

Qatar's prospects in the global gas market

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Abstract. The article analyzes Qatar's prospects in the global gas market and potential shifts in its export policy. It presents an analysis of the costs of supplying LNG from Qatar to European and Asian markets, examines Qatar's long-term LNG supply contracts, and conducts revenue calculations for export strategies. The article underscores the need for Qatar to diversify its approach to LNG exports, emphasizing the importance of not only securing sales volumes through long-term contracts but also adapting to changing gas market conditions by reserving a portion of volumes for spot sales to more effectively monetize its expanding capacities.

1 Introduction

Over the past decades, the share of natural gas in the global energy consumption structure has been continuously increasing. The growth rate of its usage from 2012 to 2022 reached 1.7%, which is significantly higher than that of other fossil fuels - oil (0.9%) and coal (0.2%). [1] Alongside the growing demand, the ongoing expansion of the geographical consumption of natural gas leads to an acceleration in the pace of international trade, with LNG (liquefied natural gas) playing a significant role due to its flexibility and adaptability to changing market conditions. Global LNG trade consistently set volume records. [2]

Research organizations on average expect that global demand for natural gas will continue to grow, exceeding 4 - 4.5 Tcm by 2030, with the main contribution to this increase coming from developing countries with rapidly growing economies that are actively reducing the share of coal in their fuel mix. [3-5] However, on the supply side, there is already an evident shortage of available gas volumes, driven by reduced investment in production in recent years, the completion of active LNG production capacity additions by 2020, as well as deferred investment decisions for new LNG plants due to low prices and reduced demand during the pandemic. At specific points in time, market dynamics are also influenced by forced interruptions in maintenance schedules for operational capacities. [6,7]

In the rapidly changing landscape of the global gas market, Qatar's significance as one of the key gas exporters is increasing. In the context of the ongoing transformation of the global gas market from a "buyer's market" to a "seller's market", the interest in Qatar's LNG has significantly grown. However, this situation might change in the coming years. The market is becoming more competitive, and both current suppliers (such as the USA, Australia, Russia) and potential ones (like Canada, Mozambique, and others) are actively announcing

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their plans to establish new production capacities. Qatar's primary challenge now is to formulate an optimal development strategy for its gas industry, taking into account both domestic consumption and the opportunities for monetizing reserves through exports.

2 Gas industry in Qatar

Qatar ranks third in the world, after Russia and Iran, in terms of proven gas reserves (25 Tcm, or 13% of global reserves). [1] The majority of the country's reserves are concentrated within a single field – the North Dome, which Qatar shares with Iran (the Iranian part known as South Pars, containing nearly half of the country's proven reserves, around 14.2 Tcm [8]). Other reserves come from associated gas of oil fields, with the largest being the Dukhan field, as well as small offshore fields scattered across Qatar's territorial waters.

As of the results of 2022, Qatar ranks sixth in the world as one of the largest producers of natural gas, following the United States, Russia, Iran, China, and Canada. The production volume amounted to 178 Bcm. [1] Gas production is represented by a series of major projects, including several development blocks within the North Field (North Field Alfa (NFA), North Field Bravo (NFB), RasGas Alfa (RGA), etc.). In total, the North Field contributes approximately 150 Bcm annually. [1] The remaining production volumes are provided by associated gas from oil fields and several small offshore projects.

Despite the fact that the North Dome field boasts unique reserves and theoretically holds a production potential of over 700 Bcm (production plateau), there are several constraints on increasing production from it:

- Production rates are significantly influenced by the availability of sales infrastructure, both within the country and beyond (these issues are discussed in the following sections of the article);
- There are technical challenges in developing the field. In 2005, the Qatari government announced a moratorium on new gas production projects in the North Dome due to a rapid decline in reservoir pressure in existing wells and the risk of reducing the potential overall recovery as a result of further production intensification;
- Substantial expansion of Qatar's gas production is also constrained by Iran's position. As early as 1992, the countries signed an agreement regulating the key operating principles for the South Pars and North Dome. However, during periods of production intensification in the Qatari areas, there was a decrease in reservoir pressure in the Iranian areas of the field. The moratorium was lifted only after a joint group of representatives from Iran and Qatar identified all technical solutions and reached new agreements on field development plans. [10,11] Intergovernmental group meetings continue to be held on an annual basis.

In this study, when forecasting theoretical production capacity, the authors assume that Qatar will maintain highly cautious rates of engaging in the exploitation of new areas [12], and its production capacities (not the production itself) will be limited to 300 Bcm.

The domestic consumption of natural gas in Qatar experienced an extraordinary growth rate from 2005 to 2014 due to the accelerated expansion of LNG and GTL plants, which require significant gas volumes for their own use, as well as the active electrification of the country through gas stations. In the period from 2015 to 2022, domestic gas demand fluctuated within the range of 40 Bcm, decreasing or increasing by less than 5% annually. There were no introductions of new large-scale plants for LNG and GTL production, nor were there significant additions to generating capacities. In the consumption structure of 2022 [13], a substantial 30% of all consumed gas in Qatar is used for the own use of the oil and gas industries, with 80% of this volume attributed to the LNG sector. The power generation

sector accounts for 50% of the domestic demand for gas, while the remaining gas is allocated to industrial and non-energy uses. Considering that only about 30% of the total gas production is consumed within Qatar, the majority of its volume is directed towards exports in the form of LNG, primarily to European and Asian markets, as well as through the "Dolphin" gas transportation system to the UAE and Oman. [14]

As of 2022, Qatar operates LNG production capacities of 77.1 Mtpa. Qatar ranks third among the world's largest LNG producers in terms of operational capacities, following the United States (88.1 Mtpa) and Australia (87.6 Mtpa), and its share in global LNG trade volumes stands at 20%. [6] Qatar exports LNG to more than 20 countries worldwide, and over the past decade, the destinations of these exports have continuously expanded. [15]

In Qatar's LNG supply portfolio, a significant part is traditionally allocated to customers in Asia, accounting for around 80% of the country's total LNG exports. This is primarily due to the dynamics of the Asian market with its rapidly growing demand for gas and the existence of the "Asian premium" in gas prices over European. The European market is the next most important for Qatar's LNG sales, in recent years, Europe has accounted for 20% to 30% of the total LNG export volume from Qatar. [16]

In the near future, Qatar plans to significantly increase its LNG export. The expansion project of the North Field will be carried out in two phases. The first phase, known as the North Field East Project (NFE), involves the construction of four production trains, each with a capacity of 8 Mtpa, along with associated facilities. This will result in Qatar's LNG production capacity growing from the current level of 77 Mtpa to 110 Mtpa. The final investment decision for this phase was made in 2021. The second phase is associated with the development of the southern part of the North Field, known as the North Field South Project (NFS). During this phase, the construction of a new LNG plant is planned, consisting of two production trains, each with a capacity of 8 Mtpa. This will further increase Qatar's LNG production capacity to 126 Mtpa. The production on the new trains is expected to commence in 2026, with the project reaching full capacity by 2028. [17] According to statements from QatarEnergy, the NFE project is estimated to cost \$28.75 billion [12], and the NFS project is estimated to cost \$10 billion [18]. This will be one of the largest investments in the energy sector in recent years. Successful completion of these expansion projects will allow Qatar to secure the second position in terms of LNG production capacities by 2027, second only to the United States (even considering the expansion plans of the US and Australia). (Fig. 1)

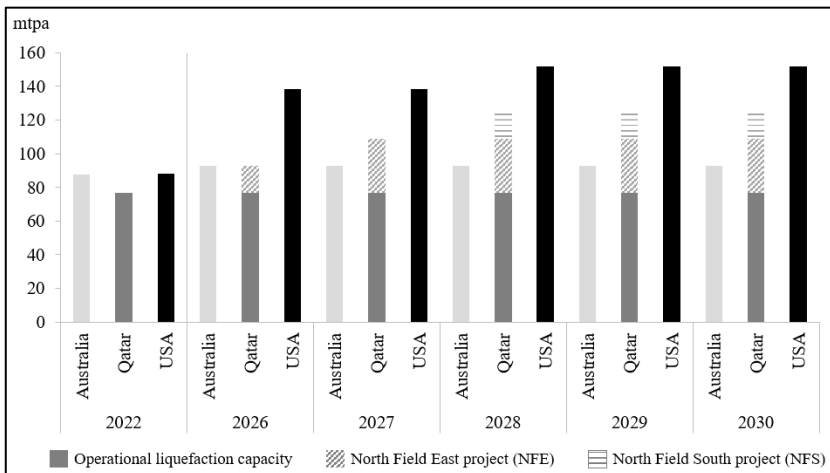


Fig.1. Operational and approved liquefaction capacity in Australia, Qatar and USA.

According to QatarEnergy, ongoing research is being conducted to determine the feasibility of constructing additional liquefaction plants. As a result of these efforts, after 2028, the cumulative LNG production capacity in Qatar could potentially exceed the currently planned 126 Mtpa. [12]

3 Current export policy of Qatar

Qatar's current export policy is based on long-term contracts. As of 2022, Qatar's production capacity was contracted for 83 million tons of LNG (excluding "take-or-pay" volumes). Until 2025, Qatar does not have any available capacity to increase exports beyond contractual commitments. [15,19] The expiration of some contracts is approaching in the coming years. For instance, by the start of introducing new capacities in 2026, if existing agreements are not extended, up to 15 Mtpa of uncontracted Qatari LNG could become available, and by the beginning of 2030, this could increase to 30 Mtpa. (Fig.2)

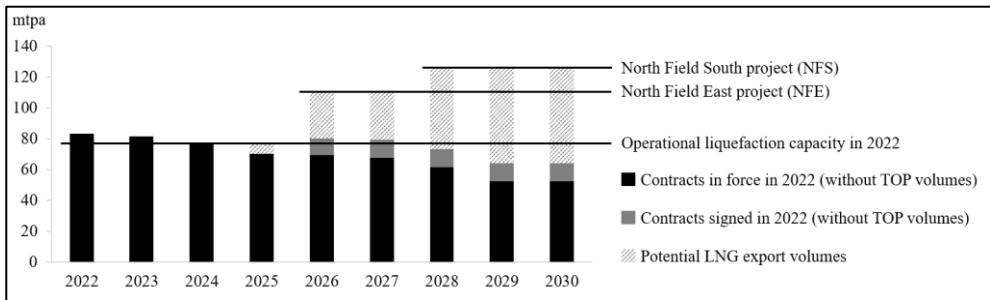


Fig. 2. Long-term contracts and potential LNG export volumes from Qatar.

It is highly likely that in the next few years, Qatar will continue actively seeking buyers for its own LNG, attempting to secure contracts for maximum possible volumes over longer durations. This strategy is logical considering Qatar's long-term strategy to expand LNG production and ensure the utilization and profitability of new projects through guaranteed supplies. The necessity of contract agreements also arises because Qatar's main competitors, Australia and the United States, are in the stages of final investment decisions and the start of construction for capacities exceeding 60 Mtpa. Additionally, more than 300 Mtpa of capacity are under consideration in the US, 45 Mtpa in Australia, and nearly 600 Mtpa in other producing countries. [6] Although it seems unlikely that all these projects will come online, Qatar's goal to secure a position and establish terms for LNG exports will remain a priority in the coming years. During 2022-2023, QatarEnergy has already secured several LNG supply contracts for planned capacities: two contracts with China totaling 8 Mtpa (for a 27-year term starting in 2026), two contracts with Germany totaling 2 Mtpa (from the NFE project for a 15-year term starting in 2026, and from the NFS project for a 15-year term starting in 2027), and a contract with Bangladesh for the supply of 1.8 Mtpa (for a 15-year term starting in 2026). [20-23]

4 The competitiveness of Qatari LNG in target markets

Undoubtedly, one of the key questions is not only in what volume but also at what costs Qatar is willing to deliver LNG to target markets, as it is the total expenses of delivery that ultimately determine the attractiveness of Qatari gas over any other alternatives for the consumers.

The assessment of the fully landed cost (cost+) of delivering natural gas from Qatar involved adding up expenses for its extraction and transportation to sales markets in Europe and Asia. The calculation took into account extraction costs, liquefaction costs, LNG marine transportation costs (including port fees, canal tolls, etc.), regasification costs, and the cost of delivering from the terminal to consumption centers. According to NEXANT data [24], Qatar's average weighted extraction costs (accounting for production structure) amount to \$27 per thousand cubic meters. The anticipated liquefaction cost for new capacities will be \$65 per thousand cubic meters. Freight costs to Europe are around \$55 per thousand cubic meters, and to Asia around \$50 per thousand cubic meters. Regasification costs do not exceed \$30 per thousand cubic meters in both regions. [23] The cost analysis indicates that when delivering to both of the examined regions, Qatar is among the most competitive suppliers. (Fig. 3)

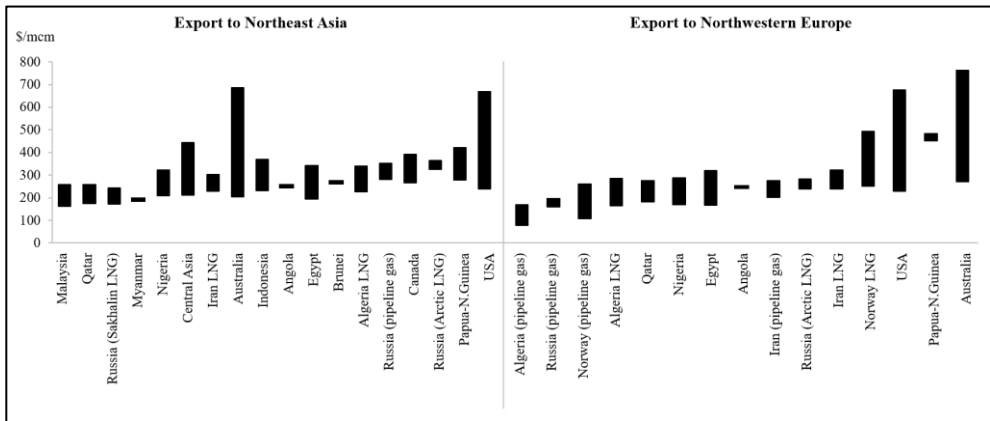


Fig. 3. Qatari LNG competitiveness on European and Asian gas markets.

When calculating the cost of delivery to the port of Shanghai (China), the range of total costs for Qatar falls within \$170 - \$260 per thousand cubic meters. Alongside Qatar, only Russian LNG from Sakhalin, LNG from Nigeria, Malaysia, and pipeline gas supplies from Myanmar and Central Asia (Turkmenistan, Uzbekistan, Kazakhstan) remain competitive in terms of total supply costs. The lower end of the cost range for these suppliers is below \$200 per thousand cubic meters. However, some of these suppliers face significant resource constraints for increasing their deliveries due to various factors. This includes rapid growth in their domestic consumption (relevant for Southeast Asian countries) and inadequate resource bases to support increased production (relevant for Sakhalin LNG and pipeline gas from Uzbekistan and Kazakhstan). [5]

In the context of supplying LNG to markets in Northwestern Europe, Qatar is among the most competitive producers in terms of full supply costs, only trailing behind pipeline gas from Russia and Norway and also Algerian gas, which is supplied both through pipelines and as LNG. Nonetheless, competing producers also have substantial limitations for expanding their supplies: geopolitical reasons affect Russia, while Norway and Algeria face constraints due to their available resource base. The range of total costs for Qatar when supplying the European market, from both existing and planned facilities, falls between \$180 - \$270 per thousand cubic meters.

Another significant potential competitor to Qatar in the global LNG market could be Iran. For years, Iran attempted to organize LNG exports but faced hindrances from Western sanctions. However, the country has shifted its focus to China. In December 2022, Iran signed several agreements with China in the oil and gas sector. [25] The most probable mode of collaboration is the construction of LNG plants to facilitate the supply of cheap Iranian gas.

If Iran gains access to LNG technology, the volumes produced at Iranian plants could directly compete with Qatari LNG, potentially leading to challenges related to gas migration between Qatar's and Iran's parts of the shared field in the case of intensified production at South Pars.

5 Long-Term export strategy choice

In a situation where Qatar is arguably the most attractive supplier, both in terms of its capacity to increase deliveries and its competitiveness parameters for Europe and Asia, and considering the crisis situation in the global gas market characterized by a shortage of available LNG and relatively high prices, the country faces a choice regarding its long-term export strategy:

- Leverage its advantageous geographical position to focus on short-term trading and attempt to maximize gains from selling LNG at the highest prices (the oil linkage in long-term contracts in 2022-2023 led to Qatari LNG delivery prices significantly below spot prices);
- Opt for the proven strategy of long-term agreements, albeit without the ability to respond to price spikes;
- Diversify the export approach by working in both directions.

In order to make a strategic choice, conducting a profitability analysis becomes imperative. This analysis will unveil the superior option in the long term, recognizing that LNG projects are tailored for a payback period spanning a decade, and even extremely elevated global market prices cannot facilitate their recovery within 1-2 years of sales. The profitability of Qatar's selected export strategy hinges on the quantity of LNG exports directed to specific destinations and the prevailing market prices in those regions.

To determine these factors, optimization calculations were conducted using the tools of economic-mathematical modeling – the World Gas Model (WGM). The analysis was carried out within the framework of two comprehensive scenarios for the development of the global natural gas market: low and high. The calculations incorporated estimates from the Energy Research Institute of the Russian Academy of Sciences (ERI RAS) for global production capacities and global gas demand (4300 Bcm for the low scenario, 4500 Bcm for the high scenario). The calculations were conducted for the year 2030. The results of the optimization calculations revealed potential volumes of LNG exports from Qatar to specific supply directions and gas prices in those markets.

In the low global demand scenario, LNG exports from Qatar amounted to 164.4 Bcm, of which 34.3 Bcm were destined for European countries, 122.8 Bcm for Asian countries, and 7.7 Bcm for other countries. In the high global demand scenario, LNG exports from Qatar reached 164.8 Bcm, with 35.7 Bcm going to European countries, 120.2 Bcm to Asian countries, and 8.7 Bcm to other countries.

To determine the profitability of LNG exports, it is necessary to calculate the revenue obtained from the sale of LNG for both demand scenarios using the options "Spot Price Export" and "Long-Term Contract Export," based on assumptions that the uncontracted LNG volumes defined in Figure 2 will be fully allocated: a) to the spot market; b) sold under long-term contracts typical for the respective market.

The revenue from LNG exports is calculated using the formula:

$$R_{lng} = \sum_{i=0}^n P_i * V_i, \text{ where:}$$

R_{lng} – the revenue from the LNG export;

i – the destination market;

V_i – the volume of gas supplies by destination market (determined based on the results of optimization calculations);

P_i – the gas price for each destination market.

The LNG prices for each destination market were determined as follows: for LNG deliveries under existing contracts - using contract-based pricing formulas; for LNG deliveries beyond contracted volumes - based on the spot price of the respective market to which the LNG is supplied (determined through the optimization calculations on the WGM). The calculation results are presented in Table 1.

Table 1. A comparative analysis of the revenue from LNG exports from Qatar depending on the chosen export strategy for the year 2030.

Export strategy	Revenue, million dollars (Low demand scenario)	Revenue, million dollars (High demand scenario)
Spot price export	49 622	50 041
Long-term contract export	52 386	52 923

The calculations indicate that despite the unique window of opportunity that Qatar has in the current "crisis" situation, allowing it to profit from spot sales, as the global gas market becomes saturated with new LNG projects outside of Qatar, spot prices will eventually stabilize around the range of \$250-300 per thousand cubic meters. The strategy of "hedging" with long-term contracts, including the use of oil and other types of indexing, will provide, at the very least, insulation against volume risks and underutilization risks of projects. Moreover, even selling the entire volume on the spot market would yield lower revenue than long-term contracts with the retention of current contract indexing.

6 Conclusions and recommendations

Interest in Qatari LNG has been growing in recent years against the backdrop of changing dynamics in the global gas market, transitioning from a "buyer's market" to a "seller's market." Striving to maintain its position as one of the industry leaders and possessing significant expertise and financial capabilities in the LNG sector, Qatar plans to significantly increase its LNG production volumes in the coming years.

The cost analysis of LNG supply revealed that Qatar is one of the most competitive suppliers in the market. Furthermore, considering the proven reserves of the North Field and its production potential, Qatar can substantially increase production and sustain it at a high level for the next decades.

However, it's currently prudent not to overplan new projects without evaluating the impact of production expansion on the reservoir pressure for approved facilities. After launching the North Field Expansion projects (NFE and NFS), decisions should be made based on the field's situation and global gas demand prospects at that time. Another crucial aspect that requires further study is the mutual influence of Qatar's North Field and Iran's South Pars, often seen as part of one massive reserves area in the Persian Gulf. If this impact is confirmed, synchronizing the plans for further development would be wise to avoid conflict situations, and collaboration with Iran should be considered an important direction of export policy, particularly given the current Iran-China collaboration plans in the oil and gas sector to prevent direct market competition.

Qatar's current export strategy, built on long-term contracts, somewhat limits profit maximization in the current global gas market conditions. However, as the market becomes saturated with new LNG projects outside of Qatar, the absence of a safety net in the form of long-term contracts might render new LNG projects economically unviable.

To address this issue, Qatar should consider maintaining its long-term contracts while keeping a "window of opportunity" for spot market earnings, dynamically responding to market shifts. In its contract portfolio, it's advisable to utilize a mix of existing indexing mechanisms, creating a "low-risk" portion through oil-indexed contracts and a "high-risk" portion with spot market indexing to different hubs. This adaptive approach, bolstered by Qatar's advantageous geographical location relative to both markets and its fleet of tankers, will enable Qatar to swiftly adapt to sudden shifts in demand and price dynamics, which have been a hallmark of gas markets in recent years. This approach will allow Qatar to extract maximum value from its LNG sales to any buyers offering premium prices.

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