader. By 2035, the United States is likely to solidify its role as the largest LNG exporter and a key stabilizing force in global gas markets. The decentralized and flexible structure of U.S. LNG exports enhances adaptability to market shocks. LNG may also remain an instrument of geopolitical influence, strengthening ties with allies in Europe and Asia.

8. Russia's Reoriented Role. Russia's gas exports will likely pivot predominantly toward Asia, particularly through expanded pipeline connections (Power of Siberia and potentially Power of Siberia-2). LNG from Yamal and Gydan could continue supplying Asian markets via the Northern Sea Route in summer and European transshipment hubs in winter. However, sanctions and technological constraints may limit Russia's export potential relative to pre-2022 levels. Central Asian producers, including Turkmenistan, may seek expanded export routes via China or trans-Caspian corridors.

9. The Gulf and Africa as LNG Exports Hubs. Qatar will reinforce its position as the second-largest LNG exporter globally, while Oman and the UAE expand their export capacity. Africa could experience significant growth by 2035: Mozambique (30–40 bcm), Tanzania (10–15 bcm, if projects proceed), Senegal-Mauritania (~10 bcm), and potentially increased Nigerian output contingent on stability and investment. The global gas supply landscape will thus become more diversified. No single exporter will dominate, but those capable of offering low-cost, low-carbon, and reliable gas will gain competitive advantage.

By 2035, natural gas will likely still account for roughly 20–25% of global primary energy consumption. Even in progressive scenarios where renewables and nuclear expand rapidly, gas is expected to retain a significant role in grid balancing and industrial applications. In the transport sector, gas may slightly strengthen its position — particularly in the form of LNG for heavy trucks and maritime shipping — although it is unlikely to become a dominant fuel for passenger vehicles.

In the residential sector, electricity and district heating systems will increasingly displace gas boilers, yet in colder regions individual gas heating will remain widespread. Thus, by 2035 natural gas will likely continue to rank among the three largest global energy sources (alongside oil and coal/renewables), though with a clear trajectory of slowing growth and a longer-term prospect of decline toward mid-century.

Medium-term uncertainties are closely tied to the evolution of climate policy. The extent to which the objectives of the Paris Agreement are implemented will become clearer by the early 2030s. If countries strengthen climate commitments in subsequent COP processes — for example, through higher carbon taxes, stricter methane regulations, bans on routine flaring, or mandatory carbon capture requirements — gas demand could decline more sharply after 2030 than baseline projections suggest. Conversely, if climate action stalls, gas consumption could persist at elevated levels for longer, albeit at the cost of intensified climate impacts — which themselves could disrupt gas infrastructure through extreme weather events such as hurricanes and floods.

Technological breakthroughs in long-duration energy storage (e.g., cost-effective hydrogen turbines, ultra-high-capacity batteries, advanced geothermal systems) could by 2035 reduce reliance on gas for renewable balancing. Conversely, slower-than-expected progress in storage technologies would prolong the need for gas as a flexible and dispatchable energy source.

Medium-term gas demand will also depend heavily on the economic trajectory of developing regions. Sustained growth rates of 5–7% annually in India and parts of Africa would generate substantial new energy demand, part of which would likely be met by gas. However, debt crises, climate-related disruptions, or slower structural growth could dampen expansion plans for new gas-fired power plants.

Equally important will be how gas companies adapt. Firms that invest proactively in emission reductions, methane control, certification of low-carbon LNG, and hydrogen integration are more likely to preserve their social and regulatory license to operate. Those that fail to adapt may face tightening regulation, reputational risks, and shrinking market access.

In sum, by 2035 the gas sector will stand at a strategic crossroads. It will still play a significant role in the global energy system, but growth momentum will have faded. Whether the trajectory beyond that point becomes a gradual, managed decline or a sharper contraction will depend on the strength of global climate policy and the industry's ability to innovate — particularly through CCUS deployment and hydrogen integration — to reduce its carbon footprint and remain compatible with a decarbonizing world.

3.7. Long-Term Outlook to 2050

The long-term outlook (2035–2050) for the gas and LNG sector is inherently characterized by high uncertainty, as it depends on technological progress and policy developments over several decades. Nevertheless, it is possible to outline plausible scenarios and key challenges toward mid-century. In simplified form, the following two polar scenarios emerge:

First, the Current Policies scenario — the world advances toward cleaner energy gradually, without radical intervention. In this case, global gas demand could still increase by 2050 compared to the 2030s, although growth would be modest. In such a scenario, the International Energy Agency (IEA) does not foresee a peak in global gas demand even by 2050, with consumption rising toward roughly 4.5–5 trillion cubic meters (International Energy Agency, 2025f). Forecasts by the Gas Exporting Countries Forum (GECF), for example, project growth of around 30–35% by 2050 (to approximately 5,360 bcm), driven primarily by economic expansion in Asia and Africa. Under this pathway, the LNG market would expand more than twofold — from roughly 400 mtpa in the 2020s to about 820 mtpa by 2050, equivalent to roughly 1,100 bcm (Gas Exporting Countries Forum, 2025). LNG would become the backbone of global gas trade, supplying regions where domestic production cannot keep pace with demand. Natural gas would remain present in national energy balances, although its share would gradually decline under the pressure of renewables. Most incremental demand would originate in power generation in developing economies (to meet rising cooling, industrial, and transport-related electricity demand) and in industry, including hydrogen production without full carbon capture. In aggregate, gas could still account for around 20% (or slightly more) of global energy consumption in 2050.

Second, the Net Zero / Paris-aligned scenario — the world implements aggressive climate policies consistent with limiting warming to 1.5–2°C. In this case, demand for fossil gas would decline sharply by 2050. A significant share of remaining gas use would be coupled with CCUS (for hydrogen production or gas-fired power with carbon capture). Unabated gas consumption would be confined to hard-to-abate segments, such as peak heating in cold climates. LNG trade would contract substantially, as overall gas demand falls and part of consumption is met by local biomethane and synthetic methane. In this structure, gas use in 2050 would be concentrated in the industrial sector (feedstock for chemicals and high-temperature processes) and limited power generation (with CCUS or as emergency reserve capacity). Direct gas use in buildings would largely disappear due to electrification, and the transport sector would be only minimally dependent on gas (International Energy Agency, 2025g).

In reality, global development is likely to fall somewhere between these two extremes — probably closer to the first scenario, though with stronger climate constraints than in a pure "business-as-usual" case. This implies that even under stringent climate policy, gas may retain a role if the sector succeeds in significantly reducing emissions. Rather than collapsing abruptly, demand would decline gradually and unevenly.

Regionally, the balance will shift: Europe and North America are likely to experience substantial reductions by 2050, while Asia and Africa may maintain gas use for longer, partially offsetting declines elsewhere. Thus, the central long-term question is not whether gas disappears, but under what conditions — technological, regulatory, and geopolitical — it evolves from a conventional fossil fuel into a lower-carbon energy carrier compatible with a decarbonizing global economy.

The future of gas after 2035 will also be determined by how widely CCUS technologies are deployed and how far the hydrogen economy advances. At the same time, it is already possible, with a fairly high degree of confidence, to assume that a significant share of this hydrogen will be "blue" — produced from natural gas with CO_2 capture. In other words, gas may increasingly serve as a feedstock for "clean" fuels. Additional uncertainty stems from the unclear prospects for e-methane (produced by synthesizing "green" hydrogen with CO_2; it is carbon-neutral and chemically identical to natural gas), the evolution of fully decarbonized power systems, and the potential emergence of new end-uses for gas.

By 2050, today's gas provinces will change. Many conventional fields discovered in the twentieth century will be in decline or depleted. Production will shift toward countries with large reserves and low costs, as well as toward unconventional gas resources. The GECF estimates that, to meet demand and replace declining production, upstream and midstream investment on the order of $11 trillion will be required by 2050 (Gas Exporting Countries Forum, 2025). This is an enormous sum, and mobilizing it depends on confidence in long-term demand. The greater the uncertainty driven by climate policy, the harder it becomes to justify such investments. Banks and investors adhering to ESG principles are already reducing financing for purely fossil projects that lack decarbonization components. As a result, by the 2040s–2050s financing is likely to flow primarily to "net-zero-compatible" projects — for example, gas capacity that includes CCUS, or low-carbon fields with minimal lifecycle emissions. High-risk projects (such as shale gas with high methane intensity or projects with very long payback periods) may not secure financing and could remain unrealized. For exporting countries, this implies a necessary strategic shift: the "pump and sell gas" paradigm will increasingly be replaced by "sell energy/fuel with minimal carbon." Those that fail to adapt risk losing market share.

By 2050, many developed countries have committed to net-zero emissions. This implies that, within their territorial consumption, there will be little room left for burning fossil gas without carbon capture. The European Union will likely almost fully phase out the combustion of natural gas by 2050, except for a limited set of applications where emissions are offset or captured. Most electricity, heat, and fuels in the EU by that time should come from renewables, nuclear, or gas coupled with CCUS/hydrogen. Japan and South Korea are expected to follow a similar trajectory, with an increasing role for ammonia and hydrogen. China has pledged carbon neutrality by 2060, so by 2050 it may still have residual gas consumption, but it should be reduced and partly compensated through afforestation or CCUS.

As a result, the main remaining demand for *non-decarbonized* gas by 2050 may be concentrated in countries without strict net-zero commitments, or those with relatively "room" in their carbon budgets — for example, parts of Africa and Southeast Asia. This creates an interesting tension: as the advanced economies tighten standards and reduce demand, global gas prices could fall, allowing developing countries to use cheaper gas for longer (while simultaneously suffering more from climate impacts). Yet an effective global climate response requires that these countries also transition away over time. Most likely, by 2050 new mechanisms of support will expand to help developing economies leapfrog directly to cleaner energy systems, rather than locking in a prolonged "gasification" phase.

An optimal long-term trajectory would see natural gas by 2050 evolve from a mass combustion fuel into primarily a feedstock and system-balancing resource. Large-scale direct burning of gas for energy would decline substantially, but gas would remain relevant in several key roles:

- Feedstock for hydrogen, ammonia, plastics, and petrochemicals — with CO_2 capture integrated to prevent atmospheric release. In this configuration, gas becomes an input for low-carbon value chains rather than a bulk combustion fuel.
- Reserve and balancing capacity for renewable-heavy power systems — gas turbines operating intermittently to ensure grid reliability. Their emissions could be captured or offset, limiting their net climate impact.
- Fuel for niche applications where full electrification or substitution proves technically difficult — for example, maritime transport (LNG with carbon-neutral certification or low-carbon methane blends) and possibly aviation (if hydrogen- or methane-based propulsion systems mature).
- Source of controlled carbon molecules for synthetic fuels and advanced materials — where CO_2 derived from gas processing is captured and reused within circular carbon systems.

In a scenario where the gas industry adapts rather than resists structural trends, it could continue supplying energy and industrial inputs to billions of people under significantly lower-emission conditions. Exporters such as Qatar may succeed in repositioning themselves as suppliers of decarbonized gas, leveraging CCUS and low-carbon certification to maintain market share. Less adaptive producers, however, may lose competitiveness.

Achieving a favorable long-term outcome will require coordinated action. This includes sustained investment in R&D and CCUS deployment, international agreements on trade in certified low-carbon or "green" gas, development of just transition strategies for gas-producing economies (to avoid abrupt revenue collapse and social instability in the 2040s–2050s), and expansion of CO_2 transport and storage infrastructure — including cross-border carbon management projects.

If, by contrast, the world remains heavily dependent on gas without sufficient climate mitigation, the sector may face mounting structural risks. Intensifying climate impacts — heatwaves, storms, flooding — could disrupt infrastructure. Public opinion may harden further against fossil fuels. Delayed but abrupt climate policy interventions (e.g., steep carbon taxes) could impose severe economic shocks on producers and consumers alike.

Conversely, the gas sector has a credible opportunity to become part of the climate solution. If it succeeds in drastically reducing methane leakage, integrating carbon capture, and embedding lifecycle transparency into supply chains, natural gas in 2050 could be associated not with a "carbon problem," but with a technologically advanced, controlled carbon energy system — where CO_2 is captured or compensated and methane emissions approach zero. Realizing this vision requires decisive transformation well before mid-century.

3.8.Conclusions

Analysis of global trends indicates that the gas and LNG sector stands at the threshold of structural change, driven simultaneously by market dynamics, geopolitical challenges, technological progress, and tightening climate constraints. Natural gas will remain an important component of the global energy mix in the coming decades, but the nature of its use is shifting — from quantitative market expansion toward qualitative transformation. This transformation will be defined less by volume growth and more by competitiveness under carbon constraints, flexibility within increasingly volatile markets, and integration into decarbonized energy systems. Table 5 summarizes the key challenges and opportunities facing the sector, along with strategic recommendations.

Table 5. Global Trends in the Gas and LNG Sector

Strategic Direction	**Key Challenge**	**Window of Opportunity**	**Policy Instruments and Measures**	**Practical Recommendations**
Energy security and supply flexibility	Rising geopolitical and logistical risks; vulnerability of supply chains	Expansion of LNG supply and increasing liquidity of global markets	• Infrastructure investment (LNG terminals, underground storage, interconnectors) • Diversification of contracts • Multilateral coordination	• Combine long-term and spot contracts • Develop regional solidarity mechanisms • Use platforms of the IEA and regional alliances
Price risk and investment management	High price volatility; risks to social and economic stability	More mature and financially deep gas markets	• Hedging instruments • Strategic gas reserves • Predictable climate policy	• Establish national and regional price benchmarks • Protect vulnerable consumers • Develop long-term roadmaps for gas in the energy mix

Decarbonization of the gas value chain	Increasing climate constraints and pressure on gas as a fossil fuel	Reduction of carbon intensity without abandoning gas	• Methane standards and monitoring • CCUS deployment • Biomethane and hydrogen integration • Carbon markets	• Mandate emissions disclosure • Support CCUS pilot projects into the 2030s • Integrate hydrogen and biomethane into gas networks
Innovation and new markets	Risk of technological stagnation	Transformation of gas into a platform for future energy systems	• R&D in hydrogen and synthetic gases • Hydrogen-ready infrastructure • Hybrid system pilots	• Update technical standards • Support projects for data centers and industry • Invest in workforce retraining
International cooperation and just transition	Asynchronous climate and energy priorities across countries	Harmonization of standards; reduction of trade barriers	• Dialogue in GECF, IEA, and other forums • Unified methane standards • Support mechanisms for exporters	• Invest gas revenues into economic diversification • Align climate and energy security objectives • Position gas as a managed transition fuel

Source: author's assessment

The global gas and LNG sector is entering a phase of qualitative transformation, in which natural gas retains a strategic role in the global energy system but is increasingly assessed not by volumes of consumption, but by its ability to deliver energy security, flexibility, and compatibility with climate objectives. The rapid expansion of LNG supply and growing market liquidity create opportunities for importers to diversify and strengthen resilience, while simultaneously heightening the need to manage price volatility and investment risks.

The long-term future of gas is becoming conditional and directly dependent on progress in decarbonizing the entire value chain — above all through methane abatement, CCUS deployment, integration of biomethane and hydrogen, and incorporation into carbon regulatory frameworks. In this environment, predictable and coordinated policy becomes decisive: it enables gas to function as a transitional fuel, sustain investment flows, and serve as a platform for technological innovation. International coordination between exporters and importers, as well as alignment between climate objectives, energy security priorities, and just transition strategies, are essential to ensure that the current gas expansion becomes a resource for adaptation rather than a source of new structural risks.

Overall, the gas and LNG sector has a window of opportunity over the next 5–10 years to consolidate its position while laying the groundwork for a role within a low-carbon energy system. Short-term trends are relatively favorable: expanding supply and more moderate prices provide the industry with breathing space. This period should be used to address structural challenges — above all environmental ones. Medium-term prospects point toward demand stagnation unless the sector "resets" around new products and services, including hydrogen and energy storage solutions. The long-term outlook, though uncertain in precise magnitude, clearly requires transformation: by 2050 the gas industry must be fundamentally different from today — cleaner, more technologically advanced, and integrated with renewable energy systems.

If policymakers and industry actors act in concert, current challenges can be converted into opportunities. Natural gas can evolve into a genuine "fuel of transition and solution," supporting economic development while contributing to climate security. This is a demanding but achievable task, the success of which would benefit the global community as a whole.

4. Development of Qatar's LNG Sector: Short-, Medium-, and Long-Term Prospects

Under these circumstances, it is logical to examine the future prospects of Qatar as an LNG producer. Qatar is one of the key players in the global liquefied natural gas market, possessing vast reserves in the North Field. Following the energy crisis of 2021–2022 and subsequent geopolitical shifts — including Europe's reorientation from Russian pipeline gas to LNG — Qatar's role has further strengthened. Today, Doha is implementing an unprecedented expansion program in gas production and LNG exports, aiming to consolidate its position for decades to come. However, this strategy is unfolding amid rapid structural changes in the global gas sector. A new "wave" of LNG supply is expected by the end of the 2020s, potentially leading to market oversupply. At the same time, major gas-consuming regions — particularly Europe and East Asia — are reassessing the long-term role of gas in the context of energy transition and tightening climate policies.

This chapter analyzes the development prospects of Qatar's LNG sector in the short term (to 2028), medium term (to 2035), and long term (to 2050), taking into account economic, geopolitical, environmental, and technological dimensions. Particular attention is given to Qatar's production expansion strategy (North Field East, South, and West projects), the risk of potential market saturation in the late 2020s and Qatar's possible response, the country's regional positioning, competition with other exporters, the impact of the energy transition, technological developments (CCUS, hydrogen, "carbon-neutral" LNG), the evolution of contractual and logistical models, and long-term scenarios through 2050.

4.1. 2026–2028: Short-Term Perspective

In the coming years, Qatar is implementing the largest LNG capacity expansion in the history of the industry. Already in 2026–2028, new trains under the North Field East (NFE) and North Field South (NFS) projects will come online, raising total capacity from the current ~77 million tons per annum (mtpa) to approximately 110–126 mtpa. These projects, developed in partnership with international companies (TotalEnergies, Shell, ExxonMobil, and others), will add roughly 48 mtpa of new LNG supply. In addition, a third phase, North Field West (NFW), has been announced, which is expected to add a further 16 mtpa by the end of the decade, bringing Qatar's total capacity to around 142 mtpa by 2030 (Cavcic, 2026b). This expansion represents an increase of approximately 85% compared to 2022 levels and would once again position Qatar as a contender for the title of the world's largest LNG exporter.

However, Qatar's growth coincides with a global "construction wave": numerous LNG plants in the United States, Canada, Africa, and elsewhere are also scheduled to come online before 2028 (Cavcic, 2026a). According to the Institute for Energy Economics and Financial Analysis (IEEFA), global liquefaction capacity could increase by roughly 40% by 2028 (to around 667 mtpa), potentially exceeding projected demand growth through 2050 (Alam et al., 2024). As a result, the market is likely to enter a phase of oversupply by the end of the 2020s. Analysts forecast that by 2026–2027 a substantial surplus could emerge — around 50 bcm (approximately 36 mtpa) in 2026, rising to as much as 200 bcm (about 145 mtpa) by 2030 relative to demand — exerting downward pressure on prices and intensifying competition for buyers (Bousso, 2025).

The prospect of a temporary LNG glut toward the end of the decade poses risks for all exporters. However, Qatar enters this phase with notable advantages. The cost of Qatari gas production remains among the lowest globally, and its geographic position enables flexible deliveries to both Asia and Europe within relatively short transit times. This means that even in a low-price environment, Qatar can continue producing profitably, whereas higher-cost projects (including many U.S. LNG facilities reliant on more expensive shale gas) may face pressure to curtail output (Bousso, 2025).

Moreover, Doha has proactively secured market share in advance. Between 2021 and 2025, QatarEnergy signed a series of long-term contracts covering future LNG volumes with key buyers. In November 2022, a record 27-year agreement was concluded with China's Sinopec for 4 mtpa. In 2023, additional long-term agreements followed: TotalEnergies (France) and Shell (Netherlands) each contracted 3.5 mtpa for 27 years; Eni (Italy) secured 1 mtpa for 27 years; China's CNPC signed for 4 mtpa over 27 years; a further Sinopec deal covered 3 mtpa for 27 years; India's Petronet contracted 7.5 mtpa for 20 years; among others (Onsat, 2024).

Through these agreements, Qatar has effectively secured a substantial portion of its future output, despite concerns among buyers about potential oversupply. Estimates suggest that by 2027 more than 70% of Qatar's export volumes will be tied to long-term contracts. Without additional agreements, this share could decline to just above 60% by 2030 and below 40% by 2035 as earlier contracts expire (Kozhanov, 2024). Doha's strategic calculation is that any short-term oversupply will not persist indefinitely and that market balance will improve in the early 2030s.

To navigate a period of lower prices, Qatar will rely on its structural advantages: low production costs, favorable geographic positioning, and a portfolio of long-term contracts that guarantee baseline revenues even under adverse market conditions. At the same time, despite its commitment to long-term contracts, Doha recognizes the need for flexibility in the changing market conditions of the late 2020s. Historically, LNG oversupply tends to weaken buyers' interest in rigid, destination-bound contracts: when spot prices are low, many prefer short-term purchases. Already in 2024, reports indicated that some of Qatar's Asian partners had paused negotiations on new long-term contracts, awaiting greater clarity on market direction. In response, Qatar has demonstrated greater flexibility in both contractual terms and pricing structures. Future Qatari contracts are likely to reflect evolving market realities: destination clauses — long resisted by Japanese and other buyers — may be softened, and a greater share of pricing may shift toward gas hub indexation rather than traditional oil linkage. In parallel, Qatar is strengthening its trading arm, QatarEnergy Trading, positioning it as a more active participant in the spot market. Supported by a new fleet of LNG carriers, more than 40 of the latest-generation tankers under construction are expected to be allocated to QatarEnergy Trading, primarily to transport uncontracted volumes (Maritime Executive, 2025).

This strategy is widely viewed as a “hidden advantage”: maintaining uncommitted volumes allows Qatar to redirect cargoes toward the highest-priced markets and capture upside during periods of volatility. In an oversupplied environment, such flexibility becomes particularly valuable, especially as the share of spot trading is projected to grow. Thus, in the short term, Qatar is pursuing a proactive strategy: expanding export capacity “with a buffer,” securing strategic long-term deals in advance, and modernizing its commercial approach to minimize potential losses from a late-2020s downturn while positioning itself to benefit from market stabilization after 2030.

The period through 2028 is also shaped by significant geopolitical shifts affecting global gas trade. After 2022, Europe sharply increased LNG imports to replace Russian pipeline gas and became a major competitor for Asian buyers. Qatar capitalized on this opportunity, strengthening energy ties with European states. Beyond concluding long-term contracts — unprecedented in duration for the EU — Doha also redirected additional spot cargoes to Europe in 2022–2023, helping mitigate the crisis. Europe’s share in Qatari exports rose, although Asia remains the primary destination (historically around 70% of Qatari LNG has flowed to Asian markets). At the same time, Qatar’s share of European imports declined relative to surging U.S. LNG supplies.

In the short term, Qatar carefully balances between these two markets: benefiting from Europe’s price premium while avoiding weakening long-standing relationships with traditional Asian customers. Asia itself presents mixed dynamics. Major LNG importers such as Japan, South Korea, and Taiwan have experienced stagnation or decline in purchases due to renewable expansion and nuclear restarts. For example, Japan’s LNG imports fell by 8% in 2023 and have declined by 20% since 2018. South Korea plans to reduce gas consumption by around 20% by the mid-2030s (Alam et al., 2024).

Conversely, China and emerging Asian economies have resumed import growth following the 2021–2022 downturn. By 2025, China returned to near-record LNG imports of approximately 79 mt, benefiting from lower prices. India also increased imports in 2024 to a historic high of 27 mt (Shell plc., 2025). Qatar has adjusted to these trends by diversifying its contract portfolio. New agreements have been concluded both with established buyers — such as the 20-year contract with Pakistan State Oil (2021) — and with newer markets, including Bangladesh (1.8 mt per year for 15 years starting in 2026) (Maritime Executive, 2025).

Thus, the short-term period represents a phase in which Qatar strengthens its global footprint: in Europe as a reliable substitute for Russian gas; in South Asia as a partner in energy security for developing economies; and in East Asia as a stable long-term supplier amid demand uncertainty. Qatar’s geopolitical neutrality — maintaining constructive relations with both Western and Eastern partners — enhances its ability to navigate shifting trade flows and capitalize on the ongoing redistribution of global gas markets.

Qatar’s short-term growth strategy is accompanied by large-scale investments in new technologies aimed at enhancing both efficiency and environmental performance. The new LNG trains under the North Field East (NFE) and North Field South (NFS) projects are being designed to minimize carbon intensity from the outset. For the first time in the industry, compressors at Qatari LNG facilities will be electrified and powered in part by solar energy, reducing the need to burn natural gas for on-site operations. In addition, carbon capture and storage (CCS) systems are being integrated into the expansion program. According to QatarEnergy, up to 9 million tons of CO_2 per year are expected to be captured and permanently stored by 2030 as part of the North Field expansion, with plans to increase capture capacity to 11 million tons annually thereafter (John, 2025). These measures will significantly lower total greenhouse gas emissions compared to conventional LNG plants of similar scale.

Through this approach, Qatar is effectively setting a new benchmark for the industry, where competitiveness is increasingly determined not only by production costs but also by carbon intensity. This "greener" LNG model enhances the attractiveness of Qatari gas for environmentally conscious buyers — particularly in Europe, where methane regulations have been introduced since 2024 and carbon border measures are under discussion. At the same time, QatarEnergy, together with international partners, is developing methodologies for transparent emissions accounting throughout the LNG value chain. For example, in cooperation with Singapore's Pavilion Energy, Qatar has helped establish a monitoring framework for tracking the carbon footprint of LNG cargoes "from well to delivery port." This framework enables the offering of "carbon-neutral LNG," either through actual emissions reductions or via offsets for residual emissions (Yep & Tan, 2021). In 2021, QatarEnergy, Pavilion Energy, and Chevron developed a methodology for Statements of Greenhouse Emissions (SGE), and in 2023 Qatar delivered a pilot LNG cargo to Singapore using the SGE framework, demonstrating its commitment to climate transparency (Bahtić, 2023; Peninsula Qatar, 2021).

These measures allow Qatar to position its LNG as comparatively cleaner than that of certain competitors. While new projects in the United States and Canada are also reducing emissions — for example, LNG Canada targets an emissions intensity of approximately 0.15 t CO_2 per ton of LNG (LNG Canada, 2019) — older facilities elsewhere remain more carbon-intensive. Qatar seeks to occupy the niche of a transition fuel supplier with minimized climate impact, an especially important positioning as major buyers such as the EU, Japan, and South Korea pursue carbon neutrality targets and increasingly favor low-carbon gas.

Thus, in the short term, Qatar is not only expanding volumes but also upgrading the environmental profile of its LNG. By embedding ESG performance and emissions transparency into its export model, Doha is laying the groundwork for sustaining long-term demand in an increasingly carbon-constrained global market.

4.2. 2028–2035: Medium-Term Perspective

In the early 2030s, the global LNG market is expected to gradually move out of its oversupply phase, having passed the point of minimum prices and margins at the end of the 2020s. Many analysts agree that the anticipated surplus is cyclical and temporary in nature. By around 2030, demand growth — particularly in Asia — combined with a slowdown in new project approvals may return the market to a more balanced state.

For Qatar, the period 2028–2035 will represent the realization of dividends from its current investments. By reaching full capacity of approximately 142 mtpa by 2030, Qatar will hold one of the world's largest LNG export portfolios alongside the United States. If in 2023 Qatar ranked third among exporters (after the United States and Australia), by the early 2030s it may reclaim leadership. Even under severe oversupply scenarios, Qatar's low production costs would likely allow it to maintain full-capacity exports, potentially displacing higher-cost producers.

Some competitors may face market share erosion. In the United States, delays or cancellations of certain planned LNG projects are possible if late-2020s prices remain too low to justify investment (Sahu, 2025). Indeed, as of 2025, several U.S. exporters have been slower than expected in securing contracts, and cumulative delays in project commissioning amounted to roughly 30 mtpa, likely shifting beyond 2030. This development benefits Qatar: postponed competing volumes could soften the depth of the anticipated glut. Consequently, a dramatic price collapse may be avoided due to deferred capacity additions. Nevertheless, even under relatively favorable conditions, Doha will need to pursue an assertive marketing strategy in the late 2020s and early 2030s to place its expanded volumes in an environment of moderate prices and intense competition (Sahu, 2025).

In the medium term (late 2020s–2035), the global LNG market will likely be structured around a small number of dominant suppliers, including Qatar. By 2030, the United States is expected to complete its current wave of projects, potentially reaching export capacity in the range of 130–150 mtpa, depending on the implementation of Plaquemines LNG, Driftwood (Louisiana LNG), Corpus Christi expansions, and others (Cavcic, 2026b).

Australia, long a leading exporter, faces structural challenges: most of its LNG plants were commissioned in the 2010s, and few new mega-projects are planned for the 2020s. Although companies such as Woodside and Santos are considering expansions (e.g., Scarborough–Pluto 2, adding around 5 mtpa by 2026–2027), Australia is more likely to maintain output near current levels (~80 mtpa), offsetting decline from aging fields.

Russia presents a more complex competitive picture. Prior to 2022, it had ambitious LNG expansion plans (Arctic LNG-2, Ob LNG, among others), potentially adding 20–30 mtpa. However, sanctions and restricted access to Western technology have slowed progress. While the first Arctic LNG-2 train began partial operations in 2024–2025, subsequent phases are delayed. The European market for Russian gas has largely closed, and expansion toward Asia proceeds mainly via the Power of Siberia pipeline. Although Moscow has announced discussions on additional pipelines toward China and possibly via Mongolia, implementation remains uncertain. As a result, Russia's share of global LNG trade by 2030 is likely to remain limited (around 8–10%).

New entrants — primarily in Africa and North America (Canada) — are also emerging. LNG Canada (Phase 1, 14 mtpa) began operations by 2025, with Phase 2 under consideration to expand capacity to approximately 28 mtpa in the early 2030s (Cavcic, 2026b). In Africa, multiple projects are progressing: Mozambique's Coral FLNG (3.4 mtpa) is operational; onshore facilities led by TotalEnergies (~13 mtpa) could come online around 2028 if security conditions stabilize. Tanzania aims to begin construction of a ~10 mtpa LNG plant. Nigeria is commissioning Train 7 (~8 mtpa by 2026). Senegal and Mauritania are developing the GTA project (Phase 1 at 2.5 mtpa in 2024; Phase 2 potentially reaching ~10 mtpa by ~2028). Angola and Congo are launching floating LNG units (Cavcic, 2026b).

Qatar closely monitors this emerging competitive landscape. Although Africa could collectively add 30–40 mtpa by 2030, many projects face financing and infrastructure constraints. Qatari leadership appears confident that even with more exporters entering the market, it can maintain or expand its market share. This confidence is based on the expectation that demand recovery after 2030 will require all available volumes, and that the relatively high costs of some new projects (such as deepwater LNG developments in East Africa) may reduce their competitiveness during periods of low prices.

Thus, between 2028 and 2035, the market structure may resemble the following: the United States and Qatar dominate as the two primary sources of supply growth; Australia and Russia remain significant but stagnating or declining exporters (though Russian pipeline exports to China could present a structural challenge); while Africa and Canada expand from a low base. For buyers, this means a more diversified market. For Qatar, it implies the need to more actively demonstrate the strategic advantages of partnership — reliability, low costs, and increasingly low-carbon credentials — in an intensifying competitive environment (Cavcic, 2026b).

In the medium term, structural shifts in regional LNG demand patterns will require Qatar to recalibrate its strategy accordingly. After the peak import levels of 2022–2025 — when the EU was compelled to procure LNG at record spot prices — European demand is expected to stabilize and gradually decline in the early 2030s due to energy efficiency measures, renewable expansion, and the gradual introduction of hydrogen technologies (Alam et al., 2024; Cavcic, 2026b).

Nevertheless, even accounting for these trends, Europe will remain a major LNG market through 2030 (approximately 70–80 mtpa) and will continue to rely on dependable suppliers, given limited domestic production and the partial loss of Russian pipeline gas. Qatar, having established itself as a "safe harbor" during the crisis, has strengthened partnerships with European companies. The 27-year contracts signed in 2023 will begin deliveries from 2026 onward — for example, supplying Germany via the Brunsbüttel terminal, France through TotalEnergies, and Italy through Eni. European governments, previously hesitant to enter into ultra-long-term agreements for climate reasons, have supported such contracts in the name of energy security.

However, Qatar recognizes the temporary nature of Europe's "window of opportunity." By the late 2030s, the EU plans significant reductions in gas consumption under frameworks such as Fit for

55 and REPowerEU, implying that Europe's share in Qatar's LNG exports will gradually decline. Consequently, Doha's primary strategic focus shifts back toward Asia. Asia in the 2030s will remain the main driver of LNG demand growth, though internal dynamics are evolving. Traditional large importers — Japan and South Korea — are expected to reduce gas consumption as decarbonization policies advance (South Korea targeting roughly a 20% reduction by the mid-2030s, with Japan also decreasing imports). In contrast, demand is rising rapidly in South and Southeast Asia. Pakistan, Bangladesh, Vietnam, and Thailand all view LNG as a means of replacing expensive oil and coal. These countries remain highly price-sensitive and were heavily affected by the 2021–2022 price spike, when LNG became unaffordable. With lower prices in the late 2020s, they are returning to the market, but with strong preferences for flexible contract terms — shorter durations and resale options. Qatar appears prepared to accommodate such requirements, particularly through expanded spot trading via QatarEnergy Trading.

China, the largest prospective LNG market, has already secured long-term supply agreements extending into the 2030s, including approximately 11 mtpa under two 27-year contracts with Qatar (Onsat, 2024). China's diversification strategy means Qatar is one of multiple suppliers, alongside pipeline gas from Central Asia and Russia, and LNG from the United States and Australia. Nevertheless, Qatar seeks to deepen strategic ties beyond LNG sales. Chinese companies such as Sinopec and CNPC have acquired equity stakes in different phases of the North Field expansion, reinforcing long-term interdependence. By 2035, Qatar envisions its role in Asia as that of a foundational supplier. Compared to the more flexible and often spot-oriented U.S. LNG model, Qatari LNG offers stability and predetermined volumes — an attractive feature for rapidly growing economies such as India, Bangladesh, and Vietnam, where secure long-term supply underpins energy security planning.

As older 20-year contracts signed by Japanese and South Korean utilities in the 1990s and early 2000s approach expiration in 2028 - 2035, Qatar is likely to pursue renewals under updated terms — potentially smaller volumes with greater flexibility. If the market tightens again after the late-2020s surplus, Asian buyers may renew interest in long-duration contracts, particularly given their experience of spot market volatility in 2022. Thus, in the medium term, Qatar's strategy pivots decisively back toward the East. While maintaining profitable niches in Europe, Doha increasingly recognizes that Asia will remain the principal engine of LNG demand growth in the 2030s and beyond.

In 2028 – 2035, the transformation of LNG trading mechanisms, initiated under the pressures of the 4th energy transition, will continue to reshape the market. For Qatar, this means carefully balancing its traditional model of long-term, oil-indexed contracts with emerging trends such as spot sales, gas hub indexation, and short-term auctions. As previously noted, Qatar has already taken steps toward greater flexibility, notably through the creation and expansion of its dedicated trading arm, QatarEnergy Trading.

By the 2030s, such flexibility will become a prerequisite for maintaining competitiveness. The share of spot and short-term sales in Qatar's portfolio is likely to increase from the current ~10–15% to a significantly higher level. At the global level, the spot share of LNG trade could exceed 50% by the early 2030s (Global LNG Hub, 2025). Nevertheless, Qatar is unlikely to abandon its strategy of cultivating "anchor clients" — major importers bound by long-term contracts. Rather, the contracts themselves will evolve. For example, the 27-year agreements signed with European buyers are structured on an FOB (free on board) basis, allowing buyers to manage transportation and potentially re-export surplus volumes. Some newer contracts are linked to gas hub prices (e.g., TTF) rather than oil indexation, providing greater confidence to buyers in periods of oil price volatility. Thus, Qatar's contractual model will become increasingly hybrid: long-term foundations will remain in place — ensuring revenue predictability for Qatar and volume security for buyers — while the spot segment expands in parallel. Supported by its expanding tanker fleet, Qatar will be able to deploy volumes dynamically toward the most attractive markets.

Logistics will play a central strategic role. By the early 2030s, Qatar will have completed an unprecedented fleet expansion program. Starting in 2024, new LNG carriers — including Q-Flex and Q-Max vessels — began entering service. By 2030, QatarEnergy is expected to receive 128 new LNG carriers (104 standard 174,000 m^3 vessels and 24 enlarged Q-Max vessels of approximately 271,000 m^3 each) (Maritime Executive, 2024). This represents the largest single shipbuilding program in the history of the LNG industry, effectively transforming Qatar's fleet into a "floating gas pipeline."

As noted by *Maritime Executive*, the strengthened fleet ensures continuous LNG flows from Qatar (primarily to Asia) along long-term trade routes (2024). At the same time, fleet control enhances trading flexibility: dozens of vessels allocated to QatarEnergy Trading can be redirected to higher-demand markets when necessary. These logistical investments have already delivered political dividends. During geopolitical tensions in 2025 affecting the Strait of Hormuz, Qatar managed to redirect vessels without disrupting contractual commitments, reinforcing its reputation for reliability. In the 2030s, Qatar is likely to continue fleet modernization, placing emphasis on environmental performance. New Q-Max vessels are equipped with LNG-fueled engines and methane reduction technologies, lowering shipping emissions. Given longer trade routes — particularly toward Asia — and the need to mitigate transit risks, Qatar may also invest in additional transshipment facilities or strategic storage capacity in partner ports, especially in Asia (Maritime Executive, 2024).

Overall, the medium-term outlook portrays Qatar as a highly adaptive supplier. While preserving the backbone of long-term contractual relationships, Doha is learning to operate effectively within shorter market cycles — leveraging advanced logistics, trading sophistication, and structural cost advantages to remain competitive in an increasingly fluid LNG marketplace. By the early 2030s, as the energy transition accelerates across many countries, Qatar is diversifying its technological initiatives to align with emerging global standards. First, environmental requirements for LNG are tightening. By 2030, the European Union is expected to implement increasingly stringent regulations on methane leakage and the carbon footprint of imported gas. Japan and South Korea are advancing their Carbon Neutrality 2050 strategies, which imply the gradual displacement of high-emission LNG with cleaner alternatives (International Energy Agency, 2025h). In response, Qatar is scaling up its CCUS programs: between 2030 and 2035, CO_2 capture volumes are projected to increase further. QatarEnergy's objective is to reduce production-stage carbon intensity to the point where it can offer low-carbon — or effectively near-zero production-emission — LNG cargoes without heavy reliance on offsets (John, 2025).

Second, Qatar is positioning itself within the emerging hydrogen economy. In the 2030s, hydrogen may begin to occupy a more visible role in energy systems. The EU, for example, plans to substitute part of natural gas consumption with green and blue hydrogen, including blending hydrogen into gas networks (International Energy Agency, 2024c). Several Middle Eastern countries, including the UAE and Saudi Arabia, have already launched pilot ammonia export projects as hydrogen carriers.

Qatar, leveraging its vast gas reserves, is focusing on blue hydrogen — producing hydrogen from natural gas with carbon capture. This direction is strategically logical: according to the Global CCS Institute, carbon capture technologies can enable substantial volumes of gas to be converted into hydrogen with minimal emissions (Global CCS Institute, 2025). Qatar has announced plans to construct a large-scale blue ammonia plant (Bahtić, 2024), and QatarEnergy has also declared cooperation with Shell in hydrogen-related initiatives (Mirza, 2021).

Hydrogen offers Qatar two strategic advantages:

1. A new market channel for its gas resources (through conversion into hydrogen or ammonia for industrial, shipping, and energy applications);
2. A mechanism to mitigate long-term demand risks, as hydrogen can substitute for direct gas combustion in hard-to-abate sectors.

According to GECF projections, by 2050 — in a net-zero scenario — up to 50% of remaining global gas consumption could be directed toward hydrogen production with CCUS (Gas Exporting Countries Forum, 2024; 2025). Qatar intends to secure a significant share of this emerging segment.

Collectively, these initiatives allow Qatar in the medium term to cultivate an image of a progressive supplier: not merely an exporter of hydrocarbons, but an active participant in the global climate agenda, investing in low-carbon solutions and channeling hydrocarbon revenues into new sectors such as solar energy, education, and advanced technologies. This enhances the legitimacy of Qatari LNG in the eyes of buyers and reduces the risk of stranded reserves in a future world characterized by structurally lower fossil fuel demand.

4.3. 2035–2050: Long-Term Perspective

The long-term horizon to 2050 for Qatar's LNG sector is largely shaped by uncertainty regarding the trajectory of the global energy transition. On the one hand, a relatively gradual evolution of the gas market remains possible. Under the International Energy Agency's baseline STEPS (Stated Policies) scenario, global LNG demand could continue to grow through mid-century. The IEA projects that global LNG trade may increase from around 400 million tons in 2024 to approximately 482 million tons by 2050 — equivalent to roughly 1,020 bcm in 2050 compared to about 560 bcm in 2024 (Twidale, 2025).

Such a scenario implies that gas remains in demand, particularly in developing economies across Asia and Africa, where economic growth and the need to replace coal and oil support continued consumption of gas as a relatively cleaner fossil fuel. Under these conditions, Qatar would be in a highly favorable position. Its planned expansion to 142 mtpa would enable it to cover a substantial share of the growing market, while its low production costs would allow it to displace higher-cost competitors if necessary. Doha might even consider further capacity additions after 2035 should demand exceed available supply. The vast reserves of the North Field are sufficient to sustain elevated production levels for several more decades. By 2050, under a favorable demand scenario, Qatar could retain its status as one of the world's leading LNG exporters alongside the United States, supplying both traditional buyers and new markets — including rapidly urbanizing African economies transitioning from fuel oil to gas.

However, an alternative trajectory is equally plausible. If the international community intensifies efforts to meet the Paris Agreement goals, sustained reductions in hydrocarbon gas demand could begin in the 2030s. Under the IEA's Net Zero 2050 scenario (global carbon neutrality by 2050), natural gas consumption and LNG trade decline sharply (International Energy Agency, 2021). This would result from large-scale deployment of renewables, hydrogen, energy efficiency measures, and electrification of transport and buildings. Gas would retain a limited role as a peak or reserve fuel and as a feedstock for petrochemicals, but would largely be phased out of power generation and heating by mid-century.

For Qatar, such an outcome would pose a strategic challenge. Given the economy's substantial reliance on LNG exports, declining global demand could translate into reduced hydrocarbon revenues. Nonetheless, even under a stringent climate scenario, gas does not disappear entirely. By 2050, hundreds of billions of cubic meters of gas demand are still expected to remain, albeit at significantly lower levels than today. In a contracting market, the most efficient, low-cost producers are likely to survive. Qatar may emerge as one of the "last standing" suppliers: thanks to its low production costs and technologically advanced, CCS-integrated projects, it could continue supplying markets where higher-cost producers are squeezed out by price or regulatory pressure (Bousso, 2025).

In this context, Qatar could even increase its share of global LNG exports despite an overall contraction in volumes, by capturing market share relinquished by less competitive producers. By

2040–2050, several traditional exporters — including Algeria, Malaysia, Egypt, and Indonesia — may experience declining export capacity due to resource depletion and rising domestic demand, potentially removing up to 48 mtpa from the global market (Shell plc., 2025). If the overall “gas pie” shrinks, Qatar’s strategy will likely focus on securing the largest possible share of what remains (Bousso, 2025).

Recognizing these uncertainties, Qatar is already preparing risk-hedging strategies. One of the central pillars is its previously noted focus on hydrogen. By the 2040s, if LNG demand declines materially, Qatar could repurpose a significant share of its gas sector toward the production of low-carbon hydrogen and ammonia for export. In such a scenario, gas would remain monetized not through direct combustion, but as feedstock for H_2. This would preserve value even under stringent climate constraints, since hydrogen combustion does not generate CO_2 emissions at the point of use. According to analysts, gas-producing countries in aggressive transition scenarios can maintain revenue streams by exporting decarbonized derivatives rather than raw gas, provided carbon capture is integrated at scale (Hjeij, et al., 2022). Qatar is structurally well positioned for this pathway: it possesses the financial capacity, state coordination, and gas reserves necessary to build large integrated ammonia, methanol, and hydrogen complexes coupled with full-cycle CCS.

A second pillar of adaptation is domestic economic diversification. Qatar is channeling current LNG windfalls into its sovereign wealth fund and into non-hydrocarbon sectors — finance, tourism, advanced manufacturing, technology, and education — with the long-term objective of reducing GDP dependence on gas exports by mid-century. This diversification strategy aims to enhance economic resilience in the event of structural LNG demand decline.

Nonetheless, gas remains Qatar’s primary strategic asset, and Doha is unlikely to voluntarily curtail production while market demand exists. At the diplomatic level, Qatar is therefore expected to continue promoting the narrative of “gas as part of the climate solution,” emphasizing that natural gas — particularly when paired with CCUS — represents an optimal transitional fuel for emissions reduction. This framing is already visible in forums such as the GECF and other international energy platforms where Qatar plays an active role.

If global climate policy proves less aggressive than net-zero scenarios assume — a plausible outcome given geopolitical fragmentation and economic constraints — Qatar will likely continue maximizing LNG production throughout the 2030s and 2040s, capitalizing on what many observers describe as the final “golden window” for gas before structural decline accelerates after 2050. Numerous analysts argue that the current period represents the last major expansion phase for hydrocarbons prior to a full low-carbon transition. This logic is clearly reflected in Doha’s actions: the third wave of North Field expansion was announced precisely to secure market share in the 2030–2040 timeframe, before the structural window for large-scale LNG growth potentially narrows.

Summarizing, several possible development scenarios can be identified, along with their implications for Qatar (see Table 6).

Table 6. Possible LNG Market Scenarios and Implications for Qatar

Scenario	**Global LNG Market Dynamics**	**Regional Demand Structure**	**Qatar's Position**	**Prices & Capacity Utilization**	**Strategic Implications for Qatar**
Scenario A: Moderate Transition (Stated Policies)	LNG demand grows steadily until ~2040, then declines only moderately toward 2050 (≈480 mtpa).	Growth concentrated in Asia and Africa; gas remains a development fuel.	Qatar thrives: full capacity utilization, contract extensions, high revenues. Possible launch of a 4th expansion phase in the 2040s. Market share ~20–25% (every 4th–5th cargo globally Qatari).	High and stable prices; minimal underutilization risk.	Retention of energy superpower status; parallel investment in green technologies to ensure long-term resilience.
Scenario B: Accelerated Transition (Announced Pledges)	Gas demand plateaus in the 2030s, then gradually declines. By 2050, global LNG market shrinks to ~250 mtpa.	Decline in Europe and advanced Asia; partial compensation from South Asia, Middle East, and Africa.	Competition intensifies. Qatar maintains a key role due to low costs, displacing higher-cost projects (parts of U.S., Canada). Survivors include Qatar, selective U.S., Russian, and low-cost African suppliers.	Price pressure; occasional underutilization. Revenues lower than in the 2020s but still substantial.	Adaptation of business model: pricing flexibility, emphasis on low-carbon LNG (CCS), partial redirection of gas toward hydrogen production to meet client climate requirements.

Scenario C: Strict Net Zero	Sharp demand contraction after 2030. By the 2040s, LNG becomes a niche market (≈100–150 mtpa).	European imports minimal; Asia rapidly transitions to renewables and hydrogen. Gas remains only in select industrial niches.	Deep transformation: part of LNG capacity underutilized or repurposed. Exports limited to legacy contracts and specialized industrial projects.	Low prices due to limited demand.	Fiscal restructuring; reliance on sovereign wealth funds and economic diversification. Potential repositioning as global leader in "green ammonia" and synthetic fuels (methane with full CCS). Requires major investment, technological breakthroughs, and international certification frameworks.

Source: author's assessment

Overall, the future of the global LNG market — and Qatar's position within it — will be determined by the depth and speed of the global energy transition. Under a moderate transition scenario, LNG demand remains strong through 2040 and declines only slightly by 2050, enabling Qatar to maintain high capacity utilization, extend long-term contracts, and preserve a market share in the range of 20–25%. In such a context, Qatar not only consolidates its status as a key energy power but also gains the financial space to invest in low-carbon technologies, thereby strengthening its long-term resilience. Even under a more active climate policy framework and gradual contraction of the global LNG market toward mid-century, Qatar would likely remain among the few competitive suppliers due to its low costs, production scale, and environmental performance, displacing higher-cost projects.

Under a strict Net Zero scenario, gas and LNG become niche products, and Qatar would face the need for deep structural transformation of its gas model. Part of its export capacity could become underutilized or repurposed for hydrogen, synthetic fuels, and "green" ammonia production with full CO_2 capture, while LNG exports would be limited to residual demand and long-term contractual obligations. Although gas revenues would decline substantially in such a world, Qatar would retain strategic flexibility thanks to accumulated financial reserves, economic diversification efforts, and its ability to reposition methane not as an end-use fuel but as a feedstock for low-carbon energy chains. This adaptability could allow the country to remain relevant even in a carbon-neutral global system.

In reality, developments are likely to fall somewhere between these extremes. A mixed outcome appears more probable: certain regions (the EU, Japan) will significantly reduce gas imports, while others (South Asia, Africa) will increase demand, though not dramatically; hydrogen technologies will expand but not instantaneously; and gas will continue to serve a balancing and industrial role. In such a scenario, global LNG trade by 2050 may decline but not disappear. Qatar, according to many expert assessments, would remain among the limited group of exporters retaining substantial volumes. Even if global LNG trade were to shrink to around 200 mtpa, Qatar could plausibly maintain 50–100 mtpa, capturing a quarter to half of the market due to its structural competitive advantages.

4.5.Conclusion.

The development of Qatar's LNG sector from 2026 to 2050 is a story of proactive adaptation to a changing global energy landscape. In the short term, Qatar is effectively doubling down on LNG, expanding production and liquefaction capacity in order to consolidate its position as a leading supplier capable of weathering a temporary period of market oversupply. In the medium term, the country reaps the benefits of this strategy: by the 2030s, it secures an expanded market share, deepens partnerships with key Asian and European buyers, and deploys advanced emissions-reduction technologies to align with the demands of the energy transition.

In the long term, Qatar faces more complex challenges associated with the potential global decline in the role of gas. Yet here too Doha demonstrates strategic foresight — investing in blue hydrogen, expanding its trading and logistical capabilities, and diversifying its broader economy. Thanks to these measures, even if global LNG demand declines significantly by 2050, Qatar is likely to remain one of the last and most efficient players in the market.

As analysts note, Qatar's "all-in" strategy — investing heavily now to secure long-term gains — carries risks, but it is not without internal logic. In virtually any scenario through 2050, natural gas will retain relevance in certain sectors, and Qatar is positioning itself to ensure that its gas continues to find demand. In this sense, Qatar represents a case study in how a traditional hydrocarbon exporter can adapt to the transition era: combining economic pragmatism (low costs, contractual flexibility) with technological modernization (CCUS, low-carbon LNG, hydrogen integration) to navigate an uncertain yet manageable future.

5.Recommendations and Policy Implications

For Qatar and the GCC states, the ongoing transformation of the global gas and LNG market represents a qualitative shift from a model of extensive growth to one of strategic management of uncertainty. Gas and LNG are no longer merely sources of export rent; they are increasingly instruments of energy security, geo-economic positioning, and foreign policy influence. In an era of market fragmentation and accelerating energy transition, the resilience of exporters is determined less by volumes supplied than by their ability to adapt strategies to divergent global trends. A key policy implication for Gulf states follows: gas policy must be embedded within a broader framework of national resilience. This requires aligning energy strategy with fiscal policy, economic diversification programs, and long-term socio-economic commitments. Gas can no longer be treated as a standalone sector; it is becoming a system-forming pillar of the overall development model.

First, GCC states must institutionalize scenario-based planning in gas policy. The divergence between inertial scenarios (with sustained LNG demand growth) and strict climate trajectories (with sharp demand contraction after 2035–2040) makes reliance on a single forecast strategically risky. Policy should focus on managing a range of possible outcomes rather than optimizing for an "average" scenario. In practice, this means designing flexible investment and export strategies that can be adjusted without undermining systemic stability. It also implies a more cautious approach to fiscal dependence on hydrocarbon revenues and the early accumulation of financial buffers in anticipation of potential long-term demand decline.

Second, the anticipated wave of new LNG supply in the late 2020s has asymmetric implications. For high-cost producers, oversupply increases the risk of underutilization and revenue loss. For GCC states, however, it creates an opportunity for structural consolidation. Low production costs and well-developed export infrastructure enable Gulf producers to remain competitive even in low-price environments. The policy implication is that temporary LNG oversupply should be viewed as a mechanism of market selection rather than a crisis. Politically and economically, this dynamic strengthens the GCC's role as "suppliers of last resort" and reduces vulnerability to cyclical fluctuations, reinforcing long-term positioning in global markets.

Third, the environmental agenda is no longer a reputational issue but a condition for market access. Tightening climate regulations in the EU, Japan, and the Republic of Korea imply that gas with high carbon and methane intensity will face direct and indirect trade barriers. Environmental performance thus becomes a determinant of the export model's economic viability. Accordingly, a central policy implication for GCC states is the accelerated deployment of CCUS, methane monitoring systems, and transparent carbon reporting as foundational elements of export infrastructure. Producers that fail to integrate environmental performance into the core of gas policy risk exclusion from premium markets as early as the 2030s.

Within the GCC, Qatar occupies a distinctive position, as its LNG strategy most clearly reflects the structural shifts of the global market. The large-scale capacity expansion of the 2020s is often portrayed as risky. Yet from a political economy perspective, it represents a rational response to uncertainty regarding future demand. Low production costs and a unique resource base allow Qatar to act proactively rather than defensively. The key policy implication for Qatar is that expansion is not a bet on a single demand trajectory, but a form of insurance against uncertainty. If global demand remains strong, Qatar benefits from volume and scale. If energy transition accelerates, Qatar's cost advantages enable it to displace higher-cost producers and preserve market share in a contracting global market.

The contractual model of LNG exports acquires particular importance for Qatar. Long-term contracts with Asian buyers serve as a macroeconomic stabilizer, reducing revenue volatility and ensuring predictability in the investment cycle. In conditions of geopolitical turbulence, such agreements also function as instruments of geo-economic anchoring, tying key markets structurally to Qatari gas. At the same time, the development of spot trading and the strengthening of in-house trading structures increase strategic flexibility. The key policy implication is that a hybrid export model, combining long-term stability with short-term maneuverability, becomes optimal for Qatar. This approach not only mitigates risks but also enables the country to extract value from global market volatility.

The evolving regional structure of demand requires a differentiated strategy. In the medium and long term, Europe increasingly becomes a market of energy security and political legitimacy for LNG, rather than a stable source of volume growth. Maintaining a presence in Europe enhances the status of Qatari gas, but it should not constitute the core of long-term export strategy. In contrast, Asia, South Asia, and parts of Africa remain the primary sources of structural demand growth. The policy implication for Qatar is to retain Europe as a strategic, but secondary, market, while concentrating contractual and investment efforts toward Asia, where gas is likely to remain integral to economic development for decades.

The environmental transformation of Qatar's LNG sector also carries strategic significance. The integration of CCUS, electrification of production processes, and systematic reduction of methane emissions position Qatari LNG among the least carbon-intensive globally. In an environment where environmental requirements increasingly function as de facto trade barriers, this becomes a crucial competitive advantage. Here, the policy implication is clear: environmental investments are not costs but insurance mechanisms for the export model. They translate directly into market access, protection against future carbon border mechanisms, and preservation of Qatar's reputation as a reliable supplier under tightening climate policy.

In the long term, the central strategic transition for Qatar lies in shifting from gas as a fuel to gas as a feedstock. As direct combustion demand declines, greater emphasis will fall on hydrogen, ammonia, and synthetic energy carriers produced from natural gas with CCUS. This strategy extends the economic life of gas reserves and reduces the risk of stranded assets. Accordingly, the policy implication is that hydrogen and ammonia should not be viewed as alternatives to LNG, but as its evolutionary continuation. This framing allows Qatari gas to remain embedded within future energy systems even under deep decarbonization scenarios.

Finally, the period 2025–2035 should be regarded as a critical window of opportunity for Qatar and the broader GCC. During this phase, global LNG demand remains relatively strong, creating favorable conditions for capital accumulation and strategic consolidation of market share. Failure to capitalize on this window could significantly narrow strategic maneuvering space in the 2040–2050 period. The policy conclusion is that current LNG revenues should be used not only to maximize export volumes, but also to accelerate technological modernization and economic diversification. By doing so, Qatar will be able to preserve a significant role in the global energy system regardless of the depth and pace of the global energy transition.

6.Conclusion

The analysis presented demonstrates that by the mid-2020s the global gas and LNG sector has entered not a phase of cyclical correction, but a period of deep structural transformation. Gas is no longer viewed solely as a "transition fuel"; it has become an integral element of a broader architecture encompassing energy security, geo-economic competition, and climate policy. This fundamentally alters the logic of decision-making for both importers and exporters. A defining feature of the current stage is the coexistence of opposing trends: renewed growth in developing economies across Asia, Africa, and the Middle East occurs simultaneously with politically driven demand reduction in Europe and parts of the developed world. This asymmetry intensifies regional market fragmentation and makes universal projections for gas and LNG increasingly unreliable, elevating the importance of scenario analysis and strategic flexibility. The role of LNG as the central balancing mechanism of the global gas market has expanded significantly since 2022. The mobility and flexibility of LNG flows enabled compensation for lost pipeline supplies, particularly from Russia to Europe, and prevented a deeper energy crisis. LNG has thus definitively shifted from being a supplementary instrument to a system-forming pillar of global gas trade.

At the same time, the analysis suggests that in the late 2020s the global LNG market is highly likely to experience a temporary oversupply. Large-scale capacity additions in the United States, Qatar, Canada, and Africa are creating conditions of intensified competition and price pressure. Yet this "glut" is likely to be selective rather than destructive, accelerating the displacement of high-cost and high-carbon projects rather than undermining the entire market.

Geopolitical dynamics have become a permanent — rather than exogenous — factor shaping gas markets. Sanctions, conflicts, trade disputes, and risks to maritime routes have reshaped importer behavior, with supply reliability and political stability often outweighing short-term price considerations. As a result, gas and LNG are increasingly evaluated through the lens of strategic resilience and hard security.

The climate and environmental agenda is now embedded within the economics of gas not as an external constraint, but as a key determinant of market access. Stricter methane regulations, expanding carbon pricing mechanisms, and emerging cross-border climate instruments (such as ETS and CBAM) mean that competitiveness depends not only on price, but on full life-cycle carbon intensity. In this context, carbon capture and storage, methane abatement, digitalization, and the development of low-carbon derivatives (hydrogen, ammonia, synthetic gases) are no longer experimental pathways; they are becoming prerequisites for long-term viability. The gas industry faces a structural choice: evolve into a technologically advanced, lower-carbon energy platform, or risk accelerated marginalization.

Medium- and long-term projections to 2035 and 2050 reveal substantial uncertainty in demand trajectories. Under inertial scenarios, gas retains a meaningful role through mid-century; under stringent climate pathways, consumption and LNG trade contract sharply. What remains constant across scenarios is the conclusion that survival will favor producers combining low costs, high reliability, and minimal carbon intensity.

The analysis of the Qatari case demonstrates that the large-scale LNG capacity expansion strategy pursued in the 2020s represents a rational response to strategic uncertainty. Low production costs at the North Field, early market capture through long-term contracts, substantial investments in fleet and logistics, and the integration of CCUS and environmental standards collectively enable Qatar to strengthen its position both under scenarios of sustained demand and in the event of a contracting market.

Taken together, the findings suggest that the next 10–15 years constitute a critical "window of opportunity" for gas exporters. The extent to which this period is used for technological modernization, diversification of export products, and alignment with climate requirements will determine whether gas evolves into a "fuel of the problem" or a "fuel of the solution." In this sense, the future of the global gas sector will depend less on the size of remaining reserves and more on its ability to integrate into a new paradigm of energy security and low-carbon development.

For Qatar specifically, the analysis confirms that the current phase of the gas and LNG market is not a temporary fluctuation but a strategic inflection point. The country operates in an environment where traditional export expansion coexists with growing uncertainty about long-term demand, requiring not only capacity growth but also a redefinition of LNG's role within broader economic and energy strategy.

Qatar's ongoing large-scale expansion of LNG capacity in the 2020s is justified precisely within a risk-management framework. The low production costs of the North Field, combined with resource concentration and economies of scale, allow Qatar to treat a potential late-decade oversupply not as a threat but as an opportunity to consolidate market share by displacing higher-cost producers.

Qatar's contractual strategy remains its central competitive advantage. Long-term agreements of 20–27 years with key Asian and European buyers provide revenue predictability and insulation from price volatility. In a context of geopolitical turbulence, these contracts perform not only a commercial function but also a geo-economic one, embedding Qatar within the long-term energy balances of importing countries. At the same time, Qatar demonstrates an awareness of market transformation by actively expanding spot and short-term trading through its own commercial structures. The enlargement of its LNG tanker fleet and enhanced logistical flexibility transform Qatar from a predominantly contract-bound supplier into a dynamic market participant capable of capturing value from regional demand imbalances and price volatility.

Regional export diversification remains a cornerstone of Qatar's resilience strategy. Europe, despite its long-term trajectory toward reduced gas consumption, has consolidated its role as a market of energy security and price premium. Meanwhile, Asia and South Asia continue to constitute the foundation of structural demand growth. Qatar's balanced approach between these regions minimizes dependence on any single market and preserves strategic flexibility.

The environmental transformation of the LNG sector carries strategic significance for Qatar. The integration of CCUS, electrification of production processes, and systematic reduction of methane emissions position Qatari LNG among the least carbon-intensive globally. In the context of tightening climate regulation, this is no longer an auxiliary advantage but a prerequisite for maintaining access to premium markets.

In the medium term, Qatar is increasingly moving toward the use of gas not only as a fuel, but also as a feedstock. The development of blue hydrogen, ammonia, and other derivatives opens new monetization channels for gas reserves at a time when direct gas combustion may face regulatory and societal constraints. This strategy reduces the risk of stranded assets in the 2030s–2040s.

In the long-term horizon to 2050, the resilience of Qatar's gas model will depend on the depth and pace of the global energy transition. Even under scenarios of sharp contraction in global LNG demand, Qatar is likely to remain among the last competitive suppliers due to its combination of low production costs, technological sophistication, and financial strength. This creates the potential not only to preserve, but possibly to increase its relative market share amid overall LNG trade contraction. Sovereign financial reserves and a policy of economic diversification serve as critical buffers in less favorable scenarios. A potential long-term decline in LNG revenues can be mitigated by accumulated assets and the development of non-hydrocarbon sectors, allowing gas transformation to be viewed not as an existential threat, but as a manageable adaptation process.

The Qatari case illustrates that a successful gas-export strategy in the era of energy transition is built upon proactive investment, technological modernization, and market flexibility. Qatar is using the current "window of opportunity" not only to maximize LNG exports, but also to prepare for a future in which gas will be valued less for volume and more for reliability, low carbon intensity, and its ability to integrate into evolving energy systems.

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