



KAPITEL 3 / CHAPTER 3³
**GLOBAL GAS AND LNG MARKETS: DEMAND, SUPPLY DYNAMICS,
AND FUTURE IMPLICATIONS**

DOI: 10.30890/2709-2313.2024-32-00-008

Introduction

Market volatility is a major driver of energy security concerns, capable of disrupting energy supplies and causing price spikes and market imbalances. The COVID-19 pandemic exacerbated this volatility by reducing demand for oil and gas, leading to significant price drops.

The long-term impacts of market volatility on energy security are evident in the aftermath of the 2008 financial crisis when many countries adopted policies to promote renewable energy and energy efficiency to reduce dependence on volatile fossil fuel markets. These policies have had a lasting impact, with renewable energy now accounting for a significant share of global electricity generation.

To address market instability and energy security concerns, various global policies have been enacted. The International Energy Agency (IEA) has called for greater investment in renewable energy and efficiency to reduce reliance on fossil fuels. The European Union has introduced directives, such as the Renewable Energy Directive and the Emissions Trading System, to encourage renewable energy adoption and reduce greenhouse gas emissions.

The Shell LNG Outlook 2023 predicts continued market volatility in the global energy industry. This volatility will necessitate interventions to enhance energy security, which will have lasting economic and environmental impacts. Europe, for instance, is expected to benefit from the flexibility of the LNG industry in 2022, increasing its LNG imports by 60% to offset reduced Russian pipeline imports. The US is anticipated to expand global supply by 6 million tons [1].

Despite market volatility posing a barrier to achieving energy security, policy interventions that promote renewable energy and energy efficiency can help mitigate the impacts of market disruptions. This comprehensive approach underscores the need

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for sustained investment in renewable energy infrastructure and efficiency measures to enhance global energy security and stability.

A comprehensive overview of the LNG market highlights that continued market volatility and uncertain global energy demand growth will drive policymakers to enhance energy security and promote renewable alternatives. As the world transitions to a low-carbon future, LNG will remain crucial for meeting energy needs. However, the industry must adapt to changing market dynamics and invest in cost-effective energy alternatives to stay competitive and sustainable.

This article emphasizes the importance of clearly identifying knowledge gaps in understanding market dynamics, supply-demand interplay, pricing mechanisms, and long-term impacts on global gas and LNG sectors. Addressing these gaps can enrich scholarly discourse and improve comprehension of the complex challenges and opportunities in the dynamic energy landscape, especially concerning gas and LNG markets.

Matching supply and demand reliably is a critical concern in the natural gas market. Short-term price fluctuations, influenced by market dynamics, geopolitical events, and weather patterns, can impact profitability, investment decisions, and market stability. However, ensuring long-term natural gas supply security is equally vital. This study addresses the overarching issue of achieving a sustainable balance between supply and demand in the natural gas industry [2].

Ensuring long-term natural gas supply security requires assessing the resilience and adequacy of the infrastructure and resources supporting production, transportation, and distribution. This includes examining reserves, infrastructure capacity, geopolitical risks, technological advancements, and environmental considerations. Understanding and addressing these factors allows policymakers, industry stakeholders, and researchers to develop strategies to mitigate supply-demand imbalances and enhance the stability and security of natural gas supply in the long run.

The analysis presented in this research involved a comprehensive review of existing literature, reports, and data on global gas and LNG markets. Data collection included supply and demand dynamics, market trends, and investment opportunities



from reputable sources such as international energy agencies, industry reports, and scholarly publications. The literature review identified key studies, reports, and academic papers providing valuable insights into the current state of global gas and LNG markets, emerging trends, and challenges.

The analysis identified challenges and investment opportunities in the global gas and LNG markets. A comprehensive market outlook was developed, highlighting expected trends, challenges, and investment opportunities, considering factors such as supply and demand dynamics, market volatility, energy security interventions, and economic and emissions impacts [3].

The findings were synthesized to conclude implications for the future of global gas and LNG markets, identifying key insights, challenges, and investment needs in the evolving energy landscape [4].

This study explores the multifaceted nature of the natural gas market, examining short-term price fluctuations and long-term supply security. By analyzing supply and demand dynamics, market trends, and key factors affecting the industry, it aims to provide insights and recommendations for a sustainable and secure natural gas market for the future.

3.1. Literature Overview

Studies emphasize the importance of emerging Asian markets and clean energy transitions in driving global gas and LNG demand. For instance, Zou (2022) highlights the influence of Asian countries on new LNG projects, while Fulwood (2020) notes the potential of smaller Asian markets to boost LNG demand. Najm (2020) discusses the negative impact of renewable energy on LNG trade, stressing the need for investment in cleaner technologies [5, 13, 14].

Several studies provide insights into the global gas and LNG market dynamics. Liu (2020) attributes Australia's LNG export success to competitiveness, Chernyaev (2020) examines Russia's role in the LNG market, and Merkulov (2020) reviews global



LNG production capacities and environmental regulations. Chen (2021) analyzes historical LNG pricing trends and offers recommendations for China's import pricing [6, 10, 14].

These studies suggest increasing competition in the global LNG market, necessitating strategies to accommodate new players, expand markets, and adapt to evolving pricing mechanisms.

- **Market Volatility and Energy Security:** Market volatility significantly influences energy security concerns by potentially disrupting energy supply, causing price spikes, and leading to market imbalances. The COVID-19 pandemic exacerbated this volatility, reducing oil and gas demand and causing price drops.
- **Policy Responses and Long-term Impacts:** In response to past crises like the 2008 financial downturn, many countries have adopted renewable energy and energy efficiency policies to lessen dependence on volatile fossil fuel markets. These policies have had a lasting impact, with renewable energy now playing a crucial role in global electricity generation.
- **International Efforts to Enhance Energy Security:** Global policy initiatives, such as those from the International Energy Agency (IEA) and the European Union, aim to boost investment in renewable energy and efficiency. These measures are designed to reduce reliance on fossil fuels and cut greenhouse gas emissions.
- **Shell LNG Outlook 2023:** Shell's LNG Outlook 2023 anticipates continued market volatility, prompting efforts to enhance energy security. Europe's LNG imports are expected to rise by 60% to 121 million tons in 2022, partly to offset reduced Russian pipeline imports. The U.S. is projected to increase global supply by 6 million tons [9].
- **Future Market Dynamics:** Market volatility remains a challenge for achieving energy security. However, policy interventions promoting renewable energy and efficiency can help mitigate market disruptions.
- **LNG Market Dynamics:** Continued market volatility and uncertain global energy demand growth will drive policymakers to focus on enhancing energy



security and promoting renewable energy alternatives. LNG is crucial in the transition to a low-carbon future, but the industry must adapt to changing market dynamics and invest in competitive energy alternatives.

- **Knowledge Gaps and Research Needs:** While this analysis covers the global gas and LNG markets, there is a need to identify knowledge gaps in market dynamics, supply-demand interplay, pricing mechanisms, and long-term impacts. Addressing these gaps will enrich scholarly discourse and improve understanding of the global gas and LNG sectors.
- **Short-term and Long-term Challenges:** The natural gas market faces challenges in balancing short-term price fluctuations with long-term supply security. Short-term price volatility can arise from various factors, impacting profitability and investment decisions. Ensuring long-term supply security requires assessing infrastructure resilience, geopolitical risks, technological advancements, and environmental considerations.
- **Major LNG Importers and Market Dynamics:** China, India, Japan, South Korea, and Taiwan are the largest LNG importers, with these countries diversifying their LNG imports. China's emergence as a major importer is driven by its shift to cleaner fuels. Stability of LNG supplies in the Asia Pacific region is critical for these importers.

3.2. Natural Gas Demand and climate changes

The Paris Agreement, adopted in 2015 under the United Nations Framework Convention on Climate Change (UNFCCC), is a global effort to combat climate change by limiting global temperature rise to below 2 degrees Celsius above pre-industrial levels. This evaluation examines the climate policy measures outlined in the agreement and their potential impact on the demand for natural gas and the long-term gas market.

The Paris Agreement promotes a variety of climate policy measures aimed at achieving its objectives, including:



- Mitigating greenhouse gas emissions
- Promoting renewable energy sources
- Improving energy efficiency
- Encouraging sustainable practices

These policies have direct implications for the energy sector, influencing the demand for natural gas as a transitional fuel.

While emphasizing the transition to low-carbon and renewable energy sources, the Paris Agreement acknowledges the role of natural gas as a cleaner alternative to more carbon-intensive fuels like coal. Natural gas is seen as a bridge fuel in the transition to a low-carbon economy. However, the long-term impact of the Paris Agreement on gas demand is complex, depending on various factors such as the implementation of climate policies, technological advancements, and the competitiveness of renewable energy sources.

The implementation of the Paris Agreement is likely to influence the long-term market dynamics of natural gas. The growing focus on carbon neutrality and the adoption of renewable energy technologies may shift the energy mix, impacting gas demand. The gas industry may need to adapt by exploring new markets and investing in technologies like carbon capture and storage (CCS) to mitigate greenhouse gas emissions from gas production and utilization [7].

The Paris Agreement represents a significant milestone in global efforts to address climate change. While its climate policies may affect gas demand in the long term, natural gas is expected to play a crucial role in the transition to a low-carbon economy. The gas industry should anticipate and adapt to evolving market dynamics, leveraging technological advancements and sustainable practices to align with the goals outlined in the Paris Agreement.

While the transition to low-carbon and renewable energy is necessary, the agreement also recognizes the importance of natural gas as a cleaner alternative to coal during the transition period. The deal's long-term impact on natural gas demand will depend on a variety of variables, including how effectively policies are implemented, how quickly technology advances and how competitive renewables are. The energy



mix may change with a growing emphasis on carbon neutrality and renewables, which could affect demand for natural gas. The gas business must adapt, find new markets and spend money on carbon capture and storage technologies to reduce emissions. Despite these changes, natural gas is still expected to play a role in the transition to a low-carbon economy.

3.3. Overview of the LNG market

The global liquefied natural gas (LNG) market has faced significant disruptions and unprecedentedly high prices following Russia's invasion of Ukraine in February 2022. This conflict led to a decline in Russian pipeline gas shipments to the European Union, resulting in heightened demand for LNG from EU buyers, record global spot prices, and a reduced LNG supply for developing economies.

High prices and supply disruptions are introducing new risks to demand growth in the LNG market, causing delays and cancellations of proposed LNG import projects in Asia. Furthermore, key LNG growth markets are enacting policies to decrease reliance on global gas imports, potentially impacting long-term demand in regions anticipated to drive substantial growth in the LNG industry.

European countries, in contrast, have increased LNG imports to offset the reduction in Russian pipeline gas shipments. However, the EU's climate and energy security policies aim to cut gas demand by at least 40% by 2030, possibly leading to a decline in LNG demand after 2023. Although Europe's LNG import capacity could increase by a third by the end of 2024 with new terminals, this capacity might remain underused due to the continent's energy transition goals [8].

High prices, COVID-19 shutdowns, slower economic growth, and rising concerns about fuel supply security and affordability are prompting Japan, South Korea, China, and South Asia to reduce their LNG purchases. These regions are turning to alternative energy sources like nuclear, wind, and solar power, lower-cost Russian pipeline imports, and domestic gas production. Southeast Asia is grappling with high prices,



limited LNG contract availability, and infrastructure constraints, leaving price-sensitive buyers vulnerable to volatile and expensive spot markets, with long-term contracts sold out globally until 2026.

As a result of high prices, industrial users in major European markets are expected to cut their average gas use by 16% compared to 2021. LNG could become a crucial energy source for Europe to meet its energy security needs. In 2023, China's LNG imports are expected to decrease by 15 million tons (or 19%) due to strict COVID measures, and South Asian LNG imports are expected to drop by 5.8 million tons due to high prices.

The global LNG trade is projected to rise to 397 million tons, an increase of 16 million tons compared to 2021, with continued uptake of gas in heavy-duty transport. Most new LNG supply until 2030 is expected to come from the US and Qatar, though a supply-demand gap may persist without further investment [9, 13].

High LNG prices will likely encourage fuel switching, including increased coal use in Asia, impacting global emissions. The number of operating LNG vessels is expected to grow to 521, with 130 more on order. Europe currently has 635 LNG fueling stations, some offering Bio LNG, and 39,600 LNG and Bio LNG-fueled vehicles. China is anticipated to provide more flexibility to the global LNG market.

According to the International Energy Agency (IEA), global natural gas markets continued to tighten in 2022 despite a 1.6% decline in global consumption. Demand for natural gas is projected to remain stable in 2023, but uncertainties due to Russia's future actions and fluctuating energy prices remain. Europe's gas demand decreased by 13% and Asia's by 2% due to high LNG prices, COVID-19 disruptions in China, and mild weather conditions in Northeast Asia.

3.4. EU's LNG imports and flexibility

Europe's increased LNG imports have become a crucial factor in the global LNG market. In 2022, Europe increased its LNG imports by 60%, exceeding 100 million



tons, to offset the decline in Russian pipeline gas shipments caused by the Ukraine crisis. This boost in LNG imports enabled Europe to maintain its energy security and meet its energy needs despite the supply disruptions.

According to the International Energy Agency (IEA), Europe's reliance on LNG imports is expected to continue growing. The IEA reports that Europe's gas demand is projected to increase by 1.5% per year until 2025, with LNG imports making up a significant portion of this growth. This underscores the increasing importance of LNG as a core energy supply for Europe as it seeks to secure its energy needs.

The increase in Europe's LNG imports also highlights the flexibility of the LNG industry. The industry's ability to redirect LNG shipments to various markets in response to changing demand has allowed it to quickly address the supply disruptions caused by the Ukraine crisis. This flexibility has been pivotal in enabling Europe to maintain its energy security and meet its energy requirements.

The situation of oversupply in the LNG market is not new, having been observed previously, such as in 2019 when global supplies clashed with weak demand, leading to a global LNG glut. The COVID-19 pandemic exacerbated this oversupply, and by the summer of 2020, global LNG markets faced severe oversupply. This led to lower-than-expected prices, posing significant concerns for LNG exporters. It is anticipated that global LNG prices will remain structurally elevated for several years due to weak supply growth and robust demand [10].

In this context, LNG exporters need to develop strategies to cope with volatile market conditions and stay competitive. One strategy is to optimize liquefaction processes and logistics to reduce production costs and increase profit margins. Additionally, LNG exporters should consider expanding their customer base beyond traditional markets like Japan and South Korea to emerging markets such as China and India, which are expected to drive global LNG demand.

Evidence suggests that LNG exporters should prioritize diversifying their portfolios by investing in alternative energy sources, particularly renewables, due to their growing cost competitiveness and potential for stable long-term revenue. This approach provides a strategic advantage by mitigating the risks associated with



overreliance on the LNG trade. Furthermore, exploring partnerships and collaborations with key industry stakeholders, including shipping companies, can offer benefits such as economies of scale and operational cost reduction, enhancing the overall competitiveness and sustainability of LNG exports.

In conclusion, the LNG market's volatility and oversupply have led to falling prices and lower profits for exporters, making it essential for them to develop robust strategies to cope with these conditions. By optimizing liquefaction processes, diversifying portfolios, and exploring new partnerships, LNG exporters can remain competitive in a rapidly changing market and secure their long-term profitability.

LNG industry stakeholders must monitor global supply and demand dynamics in light of current market conditions and adapt accordingly. With expected growth in LNG demand in emerging markets and uncertainties in Europe, market participants must be flexible and agile in their decision-making. The ability to respond quickly to changing market conditions and identify new growth opportunities will be critical to ensuring the industry's long-term success.

3.5. General gas supply and demand trends and decarbonization policies

The global gas and LNG markets have been continuously evolving over the past few years, influenced by changes in supply and demand dynamics driven by economic growth, shifts in energy policies, and technological advancements. The International Energy Agency (IEA) projects that global natural gas consumption will continue to rise, primarily driven by Asian economies such as China, India, and Southeast Asia, which are expected to account for nearly half of global gas consumption by 2040.

Europe has emerged as a significant LNG importer in recent years due to the decline in domestic production, the decommissioning of nuclear and coal-fired power plants, and increasing demand for cleaner energy sources. Simultaneously, Asia, particularly China, has become a major LNG importer as part of its efforts to reduce coal reliance and improve air quality. This intense competition has kept LNG prices



high, raising concerns over affordability and energy security. The supply-demand dynamics in the LNG market are expected to shift towards more flexible spot and short-term contracts, giving buyers greater flexibility to respond to changing market conditions [11].

In summary, the global gas and LNG markets are expected to continue evolving, driven by changes in energy policies, technological advancements, and global economic growth. These changing market dynamics are likely to lead to a structural transformation, emphasizing the need for the industry to adopt more flexible contract structures to meet evolving buyer requirements and ensure long-term sustainability. Market participants must remain vigilant and proactive in adapting to these changing conditions to stay competitive.

According to the IEA, global natural gas demand is expected to grow by 1.2% per year until 2025, primarily driven by Asian economies, especially China and India. However, the growth rate is expected to slow after 2025 due to increasing competition from renewable energy sources and efforts towards decarbonization. On the supply side, the IEA projects that global natural gas production will increase by 1.6% per year until 2025, with most growth coming from the United States, Russia, and the Middle East [12].

The global LNG market is forecasted to see a 45% increase in liquefaction capacity between 2020 and 2026, mainly due to new projects in the United States, Russia, Australia, and Qatar. Despite this, in the short to medium term, LNG demand is expected to outpace supply, with Asia and Europe competing for limited new supply. The IEA predicts that prices will remain high due to continued demand growth and challenges in increasing supply.

The competition for limited new LNG supply is particularly intense in Europe, where demand for natural gas and LNG has surged due to the closure of coal-fired power plants and the retirement of nuclear reactors. Europe faces increasing competition from Asia, particularly China, which is expected to overtake Japan as the world's largest LNG importer by the mid-2020s. This competition is expected to keep prices high and create opportunities for LNG traders and exporters to capture value.



The global gas and LNG markets are anticipated to undergo structural changes that will shape the industry for decades. Despite expected short-term growth, there are concerns about increasing competition from renewable energy sources and the push towards decarbonization. The intense competition for limited new supply in Europe, driven by the closure of coal-fired power plants and the retirement of nuclear reactors, is expected to lead to a surge in demand for natural gas and LNG.

Conclusion

This article highlights the current state of the global gas and LNG markets, focusing on supply and demand dynamics, pricing trends, and investment needs. Over the past few years, these markets have experienced significant growth, driven by increasing demand from Asia and the adoption of gas in heavy-duty transport. However, this growth has also led to a supply-demand gap and a decline in prices in certain markets, underscoring the need for further investment in new supply infrastructure. Looking ahead, the majority of new LNG supply until 2030 is expected to come from the US and Qatar, with China playing an increasingly important role in providing flexibility to the global LNG market. While the future of the global gas and LNG markets is one of continued growth and evolution, challenges such as supply-demand imbalances and competition from renewable energy sources remain. China's increasing role in the global LNG market is contributing to its growth and flexibility, but existing facilities and slow supply growth present ongoing challenges.

The future of LNG demand growth remains uncertain due to various factors, including concerns over fuel supply security and affordability, a decrease in gas consumption in Europe, and investments in cost-competitive energy alternatives. To avoid a supply-demand gap, further investment in infrastructure and technology will be necessary. The global LNG market will continue to evolve and face challenges, requiring market participants to stay informed and adapt to changing conditions. Strategic investment and collaboration between industry stakeholders are essential to



ensuring a sustainable and stable market.

The Paris Agreement, adopted in 2015, aims to address climate change and limit global temperature rise. This research evaluates the impact of the agreement's climate policies on natural gas demand and the long-term gas market. The agreement promotes greenhouse gas mitigation, renewable energy adoption, and energy efficiency improvements. While emphasizing the transition to low-carbon sources, it recognizes natural gas as a cleaner alternative. However, the long-term implications on gas demand depend on policy implementation, technological advancements, and renewable energy competitiveness. Market dynamics may shift as carbon neutrality gains importance, requiring the gas industry to adapt strategies and invest in carbon capture and storage technologies. The Paris Agreement marks a significant milestone, and the gas industry should anticipate and align with evolving market dynamics and sustainability goals.

Global natural gas supply has experienced steady growth, with increasing consumption projected for the future. The United States, Russia, and Iran are the largest producers, while Russia, Qatar, and Norway lead as exporters. Japan, China, and South Korea are major importers of liquefied natural gas. However, the rapid growth of gas demand in emerging countries, such as China and India, challenges the security of gas supply in Europe, where competition for limited LNG supplies can lead to price volatility and supply disruptions. To address these challenges, European countries are investing in infrastructure and diversifying supply sources. Additionally, integrating the development of the gas market into long-term carbon neutrality plans is essential, involving reducing reliance on fossil fuels and exploring cleaner energy alternatives. By adopting innovative solutions, policies, and technologies, a more sustainable future can be achieved, balancing the demand for natural gas with the imperative of mitigating climate change.