

Vietnam's liquefied natural gas demand—potential to import liquefied natural gas from the USA

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ABSTRACT

Vietnam, a dynamic and rapidly developing country in Southeast Asia, is experiencing a surge in energy demand due to its booming economy and growing population. However, with the strong commitment of the Vietnamese government to achieve net-zero emissions by 2050 at COP 26, Vietnam needs to implement robust measures to reduce greenhouse gas emissions, with energy transition as a top priority. To meet this growing energy demand and minimize greenhouse gas emissions in the energy sector, Vietnam is turning its attention to liquefied natural gas (LNG), an environmentally friendly and versatile energy source. With the USA emerging as a major global exporter of LNG based on the shale gas revolution, Vietnam has recognized the potential to import LNG from the USA to meet its energy needs in a sustainable manner. The purpose of this article is to analyse the reasons why Vietnam has prospects for importing LNG from the USA.

INTRODUCTION

Energy and the environment remain key challenges for humanity in the 21st century. Over the past 20 years, Vietnam has gradually become one of the fastest-growing economies in the world. This economic expansion has been accompanied by a steady increase in energy demand. This continued rise in energy demand has not only positioned Vietnam as one of the most vulnerable nations to climate change,¹ but also poses a significant hurdle to ensuring Vietnam's future energy security.

According to recent projections, energy consumption in Vietnam is expected to continue to increase without any decline, and could reach an annual growth rate of 8 per cent from the present until 2035.² Based on calculations derived from the National Energy Development Strategy, the future energy demand is expected to be around 100–110 million tonnes of oil equivalent (TOE) for primary energy by 2020, increasing to 110–120 million TOE by 2025 and further increasing to 310–320 million TOE by 2050.³ According to a 2016 report by Enerdata, Vietnam will experience

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¹ Vietnam's NDC, 'Nationally Determined Contribution' (2022) <https://unfccc.int/sites/default/files/NDC/2022-11/Viet%20Nam_NDC_2022_Eng.pdf> accessed 24 July 2023.

² Danish Energy Agency, *Vietnam Energy Outlook Report 2019* (Danish Energy Agency 2019).

³ Nguyen Van Binh, *Vietnam's National Energy Development Strategy Orientation to 2030, Vision to 2045* (NEU Publishing House 2020).

the largest increase in primary energy demand, followed by China and India, accounting for 78 per cent over the period 2015–2040.⁴ The Asian Development Bank report predicts that Vietnam's primary energy demand will increase from 67.7 million tonnes of oil equivalent (Mtoe) in 2010 to 186.0 Mtoe in 2035, maintaining an annual growth rate of 4.1 per cent.⁵ Finally, Vietnam's total energy consumption is expected to continue growing at an annual rate of 3.3 per cent until 2035.⁶

In particular, the demand for electricity is constantly increasing in Vietnam in the coming period. According to projections by the General Statistics Office of Vietnam, electricity demand will continue to grow at an annual rate of 10–12 per cent, escalating from 169.8 terawatt hours (TWh) in 2015 to 615.2 TWh in 2030. According to the National Power Development Plan for the period 2021–2030, vision to 2050 (Power Master Plan 8) approved by the Vietnamese Government in May 2023, commercial electricity will be around 505.2 billion kWh by 2030 and around 1.1141–1.2546 billion kWh by 2050. The peak capacity in 2030 is about 90,512 MW; by 2050 about 185,187–208,555 MW.⁷ Currently, Vietnam's electricity still mainly comes from coal power, but in the future, there needs to be a transition from coal power to clean energy to minimize greenhouse gas (GHG) emissions to achieve net-zero emissions by 2050. How can we reduce GHG emissions to mitigate global warming and climate change? The best solution at present is to use energy efficiently and to save it, together with the use of renewable energy sources such as wind and solar power and emission-free energy sources such as nuclear power to replace traditional fossil fuel sources. However, these solutions may face short-term technical and economic barriers. A more feasible solution, and one that is currently trending globally, is to replace traditional fossil fuels such as oil and coal with lower-emission energy sources. In the current context, natural gas is seen as a promising energy option that can replace coal and oil in many sectors. It is considered as a transitional energy during the transition from conventional to renewable energy sources.⁸ Natural gas is recognized as the least polluting of the fossil fuel sources, as its combustion releases approximately half the amount of carbon dioxide (CO₂) emitted by coal and three-quarters less than oil. In addition, its emissions of nitrogen oxides are significantly lower than those of coal and oil, while it produces virtually no sulphur dioxide, particulate matter, or mercury.⁹ Natural gas is used in a wide variety of applications, most notably as a substitute for coal in the generation of electricity to reduce GHG emissions and pollution. For these reasons, natural gas consumption has increased rapidly in recent decades, with liquefied natural gas (LNG) emerging as a promising alternative.¹⁰ This is also shown in Power Master Plan 8.

According to the Power Development Plan 8, there will be a gradual shift in power generation structure, with a decreasing proportion of coal-fired thermal power and an increasing proportion of gas-fired thermal power and renewable energy. The proportion of hydroelectric power will also decrease gradually as major hydroelectric projects in Vietnam have been largely exploited and put into operation. Electricity generated from gas-fired thermal power sources is expected to account for approximately 21.7 per cent by 2030 and increase to 24 per cent by 2050 (see Figure 1). In the future, Vietnam's gas thermal power plants will mainly be gas generators from imported LNG sources.

⁴ Enerdata, 'Energy Outlook for Power and Gas in Asia—Focus on Risk Assessment' (2016).

⁵ Asian Development ADB Bank, *Energy Outlook for Asia and the Pacific 2013* (Asian Development Bank 2013).

⁶ EREA & DEA, 'Vietnam Energy Outlook Report 2019' (2020) <https://ens.dk/sites/ens.dk/files/Globalcooperation/vietnam_energy_outlook_report_2019.pdf> accessed 20 March 2023.

⁷ Decision No 500/QĐ-TTg, 'The National Master Plan for Power Development for the 2021–2030 Period with the Vision to 2050'.

⁸ Steffen Jenner and Alberto J Lamadrid, 'Shale Gas vs. Coal: Policy Implications from Environmental Impact Comparisons of Shale Gas, Conventional Gas, and Coal on Air, Water, and Land in the United States' (2013) 53 *Energy Policy* 442.

⁹ EIA, 'Natural Gas 1998: Issues and Trends' (1998) <http://www.eia.gov/oil_gas/natural_gas/analysis_publications/natural_gas_1998_issues_and_trends/it98.html> accessed 25 May 2016.

¹⁰ Le Minh Thong and Tran Van Hiep, 'Advantages and Disadvantages of the Development of Liquefied Natural Gas in Vietnam Today' (2023) 630 *Asia-Pacific Economic Review* 4. Le Minh Thong, Tran Van Hiep and Nguyen Thanh Thuy, 'Developing the Liquefied Natural Gas Market in Vietnam' (2023) 5 *Economy & Forecast Review* 36.

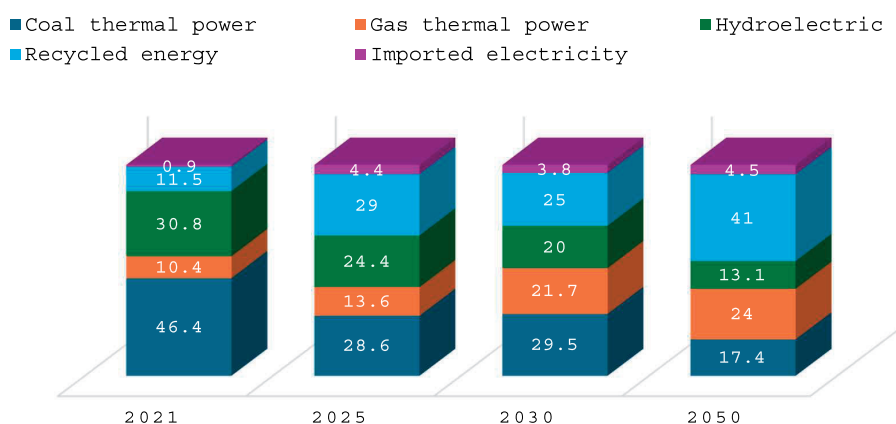


Figure 1. Structure of power sources by capacity in the period 2021–2045. Decision No 500/QĐ-TTg, ‘The National Master Plan for Power Development for the 2021–2030 Period with the Vision to 2050’.

VIETNAM’S NATURAL GAS POTENTIAL AND LNG IMPORT DEMAND

Vietnam has significant natural gas potential, such as the Nam Con Son Basin, the Cuu Long Basin and the Song Hong Basin. Vietnam is very active in exploring and developing new gas fields to meet future demand, particularly for gas-fired power plants. Vietnam’s natural gas potential is estimated to be around 432 billion cubic metres at level 2P reserves (relatively certain reserves).¹¹

To date, Vietnam has extracted over 150 billion cubic metres (bcm). Natural gas production is mainly from gas fields, accounting for 64.8 per cent and the remaining 35.2 per cent is associated gas.¹² Currently, out of 55 oil fields discovered in Vietnam, 27 oil fields are in production, and out of 27 oil fields in production, only 18 oil fields are producing associated gas.¹³ Total gas production from offshore fields in Vietnam is approximately 10 billion cubic metres per year. Figure 2 shows Vietnam’s natural gas production in recent years.

Although Vietnam has recently discovered many large gas fields such as Lan Tay—Lan Do, Su Tu Trang, Ken Bau, etc. However, natural gas production has not grown over the years and has tended to decline. The main reasons for Vietnam’s low natural gas production are the slow development progress of some gas fields, the lower-than-expected production of some fields, and the faster production decline of some fields. All gas production is consumed domestically, with about 8 billion cubic metres per year used for power generation, accounting for about 75 per cent of total dry gas production supplied to consumers.

It is clear that Vietnam has made considerable progress in domestic energy production, including the extraction of natural gas from offshore reserves. However, the country’s domestic natural gas reserves are limited and, despite efforts, natural gas production remains modest. In the face of growing demand, this means that domestic gas supplies are insufficient to meet future consumption needs, particularly in the power generation sector. There is an urgent need to diversify energy sources to ensure long-term energy security. In this context, imports of natural gas are becoming crucial, with LNG imports offering a viable solution to bridge the gap between supply and demand.

Recognizing the pivotal role of natural gas in the future energy landscape and its importance in the energy transition, Vietnam has set strategic directions and policies for the import of LNG. This commitment is evident in Resolution No 60/QĐ-TTg, issued on 16 January 2017, which approved the development plan for Vietnam’s gas industry until 2025, with a forward-looking

¹¹ Vietnam Energy Magazine, ‘Update on Vietnam’s Gas Reserves and Potential’ (*Năng lượng Việt Nam Online*, August 2020) <<https://nangluongvietnam.vn/cap-nhat-ve-tru-luong-tiem-nang-khi-dot-cua-viet-nam-24932.html>> accessed 9 February 2023.

¹² Vietnam Energy Magazine *ibid*.

¹³ Vietnam Energy Magazine, ‘Update on the Potential of Vietnam’s Energy Resources and Exploitation Ability’ (*Năng lượng Việt Nam Online*, November 2020) <<https://nangluongvietnam.vn/cap-nhat-ve-tiem-nang-tai-nguyen-nang-luong-viet-nam-va-kha-nang-khai-thac-25552.html>> accessed 20 March 2023.

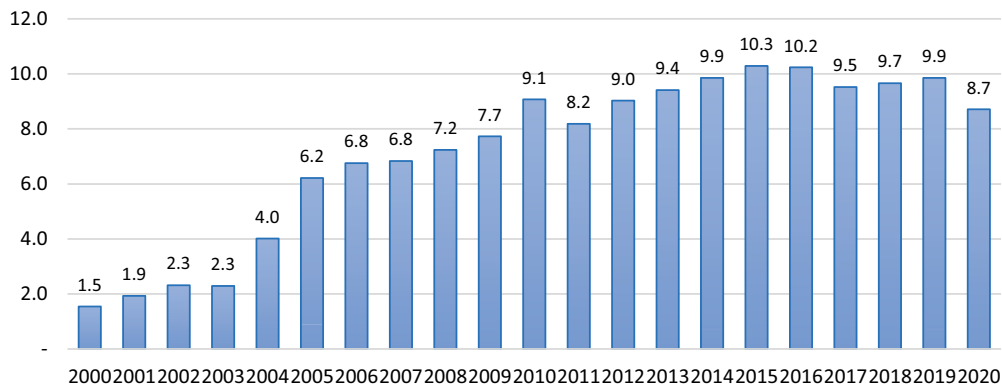


Figure 2. Vietnam's natural gas production. BP, 'BP Statistical Review of World Energy 2022' (2022).

perspective that extends to 2035. In addition, Resolution No 55-NQ/TW, issued by the Politburo on 11 February 2020, outlines strategic directions for Vietnam's national energy progress until 2030, with a forward-looking vision that extends to 2045.

In light of these considerations, the upcoming development of Vietnam's gas industry involves a concentrated effort on its growth. The focus is on the comprehensive development of the gas sector, with priority given to the development of the electricity and gas sectors. This effort includes significant investment in technical infrastructure to facilitate the import and use of LNG. The overall objective is to ensure a robust LNG import capacity, targeting around 8 bcm by 2030 and subsequently around 15 bcm by 2045.¹⁴ According to the newly established development direction, Vietnam will gradually reduce its reliance on coal-fired power and develop gas-fired power sources, increasing the electrification rate from the current 15 to 23 per cent in 2030 and 25 per cent in 2045.¹⁵ In the longer term, large-scale LNG will be needed not only to replace pipeline supplies but also to fuel new power generation to reduce carbon intensity and meet economic targets.

Decision 500/QĐ-TTg of 15 May 2023, which approves the National Power Development Plan for 2021–2030 with a vision up to 2050 (Power Master Plan 8), emphasizes the key importance of promoting domestic gas-based power generation and appropriately expanding the development of imported LNG power sources. As domestic gas production declines, additional natural gas or LNG will be imported. Synchronous development of projects using LNG and LNG import infrastructure using modern technology. The plan also includes a roadmap for the transition to hydrogen fuel when the technology is commercialized and the cost is affordable. The government has set targets to increase the share of natural gas in the country's energy mix and aims for natural gas to account for a significant proportion of the country's power generation capacity by 2030. By 2030, the total capacity of LNG power sources is expected to reach a peak of 22,400 MW, generating 83.5 billion kWh, accounting for approximately 14.9 per cent of Vietnam's total power generation capacity.¹⁶

To achieve these targets, Vietnam has been actively investing in the development of its LNG infrastructure to receive imported LNG sources. Pursuant to Decision No 60/QĐ-TTg of 16 January 2017, which approves the development plan for Vietnam's gas industry until 2025, with a perspective until 2035, the government has approved the establishment of LNG storage and regasification terminals. This includes an LNG terminal at Cat Hai—Hai Phong with an estimated

¹⁴ Decision No. 500/QĐ-TTg (n 7).

¹⁵ Resolution No 55-NQ/TW, 'Politburo's Resolution 55-NQ/TW on the Orientation of the Viet Nam's National Energy Development Strategy to 2030 and outlook to 2045' <<https://tulieuvankien.dangcongsan.vn/he-thong-van-ban/van-ban-cua-dang/nghe-quyet-so-55-nqtw-ngay-11-02-2020-cua-bo-chinh-tri-ve-dinh-huong-chien-luoc-phat-trien-nang-luong-quoc-gia-cua-viet-nam-den-6096>> accessed 9 February 2023.

¹⁶ Decision No 500/QĐ-TTg (n 7).

reserve capacity of 1.8 million tonnes per annum to meet the needs of the northern region. It is expected to be operational by 2030. In addition, LNG import terminals at Van Phong–Khanh Hoa, designed with a port capacity of 3.0 million tonnes per annum, are expected to secure supply for the central region, with operations also expected to start in 2030. The Thi Vai LNG terminal in Ba Ria–Vung Tau, with a cumulative capacity of 3 million tonnes, has the potential to expand to 6 million tonnes per year. This expansion is planned to address the declining supply in the Southeast region and meet the increased gas demand of the Nhon Trach 3, Nhon Trach 4, Phu My 3 and Hiep Phuoc power plants. The expected operational timeframe for this initiative is from 2020 to 2023. The Son My–Binh Thuan LNG import terminal has been invested to serve as a gas source for the Son My power hub and the wider Southeast region. With a maximum capacity of up to 10 million tonnes per year, this terminal aims to meet the growing demand for gas. In addition, the Hon Khoai/FSRU LNG terminal in the southwest is designed to have a capacity range of 2.0 to 3.3 million tonnes per annum. This terminal is expected to become operational in 2023, contributing to the overall energy infrastructure (Decision No 60/QĐ-TTg, 2017). In addition, there are additional proposed initiatives and proposals for floating LNG storage units (FSRUs), including the Hai Linh LNG project at the Cai Mep Industrial Park port, the FSRU in Bac Lieu and in Thai Binh province.

Vietnam's demand for LNG imports is forecast to grow steadily in the coming years. In order to meet the demand for natural gas, Vietnam will need to engage in LNG imports. Currently, as the global supply of natural gas is increasing, Vietnam can import LNG from many countries with significant export potential in the world, such as the USA, Australia, Qatar, and others. Among these, LNG from the USA has emerged as the largest potential source based on recent commitments between Vietnam and the USA on LNG imports. The US government has actively supported LNG exports and signed agreements with Vietnam to promote energy trade.¹⁷ These agreements provide a framework for cooperation between the two countries and facilitate the smooth flow of LNG imports from the USA.

LIQUEFIED NATURAL GAS SUPPLY—THE CASE OF US LNG

Changes in the world natural gas supply

Advances in science and technology, coupled with the development of unconventional gas over the last decade, have created great opportunities and potential for expanding the global supply of natural gas. Natural gas, once thought to be depleted in one place, has now been transformed into an abundant energy resource. This shift has led to significant changes in natural gas markets in different regions and countries. According to BP, proven gas reserves are sufficient to meet current demand for more than 50 years.¹⁸ According to the IEA, the total remaining technically recoverable resources are equivalent to 235 years of current production.¹⁹ The evolution of the global natural gas market, in particular the recent growth of the LNG sector, has played a pivotal role in the globalization of gas markets and the expansion of the range of supply within the international natural gas market.²⁰

The significant increase in global natural gas demand, particularly for LNG, has led natural gas producers to increase production and invest more in LNG projects to meet future growth in LNG demand. Many LNG production projects have been and are being developed in LNG exporting countries. Half of these projects are in North America, with the other half spread across Qatar, Africa and the Asia-Pacific region. By 2021, global LNG capacity will have increased by an additional 104 million tonnes per annum to 392 million tonnes per annum. Forecasts to 2030 suggest

¹⁷ Le Minh Thong and Tran Van Hiep, 'Vietnam's Energy Transition to 2050: Is Importing Liquefied Natural Gas a Good Solution?' (2023) 16 *Journal of World Energy Law & Business* 414.

¹⁸ BP, 'BP Statistical Review of World Energy 2022' (2022).

¹⁹ IEA, *World Energy Outlook—Are We Entering a Golden Age of Gas?* (IEA 2011).

²⁰ James Henderson, *The Potential Impact of North American LNG Exports* (Oxford Institute for Energy Studies 2012). Roberto F Aguilera, Julian Inchauspe and Ronald D Ripple, 'The Asia Pacific Natural Gas Market: Large Enough for All?' (2014) 65 *Energy Policy* 1.

that if all feasible projects are approved and built, the global LNG market could supply up to 557 Mtpa, potentially leading to a period of oversupply even in high-demand scenarios.²¹ The abundant global supply of LNG will be an important factor influencing LNG imports in Vietnam.

Today, LNG accounts for almost 50 per cent of internationally traded gas, up from 30 per cent in the mid-1990s. By early 2023, the global LNG trading network will connect 20 export markets with 48 import markets.²²

The potential supply of LNG from the USA—the role of shale gas

The start of large-scale shale gas production dates back to the early 2000s, when commercial production of shale gas from the Barnett shale formation in north-central Texas in the USA began. As the commercial success of the Barnett became apparent, other companies began drilling wells in the formation, and by 2005 the Barnett was producing nearly 14 billion cubic metres of natural gas per year. As producers gained confidence in the viability of shale gas development in the Barnett shale and received validation from successful results in the Fayetteville shale in northern Arkansas, they began to explore and develop other shale gas formations. This proactive pursuit included formations such as Haynesville, Marcellus, Woodford, and Eagle Ford.²³ The development of shale gas in the USA has led to many changes in the US gas market. Due to its substantial natural gas reserves and the expansion of LNG production facilities, the USA has recently established itself as a prominent LNG exporter.²⁴

The increase in US natural gas reserves

Due to the implementation of innovative technologies in the exploration and development of shale gas, shale gas reserves in the USA have grown rapidly over the past decade. Estimates of recoverable natural gas reserves in the USA have risen to twice the global average. This surge has also led to a significant increase in US natural gas reserves (see Figure 3). The shale gas revolution has transformed the USA from a country facing a severe gas shortage to one with significant reserve potential in the world.²⁵ President Obama has stated that the USA has nearly 100 years of secure natural gas supplies and that Americans will take all necessary steps to safely develop this energy source.²⁶

Natural gas production increases as shale gas production rises

The process of extracting natural gas from shale formations has not only offset the decline in conventional gas production but has also driven the expansion of total natural gas production. The USA estimates that it has enough natural gas to last a century at the current rate of consumption.

Since 2009, shale gas has allowed the USA to overtake Russia as the world's largest gas producer. Between 2008 and 2013, annual shale gas production in the USA quadrupled, rising from 60 to 240 billion cubic metres and accounting for 36 per cent of US gas production in 2013.²⁷ According to the US Energy Information Administration, in 2015, total US natural gas production was equivalent to about 99 per cent of natural gas consumption due to the increase in shale gas production. Shale gas production accounted for about 50 per cent of total US production. So, this shale gas revolution has also helped the USA become self-sufficient in natural gas consumption and ensure its energy security. It leads to excess production, so that the USA has become a major exporter of natural gas, especially liquefied natural gas, in the world.²⁸

²¹ IUG, 'World LNG Report 2022' (2022) <<https://www.igu.org/resources/world-lng-report-2022/>> accessed 9 February 2023.

²² IUG, 'World LNG Report 2023' (2023) <<https://www.igu.org/resources/lng2023-world-lng-report/>> accessed 24 July 2023.

²³ Department of Energy, *Modern Shale Gas Development in the United States: A Primer—Geology, Regulations, Environmental Considerations, Hydraulic Fracturing, Protecting Groundwater, Pollution Threats* (Progressive Management 2011).

²⁴ Kentaka Aruga, 'The US Shale Gas Revolution and Its Effect on International Gas Markets' <<http://mpr.ub.uni-muenchen.de/49545/>> accessed 21 September 2014. Minh Thong Le and others, 'Can Natural Gas Play an Important Role in the Energy Transition in Asia in the Future?' (2019) 7 *Eurasian Journal of Business and Management* 28.

²⁵ Minh-Thong Le, 'An Assessment of the Potential for the Development of the Shale Gas Industry in Countries Outside of North America' (2018) 4 *Heliyon* e00516.

²⁶ Thierry Bros, *After the US Shale Gas Revolution* (Technip 2012).

²⁷ Barbier Frédéric, 'L'impact Économique de l'exploitation de Gaz de Schiste' (Assemblée Nationale 2014).

²⁸ Henderson (n 20). Aguilera, Inchauspe and Ripple (n 20).

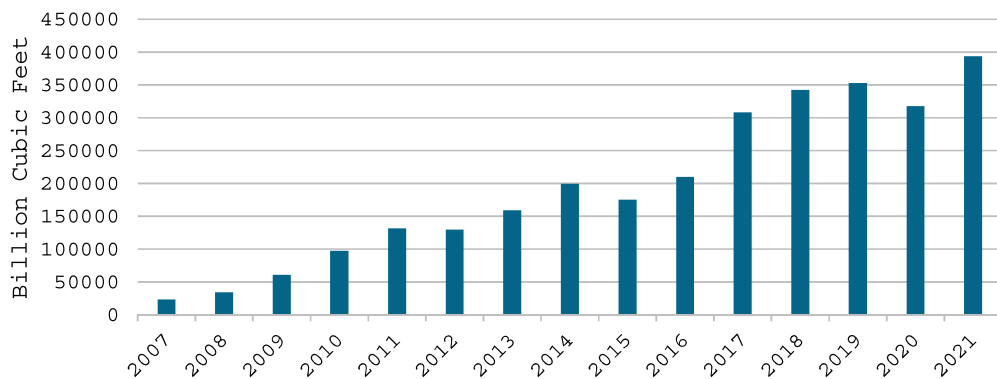


Figure 3. US shale gas proved reserves. EIA, 'US Shale Gas Proved Reserves, Reserves Changes, and Production' (2023) <https://www.eia.gov/dnav/ng/NG_ENR_SHALEGAS_DCU_NUS_A.htm> accessed 24 July 2023.

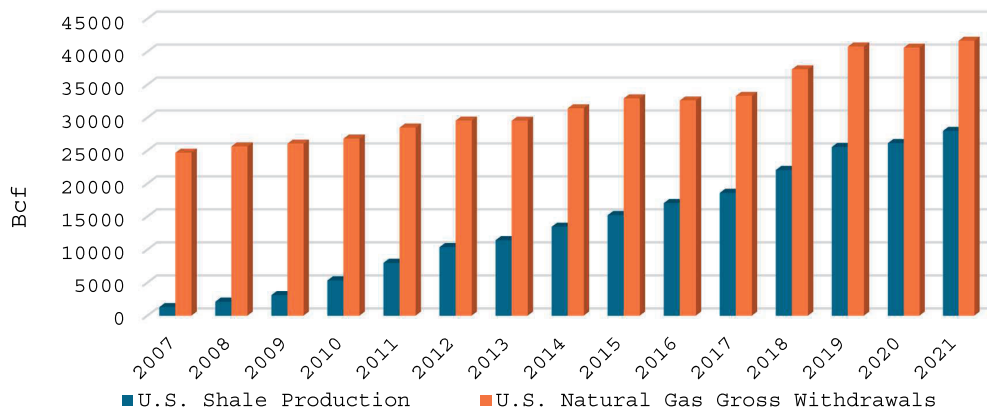


Figure 4. US natural gas production. EIA, 'US Shale Gas Proved Reserves, Reserves Changes, and Production' (2023) <https://www.eia.gov/dnav/ng/NG_ENR_SHALEGAS_DCU_NUS_A.htm> accessed 24 July 2023.

Figure 4 shows the increase in US natural gas production since the shale gas boom and the outlook for production. The figure shows that the growth in total gas production in recent years and in the future will come mainly from shale gas, while production from other gas sources (such as offshore, onshore and Alaska) will tend to decline. Similarly, the EIA estimates that shale gas production will account for about two-thirds of total US gas production in the future. According to the Annual Energy Outlook 2016, shale gas production is projected to grow from about 400 bcm, or about half of total natural gas production in 2015, to 810 bcm in 2040. This projection represents about 70 per cent of total gas production.²⁹

According to the EIA, US natural gas production has increased rapidly in recent years, mainly due to shale gas production. In 2007, US shale gas production was 1293 billion cubic feet (bcf), or 5.2 per cent of total US gas production. By 2021, shale gas production will have increased to 27,985 Bcf, or 67.1 per cent of total US natural gas production.³⁰ Unconventional gas production is expected to continue to dominate the expansion of total US natural gas production in the coming years and decades.

²⁹ EIA, 'Annual Energy Outlook 2016' (2016).

³⁰ EIA, 'U.S. Shale Gas Proved Reserves, Reserves Changes, and Production' (2023) <https://www.eia.gov/dnav/ng/NG_ENR_SHALEGAS_DCU_NUS_A.htm> accessed 24 July 2023.

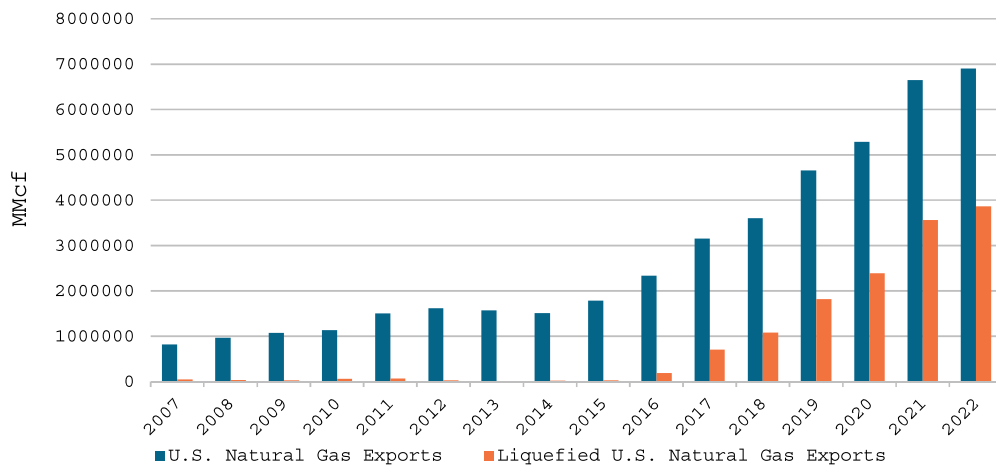


Figure 5. US natural gas export. EIA, 'US Shale Gas Proved Reserves, Reserves Changes, and Production' (2023) <https://www.eia.gov/dnav/ng/NG_ENR_SHALEGAS_DCU_NUS_A.htm> accessed 24 July 2023.

This increase in production has gradually made the USA more self-sufficient in terms of production and has also recently positioned the country as one of the world's leading exporters of liquefied natural gas.³¹

LNG exports on the rise

The significant expansion of unconventional gas production has allowed the USA to achieve self-sufficiency in natural gas and to rebalance the trade balance in the gas sector. It has made it possible to reduce imports of fossil hydrocarbons. Similarly, the high availability of shale gas is expected to allow the USA to become a net exporter of natural gas in the short and medium term.

Figure 5 shows the evolution of natural gas trade in the USA. It can be seen that the shale gas boom is allowing an increase in American gas production, so that the volume of imported gas falls rapidly after 2007, while the volume of exported gas tends to rise sharply.

According to the EIA, US LNG exports have grown rapidly in recent years. While before 2016, total annual US LNG exports accounted for less than 10 per cent of total US natural gas exports and about 1 per cent of the world's total commercial LNG, by 2017 LNG exports accounted for 22.5 per cent of total US gas exports, and by 2022 US LNG exports will account for nearly 56 per cent of total US gas exports or 20 per cent of the world's total traded LNG.

According to the IGU report, the total global LNG trade volume in 2022 is 401.5 million tonnes, of which the USA is the country with the most significant growth in LNG exports at 80.5 million tonnes (MT), increasing global LNG supply. Previously, the volume of US exports was to Asian countries, mainly China, Korea, and Japan, but the war between Russia and Ukraine occurred, leading 2022 the source of US exports mainly the country's European. The increase in LNG exports in 2022 was mainly driven by the USA (+10.5 Mt). The USA overtook Qatar as the world's second largest LNG producer last year, just behind Australia. In 2022, the USA exported 80.5 million tonnes, up from 70 million tonnes in 2021.³²

The notable increase in LNG imports in 2022 was mainly driven by Europe, which experienced significant annual growth of 50.4 million tonnes compared to 2021. Europe successfully imported 126.6 million tonnes last year, compensating for the decline in Russian pipeline supplies and establishing itself as the second largest region for global LNG imports. Meanwhile, the Asia-Pacific region maintained its top position as the largest importer, with a total of 160.9 million

³¹ IUG (n 21); IUG (n 22).

³² IUG (n 22).

tonnes of LNG imported in 2022, an increase of 4.6 million tonnes compared to the previous year.

In order to secure LNG exports, many countries around the world have stepped up investment in the construction and commissioning of liquefaction plants to increase capacity. By 2022, global liquefaction capacity had increased by a total of 19.9 million tonnes per annum (Mtpa), mainly due to capacity additions in the USA. The US Sabine Pass LNG T6 export terminal (5.0 Mtpa) began commercial operations in February, and Calcasieu Pass LNG T1-T18 (10 Mtpa) will come online in May 2022, bringing total operational liquefaction capacity in the USA to 88.1 Mtpa.³³ As a result, the USA has established itself as the world leader in LNG exports. In addition, the USA is actively pursuing investment projects to build additional liquefaction facilities to further expand its natural gas liquefaction capacity in the future.

LNG export price is highly competitive

The gas market is currently divided into three basic regions: the European market, the Asian market and the North American market. Each market has different formation characteristics and pricing mechanisms, so the price of each region is also different. Figure 6 shows the price difference between the markets and the market dynamics of the regions.

However, it is clear that the shale gas revolution has kept gas prices within the North American market significantly lower than in other regions of the world. This gives US LNG exports a competitive advantage over other LNG exporting countries around the world. US LNG exports currently exceed 70 Mtpa (with several new projects in the pipeline) and are fully destination flexible. LNG buyers now have the option to purchase LNG based on Henry Hub (gas-on-gas pricing), either as the sole index or in the form of hybrid pricing.

LNG pricing will be largely determined by the identity of the supplier. US producers will sell LNG at source for $HH \times 1.15 + \text{liquefaction fees}$. For US Gulf Coast projects, the FOB cost of LNG follows the formula³⁴:

$$P = 1.15 \times \text{Henry Hub} + \text{liquefaction fee}(1).$$

- Liquefaction fees are typically \$2.5/MMBtu BUT the current increase in project costs is bringing this closer to \$3/MMBtu.
- For cargoes delivered to Asia, shipping costs must be added and are based on non-Panama shipping routes: the canal is full.
- Depending on vessel costs and profit margins, a delivered ex-vessel price of \$4-\$10/MMBtu to South East Asia would apply.

It can therefore be seen that the cost of imported LNG to Vietnam depends mainly on the US gas price (commonly referred to as the Henry Hub price) and the shipping fee.

Figure 6 shows the US LNG import prices to countries in the Asian region close to Vietnam.

Shipping costs are a significant part of the netback calculation for LNG transportation (Figure 7). Consequently, charter rates are an important consideration in the development of market strategies. In the past, LNG was predominantly marketed through long-term contracts, which led shipowners to enter into time charters with prominent companies. With the rise of portfolio players, a greater number of vessels have become available in the spot market, increasing the breadth of the market in terms of charter arrangements and pricing.

In the early 2010s, there was a harmonious balance between fleet expansion and the introduction of additional liquefaction capacity, resulting in a steady charter market. However, from 2013 onwards, the pace of ship deliveries significantly outpaced the growth in liquefaction capacity.

³³ IUG (n 21).

³⁴ Joe Figueiredo, 'International Leading Practices for LNG Import Terminal Projects Presentation' (2023).

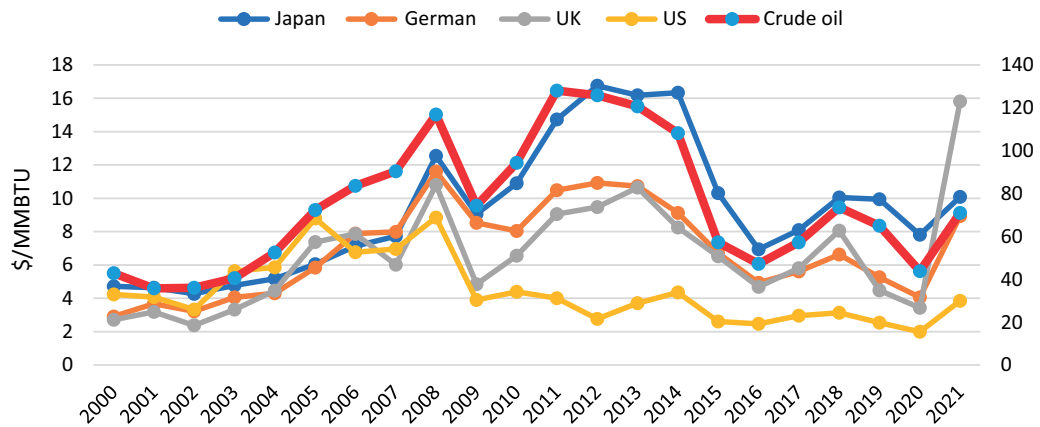


Figure 6. The price of natural gas in the world. BP, 'BP Statistical Review of World Energy 2022' (2022).

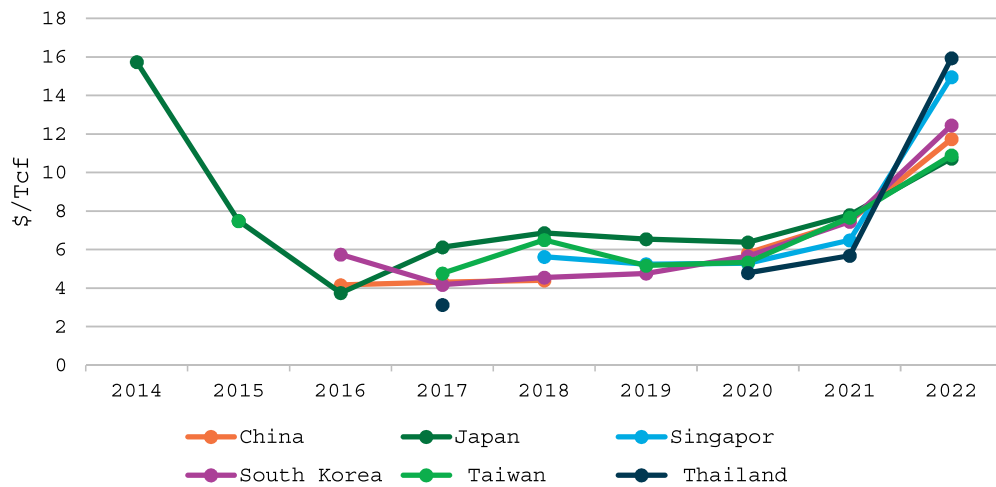


Figure 7. Cost of shipping US liquefied natural gas exports via vessels. EIA, 'US Shale Gas Proved Reserves, Reserves Changes, and Production' (2023) <https://www.eia.gov/dnav/ng/NG_ENR_SHALEGAS_DCUS_NUS_A.htm> accessed 24 July 2023.

This led to an oversupply of LNG carrier capacity and a gradual decline in charter rates. This trend continued until 2015, followed by a period of stability with rates ranging between \$15,000/day and \$50,000/day (for steam turbines) until the fourth quarter of 2017. The dynamics changed in response to a rapid increase in Asian LNG demand, which catalyzed an upturn in charter rates. In particular, the end of 2018 saw a notable surge in charter rates, with pot charter day rates for tri-fuel diesel-electric (TFDE) LNG vessels reaching \$190,000/day for a significant part of November. Other causes, such as the coronavirus disease 2019 (Covid-19) epidemic, changes in weather phenomena, the war between Russia and Ukraine, and even the stagnation of the Suez Canal, have led to unexpected changes in charter prices.

CONCLUSIONS AND RECOMMENDATIONS

Vietnam's energy demand will continue to grow in the coming years. In order to meet the energy needs for the country's socio-economic development, as well as to ensure the goals of combating

climate change and becoming carbon neutral by 2050 as committed at the COP 26 conference, the trend of energy transition towards cleaner energy sources such as natural gas is the right choice. To meet the demand for natural gas, particularly in the power generation sector, LNG imports are essential. LNG imports play a crucial role in meeting Vietnam's energy needs, supporting economic growth and reducing GHG emissions. It provides a cleaner alternative to coal, helping to mitigate environmental impacts.

More than a decade into its shale gas revolution, the USA has seen its reserves and production grow steadily over the years. From being an importer of natural gas, the USA has now become a major global exporter of LNG. With the advantage of abundant supply and competitive natural gas prices, the USA is one of the potential LNG exporters for LNG importing countries in the world, including Vietnam. However, to ensure the effective and sustainable import of LNG, Vietnam needs appropriate mechanisms and policies, from infrastructure development to electricity and gas market development, building a pricing policy towards liberalization, and ensuring competitiveness. Some immediate issues that Vietnam needs to implement to develop the LNG market and facilitate the import of LNG include:

Liberalization of gas and electricity markets: At present, the government and ministries have policies and plans to liberalize the electricity market and link it to input fuel markets such as the gas market. However, in reality, there are many problems in implementation, so to develop the LNG gas market, it is necessary to focus on developing a highly competitive gas-fired power market. In addition, the liberalization of Vietnam's gas and electricity markets can create the necessary conditions for the successful development of the LNG industry by fostering competition, attracting investment and promoting a more diverse and sustainable energy mix.

The changing composition of Vietnam's power generation fleet: The adjustment of the power generation structure has been reflected in the decision documents, in particular in the Power Master Plan 8 just promulgated by the government. However, it is also necessary to consider how to ensure its implementation in order to guarantee the development of electrification, in particular electricity from liquefied natural gas.

Third-party access to LNG import facilities and gas pipelines to promote competition and strengthen the role of key LNG import companies such as PetroVietnam and PV Gas. This approach ensures that multiple companies have equal opportunities to use and invest in infrastructure, thereby promoting fair competition, encouraging investment and preventing the dominance of a few large players. Third-party access also facilitates efficient resource allocation, risk sharing, and innovation, leading to consumer benefits, regulatory compliance, and the development of a resilient and diversified energy sector. Overall, it is a key element in Vietnam's efforts to develop its LNG industry, attract investment and align with global best practices in the energy sector.

Security of supply in terms of volume and duration: In order to ensure a large and long-term supply, it is necessary to consider the flexible choice of long-term and highly competitive contracts when signing LNG trading transactions. Vietnam should establish technical exchanges with regulators in Thailand, Singapore, and the Philippines to gain a broader perspective on the use of LNG for power generation and its pricing.

Develop a more detailed framework for LNG imports in the next Gas Master Plan and consider implementing gas market legislation and accelerating the development of integrated gas transmission infrastructure.