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Dimensions of natural gas supply security: Poland's energy transition, supply and geopolitics

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Foreword by Miłosz Motyka, Minister of Energy



Energy security is now one of the most important challenges facing Poland and Europe as a whole. Recent years have demonstrated very clearly that energy and energy resources are significant not only economically, but also strategically and geopolitically. This is why the discussion on the security of natural gas supplies is so important today.

Poland is consistently strengthening its energy sovereignty by developing infrastructure and diversifying supply routes. The LNG terminal in Świnoujście, Baltic Pipe and the development of interconnections have made Poland an important pillar of energy security in Central and Eastern Europe.

It is also becoming increasingly clear that Poland can serve as a regional gas hub. We are developing the concept of the so-called "Northern Gateway", based on Poland's LNG infrastructure and transmission network, which can strengthen security of supply throughout the region and support our partners in Central and Eastern Europe.

At the same time, the energy transition is changing the role of natural gas in the energy system. In the coming years, gas will continue to play an important stabilising role, particularly as renewable energy sources are developed and the power sector is modernised.

This makes expert initiatives that offer a broader view of the gas sector—from the perspective of national security, the economy and regional stability—particularly valuable. The report prepared by DISE Energy is another important contribution to the debate on the future of Poland's energy sector.

I believe that the publication "Dimensions of Natural Gas Supply Security: Poland's Energy Transition, Supply and Geopolitics" will be of interest to everyone concerned with the energy security of Poland and Europe.

*Miłosz Motyka
Minister of Energy*

Foreword by Remigiusz Nowakowski, President of DISE Energy



Polish energy policy is entering a phase in which the existing logic of the energy transition requires fundamental revision. Over the past decade, energy security efforts have focused on replacing Russian energy commodities with alternative sources of imports. This objective has largely been achieved. However, it has not resolved a more fundamental problem: the economy's heavy dependence on fuels whose prices and availability are determined outside Poland and often outside the European Union.

Natural gas occupies a particular position within this framework. It is expected to assume some of the functions of retiring coal-fired power plants, support the power system as the share of wind and solar generation increases, and contribute to the modernisation of the district heating sector. At the same time, it is an imported commodity, while European domestic production is insufficient to meet demand. Poland is therefore not replacing coal exclusively with domestic and zero-emission technologies. Instead, it is exchanging part of its dependence on a domestic, albeit highly carbon-intensive, fuel for exposure to the global gas market.

This is the most important strategic dilemma examined in the Report. Gas can reduce the risk of capacity shortages during the transformation of the power sector, but excessive reliance on it creates other forms of vulnerability: import dependency, price exposure, infrastructure-related risks and geopolitical exposure. The issue is therefore not a straightforward choice 'for' or 'against' gas. What matters is the scale of new investment, its intended purpose, the anticipated operating lifetime of the assets and the system's ability to gradually reduce gas consumption after 2035.

As we hand over to you the latest DISE Energy report, which focuses on the role of gaseous fuels in the energy transition, I hope you enjoy reading our publication, and I invite decision-makers to make use of the conclusions presented in the report.

Remigiusz Nowakowski
President of DISE Energy

EXECUTIVE SUMMARY

From supply diversification to reducing dependency

The crises of 2021–2022 and 2026 demonstrated that expanding import infrastructure does not eliminate risk but shifts it to other parts of the value chain. LNG enabled Europe to replace a large proportion of Russian pipeline gas rapidly and increased the number of potential suppliers. At the same time, it linked European prices to demand in Asia, the availability of liquefaction capacity, freight costs and the security of maritime transport.

For Poland, this represents a fundamental change in its risk profile. Previously, the principal threat was political pressure exerted by a single supplier. Today, geographically dispersed events are becoming increasingly significant: conflicts in LNG-exporting regions, the closure of strategic straits, disruption to shipping, terminal failures, cyberattacks, and acts of sabotage targeting subsea infrastructure. From the end user's perspective, the outcome may be similar—a shortage of gas or a sharp increase in its price.

Further diversification of supply remains necessary, but it cannot constitute the sole response. Replacing Russian dominance with an increasing concentration of purchases from the United States would represent an improvement in political and infrastructure terms, but would not amount to full diversification. The expansion of US LNG capacity will increase market liquidity and is likely to ease supply pressures. However, it may simultaneously deepen Europe's dependence on a single jurisdiction, North Atlantic logistics, and prices shaped by Henry Hub, the US dollar exchange rate and maritime freight costs.

A modern energy security policy should therefore measure not only the number of supply sources and terminal capacity, but also the volume of gas that the economy would need to import under stress conditions. Diversification reduces the likelihood of supply disruptions. Electrification, energy efficiency and the use of domestic zero-emission energy sources, in turn, limit the potential impact of such disruptions.

Misalignment between system planning and investment strategies

The National Energy and Climate Plan (NECP) should integrate climate policy, security of supply, infrastructure development and industrial strategy. It cannot, however, be reduced to a forecast of growing gas demand that subsequently serves to justify further investment in supply infrastructure. A forecast based on the assumption of extensive gas use can easily become a self-fulfilling scenario: it leads to the expansion of power plants, networks and terminals, while the resulting capital expenditure subsequently creates pressure to operate these assets over the long term.

This risk is evident in the plans of state-owned energy groups. Announced investment programmes indicate that at least 8 GW of additional gas-fired capacity could be developed, while longer-term ambitions extend to more than 10 GW over the coming years. These plans

should be assessed against PSE's new strategy. The transmission system operator intends to prepare the National Power System (KSE) to operate with a zero-emission energy mix as early as 2035, with renewables accounting for more than 60% of electricity generation. The system is expected to accommodate 110 GW of renewable capacity, 24 GW of energy storage and 5.3 GW of nuclear capacity, while conventional sources are to perform a balancing role without the stability of the grid depending on them.

Comparing these two directions reveals a risk of misalignment. If the power system is to be designed around renewables, energy storage, demand-side flexibility and nuclear power, the required gas-fired capacity should be determined on the basis of any shortfall in system services, rather than by aggregating the projects developed by individual companies. Without such coordination, Poland may contract more gas-fired capacity than is economically justified and subsequently finance its continued availability through the capacity market or other support mechanisms.

Investment decisions should be preceded by a joint adequacy assessment of the electricity and gas systems. The assessment must include scenarios involving prolonged periods of low renewable generation, delays to nuclear power projects, disruption to one of the principal gas import routes, high LNG prices, and faster-than-expected growth in energy storage and demand-side response. Only on this basis can it be determined how much gas-fired capacity is genuinely required, which technologies should be used and how many operating hours should be anticipated.

Not every gas-fired power plant creates the same level of risk. Peaking units operating for a limited number of hours can provide security for the system while consuming relatively little fuel. The expansion of units designed for regular electricity generation has far greater consequences. Public policy should therefore reward availability, rapid response and the provision of system services, rather than create incentives to maximise gas-fired generation. The declared ability of new generating units to burn hydrogen or other low-emission gases should be treated with equal caution. The technical possibility of future conversion does not guarantee the availability, price or origin of the fuel, nor the necessary infrastructure. 'Hydrogen-ready' status cannot substitute for a credible fuel-switching plan.

Electrification as an instrument of energy security and competitiveness

The most serious weakness of Poland's strategy is the insufficient integration of gas policy with the global shift towards electrification. The world's largest economies are investing in electric transport, heat pumps, the electrification of industrial processes, energy storage and digitally enabled demand management. Electricity is becoming the principal platform integrating transport, buildings, industry and district heating.

Poland is falling behind in this respect. According to an analysis by Forum Energii (Energy Forum), current national plans would result in electricity accounting for approximately 26.3% of final energy consumption in 2040, compared with a European target of around 46%. Faster electrification of industry, transport and heating could simultaneously reduce total energy consumption by approximately 15%.

This gap is not merely a matter of meeting climate targets. It creates a risk that the Polish economy will lose competitiveness by remaining dependent on expensive imported fuels for longer, while its trading partners make increasing use of locally generated electricity. From this perspective, electrification is not an additional burden imposed by the energy transition, but an instrument for reducing macroeconomic risk, improving the trade balance and stabilising energy costs.

Recommendations presented in analyses by leading think tanks specialising in the energy transition and energy security point to a common conclusion: security should be built primarily through demand-side measures and electricity infrastructure. Priorities should include energy-efficient building renovation, heat pumps, the electrification of industrial heat, the expansion of electric transport, electricity and heat storage, flexible tariffs, demand aggregation and the faster development of electricity networks. Forum Energii also indicates that currently available technologies could electrify more than 60% of the heat used in manufacturing.

National energy strategy should therefore establish a measurable electrification pathway, broken down by sector and coordinated with investment in electricity networks. Without such a framework, Poland may simultaneously finance the development of renewable energy and entrench demand for gas, instead of using growing electricity generation to achieve a lasting reduction in fuel imports.

Resilience requires a cohesive portfolio, not a dominant technology

The alternative to extensive expansion of gas-fired generation is not to base the system on a single technology. It is to develop a portfolio of resources with different operating timescales, combining battery storage, thermal energy storage, pumped-storage hydropower, demand-side flexibility, interconnectors, stable zero-emission sources and a limited number of gas-fired generating units.

The integration of the power and district heating sectors could play a particularly important role. Electrode boilers, large-scale heat pumps and thermal energy storage can absorb surplus renewable electricity, reduce generation curtailment and lower gas consumption. Biomethane should be directed primarily towards applications in which direct electrification is technically difficult or disproportionately expensive. Distributing the limited supply of biomethane among applications for which cheaper electric alternatives are available would reduce its value to the energy system.

The approach to assessing gas infrastructure must also change. New terminals, storage facilities and interconnectors should be evaluated not only in terms of their ability to serve a growing market, but also their usefulness under a scenario in which consumption declines after the mid-2030s. These assets should strengthen regional resilience and facilitate multi-directional flows without creating pressure to maintain high domestic demand.

The ambition to establish a regional gas hub requires similar realism. A hub cannot be created by administrative decision or infrastructure alone. It requires a liquid futures market, transparent rules, third-party access, credible price signals, a sufficient number of market participants and regulatory stability. A benchmark incorporating Henry Hub could more ac-

curately reflect the cost structure of US LNG, but it would not eliminate exchange-rate or transport risks, nor the differences between the US and European markets. It should therefore complement TTF-based hedging instruments rather than be presented as a straightforward means of making domestic prices independent of external markets.

Priorities for the state

The analysis identifies five decisions of strategic importance:

- 1. Define the long-term role of gas-fired power plants.** The state should adopt a single system needs assessment covering the projects of all state-controlled companies. Public support should be directed towards capacity genuinely required to ensure the adequacy and flexibility of the National Power System (KSE).
- 2. Incorporate gas-related risks into power system planning.** Every scenario involving the development of new gas-fired units should take into account fuel availability, gas network capacity, gas stocks, LNG prices, emissions costs and the consequences of prolonged disruption to imports.
- 3. Make electrification a clear strategic goal.** Sector-specific targets are required for industry, transport, buildings and district heating, supported by a plan for the development of electricity networks, energy storage and demand-side management.
- 4. Move from protecting individual assets to securing entire supply chains.** Cooperation between operators, public authorities, security services and the Armed Forces should cover terminals, subsea pipelines, shipping lanes and infrastructure in partner countries. Poland must develop its capacity to identify threats beyond the Baltic Sea and address them through NATO and regional cooperation.
- 5. Prepare the system for a declining role for gas after 2035.** Capacity contracts, siting decisions and financing models should prevent the development of assets that would require long-term subsidies or high levels of gas-fired generation to remain economically viable.

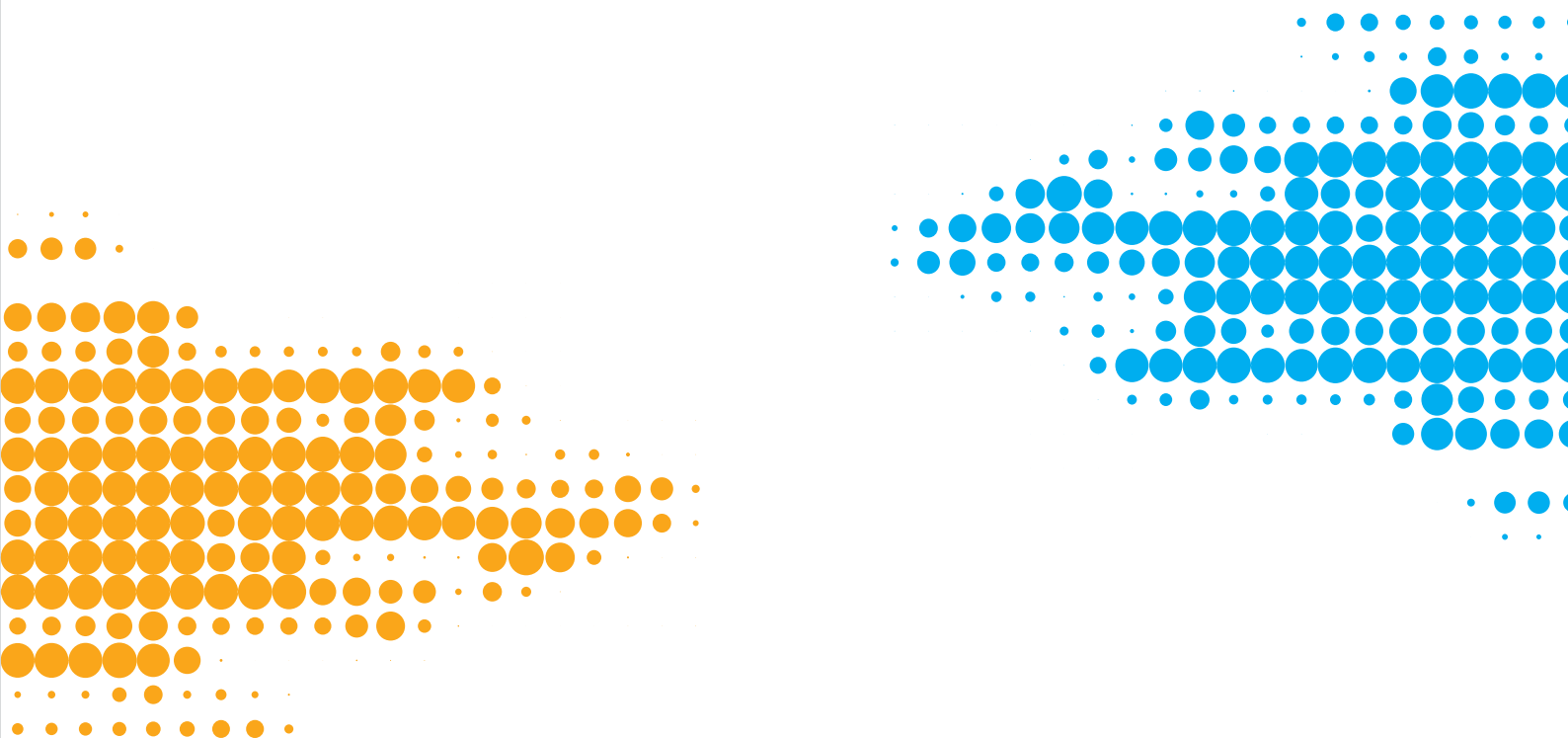
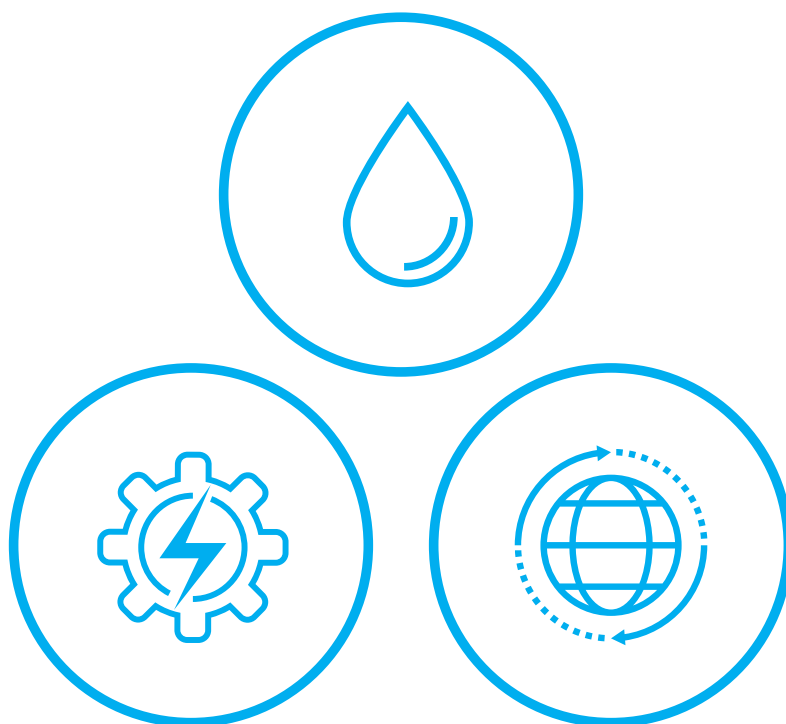
The strategic response to uncertainty is not to maximise every type of reserve capacity. It is to design the system so that disruption to one energy source does not spread across the entire economy. Gas will remain an important component of Poland's energy balance over the next decade, but it should not become the central pillar around which the energy system is designed for the next thirty years.

The success of the energy transition will not be measured by the number of terminals constructed or the capacity of new gas-fired power plants, but by the ability to ensure energy supply while progressively reducing exposure to fuel imports, price volatility and geopolitical pressure. Poland needs gas as a safeguard for the transition, limited in both duration and scale. In the long term, resilience should instead be founded on domestic zero-emission energy, efficient networks, flexible demand, energy storage and the widespread electrification of the economy.

Remigiusz Nowakowski
President of DISE Energy

List of abbreviations

Bcm	– billion cubic metres
CAPEX	– capital expenditures
CCGT	– Combined Cycle Gas Turbine
CEE	– Central and Eastern Europe
CEP	– Central European Petroleum
CHRL	– People's Republic of China (PRC)
DISE	– Lower Silesian Institute for Energy Studies
EAP	– Energy Action Plan
EIA	– Energy Information Administration
EPBD	– Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (Energy Performance of Buildings Directive)
ENTSOG	– European Network of Transmission System Operators for Gas
EU ETS	– European Union Emissions Trading System
FR	– Russian Federation
FSRU	– Floating Storage and Regasification Unit
GECF	– Gas Exporting Countries Forum
GUS	– Statistics Poland
ICDS	– International Centre for Defence and Security
IEA	– International Energy Agency
IEEFA	– Institute for Energy Economics and Financial Analysis
IGU	– International Gas Union
JKM	– Japan Korea Marker
NECP	– National Energy and Climate Plan
KSE	– Polish Power System
LNG	– liquefied natural gas
mmBTU	– million British thermal units
MTPA	– million tonnes per annum
NATO	– North Atlantic Treaty Organization
NFE	– North Field East
NFS	– North Field South
NFW	– North Field West
NOAA	– National Oceanic and Atmospheric Administration
NIK	– Supreme Audit Office
TSO	– Transmission System Operator
RES	– renewable energy sources
PGNiG	– Polish Oil and Gas Company
PGI-NRI	– Polish Geological Institute – National Research Institute
PSE	– Polskie Sieci Elektroenergetyczne (Polish Power Grids)
SKBM	– Strategic Concept of Maritime Security of the Republic of Poland
TTF	– Title Transfer Facility
UE	– European Union (EU)
USA	– United States of America
UAE	– United Arab Emirates



INTRODUCTION

Introduction

Dr. Marcin Sienkiewicz

The energy crisis of 2021–2022 and the closure of the Strait of Hormuz in 2026 as a result of the US–Iran war served as reminders of how fundamental uninterrupted access to energy carriers on economically acceptable terms is to the functioning of economies and, consequently, entire societies. Recognition of this dependence is particularly important for countries such as Poland, where natural gas is regarded as a transition fuel in the transformation of the national energy sector. As the share of renewable energy sources systematically increases and successive coal-fired power plants are decommissioned, natural gas will increasingly assume the role of stabilising the National Power System. In district heating, natural gas—alongside sustainable biomass—is also expected to replace coal, which continues to dominate the sector. It can therefore be assumed that these segments of the national economy will be the principal drivers of growth in Poland's demand for natural gas over the coming years. Increased consumption of this predominantly imported commodity may, however, make the Polish energy sector more vulnerable to risks affecting the global gas market.

The termination of Russian gas supplies to Poland in 2022 and the EU ban on Russian gas imports taking effect in 2027 may be regarded as major milestones in strengthening energy security. Achieving these milestones will not, however, completely eliminate the geopolitical risks associated with natural gas, which is not—and will not become—immune to threats arising from the international environment. The global market for this commodity operates in the shadow of international politics, which is inherently marked by persistent tensions and conflicts of varying scale and intensity.

The continuing rivalry among actors on the international political stage is frequently accompanied by the use of military force or instruments of economic pressure. In the latter case, threats to restrict or interrupt access to essential energy supplies were used repeatedly throughout the twentieth and early twenty-first centuries. Political practice also demonstrates that control over particular energy resources, including oil and gas, is regarded as a strategic asset over which disputes and conflicts arise. In view of these circumstances, maintaining energy security requires modern states, among other things, to monitor the international environment continuously, together with the processes and trends developing within it. Accurate assessments produced through such monitoring should inform an optimal security policy and the selection of an appropriate set of instruments for its implementation.

This Report seeks to identify the current conditions affecting the security of natural gas supplies in the context of Poland's ongoing energy transition. It also draws attention to a fundamental problem in Polish energy policy: although ending dependence on Russian gas was a necessary step, the former dependency was rapidly replaced by new ones—on global LNG supplies, terminal capacity and long-term contracts. The authors examine whether the ex-

pansion of gas infrastructure reflects the genuine needs of the transition or risks entrenching a fossil-fuel-based model and locking capital into assets whose profitability will decline as gas demand falls.

Ensuring energy security requires more than the diversification of suppliers. A systemic reduction in demand for imported fossil fuels through technological diversification is becoming essential. The publication examines the use of decarbonised gases and explains why Polish biomethane should be treated as a valuable strategic fuel rather than a universal substitute for natural gas. Owing to Poland's substantial domestic production potential and the possibility of using existing gas infrastructure, biomethane could play an important role in sectors that are difficult to electrify.

At the same time, Poland's transition pathway must ensure secure system operation amid the rapid development of low-emission technologies. The challenge lies in striking a balance between maintaining an adequate number of dispatchable balancing sources and accommodating the growing share of renewables and the electrification of the economy. This requires greater system flexibility and careful planning of the respective roles of gas, electricity and heat storage, and renewable gases during the transition period. The Report also addresses the modernisation of ageing transmission and distribution networks and the role of electricity interconnectors in strengthening resilience.

The substantive scope of the publication also includes an overview of the current state of the international gas market and the trends and trading practices observed within it. The termination of Russian gas supplies to Poland in 2022 coincided with an increased share of new supply sources made accessible by maritime transport. The expansion of liquefied natural gas (LNG) supplies became a key factor in restoring market balance and rebuilding stability in Poland and across the European Union.

The Report describes the LNG logistics chains used to supply the Polish market. From this perspective, a particularly important aspect of the publication is the geographical location and nature of political threats that are currently affecting—or could potentially disrupt—the normal operation of those supply chains. The analysis is complemented by an assessment of the Polish state's capabilities for securing natural gas supplies. It covers various components of the security system, including infrastructure, military, and political and diplomatic dimensions. The Report also proposes solutions for reducing dependence on gas imports and recommends measures to strengthen the security of gas supplies and protect the gas infrastructure required to deliver them.

In formulating the title of this Report, DISE once again drew on the concept of 'geopolitics', used here as a synonym for international relations or international politics. It is within this sphere that the aforementioned factors affecting the security of the global natural gas market—and, consequently, gas supplies to Poland—have been identified. These factors may create favourable conditions for particular market participants, but they may also generate serious threats. In the authors' assessment, geopolitical factors will continue to play a decisive role, both now and in the years ahead, in maintaining continuity of supply and the overall stability of global gas markets. This is due to the particular intensity of activity by major po-

litical actors, including global and regional powers, whose frequently conflicting objectives increase the volatility of international relations. Further developments in the international environment are important not only for energy security, but also for the planned course of the energy transition in Poland and throughout the European Union. The implementation of ambitious strategies aimed at achieving climate neutrality is increasingly encountering political and economic barriers arising from the international environment.

The Report contains conclusions concerning improvements to energy security and possible future scenarios for the use of natural gas in Poland's energy transition. The sections devoted to geopolitical issues do not, however, seek to present a complete picture of the current international situation or provide a detailed account of the ongoing conflicts affecting the global gas market. The complexity and rapidly evolving nature of this subject require separate consideration and dedicated research in the fields of security studies and international relations. Instead, the Report outlines the nature of the geopolitical threats affecting individual geographical regions that play a key role in the LNG logistics chains supplying Poland and Europe.



1

NATURAL GAS MARKETS IN THE EUROPEAN UNION AFTER THE CRISIS

Chapter 1.

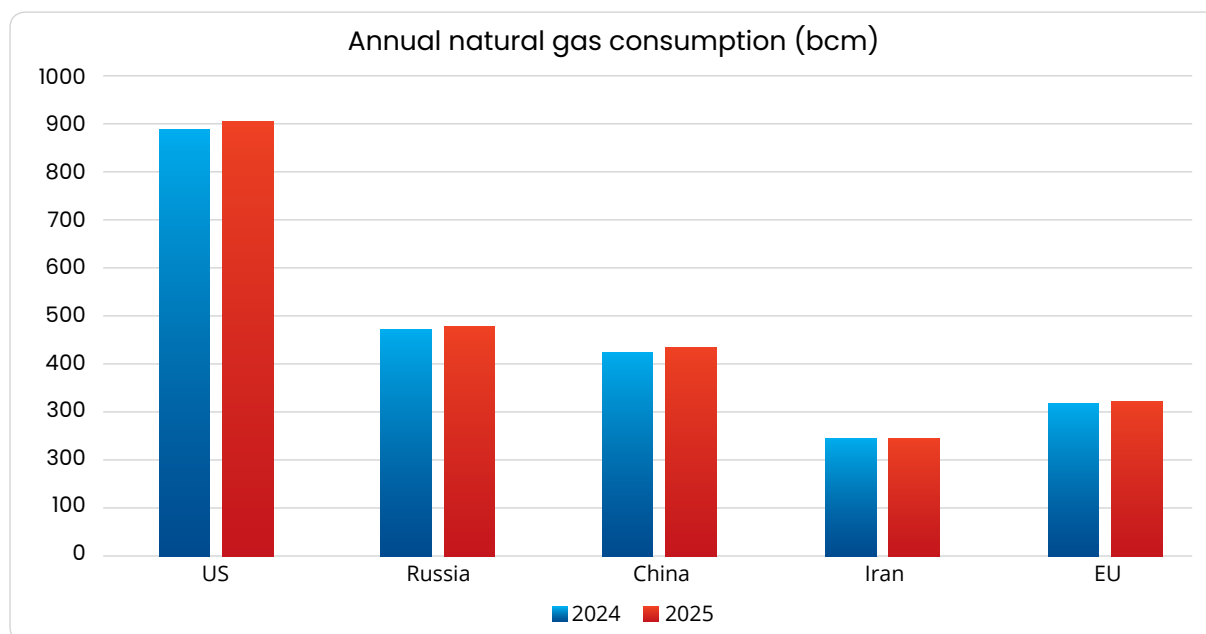
Natural gas markets in the European Union after the crisis

Kamil Moskwik, Dr. Marcin Sienkiewicz

1.1. The relationship between supply and demand for natural gas

In 2025, the share of natural gas in the global consumption of fossil fuels was 29%, satisfying one-fourth of the total energy demand¹. In the same year, the demand for gas reached 4,186 billion m³ and was 1.6% higher compared to the previous year². The leaders in this respect, as in previous years, were the United States (913 billion m³), the Russian Federation (480 billion m³) and the People's Republic of China (441.9 billion m³), which, together with Iran, accounted for nearly half of global gas consumption³. In the case of the European Union countries, their combined demand for natural gas amounted to 339.2 billion m³ in 2025 and was 2% higher than the previous year's demand, which meant the second consecutive year of moderate demand recovery after its collapse in 2022–2023⁴.

Fig. 1. Natural gas consumption of the five largest global consumers in 2024–2025.



Source: Own study based on Energy Institute, *Statistical Review of World Energy 2026*

1 Energy Institute, *Statistical Review of World Energy 2026*

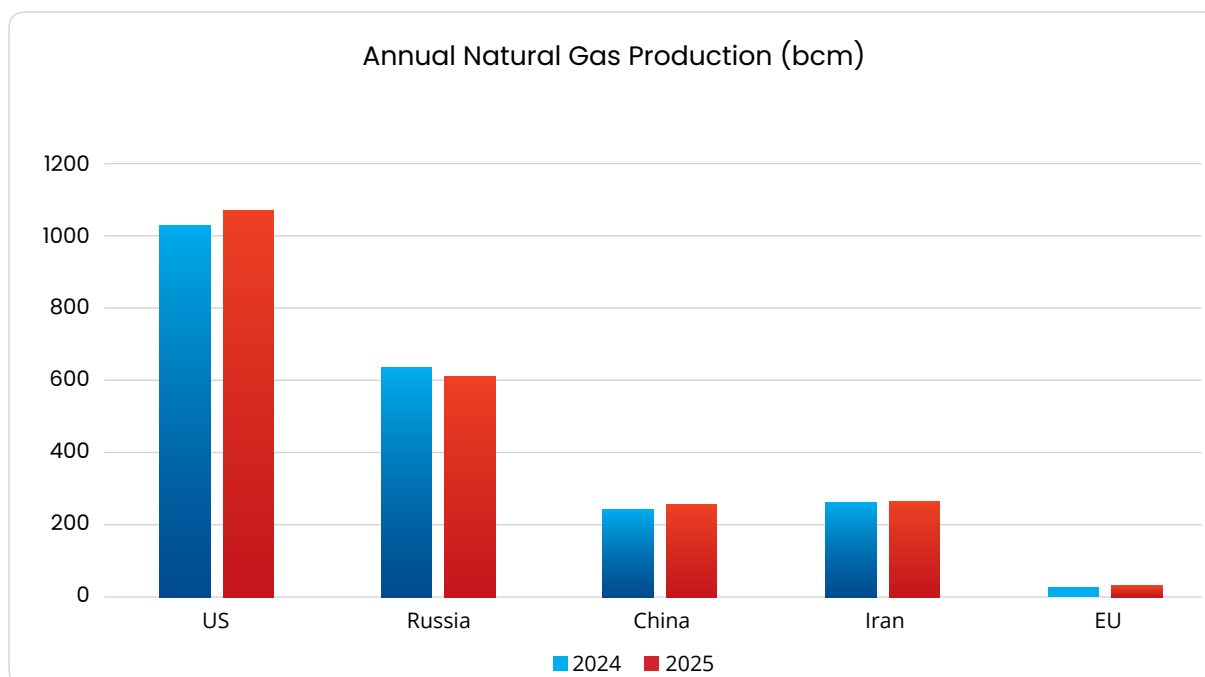
2 Ibid.

3 Ibid.

4 European Commission, Market analysis – EU gas market indicators, [access: 17/08/2026: https://energy.ec.europa.eu/data-and-analysis/market-analysis_en].

On the supply side, global production is expected to increase in 2025 to 4,196.5 billion m³, a 1.6% increase compared to the previous year⁵. On the supply side, the same countries—the USA, Russia, Iran, and China – are also among the global leaders. In this case, only the USA and Russia are among the top global exporters of this commodity. Natural gas production in the European Union is marginal in this context – in 2025, it amounted to 33.9 billion m³, covering only about 10% of EU consumption; after years of systematic decline, a slight increase of 3.2% compared to 2024 was recorded⁶.

Fig. 2. Natural gas production of four global producers and the EU in 2024–2025.



Source: Own study based on Energy Institute, *Statistical Review of World Energy 2026*

The European Union remains a market area permanently dependent on natural gas imports, which have a dominant share in its supply. According to data published by the EU, despite the decline in consumption caused by the crisis, between 2021 and 2023 the share of imports in supplying EU markets increased from 86.3% to 90%⁷. In 2025, the EU's import dependency ratio was 87.6%, with total gas imports at 289 billion m³, i.e. 5% higher than a year earlier⁸.

⁵ Energy Institute, *Statistical Review of World Energy 2026*

⁶ Eurostat, *Natural gas supply statistics*, June 2026, [access: 17/08/2026: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Natural_gas_supply_statistics]. European Commission data indicate extraction at the level of 33 billion m³, covering approximately 10% of EU consumption.

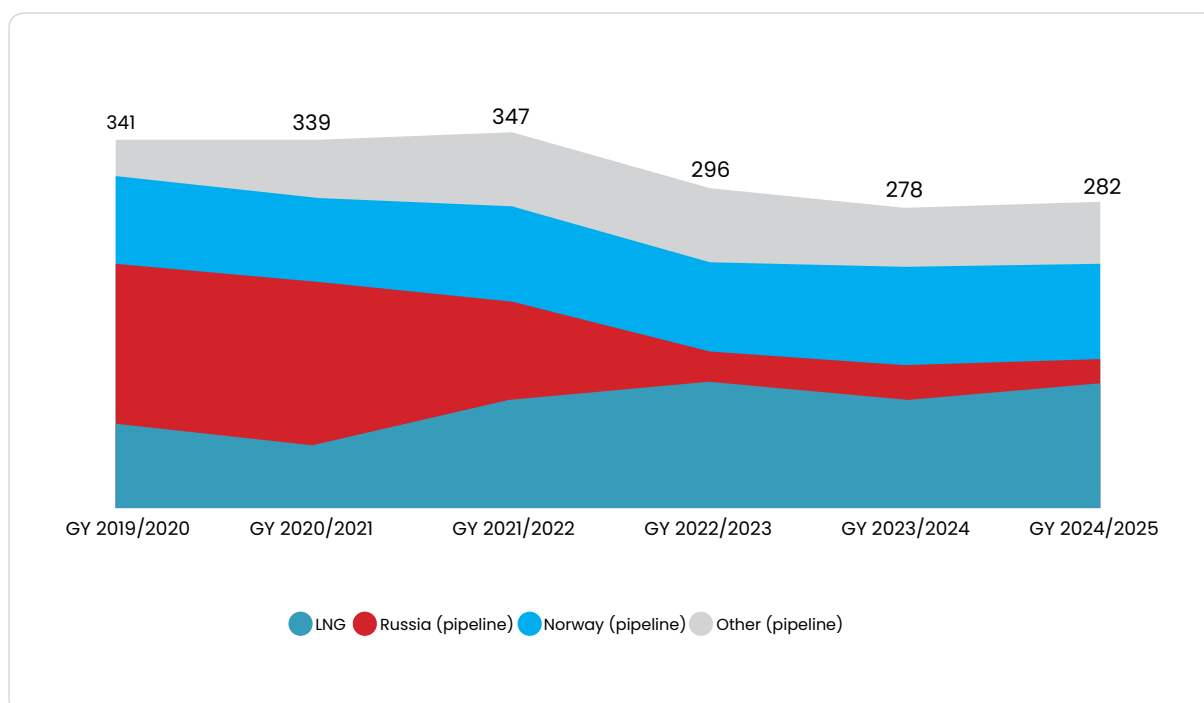
⁷ European Parliament, *Gas supply: MEPs advocate for flexibility in refilling to bring down prices*, 24/04/2025, [access: 10/07/2026: <https://www.europarl.europa.eu/news/en/press-room/20250422IPR28105/gas-supply-meps-advocate-storage-refill-flexibility-to-bring-down-prices>].

⁸ Eurostat, *Natural gas supply statistics*, op. cit.; European Commission, *Market analysis – EU gas market indicators*, op. cit.

1.2. The role of LNG in supply

The most significant supply-side change is the shift from pipeline gas towards LNG. This does not mean the disappearance of pipeline infrastructure, but rather a shift in hierarchy. Pipelines remain critical to the security of supply to the EU, but LNG has become the primary instrument for balancing shortages, responding to crises, and directing volumes to the highest marginal price. After the reduction of supplies from Russia⁹, increased LNG imports, rather than gas flowing through pipelines other than Russian ones, managed to stabilise markets. In 2025, Member States imported a total of approximately 140 billion m³ of LNG, making the EU the largest consumer of this fuel globally¹⁰. Meanwhile, the share of liquefied natural gas in EU import supplies increased from 20% in 2021 to 45% in 2025¹¹.

Fig. 3. Dynamics of changes in the structure of natural gas imports to the EU in 2019–2025



Source: European Commission, Ensuring well-functioning gas markets Report by the Gas Market Task Force ("GMTF"), Brussels, 01/06/2026, p. 9.

Norway has become the leading supplier of natural gas to European Union Member States, supplying them primarily under long-term contracts serviced by a network of pipelines running across the seabed of the Norwegian Sea and the North Sea. However, it was the United States that recorded the largest increase in sales to its European trading partners. In 2025, it became the EU's second-largest gas supplier after Norway, accounting for 26%–76 billion

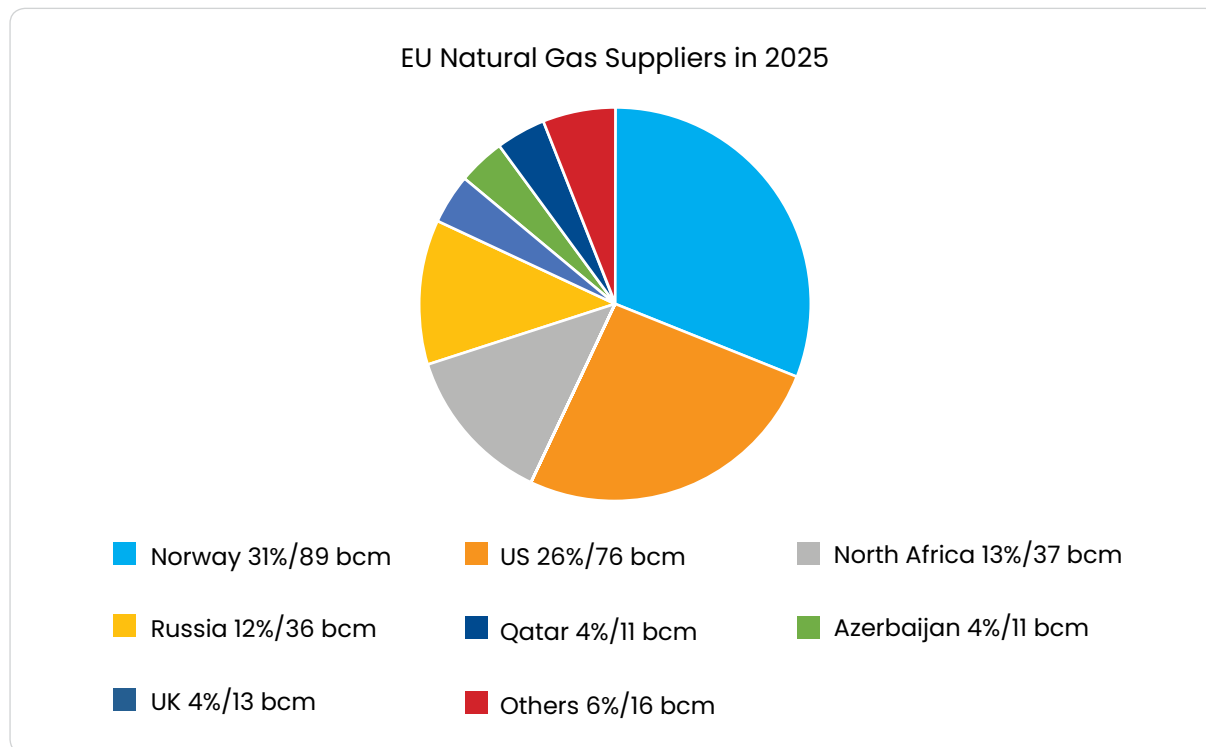
⁹ Participation supplies from Russia dropped from 42% of the total deliveries imports to the EU in 2021 to only 12% in Q3 2025, European Commission, *Ensuring well-functioning gas markets Report by the Gas Market Task Force ("GMTF")*, Brussels, 01/06/2026, p. 8.

¹⁰ European Council, *Where does the EU get its gas from ?* [access: 13/06/2026 in: ?, <https://www.consilium.europa.eu/pl/infographics/where-does-the-eu-s-gas-come-from/>].

¹¹ European Commission, *Liquefied natural gas*, [accessed: 13/06/2026: https://energy.ec.europa.eu/topics/carbon-management-and-fossil-fuels/liquefied-natural-gas_en].

cubic metres-of total gas imports¹². In the LNG segment, the United States ranked first in the same year, supplying 55% of the EU's imported liquefied natural gas¹³.

Fig. 4. Share of natural gas suppliers in the structure of European Union imports in 2025.



Source: European Commission, *Ensuring well-functioning gas markets Report by the Gas Market Task Force ("GMTF")*, Brussels, 01/06/2026, p. 9.

Across the EU, Russian pipeline gas exports declined sharply, mainly as a result of the sudden fall in pipeline deliveries¹⁴. At the same time, EU imports of Russian LNG began to increase in 2023. In 2024, they reached their highest level on record, making Russia the EU's second-largest LNG supplier. As successive EU sanctions and regulations restricting the trade, transshipment and re-export of Russian liquefied natural gas entered into force, import volumes declined in 2025. Under the regulation phasing out Russian gas, they should fall to zero by the end of 2027. Unlike gas transported by pipeline, however, Russian LNG can be redirected relatively easily to other markets, where it will have to compete with supplies from other producers. Meanwhile, in March and April 2026, EU imports of Russian LNG rose again to record levels compared with the corresponding months of previous years¹⁵. Largely due to the blockade of the Strait of Hormuz and supplies from Qatar, the Russian Federation became the second

¹² Ibid., p. 9.

¹³ European Commission, *EU-US trade deal explained – energy aspects*, [access: 12/06/2026: https://ec.europa.eu/commission/presscorner/detail/en/qanda_25_1935].

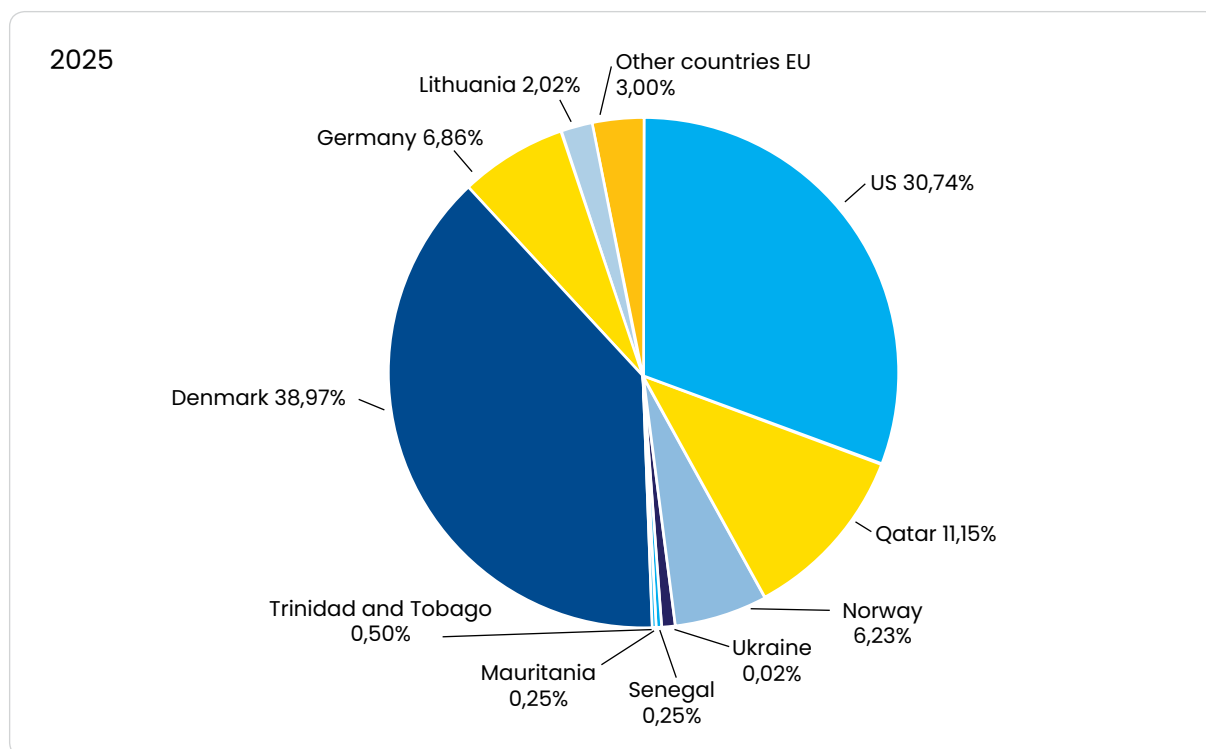
¹⁴ European Council, *Where does the EU get its gas from?*, op. cit.

¹⁵ Bruegel, *European natural gas imports*, [accessed: 23/07/2026: <https://www.bruegel.org/dataset/european-natural-gas-imports>]. In March 2026, Russian LNG imports to the EU reached 2.459 billion m³, the highest since the beginning of this measurement in 2019.

largest supplier to the EU market in the first quarter of 2026^{16, 17}

In Poland, LNG is imported primarily under long-term contracts with suppliers from the United States and Qatar. Exporting countries also include Trinidad and Tobago, Senegal and Mauritania. According to data from the Ministry of Energy, Poland's gas imports increased by 23% in 2025 to 213.5 TWh. LNG received at the Świnoujście terminal accounted for 42.9% of this volume—91.6 TWh—representing an increase of 30% year on year and the highest level on record. A total of 82 LNG cargoes were delivered, compared with 61 in 2024, of which 62 originated in the United States and 17 in Qatar. As a proportion of total gas imports, the United States accounted for 30.7% and Qatar for 11.15%, while pipeline supplies from Denmark represented 38.9%, Norway 6.2%, Germany 6.86% and Lithuania 2.02%. Marginal imports from Mauritania, Senegal and Ukraine were also recorded, with a combined share of 0.52%. Domestic gas production amounted to 40.7 TWh during the same period, equivalent to approximately 17.7% of national gas consumption¹⁸.

Fig. 5. Structure of gas fuel imports from abroad to Poland in 2025.



Source: Ministry of Energy, *Report on the results of monitoring the security of gas fuel supplies for the period from 1st January 2024 to 31st December 2025*, July 2026, p. 12.

¹⁶ IEEFA, *Europe to source two-thirds of its LNG imports from US in 2026 as dependence deepens*, 13/05/2026, [accessed: 23/07/2026: <https://ieefa.org/articles/europe-source-two-thirds-its-lng-imports-us-2026-dependence-deepens>].

¹⁷ A. Łoskot-Strachota

¹⁸ Ministry of Energy, *Report on the results of monitoring the security of gas fuel supplies for the period from 1 January 2025 to 31 December 2025*, Warsaw, July 2026, p. 12.

In 2025, the import capacity of LNG terminals located on the coasts of European Union countries totalled 242 billion m³. According to European Commission estimates, this capacity is expected to increase by another 100 billion m³ by 2030¹⁹. New terminals are being built in Germany and Poland, among others. In the former case, the new terminal is scheduled to open in 2027 in Stade, near Hamburg. The facility's regasification capacity is expected to reach 13.3 billion m³ annually²⁰. In the latter case, the floating storage and regasification unit (FSRU) will be located in the southern part of the Gulf of Gdańsk, approximately 3 km offshore and directly adjacent to the shipping channel leading to the Port of Gdańsk. The new terminal, with an annual regasification capacity of 6.1 billion cubic metres of gas, is scheduled to be commissioned at the turn of 2027 and 2028²¹.

Fig. 6. Geographical location of LNG receiving terminals in the European Union.



Source: European Council, Infrastructure for liquefied petroleum gas natural gas in the EU, as of 2024

19 European Commission, *Liquefied natural gas*, [access: 17.06.2026: https://energy.ec.europa.eu/topics/carbon-management-and-fossil-fuels/liquefied-natural-gas_en].

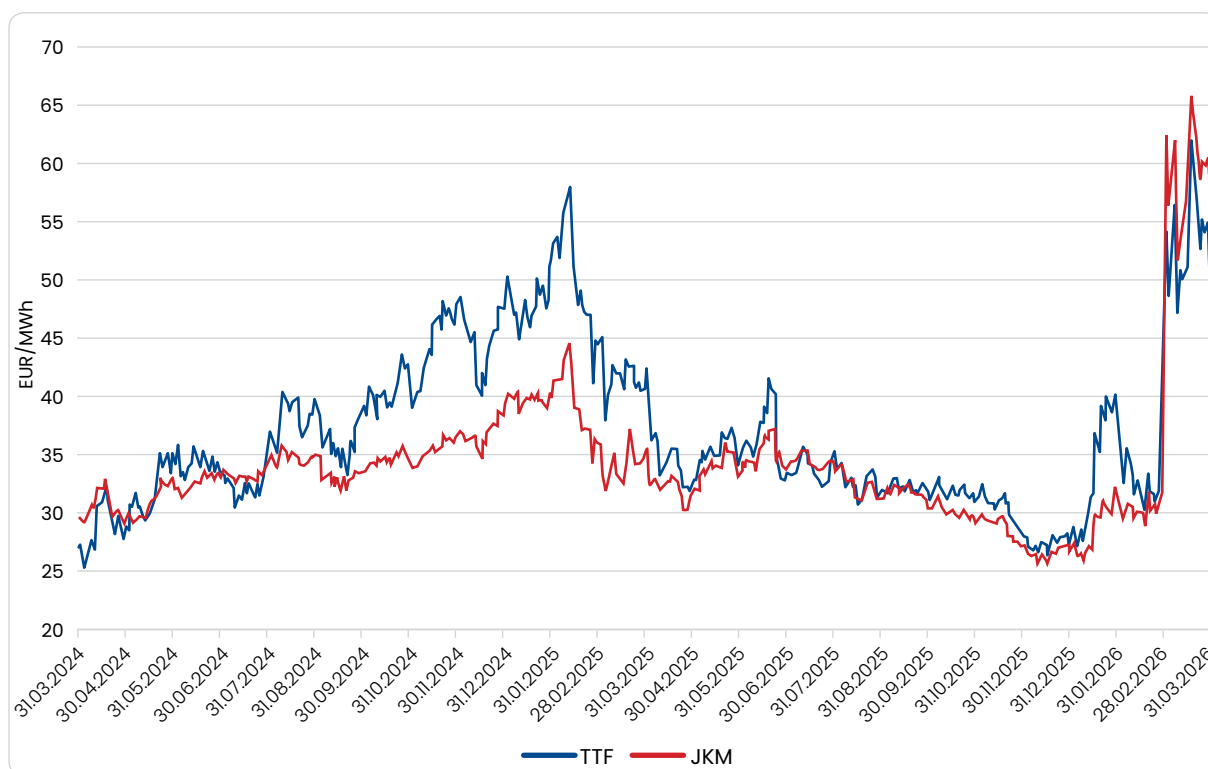
20 Sacyr, *New LNG terminal in Germany*, [access: 17.06.2026: <https://sacyrinfraestructuras.com/en/nueva-terminal-de-gnl-en-alemania>].

21 GAZ-SYSTEM, *FSRU Terminal - news* [access: 17/06/2026: <https://www.gaz-system.pl/pl/terminal-fsru/pytania-i-odpowiedzi.html>].

1.3. Price dynamics and market equilibrium

After 2022, European gas markets embarked on a gradual return to equilibrium, built on new foundations centred on increased purchases of liquefied natural gas transported by sea. Despite the marginalisation of Russian gas supplies, the European Union remains exposed to sharp price increases caused by geopolitical factors, including political and military crises. This significant exposure became apparent once again following the outbreak of the US–Iran war on 28 February 2026. Military operations in the Persian Gulf and the Strait of Hormuz initially disrupted and subsequently halted supplies from the region. Disruption to Qatari gas supplies, combined with the rapidly evolving military situation, caused significant increases in gas prices on European exchanges, although these were less dramatic than those recorded in 2021–2022. On 9 March 2026, widely traded Dutch TTF month-ahead contracts were priced at more than EUR 70/MWh, their highest level since the beginning of 2024²². Sensitivity to geopolitical crises is also reflected in East Asian market prices. The chart below compares Europe's principal benchmark, the Title Transfer Facility (TTF), with the Asian Japan Korea Marker (JKM). When global gas supplies are constrained, European and Asian importers effectively compete for available volumes through price.

Fig. 7. Comparison of the dynamics of price indices for TTF and JKM gas in the period March 2024–March 2026.

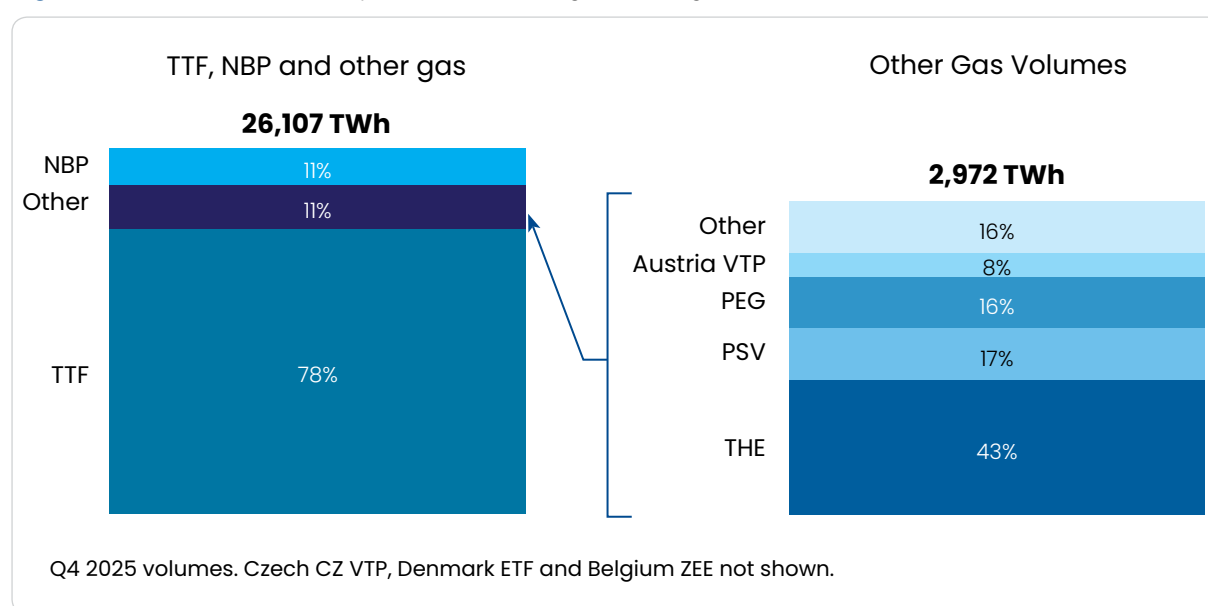


Source: Elengier, Gas market overview 2026

22 Elengier, *Gas market overview 2026* [access: 17/04/2026: <https://elengier.ee/en/gas-market-overview-q1-2026/>]

In contrast to Asia, Europe is not the main source of long-term demand growth, but remains a key market for price formation and the absorption of flexible LNG volumes. This means that Europe's importance no longer stems solely from the size of physical consumption, but rather from the role played by its trading hubs, regasification infrastructure, and ability to attract cargo in crisis situations. Europe's leading gas trading hub, the Dutch Title Transfer Facility (TTF), accounted for approximately 80% of European gas trading volumes in 2024–2025, while its churn ratio—the ratio of trading volume to physical gas consumption in Europe—stood at 20.3. This level is many times higher than the value assumed in the analyses of the Oxford Institute for Energy Studies (OIES) as the limit of a mature, liquid hub (approx. 10), which means that the TTF now functions as a financial market, and not only as a place for physical gas trading²³.

Fig 8. Share of individual European hubs in the gas trading volume.



Source: Trayport Commodities Report Q4

According to the Oxford Institute for Energy Studies (OIES), TTF is increasingly used to price spot LNG cargoes and establish price relationships for LNG benchmarks in north-western Europe, as well as for some cargoes destined for the Asia-Pacific region. This means that, despite declining physical consumption in certain segments, the European market continues to exert considerable influence over the global gas price-discovery mechanism. In a world where an increasing share of trade takes place on flexible terms, benchmark liquidity is almost as important as the size of the physical market itself. At the same time, the structure of European demand remains problematic. According to estimates by Boston Consulting Group (BCG), long-term contracts cover approximately 72% of European LNG demand—20 percentage points less than in Asia, where the figure is 92%. A significant proportion of imports is based either on short-term indexation or on contracts expiring by 2030. Approximately 19 billion cubic metres, or 200 TWh, of Europe's contracted volumes will expire by 2030.

23 P. Heather, OIES *European traded gas hubs: TTF now a global gas benchmark*, OIES PAPER: NG 198 June 2025, p. 23.

Unless new agreements are concluded, exposure to the spot market could increase to 47%. This asymmetry is one of the principal sources of Europe's vulnerability to price volatility²⁴. The experience of 2026 demonstrates, however, that the proportion of demand covered by contracts does not in itself protect against supply disruptions. A significant share of volumes covered by long-term contracts, particularly those destined for Asian markets, originates in the Persian Gulf. Following the closure of the Strait of Hormuz, the Qatari exporter invoked force majeure in respect of some of its long-term contractual obligations. No Qatari cargoes arrived at the Świnoujście terminal in the second quarter of 2026, while approximately 95% of the LNG received there during that period originated in the United States²⁵.

The new equilibrium that emerged in European gas markets following the 2021–2022 crisis cannot be assessed solely in terms of physical access to sufficient volumes. Equally important is the question of at what price these volumes are available and who bears the risk of acquiring them. According to BCG analysis, long-term LNG contracts indexed to the US Henry Hub, in a formula including the raw material price plus a liquefaction fee and freight, could provide gas in the range of around €25–30 per MWh, with a historical median cost of €27/MWh, while the German spot market between 2021 and 2025 showed a much higher and more volatile price, with a median of €43/MWh and a wide fluctuation range²⁶. This difference has enormous implications for the demand side, especially for energy-intensive industries. BCG indicates that at a gas price of around €27/MWh, some processing industries would be able to operate at profitability close to pre-crisis levels, while a level of around €60/MWh would lead to a significant deterioration in economic profitability and even losses in industries responsible for millions of jobs in the EU²⁷. From this perspective, the challenge facing the gas market is no longer limited to the physical availability of supply, but also concerns whether gas prices allow industrial activity to be maintained and competitiveness with the United States and Asia to be preserved. It should be emphasised that Henry Hub indexation does not equalise the costs borne by European and US consumers. Liquefaction fees, freight costs and regasification costs must be added to the commodity price, while the United States has an interest in maintaining lower prices in its domestic market than for exports. A Henry Hub-based pricing formula therefore reduces volatility and improves the predictability of supply costs, but it does not eliminate the cost advantage enjoyed by the US economy.

The global gas market is increasingly divided into regions with better access to cheap structural supply and regions dependent on marginal imports. Individual gas regions also exhibit varying degrees of exposure to geopolitical risks. The EU's largest gas importers, primarily Germany, have been deprived of their former advantage stemming from large-scale pipeline imports from Russia. Consequently, they now function more like marginal importers, whose prices must attract flexible LNG cargoes. At the same time, EU gas markets remain highly sensitive to the consequences of political and military crises that disrupt import logistics chains, as evidenced by the aforementioned price spikes triggered by the US–Iran conflict.

24 S. Rexhausen, J. Große, F. Friedwagner, J. Schröder, BCG, *A New Gas Procurement Paradigm to Protect Europe's Industrial Future. From volatility to stability. Why Europe needs price-secured long-term contracts now*, August 2025, p. 7.

25 ACER, *Key developments in European gas markets – winter 2025/2026*, [access: 17/08/2026: <https://www.acer.europa.eu/sites/default/files/documents/Publications/2026-ACER-Gas-Key-Developments-winter.pdf>].

26 Ibid., p. 8.

27 Ibid., p. 5.

Compared to the EU, North America remains an area of relatively low prices, reflected in the steady trajectory of the Henry Hub price index. The stability of the North American region rests on a very large resource base and a developed domestic market. Due to its virtual self-sufficiency in natural gas and oil production and its military capabilities (at the disposal of the US), North America is also much less exposed to geopolitical risks than the European Union. The conclusion from this comparison, however, is not to assert the superiority of the US market, but rather to indicate that the European Union lacks a supply-side instrument comparable to the US resource base. The realistically available tools for reducing gas costs on the European side therefore boil down to increasing the share of contracts with predictable pricing formulas, developing demand flexibility, and consistently reducing gas demand itself.

East Asia represents the third pillar of the global natural gas market, and its position differs from those of both the European Union and North America. Japan, the Republic of Korea, the People's Republic of China and Taiwan together constitute the world's largest concentration of demand for liquefied natural gas. The Japan Korea Marker (JKM), calculated for this region, serves alongside TTF as a global benchmark for pricing spot LNG cargoes. According to the International Energy Agency (IEA), the Asia-Pacific region is expected to account for approximately half of the increase in global natural gas demand in 2026²⁸. Unlike the European Union, the region is therefore experiencing structural growth in demand rather than a structural decline.

The supply security model also differs. Asian importers rely primarily on long-term contracts, which, as noted above, cover a significantly higher proportion of demand than in Europe²⁹. This limits exposure to spot price volatility, although it does not eliminate the risk of physical supply disruptions.

China has an additional buffer, combining domestic production with pipeline imports from Russia and Central Asia. This allows it to reduce LNG purchases during periods of high prices. This mechanism became evident in March 2026, when Chinese imports of liquefied natural gas fell by 30% year on year³⁰.

At the same time, of the three regions, Asia remains the most exposed to risks associated with the Strait of Hormuz, through which approximately 20% of global LNG trade passes. The majority of Qatari and Emirati LNG volumes were destined for Asian markets. The closure of the Strait resulted in a sharp increase in JKM prices, which averaged USD 20.7/MMBtu in March 2026—their highest level since January 2023³¹. The relationship between the benchmarks was also reversed: the European premium of approximately USD 0.9/MMBtu recorded in January and February gave way to an Asian premium averaging USD 2.8/MMBtu in March, prompting flexible LNG cargoes to be redirected from Europe to the Far East³². This confirms

28 IEA, *Gas Market Report, Q1-2026*, Paris 2026, [access: 23/07/2026: <https://www.iea.org/reports/gas-market-report-q1-2026>].

29 S. Rexhausen, J. Große, F. Friedwagner, J. Schröder, BCG, *A New Gas Procurement...*, op. cit., p. 7.

30 IEA, *Gas Market Report, Q2-2026*, Paris 2026, [accessed : 23/07/2026: <https://www.iea.org/reports/gas-market-report-q2-2026>].

31 Ibid.

32 Ibid.

that the European and East Asian markets do not operate as separate pricing regions, but compete for the same limited pool of flexible LNG volumes. The price differential between the two markets determines the direction of flows when supply is constrained.

1.4. Trading practices in the global natural gas market

Contemporary trading practices in the natural gas market have undergone a profound transformation, reflecting a shift from bilateral, rigid contractual relationships towards a considerably more complex, liquid and multidimensional system. Only a decade ago, trade was dominated by long-term pipeline contracts indexed to oil prices, concluded between states or large energy companies and based on security of contracted volumes and take-or-pay clauses. Today, the market operates under a hybrid model in which long- and medium-term contracts coexist with the spot market. Their respective shares vary according to the region, the maturity of the market and the strategies adopted by market participants.

In commercial practice, this means that gas contracts are increasingly indexed to gas hub prices rather than directly linked to oil prices. In the LNG market, the shift towards indexation to Henry Hub in the United States or the European TTF is particularly evident, providing greater transparency and allowing purchasers to manage their portfolios more flexibly. McKinsey emphasises that the US model, based on a Henry Hub price plus a liquefaction fee, has become one of the principal reference points for new LNG contracts. It separates commodity price risk from infrastructure costs and gives buyers greater control over their portfolios. At the same time, this model encourages the development of global LNG portfolios in which cargoes can be directed to the most commercially attractive markets³³.

At the same time, spot trading and short-term LNG contracts are becoming increasingly important, enabling market participants to respond rapidly to changes in supply and demand. The share of LNG traded on a short-term or spot basis has grown steadily and, in recent years, has exceeded one-third of global trade. This represents a significant departure from the previous model, which relied almost entirely on long-term contracts. Such evolution increases market liquidity and improves allocative efficiency, but also heightens volatility, as a greater proportion of available volumes is subject to direct price competition³⁴.

Another important element of trading practice is the management of contract portfolios by large energy companies and traders. Portfolio players are becoming increasingly significant, managing diversified portfolios of supply sources, pricing indexation mechanisms and delivery destinations, and acting as market integrators. Consequently, gas trading increasingly resembles financial portfolio management, in which hedging strategies, the use of derivatives and active price exposure management play a central role.

33 McKinsey & Company, *Reflecting on 2021 global LNG and European pipeline flows*, [accessed : July 23, 2026: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/oil-and-gas-blog/reflecting-on-2021-global-lng-and-european-pipeline-flows>]

34 GIIGNL, *The LNG Industry – GIIGNL Annual Report 2025*, Paris 2025. In 2024, spot and short-term trading amounted to 146 million tonnes, corresponding to 36% of world LNG imports.

The development of the LNG market has further increased the importance of contractual flexibility. New contracts increasingly include clauses permitting changes to delivery destinations, the re-export of cargoes and logistics optimisation, thereby facilitating global arbitrage. Unlike traditional pipeline contracts, which were tied to specific routes and delivery points, LNG allows volumes to be physically redirected in response to price signals. This flexibility is unevenly distributed, however, as it is available primarily to large portfolio players, leading to a concentration of trading expertise and increasing the importance of operational scale³⁵.

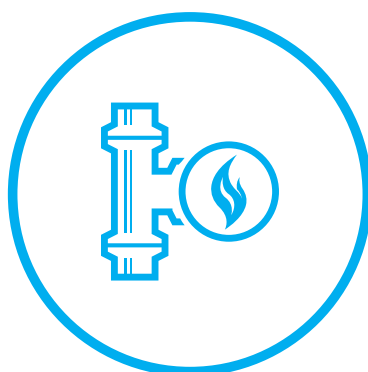
At the strategic level, contract structure is becoming increasingly important in the context of energy security. An optimal procurement strategy involves neither complete reliance on the spot market nor the full coverage of required volumes through long-term contracts. Instead, it requires a balanced portfolio combining stability with flexibility. Regions with high levels of long-term contractual coverage are less exposed to price spikes, while those relying more heavily on the spot market face greater volatility and risk.

Main conclusions:

- The balance of the global gas market currently rests on a complex interaction between geopolitics, LNG infrastructure, contracting practices and pricing mechanisms. This increases the system's flexibility, while at the same time making it more vulnerable to shocks.
- There has been a lasting shift from pipeline gas towards LNG, which has become a key market-balancing mechanism and a factor integrating regional systems into a single global market.
- After 2022, the gas market entered a new regime characterised by greater volatility and stronger dependence on geopolitical factors and global competition for LNG. This represents a lasting departure from the relatively stable and low price levels observed between 2015 and 2021. The principal source of volatility is not cyclical economic fluctuations, but unpredictable geopolitical factors, which produced two supply crises within four years: the first in 2021–2022 and the second in 2026.
- In the medium term, the key factor shaping supply will be the rapid expansion of new LNG capacity, particularly in the United States. At the same time, this reduces the diversification of supply sources and increases the risk of oversupply and competitive pressure in the coming years.
- Russia has lost its position as Europe's dominant supplier but remains an important participant in the global market. Its future role will depend on its ability to redirect volumes to Asia and on geopolitical and infrastructure constraints.
- Asia remains the principal source of demand growth. However, the scale of that growth will depend on the market's ability to offer competitive prices and flexible contracts, as many developing economies remain highly price-sensitive.

35 J. Sharples, *A Brave New World? LNG Contracts in the Context of Market Turbulence and an Uncertain Future*, "OIES Paper", NG 187, December 2023.

- Despite weaker growth in physical demand, Europe plays a key role in the global system as a centre of price discovery and a marginal market for LNG. Consequently, developments in Europe have a direct impact on global flows and price levels.
- The structure of Polish imports, dominated by US LNG priced according to a Henry Hub-based formula plus liquefaction and freight costs, means that Poland's supply costs are now determined by a combination of TTF and Henry Hub prices. This justifies the development of domestic price-risk management tools: a liquid futures market on the Polish Power Exchange (TGE) and hedging instruments based on a modified benchmark incorporating the Henry Hub index. Whether Poland should seek to establish an independent price benchmark requires a separate analysis and is considered in the recommendations section of the Report.





NATURAL GAS AND THE POLISH ENERGY TRANSITION



Chapter 2.

Natural gas and the Polish energy transition

Dr. Marcin Sienkiewicz, Kamil Moskwik

2.1. Gas in the European Union's long-term climate and energy policy

In light of the European Union's strategic objective of achieving climate neutrality by 2050, natural gas is a problematic energy commodity. Its use in the economy generates greenhouse gas emissions in the form of carbon dioxide and methane. Since the adoption of the European Green Deal in 2019, the European Commission has initiated numerous measures aimed at significantly reducing natural gas consumption.

EU targets for reducing CO₂ emissions – about 55% by 2030 and 90% by 2040

» Heating without natural gas

Under Directive (EU) 2024/1275 of 24 April 2024 on the energy performance of buildings (hereinafter: the Energy Performance of Buildings Directive or EPBD), Member States must ensure that new buildings owned by public bodies are zero-emission from 2028, while all other new buildings must meet this standard from 2030. In other words, such buildings will have to meet stringent energy performance requirements and produce no on-site carbon emissions from fossil fuel combustion³⁶. In practice, implementation of the EPBD may reduce the consumption of gas for heating by individual and institutional consumers, thereby contracting the retail segment of the gas market.

» European Emissions Trading Scheme 2 (ETS2)

As a result of the 2023 revision of the EU ETS Directive, a new emissions trading system, known as ETS2, was established. It will cover carbon dioxide emissions from the combustion of fossil fuels, including natural gas, primarily in buildings and road transport. Under the system, which is expected to apply from 2027, fuel suppliers will be required to monitor and report emissions and to surrender sufficient emissions allowances to cover them. Consequently, the cost of gas for consumers, including households, can be expected to increase. This will reduce the market attractiveness of gas and contribute to lower consumption³⁷.

36 DIRECTIVE (EU) 2024/1275 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 April 2024 on the energy performance of buildings

37 European Commission, *ETS2. Buildings, transport and additional sectors*, [access: 24/08/2026: https://climate.ec.europa.eu/eu-action/carbon-markets/ets2-buildings-road-transport-and-additional-sectors_en]

» Methane emissions reduction

In accordance with the EU Methane Strategy adopted in 2020, the European Union is seeking to establish an effective system for monitoring and subsequently reducing methane emissions. Regulation (EU) 2024/1787 of the European Parliament and of the Council of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942 (hereinafter: the Methane Regulation) entered into force on 4 August 2024. The Regulation introduced obligations concerning, inter alia, measurement accuracy and the quantification, monitoring, reporting and verification of methane emissions in the energy sector. It also introduced measures aimed at reducing such emissions, including requirements for the gas industry to conduct leak detection and repair surveys, as well as restrictions on the venting and flaring of gas and methane. The Methane Regulation covers various parts of the gas industry value chain, including natural gas exploration and production, storage and processing, transmission and distribution, and operations conducted at LNG facilities. Gas companies operating in these areas will be subject to detailed reporting obligations, including the reporting and quantification of methane emissions at production-site level and the submission of annual reports containing the results of all completed surveys of gas installations, together with information on repair schedules and the monitoring of those installations. Compliance with all obligations introduced by the Methane Regulation will increase costs and add further complexity to business operations, thereby reducing their commercial attractiveness³⁸.

» European Union without Russian gas

In January 2026, the Council of the European Union approved the final text of the regulation on phasing out imports of Russian energy commodities. The Regulation introduces measures to phase out imports of Russian natural gas into EU Member States, with a complete ban scheduled to apply from November 2027.

Under the Regulation, Member States were required to submit national gas supply diversification plans by 1 March 2026 and, within one month of its entry into force, inform the European Commission of existing contracts or national import bans.

Schedule for phasing out Russian gas:

- a. Short-term contracts concluded before 17 June 2025:
 - ban on imports of Russian LNG from 25 April 2026,
 - ban on imports of gas transported via pipelines from 17 June 2026
- b. Long-term LNG contracts concluded before 17 June 2025:
 - import ban from 1 January 2027, in accordance with the 19th sanctions package.
- c. Long-term pipeline gas contracts:
 - import permitted until 30 September 2027 at the latest,
 - in the event of difficulties in filling warehouses – the ban may be postponed until 1 November 2027³⁹.

38 REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions from the energy sector and amending Regulation (EU) 2019/942

39 REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on phasing out natural gas imports from Russia and preparing for the phasing out of imports of Russian crude oil, improving the monitoring of potential energy dependencies and amending Regulation (EU) 2017/1938, [access: 24/08/2026: <https://www.consilium.europa.eu/pl/press/press-releases/2026/01/26/russian-gas-imports-council-gives-final-greenlight-to-a-stepwise-ban/>]

2.2. Gas as a transition fuel in the model of Polish energy transition

Adopted by the Council of Ministers in February 2021, *Poland's Energy Policy until 2040*, drawing on the European Union's climate policy as reflected, among other initiatives, in the European Green Deal, established the framework for Poland's energy transition towards a 'zero-emission energy system'. This objective was to be achieved through the development of nuclear power and offshore wind energy. The share of renewable energy sources in gross final energy consumption was expected to reach 23% by 2030⁴⁰. Natural gas was regarded as a fuel that should play a greater role in power generation, supporting the achievement of climate objectives and providing additional reserve capacity to balance renewable energy sources⁴¹. It was also assumed that the 'bridging' role of natural gas in the energy transition would require improvements in market competitiveness and security of supply.

In June 2026, the Ministry of Energy published the draft "National Energy and Climate Plan 2030 with an Outlook to 2040" (hereinafter referred to as NECP), which prioritizes greenhouse gas reduction as the government's top policy priority. The document is based on two scenarios:

- Accelerated transformation scenario, the so-called WAM Scenario (with additional measures) – assumes accelerating the current pace of transformation in order to implement some of the commitments from the EU "Fit for 55" package.
- Sustainable transformation scenario, the so-called WEM Scenario (with existing measures) – provides a transformation path based on the currently existing legal and investment framework⁴².

40 *Poland's Energy Policy until 2040*, Warsaw 2021, pp. 5–6.

41 Ibid, p. 27.

42 Ministry of Energy, *National Energy and Climate Plan to 2030 with an outlook to 2040, draft NECP*, June 2026, p. 6, [access: 24/08/2026: <https://www.gov.pl/web/energia/krajowy-plan-w-dziedzinie-energii-i-klimatu-do-2030-rz-perspektywa-do-2040-r---przyjety-przez-rade-ministrow>]

The main means of achieving these greenhouse gas reduction levels is to develop renewable energy sources on a larger scale than in PEP 2040. The new goals for the energy transition are presented in Table 1.

Tab. 1. Goals included in the scope of emission reduction and development of renewable energy sources in the draft NECP of June 2026.

Reducing greenhouse gas (GHG) emissions	WEM scenario	WAM scenario
» in the entire economy (vs. 1990)	-43.3%	-52.7%
» in non-ETS sectors (vs. 2005)	-12.0%	-19.4%
» in ETS sectors (vs. 2005)	-46.1%	-50.9%
» LULUCF uptake	-28.8 million tons	-46.5 million tons
Renewable energy sources (RES)	WEM	WAM
» in gross final energy consumption	30.0%	32.0%
» in the power sector	51.6%	53.2%
» in heating sector	31.6%	36.5%
» in transport	16.5%	16.5%

Source: Own study based on the draft NECP of June 2026.

The implementation of one or the other of the above scenarios assumes that in the case of the power sector there will be a “gradual withdrawal of coal-fired capacity and a temporary increase in gas-fired capacity to ensure system availability and the reliability of energy supplies”⁴³. In the district heating and building heating sectors, coal is to be phased out—particularly in households—and replaced with low-emission sources in district heating systems and zero-emission sources in households⁴⁴.

In summary, the growing share of renewable energy sources in electricity generation can be expected to create progressively greater balancing and stabilisation needs within the National Power System during the transition period. Consequently, this will increase demand for natural gas in Poland in the short term, with demand expected to peak in 2030⁴⁵.

The growing needs in this area were also highlighted in the strategy of Polskie Sieci Elektroenergetyczne (PSE), the Polish transmission system operator. The increasing share of electricity generated from renewable energy sources will make system operation progressively more complex, as renewable generation is variable, difficult to predict and dependent on weather conditions. The system experiences prolonged periods of both low renewable genera-

43 Ibid., p. 9.

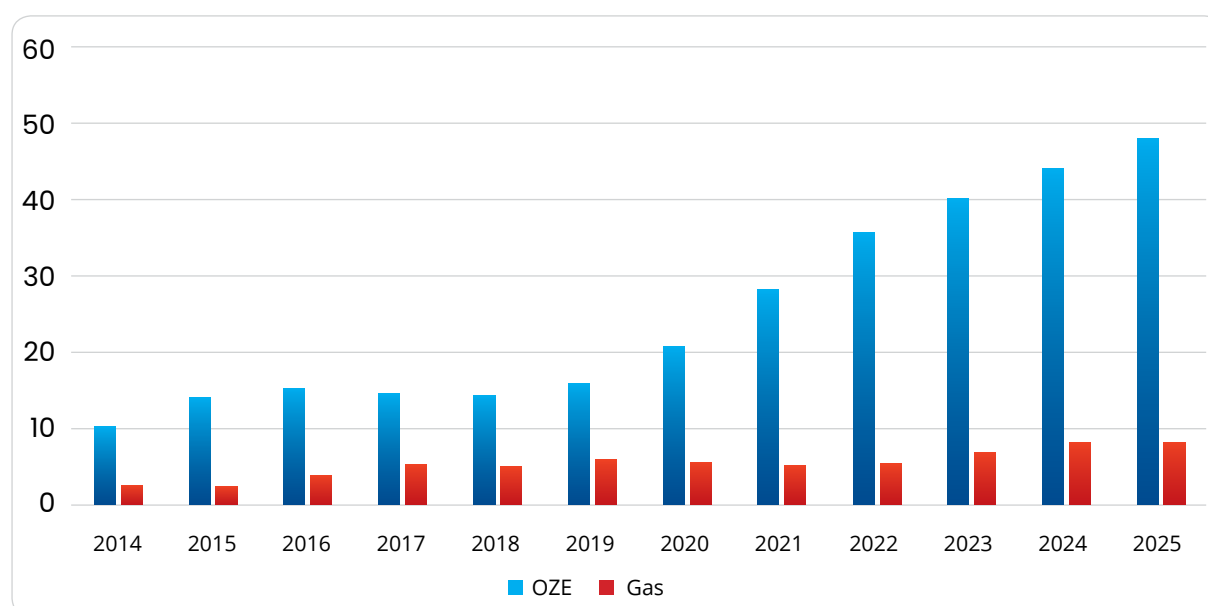
44 Ibid.

45 Ibid., p. 126.

tion and surplus renewable electricity production⁴⁶. In PSE's assessment, an energy transition based on renewable energy sources will require the development of the electricity grid to be properly coordinated with the expansion of the gas transmission network⁴⁷. New gas-fired power plants are expected to ensure stabilization of the power system⁴⁸.

An analysis of data published by Polskie Sieci Elektroenergetyczne S.A. indicates a strong upward trend in renewable energy between 2014 and 2025, with its share of total installed capacity increasing from 10.7% to 44.08% over this period⁴⁹.

Fig. 9. Percentage share of renewable energy sources and gas-fired power plants in the installed capacity of the National Power System between 2014 and 2025



Source: Own study based on PSE annual reports on the operation of the National Power System in 2014-2025

As regards changes in the electricity generation mix, the share of renewable energy increased from 4% to 25.28% over the period analysed. Both indicators also increased for gas-fired generation, although at a considerably slower rate than for renewables. The share of gas-fired capacity in the total installed capacity of the National Power System rose from 2.62% to 8.28%, while its share of electricity generation increased from 2.09% to 10.04% over the same period⁵⁰.

46 PSE, *Guardian and Architect. PSE SA Strategy to 2040*, p. 5.

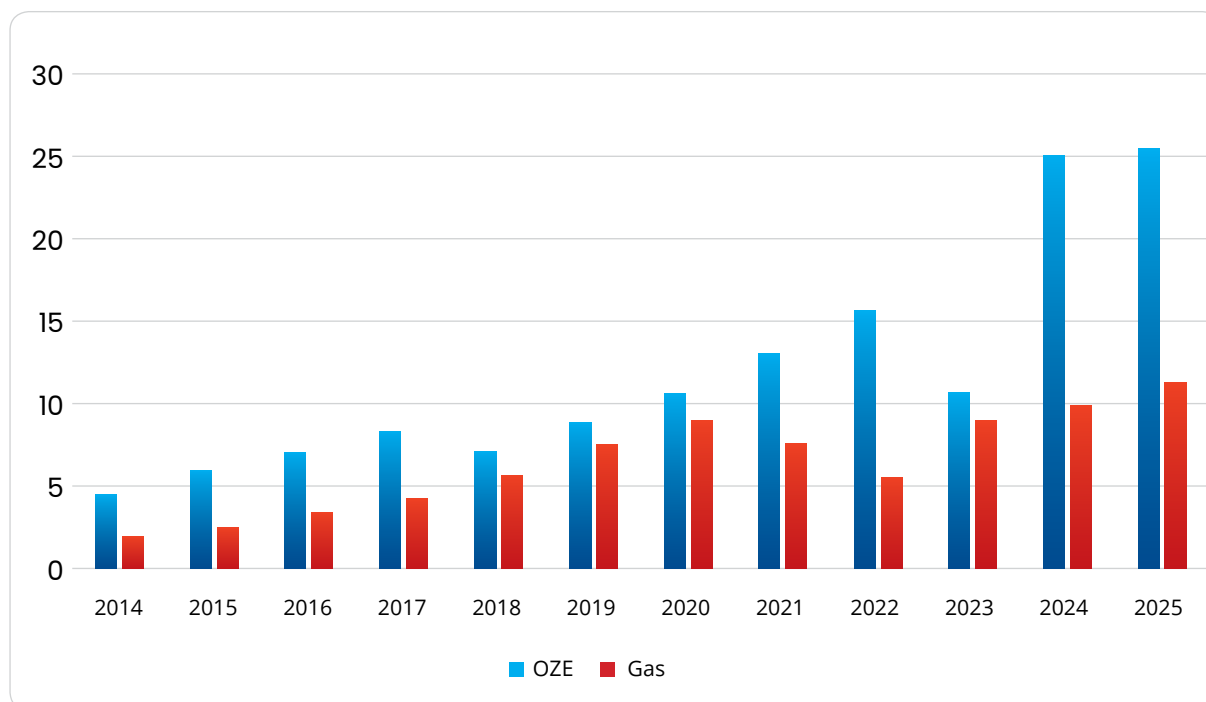
47 Ibid., p. 38.

48 Enerad.pl, *President of PSE: the stability of the power system until 2030 depends on investments in gas and renewable energy sources*. 25 March 2025, [access: 24 August 2026: <https://enerad.pl/prezes-pse-stabilnosc-systemu-elektroenergetycznego-do-2030-roku-zalezy-od-inwestycji-w-gaz-i-oze/>]

49 PSE, *Annual reports on the operation of the National Power System*, 2014 – 2024, [access: 24/08/2026: <https://www.pse.pl/mapa-raportow/>].

50 Ibid.

Fig. 10. Percentage share of renewable energy sources and gas power plants in domestic electricity production in 2014–2025.



Source: Own study based on PSE annual reports on the operation of the National Power System in 2014–2025

Over the next five to ten years, a considerably more substantial increase in gas-fired electricity generation and installed capacity can be expected. This expansion of gas-fired power generation is reflected in the investment decisions being taken by Poland's leading electricity producers. All major domestic energy groups are currently developing new gas-fired generating capacity. PGE Group, for example, aims to develop gas-fired units with a combined capacity of nearly 10 GW⁵¹. ENEA plans to replace its coal-fired power plants with gas-fired units with a target capacity of 1.4 GW, which will operate alongside the renewable energy sources being steadily developed by the company⁵². ZE PAK SA's strategy for 2024–2028 assumes a complete phase-out of lignite in favour of a new generation mix consisting of 68% gas-based power and 33% renewable energy⁵³.

For ORLEN, natural gas is "(...) an indispensable element of the Polish energy transition, combining system stability, security of supply and emission reduction⁵⁴. In its current strategy, the company assumes the expansion of installed capacity in gas-fired power plants and com-

51 PGE, PGE signed contracts for the construction of two new gas power plants in Rybnik and Gryfino, March 4, 2026, [accessed April 3, 2026: <https://www.gkpgge.pl/grupa-pge/dla-mediow/komunikaty-prasowe/korporacyjne/pge-podpisala-umowy-na-budowe-dwoch-nowych-elektrowni-gazowych-w-rybniku-i-gryfinie>].

52 ENEA, Development strategy of the ENEA Group until 2035, p. 6, [access: 04/04/2026: <https://ir.enea.pl/informacje-dla-inwestorow/zalacznik/2753547>].

53 ZE PAK, ESG STRATEGY for 2024–2028, pp. 6–7, [access: 04/04/2026: <https://ri.zepak.com.pl/pl/o-spolce/strategia-esg.html>].

54 ORLEN, Gas-fired power generation. The role of gas in building the security of economic development, [access: 06.04.2026: <https://www.orlen.pl/pl/zrownowazony-rozwoj/projekty-transformacyjne/energetyka-gazowa>].

bined heat and power plants (CCGT technology) from 1.8 to 4.3 GW⁵⁵. As part of its strategy, ORLEN envisages the complete phase-out of its coal-fired generating units by 2025 and their replacement with renewable energy sources balanced by gas-fired generation⁵⁶.

Tab. 2. Goals of national energy groups in terms of target installed gas capacity

Subject	Target gas installed capacity in GW
PGE	10
ORLEN	4.3
ENEA	1.4
ZE PAK	0.2
TAURON	0.56
Together	16.46

Source: Own study based on strategies published by national energy groups

According to information provided by Poland's energy groups, new gas-fired generating units—primarily combined-cycle gas turbine (CCGT) plants—with an estimated total capacity exceeding 7 GW are due to be commissioned between 2026 and 2030. Publicly announced capital expenditure over this period is expected to exceed PLN 32 billion. The expansion of gas-fired generating capacity also entails further investment in gas infrastructure. A second LNG terminal, a floating storage and regasification unit (FSRU) located in the Gulf of Gdańsk and with an annual regasification capacity of 6.1 billion cubic metres, is scheduled to become operational in early 2028. Integrating the new LNG facility with the national transmission system required the construction of the new Gdańsk–Kolnik–Gardeja–Gustorzyn gas pipeline. GAZ-SYSTEM estimated the total cost of the project, comprising the FSRU terminal and its associated infrastructure, at PLN 4.5 billion⁵⁷.

In 2026, following the successful outcome of the Open Season procedure, under which four entities contracted long-term access to services, a decision was taken to construct a third LNG terminal (FSRU-2), also located on the coast of the Gulf of Gdańsk. The new terminal, with a regasification capacity of 6.1 billion cubic metres, is expected to become operational in 2030⁵⁸. The unit will use the infrastructure already constructed for the first FSRU. Experts therefore estimate that the cost of this investment may be significantly lower, amounting to USD 250 million, or approximately PLN 940 million (based on the exchange rate as at July

55 ORLEN, *Tomorrow's energy starts today*, [access: 05/04/2026: <https://www.orlen.pl/pl/o-firmie/strategia>]

56 ORLEN, *Key phase of the implementation of the gas power plant in Grudziądz* [access: 24/08/2026: <https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/archiwum/2024/Lipiec-2024/kluczowa-faza-realizacji-elektrowni-gazowej-w-grudziadzu>].

57 PAP biznes, *Gaz-System estimates the cost of the floating LNG terminal and infrastructure at approximately PLN 4.5 billion*, 31/05/2025, [access: 29/07/2026: <https://biznes.pap.pl/wiadomosci/firmy/gaz-system-szacuje-koszt-plywajacego-terminala-lng-i-infrastruktury-ok-45-mld-zl>].

58 Ministry of Energy, *The third LNG terminal will be built in Poland*, 23/06/2026, [access: 31/07/2026: <https://www.gov.pl/web/energia/powstanie-trzeci-terminal-lng-w-polsce>].

2026)⁵⁹. In 2023, ORLEN began expanding the Wierchowice underground gas storage facility. Its capacity is expected to increase from 1.3 billion cubic metres to 2.1 billion cubic metres, an increase of 0.8 billion cubic metres⁶⁰. The investment, which is expected to cost PLN 575 million, will increase the country's gas storage capacity by one-quarter⁶¹.

The total costs of building and expanding the key strategic gas infrastructure mentioned above by 2030 may exceed PLN 6 billion.

Tab. 3. List of investments in gas generation capacities in 2026–2030.

Location of power units	Investor	Power in MW	Planned launch date	Estimated investment outlays in PLN billion	Estimated annual gas consumption in billion m ³
Grudziądz I	ORLEN	560	2026	2	0.50
Ostrołęka	ORLEN	745	2026	2.85	0.70
Rybnik	PGE	882	2027	4.6	0.84
Adamów	ZE PAK	600	2027	2.3	0.57
Gdańsk	ORLEN	450	2029	2.5	0.40
Grudziądz II	ORLEN	650	2029	3.1	0.60
Kozienice	Enea	1,336	2029	7.0	1.25
Gryfino II	PGE	600	2030	3.5	0.57
Rybnik	PGE	600	2030	2.5	0.57
Jaworzno	TAURON	600	2030	1.8	0.57
Together:		7.023		32.15	6.57 mld m³

Source: Own study based on media publications of national energy groups.

As part of Poland's energy transition, natural gas is also expected to play a greater role than before in district heating. Under the current draft of the National Energy and Climate Plan (NECP), the district heating sector is to gradually shift 'away from high-emission fuels towards low- and zero-emission technologies'⁶². Ultimately, natural gas is expected to play a supplementary role in the district heating sector. Under both the WEM and WAM scenarios,

59 D. Malinowski, *This will be the cheapest and fastest gas port. A new investment on the Coast, „WNP.”* [access: 31/07/2026: <https://www.wnp.pl/energia/to-bedzie-najtanszy-i-najszybszy-gazoport-nowa-inwestycja-na-wybrzezu,1074978.html>].

60 ORLEN, *ORLEN focuses on safety – the largest investment in domestic gas storage facilities begins*, March 30, 2023, [access: 24/08/2026: [https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/archiwum/2023/Sierpień 2023/Orlen-stawia-na-bezpieczenstwo--rusza-najwieksza-inwestycja--w-krajowe-magazyny-gazu](https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/archiwum/2023/Sierpień%2023/Orlen-stawia-na-bezpieczenstwo--rusza-najwieksza-inwestycja--w-krajowe-magazyny-gazu)]

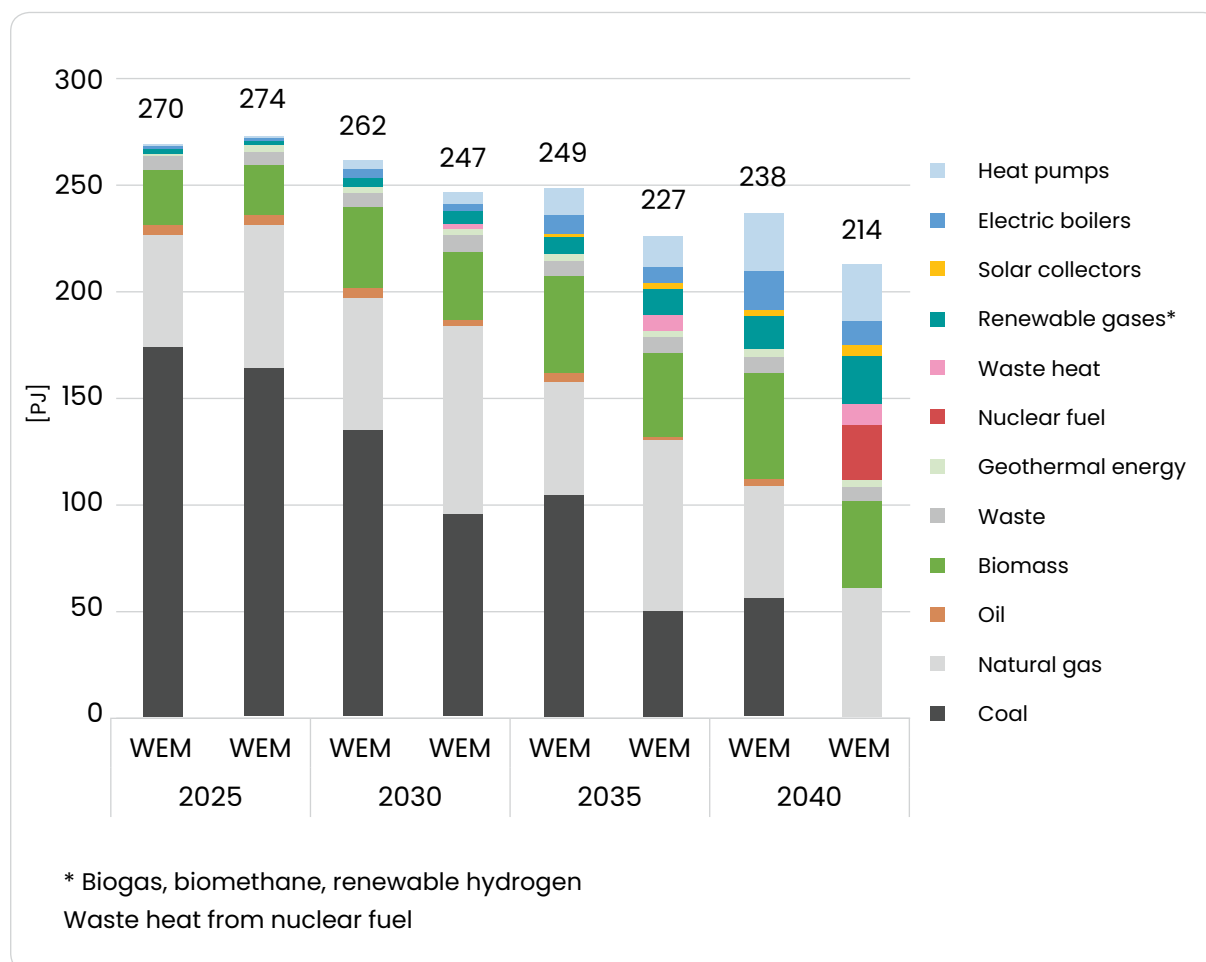
61 WysokieNapiecie.pl, *Orlen starts expanding the gas storage facility in Wierchowice to 2.1 billion m³*, 30/08/2023, [access 31/07/2026: <https://wysokienapiecie.pl/krotkie-spiecie/orlen-rusza-z-rozbudow-magazynu-gazu-w-wierchowicach-do-2-1-mld-m3/>].

62 Ministry of Energy, *National Plan...*, op. cit., p. 43.

annual district heat production from natural gas is projected to exceed 50 PJ⁶³.

In the case of individual heating, the NECP assumes support for non-emission technologies such as heat pumps and the end of public funding for the installation of gas installations in accordance with the EPBD directive⁶⁴.

Fig. 11. Expected changes in the structure of district heating production by fuel (in PJ).



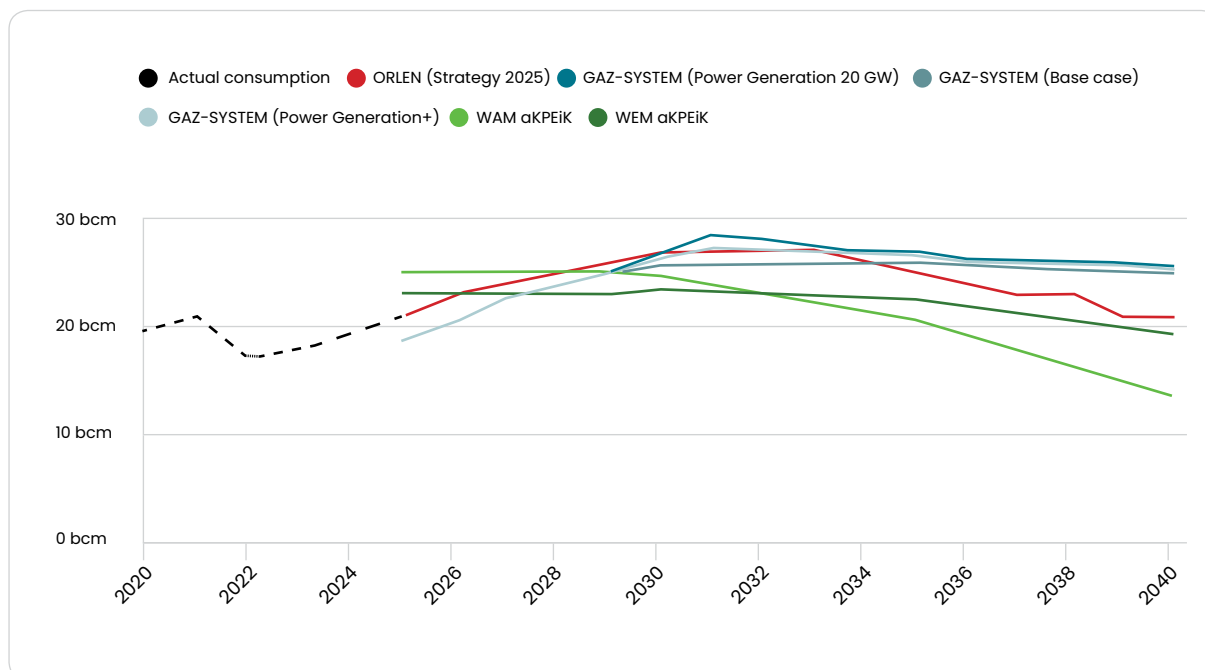
Source: Draft NECP of December 2025, p. 47.

GAZ-SYSTEM's forecasts project that demand for gas transmission services will increase to 26–29 billion cubic metres per year by 2031. This trend is expected to reflect growing demand from the power generation and district heating sectors in the coming years, as also confirmed by other industry and strategic forecasts.

63 Ibid., p. 47.

64 Ibid., p. 44.

Fig. 12. Forecasts for the use of natural gas in Poland

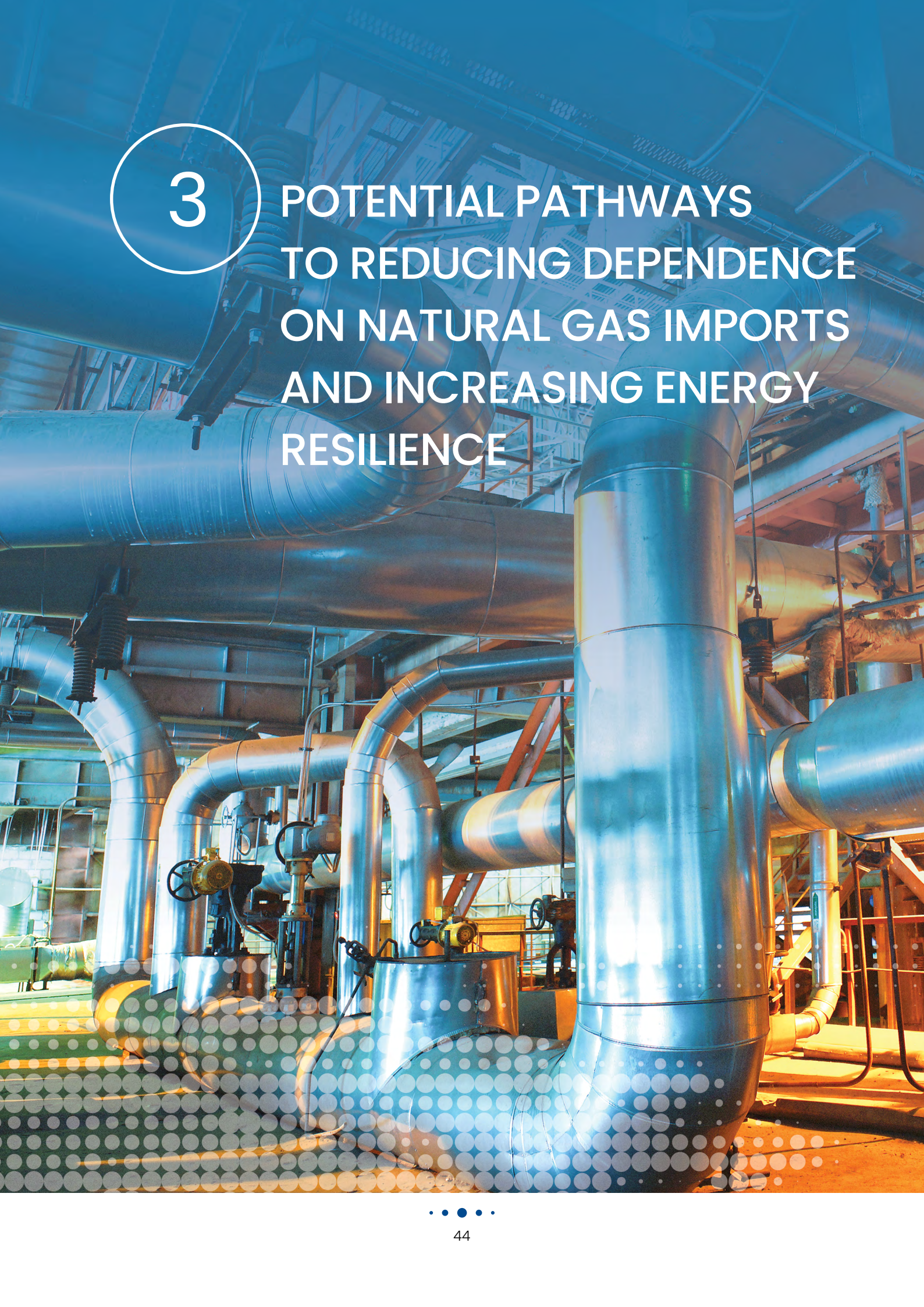


Source: Prepared by Forum Energii based on data from: GAZ-SYSTEM, National Development Plan and NECP (December 2025), ORLEN, Orlen Strategy until 2025.

Conclusions:

- The EU is consistently seeking to reduce the role of natural gas in the economy and in household consumption.
- Poland regards natural gas as a 'transition fuel' for the power sector and as one of the alternatives to coal in district heating.
- In Poland's energy transition model, the growing need to balance the National Power System (KSE), driven by increasing installed renewable capacity, will be met by additional gas-fired generating units. At the same time, energy storage technologies will play an increasingly important role in the market by enhancing system flexibility and enabling temporary surpluses of renewable electricity to be utilised.
- A political consensus has emerged on the role of natural gas as a transition fuel and has persisted despite the change of government and ongoing political disputes.
- Over the next few years, Poland's energy transition model will generate growing demand for natural gas.



A photograph of an industrial facility, likely a power plant or refinery, featuring large, complex piping systems and machinery. The image is overlaid with a blue gradient and a pattern of white dots at the bottom.

3

POTENTIAL PATHWAYS TO REDUCING DEPENDENCE ON NATURAL GAS IMPORTS AND INCREASING ENERGY RESILIENCE

Chapter 3.

Potential pathways to reducing dependence on natural gas imports and increasing energy resilience

Dr. Eng. Agata Romanowska, Kamil Moskwik, Dr. Marcin Sienkiewicz

With import dependency remaining above 80%, gas imports will continue to be Poland's principal source of exposure to global geopolitical shocks over the next decade. In these circumstances, ensuring energy security requires moving beyond the diversification of supply routes: a systemic reduction in demand for natural gas is becoming essential. Alternative solutions must therefore be pursued to reduce both import dependency and demand for fossil gas. At the same time, the EU climate policy framework requires Poland to accelerate its transition away from natural gas. Although gas was originally intended to serve as a transition fuel, documents such as REPowerEU (2022)⁶⁵, the Hydrogen and Decarbonised Gas Market Package (2024)⁶⁶, the revised Renewable Energy Directive, known as RED III (2023)⁶⁷, the aforementioned Methane Regulation and the latest Electrification Action Plan (EAP) of 2026⁶⁸ are redefining this model. Dependence on imported natural gas generates political risks, exposes the economy to severe price fluctuations and makes it more difficult to achieve emissions-reduction targets under the EU Emissions Trading System (EU ETS). Although the system is undergoing revision, the overall direction of regulation remains largely unchanged⁶⁹.

The projected peak in demand for fossil fuels in Poland differs from that in most European countries, where the energy mix is already significantly less carbon-intensive and dependence on imports is also lower. Although the phase-out of coal is progressing rapidly—not only because of rising emissions costs, but primarily due to the profitability of coal mines and the cost of coal-fired power generation—coal-fired units continue to provide stability to the National Power System. Coal-fired generating units are now reaching the end of their operational lives and are gradually being replaced by gas-fired capacity. This, in turn, shifts the projected peak in demand for natural gas to the early 2030s. However, the investments currently being developed are intended to remain operational for many years, given the 30-year lifetime of the infrastructure, 20-year supply contracts and 17-year capacity market contracts. This raises the question of how Poland can build resilience not only to potential risk factors, but also avoid falling into a 'gas trap' of its own making.

65 European Commission, *REPowerEU Affordable, secure and sustainable energy for Europe*, 2022.

66 European Commission, *Hydrogen and decarbonised gas market*, 2024 [access: 24/08/2026: https://energy.ec.europa.eu/topics/markets-and-consumers/hydrogen-and-decarbonised-gas-market_en].

67 DIRECTIVE (EU) 2023/2413 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources and repealing Council Directive (EU) 2015/652.

68 European Commission, *Electrification Action Plan*, 2026.

69 WysokieNapiecie.pl, *ETS reform: Brussels softens the course, but does not change the target* [access: 24/08/2026: <https://wysokienapiecie.pl/120451-reforma-ets-bruksela-lagodzi-kurs-ale-nie-zmienia-celu/>].

From the perspective of Poland's energy transition—including the power sector, district heating and energy-intensive industry—the principal solutions are electrification combined with the development of energy storage, as well as domestic biomethane production based on sustainable feedstocks. According to analyses by the International Energy Agency (IEA)^{70–71}, the principal drivers of declining gas demand include the electrification of heating, the growing share of renewable energy sources accompanied by falling renewable energy costs, and improvements in energy efficiency, including through the modernisation of industrial processes. A prolonged peak in gas consumption will remain characteristic of emerging markets, where low-emission technologies are nevertheless also being developed and gas is replacing coal's traditional role in electricity and heat generation. In Poland's case, however, the delayed decarbonisation pathway presents the energy system with the challenge of balancing dispatchable sources that provide system stability against growing demand for low-emission solutions and a more flexible operating profile. As a result of disruptions in the global gas market in the first half of 2025, wholesale electricity prices in Europe and the United States increased by as much as 40% year on year⁷². At the same time, negative wholesale electricity prices are being recorded with increasing frequency across many markets. This highlights the need to balance supply and demand through appropriate regulatory and market-based solutions, particularly energy storage and technologies enabling surplus renewable electricity to be utilised.

3.1. Decarbonized gases

Continuing the decarbonisation of Poland's power sector requires not only reducing emissions, but also ensuring the stable operation of the power system amid the growing share of weather – dependent generation, record peaks in electricity demand and the risk of *Dunkelflaute* – prolonged periods of low wind and solar generation – during autumn and winter. Under Polish conditions, weather-dependent renewable energy sources cannot provide adequate volumes of electricity aligned with the changing pattern of demand. The energy transition must therefore include measures to maintain the stability and security of electricity supply. While natural gas is consolidating its role in Europe as a transitional balancing source, renewable gases such as biomethane and hydrogen could also play an important part in this process. According to Poland's draft National Energy and Climate Plan (NECP), they are intended to provide 'alternatives to natural gas'⁷³.

Each technology used to supply electricity or heat has its own characteristics and range of applications, as well as specific advantages and disadvantages. The choice of a particular alternative to natural gas depends largely on the fuel's end use, but also on prevailing technological and political factors. In the case of low-emission technologies, there is also a trade-off between financial viability, the use of public funding to support their deployment and the effective functioning of the market.

70 International Energy Agency, *World Energy Outlook 2025* [access: 24/08/2026: <https://iea.blob.core.windows.net/assets/9753df19-0a71-422a-b725-012c555763b3/WorldEnergyOutlook2025.pdf>]

71 International Energy Agency, *Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach, 2023 Update* [access: 4.08.2026: https://iea.blob.core.windows.net/assets/8ad619b9-17aa-473d-8a2f-4b90846f5c19/NetZeroRoadmap_AGlobalPathwaytoKeepthe1.5CGoalinReach-2023Update.pdf]

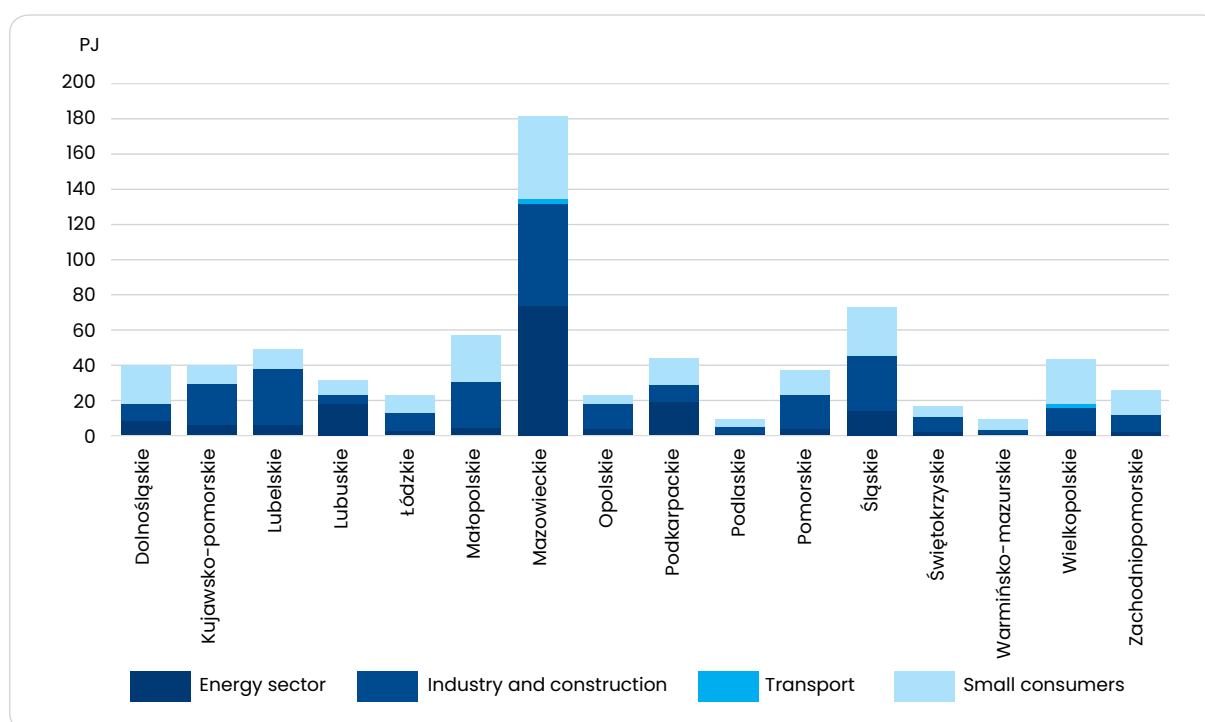
72 International Energy Agency, *Electricity Mid-Year Update 2025* [access: 24/08/2026: <https://www.iea.org/reports/electricity-mid-year-update-2025>]

73 National Energy and Climate Plan, June 2026, p. 133

The technological characteristics of many sectors still require fuel combustion and the maintenance of specific process parameters, particularly high temperatures. At present, it is neither technically feasible nor economically viable to replace natural gas combustion with other technologies in every end use; such applications are regarded as hard to abate. Meanwhile, the growing share of natural gas in electricity generation currently affects almost every sector of the Polish economy.

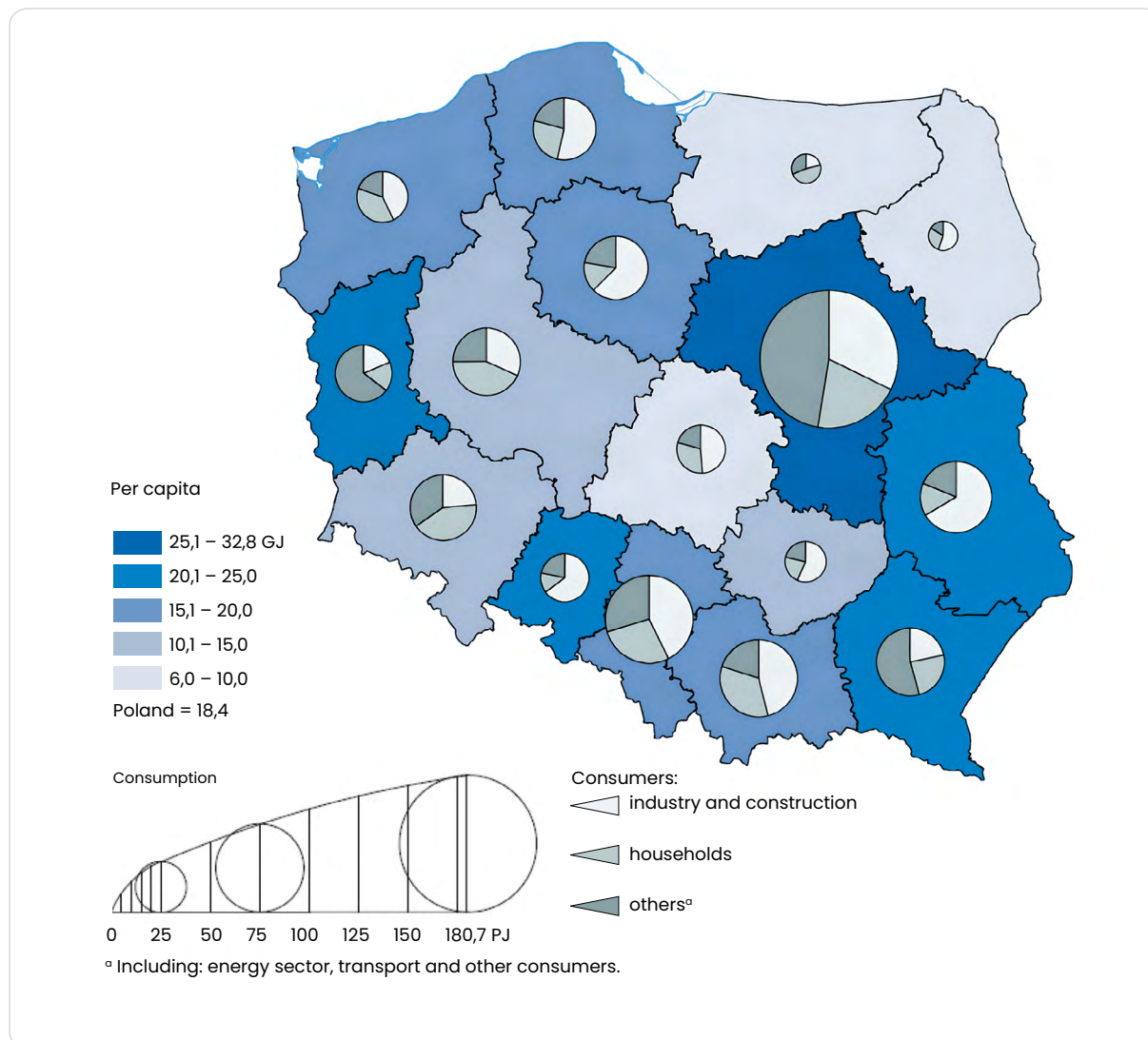
According to data from the Statistics Poland (GUS), in 2024, gas consumption increased by 8.3% compared to the previous year⁷⁴. The largest consumers are the industry and construction sectors, accounting for 40.5% of total consumption, in the energy sector it is 24.2%, in transport 0.9%, and in the small consumer sector (including households) 34.4%:

Fig 13. Natural Gas Consumption in Poland in 2024, by Economic Sector and Voivodeship.



Source: Statistics Poland

⁷⁴ Central Statistical Office, *Consumption of fuels and energy carriers in 2024*, [access: 24/08/2026: <https://stat.gov.pl/obszary-tematyczne/srodowisko-energia/energia/zuzycie-paliw-i-nosnikow-energii-w-2024-r-6,19.html>]

Fig. 14. Natural gas consumption in Poland in 2024, broken down by voivodeship and economic sector.**Source:** Statistics Poland

In view of the ongoing modernisation and expansion of Poland's gas infrastructure, questions arise as to whether it is justified to safeguard its continued operation over the coming years, as well as whether gas supply shortages could occur as demand within the Polish system increases, together with the associated price exposure during periods of peak demand. Against this background, a debate is under way on developing natural gas substitutes that could be used within the existing infrastructure. The primary options under consideration are renewable or decarbonised gases: gaseous fuels produced from renewable feedstocks or through zero-emission processes that could theoretically replace natural gas. At present, these mainly include biomethane (upgraded biogas) and green hydrogen produced by electrolysis using electricity from renewable sources.

Analyses of the suitability and potential use of renewable gases take the following criteria into account:

- economic viability, assessed by reference to the price of natural gas;
- the emissions intensity of production;
- dispatchability, meaning the independence of production from weather conditions and the ability to commence operation at short notice;
- storage potential;
- compatibility with existing infrastructure, thereby limiting investment costs; and
- the degree of dependence on imports, both of the fuel itself and of the relevant technologies.

Both green hydrogen and biomethane have their limitations. Hydrogen production requires substantial surpluses of renewable electricity, as well as the adaptation of the entire infrastructure to enable its transport and storage under appropriate conditions. The relevant challenges include difficulties in storing hydrogen and the hydrogen embrittlement of steel⁷⁵).

Biomethane production, in turn, is limited primarily by the available supply of sustainable substrates, which determine the functioning of the entire biogas sector.

The principal barrier to the wider deployment of renewable gases is their production cost, which is compared on the market with the price of fossil gas. However, that price does not reflect the environmental and climate-related costs borne by society, nor the price paid for energy security and the stable operation of the energy system. Forward-looking strategies also account for the cost of risks associated with fluctuations in gas market prices and the availability of supply—an approach under which biomethane becomes significantly more competitive.

The strongest impetus for accelerating renewable gas production in the EU came from the REPowerEU Plan, published in 2022. Its central objective was to end dependence on Russian fossil fuels, inter alia by maximising hydrogen and biomethane production—targeting 20 million tonnes of domestically produced and imported hydrogen and 35 billion cubic metres of domestically produced biomethane annually by 2030⁷⁶) — and by developing electricity grids. According to ENTSOG data from March 2026, renewable gas injection into the grid is growing by approximately 12% annually⁷⁷, with the combined efforts of all EU Member States delivering 7 billion cubic metres in 2025. Nevertheless, 90% of hydrogen is still produced from fossil fuels⁷⁸. Available sources indicate renewed legislative and investment activity across Europe, but the prospect of achieving the ambitious targets is becoming increasingly remote. Meanwhile, as efforts focused on phasing out Russian supplies, European economies found themselves predominantly dependent on US LNG in 2026. Current geopolitical tensions clearly demonstrate how unstable such assumptions can be.

75 Hydrogen embrittlement of steel is a form of mechanical degradation involving a loss of ductility and cracking caused by hydrogen atoms penetrating the metal's structure.

76 European Council, *REPowerEU Plan: Energy Policy in EU Countries' Recovery and Resilience Plans, 2022–2026*.

77 ENTSOG, *Report on annual renewable gas injections into gas networks*. 2026 [access: 24/08/2026: [https://www.entsog.eu/sites/default/files/2026-02/ENTSOG Report on Annual Renewable Gas Injections into Gas Networks 2026.pdf](https://www.entsog.eu/sites/default/files/2026-02/ENTSOG%20Report%20on%20Annual%20Renewable%20Gas%20Injections%20into%20Gas%20Networks%202026.pdf)]

78 International Energy Agency, *Global Hydrogen Review, 2025*

3.1.1. Problems with the production and development of the Polish biomethane market

In the report *From Natural Gas to Biomethane*⁷⁹, we identified domestic biomethane production using local feedstocks and the utilisation of existing gas infrastructure as the most rational pathway towards decarbonising the gas sector and reducing dependence on natural gas imports. Although achieving a low-emission energy mix remains a distant and costly prospect, Poland's potential to produce biomethane from sustainable feedstocks is estimated to be very high—among the highest in the European Union. Estimates indicate a technical production potential of up to 8 billion cubic metres per year⁸⁰. Biomethane is a less expensive and more readily available solution than green hydrogen owing to the extensive existing gas infrastructure, which is already capable of transporting this renewable gas, as well as the considerable maturity of biomethane production technologies.

As a result, biomethane produced from domestic feedstocks could serve as an effective instrument for decarbonising those areas of the economy in which electrification is less economically viable or technically unfeasible. Unfortunately, biomethane production in Poland is currently limited to a single facility connected to the gas grid, placing the country at a disadvantage both in relation to its own needs and compared with other European economies. This situation is generally attributed to persistent barriers to investment—not only financial, but also legislative, administrative and social.

High capital expenditure, including the cost of constructing biomethane plants and connecting them to the grid, together with substantial operating costs, remains the principal obstacle to the development of new facilities. Given the underdeveloped biogas sector and the lack of strong government incentives, the largest feedstock producers are reluctant to combine agricultural activity with energy production. Stable access to feedstocks is essential for the efficient and economically viable operation of a facility, whereas organic waste prices are subject to significant fluctuations. In business assessments, the cost of producing biomethane continues to be compared with the market price of natural gas. As long as natural gas remains cheaper than renewable gas, demand for biomethane will be limited. However, biomethane production costs and natural gas prices may converge in the coming years. Biomethane production costs are forecast to decline as the industry expands and its technologies become more standardised, while fossil fuels will be subject to increasingly high emissions charges. As the economy continues to decarbonise, businesses are adopting progressively lower-emission solutions, often taking action ahead of national climate and energy policy.

Meanwhile, expectations regarding the use of biomethane in the Polish market are high. According to research conducted by GAZ-SYSTEM⁸¹, the estimated potential demand for bio-

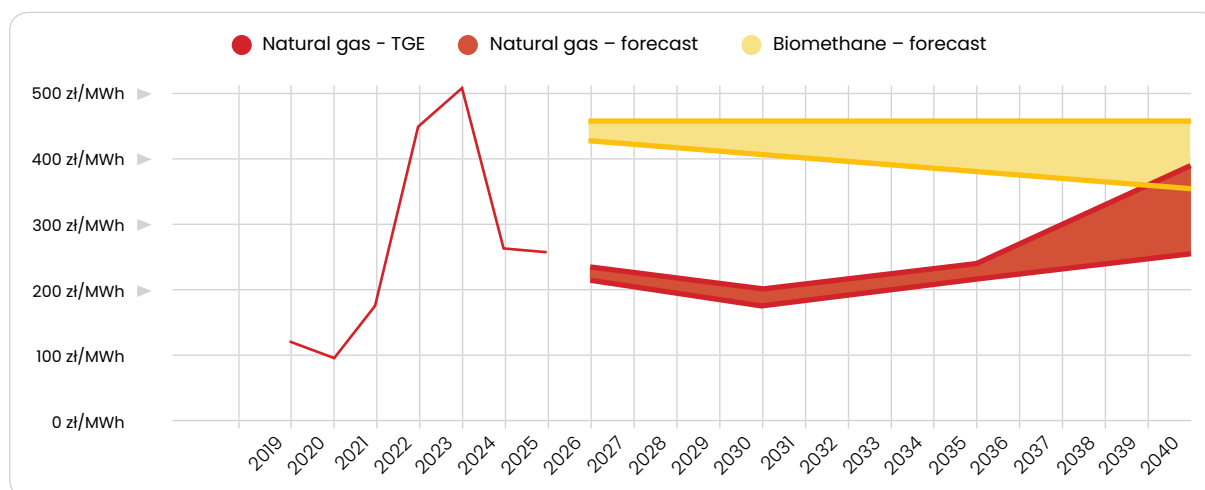
79 DISE Energy, *From natural gas to biomethane. Decarbonising the Polish gas industry*. 2024 [access: 22/08/2026: <https://dise.org.pl/Report-From-natural-gas-to-biomethane.pdf>].

80 NCBR, *The Real Potential for Biomethane Production in Poland: A Study Prepared for the Polish Energy System Simulator*, 2024

81 GAZ-SYSTEM, *Results of the 2025 Biomethane Market Survey* [access: 24/08/2026: <https://www.gaz-system.pl/pl/dla-klientow/biometan/wyniki-badania-rynku.html>].

methane among customers connected to the national gas transmission network amounts to as much as 7 billion cubic metres per year. This figure is close to the current annual production of biomethane across the entire European Union, whereas a maximum of only 0.5 billion cubic metres of biomethane can currently be produced annually from Polish biogas.

Fig 15. Range of biomethane production costs and natural gas prices on the Polish Power Exchange, including carbon emissions charges



Source: Forum Energii

Producing biomethane from various types of organic waste is not only a means of managing emissions and supporting the circular economy, but above all a way to utilise domestic resources and potentially Polish technologies, thereby reducing dependence on fossil fuel imports. According to estimates by Forum Energii, biomethane could meet approximately 17% of Poland's domestic natural gas demand by 2040 and retain PLN 30 billion within the national economy that would otherwise be spent on gas imports – or as much as PLN 70 billion at crisis-level gas prices⁸². Given that demand for natural gas is expected to stabilise and subsequently decline as other energy sources are developed, biomethane is becoming an essential component of Poland's energy system and a viable domestic energy resource for the future.

Poland's prospects for biomethane use are promising; however, bottom-up efforts are not reflected in national energy policy. Interest in and willingness to invest are noticeably high, yet the existing barriers are effectively constraining the sector's development⁸³. Nevertheless, the continued absence of biogas and biomethane from Poland's energy sector remains surprising. BioCH₄ appears to offer a balanced solution to the challenges facing not only the power sector – and the gas industry in particular – but also agriculture, which is currently undergoing modernisation, as well as district heating, effective emissions management and

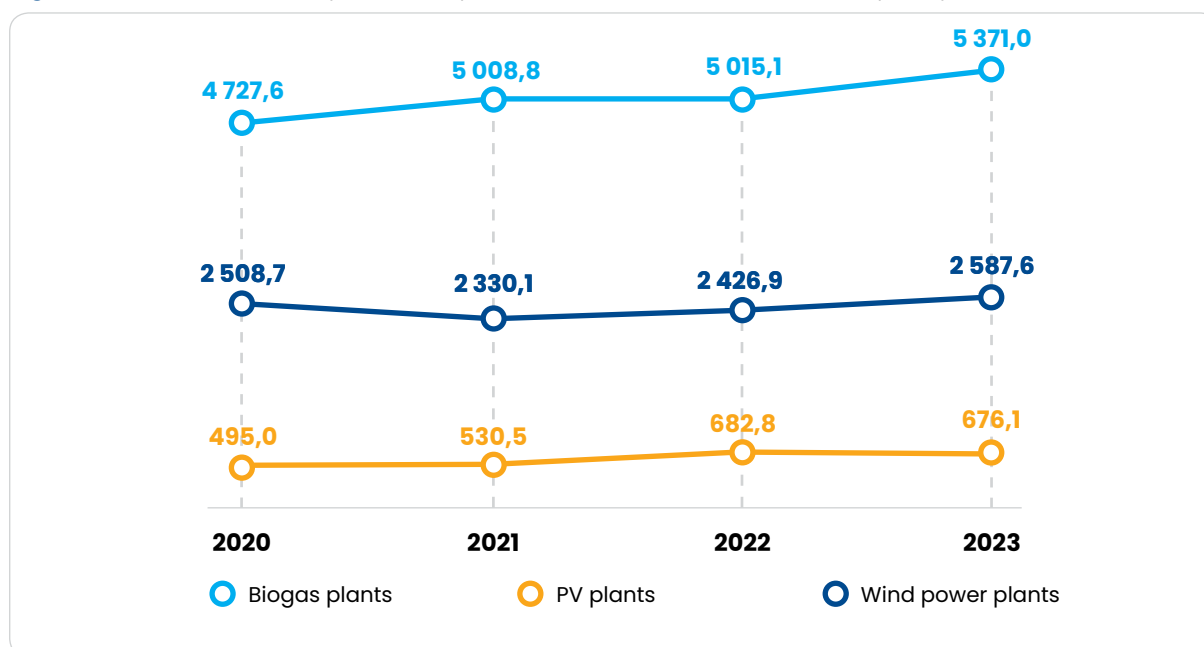
82 Forum Energii, *Molecules of Independence. Opportunities Arising from the Use of Poland's Biomethane Potential*, 2026 [access: 24/08/2026: <https://www.forum-energii.eu/molekuly-niezaleznosci-biomentan-jako-niewykorzystany-potencjal-polski>].

83 Lower Silesian Institute for Energy Studies (DISE), *Unlocking Poland's Biomethane Production Potential. Summary and Recommendations 2025*.

the circular economy. It enables all types of organic waste to be utilised, especially waste that generates substantial emissions or is otherwise harmful or burdensome to its surroundings.

In March 2026, Poland's Supreme Audit Office (NIK) published the findings of its audit entitled *Use of Biogas for Energy Generation*⁸⁴, the principal objective of which was to determine whether Poland was making effective use of its potential to generate energy from biogas. While emphasising the importance of developing renewable energy to reduce fossil fuel consumption, pollution and emissions, the audit found that installed biogas capacity in Poland operates more efficiently than weather-dependent renewable energy sources – seven times more efficiently than photovoltaic installations and almost twice as efficiently as wind power installations⁸⁵.

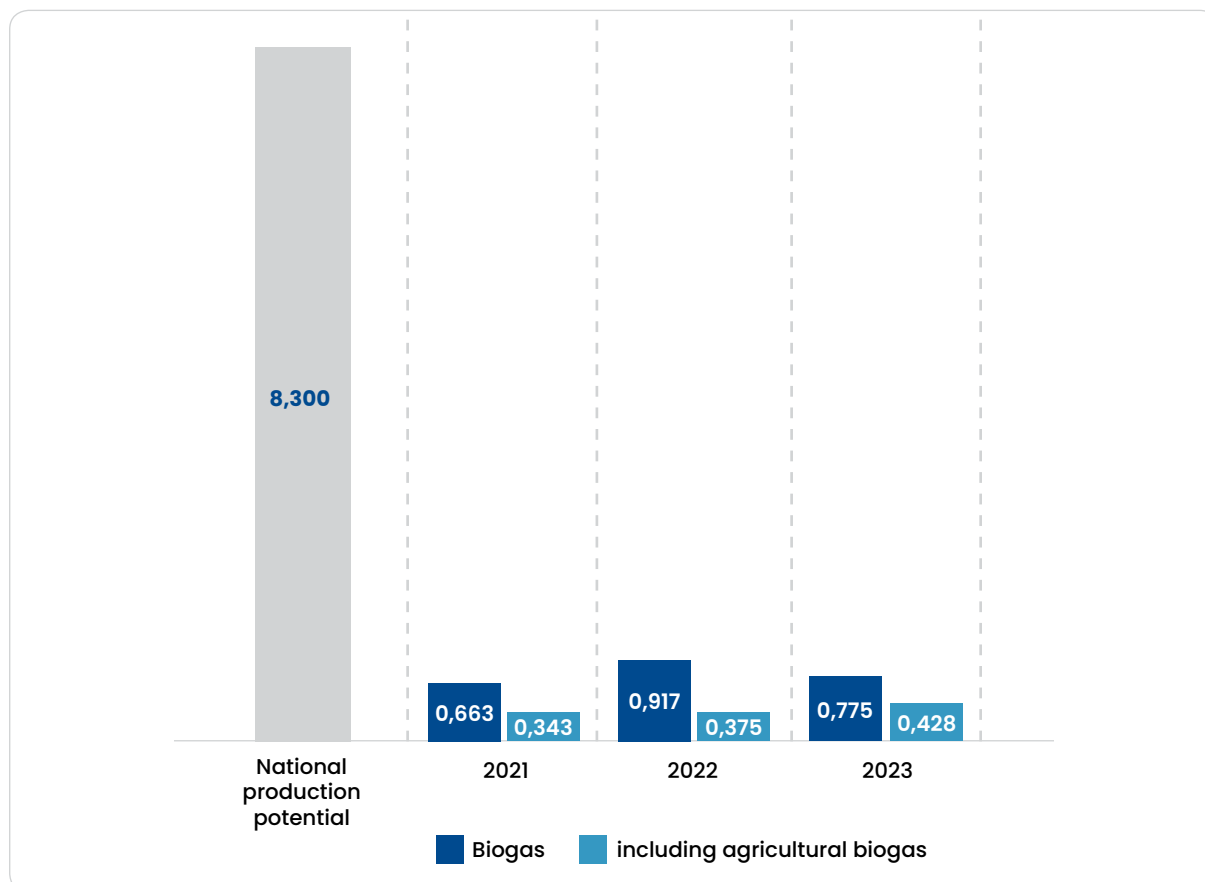
Fig. 16. Amount of electricity (in MWh) produced from 1 MW of installed capacity in 2020–2023



Source: Supreme Audit Office

84 Supreme Audit Office, LKA.430.3.2025, reference No. 67/2025/P/24/059/LK

85 Ibid.: the analysis concerned the installed capacities in 2020–2023 based on data from GUS.

Fig. 17. Biogas production, including agricultural biogas, in Poland in 2021–2023 (in billion m³)

Source: Supreme Audit Office

The audit also highlighted Poland's vast, untapped biomethane production potential compared with other EU Member States. This is reflected in the absence of a strategy and basic operational targets for the biogas and biomethane sectors, as well as the inadequate treatment of these issues in Poland's strategic energy policy documents. Consequently, the increase in the number of biogas installations was three times lower than projected even under the pessimistic scenario set out in the National Energy and Climate Plan (NECP).

The document also identifies significant delays in implementing the EU's RED II and RED III directives, which could have substantially accelerated the development of sustainable renewable gas production, unlocked its potential and ended the preferential treatment of weather-dependent renewable energy sources. Poland also failed to align its actions with the EU's REPowerEU Plan, which has formed the basis for reducing dependence on fossil gas supplies in recent years. According to the Supreme Audit Office, this approach 'marginalised the role of domestic biomass resources, including the potential for biogas and biomethane production'.

The report depicts a stark contrast between Poland's considerable feedstock potential and the almost complete absence of its practical utilisation for biomethane production. In view of the identified legislative and planning failures on the part of the state, the Supreme Audit

Office recommends developing a separate strategy for the use of biogas and biomethane in the energy sector.

A clear policy impetus for the domestic development of biogas production and upgrading would demonstrate an effort to strike a balance between harnessing the benefits of biomethane and meeting the high costs of its widespread deployment. Compared with other renewable energy sources, both capital expenditure and operating costs in the biogas sector are high, while projects require substantial operational involvement. The significant cost associated with the stability and predictability of biomethane-based energy production must be considered when defining its role and planning its prudent use across the economy. This also requires an in-depth assessment of the potential use of other low-emission energy generation technologies, together with structured cooperation with key sectors such as agriculture and organic waste recovery.

3.1.2. Prioritisation of biomethane end uses in Poland

Since biomethane—even under the most ambitious scenario for harnessing its potential—will not be capable of meeting the demand for natural gas across Poland's power sector and wider economy, its suitability for decarbonising individual sectors must be assessed. Polish industry and district heating also rely heavily on gas. Pending the decarbonisation of the national energy mix and the development of other low-emission technologies, this dependence justifies the large-scale expansion of biomethane production over the coming years. Accordingly, biomethane should be prioritised in areas where decarbonisation through electrification is either technically unfeasible or remains a distant prospect. Electricity cannot be used cost-effectively and efficiently in every application, particularly in high-temperature processes.

The use of biomethane is recommended primarily in areas such as:

- energy-intensive and process industries, particularly glassmaking, ceramics, chemicals and food processing, which require high temperatures,
- combined heat and power (CHP) plants supplying district heating systems,
- aviation and shipping, as liquefied biomethane is easy to store, enabling fleets to reduce emissions and operate under demanding conditions, and
- energy storage in gaseous form and the stabilisation of energy systems, particularly local systems based on renewable energy sources.

The desired decarbonisation of the gas sector – and, through it, many other branches of the Polish economy – through biomethane should be based from the outset on carefully designed solutions for sustainable production and end use. As a valuable resource constrained by feedstock availability, biomethane should not compete with other low-emission technologies. Instead, it should be used where alternative solutions are unsuitable, technically unfeasible or economically unviable. Its end uses must therefore be prioritised to ensure the optimal allocation of resources and avoid creating competition between the available environmentally beneficial technologies.

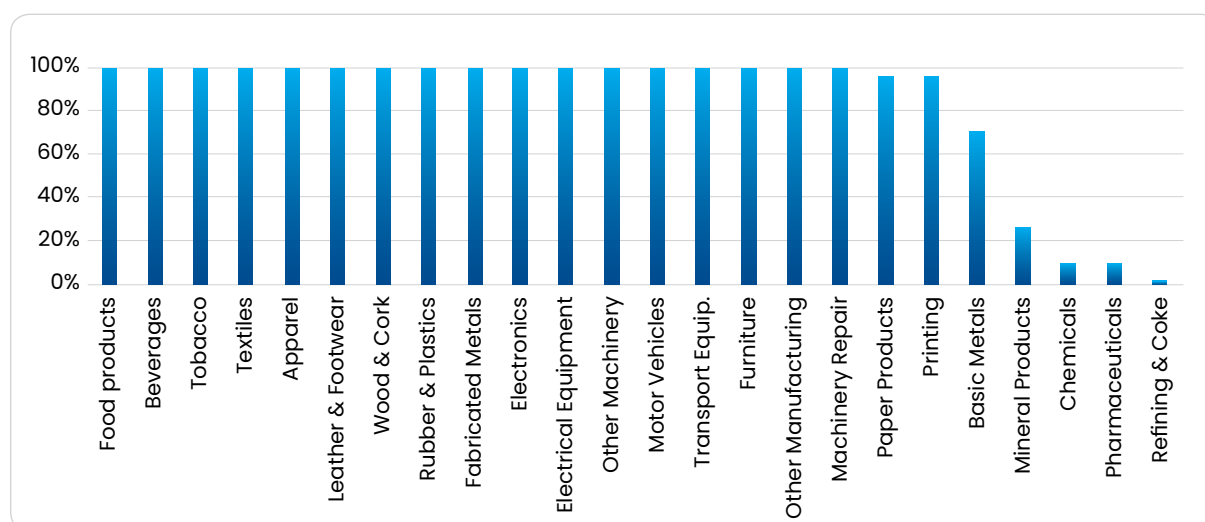
3.2. Electrification and flexibility management

Technological advances in recent years have significantly accelerated the shift towards electrification, particularly in sectors such as private transport through electric vehicles, building heating primarily through heat pumps, and certain branches of industry through digitalisation and changes to technological processes. The electricity used to power these technologies must be as low-emission and affordable as possible – an issue that is currently the subject of extensive debate. Consequently, the greatest challenge facing the market is the price differential between electricity and energy derived from fossil fuels.

The industrial sector is particularly important in the context of the energy transition, as it accounts for half of Poland's natural gas consumption, 98% of its coking coal consumption, and 18% of domestic consumption of crude oil and petroleum products⁸⁶. According to analyses by Forum Energii, heat generation can already be fully electrified in 17 of the 24 branches of manufacturing, which together account for as much as 61% of the sector's total heat consumption. The electrification of industrial heat could radically reduce fossil fuel consumption: natural gas by 62%, coal by 42%, and crude oil and petroleum products by as much as 83%. In absolute terms, this would deliver annual savings of approximately 3 billion cubic metres of natural gas and 2 million tonnes of coal, reducing emissions by around 21 million tonnes of CO₂.

Although this process would reduce primary energy consumption in manufacturing by one-third, it would also double the sector's electricity demand. For the National Power System (KSE), this would represent a major challenge: the need to supply an additional 57 TWh of electricity while meeting an average increase in capacity demand of 9.6 GW.

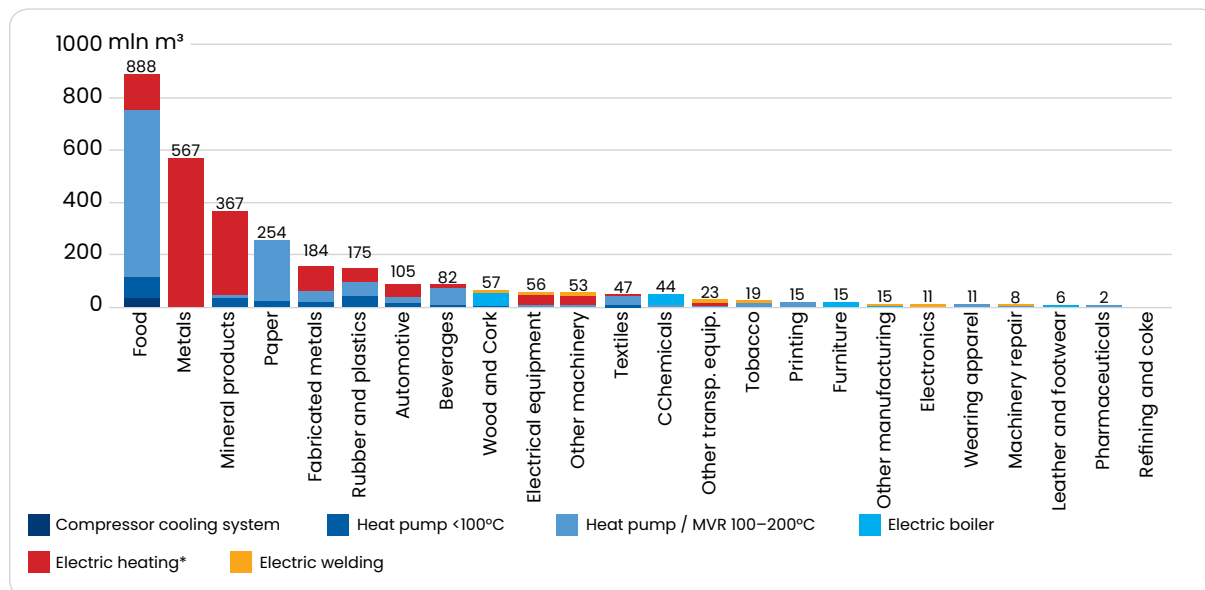
Fig. 18. Potential for heat electrification using currently available technologies, by industry.



Source: Forum Energii

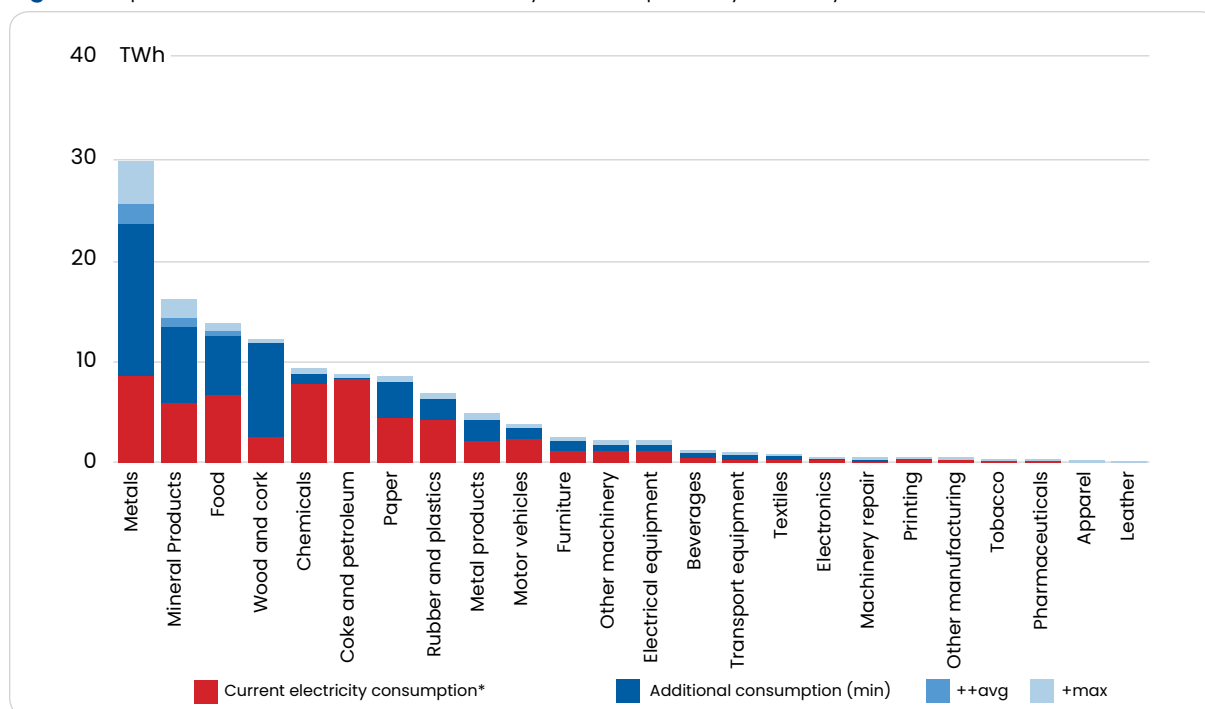
⁸⁶ Forum Energii 2026, *Modernisation or Marginalisation: How Industrial Electrification Can Provide Poland with Security, Competitiveness and Economic Growth*, 2026.

Fig. 19. Potential for reducing natural gas consumption, by industry and electrification technology.



Source: Forum Energii

Fig. 20. Impact of electrification on electricity consumption by industry.



Source: Forum Energii

The greatest potential for reducing natural gas consumption lies in the following industries:

- food processing: a potential annual reduction of 888 million cubic metres of gas, primarily through the use of heat pumps,
- metal production: a potential reduction of 567 million cubic metres, through induction and electric arc furnaces,

- non-metallic mineral products, including glass and ceramics: a potential reduction of 367 million cubic metres, through resistance heating; and
- paper industry: a potential reduction of 254 million cubic metres.

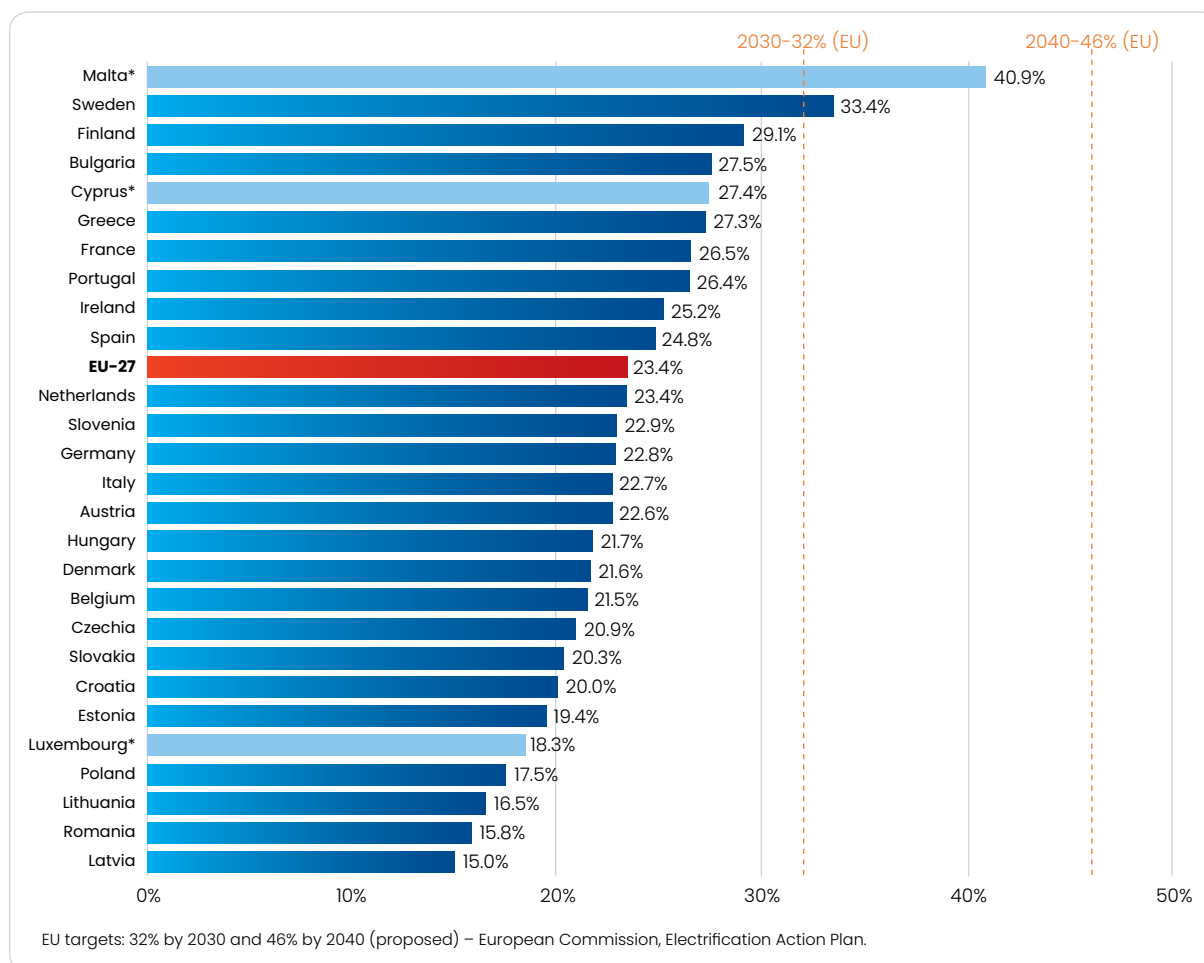
The authors of the study identify two conditions for the successful electrification of industry: a change in the price relationship between electricity and fossil gas, and access to affordable, low-emission electricity from renewable and nuclear sources, so that the process becomes economically viable for businesses. Electricity prices are currently highly volatile in markets with a large share of renewable generation. While fluctuations in fossil fuel prices – driven by import dependence and geopolitical factors – have already become commonplace, the dynamics of renewable energy markets present a new challenge. Consequently, forward-looking solutions are being sought that would allow the economy to function under conditions of ‘stable instability’ while progressively reducing dependence on external suppliers of raw materials and technologies. The European Commission also seeks to address the challenges of the energy transition through its latest Electrification Action Plan (EAP), which builds on the principles of the Clean Industrial Deal⁸⁷ and Affordable Energy Action Plan⁸⁸. The strategy’s principal objective is for electricity to account for 46% of final energy consumption in the EU by 2040, compared with approximately 23% at present. The document also envisages an almost fourfold increase in energy storage capacity, faster deployment of heat pumps and the further electrification of transport, including heavy-duty road transport and ferry services. The European Commission proposes reforming network charges, eliminating taxes that discriminate against electricity and gradually phasing out fossil fuel subsidies to make electrification technologies more competitive than fossil fuel use.

Meanwhile, under the WAM (With Additional Measures) scenario, Poland’s NECP assumes an electrification rate of 20.3% in 2030 and 26.3% in 2040. Poland is currently one of the least electrified economies in the European Union.

87 European Commission, 2026, *Clean Industrial Deal* [access: 25/08/2026: https://energy.ec.europa.eu/strategy/affordable-energy_enhttps://commission.europa.eu/topics/competitiveness/clean-industrial-deal_en].

88 Committee European, 2025, *Affordable Energy Action Plan*

Fig. 21. Current level of electrification of EU economies in relation to the objectives of the EAP 2026 document.



Source: Klimadashboard, How fast is the EU electrifying?, on basis Eurostat data

In the reference scenarios set out in the National Energy and Climate Plan (NECP) and PSE's Development Plan for 2025–2034, the assumed level of industrial heat electrification remains conservative. Analyses used in the Report—including studies by Fraunhofer ISI⁸⁹, Agora Industry⁹⁰, and MAE 2024⁹¹ – indicate that fully exploiting the technical potential for electrification, combined with improved energy efficiency, could reduce natural gas demand in Polish industry by approximately 20–40% by 2040 compared with the reference pathways.

A significant acceleration of electrification is currently possible primarily in industry, transport and building heating. It could improve the energy efficiency and competitiveness of these sectors and, above all, strengthen resilience to price spikes and reduce dependence on fuel imports. This requires expanding domestic energy production based on national resources and distributed generation.

⁸⁹ Fraunhofer ISI, 2024, *Direct Electrification of Industrial Process Heat: An Assessment of Technologies, Potentials and Future Prospects for the EU*.

⁹⁰ Agora Industry, 2023, *The Business Case for Electrifying Industrial Heat*.

⁹¹ IEA, 2024, *World Energy Outlook 2024*.

However, widespread electrification will lead to a substantial increase in electricity demand and consumption. For the Polish energy system, rapid growth in electricity consumption by both industry and individual consumers is also challenging because of the annual and daily profiles of electricity supply and demand. Meanwhile, the expansion of weather-dependent generation within a National Power System (KSE) that is not yet adapted to accommodate it is creating an increasingly severe paradox of surplus: renewable electricity cannot be absorbed domestically or even exported through cross-border connections, while wholesale electricity prices become negative. This threatens the operation of the system and leads to increasingly frequent non-market redispatch, involving the compulsory curtailment of certain generating sources—primarily wind farms and non-prosumer photovoltaic installations. In 2025, 1.4 TWh of renewable electricity was subject to non-market redispatch, more than twice the volume recorded in the previous year⁹².

The development of renewable energy, which results in periodic surpluses of green electricity, should therefore be accompanied by greater flexibility in the operation of the energy system. This, in turn, requires investment in balancing resources, thermal and electricity storage—including battery energy storage systems (BESS) and hybrid RES+BESS installations—as well as measures to improve energy efficiency. These include the deployment of smart metering (Poland is replacing electricity meters by 2031⁹³) and the modernisation and digitalisation of distribution networks to enable active demand-side management.

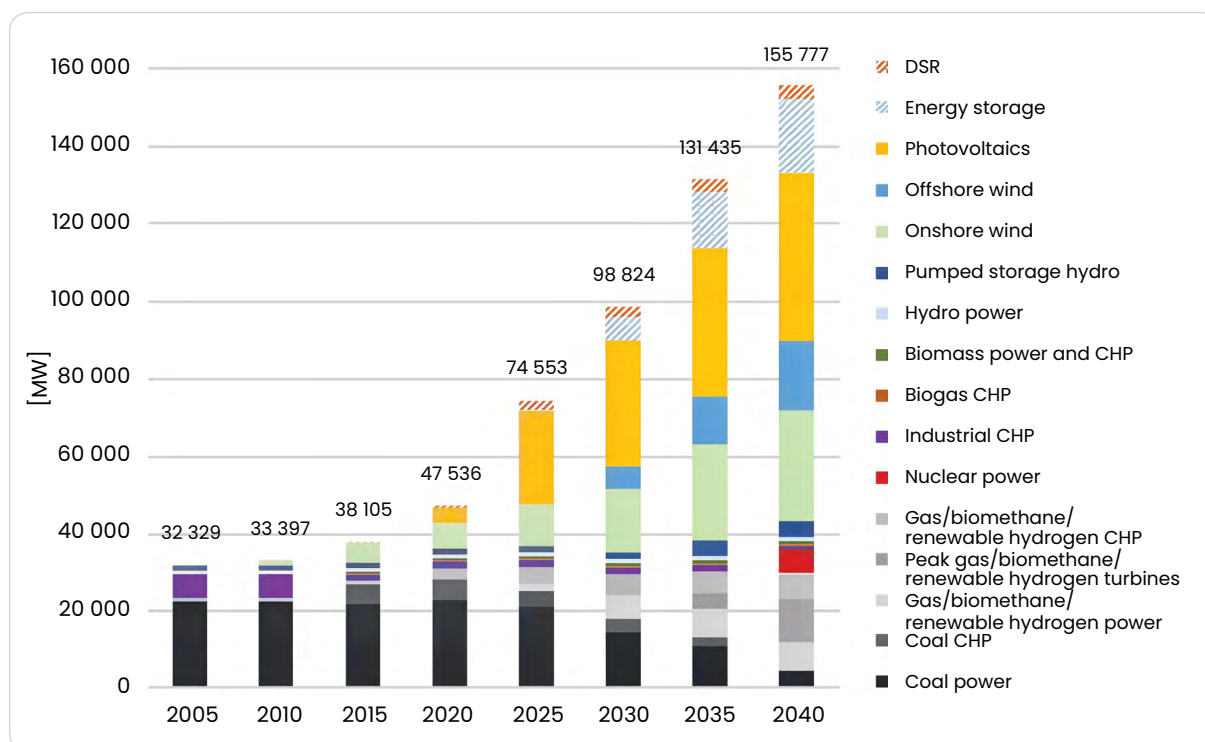
The development of electricity and heat storage and the management of system flexibility have not yet been placed on the government's energy policy agenda. Nevertheless, the annexes to the National Energy and Climate Plan (NECP) contain projections under which electricity storage capacity would increase to 5.9 GW by 2030 and 19.1 GW by 2040. For thermal storage in district heating systems, the corresponding projected capacities are 124 GWh and 576 GWh. Meanwhile, PSE is implementing requirements for grid-forming (GFM) technologies. Energy storage facilities are expected not only to shift electricity consumption over time, but also to actively shape grid parameters and respond to system failures. This forms part of the implementation of PSE's Strategy to 2040⁹⁴. The establishment of mandatory technical standards for energy storage and the development of a balancing services market are essential to the further development of a system increasingly based on renewable energy. These standards should not be treated as optional additional criteria, but as requirements for market participation. As fossil fuel-based generation is phased out, the synchronous generators that have traditionally supported grid stability are also disappearing from the system. Among other functions, they provide inertia, short-circuit current and voltage regulation, all of which are essential during system failures or sudden changes in electricity generation and demand.

92 Forum Energii, 2026, *Energy Transformation in Poland. Yearbook 2026* [access: 25/08/2026: <https://www.forum-energii.eu/transformacja-energetyczna-w-polsce-edycja-2026>]

93 According to provisions of the Energy Law Act.

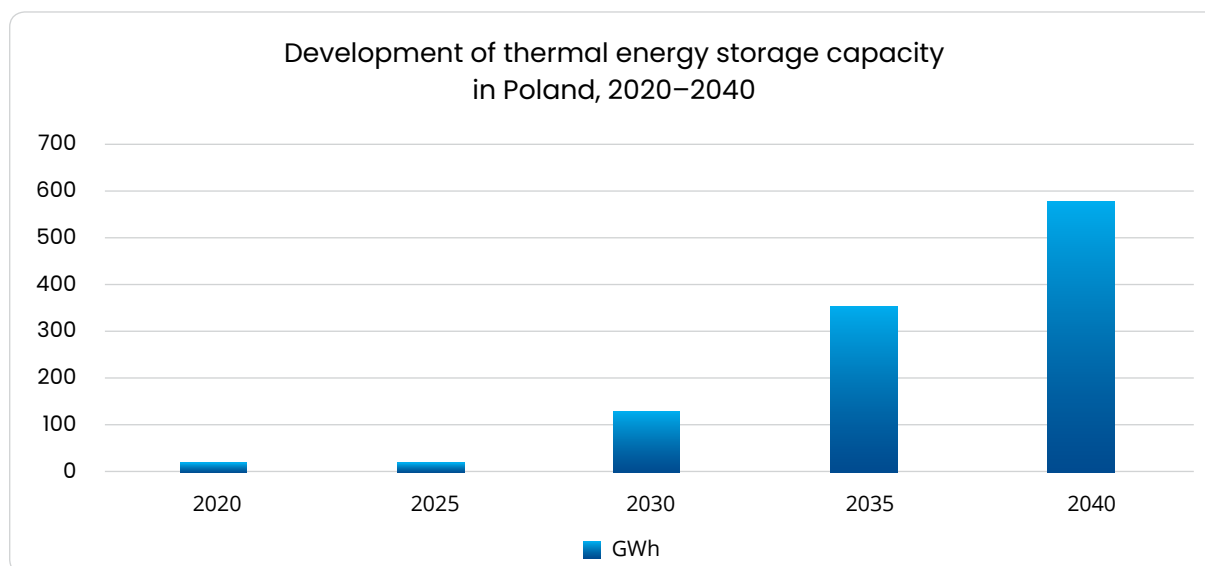
94 PSE, 2026, *PSE begins work on enabling electricity storage facilities to shape grid parameters* [access: 25/08/2026: <https://www.pse.pl/-/pse-rozpoczynaja-prace-nad-kszaltowaniem-parametrow-sieci-przez-magazyny-energii-elektrycznej>]

Fig. 22. Achievable power of electricity generation sources by technology [MW], according to the WAM scenario.



Source: KPEiK, WAM scenario

Fig. 23. Development of heat storage capacity in Poland in district heating in 2020-2040.



Source: NECP, WAM scenario

Energy storage facilities participated in the capacity market auctions for delivery in 2030⁹⁵, where they were classified in publicly available data as part of the category of 'new generating capacity market units'. Detailed capacity market data are not publicly available, while the available figures for installed capacity in the National Power System (KSE) vary depending on the source. This has prompted debate about the transparency of such information, particularly given the public funding supporting the operation of the capacity market⁹⁶. According to Forum Energii, approximately 5.1 GW of capacity obligations for battery energy storage systems will be added between 2028 and 2030, corresponding to 11.3 GW of available capacity⁹⁷. This trend is also reflected in the plans of Polish energy companies – some of which are already being implemented – and in the emergence of new project financing opportunities.

3.3. Integration of district heating with the power system: electricity and heat storage

The integration of district heating with the power system is one of the key directions in the sector's transformation. The traditional model, in which the two systems operated independently, is giving way to close coordination driven by the growing share of variable renewable generation. Owing to its ability to store energy and flexibly manage heat production and consumption, modern district heating is becoming an active component of power system balancing. This not only improves the efficiency of the entire energy system but also delivers tangible emissions reductions.

The main mechanism behind these changes is the electrification of heat production. This involves replacing fossil fuels with electricity-based technologies, such as heat pumps and electrode boilers. This process allows for the efficient utilization of surplus renewable energy that would otherwise have to be curtailed. In practice, excess energy from renewable sources is converted into heat and delivered to consumers or stored in heat storage facilities, optimizing the operation of the entire system.

The effectiveness of this integration nevertheless depends on several key factors. These once again include access to affordable renewable electricity, the modernisation of district heating systems to enable them to operate at lower temperatures, and technological progress in coupling the two sectors. This approach allows the share of green energy in the economy to be increased sustainably while maintaining security of heat supply.

The growing incidence of low electricity prices supports the exploitation of this potential. In several European markets, electricity is cheaper than gas for as much as 40% of the time,

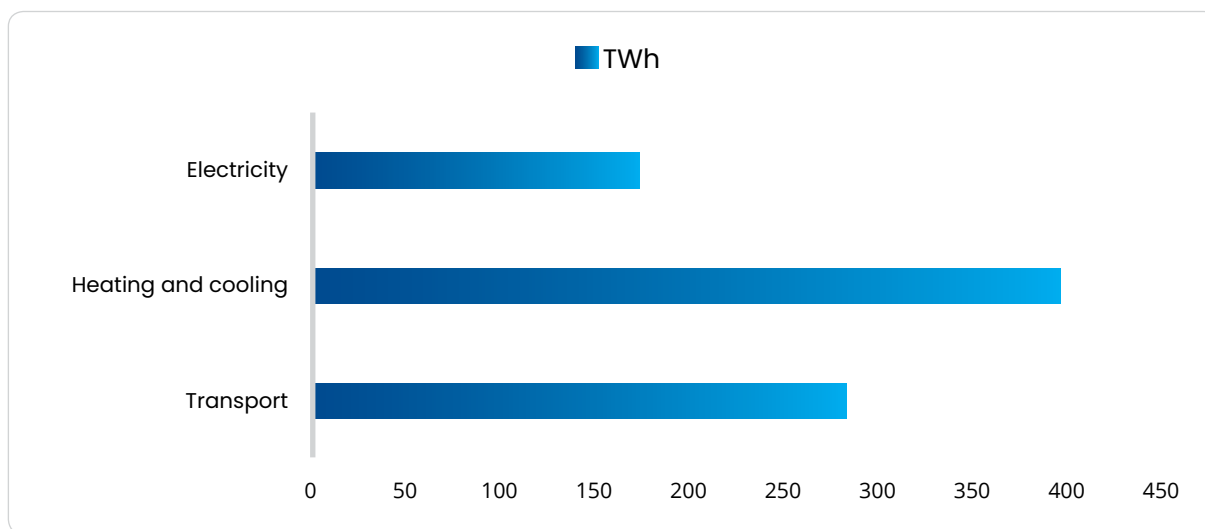
95 Energy Regulatory Office (URE), President of URE announces the final results of the main capacity market auction for delivery in 2030 [access: 25/08/2026: <https://www.ure.gov.pl/pl/urzed/informacje-ogolne/aktualnosci/13031,Prezes-URE-oglasza-ostateczne-wyniki-aukcji-glownej-rynku-mocy-na-dostawy-w-2030.html>].

96 InStrat Foundation, 2026, How much capacity is installed in the system and what types? [access: 25/08/2026: <https://instrat.pl/rynek-mocy-apel-2026/>].

97 Forum Energii, 2026, Capacity at any cost? What has Poland achieved in 10 years of developing the capacity market? [access: 25/08/2026: <https://www.forum-energii.eu/moce-za-wszelka-cene>].

even after accounting for CO₂ and transmission costs⁹⁸. Thermal energy storage (TES) provides companies with a unique arbitrage opportunity: they can purchase inexpensive electricity during periods of peak generation, convert it into heat and use it whenever required. Decoupling heat production from prevailing market prices significantly improves the economic viability of investments. In view of favourable trends, the early adoption of TES is becoming not only a step towards industrial decarbonisation, but above all a strategic business decision. Analysts predict that market conditions may become increasingly favourable for the electrification of heat in the coming years.

Fig. 24. Gross final energy consumption in Poland in 2024 by sector [TWh]



Source: Own study based on Eurostat and Statistics Poland data (SHARES), data for Poland 2024.

In Poland, sector coupling and the role of thermal energy storage in stabilising the energy system and efficiently utilising surplus renewable electricity have also been under discussion for several years⁹⁹. Power purchase agreements (PPAs) between renewable energy producers and municipal heating companies or industrial consumers could be particularly important.

This would primarily involve the electrification of municipal and industrial heat production. By using electrode boilers and thermal energy storage, these facilities could absorb surplus green electricity and subsequently supply it to consumers as low-temperature heat for space heating and domestic hot water, or as high-temperature heat, for example in the form of process steam¹⁰⁰. District heating plants, combined heat and power plants and industrial facilities could all benefit by committing to increase their electricity consumption during periods of surplus renewable generation. At such times, they could purchase electricity directly from renewable energy producers — together with the associated distribution

98 McKinsey&Company 2026, Industrial heat electrification in Europe: New business models emerge [access: 25/08/2026: <https://www.mckinsey.com/industries/energy-and-materials/our-insights/blog/industrial-heat-electrification-in-europe-new-business-models-emerge>]

99 IEO 2024, *Roadmap for the thermal storage market in Poland* [access: 25/08/2026: <https://ieo.pl/raporty-i-artkuly-ieo-oze-w-polskim-cieplownictwie/1693-mapa-drogowa-rynku-magazynow-ciepla>]

100 IEO, 2026, *Electrification of industry using heat and electricity storage from renewable energy sources*

service—at a cost lower than the equivalent cost of heat, while renewable generators would avoid curtailing and wasting their output. Registering generators covered by such contracts in a dedicated register could, in turn, exempt them from non-market redispatch.

Importantly, as a result of climate policy to date and the accompanying support schemes, biomass remains a significant component of the transition in district heating, building heating and sectors that are difficult to electrify. Solid biofuels such as wood pellets already account for a substantial share of renewable energy production in Poland and contribute to the stability of the national energy system. The use of biomass that meets sustainability criteria is essential to the development of efficient district heating systems. However, the associated risks must also be recognised. Europe's high dependence on pellet imports¹⁰¹, including from the United States and Canada, combined with Poland's subsidy policy for biomass boilers, led to temporary market shortages during the most recent heating season. Dependence on pellets for energy production also raises concerns about domestic resources and the future of forest management.

The cascading-use principle for biomass provides a safeguard in this respect by protecting the feedstock against excessive exploitation¹⁰². Nevertheless, given high domestic demand, the question remains as to which sources will be capable of meeting it over the longer term. Analyses indicate that the coming years will be crucial for decisions shaping the following decades. In the absence of strategic assessments, growing global competition for feedstocks—together with domestic competition between the energy sector and the wood-processing industry—may lead to high-risk investment decisions. As with biogas, sustainability criteria and the prioritisation of solid biofuel end uses remain essential. The persistent problem of air pollution associated with seasonal heating is another important consideration.

The case for widespread industrial electrification rests not only on stringent emissions requirements, but above all on the pursuit of energy sovereignty and reduced dependence on risky external supplies of raw materials. Electrical technologies, ranging from motors to heat pumps, offer significantly higher process efficiency than their combustion-based counterparts. Consequently, the degree of electrification is becoming a new measure of global competitiveness, combining cost efficiency with the achievement of ESG objectives and improved air quality in industrialised regions.

Despite these benefits, electrification faces significant barriers in Poland. Alongside high capital expenditure, the principal constraints remain electricity prices and difficulties in obtaining grid connection conditions for new installations and on-site generation. A successful transition will require capital-intensive modernisation of transmission and distribution networks so that they can accommodate new load profiles. Achieving the necessary system flexibility will require extensive sector integration and closer cooperation between different branches of the economy.

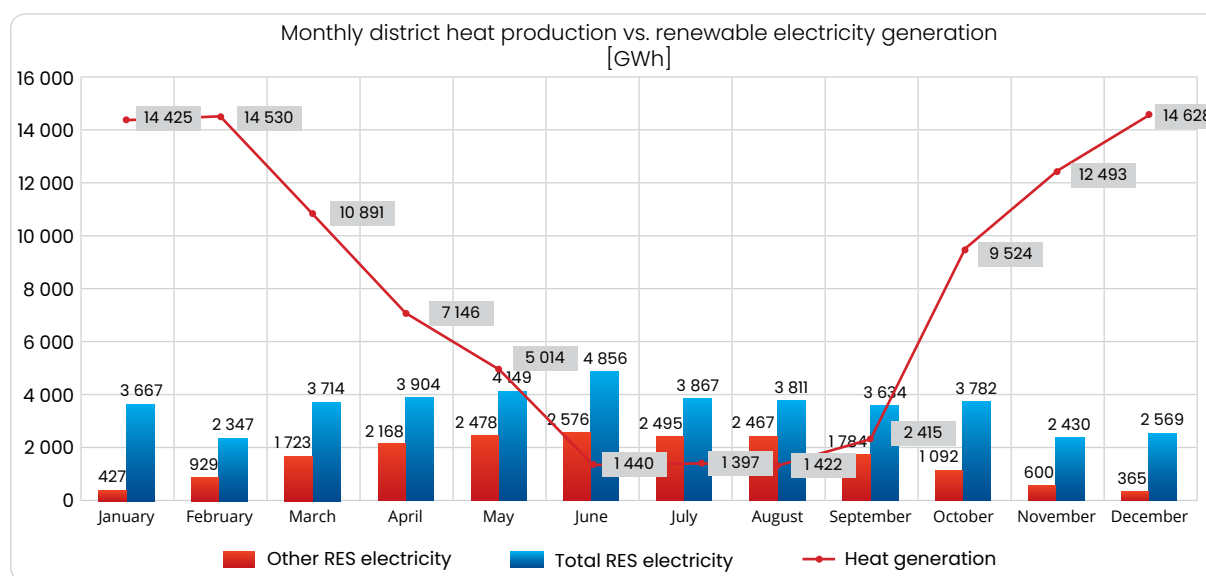
101 Institute of Energy Policy (IPE), *The future of solid biofuels in Poland to 2040* [access: 25/08/2026: https://www.institutpe.pl/wp-content/uploads/2026/03/Komentarz_IPE-I-2026_T-Mirowski_Przyszlosc-biopaliw-w-Polsce.pdf]

102 Parliamentary Group on District Heating, meeting on *Harnessing the Potential of Biomass in the National Energy System and District Heating*, 10 March 2026

Polish industry currently makes only limited use of the potential offered by renewable energy, basing its strategy primarily on short-term regulatory measures. Instead of pursuing systemic investment, the sector focuses on securing subsidies, relief from capacity charges and reductions in the costs arising from the EU ETS. As the energy transition progresses, however, deep electrification could become a lasting foundation for competitiveness and resilience, delivering benefits extending well beyond reduced fuel costs.

Given Poland's climatic and geographical conditions, its electrification pathway must be accompanied by greater system flexibility, supported by investment in large-scale energy storage and sufficient volumes of dispatchable generation, including gas-fired capacity, to maintain stability. The contribution of individual renewable energy sources to electricity generation must also be reassessed. During winter, when demand for heat is highest, the system cannot rely predominantly on photovoltaic generation, which currently dominates Poland's renewable capacity. Improving investment conditions for wind power and biomethane and biogas could make these alternatives genuinely viable.

Fig. 25. Analysis of monthly distributions of district heating production in relation to electricity production from renewable energy sources based on data from the Energy Regulatory Office "Thermal energy in numbers – 2025" and PSE Reports for 2025



Source: Niestępska M., Proposals for the electrification of district heating are based on the assumption that surplus electricity generated from renewable energy sources will be utilised (...), LinkedIn [access: 12/08/2026: <https://lnkd.in/p/duswDkNw>]

3.4. Enhancing system flexibility, network development and cross-border interconnections

As sector integration increases, demand-side management—including the management of capacity demand—and the flexibility of the energy system are becoming increasingly important. Through the use of electricity and thermal energy storage and the ability to control heat production, the district heating sector can respond actively to electricity market signals and support power system flexibility. The energy transition and the integration of new processes are significantly changing the operation of the power system and electricity networks. On the one hand, electrification increases demand for both capacity and electricity,

potentially placing greater strain on the grid, particularly during periods of peak electricity and heat demand across the two systems. On the other hand, the development of Power-to-X technologies and thermal energy storage enables electricity consumption to be distributed more evenly over time.

Flexible cooperation between district heating and the power system can support power system balancing while also facilitating grid congestion management and preventing network overloads in areas experiencing periodic surpluses of renewable electricity generation¹⁰³.

The modernisation of Poland's electricity networks will be one of the most significant investment programmes of the coming decades, with expenditure estimated at hundreds of billions of zlotys. PSE will invest primarily in constructing a strategic north-south transmission corridor to transmit electricity from offshore wind farms and the nuclear power plant, as well as in integrating new renewable energy connections, at an estimated cost of PLN 64 billion¹⁰⁴. Distribution system operators, in turn, plan to spend more than PLN 130 billion on digitalisation, increasing connection capacity for photovoltaic installations and heat pumps, and modernising ageing infrastructure¹⁰⁵. The modernisation of transmission and distribution networks is not merely necessary to accommodate modern technologies; it is essential because much of the existing infrastructure is approaching the end of its operational life.

Growing electricity demand and the changing generation profile mean that electricity networks can no longer be regarded simply as transmission infrastructure: they have become a fundamental condition for the success of the energy transition. The new energy model requires both the modernisation of domestic networks and a broader approach to cross-border electricity exchange. Interconnectors are central to this process, as they can help optimise electricity prices for consumers through cross-border trading and support energy security during technical failures or emergencies. They can also reduce electricity curtailment by enabling surplus generation to be exported.

According to ENTSO-E¹⁰⁶, the combined planned capacity of Poland's interconnectors with Germany, Lithuania, Slovakia and the Czech Republic in 2030 remains below the EU average ratio of interconnection capacity to peak demand. An ACER report¹⁰⁷ indicates that insufficient integration of electricity markets in Central and Eastern Europe remains one of the principal causes of cross-zonal congestion and price isolation in the region.

A map of Europe's electricity infrastructure reveals a clear east-west divide. Against the backdrop of rapid developments elsewhere in Europe, Central and Eastern Europe – with Poland in particular – performs modestly in terms of network expansion. Although Poland

103 K. Moskwik, *A Revolution in district heating: How can a coal-dominated sector be made greener?* Report, 2026.

104 PSE, 2025, *Draft new transmission network development plan for 2025-2034 approved* [access: 25/08/2026: <https://www.pse.pl/-/projekt-nowego-planu-rozwoju-sieci-przesylowej-na-lata-2025-2034-uzgodniony>].

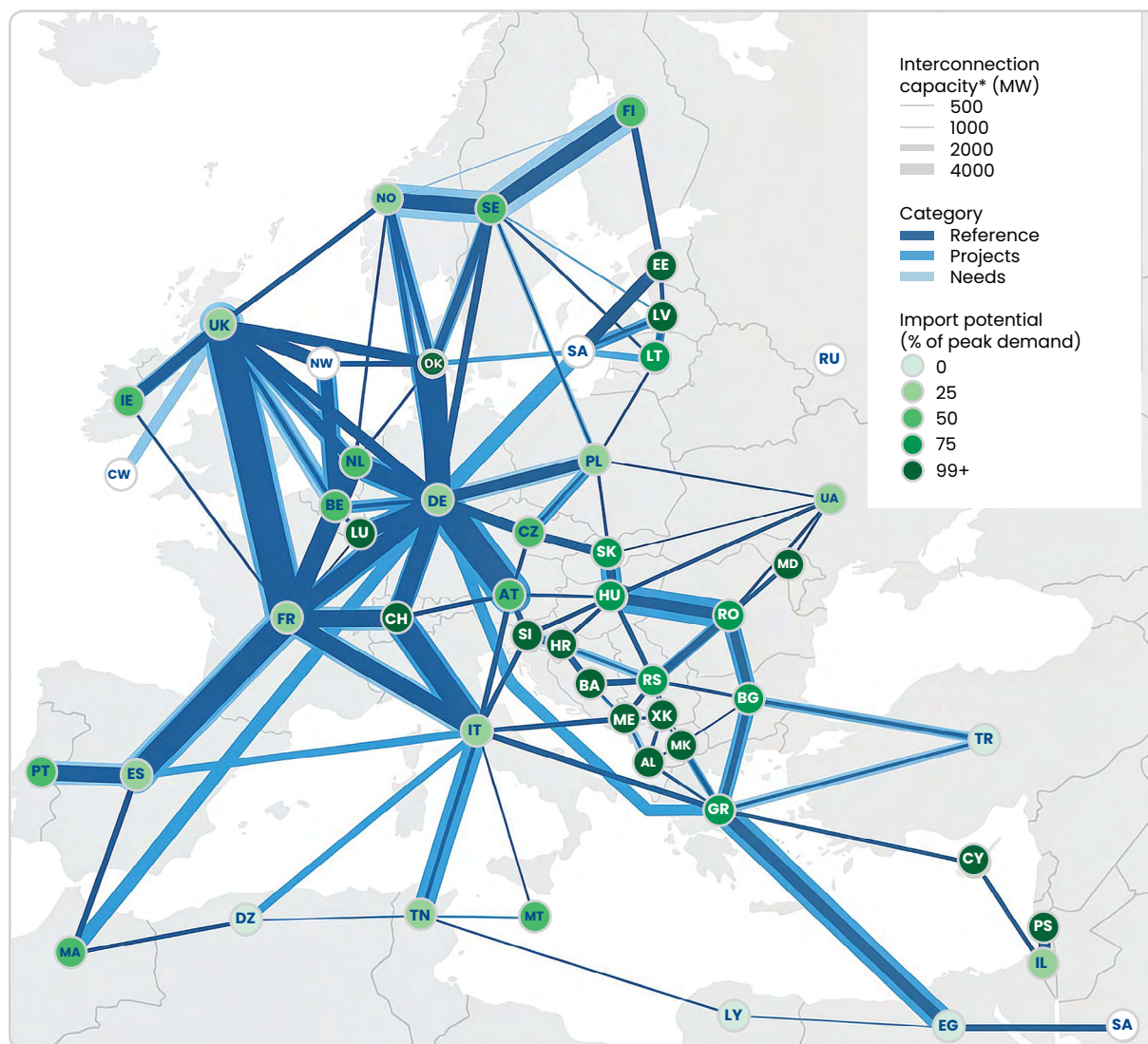
105 Energy Regulatory Office, *Charter for the Effective Transformation of Poland's Electricity Distribution Networks*

106 ENTSO-E, *Ten-Year Network Development Plan*, 2024

107 ACER, 2025, *Transmission capacities for cross-zonal trade of electricity and congestion management in the EU. Monitoring Report*, 2025

is the EU's fifth-largest electricity market, its plans do not provide for a sufficient increase in interconnector capacity. Combined with growing capacity demand, this restricts system flexibility and hinders full integration with the EU electricity market¹⁰⁸.

Fig. 26. Projektowane moce transgranicznego przesyłu energii elektrycznej w MW (2040).



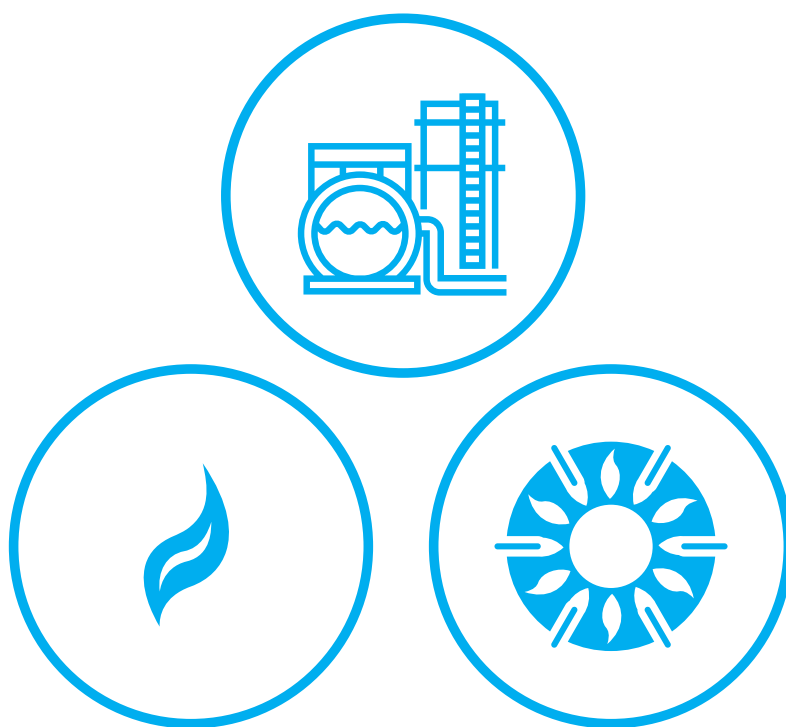
Source: Ember

The European Grids Package currently being implemented¹⁰⁹ is intended not only to increase transmission capacity but also to protect critical infrastructure. This is essential to Europe's resilience against system failures—such as the 2025 blackout on the Iberian Peninsula—and geopolitical threats. Although EU transmission capacity could increase as much as threefold by 2040, Poland's plans omit key investments. This remains the case despite incidents that

¹⁰⁸ Ember, *New lines of defence: How interconnectors keep the lights on, 2025* [access: 25/08/2026: <https://ember-energy.org/latest-insights/new-lines-of-defence-how-interconnectors-keep-the-lights-on/>]

¹⁰⁹ European Commission 2025, *European Grid Package* [access: 25/08/2026: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14672-European-grid-package_en]

have brought the system close to the limits of grid stability and the continuing risk of sabotage. Participation in regional projects such as the Baltic Energy Hub or an Eastern European electricity transmission superhighway could provide an opportunity to overcome this impasse. Such projects would strengthen the region's protection against threats from Russia and facilitate the integration of the Ukrainian, Moldovan and Western Balkan power systems with those of the European Union ¹¹⁰.



¹¹⁰ Eurelectric, *Grids for Speed. Report, 2024*.

3.5. Assessment of the implementation of measures to reduce gas demand in Poland in the context of natural gas infrastructure operations

Technology/Fuel	Implementation period	Costs
Natural gas infrastructure (network modernization, FSRU, new gas units)	Network: ongoing process. FSRU-1 in Gdańsk: land part ready in 2026, unit on-site in Q4 2027, terminal launch in 2028; FSRU-2 contingent on the outcome of the open season procedure. CCGT unit: 4-6 years from FID, bottleneck is turbine slots (OEM capacity sold out until 2030, reservations already cover 2031, turbine prices are rising rapidly).	CAPEX 5-6 million PLN/MW. High and variable OPEX: gas + EU ETS. Estimated cost of 13 new gas units with a total capacity of approx. 7 GW: PLN 35-40 billion by 2030. Modernization and development of the gas network: - PSG distribution approx. PLN 3.1 billion per year - transmission: GAZ-SYSTEM intends to allocate approximately PLN 6 billion for investments in 2026-2028 (even higher costs will arise when modernising the hydrogen transmission network).
Biomethane	2-5 years for a single installation, systemic impact only after 2030.	The production cost is 2-3 times higher than the price of natural gas (around PLN 250-450/MWh). High unit CAPEX at small scale.
Hydrogen	Pilots until 2030, full-scale application after 2035.	Very high. Electrolyzer approx. 2000-2200 euros/kW for a 100 MW system (European Hydrogen Observatory, 2025), green H ₂ 5-9 euro/kg, power -to-H ₂ -to- power chain efficiency 30-40%.
Electrification of industry/electricity/heating	Continuous process, cumulation of effects in 2027-2035.	Moderate CAPEX (electrode boiler approx. 150 euro/kW, large-scale heat pump 800-1200 euro/ kWt). Profitability is determined by the gas/energy price spread and the share of network fees and para-taxes in the final price.
Energy and heat storage	12-24 months (BESS), 24-36 months for large heat accumulators (Żerań CHP: construction in 2025-2027). The shortest cycle on the entire list.	BESS approx. PLN 1-1.7 million/MWh capacity, downward trend. Heat storage in the range of PLN 30-50/kWh (Żerań CHP: PLN 112.5 million for approx. 3.5 GWh capacity), marginal compared to the source's CAPEX.
Development of electricity networks and international connections	3-5 years in distribution, 7-12 years for LV and new cross-border lines.	Very high in absolute terms. PSE plans exceed PLN 64 billion in PRSP 2025-2034, and DSO development plans total approximately PLN 72 billion for 2023-2028 – a total of over PLN 130 billion, mostly transferred to the tariff, partially co-financed by KPO and FENiKS.

Feasibility	Risk exposure	Comment:
High. Mature technology, known supply chain, limitations on the part of turbine and gas connection manufacturers.	High gas price (geopolitics), rising CO ₂ price, tightening conditions for public aid for fossil fuels and shortening the horizon of capacity contracts (the 550 g/kWh limit itself does not exclude CCGT, which emits approx. 330-380 g CO ₂ /kWh; the derogation for coal-fired units expires in 2029), stranded risk as-sets after 2040.	<i>Transitional and balancing role rather than baseload generation. Justified where capacity utilisation is low (peaking and reserve capacity) and where gas replaces coal in district heating. Declining gas demand creates a risk of overcontracting regasification capacity.</i>
Medium. Large raw material potential (technical potential approx. 8 billion m ³ , implementation potential approx. 4.7 billion m ³ /year according to NECP), realistic by 2030 at around 0.3-0.5 billion m ³ – the first biomethane plants with grid injection were launched only in 2025. Barriers: substrate dispersion, OSD connections, procedures and local acceptance.	Average. The shape of the support system, guarantees of origin, competition for substrate with agricultural biogas and the energy sector.	<i>The only renewable fuel that can be introduced into the existing infrastructure without modification. The most cost-effective means of reducing the carbon footprint of the gas network, although limited production potential restricts its contribution to only a few per cent of national consumption. Suitable as a supplementary fuel, but not as a central pillar of the energy system.</i>
Low over the next decade. Lack of base demand, no dedicated network, cavern storage requires several years of preparation.	Very high. Demand, regulatory (RFNBO criteria), and technological risks. A series of FID cancellations in the EU in 2024-2026.	<i>It only makes sense where there is no alternative: refineries, ammonia, steel, heavy transport, and aviation. In heating and light transport, it loses out to electrification. The "H2-ready" declaration in CCGT should be treated as an option, not an investment commitment.</i>
Technically advanced, economically limited. The real barriers are connection conditions and tariff structure, not technology.	Average. Energy price risk, connection refusal risk, emission effect dependent on the KSE mix.	<i>The most effective reduction vector per unit of final energy (COP 2.5-3.5 in district heating means a multiplier effect that fuels do not have). Success conditions: removing non-price burdens from electricity, dynamic tariffs, and efficient load connection.</i>
High. Short construction cycle, accessible connection conditions, and a well-established revenue model based on the capacity market.	Low to medium revenue risk: cannibalization spreads when the market is saturated, dependence on the stability of the capacity market and system services.	<i>Najlepszy stosunek efektu do czasu wdrożenia w perspektywie do 2030 r. W ciepłe akumulator odpasja pracę kogeneracji od profilu odbioru i pozwala zarabiać na rynku bilansującym, co poprawia rentowność jednostek gazowych.</i>
Average. The technology is undisputed, but barriers lie in location procedures, land rights, and the availability of transformers and cables (3-5 year queues).	Low-tech, high-schedule, and high-cost. The principal risk is delay rather than technological failure.	<i>The only option with no stranded-asset risk. The ageing infrastructure of transmission and distribution system operators (TSOs and DSOs) must be modernised because of its deteriorating condition and inability to meet contemporary system needs. A prerequisite for the simultaneous development of renewables, electrification and energy storage. Electricity networks are currently the system's principal bottleneck, and delays in their expansion negate the benefits of the other pathways.</i>

Based on:

Natural gas infrastructure

1. GAZ-SYSTEM, *Launch of the FSRU 2 Open Season Procedure*, press release, 20 March 2026 (FSRU-1 schedule, technical parameters and FSRU-2 procedure).
2. GAZ-SYSTEM, *A Record-Breaking 2025 at GAZ-SYSTEM*, press release, 12 January 2026 (terminal scheduled to become operational in the first half of 2028; funding under the National Recovery and Resilience Plan and the European Funds for Infrastructure, Climate and Environment programme).
3. GAZ-SYSTEM, *National Ten-Year Gas Transmission Network Development Plan 2026–2035*, approved by the President of the Energy Regulatory Office on 29 October 2025.
4. Polska Spółka Gazownictwa, *Investments*, psgaz.pl (2026 Investment Plan worth PLN 3.138 billion, including PLN 2.791 billion for the gas network).
5. B. Sawicki, *Gas Instead of Lignite: Polish Consumers Will Pay for the New Pillar of the Energy Sector*, 'Rzeczpospolita' / 'Parkiet', 27 February 2026 (13 new gas-fired units costing PLN 35–40 billion by 2030; schedules and unit costs for PGE, Enea, Tauron and Energa projects).
6. Utility Dive, *GE Vernova Gas Turbine Backlog Climbs to 116 GW*, 23 July 2026; and POWER Magazine, *Ansaldo Returns to U.S. Gas Turbine Market as Equipment Crunch Widens Supplier Field*, September 2026 (order backlog, manufacturing capacity sold out through 2030 and reservations for 2031).
7. Wood Mackenzie, as cited in *Gas Turbine Orders 2025–26: Backlog, Price & Lead-Time Data* (turbine prices up by 195% compared with 2019, reaching approximately USD 600/kW by the end of 2027; projects scheduled for 2030–2031 reporting costs exceeding USD 2,000/kW, compared with USD 1,116–1,427/kW for projects completed in 2026–2027).
8. Regulation (EU) 2019/943 of the European Parliament and of the Council, Article 22 (the 550 g CO₂/kWh emissions limit applicable to capacity mechanisms).
9. European Commission decision of 11 August 2025 concerning the Polish capacity market (derogation from the emissions limit from 1 July 2025 to 31 December 2028).

Biomethane

10. *National Energy and Climate Plan to 2030 with an Outlook to 2040*, updated version (technical potential of 8 billion cubic metres; implementation potential of 4.7 billion cubic metres; projected domestic production in 2030 of approximately 0.5 billion cubic metres under the WEM scenario and approximately 1 billion cubic metres under the WAM scenario).
11. National Centre for Research and Development (NCBR), *The Real Potential for Biomethane Production in Poland* (methodology distinguishing technical, implementation and investment potential; fragmentation of agricultural production as the reason for differences between these categories).
12. Polish Biomethane Organisation, *Current Status and Prospects for the Development of Biomethane Facilities in Poland* (122 investment projects as at the end of the third quarter of 2025).
13. Lower Silesian Institute for Energy Studies (DISE), *Unlocking Poland's Biomethane Potential*, 2025 (investment potential of 3.2 billion cubic metres per year and prioritisation of end uses).

Hydrogen

14. European Hydrogen Observatory, *Electrolyser Cost*, 2025 data (CAPEX of approximately EUR 2,075/kW for alkaline electrolyzers and EUR 2,196/kW for PEM electrolyzers for an advanced-stage 100 MW project; European electrolyser manufacturing capacity of 13.1 GW per year).
15. ACER, based on the European Hydrogen Observatory LCOH Calculator, October 2025 (LCOH of EUR 5.8–8.8/kg, depending on the energy source and annual operating hours).

16. Joint Research Centre (JRC), *Water Electrolysis and Hydrogen in the European Union*, 2025 (electricity consumption of 48–60 kWh/kg and the range of system CAPEX).

Electrification

17. Danish Energy Agency, *Technology Data for Energy Plants for Electricity and District Heating Generation*, Chapters 40 and 41.

Electricity and heat storage

18. ORLEN Termika, *Europe's Largest Thermal Energy Storage Facility to Supply Żerań Combined Heat and Power Plant*, press release, September 2025; and PGNiG TERMIKA, press release announcing the signing of the contract with the contractor (value: PLN 112.5 million; volume: 61,000 cubic metres; capacity: almost 10 TJ and approximately 230 MWth; commissioning scheduled for September 2027).

19. PGE, tender for the Żarnowiec energy storage facility, 263 MW / more than 900 MWh (contracting authority's budget of approximately PLN 877 million; bid of PLN 1.555 billion submitted by a consortium including LG Energy Solution).

20. BloombergNEF, CAPEX benchmark for utility-scale long-duration energy storage outside China and the United States (USD 125/kWh).

Electricity network development

21. PSE, *Transmission Network Development Plan for 2025–2034 Approved*, press release, 2 January 2025 (approved by the President of the Energy Regulatory Office on 20 December 2024; more than PLN 64 billion of expenditure by 2034; 4,700 km of 400 kV transmission line circuits; 28 new and 110 modernised substations; and an HVDC line).

22. PSE, as cited in *PSE: This Year the Network Operator Will Announce Tenders for Investments Worth PLN 7.5 Billion*, WNP, March 2026 (2027–2036 plan worth approximately PLN 66 billion).

23. Energy Regulatory Office, data concerning distribution system operators' development plans for 2023–2028 (increase in expenditure from PLN 42 billion to PLN 72 billion—more than 70% compared with the 2020–2025 plans; more than PLN 130 billion together with PSE expenditure).

24. Energy Regulatory Office, *Charter for the Effective Transformation of Poland's Electricity Distribution Networks*, 2022 (expenditure scenarios and WACC adjustment through a reinvestment premium for 2023–2028).

25. GridReadiness, *Transformer Lead Times Europe 2026* (delivery times for large power transformers: 20–32 months from second-tier manufacturers and 48–60 months from ABB and Siemens).

3.6. Domestic natural gas resources

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Chapter 1 demonstrated the substantial role played by imports in supplying the Polish market. As emphasised in the introduction, the global gas market is not—and will not become—free from threats arising from the international environment. It should therefore be reiterated that geopolitical risks are a permanent feature of the global gas market, although their intensity varies over time. Energy security should consequently be built not only through the diversification of external supplies, but first and foremost through the optimal use of domestic resources and the protection of infrastructure required to maintain strategic reserves.

a. Conventional natural gas resources

The level of domestic natural gas production depends primarily on the size of geological resources and their technical and economic recoverability. Natural gas deposits are dispersed

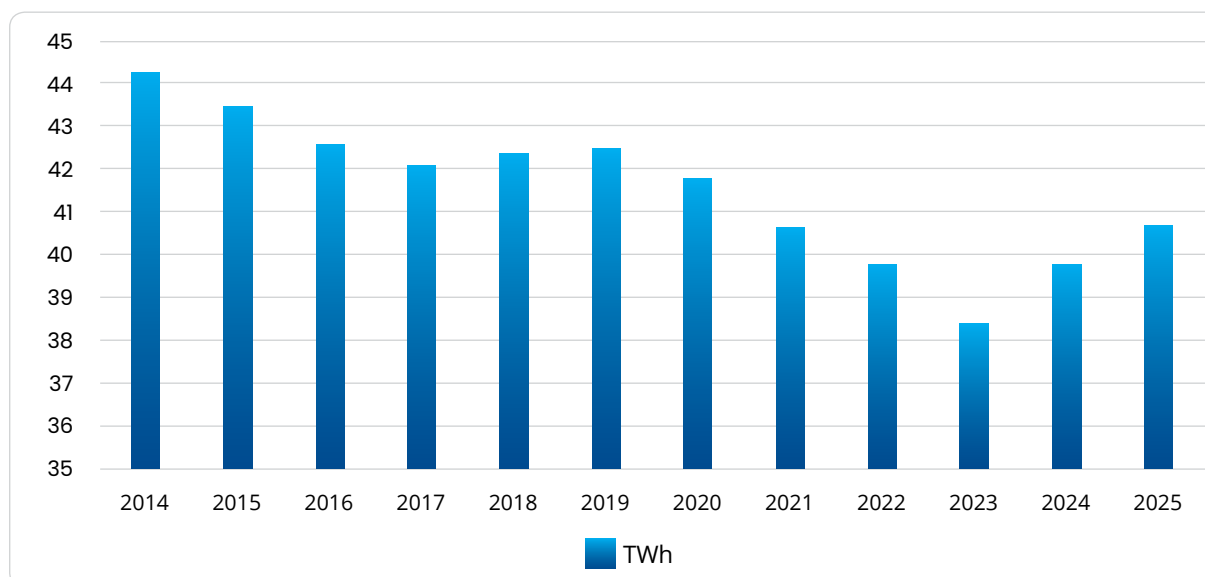
across the south-eastern regions of Poland, in the Carpathian Foothills and the Carpathian Mountains. These are relatively small deposits containing gas with a high methane content—exceeding 85%—and a low nitrogen content, classified as Group E high-methane natural gas. Deposits in this region account for 23.9% of Poland's identified domestic resources. Most identified deposits, representing 71.8% of documented resources, are located in western Poland within the Polish Lowlands. The gas produced in this area has an elevated nitrogen content of 19.5% and a lower methane content of 79%¹¹¹. Documented natural gas deposits are also located within Poland's exclusive economic zone in the Baltic Sea.

According to the *Balance of Mineral Deposit Resources in Poland*, prepared as at 31 December 2024 by the Polish Geological Institute–National Research Institute (hereinafter: PGI–NRI):

- recoverable natural gas resources, comprising both high-methane and nitrogen-rich gas, amounted to 152.64 billion cubic metres,
- recoverable resources in developed natural gas deposits amounted to 130.41 billion cubic metres,
- economically recoverable reserves in natural gas deposits amounted to 75.49 billion cubic metres in 2024,
- cushion gas reserves designated for underground gas storage facilities amounted to 6.65 billion cubic metres¹¹².

The above figures refer to the raw material found in conventional deposits, which are exploited using proven technologies available to domestic exploration and production companies (in practice, ORLEN). However, domestic production has been on a downward trend in recent years. Between 2014 and 2025, supplies from this source decreased from 44.3 TWh (approximately 4.2 billion m³) to 40.7 TWh (approximately 3.85 billion m³) annually, a decline of approximately 10%.

Fig. 27. Natural gas supplies in TWh from domestic production to the Polish market in 2014–2025.



Source: Own study based on data from reports published by the Energy Regulatory Office and the Ministry of Energy in 2014–2025.

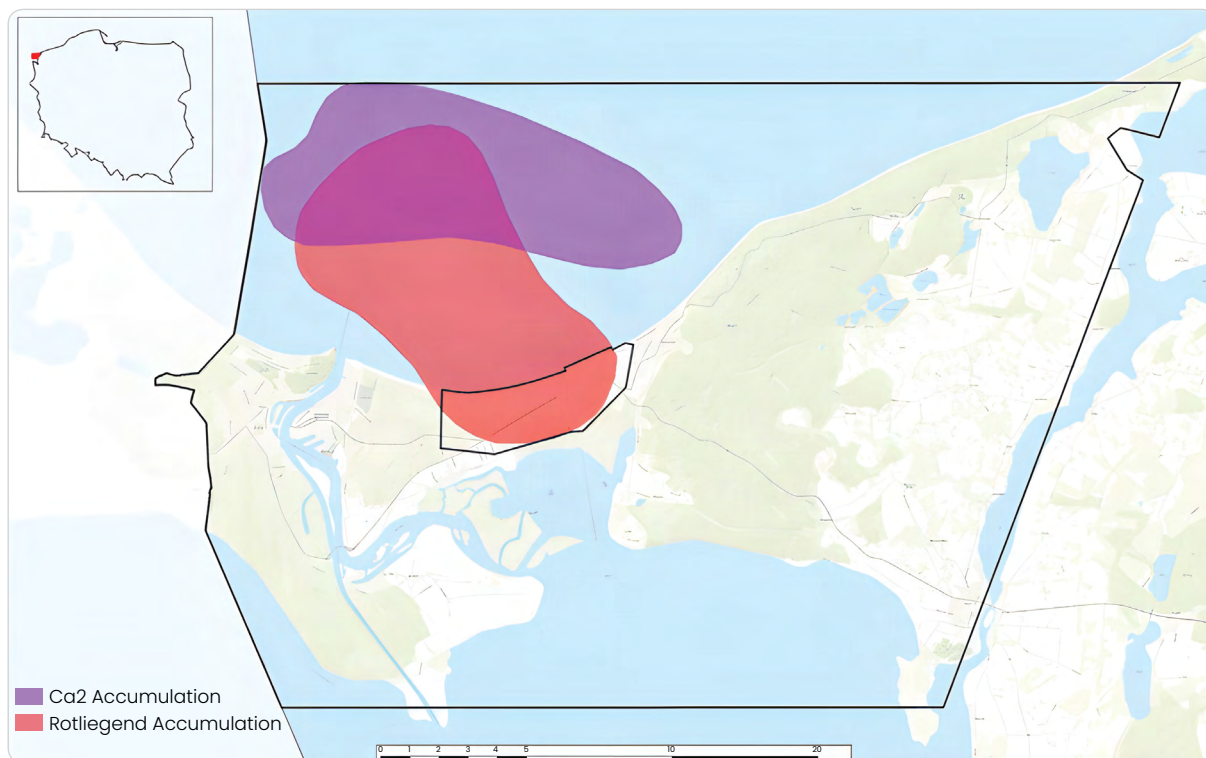
¹¹¹ Polish Geological Institute – National Research Institute, *Balance of mineral deposit resources in Poland as at 31 December 2024*, p. 11.

¹¹² Ibid.

Under ORLEN's strategic plans, investment in the upstream segment is intended to gradually increase domestic production to 4 billion cubic metres by 2035. If this target is achieved, domestically produced natural gas would cover only approximately 15% of demand in 2035 under the 'optimal development scenario' and approximately 18% under the 'moderate growth scenario' adopted in GAZ-SYSTEM's forecast of demand for natural gas transmission services for 2024–2045. At the same time, the Plock-based group plans to steadily increase gas production from its Norwegian fields and assets in other regions of the world to 8 billion cubic metres per year by 2035¹¹³.

In the context of a potential increase in natural gas production from Polish deposits, particular attention should be paid to the activities of the Canadian company Central European Petroleum (hereinafter: CEP), which has conducted exploration activities in north-western Poland since 2016. Drilling work has been carried out within its Wolin licence area, located along the Polish–German border and the Baltic coast, to estimate the size of the hydrocarbon deposits expected at the site. According to statements published by the Canadian company, the deposits under investigation may contain up to 16.5 billion cubic metres of recoverable natural gas. The company's estimates are still awaiting independent verification and confirmation¹¹⁴.

Fig. 28. Map of the "Wolin" concession belonging to Central European Petroleum.



Source: Central European Petroleum

¹¹³ ORLEN, ORLEN Strategy to 2035, p. 19.

¹¹⁴ CEP, *About us*, [accessed : 28/03/2026: <https://www.cepetro.com/pl>].

b. Unconventional natural gas deposits

The Polish Geological Institute–National Research Institute (PGI–NRI) also records the presence of unconventional natural gas resources. Gas contained ‘in the Lower Palaeozoic shales of the onshore Baltic–Podlasie–Lublin Basin is estimated at approximately 75.3–622.2 billion cubic metres, and in the offshore area at approximately 126.7–166.1 billion cubic metres’¹¹⁵. Unconventional gas is also believed to occur ‘in the Permian Rotliegend sandstones of the Poznań–Kalisz zone, the Carboniferous sandstones of the Wielkopolska–Silesia zone and the Cambrian sandstones in the western part of the Baltic Basin’. Their combined geological resources are estimated at 1,528–1,995 billion cubic metres, corresponding to approximately 153–200 billion cubic metres of technically recoverable resources¹¹⁶. Between 2007 and 2012, 113 licences were issued for exploration and appraisal activities covering approximately 30% of Poland’s territory. However, the activities undertaken during this period were unsuccessful. According to the Supreme Audit Office (NIK), this failure resulted primarily from inappropriate action by government authorities and economic and financial conditions that became increasingly unfavourable to investors¹¹⁷.

Unconventional gas resources also include methane contained in hard-coal seams. Poland’s documented recoverable coal-bed methane resources amounted to 105.4 billion cubic metres in 2024. Methane accompanies hard-coal extraction and poses a risk to miners because it is highly flammable and explosive. In Poland, some of this gas is released into the atmosphere through mine ventilation systems—432.71 million cubic metres in 2024—while some is captured by mine degasification systems and subsequently used by mining companies—301.38 million cubic metres in 2024. As at the date of this Report, no commercial activity involving the extraction and sale of methane trapped in domestic hard-coal seams had been recorded.

c. Warehouse infrastructure

For countries importing substantial volumes of natural gas, gas storage facilities capable of holding strategic reserves are of critical importance. Poland currently has seven underground gas storage facilities (UGS facilities), with a combined working gas capacity of 3.3 billion cubic metres in the 2025/2026 season¹¹⁸. By comparison, Slovakia has storage capacity of 3.2 billion cubic metres¹¹⁹, while annual consumption on the Slovak market amounted to 4.3 billion cubic metres in 2024¹²⁰. The aforementioned draft National Energy and Climate Plan (NECP) states that energy security policy will be implemented, inter alia, through the development of natural gas storage by the entities responsible for the relevant infrastructure. One such entity is the storage system operator, which, under the applicable Energy Law, ‘prepares

115 PGI–NRI, *Balance...*, op. cit., p. 12.

116 Ibid.

117 For further information, see: Supreme Audit Office, *Information on Audit Findings: Exploration, Extraction and Development of Shale Gas*, Warsaw, 6 December 2012 [access: 30 January 2026: <https://www.nik.gov.pl/najnowsze-informacje-o-wynikach-kontroli/nik-o-poszukiwaniach-gazu-lupkowego.html>].

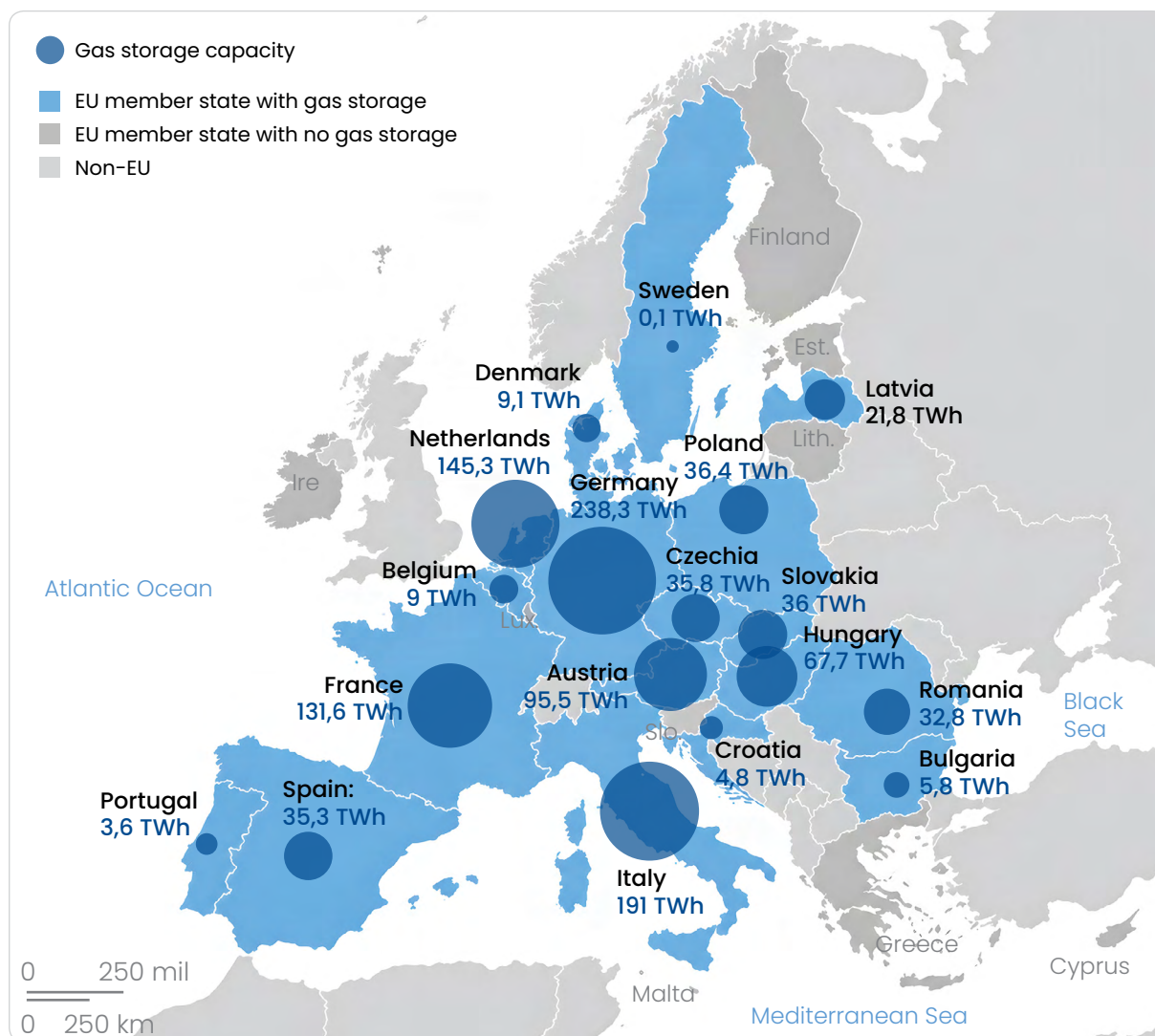
118 Gaz Storage Poland, *Technical parameters – underground gas storage facilities in Poland*, [access: 30/03/2026: <https://ipi.gasstoragepoland.pl/pl/menu/transparency-template/?page=dane-operacyjne/>].

119 NAFTA, *NAFTA’s storage operations* [access: 26/08/2026: <https://www.nafta.sk/en/news/your-partner-underground-gas-storage>].

120 Energy Institute, *Statistical Review of World Energy 2025*, p. 39.

a development plan for meeting current and future demand for storage facility capacity over a ten-year period. The plan is updated every two years¹²¹. A project is currently under way to expand the Wierchowice underground gas storage facility from 1.3 billion cubic metres to 2.1 billion cubic metres by 2026. By 2030/2031, this is expected to increase Poland's total storage capacity to approximately 4.1 billion cubic metres and its withdrawal capacity to approximately 60 million cubic metres per day¹²².

Fig. 29. Gas storage capacities located in EU countries.



Source: S&P Global

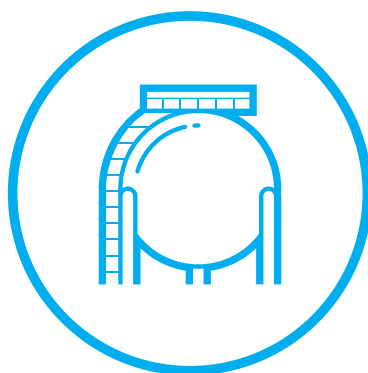
¹²¹ Act of 10 April 1997 – Energy Law, Art. 16.1.

¹²² Ministerstwo Energii, *Krajowy Plan ...*, op. cit., s. 128., [dostęp: 30.03.2026 r. w: <https://www.gov.pl/web/energia/projekt-krajowego-planu-w-dziedzinie-energii-i-klimatu-do-2030-r-z-perspektywa-do-2040-r---wersja-opracowana-przez-me-do-zatwierdzenia-rzadowego>]

Conclusions:

- Poland's high dependence on natural gas imports will remain one of the principal energy security challenges over the coming decade. Replacing retiring coal-fired capacity with gas-fired units reduces the carbon intensity of the system, but simultaneously increases the risk of long-term dependence on imported fuel and exposure to price volatility and geopolitical tensions.
- Poland's energy transition is taking place against the background of delayed decarbonisation compared with most EU Member States. This requires secure system operation to be maintained while low-emission technologies are developed rapidly. The key challenge is to strike a balance between retaining sufficient dispatchable balancing capacity and accommodating the growing share of renewables and the electrification of the economy. This requires greater flexibility within the National Power System (KSE) and careful planning of the respective roles of gas, energy storage and renewable gases during the transition period.
- Electrification, improved energy efficiency and the development of renewable energy sources offer the greatest potential for reducing natural gas consumption. Particularly significant opportunities exist in industry and district heating, although exploiting them will require the simultaneous expansion of the national power system.
- Developing renewable energy without simultaneously increasing system flexibility creates growing balancing problems. The increasing frequency of periods characterised by surplus generation, negative prices and compulsory curtailment demonstrates the need for the rapid development of electricity and heat storage, demand-side management and modern system services.
- Biomethane is Poland's most promising renewable substitute for natural gas. Owing to the country's substantial domestic production potential and the ability to use existing gas infrastructure, it could play a key role in sectors that are difficult to electrify, although it cannot completely replace fossil gas.
- Biomethane should be treated as a strategic fuel rather than a universal substitute for natural gas. Its use should focus primarily on energy-intensive industry, district heating and energy storage, where low-emission alternatives remain limited.
- Poland's energy transition will lead to a significant increase in electricity demand. This necessitates faster investment in transmission and distribution networks, energy storage, balancing resources and the digitalisation of electricity infrastructure.
- The most resilient transition pathway is based on technological diversification. Combining electrification, renewable energy development, energy storage, biomethane production, network modernisation and improved energy efficiency can simultaneously reduce emissions, decrease dependence on gas imports and strengthen the resilience of the national energy system to future crises.

- Domestic gas production has followed a downward trend over the past ten years. It currently stands at approximately 3.8 billion cubic metres per year and is too limited to constitute a significant pillar of gas supply security. Furthermore, it will be subject to increasingly high charges.



4

SELECTED LNG SUPPLY CHAINS IN THE CONTEXT OF GEOPOLITICAL CONDITIONS



Chapter 4.

Selected LNG supply chains in the context of geopolitical conditions

Agata Łoskot-Strachota, Dr. Marcin Sienkiewicz, Kamil Moskwik

The Polish energy transition model described above increases exposure to threats and related risks affecting the global natural gas market. Changes in the supply structure of Poland and the European Union in favour of LNG necessitate continuous and careful monitoring of this critical segment of the global gas trade and distribution system.

Monitoring and analysis should cover three fundamental elements of the international LNG supply chain:

- sources of supply in which LNG production is concentrated,
- LNG transport routes,
- bottlenecks and strategic chokepoints along those routes.

4.1. Selected LNG supply sources – analysis of LNG production potential

United States:

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President Donald Trump and his administration have clearly defined the objectives of US energy policy: strengthening American energy dominance, including by consolidating the country's position as the world's leading LNG exporter¹²³. The first step towards implementing this strategy was the Department of Energy's reversal of the previous administration's decision¹²⁴ to suspend the consideration of applications for permits to export US LNG. A decision was also taken to lift the prohibition on the use of liquefied natural gas as a marine fuel. The removal of administrative barriers affecting the LNG sector forms part of a policy intended to double US export volumes by the end of the 2020s¹²⁵. New facilities are also being commissioned, including Plaquemines LNG in Louisiana, which began operating in December 2024 and has an annual liquefaction capacity of 28 million tonnes, with further expansion planned¹²⁶. The Golden Pass LNG terminal, located on the Texas coast of the Gulf of Mexico, was commissioned in April 2026. The terminal comprises three liquefaction trains with

¹²³ Department of Energy, *President Trump Is Delivering On LNG* [access: 26/06/2026: https://www.energy.gov/sites/default/files/2025-06/Jera_LNG_Factsheet_061125.pdf].

¹²⁴ In January 2024, U.S. President Joe Biden suspended approvals of current and future applications for liquefied natural gas exports from new projects. This decision was made based on the need to examine the impact of LNG exports on energy costs, energy security, and the natural environment (climate). T. Gardner, *Biden pauses LNG export approvals after pressure from climate activists*, "Reuters" [access: 26 June 2026: <https://www.reuters.com/business/energy/biden-pauses-approval-new-lng-export-projects-win-climate-activists-2024-01-26/>].

¹²⁵ Department of Energy [access: 26/06/2026: <https://www.energy.gov/articles/fact-sheet-delivering-us-oil-and-natural-gas-production>].

¹²⁶ Venture Global, *Plaquemines* [accessed : 04/07/2026: <https://ventureglobal.com/venture-global-plaquemines/>].

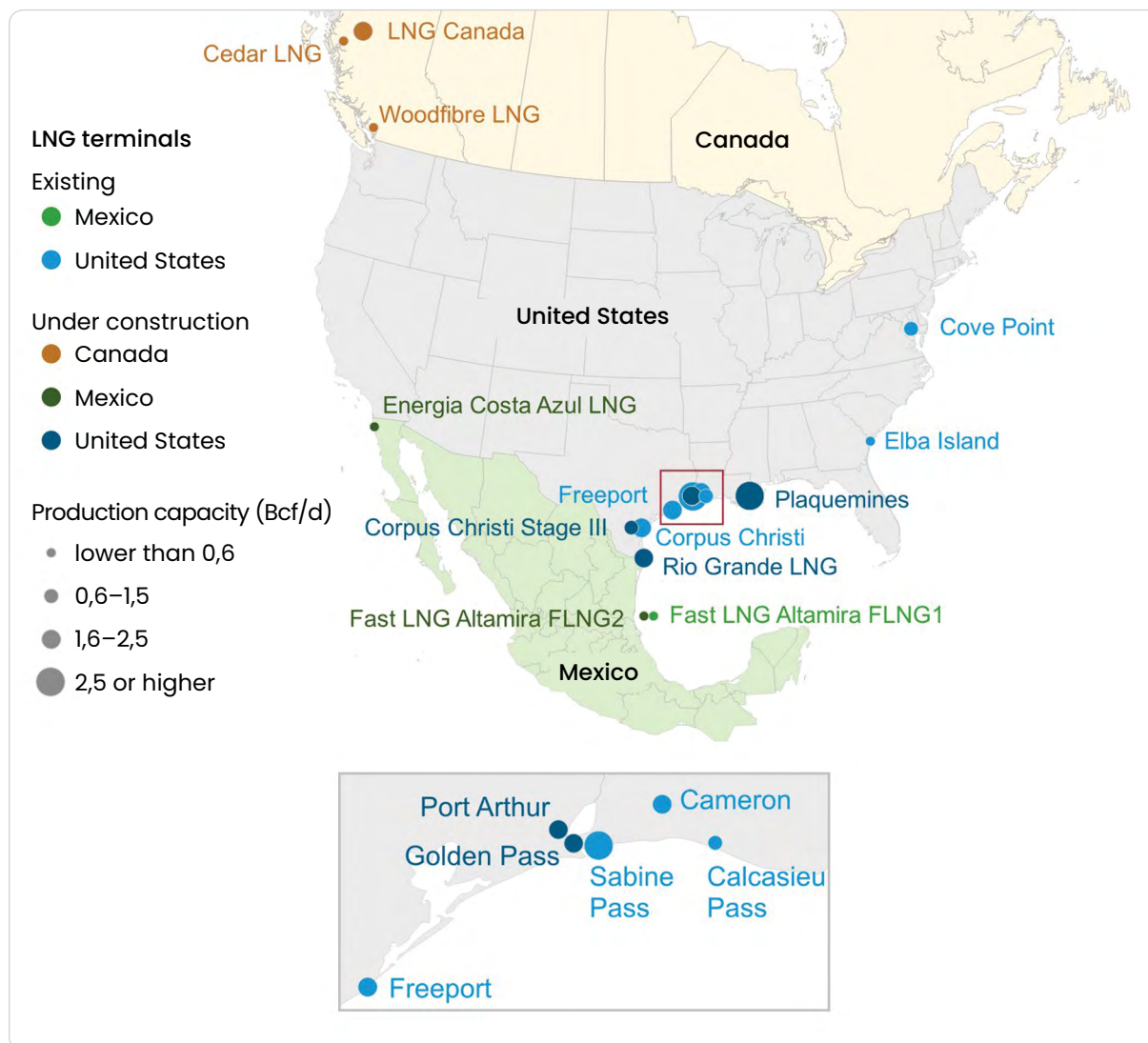
a combined capacity of 18.1 million tonnes per year, five LNG storage tanks with a capacity of 155,000 cubic metres each, and two LNG carrier loading berths¹²⁷. A further four facilities currently under construction and intended to increase US export capacity are also concentrated along the Gulf Coast, which has become the largest LNG export hub in the Atlantic Basin¹²⁸. The geographical concentration of US terminal infrastructure is determined primarily by the proximity of producing fields, the existing and continually expanding transmission infrastructure, and the principal destination of US gas exports, which are transported across the North Atlantic to Europe. These waters are patrolled by the United States Navy and fall within the geographical scope of allied responsibility defined in Article 6 of the North Atlantic Treaty of 4 April 1949¹²⁹.

127 Department of Energy, *The 9th US liquefied natural gas export terminal, Golden Pass, ships first cargo*, [access: 6 July 2026: <https://www.eia.gov/todayinenergy/detail.php?id=67564>]

128 US Energy Information Administration, *North America's LNG export capacity could more than double by 2029* [access: June 26, 2026: <https://www.eia.gov/todayinenergy/detail.php?id=66384>]

129 North Atlantic Treaty done at Washington on 4 April 1949 (Journal of Laws of 19 October 2000), Article 6 For the purposes of Article 5, an armed attack against one or more Parties shall be deemed to include an armed attack:

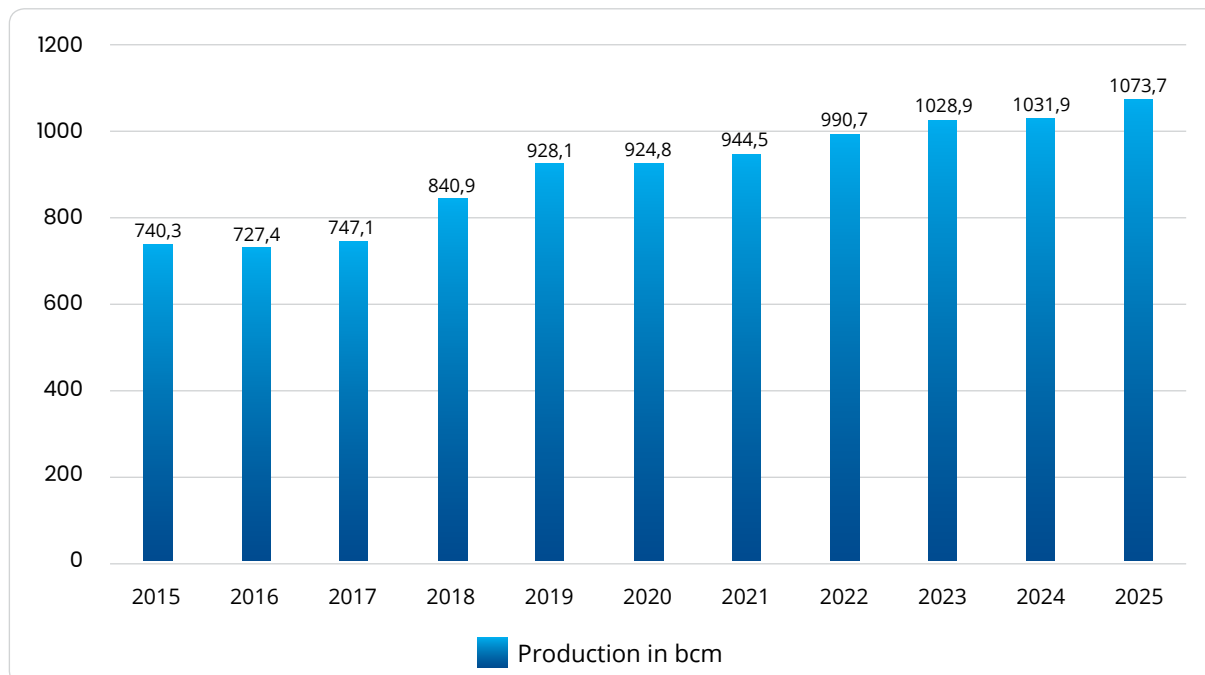
- on the territory of any of the Parties in Europe or North America, on the Algerian Departments of France, on the territory of Türkiye or on the islands under the jurisdiction of any of the Parties in the North Atlantic area north of the Tropic of Cancer;
- on the forces, vessels or aircraft of any of the Parties, when in or over these territories or any other area in Europe in which occupation forces of any of the Parties were stationed on the date when the Treaty entered into force, or the Mediterranean Sea or the North Atlantic area north of the Tropic of Cancer. North Atlantic Treaty done at Washington on 4 April 1949 (Journal of Laws of 19 October 2000).

Fig. 30. Map of existing and under-construction LNG export terminals in North America.

Source: Energy Information Administration

One consequence of the geographical concentration of US terminal infrastructure is its recurring exposure to hurricanes, which are characteristic of the south-eastern Atlantic coast of North America. The National Oceanic and Atmospheric Administration (NOAA) defines the Atlantic hurricane season as running from 1 June to 30 November¹³⁰. Given the growing importance of LNG production facilities located along the US Gulf Coast to the global market, hurricane-related production disruptions could periodically destabilise the balance between supply and demand in the global gas market.

¹³⁰ National Oceanic and Atmospheric Administration, *NOAA to announce 2026 Atlantic Hurricane Season Outlook* [access: 6 July 2026: <https://www.noaa.gov/media-advisory/noaa-to-announce-2026-atlantic-hurricane-season-outlook>]

Fig. 31. Dynamics of natural gas production in the United States in 2015–2025.

Source: Own study based on: Energy Institute, 2026 Statistical Review of World Energy.

Tab. 4. US LNG export terminals

No.	Terminal	Operator	Location	Estimated annual liquefaction capacity in million tonnes	Status
1.	Sabine Pass LNG	Cheniere	Gulf of Mexico/Louisiana	29.5	Operational
2.	Corpus Christi LNG	Cheniere	Gulf of Mexico/Texas	15	Operational
3.	Freeport LNG	Freeport LNG	Gulf of Mexico/Texas	6	Operational
4.	Calcasieu Pass	Venture Global	Gulf of Mexico/Louisiana	12	Operational
5.	Cameron LNG	LLC Sempra	Gulf of Mexico/Louisiana	15	Operational
6.	Plaquemines LNG	Venture Global	Gulf of Mexico/Louisiana	28	Operational
7.	Cove Point LNG	Cove Point LNG LP	Atlantic/Maryland	5.75	Operational
8.	Elba Liquefaction Terminal	Southern Liquefaction Company	Atlantic/Georgia	2.5	Operational
9.	Golden Pass LNG	QatarEnergy/ExxonMobil	Gulf of Mexico/Texas	18.1	Operational
10.	Port Arthur LNG Faza I	Sempra/CoconoPhillips	Gulf of Mexico/Texas	13	Under construction
11.	Rio Grande LNG	NextDecade	Gulf of Mexico/Texas	27	Under construction

12.	Woodside Louisiana LNG	Woodside Energy	Gulf of Mexico/ Louisiana	27.6	Operational
13.	CP2 Faza 1	Venture Global	Gulf of Mexico/ Louisiana	28	Operational
Planned total annual production capacity in 2030				227.45 (313, 65 m³)	

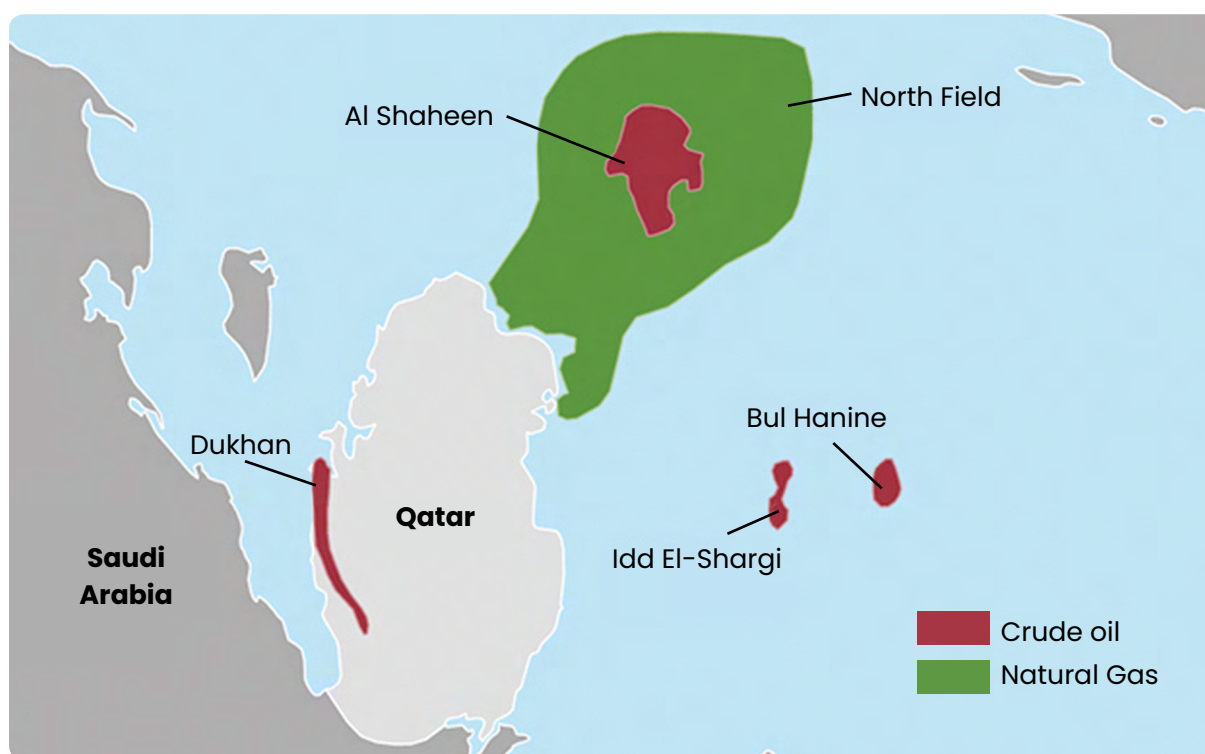
Source: Own study based on data published by terminal infrastructure owners and the US Energy Information Administration

Qatar:

Dr. Marcin Sienkiewicz

Qatar holds the world's third-largest documented natural gas reserves, after the Russian Federation and Iran. These reserves are located off the country's north-eastern coast in the North Field, which is shared with Iran¹³¹ and are estimated at 871 billion cubic metres¹³². Through the effective development of its domestic resources, Qatar has become the world's second-largest LNG supplier and plays a crucial role in maintaining the stability of the global market, particularly by ensuring secure supplies to Asian and European consumers. Qatar's energy policy seeks to increase natural gas production and expand the export capacity of its LNG facilities. Its strategic objective is to maintain the country's leading position in global LNG sales over the coming years¹³³.

Fig. 32. Map of Qatar's main oil and gas reserves (as at September 2025)



Źródło: Energy Information Administration

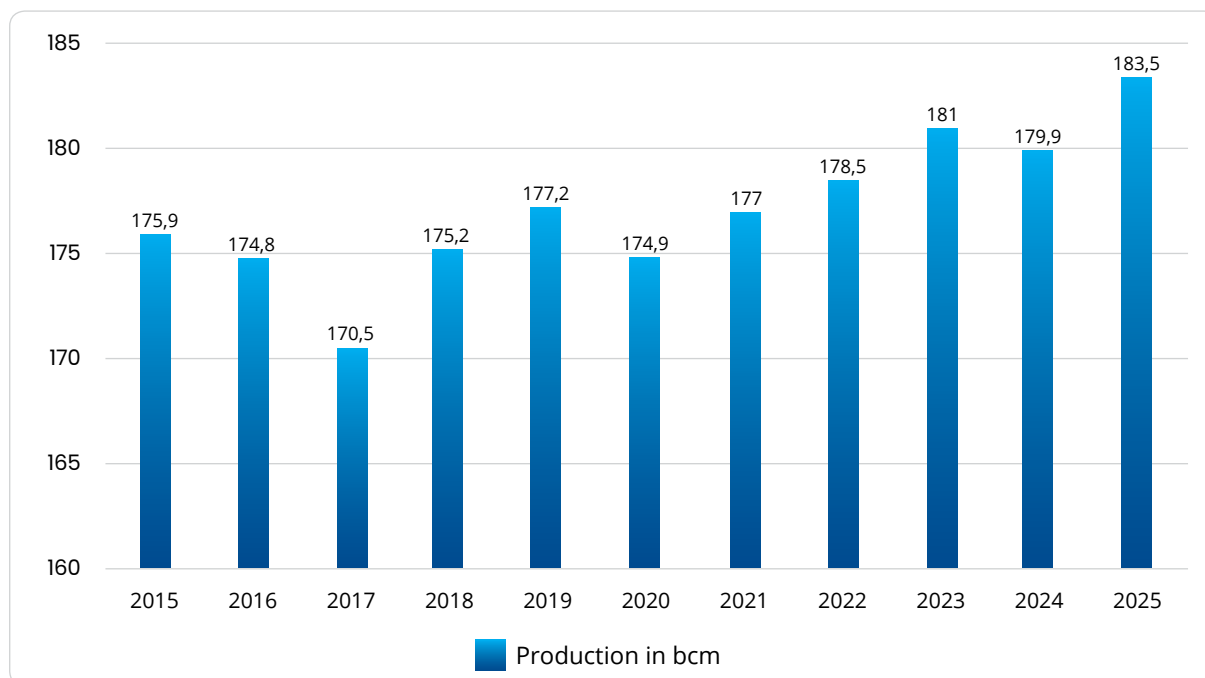
131 Qatar Energy LNG, *North Field* [access: 07/07/2026: <https://www.qatarenergylng.qa/english/About-Us/North-Field>].

132 Service of the Republic of Poland, *Qatar. A short description of the economy and its structure*, [access: 07/07/2026: <https://www.gov.pl/web/katar/informator-ekonomiczny>].

133 The State of Qatar, *Energy* [access: 14/08/2026: <https://imo.gov.qa/priorities/energy>].

The LNG production hub is located in the Qatari city of Ras Laffan and covers a total area of 7.8 km². Developed since the 1980s, the industrial complex – owned by the state-controlled QatarEnergy – currently comprises 14 liquefaction trains with a combined annual production capacity of 77 million tonnes of LNG. QatarEnergy is currently implementing three infrastructure projects: North Field East (NFE), North Field South (NFS) and North Field West (NFW). Once commissioned, these projects are expected to increase Qatar's LNG production capacity to 142 million tonnes per annum (MTPA) by the end of 2030¹³⁴.

Fig. 33. Dynamics of natural gas production in Qatar in 2015–2025.



Source: Own study based on: Energy Institute, 2026 Statistical Review of World Energy.

Tab. 5. Qatar's LNG export terminals.

No.	Terminal	Owner	Location	Annual liquefaction capacity million tons	Status
1.	Ras Laffan LNG Terminal	Qatar Energy 100%	Persian Gulf	77	Operational
2.	NFE LNG	Qatar Energy 75%	Persian Gulf	33	Under construction
3.	NFS LNG	Qatar Energy 75%	Persian Gulf	16	Under construction
4.	NFW LNG	Qatar Energy 100%	Persian Gulf	16	Under construction
Planned total annual production capacity in 2030				142 (195.82 billion m³)	

Source: QatarEnergy

¹³⁴ Qatar Energy, *LNG: cleaner source of energy* [access: 26/08/2026: <https://www.qatarenergy.qa/en/whoweare/Pages/WhatIsLNG.aspx>]

Australia

Kamil Moskwik

For most of the past decade, Australia was the world's largest exporter of liquefied natural gas. It currently ranks third, behind the United States and Qatar. At the beginning of 2026, ten liquefaction facilities were operating in the country, with a combined nominal production capacity of up to 88 million tonnes per year. However, one 2.5 million-tonne train at the North West Shelf terminal has been permanently decommissioned, reducing effective capacity to approximately 85 million tonnes¹³⁵. A further 5 million tonnes of annual capacity is under construction as part of the second production train at Pluto LNG.

A distinctive feature of the Australian supply chain is the parallel operation of two separate production models. The first is based on conventional gas extracted from offshore fields in Western Australia and the Northern Territory, while the second uses coal seam gas (CSG) produced in Queensland. This dual structure shapes both the geographical distribution of terminals and the flow of feedgas between upstream operations and liquefaction facilities. In Queensland, gas is sourced from dispersed CSG fields in the Surat and Bowen basins and transported through transmission pipelines to the concentrated liquefaction infrastructure on Curtis Island, off the coast of Gladstone. The Australia Pacific LNG project—owned by ConocoPhillips (47.5%), Origin Energy (27.5%) and Sinopec (25%)—transports gas through a 530 km pipeline. Its facilities comprise two production trains, each with a capacity of 4.5 million tonnes per year, two storage tanks with a capacity of 160,000 cubic metres each, and an LNG carrier loading berth¹³⁶. Parallel pipelines serving the neighbouring Gladstone LNG and Queensland Curtis LNG projects also lead to Curtis Island, creating a compact export cluster comparable in scale to those in the United States.

Under the Western Australian model, the supply chain is organised around offshore projects in which gas is extracted at sea and transported through subsea pipelines to onshore facilities such as North West Shelf, Gorgon and Wheatstone—or, in one case, to the Prelude floating LNG facility. Maintaining export capacity during the second half of the current decade depends on two projects intended to supplement the feedgas resource base. The first is the Scarborough field in the Carnarvon Basin, located approximately 375 km off the Pilbara coast. It is connected by a 433 km pipeline to the second train under construction at the Pluto LNG terminal, which will have a capacity of approximately 5 million tonnes per year. The first cargo is scheduled for the fourth quarter of 2026¹³⁷. The second is Santos's Barossa field, which commenced production in January 2026 and enabled the restart of Darwin LNG, suspended since 2023 following the depletion of its previous resource base. At the same time, regulatory risk is increasing. The average period for decisions on exploration applications is 562 days, while development applications take an average of 400 days. These delays directly affect the commissioning schedules for additional liquefaction capacity and Australia's ability to maintain full export volumes after 2030¹³⁸.

135 Institute for Energy Economics and Financial Analysis (IEEFA), *Australian Gas and LNG Tracker*, [access: 10/07/2026: <https://ieefa.org/australian-gas-and-lng-tracker/>].

136 Australia Pacific LNG, *Liquefied Natural Gas* [accessed : 10/07/2026: <https://aplng.com.au/liquefied-natural-gas/>]

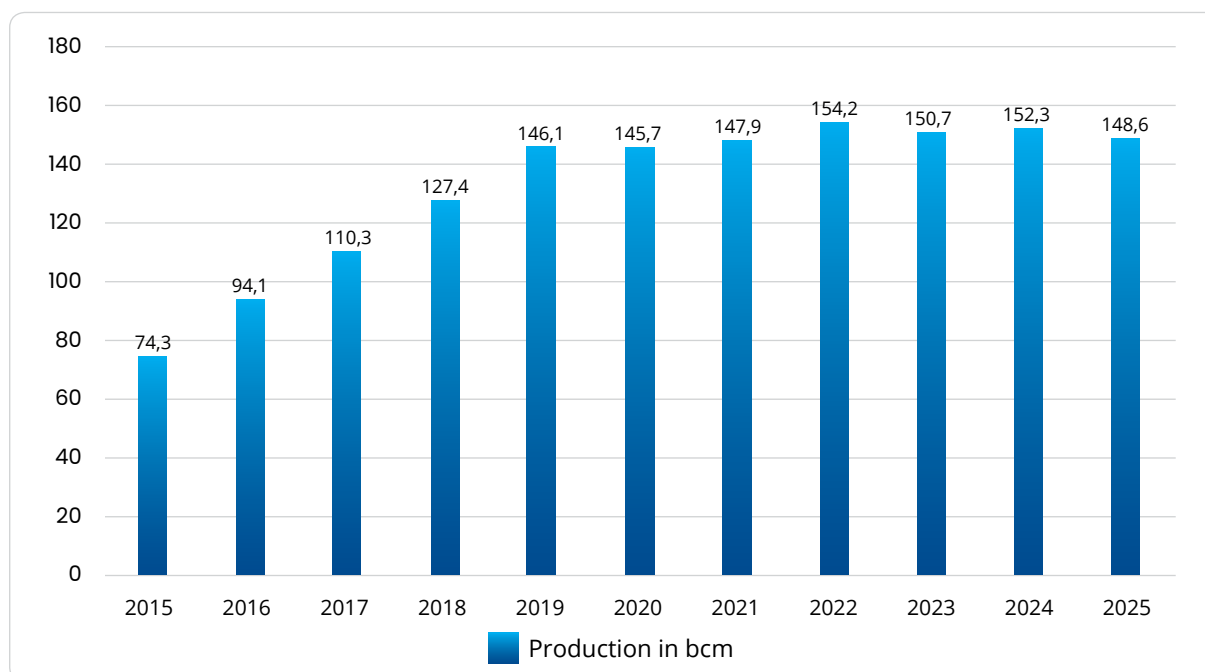
137 Woodside Energy, *Scarborough Energy Project and Pluto Train 2*, [access: 10/07/2026: <https://www.woodside.com/what-we-do/growth-projects/Scarborough-Energy-Project>]

138 Asia Natural Gas & Energy Association (ANGEA), *Natural Gas & Energy In Australia*, [access: 10/07/2026: <https://angeaassociation.com/location/australia/>]

An exceptionally high level of infrastructure utilisation is characteristic of Australia's mid-stream LNG segment. Utilisation of the country's export terminals remained above 90% between 2021 and 2024, despite structurally lower utilisation at the Gladstone LNG facility and the Prelude unit. This level is attributable not only to the performance of long-term contractual obligations, but increasingly to volumes sold on the spot market, whose share of total exports rose to 25% in 2024¹³⁹. Australian producers are therefore increasingly adopting a model resembling US portfolio operations, in which access to feedgas and available liquefaction capacity constitutes a tradable asset rather than merely a means of fulfilling contractual obligations.

The demand side, meanwhile, is characterised by a high concentration of export destinations. In 2024, the largest export markets were China, with a share of 33%, Japan with 32%, South Korea with 15%, and Taiwan with 10%. These four markets therefore absorbed 90% of Australia's export volume¹⁴⁰. China overtook Japan as the largest buyer for the first time that year, although the structure of Chinese demand is changing to Australia's disadvantage. The share of Australian LNG in Chinese imports fell from 45% in 2019 to 35% in 2024, while Chinese companies concluded new long-term agreements with Qatar and US suppliers¹⁴¹. Japanese companies have also become important trading intermediaries within the supply chain. The volume of LNG resold by them to third countries increased by more than 250% between the 2018 and 2023 financial years and already represented more than half of Japan's LNG imports. This means that a substantial proportion of cargoes formally delivered under contracts with Japanese buyers is ultimately redirected elsewhere.

Fig. 34. Dynamics of natural gas production in Australia in 2015–2025.



Source: Own study based on: Energy Institute, 2026 Statistical Review of World Energy.

139 IEEFA, op. cit.

140 IEEFA, op. cit.

141 IEEFA, op. cit.

Tab. 6. Australian LNG export terminals.

No.	Terminal	Owner/operator	Location	Annual liquefaction capacity in million tonnes	Status
1.	North West Shelf LNG	Woodside Energy (operator)	Karratha, Western Australia / Indian Ocean	16.9	Operational
2.	Pluto LNG (T1)	Woodside Energy	Burrup Peninsula, Western Australia	5.1	Operational
3.	Gorgon LNG	Chevron	Barrow Island, Western Australia	15.6	Operational
4.	Wheatstone LNG	Chevron	Onslow, Western Australia	8.9	Operational
5.	Prelude FLNG	Shell	Browse Basin / Western Australian Shelf	3.6	Operational
6.	Ichthys LNG	INPEX	Darwin, Northern Territory	8.9	Operational
7.	Darwin LNG	Santos	Darwin, Northern Territory	3.7	Operational
8.	Queensland Curtis LNG	Shell	Curtis Island, Queensland	8.5	Operational
9.	Gladstone LNG	Santos	Curtis Island, Queensland	7.8	Operational
10.	Australia Pacific LNG	ConocoPhillips 47,5% / Origin Energy 27,5% / Sinopec 25%	Curtis Island, Queensland	9.0	Operational
11.	Pluto LNG (T2, projekt Scarborough)	Woodside Energy	Burrup Peninsula, Western Australia	5.0	Under construction
Planned total annual production capacity in 2030				93.0 (128.25 billion m³)	

Source: Own study based on data published by owners terminal infrastructure and IEEFA, Australian Gas and LNG Tracker

Trinidad and Tobago

Kamil Moskwik

Trinidad and Tobago is the oldest exporter of liquefied natural gas in the Atlantic Basin and remains an example of a highly vertically integrated model in which the individual segments of the supply chain have been adapted to a limited and regionally concentrated resource base. The entire system was developed around a single liquefaction facility—Atlantic LNG at Point Fortin on the south-western coast of Trinidad—making it structurally different from the dispersed Australian and US clusters¹⁴². The upstream segment is based on fields located in the waters surrounding Trinidad and operated by companies including bpTT, Shell and EOG

¹⁴² Atlantic LNG, *Atlantic at a Glance*, [accessed : 10/07/2026: <https://atlanticlng.com/about-us/atlantic-at-a-glance/>]

Resources. Average gas production over the past five years amounted to slightly more than 34 billion cubic feet per year, or approximately 1 billion cubic metres. At its peak, LNG sales reached 17 billion cubic metres annually, representing 3.5% of global exports and making Trinidad and Tobago the world's seventh-largest producer¹⁴³. Feedgas is supplied to the liquefaction facility through the National Gas Company of Trinidad and Tobago, which acts as a commercial intermediary: it purchases gas from upstream companies and resells it to the Point Fortin facility¹⁴⁴. This structure separates upstream risk from liquefaction risk. Historically, it facilitated the conclusion of agreements with end customers despite the resource base being divided among several operators.

Atlantic LNG has a nominal liquefaction capacity of 14.8 million tonnes per year, distributed across four production trains commissioned successively between 1999 and 2005. The trains use the Phillips Optimized Cascade process, in which gas is cooled by refrigerants until it reaches a liquid state at atmospheric pressure¹⁴⁵. Train 1, commissioned in 1999, continues to hold the record for the lowest unit construction cost of any LNG facility. However, it has not produced LNG since 2020 because of insufficient gas supply from offshore fields. In January 2026, the operator confirmed that Train 1, the least efficient unit in the complex, would be decommissioned in the fourth quarter of 2026¹⁴⁶. The system's effective operating capacity will therefore amount to 11.8 million tonnes per year across Trains 2, 3 and 4.

A fundamental change in the midstream architecture resulted from the restructuring of Atlantic LNG, completed in December 2023. The previous arrangement of separate holding companies for individual trains was replaced by a single entity with a common ownership structure. A new commercial structure for Trains 2 and 3 took effect on 1 October 2024¹⁴⁷. The merged company is owned by bp, Shell and the National Gas Company, while China Investment Corporation has withdrawn from the consortium. The restructuring enabled the facility to purchase gas from third parties, including operators outside the existing shareholder group. This changes the logic of a segment previously based on parallel ownership of upstream fields and liquefaction capacity.

The maritime component of the supply chain is concentrated around the port infrastructure at Point Fortin, which comprises two loading jetties, each 700 metres long, together with an approach channel and turning basin. Each berth can accommodate LNG carriers with a capacity of approximately 171,000 cubic metres¹⁴⁸. Atlantic LNG does not conduct exploration, distribution or shipping activities, limiting its operations to liquefaction. This reflects the traditional allocation of roles along the value chain: exploration and production companies handle upstream operations; the gas intermediary and plant operator manage the mid-

143 Trinidad and Tobago NGL Limited (TTNGL), T&T's Energy Sector [access: 10/07/2026: <https://ngl.co.tt/about/tts-energy-sector/>].

144 Ministry of Energy and Energy Industries of Trinidad and Tobago, *Liquefied Natural Gas (LNG)*, [accessed : 10/07/2026: <https://www.energy.gov.tt/our-business/lng-petrochemicals/liquefied-natural-gas-lng/>]

145 Atlantic LNG, op. cit.

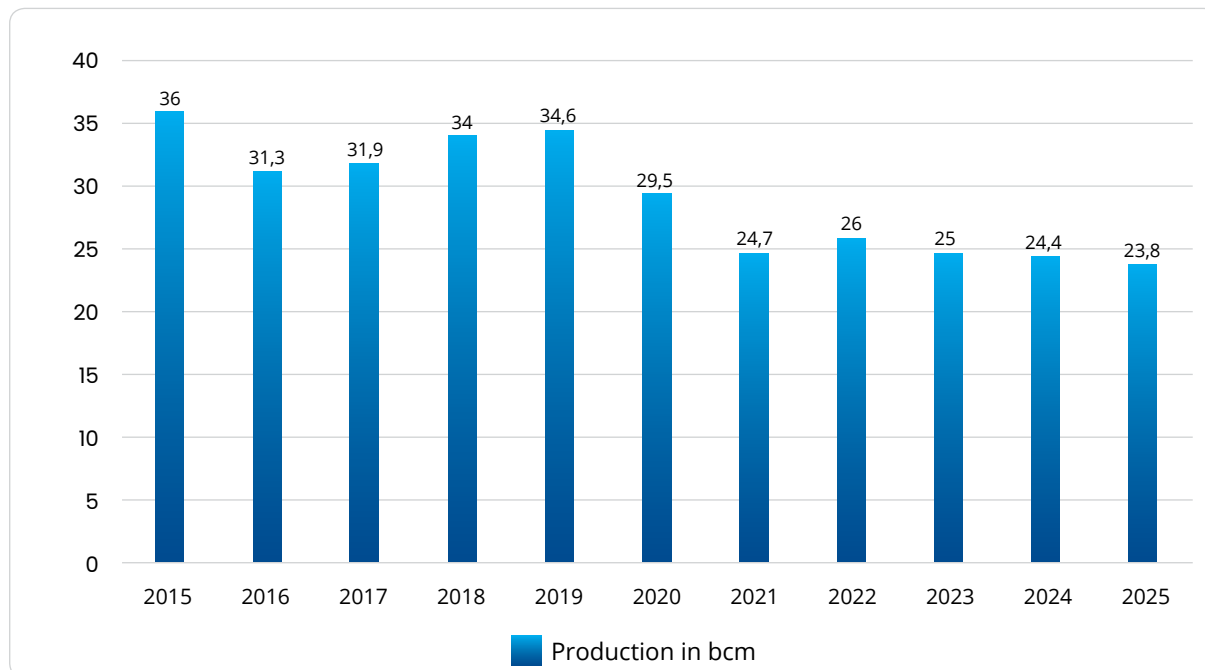
146 The Energy Year, *Atlantic LNG to decommission Train 1 due to gas shortage* [access: 10/07/2026: <https://theenergyyear.com/news/atlantic-lng-to-decommission-train-1-due-to-gas-shortage/>].

147 bp, *Annual Report and Form 20-F 2024*, p. 261; cf. Trinidad Express, BP confirms plans to „decommission” Train 1 [access: 10/07/2026: https://trinidadexpress.com/business/local/bp-confirms-plans-to-decommission-train-1/article_c75ca9d6-fee8-11ef-a61b-f398b8e86619.html].

148 Atlantic LNG Company of Trinidad and Tobago, *Atlantic at a glance*.

stream segment; and LNG traders purchase cargoes and deliver the gas into transmission networks in destination countries¹⁴⁹.

Fig. 35. Dynamics of natural gas extraction in Trinidad and Tobago in 2015–2025.



Source: Own study based on: Energy Institute, 2026 *Statistical Review of World Energy*.

Tab. 7. Export liquefaction capacity of Trinidad and Tobago.

No.	Terminal	Owner/ operator	Location	Annual liquefaction capacity in million tons	Status
1.	Atlantic LNG – Train 1	bp / Shell / NGC	Point Fortin, Trinidad / Sea Caribbean	3.0	Excluded, mmissioning from Q4 2026
2.	Atlantic LNG – Train 2	bp / Shell / NGC	Point Fortin, Trinidad / Sea Caribbean	3.3	Operational
3.	Atlantic LNG – Train 3	bp / Shell / NGC	Point Fortin, Trinidad / Sea Caribbean	3.3	Operational
4.	Atlantic LNG – Train 4	bp / Shell / NGC	Point Fortin, Trinidad / Sea Caribbean	5.2	Operational
Nominal plant capacity / effective operating capacity after 2026				14.8 (20.41 billion m)	

Source: Own study based on data from Atlantic LNG, Atlantic at a Glance

¹⁴⁹ Ministry of Energy and Energy Industries of Trinidad and Tobago, op. cit.

Russian Federation

Dr. Marcin Sienkiewicz

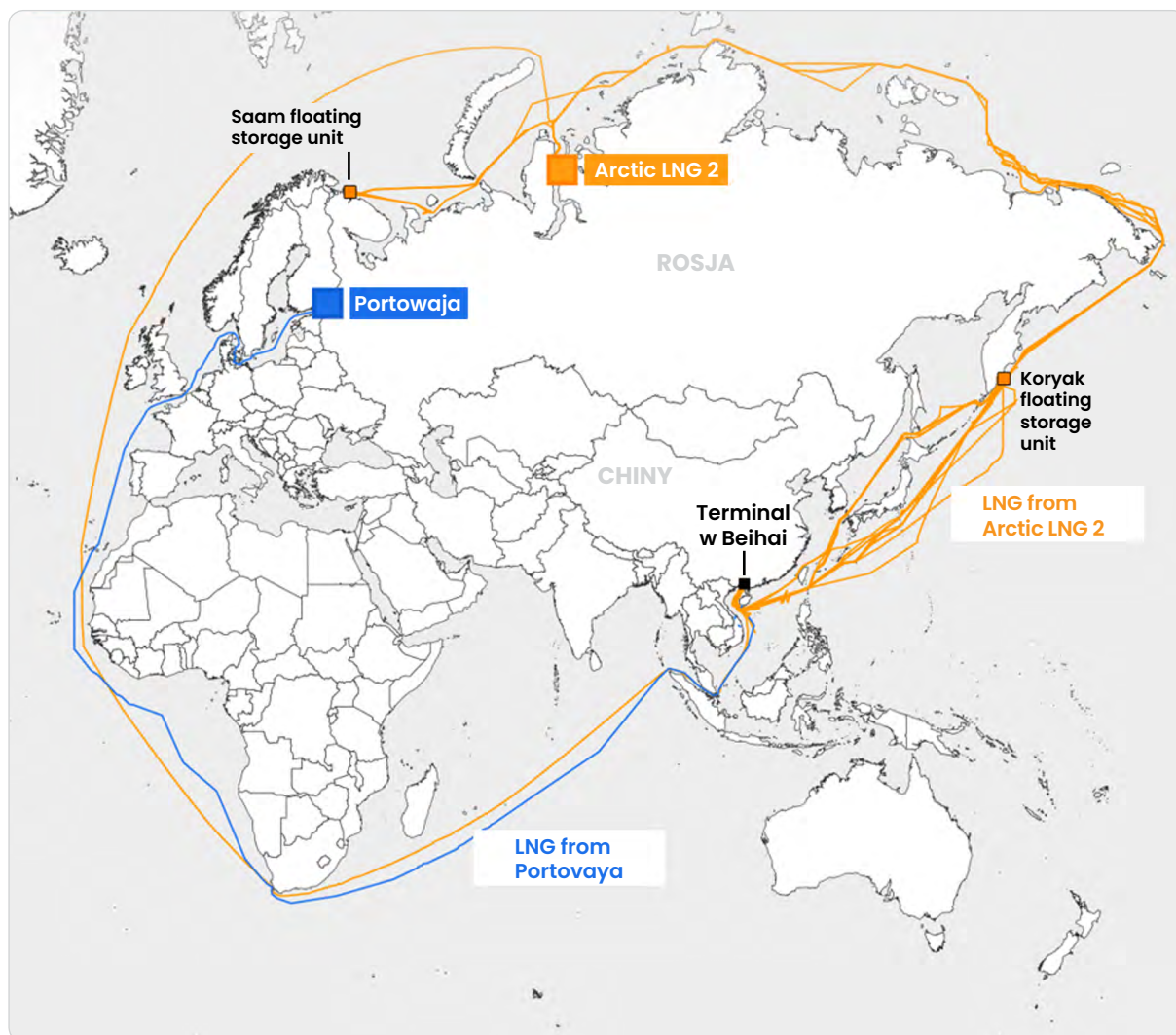
Under the *Long-Term Programme for the Development of Liquefied Natural Gas Production in the Russian Federation*, approved by the Russian government in March 2021, Russia's LNG production capacity is expected to increase to a maximum of 140 million tonnes per year by 2035. At the same time, the Russian authorities declared their intention to increase the country's share of global LNG trade systematically, potentially reaching 20–30%¹⁵⁰. Despite restrictions imposed by the EU and the introduction of a ban on Russian gas imports after 2027, the Russian state continues to develop its LNG production capacity. In 2022, Russia had two major gas liquefaction facilities: Sakhalin-2, owned by an international consortium and having a nominal capacity of 9.6 million tonnes per year, and Novatek's Yamal LNG facility, with an annual production capacity of up to 17.4 million tonnes. Two smaller liquefaction terminals are located on the Baltic coast: Cryogas-Vysotsk, constructed by Novatek and having a production capacity of 0.66 million tonnes per year, and Gazprom's Portovaya LNG facility, with an annual liquefaction capacity of 1.5 million tonnes. In 2022, Russian companies sold a total of 45.7 billion cubic metres of gas—equivalent to 33 million tonnes of LNG—on foreign markets, of which 19.2 billion cubic metres was delivered to European markets¹⁵¹. However, the People's Republic of China is becoming the principal market in which Russian LNG producers seek to sell their output. According to data published by the International Centre for Defence and Security (ICDS), Russian pipeline gas exports to China increased from 15 billion cubic metres in 2022 to 38 billion cubic metres. Over the corresponding period, LNG supplies increased from 9 billion cubic metres to 15 billion cubic metres¹⁵².

150 S. Kardaś, *Wielkie ambicje: rosyjska ekspansja na rynku LNG (Great Ambitions: Russia's Expansion in the LNG Market)*, [access: 25.06.2026, <https://www.osw.waw.pl/pl/publikacje/komentarze-osw/2021-05-17/wielkie-ambicje-rosyjska-ekspansja-na-rynku-lng>]

151 M. Rashad, E. Chow, C. Aizhu, *China lines up second LNG terminal for sanctioned Russian cargoes, sources say*, Reuters [dostęp: 01.07.2026 r. w: <https://www.reuters.com/business/energy/china-lines-up-second-lng-terminal-sanctioned-russian-cargoes-sources-say-2026-06-22/>]

152 ICDS, J. Lough, *Has the China-Russia Partnership Peaked?*, [dostęp: 26.06.2026 r. w: <https://icds.ee/en/has-the-china-russia-partnership-peaked/>]

Fig. 36. Map showing the routes of Russian LNG shipments from the sanctioned Portovaya (in blue) or Arctic LNG 2 (in orange) terminals to the Chinese Beihai terminal.



Source: France24

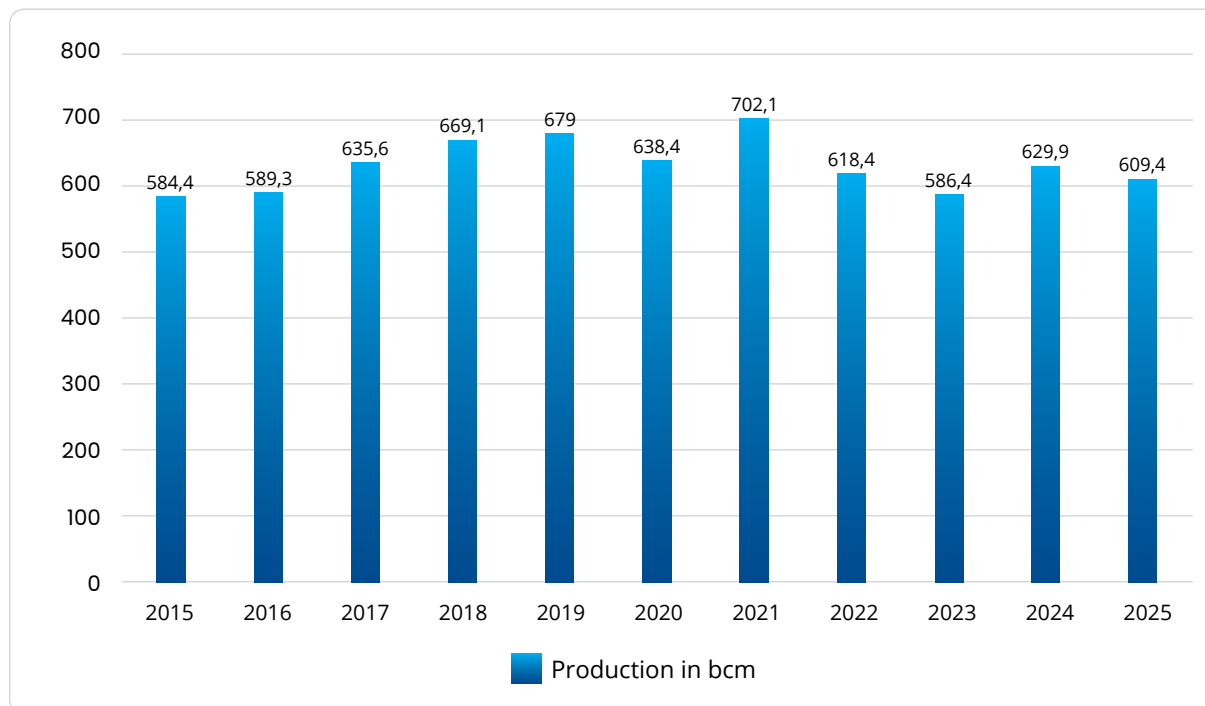
The aforementioned company Novatek is developing two additional large-scale LNG export terminals¹⁵³. The first, Arctic LNG 2, is located on the coast of the Gydan Peninsula in the Yamalo-Nenets Autonomous Okrug. The project is being constructed in stages and is ultimately intended to comprise three liquefaction trains with a combined production capacity of 19.8 million tonnes per year¹⁵⁴. The second facility is located in Murmansk on the coast of the Barents Sea. Following completion of the first construction phase in 2027, the terminal is expected to reach an annual production capacity of 13.6 million tonnes of LNG. Completion of the second expansion phase by 2030 is expected to add a further 6.6 million tonnes of annual capacity¹⁵⁵.

153 V. Afanasiev, *Russia declares breakthrough in LNG compressor manufacturing capability* [access: 24 June 2026; <https://www.upstreamonline.com/lng/russia-declares-breakthrough-in-lng-compressor-manufacturing-capability/2-1-2006976>].

154 *Arctic LNG 2 Terminal*, [access: 24/06/2026: https://www.gem.wiki/Arctic_LNG_2_Terminal].

155 "Offshore Technology", *LNG terminal profile: Murmansk LNG Liquefaction Terminal, Russia*, [access: 25 June 2026: <https://www.offshore-technology.com/data-insights/murmansk-lng-liquefaction-terminal-russia/>].

Fig. 37. Dynamics of natural gas production in the Russian Federation in 2015–2025.



Source: Own study based on: Energy Institute, 2026 *Statistical Review of World Energy*

Tab. 8. Russian LNG export terminals.

No.	Terminal	owner	Location	Annual liquefaction capacity in million tons	Status
1.	Yamal LNG	Novatek	Yamal Peninsula/ Arctic Ocean	9.6	Operational
2.	Sachalin-2	Gazprom	Sakhalin Island/ Pacific Ocean	17.4	Operational
3.	Gazprom	Portowaja LNG	Baltic Sea coast	1.5	Operational
4.	Cryogas-Vysotsk	Novatek	Baltic Sea coast	0.66	Operational
5.	Arctic LNG 2	Novatek	Gydan Peninsula / Arctic Ocean	19.8	Under construction
6.	Murmańsk LNG	Novatek	Kola Peninsula/ Barents Sea	20.2	Under construction
Planned total annual production capacity in 2030				71.16 (98.13 billion m³)	

Source: Own study based on data published on the Internet

4.2. Selected sources of LNG supply: analysis of political factors

United States

Agata Łoskot-Strachota

The United States is regarded as Poland's most important ally in foreign and security policy and as the strongest partner within the Euro-Atlantic security system. Formal Polish-US co-operation on LNG supplies began in 2017 with the signing of the first contract between PGNiG and the US producer Cheniere Marketing International¹⁵⁶. Warsaw regards the development of cooperation with the United States as a desirable means of ensuring predictable and secure natural gas imports into Poland¹⁵⁷. Cooperation with US suppliers is also intended to support Poland's ambition to become a regional centre for gas trading and distribution¹⁵⁸. However, the strategic status of energy cooperation with the United States should not preclude an analysis of the potential risks affecting US LNG supplies. Some arise from the specific characteristics of the US oil and gas sector. According to some sources, growth in US production potential will slow in the coming years because of the characteristics of gas extraction, including associated gas produced alongside oil. At the same time, domestic US demand is expected to increase, driven by the digital sector and data centres, among other factors, as well as by growing demand for feedgas at export terminals. Competition for US gas and upward pressure on its price are therefore expected to intensify¹⁵⁹. In the political sphere, risks may arise from the domestic situation in the United States and the continuing deep divisions between the Republican Party—particularly the Make America Great Again movement—and the Democratic Party over the direction of energy and climate policy. A Democratic victory in a future election could potentially result in a reversal of the current policy supporting US hydrocarbon production and exports. A scenario cannot therefore be excluded in which a Democratic administration reintroduces administrative restrictions affecting the LNG sector, constraining the future development of production and slowing supply growth during the next investment cycle—that is, over the medium or long term¹⁶⁰.

Questions concerning the security and stability of US LNG supplies also arise from the increasingly visible differences and tensions in US-EU relations regarding American interests and actions on the international stage—including those concerning Greenland and the war

156 Ministry of State Assets, *The first contract for regular deliveries of American LNG to Poland*, 21/11/2017, <https://www.gov.pl/web/aktywa-panstwowe/pierwszy-kontrakt-na-regularne-dostawy-amerykanskiego-Ing-do-polski>, [access: 03/04/2026].

157 More on the initiation of gas cooperation between Poland and the United States, among others, in: M. Sienkiewicz, *The importance of natural gas in Polish-American relations*, pp. 119-133, in: „Dyplomacja i Bezpieczeństwo” 2017/2018, no. 1 (5).

158 ORLEN, *ORLEN develops the strategic Baltic project Eagle Gas Hub*, 26/06/2026, <https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/biezace/2026/czerwiec-2026/orlen-rozwija-strategiczny-projekt-baltic-eagle-gas-hub>, [access: 18/08/2026]; Radio Gdańsk, *President of GAZ-SYSTEM: “Poland will become a gas hub for Europe”* 17/08/2026, <https://radiogdansk.pl/audycje/gosc-radia-gdansk/2026/08/17/prezes-gaz-systemu-polska-stanie-sie-hubem-gazowym-dla-europy/>, [access: 19/08/2026].

159 See e.g. BloombergNEF, *Global Gas and LNG Outlook*, <https://about.bnef.com/insights/commodities/global-gas-and-Ing-outlook/#overview>

160 For example, Democratic Senator Sheldon Whitehouse criticised President Donald Trump's executive orders removing administrative restrictions on the oil and gas industry. In his view, they undermine state policies developed over decades to protect the environment and reduce carbon dioxide emissions. US Senate Committee on Environment & Public Works, *Whitehouse Slams Trump's Executive Order as Cost-Raising Giveaway to Big Oil, Assault on State Sovereignty*, 9 April 2025, <https://www.epw.senate.gov/public/index.cfm/2025/4/whitehouse-slams-trump-s-executive-order-as-cost-raising-giveaway-to-big-oil-assault-on-state-sovereignty>, [access: 4 July 2026].

in Iran—and the manner in which those interests are pursued. This has raised concerns that Washington might instrumentalise Europe's dependence on US LNG. Over the longer term, the US strategy of expanding LNG production and exports may also come into conflict with the EU's policy of phasing out fossil fuels¹⁶¹. US–EU tensions also emerged during negotiations on the customs agreement between the two parties¹⁶². According to the US President, rejection of the agreement by Members of the European Parliament could result in the EU losing 'favourable access' to US LNG¹⁶³. Ultimately, however, the European Parliament approved the agreement with the United States in June 2026¹⁶⁴.

Nor can the current US administration's willingness to influence the rules governing gas trade in the Western Hemisphere be excluded. It could potentially seek similar influence in the Middle East—including Iran—in the event of victory in the Gulf war, or over the transport of gas through strategic chokepoints such as the Strait of Hormuz and the Panama Canal. It is also conceivable that the United States might seek some degree of influence over Russian gas trading. Such objectives have not, however, been formally or unequivocally confirmed. If achieved, they could give the United States a dominant position in the global gas market, potentially enabling it to influence gas flows, destination markets and prices¹⁶⁵.

Concerns about the US administration instrumentalising gas supplies are mitigated by the existing nature of gas trading relationships and the structure of the US gas market. First, LNG exporters are primarily private US companies whose dependence on and cooperation with the federal administration is significantly lower than in Russia. Moreover, the oil and gas industry itself exercises a degree of influence over the current White House administration. Second, Europe is the principal market for US LNG, accounting for 68% of total US exports in 2025¹⁶⁶. To achieve its objective of increasing sales, the United States has an interest in maintaining stable and reliable supplies, which would make their instrumentalisation more difficult. A permanent redirection of significantly larger volumes to other major markets, including China, would also be difficult because the relevant supply routes are longer and more expensive and political tensions between Washington and Beijing persist. Even if China were to lift its restrictions on US LNG, it would not appear to be in the interests of the United

161 One example of these differences was German Environment Minister Carsten Schneider's criticism of the US President's decision to revoke the official 2009 assessment of the risks posed by greenhouse gases, issued during Barack Obama's presidency. The German minister emphasised that Germany remained committed to climate protection and was reducing its emissions each year. A. Widzyk, *Trump Repeals Climate Regulations: Criticism from Berlin*, Deutsche Welle, 13/02/2026, <https://www.dw.com/pl/trump-znosi-regulacje-klimatyczne-krytyka-z-berlina/a-75949282>, [access: 04/07/2026].

162 On 27 July 2025, US President Donald Trump and European Commission President Ursula von der Leyen announced a political agreement on the framework for an EU–US trade agreement. Under the agreement, most goods exported from the EU to the United States were to be subject to a 15% tariff. Polish Institute of International Affairs (PISM), *Agreement on the European Union–United States Trade Deal*, 30 July 2025, <https://www.pism.pl/publikacje/porozumienie-w-sprawie-umowy-handlowej-unia-europejska-usa>, [access: July 4, 2026].

163 P. Bera, *Trump Gives the EU a Tariff Ultimatum and Uses Gas as Leverage: Sanctions on Europe Are Possible*, money.pl, 25 March 2026, <https://www.money.pl/gospodarka/trump-daje-ultimatum-ue-ws-cel-i-szantazuje-gazem-sankcje-na-europe-to-mozliwe-7267756762843232a.html>, [access: July 4, 2026].

164 WNP.PL, *European Parliament Approves Tariff Agreement with the United States*, 16 June 2026, <https://www.wnp.pl/rynki/parlament-europejski-za-porozumieniem-z-usa-w-sprawie-cel,1072335.html>, [access: 14/08/2026].

165 Based on A. Łoskot-Strachota, *Excessive Dependence? The Growing Role of US LNG and Oil in the EU Market*, Centre for Eastern Studies (OSW), 4 February 2026, <https://www.osw.waw.pl/pl/publikacje/komentarze-osw/2026-02-04/nadmierna-zaleznosc-rosnaca-rola-lng-i-ropy-z-usa-na-rynku>

166 US Energy Information Administration (EIA), *US Natural Gas Exports to Grow Nearly 30% by 2027 as LNG Facilities Ramp Up*, 16 April 2026, <https://www.eia.gov/todayinenergy/detail.php?id=67484>, [access: 06/07/2026].

States to increase its dependence on the Chinese market. Finally, the current structure of the LNG market—shaped to a considerable extent by US trading practices—also appears to discourage the instrumentalisation of US–European gas relations. The growing liquidity and flexibility of LNG trading, its global nature, and the increasing prevalence of destination-free contracts and portfolio players reduce importers' dependence on individual suppliers and make it easier to secure alternative supplies when necessary. US companies also appear to use the structure and rules of this market to advance their own commercial interests. Their increasing global importance and market share, together with their role as a 'supplier of last resort' during market disruptions—such as the 2022–2023 crisis and the current crisis caused by the closure of the Strait of Hormuz—create opportunities to maximise profits. Measures taken by the US administration, including pressure to limit the application of EU regulations to third countries, also support their interests without fundamentally altering the existing rules of the market.

Qatar

Agata Łoskot-Strachota

Political relations between Poland and Qatar began with the formal establishment of diplomatic relations in 1989. Polish foreign policy regards Qatar as a friendly state with which the Republic of Poland shares significant economic interests. The practical diversification of Poland's natural gas import sources began with the first 20-year LNG supply contract concluded in 2009 with the Qatari company Qatargas—now QatarEnergy—and implemented from 2014. A supplementary agreement to the long-term contract was signed in 2017¹⁶⁷. Together, these agreements provide for annual deliveries to Poland of 2.1 million tonnes of LNG, equivalent to 2.7 billion cubic metres of gas following regasification, unloaded at the Świnoujście terminal¹⁶⁸. As noted in Chapter 1 of the Report, gas originating in Qatar accounted for 11.2% of Poland's total gas imports in 2025¹⁶⁹.

The risks to the continuity of contracted Qatari gas supplies do not arise from Qatar's policy towards Poland. There are currently no grounds for considering the instrumentalisation of gas supplies to Poland by Qatar to be probable. The principal challenge is Qatar's geopolitical location in the Persian Gulf region. The region comprises eight states with access to the Gulf coast: Bahrain, Iran, Iraq, Qatar, Kuwait, Oman—through the Musandam Governorate, a semi-exclave located on the Musandam Peninsula—Saudi Arabia and the United Arab Emirates. Together, these countries cover 4,642,676 km² and have a combined population of approximately 190 million. The Persian Gulf itself covers approximately 241,000 km²¹⁷⁰.

The Persian Gulf is characterised by quasi-permanent political and military instability dating back to at least 1973 and the first oil crisis. This instability results from the competing and sometimes conflicting interests and ambitions of regional actors, including Saudi Arabia and

167 *Government of the Republic of Poland, Diplomatic Relations between Poland and Qatar Were Established in September 1989*, 20 March 2023, <https://www.gov.pl/web/katar/relacje-dwustronne>, [access: July 20, 2026].

168 ORLEN, PGNiG: *Conclusion of a Supplementary Agreement with Qatar Liquefied Gas Company Limited (3)*, 14 March 2017, <https://www.orklen.pl/pl/relacje-inwestorskie/raporty-i-publicacje/Archiwum-PGNiG/Raporty-biezace/2017/01/raport-biezacy-nr-20-2017>

169 Minister of Energy, *Report on the Results of...*, op. cit., Warsaw, 2026, p. 11.

170 Encyclopaedia Britannica, *What Is the Persian Gulf and Where Is It Located?*, <https://www.britannica.com/summary/What-is-the-Persian-Gulf-and-where-is-it-located>, [access: 20/08/2026].

Iran, as well as the activities and interests of external powers and states such as the United States, Israel, the Russian Federation and the People's Republic of China. The region's oil and natural gas deposits—representing approximately 50% and more than 30% of global reserves respectively—and the production and supply of these commodities are treated by participants in the continuing political rivalry as both valuable strategic assets and instruments of economic pressure¹⁷¹.

Tab. 9 List of selected political and military conflicts in the Persian Gulf region in the period 1973–2026.

Date	Conflict	Pages	Consequences
1973	And the oil crisis	The US and other countries supporting Israel in the Yom Kippur War – Arab oil-producing states.	• Drastic increase in oil prices on world markets resulting from limited supply. • Economic recession in the USA and Western European countries in 1973–1975. • Development of the LNG sector as an alternative to crude oil.
1979		The pro-American Persian monarchy – Shia leader Ruhollah Khomeini	• Overthrow of the monarchy and establishment of a theocratic Islamic republic in Iran. • Iran considers the US an enemy. • A state of hostility and permanent conflict between Iran and Israel. • Second oil crisis.
1980 – 1988	Iranian Islamic Revolution	Iraq – Iran	• Status quo ante bellum. • Human and material losses of the belligerents.
1990	Iran-Iraq War	Iraq – Kuwait	• Military occupation of Kuwait by Iraq. • Annexation of Kuwait by Iraq.
1990 – 1991	Iraqi invasion of Kuwait	UN-Iraq Coalition	• Liberation of Kuwait. • Introducing international supervision of Iraqi oil trade. • Reduction of Iraq's military capabilities.
2003	First Gulf War	USA and coalition partners – Iraq	• Defeating Iraq. • Overthrow of Saddam Hussein. • The occupation of Iraq begins.

¹⁷¹ Given its limited thematic scope, the Report does not seek to provide a detailed account of the origins, evolution and current state of political and economic relations in the Persian Gulf region. This is a separate and complex subject, already extensively discussed in academic literature, which requires continuous monitoring and regularly updated research.

2003 – 2011	Stabilization mission in Iraq (occupation) – asymmetric warfare	USA and coalition partners – Makhdi Army (Shiites), Al-Qaeda (Jihadists Sunni), Iraqi Ba'ath Party.	- Political regime change in Iraq. - U.S.-Iraq Strategic Framework Agreement¹⁷². - US takeover of Iraqi oil resources - Maintaining the supremacy of the US dollar in oil trading.
2014 – 2020	War against the Islamic State (territories of Iraq and Syria).	The USA and its coalition partners, the Russian Federation – the Islamic State is treated as an organization seeking to create a Sunni caliphate in the Middle East.	- Defeat of the armed forces of the Islamic State. - The Islamic State has lost its territorial base. - Periodic increase in the role and influence of the Russian Federation in the Region.
2025	Twelve Day War.	Israel–Iran: Large-scale bombardment of Iranian nuclear facilities as part of Israel's Operation Rising Lion. Iran responded with missile and drone attacks against Israel.	- Weakening of Iran's military capabilities. - Destruction of facilities used to advance Iran's nuclear programme. - Iran has not, however, abandoned its nuclear programme or withdrawn support for its proxies, including the Houthi movement in Yemen, Hezbollah in Lebanon and Hamas in the Gaza Strip.
2026	Iran War*	USA, Israel – Iran, Hezbollah, Houthi Movement.	- Blockade of the Strait of Hormuz - Disruption of gas and oil supplies. from the Persian Gulf region and an increase in the prices of these commodities.

* At the time of writing, hostilities were ongoing. The outcome and full consequences of the conflict are not yet known.

Source: Prepared by M. Sienkiewicz.

The armed conflicts that have repeatedly affected the region over recent decades pose a genuine threat to the continuity of production and transportation of Qatari LNG, as well as the considerably smaller volumes of liquefied natural gas exported by the United Arab Emirates and Oman. Iranian missile attacks on Qatar's LNG facilities in March 2026 resulted in the loss of 17% of the country's export capacity, equivalent to 12.8 million tonnes of LNG per year. Qatar's resulting financial losses were estimated at USD 20 billion in annual LNG sales revenue. Repairing the damage and restoring production to pre-attack levels could take

¹⁷² The *US–Iraq Strategic Framework Agreement*, signed in 2008, is intended to normalise US–Iraqi relations through close economic, diplomatic, cultural and security cooperation. It also provides the foundation for a long-term bilateral relationship based on shared objectives. US Embassy in Baghdad, <https://iq.usembassy.gov/our-relationship/>, [access: 08/07/2026].

between three and five years, seriously disrupting Qatar's previously described plans for developing its LNG sector¹⁷³.

As demonstrated by the closure of the Strait of Hormuz in 2026, any major disruption to supplies from these countries—although affecting Asian states most severely—has consequences for the entire global gas market, including Europe. The principal effects are higher and more volatile prices and intensified competition for available volumes on the global market. The war in the Gulf can be expected to alter the export strategies of Qatar and the United Arab Emirates, including through measures intended to reduce their dependence on transportation through the Strait of Hormuz. The construction of new export pipelines cannot therefore be excluded. Options under consideration include a route to the Red Sea and the extension of an existing pipeline to an LNG terminal in Oman¹⁷⁴. Other possible responses include changes to the structure of exports, such as increasing the share of gas-derived products or energy-intensive goods that are easier to transport by sea or overland than natural gas itself. These developments could affect both the volume and share of Qatari LNG on the global market, as well as the commercial viability of supplying individual regions. At the same time, once peace has been restored and stable conditions for transporting gas through the Strait of Hormuz have returned, Doha is likely to seek to rebuild its reputation as a stable and reliable supplier, including among its European customers.

Australia

Kamil Moskwik

Australia is not one of Poland's direct LNG suppliers and, under foreseeable market conditions, is unlikely to become one. Geography is the decisive factor: the location of its liquefaction facilities in the Pacific Basin, the transport distance and freight costs make deliveries to Świnoujście uneconomic compared with US and Qatari cargoes. Australia's importance to Polish security of supply is therefore indirect, but not marginal. As the world's third-largest LNG exporter, Australia is a principal supplier to East Asian markets and thus stabilises demand that would otherwise shift towards the Atlantic Basin. Any sustained reduction in Australian export capacity transfers competition for cargoes to the Atlantic and raises prices in the market from which Poland obtains its supplies.

The first source of risk is domestic policy. From July 2027, Australia will require exporters to reserve 20% of their gas production for the domestic market. The measure is intended to prevent shortages and moderate domestic gas and electricity prices. Existing contracts will be exempt, but compliance with the requirement will become a condition for obtaining future export licences¹⁷⁵. Domestic pressure has structural foundations: in eastern Australia, the LNG sector absorbs most gas production, while the proportion available to the domestic market fell from 30% in 2019 to 26% in 2024¹⁷⁶. The conflict between exports and domestic demand means that any regulatory decision prioritising the domestic allocation of spot

173 M. El Dahan, A. Mills, Y. Saba, *Iran Attacks Wipe Out 17% of Qatar's LNG Capacity for Up to Five Years, QatarEnergy CEO Says*, Reuters, 19 March 2026, <https://www.reuters.com/business/energy/iran-attack-damage-wipes-out-17-qatars-lng-capacity-three-five-years-qatarenergy-2026-03-19/>, [access: 14/08/2026].

174 *In Qatar Energy Sector Damage is Severe and the Way Back Will be Long*, NY Times, 14 May 2026, <https://www.nytimes.com/2026/05/14/business/qatar-lng-iran.html>

175 Enerdata, *Australia to Introduce a 20% Domestic Gas Reservation Obligation for LNG Exporters, 2026*

176 IEEFA, op. cit.

volumes would directly reduce terminal utilisation and the supply of flexible cargoes to the global market.

The second source of risk is the erosion of the resource base and the pace of administrative procedures. The depletion of existing producing fields means that maintaining export volumes depends on the timely commissioning of the Scarborough and Barossa projects and their successors. With average waiting times for regulatory decisions extending to several hundred days, every investment delay reduces utilisation of liquefaction facilities and, over the longer term, diminishes the attractiveness of further capacity-expansion projects.

The third category comprises the geopolitical risks inherent in the Pacific Basin. The concentration of 90% of exports in four East Asian markets makes the entire system highly vulnerable to tensions surrounding Taiwan and the South China Sea, as well as to disruption along routes passing through the straits of the Indonesian archipelago. A serious crisis in this region would not only interrupt supplies to Asian customers but also cause their demand to shift rapidly towards the Atlantic Basin. With the Strait of Hormuz already closed, this would result in the cumulative impact of two independent supply shocks. For Poland, which obtains more than one-third of its volumes on the spot market, this would represent the most severe price-risk scenario.

The fourth factor is the changing nature of Australian exports. The growing share of spot cargoes and the intermediary role played by Japanese portfolio traders weaken the link between the country of production and the country of final delivery. This reduces the transparency of actual destinations, but simultaneously benefits European customers. Under conditions of strong price arbitrage, volumes originating in Australia may reach Europe through portfolio players, increasing the flexibility of the global market and indirectly strengthening the negotiating position of importers such as Poland.

Trinidad and Tobago **Kamil Moskwik**

Trinidad and Tobago plays a marginal but tangible role in Poland's gas supply balance. In 2025, when the Świnoujście terminal received a record 81 cargoes totalling nearly 6 million tonnes, individual deliveries originated in Trinidad and Tobago and Senegal, compared with 62 from the United States and 17 from Qatar¹⁷⁷. Trinidadian cargoes are delivered to Poland on a spot basis, which accounted for more than one-third of the volume received in 2025. The significance of this source results from geography: the relatively short distance from Point Fortin to the European coast makes Trinidad one of the few sources of flexible Atlantic cargoes available at short notice. This is particularly valuable during periods of market tension, such as the current closure of the Strait of Hormuz¹⁷⁸.

177 Orlen, *ORLEN Accelerates Its LNG Expansion: More Deliveries, a Stronger Fleet and Growing Import Capacity* [access: 10/07/2026: <https://www.orlen.pl/pl/o-firmie/media/komunikaty-prasowe/biezace/2026/luty-2026/orlen-przyspiesza-w-lng-wiecej-dostaw-silniejsze-flota-i-rosnace-moce-importowe>].

178 WNP.pl, *A Rare Gas Supplier Arrives at Poland's LNG Terminal*, [access: 10/07/2026: <https://www.wnp.pl/energia/rzadki-dostawca-gazu-zawital-do-polskiego-terminala-lng,1072632.html>].

The risks affecting this source of supply are primarily economic and technological rather than political. The fundamental challenge to its long-term viability is the structural shortage of feedgas for the liquefaction facilities. As existing fields mature and new upstream projects are delayed, the Point Fortin facility has repeatedly operated below its nominal capacity. In 2024, approximately 9 million tonnes were exported against effective capacity of 12 million tonnes, corresponding to infrastructure utilisation of approximately 75%. This reverses the conventional logic of the LNG market: the bottleneck is neither liquefaction capacity nor maritime logistics, but the volume of gas available for liquefaction. Trinidad therefore represents an exceptional case within the global LNG landscape: it has established infrastructure and has historically played a significant role, yet its future depends on decisions extending beyond the supply chain itself.

The second and most serious risk is the dependence of future development on US sanctions policy towards Venezuela. The key project intended to supplement the resource base is the Dragon field in Venezuelan waters. Its estimated reserves amount to 4 trillion cubic feet, or 113 billion cubic metres, and it lies only several kilometres from a Trinidadian field connected by pipeline to Atlantic LNG. Trinidad and Tobago obtained a 30-year exploration and production licence from Caracas in December 2023, but implementation of the project depends on authorisation from the US Office of Foreign Assets Control (OFAC). The licence issued in October 2023 was revoked in April 2025 and subsequently replaced in October 2025 by a new phased licence. Its first phase covered negotiations only, expired in April 2026 and required the participation of US entities¹⁷⁹. Consequently, the availability of future Trinidadian volumes—including spot cargoes supplied to Europe—remains subject to a short and uncertain regulatory horizon determined in Washington rather than Port of Spain.

The third risk factor is the escalation of tensions between the United States and Venezuela and their potential consequences for shipping security in the southern Caribbean Sea. Trinidad's proximity to the area of a possible conflict means that a serious military crisis would threaten not only the Dragon project but also the routine operation of LNG carriers at Point Fortin.

The fourth risk is the extreme concentration of infrastructure. The dependence of the entire export system on a single facility and a single port, without any redundancy, means that a technical failure, labour dispute or port incident could halt the country's entire LNG exports. The fifth is competition from the US Gulf Coast, which displaced Trinidadian gas from the US market after 2016 and now competes with it along the same Atlantic routes at lower unit costs.

From the perspective of Poland's security of supply, Trinidad and Tobago is not a strategic source and cannot be regarded as an alternative to US or Qatari suppliers. Its role is to supplement the pool of flexible cargoes available in the Atlantic Basin, from which Poland obtains its spot supplies. The continuing decline in Trinidadian exports, the decommissioning of Train 1 and uncertainty surrounding the Dragon project are therefore reducing the volume of cargoes available outside long-term contracts. In a tight market, this translates into higher gas procurement costs for European consumers, including those in Poland.

¹⁷⁹ Trinidad Guardian, Government Obtains OFAC Licence for Dragon Gas Field, [access: 10/07/2026: <https://www.guardian.co.tt/news/govt-gets-ofac-licence-for-dragon-gas-field-6.2.2420494.d88f0666f3>].

Russian Federation

Agata Łoskot-Strachota

As already noted in the Report, Poland ended its imports of natural gas from the Russian Federation in 2022¹⁸⁰. From Poland's perspective, the Russian state continues to pose a long-term and structural threat to national security, particularly in the military sphere, as well as to energy security. Poland's gas supply diversification strategy eliminated its dependence on the Russian supplier and removed the risk of deliberate disruption to supplies from the east. Moreover, Poland was one of the key EU Member States contributing to the adoption of the EU strategy to phase out imports of Russian energy commodities completely. For Moscow, this entails both market costs—the loss of a market and revenue—and political costs, particularly a significant reduction in its ability to influence developments in Poland and the EU. It can be assumed with a high degree of probability that Russia regards, and will continue to regard, this situation as undesirable. In the short term, gas infrastructure is of critical importance. Import pipelines, interconnectors and the LNG terminal in Świnoujście could become targets of physical or cyber hybrid attacks commissioned or inspired by Russia. Damage to or permanent destruction of these assets could directly threaten the security of natural gas supplies to Poland.

As one of the principal participants in the global gas market, Russia will continue to seek to preserve its ability to influence developments within it. From the perspective of Poland and the EU as a whole, its activity in the LNG segment requires particular attention. It should be assumed that, despite the adverse conditions of recent years, the Russian state will consistently seek to develop its own LNG production and export capacity and strengthen the market position of its companies, particularly Gazprom and Novatek.

Russia is actively seeking to circumvent restrictions and legal provisions affecting its LNG trade. This creates various risks, including weaker enforcement of EU law and erosion of internal EU unity; difficulties in relations with alternative gas and LNG suppliers, including Azerbaijan and Türkiye; and accidents or collisions involving, for example, shadow-fleet vessels transporting Russian LNG. Such incidents could disrupt important transport routes and cause environmental damage.

Russia is also using—and will continue to use—every remaining opportunity to instrumentalise the EU's limited residual dependence on Russian gas. Immediately after Qatari supplies to global markets were suspended, the Russian Deputy Prime Minister suggested that Russia could redirect LNG destined for European customers to Asian markets with a greater need for it. At the same time, Vladimir Putin suggested that long-term gas cooperation could resume if the EU changed its policy. He criticised the EU decision to close its market to Russian gas, describing it as self-defeating¹⁸¹. As long as Russia's war against Ukraine and its hybrid war against Europe continue, Russia is highly likely to use gas supplies, including LNG, as an instrument of pressure. This may involve tempting Europe with the prospect of short-term

¹⁸⁰ For more information, see the DISE Report, *Natural Gas Held Hostage by Geopolitics: The Use of Natural Gas for Energy Purposes in the European Union in the Context of Geopolitical Factors*, Wrocław, 2022.

¹⁸¹ *Kremlin Says EU's LNG Plan Is Self-Defeating, Russia Will Find New Markets*, Reuters, 20 March 2026 <https://www.reuters.com/business/energy/russia-says-it-will-shift-new-markets-its-lng-eu-shooting-itself-foot-2026-03-20/> [access: 23/07/2026].

benefits while simultaneously exploiting its remaining dependency for Russia's advantage and Europe's detriment. Russia may also seek to increase deliveries of Russian gas, including LNG, to the EU once again, particularly if the war in Ukraine ends permanently. The scope for such action was evident in the first half of 2026, when the unavailability of Qatari gas led EU Member States to import significantly more Russian LNG than a year earlier, despite the strategic decision to phase out Russian gas imports¹⁸². Russia possesses the world's largest natural gas reserves and remains one of the producers geographically closest to the EU, with substantial production and export potential. A significant and sustained increase in exports would be possible only following the lifting of sanctions and an amendment to the regulation phasing out Russian gas. Pressure in this area can therefore be expected to intensify, both from Moscow and from entities within the EU interested in restoring Russian supplies. At the same time, a return to the scale and intensity of pre-war energy ties appears unlikely.

The continuing disruption of the global LNG market caused by the war in the Middle East has recently produced indications of growing interest within the EU in easing sanctions. This was reflected, among other things, in statements by Belgian Prime Minister Bart De Wever, who in March 2026 called on the EU to 'normalise relations with Russia' and consider postponing or abandoning the ban on Russian gas imports, including LNG, in response to the deepening energy crisis¹⁸³. For some EU countries, maintaining or increasing Russian supplies under current market conditions may be regarded as a means of balancing gas supply and demand, replenishing storage facilities and reducing gas prices. So far, however, such proposals have gained little support in Brussels or among most Member States. The EU still appears determined to implement an orderly and permanent phase-out of Russian gas imports.

4.3. Key LNG transport routes to Poland and the European Union – an assessment of geopolitical threats

Agata Łoskot – Strachota

Owing to its global nature and dependence on maritime transport, LNG trade is highly dependent on a range of factors beyond an importer's control, including the security and reliability of transport routes and logistics chains, as well as the conduct of producers, exporters and intermediaries. It is therefore exposed to numerous physical risks, primarily associated with the specific characteristics of LNG transport and supply routes. These risks are mitigated to some extent by the flexibility of the LNG market. The absence of fixed transport connections means that, in many cases, a supplier, shipping route or intermediary can be replaced. There are, however, clear limits to this flexibility and substitutability, arising from bottlenecks at critical points along export routes, the global availability of LNG and, ultimately, price levels.

As noted above, LNG trade relies on maritime transport. Its security and stability are crucial to the security and continuity of LNG supplies to European customers. This depends, among other factors, on conditions along the principal shipping routes and, in particular, on:

¹⁸² See D. Callanan, *Russian LNG Imports Hit Record High as Europe's Storage Dilemma Deepens*, Global LNG Hub, 16 July 2026, <https://globallnghub.com/russian-lng-imports-into-europe-hit-record-high-despite-falling-pipeline-flows/>

¹⁸³ "The Guardian", *Belgian PM condemned over call to repair relations with Russia to ease energy costs*, 13/03/2026, <https://www.theguardian.com/world/2026/mar/16/belgian-pm-bart-de-wever-call-repair-relations-russia-energy-costs-condemned>

- a. protecting strategic chokepoints against unlawful activities—including piracy, armed attacks, maritime terrorism and the blockade of ports or waterways—as well as against navigational and operational risks, such as collisions, accidental blockages and other incidents;
- b. the existence, development and international observance of rules governing transport and logistics chains, which may have complex structures, interdependencies and routes and generally cross both territorial and international waters.

The EU receives LNG primarily via six principal routes:

a. North Atlantic route

In 2025, the principal route, carrying more than 50% of Europe's LNG supplies, was the **North Atlantic route**. It is used to transport cargoes from US terminals, mainly those located on the Gulf Coast. Its importance is increasing and will continue to grow as US export capacity expands, production rises elsewhere in North and Latin America, and European imports increase. Potential LNG supplies from the west coasts of Mexico, Canada or Peru may also reach Europe via this route through the Panama Canal.

b. South Atlantic Route

The **South Atlantic route** is used to transport LNG from West African countries, including Nigeria, Angola, Senegal and Mauritania. LNG from Trinidad and Tobago also reaches the EU across the South Atlantic, as could supplies from Argentina in the future.

c. North European Route

The **Northern European route** was the second most important and is used for supplies from Russia and Norway. Its importance increased after the outbreak of Russia's full-scale war against Ukraine and rose again—temporarily—following the closure of the Strait of Hormuz in March 2026. However, its role is expected to decline sharply as EU legislation is implemented. Once the complete ban on imports of Russian LNG into the EU enters into force in 2027, volumes transported along this route are expected to fall by more than sevenfold.

d. Middle Eastern route

The **Middle Eastern route** is perhaps the most vulnerable of all. LNG transported to Europe along this route must pass through as many as three chokepoints: the Strait of Hormuz, the Bab el-Mandeb Strait and the Suez Canal. It then crosses the Mediterranean Sea and, in some cases, the Strait of Gibraltar. Under normal conditions, the route carries LNG from Qatar and, potentially, from the United Arab Emirates and Oman. However, conflicts and security challenges affecting these chokepoints since 2023, as discussed below, have contributed both to a reduction in Qatari supplies to Europe in favour of Asia and to the more frequent use of an alternative route around the Cape of Good Hope and Africa. The current war in the Persian Gulf has resulted in a—presumably temporary—decline in the importance of this route to virtually zero.

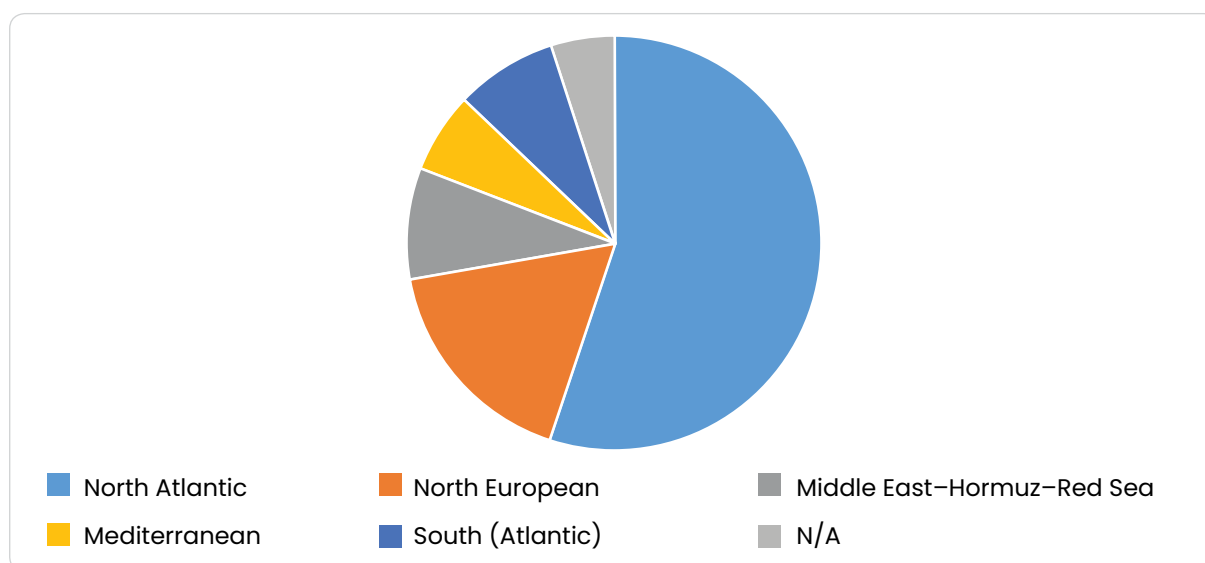
e. Mediterranean route

The **Mediterranean route**, which also forms part of the Middle Eastern route, carries LNG from Algeria to EU terminals, as well as supplies from Qatar, as described above. In the future, it could also be used for supplies originating in Egypt, Israel or Cyprus.

f. South African Trail

Finally, the **Southern African route**, running around the Cape of Good Hope and along the west coast of Africa, is used to a limited extent and on an irregular basis to supply LNG to the EU. It is primarily regarded as an important alternative emergency corridor for supplies from the Middle East, particularly when access to the Red Sea is disrupted, as has increasingly been the case since 2023. This is a very long route, increasing both delivery times—by an average of 10–15 days for cargoes originating in the Persian Gulf—and transport costs. Nevertheless, it can be used in emergencies for supplies from Qatar, the United Arab Emirates, Oman and Mozambique.

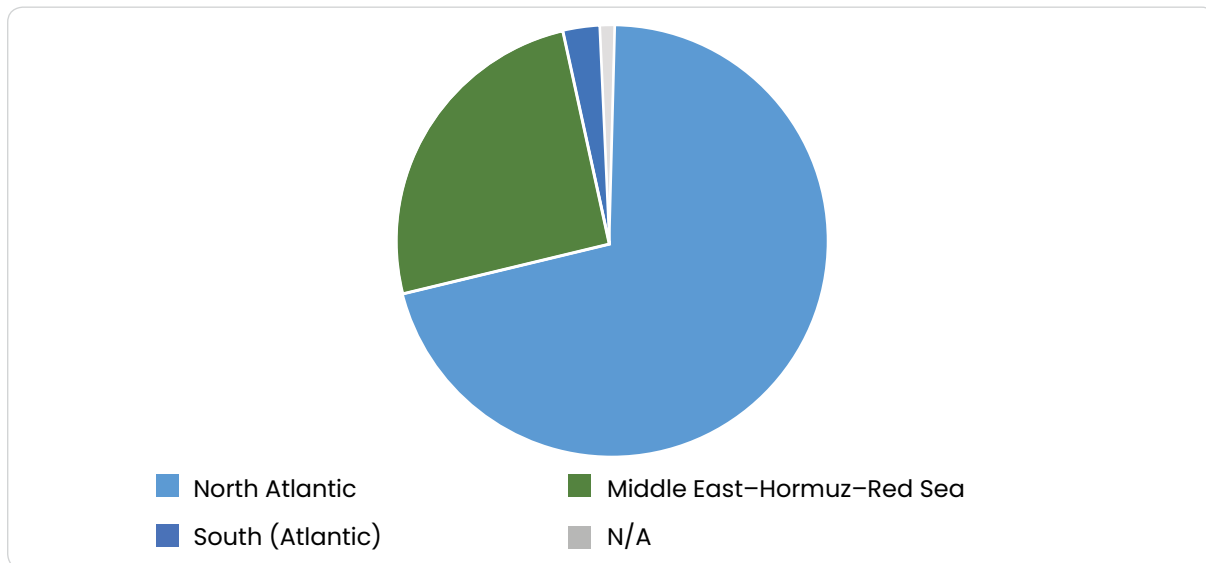
Fig. 38. LNG supply routes to the EU in 2025.



Source: Own study based on Eurostat data

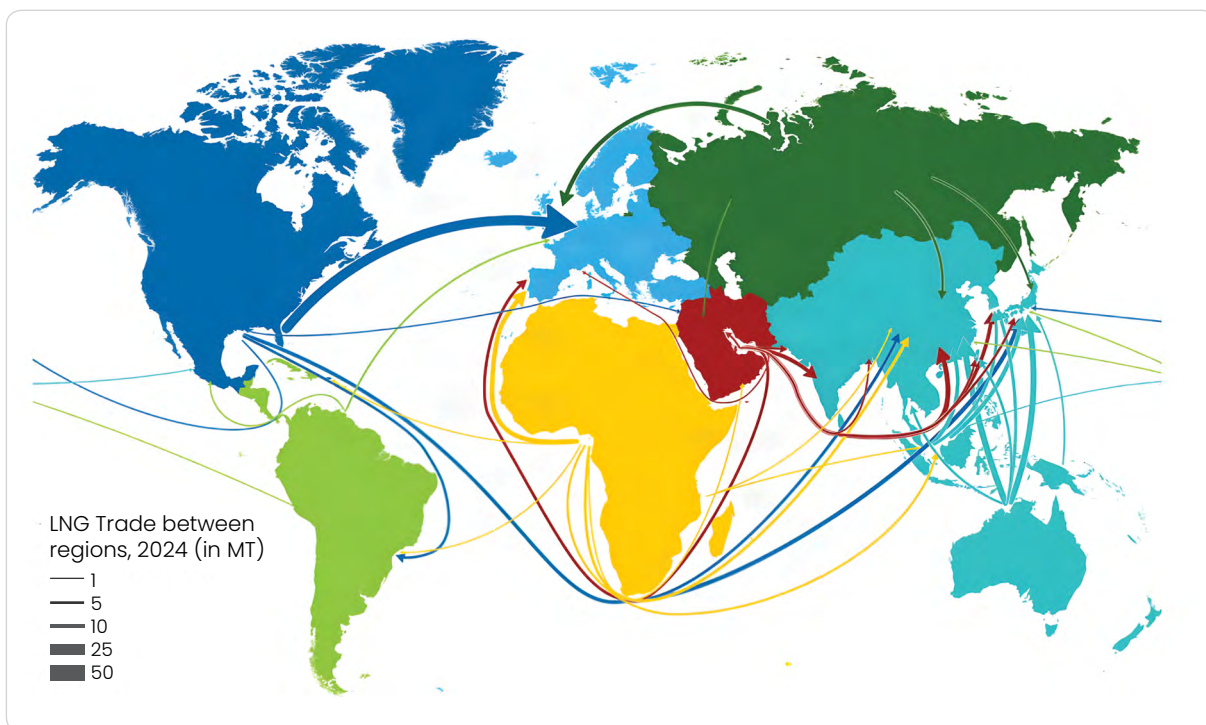
Poland's LNG supply routes are less diversified than those of the EU as a whole. The most important is the North Atlantic route, which accounts for more than 71% of supplies. The second is the Middle Eastern route—or, alternatively, the Southern African route—although, during the closure of the Strait of Hormuz, these supplies are being replaced by cargoes transported along other routes. Finally, individual cargoes reached the Polish market via the South Atlantic route in 2025.

Fig 39. LNG supply routes to Poland in 2025.



Source: Own study based on CIRE data

Fig. 40. Map of the main LNG supply routes around the world.



Source: IGU, 2025 World LNG Report

4.4. Chokepoints and risks along LNG supply routes to Poland and the European Union

Agata Łoskot-Strachota

The stability and security of LNG supplies along individual routes are exposed to the risk of physical disruption, particularly at so-called chokepoints. These are strategically important locations—narrow passages along maritime trade routes, usually straits or canals—where blockages or capacity restrictions result in significant delivery delays and higher transport costs and, in extreme cases, more serious disruption to trade. Access to straits and canals that are important to global maritime trade is governed by international law. While straits are expressly covered by the United Nations Convention on the Law of the Sea (UNCLOS)¹⁸⁴, canals—artificial waterways constructed and maintained by individual states—are governed by dedicated treaties and their use is generally subject to fees.

For Poland and the EU, the most important chokepoints are those located along the principal LNG supply routes currently in use and those whose importance is expected to increase in the future. At the same time, if gas demand rises suddenly or problems occur along one of the established major routes, other supply corridors—including those currently of lesser importance or not previously used at all—may become more significant, together with the risks associated with them. Among the world's strategically important chokepoints, the greatest risks to the stability and security of supplies to the EU arise from three located along the Middle Eastern route: the Strait of Hormuz, the Bab el-Mandeb Strait and the Suez Canal. This is due to the volume of EU imports transported from this region, the number of political challenges involved, and the intensity of regional tensions and conflicts. The security of the English Channel is also important to the EU as a whole, while the Danish Straits are critical to securing LNG—and other commodity—supplies to Poland, the Baltic States and Finland.

Strait of Hormuz

The Strait of Hormuz, located between Iran and Oman and connecting the Persian Gulf and the Gulf of Oman with the Arabian Sea and the Indian Ocean, is 54 km wide at its narrowest point. It is arguably the world's most important strait for LNG trade and is critical to Europe's oil and gas supplies. Under normal conditions, approximately 20% of globally traded LNG passed through it¹⁸⁵. The Strait's importance—and the extent to which its closure can disrupt LNG exports—became particularly evident in early March 2026, when Tehran blocked access to the Strait of Hormuz following the outbreak of war between Iran and Israel and the United States. The United States subsequently blocked exports from Iranian terminals. Despite peace negotiations, a temporary ceasefire and the partial resumption of shipping through the Strait, traffic remained approximately ten times lower in August 2026 than before the outbreak of the war¹⁸⁶. The closure has had its greatest impact on Asian countries, which previously received more than 80% of exports from the Persian Gulf. Its effects have nevertheless also been felt in the EU, particularly in countries importing Qatari gas—including Italy, Belgium, Poland and Spain—but also across the Union as a whole owing to higher prices and increased competition on the spot market.

184 Part III of the 1982 United Nations Convention on the Law of the Sea, including the right of transit passage.

185 The Strait also carries approximately 25% of global seaborne trade in crude oil and refined fuels. See IEA, Strait of Hormuz: Factsheet, February 202, <https://www.iea.org/about/oil-security-and-emergency-response/strait-of-hormuz>

186 See *Hormuz Traffic Still Low, Iran Seeks Concessions*, Argus Media, 12 August 2026, <https://www.argusmedia.com/en/news-and-insights/latest-market-news/2864029-hormuz-traffic-still-low-iran-seeks-concessions>

As already noted in the Report, the Strait of Hormuz was physically blocked as a consequence of the US–Iran war. Vessels attempting to transit the Strait are exposed to attacks, primarily by Iranian forces, as well as the risk of striking naval mines. A number of additional factors also impede the use of the Strait. Following the outbreak of the war—even before Iranian forces formally declared the blockade—international insurers either ceased providing cover for vessels seeking to transit the Strait or sharply increased insurance premiums because of the significant risk of damage and accidents arising from hostilities. Furthermore, any attempt to pass through the Strait requires negotiations with the unpredictable Iranian regime, including obtaining its consent and paying a levy for passage. Such arrangements may themselves be problematic. First, they legitimise a practice widely regarded as contrary to international rules governing access to straits that include international waters. Second, they may be challenged by the United States, which is a key LNG partner and supplier both to Europe and globally.

The restoration of unrestricted passage through the Strait will depend on the termination of the war. At the same time, the manner in which the conflict ends—and its impact on regional rivalries, including those between Israel and Iran and between the states of the Arabian Peninsula and Iran, as well as on Iran's political stability, governance and foreign policy—will undoubtedly affect both the durability of peace and the future conditions governing the use of the Strait for commercial shipping. Finally, the closure of the Strait—a critical transport node not only for LNG but also for crude oil, refined fuels and petroleum products destined for global markets—sets a precedent. It signals that unrestricted access to strategic points along international trade routes, and transport conducted in accordance with generally recognised rules, could also be challenged elsewhere in the world. This appears particularly possible in the case of states that are not parties to the United Nations Convention on the Law of the Sea (UNCLOS), including Iran, Israel and the United States.

Strait of Bab al-Mandeb and the Suez Canal

The Bab el-Mandeb Strait connects the Indian Ocean and the Gulf of Aden with the Red Sea. It lies between Yemen and the Horn of Africa states of Djibouti and Eritrea and is only 26 km wide at its narrowest point¹⁸⁷. Its importance to global trade, including trade in energy commodities such as LNG, increased following the construction and opening of the Suez Canal. The Suez Canal is located in Egypt and connects the Red Sea with the Mediterranean Sea. It is almost 200 km long and approximately 200 metres wide at its narrowest point. Vessels meeting specified size and cargo requirements may use it upon payment of the applicable transit fees¹⁸⁸. Freedom of navigation through the Canal is governed by the 1888 Convention of Constantinople¹⁸⁹. The use of these two chokepoints for transport towards Europe is closely interconnected. During periods of relative stability in the region, more than 8% of global LNG exports passed through the Bab el-Mandeb Strait and the Suez Canal in 2021–2022. These

187 See e.g. Bab-el-Mandeb, Wikipedia, <https://en.wikipedia.org/wiki/Bab-el-Mandeb> -

188 Canal Characteristics, SuezCanal, <https://www.suezcanal.gov.eg/English/About/SuezCanal/Pages/CanalCharacteristics.aspx>

189 *Convention Respecting the Free Navigation of the Suez Maritime Canal*, Cambridge University Press, 4 May 2017, <https://www.cambridge.org/core/journals/american-journal-of-international-law/article/abs/convention-respecting-the-free-navigation-of-the-suez-maritime-canal-signed-at-constantinople-october-29-1888/0A1DD4D14F9C601DB8044CBF424EF91E>

volumes began to decline in 2023 and reached their lowest level in 2024—below 1%—when the route was used almost exclusively to transport LNG to Egypt¹⁹⁰.

The principal challenge affecting the use of both chokepoints is security. This results from political instability in the region—including the civil war in Yemen and conflicts involving Iran—as well as partly related threats posed by armed groups, including the Iran-aligned Houthis, and criminal organisations engaged in activities such as piracy, particularly Somali piracy¹⁹¹. Since November 2023, Houthi forces have regularly attacked vessels transiting the Bab el-Mandeb Strait. As attacks became more frequent, commercial vessels—including oil and LNG carriers—began avoiding the Red Sea route and increasingly opted for the nearly twice-as-long voyage around Africa¹⁹². In addition, as part of their portfolio optimisation strategies, some market participants appear to have conducted swap transactions, with Qatari LNG being supplied more frequently to Asian markets and US LNG to Europe. Owing to the continuing risks and regional tensions, major international shipping companies did not resume using the Red Sea route in 2025. A return to the route was considered in early 2026, but these plans were frustrated by the outbreak of war in the Persian Gulf and the closure of the Strait of Hormuz, as discussed above.

Another potential threat to navigability, particularly through the Suez Canal, arises from weather conditions. Drought, in particular, may further restrict the number and size of vessels able to use the route.

Panama Canal

The Panama Canal is located in Panama, connects the Atlantic and Pacific Oceans, and is 80 km long. Its opening significantly reduced transit times on trade routes, including those linking the United States with Asian markets such as Japan, South Korea, Taiwan and China. The Canal does not currently play a direct role in LNG supplies to Europe.

From the perspective of the EU and Poland, its importance is primarily indirect. The physical and commercial availability of the Canal facilitates the transportation of LNG from the US Gulf Coast to Asian markets. This is disadvantageous to the EU because it intensifies competition for cargoes that could otherwise be delivered to Europe. This becomes particularly important during periods of disruption in global gas markets, such as those associated with the war in the Persian Gulf and the temporary unavailability of Qatari LNG. Owing to current shortages, particularly in Asian markets, the Canal is operating at full capacity¹⁹³, while the cost of securing transit slots through special auctions has risen sharply. Furthermore, as new or expanded LNG export capacity is commissioned in Canada, Mexico and Peru, the Panama Canal could also be used to transport LNG from these countries to the EU, provided that demand and prices are sufficiently high.

190 US Energy Information Administration, *World Oil Transit Chokepoints*, 3 March 2026, https://www.eia.gov/international/analysis/special-topics/World_Oil_Transit_Chokepoints

191 Coface, *Bab el-Mandeb Strait: Tension at a Global Trade Route*, 14 May 2025, <https://www.coface.ch/news-publications-insights/bab-el-mandeb-strait-tension-at-a-global-trade-route>

192 EIA, *Red Sea Attacks Increase Shipping Times and Freight Rates*, 1 February 2024, <https://www.eia.gov/todayinenergy/detail.php?id=61363>

193 *Panama Canal Operates at Full Capacity as LNG Tankers Reroute amid US–Iran War*, Marine Insight, 21 March 2026, <https://www.marineinsight.com/panama-canal-operates-at-full-capacity-as-lng-tankers-reroute-amid-us-iran-war/>

The 1977 Treaty Concerning the Permanent Neutrality and Operation of the Panama Canal, concluded between the United States and Panama, recognised the Canal as an international transit waterway and established its permanent neutrality¹⁹⁴. Nevertheless, its availability, navigability and use may be constrained by political factors, including the nature of US–China relations. Rising tensions and Chinese restrictions on imports of US LNG have reduced the use of the Canal for LNG shipments to Asia.

At the same time, control over the Canal itself has become a source of tension in bilateral relations. Since 1999, the Panama Canal has formally been under Panamanian control, although the United States remains its principal user, accounting for approximately 40% of traffic. In 2025, following Donald Trump's re-election as US President, Washington induced Panama to scale back its political and economic ties with China—including by withdrawing from the Belt and Road Initiative—and increased US influence over strategic port infrastructure around the Canal that had previously been under Chinese management, through the acquisition of a majority interest in its operator by the US investment company BlackRock. These developments may affect how the Canal is used, particularly for trade involving US commodities, including LNG. Its navigability and operational capacity are also affected by the consequences of climate change, including droughts and other extreme weather events, as demonstrated in 2024.

Strait of Malacca

The Strait of Malacca—a critical chokepoint in global trade—is located between the Malay Peninsula and Indonesia and connects the Indian and Pacific Oceans. At its narrowest point, near Singapore, it is less than 3 km wide. Approximately 90,000 vessels transit the Strait each year. It is a strategically important point along the supply and trade routes of Asian countries, including China. In the first half of 2025, almost 30% of global seaborne oil trade and 16% of LNG trade passed through the Strait of Malacca. Its importance to Europe is indirect and probably less significant than that of the Panama Canal. Any disruption to navigation through the Strait would increase demand from Asian countries for energy commodities normally transported along other routes, including those supplying Europe.

English Channel

Chokepoints located in the waters surrounding Europe are also important to the security of supplies to the EU and Poland. The two most significant for both the Union as a whole and Poland are the English Channel and the Danish Straits. The English Channel—known as La Manche in France—lies between France and Great Britain and connects the North Sea with the Atlantic Ocean. It provides German, Dutch, Belgian, Scandinavian and Baltic ports with access to the open ocean. At its narrowest point, the Strait of Dover, it is approximately 33 km wide¹⁹⁵. Between 400 and 500 vessels pass through the Channel each day, making it one of the world's busiest shipping corridors.

194 Treaty Concerning the Permanent Neutrality and Operation of the Panama Canal, <https://treaties.un.org/doc/Publication/UNTS/Volume%201161/volume-1161-I-18342-English.pdf>

195 See here and below: F. Loew-Turbout and J.-L. Shurmer-Smith, *The Dover Strait, English Channel: Global Maritime 'Choke Point' under Constant Pressure*, HAL Open Science, 27 June 2025.

The English Channel is not an artificial waterway like the Suez or Panama Canal, but a natural body of water between Great Britain and France. Consequently, it is governed primarily by the international law of the sea, particularly UNCLOS, including in the strategically important Strait of Dover. The Channel is an important supply route for terminals accounting for almost one third of the EU's LNG import capacity. In the first half of 2025, these terminals received 40% of all LNG imported by EU Member States¹⁹⁶. LNG supplies are now crucial to maintaining security and continuity of supply, given the sharp decline in Russian gas imports and the planned complete phase-out of such imports. The principal challenge associated with the English Channel appears to be its extremely heavy shipping traffic, which increases the risk of accidents. Navigation may also be difficult, particularly in shallower areas, while weather conditions—including sudden storms and hurricanes—create additional risks. The Channel is also a strategic corridor providing access to Europe and is therefore highly important to the continent's security and defence. As such, it is also taken into account in NATO defence planning¹⁹⁷.

Danish Straits

The Danish Straits comprise three straits passing through Danish territory: the Little Belt, the Great Belt and the Øresund. They connect the Baltic Sea with the Kattegat, the Skagerrak and the North Sea. Navigation through the Straits is governed by a special historical regime established by the 1857 Treaty of Copenhagen¹⁹⁸, which is recognised as the basis for freedom of passage through these waters, alongside the regime established under UNCLOS. The Danish Straits are among the world's busiest maritime chokepoints, with approximately 70,000 vessels passing through them each year. They constitute the only maritime supply route for crude oil, LNG and other commodities delivered to Poland, the Baltic States and Finland, while also serving as an important supply route to Sweden and Germany. The Straits provide access to terminals representing 9.6% of the EU's LNG import capacity, including all LNG terminals in Poland, Finland and the Baltic States¹⁹⁹. As access to the LNG market enabled these countries to discontinue imports of Russian gas as early as 2022, the terminals and the ability to supply them by sea are of strategic importance to their energy and economic security.

The physical characteristics of the Straits present challenges to navigability and access. Their shallow waters and narrow navigable channels, combined with varying sea currents, extremely heavy traffic and environmental requirements, make navigation difficult. Their accessibility is also affected by extreme weather events, including droughts, storms and hurricanes. Another major source of risk is Russia's continuing full-scale war against Ukraine and its associated hybrid campaign against Europe. First, physical disruption could arise from the activities of Russia's so-called shadow fleet, which often consists of ageing vessels. Accidental or deliberate incidents capable of temporarily restricting access to the Straits or reducing their capacity cannot therefore be ruled out. Cyberattacks could also potentially disrupt safe navigation through this chokepoint.

¹⁹⁶ Authors' own calculations based on data from Gas Infrastructure Europe (GIE) and calculations by the Institute for Energy Economics and Financial Analysis (IEEFA).

¹⁹⁷ Violet G. Johnston, Michael Kidd, Giana Farry, Mohamed Abdelsalam, Aakash Palathra, Andrew Velasquez, Strategic Relevance Of Maritime Chokepoints For Global Trade, The Defence Horizon Journal, 1 December 2025, <https://tdhj.org/blog/post/nato-maritime-chokepoints/>

¹⁹⁸ PASSAGE THROUGH THE GREAT BELT, Memorial of the Government of the Republic of Finland, December 1991, <https://icj-web.ileman.un-icc.cloud/sites/default/files/case-related/86/6885.pdf>

¹⁹⁹ Authors' own calculations based on data from Gas Infrastructure Europe (GIE) and calculations by the Institute for Energy Economics and Financial Analysis (IEEFA).

Finally, there is ongoing debate as to whether Denmark, as an EU Member State required to enforce EU law—including sanctions targeting Russian trade, particularly in energy commodities—may or should permit vessels carrying Russian goods to use the Straits. Such a prohibition would have a particularly severe impact on Russian oil exports, more than 30% of which are transported through the Baltic Sea. Under international law, however, Denmark cannot deny vessels from third countries access to the Straits provided that they comply with applicable pollution-control requirements²⁰⁰. Furthermore, the importance of the Straits to Russian imports and exports—including trade in energy commodities—is regarded by many as a form of insurance against more serious disruption to the operation of this route.

Conclusions:

- Purchasing LNG on the global market provides an alternative to Russian gas supplied through pipelines. Poland has successfully replaced Russian gas by contracting new volumes from several independent suppliers.
- The global LNG market and its logistics chains are not, however, free from threats. These threats may also be geopolitical in origin, as demonstrated by the renewed war in the Persian Gulf in 2026. The latest gas crisis—a supply shock caused by the closure of the Strait of Hormuz—may lead to structural changes in the gas market, forcing importing countries to review their existing procurement strategies.
- To safeguard its gas supplies, Poland should continue pursuing a diversification strategy and avoid allowing any single source of supply to become dominant once again.
- LNG supply security requires continuous monitoring and assessment of threats in three areas: sources of supply, LNG transport routes and maritime chokepoints. This will provide a basis for developing future trading strategies and selecting the most reliable partners.
- Despite the challenges and temporary reduction in global LNG availability caused by the closure of the Strait of Hormuz and damage to infrastructure in Qatar, LNG production and exports are expected to increase over the coming years, potentially resulting in oversupply.
- The largest increase in export capacity will occur in the United States, significantly strengthening its position in the global LNG market. Supplies transported via the North Atlantic route may be regarded as the most secure. The development of gas trade with the United States and, more broadly, with other suppliers in the Western Hemisphere, based on transparent, market-oriented rules, could strengthen the security of supplies to Poland and the EU.
- The availability of Russian gas on the European market is already restricted and will formally be eliminated in the near future. Considerable uncertainty nevertheless remains regarding the future role of Russian LNG after the end of the war in Ukraine. Regardless of the subsequent course and outcome of the war, maintaining the exclusion of Russian gas from the European market should be regarded as necessary, given the absence of any indication that the Russian state intends to abandon its imperial policy towards neighbouring countries.

200 Passing through? Russian Vessels in the Danish Straits, Gorrisen Federspiel, 2 April 2024, <https://gorrisenfederspiel.com/en/passing-through-russian-vessels-in-the-danish-straits>

5

ENERGY SECURITY IN THE CONTEXT OF GAS SUPPLIES



Chapter 5.

Energy security in the context of gas supplies

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Gas supplies, alongside storage capacity and domestic production, constitute one of the pillars of Poland's energy security. The development of import infrastructure located on the coast—the operational LNG terminal in Świnoujście and the planned LNG terminals in the Gulf of Gdańsk—combined with the contracting of gas from reliable producers guided by commercial considerations, is intended to guarantee stable supplies.

The sea plays a particularly important role as an environment conducive to trade and enabling the intercontinental transportation of energy commodities. Depending on the methodology applied, maritime transport accounts for between 85%²⁰¹ and 90%²⁰² of global freight. The seabed also allows gas to be transported from geographically closer sources, including directly from offshore fields, as in the case of Norwegian gas transported through the Baltic Pipe and the Baltic Sea deposits operated by ORLEN Petrobaltic. Although the latter are not of strategic importance, they demonstrate Poland's capabilities in the exploration, production and transportation of gas in a challenging marine environment ^{203, 204}.

The architecture of Poland's natural gas supply security system encompasses infrastructure investments, the contracting and continuity of supplies, domestic production and storage capacity. In 2023–2024, this system enabled Poland to establish and maintain the legally required level of gas stocks²⁰⁵. This demonstrates the effectiveness of the system and the strategic directions adopted. At the same time, account must be taken of the impact exerted on energy security by geopolitical factors and the changes in international relations that accompanied Donald Trump's presidency. Det Norske Veritas estimates that the consequences of the US–Israeli–Iranian conflict of March 2026 will affect both the time required to restore

201 US Navy's Military Sealift Command, NATO Shipping Working Group enhances maritime cooperation, 2022, [access: 31 March 2026: <https://www.msc.usff.navy.mil/Press-Room/News-Stories/Article/3041267/nato-shipping-working-group-enhances-maritime-cooperation/>]

202 NATO Standardization Office, Allied Joint Doctrine for Maritime Operations, NATO Standard AJP-3.1, Edition B, Version 1, 2025, p. 19

203 R. Miętiewicz, Capabilities of Naval Forces to Monitor the Condition of the B8 Field–Władysławowo Subsea Gas Pipeline, Bulletin of the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, No. 107, 2018, pp. 33–46, DOI: 10.24425/123723, p. 34

204 S&P Global, *Europe's surging LNG imports in 2025 reshape gas supply dynamics: traders*, [dostęp: 22.03.2026 r. w: https://www.spglobal.com/energy/en/news-research/latest-news/lng/010526-europes-surging-lng-imports-in-2025-reshape-gas-supply-dynamics-traders?utm_source=google&utm_medium=cpc&utm_campaign=q1_2026_global-inbound-website-ad-news_products-services-LNG&gad_source=1&gad_campaignid=21824151569&gbraid=0AAAAADz9Xd5ozrTTrBTlFPSlwKYhePm9X&gclid=Cj0KCQjw-pv7NBhCzARIsADKlfWw4eXPuUe0RtLYg24QiGrgY6GEGdnYjJghaDKPKCf0MesPyAgX7SG4aAhcoEALw_wcB].

205 M. Kaźmierczak, *Oil and Gas Economy as an Important Element of Shaping Poland's Energy Security*, Wiedza Obronna, Vol. 292 No. 3, 2025, p. 281 (259–283).

the production and maritime transportation of energy commodities and international confidence in the region. Energy security concerns will reinforce the transition towards renewable energy sources and nuclear power²⁰⁶.

Gas is supplied to Poland through infrastructure located on the Baltic coast, sometimes collectively referred to as the Northern Gateway. This infrastructure comprises the LNG terminal in Świnoujście, the Baltic Pipe and two pipelines transporting gas extracted from beneath the seabed in Poland's exclusive economic zone. The system is to be expanded by the addition of an FSRU terminal in the Gulf of Gdańsk. Following the completion of its expansion in 2024—including the construction of a third storage tank and an additional jetty—the Świnoujście terminal has an annual regasification capacity of 8.3 billion cubic metres, sufficient to cover almost half of Poland's domestic demand. The number of vessels handled by the terminal has continued to increase, reaching 81 by the end of 2025, 30% more than in the preceding year. During its first decade of operation, up to June 2026, the terminal received a total of 445 LNG deliveries. Its operational availability exceeded 99%²⁰⁷. In addition to regasification, the facility enables LNG storage and subsequent distribution through bunkering, transshipment and road transport. More than 50,000 LNG road tankers have been loaded at the terminal²⁰⁸. The offshore Baltic Pipe, recognised by the European Commission as a Project of Common Interest contributing to the strengthening of the EU's internal energy market, provides access to natural gas deposits on the Norwegian Continental Shelf. It is capable of supplying 10 billion cubic metres of gas annually, while shortening the transmission route by 800 km compared with the previous route through Germany. The Baltic section of the pipeline is 275 km long and crosses the maritime zones of Poland, Denmark and Germany, with approximately 200 km located within exclusive economic zones beyond territorial waters. The section laid on the seabed of the North Sea connects the Baltic Pipe system to the Europipe II pipeline running from Kårstø to Dornum in Germany. The Polish section follows a variable depth profile, from approximately 15 metres in its initial section to 55–60 metres. Other factors determining its exposure to threats include intersections with more than twenty infrastructure assets—including the Nord Stream and Nord Stream 2 pipelines and telecommunications cables—and heavy traffic along shipping routes A, B, C, E, I, L and M, frequently including their respective branches²⁰⁹.

The planned FSRU terminal in the Gulf of Gdańsk will comprise the necessary infrastructure and a floating unit capable of receiving LNG from carriers, storing it and regasifying it. The terminal will be able to receive up to 6.1 billion cubic metres of gas annually. The plans also provide for the possibility of mooring a second unit, although this will depend on market

206 DNV, *The likely effects of the Iran war on the global energy transition*, [access: 26 March 2026: https://www.dnv.com/energy-transition-outlook/the-war-in-iran-and-effects-on-the-global-energy-transition/?utm_id=&utm_campaign=GR_GLOB_26Q1_PROM_ETO_2026_Critical_mineral_supply_shocks&utm_medium=email&utm_source=Eloqua]

207 Gaz-System, Ten Years since the First Commercial Delivery to the LNG Terminal in Świnoujście, [access: 24/07/2026: <https://www.gaz-system.pl/pl/dla-mediow/komunikaty-prasowe/2026/czerwiec/17-06-2026-10-lat-od-pierwszej-kredytej-dostawy-do-terminala-lng-w-swinoujsciu.html>]

208 Gaz-System, A Record Year for GAZ-SYSTEM in 2025, [access: 04.02.2026: <https://www.gaz-system.pl/pl/dla-mediow/komunikaty-prasowe/2026/stychen/12-01-2026-rekordowy-rok-2025-w-gaz-system.html>]

209 R. Miętiewicz, Offshore Energy Infrastructure Assets: An Attempt to Assess Their Vulnerability to Attacks by Unmanned Platforms, *Alcumena Interdisciplinary Journal*, No. 3(15), 2023, pp. 205–226, DOI: 10.34813/pisc.3.2023.11.

conditions and the level of gas demand in Poland and the wider region²¹⁰. More than two decades of offshore production in the Baltic Sea have yielded, in addition to crude oil, over 535 million Nm³ of gas. Production from these fields is expected to continue until 2031, when the relevant licences expire. Associated gas from the B3 and B8 oilfields is transported through two pipelines, 75 km and 83 km long respectively. It supplies the combined heat and power plant in Władysławowo and is also consumed by customers in the region²¹¹.

The maritime gas transport system is complemented by a fleet of cryogenic tankers built in South Korea and owned by the Norwegian shipping company Knutsen. ORLEN, which char- ters the vessels, became one of the largest charterers of Aframax-class tankers on the spot market in 2024²¹². The importance of maritime transport is illustrated by the fact that a single cargo of approximately 70,000 tonnes of LNG is sufficient to meet the weekly demand of all Polish households²¹³. The principles governing ORLEN's use of this fleet should be subject to further discussion. In the Author's view, the vessels should not only bear Polish names but also sail under the Polish flag, be commanded by Polish captains and be crewed by Polish seafarers. This is particularly important in the context of contemporary maritime threats. In addition to meeting Poland's domestic requirements as a priority, a dedicated fleet offers the ability to respond flexibly to market developments, including emergencies such as crises, blockades or sudden increases in demand. Vessels chartered by ORLEN have delivered LNG to Japan, China, Thailand and Egypt, as well as to terminals in Western Europe²¹⁴. The market for cryogenic tankers is developing rapidly. At the end of 2024, the global LNG fleet com- prised 831 vessels, including 79 floating storage and regasification units (FSRUs). A total of 67 tankers were delivered during that year, compared with 41 in 2023. Orders were placed for 89 vessels, compared with 66 in the preceding year, while 103 vessels were scheduled for de- livery in 2025²¹⁵. Constructing such vessels in Poland, together with a fleet of smaller auxiliary ships, would undoubtedly stimulate economic activity and develop the capabilities of Polish shipyards to build highly specialised vessels for which there is strong global demand. This would require both the acquisition of appropriate industrial expertise and the existence of a robust Polish shipowner prepared to place orders for such vessels²¹⁶. A national fleet would constitute an important element in strengthening the security of supplies of this strategic commodity²¹⁷.

210 GAZ-SYSTEM S.A., FSRU Terminal in the Gulf of Gdańsk, 2026.

211 P. Kozłowski, Treasure Island in the Baltic: Five Million Tonnes of Oil in Three Decades, [access: 28/03/2026: <https://www.gdansk.pl/wiadomosci/Wyspa-skarbow-na-Baltyku-5-mln-ton-ropy-w-3-dekady,a,280458>, []].

212 B. Jask, ORLEN among the Largest Tanker Charterers in the First Half of the Year, PortalMorski.pl, 2024, [access: 21/03/2026: <https://www.portalmorski.pl/zegluga/55944-orklen-wi-polowie-roku-wi-lidze-najwiekszych-czarterujacych-zbiornikowce>].

213 PortalStocznioowy.pl, New LNG Carriers Ready for ORLEN, [access: 21/03/2026: <https://portalstocznioowy.pl/polskie-gazowce-lng-orklen-flota/>].

214 Orlen, ORLEN Expands Its LNG Carrier Fleet: Two New Vessels Ready [access: March 21, 2026: <https://www.orklen.pl/pl/o-firmie/media/komunikaty-prasowe/biezace/2026/marzec-2026/ORKLEN-rozwija-flote-gazowcow-Dwie-nowe-jednostki-gotowe>].

215 International Group of Liquefied Natural Gas Importers, *The LNG Industry: GIIGNL Annual Report*, 2024, p. 38.

216 Trojmiasto.pl, *Poland Has an LNG Terminal—but Can It Build Its Own LNG Carriers?* [access: 25/03/2026: <https://www.trojmiasto.pl/biznes/Mamy-terminal-LNG-czy-mozemy-zbudowac-polskie-gazowce-nl66587.html>]

217 R., Miętkiewicz, T., Chyła, *Does Poland need a fleet of LNG tankers ?*, IPE Analysis No. 1/2021, Ignacy Łukasiewicz Energy Policy Institute, p. 11.

5.1. The military dimension: naval capabilities and their deployment

The military component, represented in the maritime domain primarily by the navy, performs military, constabulary and diplomatic functions that are characteristic of, and unique to, this branch of the armed forces. Particular features and capabilities—including mobility, versatility, flexibility, operational readiness and combat potential—combined with freedom of navigation in international waters, make naval forces an instrument through which the state can pursue its interests at sea. The characteristics and attributes of naval forces arise directly from the nature of the maritime environment. Understanding this environment is essential to recognising the importance of the sea to national energy security. Equally important, although still insufficiently recognised by the public and political decision-makers, are the mutually reinforcing capabilities of naval forces as instruments for preventing conflicts, countering threats and shaping—or, in Poland's case, contributing to—the international security environment. The latter function requires clearly defined strategic objectives and appropriate state instruments for achieving them. The Navy constitutes precisely such an instrument²¹⁸. As vessels in state service, warships exercise public authority in implementing state policy. They represent the state and constitute its armed instrument for protecting both its territory and its interests²¹⁹, including beyond its own maritime zones. Warships are subject exclusively to the authority of their flag state and enjoy immunity. Consequently, except in circumstances provided for under international law ratified by that state, no foreign state may exercise authority over them or interfere with their internal affairs.

To pursue its strategic objectives effectively, the Republic of Poland, as a maritime state, should undertake measures designed to shape conditions favourable to its national interests, including the security of gas supplies. Given the geographical extent of the world's oceans and the number of maritime areas relevant to Poland's interests, as well as the provisions of strategic and doctrinal documents, Poland's maritime security environment should be considered across several dimensions: Baltic, European, Euro-Atlantic and global. National interests determine the potential operational areas of the Polish Navy. These include the Baltic Sea—with its gas import, production and transmission infrastructure—as well as the maritime areas through which gas is transported: the North Sea, the North Atlantic, the Mediterranean Sea and the Red Sea, extending as far as the Persian Gulf.

Naval operations should seek to preserve peace, uphold the rule of law and maintain high standards of environmental protection²²⁰. The Navy is particularly well suited to promoting national prosperity by protecting sea lines of communication, shipping²²¹ and infrastructure of critical importance to national security.

In the Baltic dimension, its responsibilities include preventing a maritime blockade of Poland, maintaining sea lines of communication, protecting critical offshore infrastructure and par-

218 R. Miętkiewicz, *Autonomous Systems in Maritime Operations*, Polish Naval Academy Publishing House, 2024, p. 277.

219 T. Szubrycht, *The Maritime Security of the State: An Outline of the Issue*, Polish Naval Academy, Gdynia, 2011, p. 157.

220 *Strategic Concept for the Maritime Security of the Republic of Poland*, National Security Bureau, Warsaw –Gdynia, 2017, p. 16

221 E. E. Björnehed, 'What Is the Value of Naval Forces? Ideas as a Strategic and Tactical Restriction', *Defence Studies*, 2021, DOI: 10.1080/14702436.2021.1931133.

ticipating in crisis-response operations²²². At the European and Euro-Atlantic levels, the EU and NATO—including NATO's standing naval groups—are the principal institutions responsible for maritime security²²³. Activities at these levels contribute to shaping the broader security environment. One example of EU action is EUNAVFOR ASPIDES. Its area of operation encompasses the Bab el-Mandeb and Strait of Hormuz, as well as international waters in the Red Sea, the Gulf of Aden, the Arabian Sea, the Persian Gulf and the Gulf of Oman. Its purpose is to protect shipping against multidomain attacks and improve maritime situational awareness in the region²²⁴. Another initiative is the US-led multinational maritime operation Prosperity Guardian, whose purpose is to protect Red Sea shipping routes carrying between 10% and 15% of global trade²²⁵.

Ultimately, the Polish fleet should have an optimised structure and sufficient forces to perform tasks in accordance with the adopted strategies and national interests in maritime areas of vital importance to the state. Such a Navy should become both an integral component of national defence capabilities — with frigates contributing to Poland's air-defence system — and an instrument for the sustained and consistent demonstration of state resolve beyond territorial waters, in cooperation with allies²²⁶. It should also be a balanced force, possessing sufficient capabilities to defend national sovereignty and protect Polish interests internationally while simultaneously making a limited but meaningful contribution of assigned forces to allied missions²²⁷.

With regard to the present capabilities of the Polish Navy, it should be noted that they can ensure the security of maritime gas supplies only to a limited extent. The principal weakness is the lack of a capability to conduct operations in maritime areas distant from Polish bases. Such capabilities are normally provided by the navies of coastal states through the deployment of frigates and larger vessels, as corvettes generally have insufficient operational capabilities. Poland's two existing former US frigates have limited combat value and are used primarily to maintain crew proficiency. Their capabilities have been further diminished by the absence of shipborne helicopters following the withdrawal of the Kaman SH-2G Super Seasprite helicopters from service in 2025. Poland's capabilities to counter subsurface threats—which extend far beyond mine warfare and are characteristic of hybrid conflict—are considerably stronger. They are provided by two classes of vessels: Kormoran II-class mine countermeasure vessels and two groups of modernised base minesweepers. Poland possesses a total fleet of 16 minesweepers, although many of the older vessels now have limited operational value. These forces are stationed in Gdynia and Świnoujście, allowing them to be deployed rapidly to protect infrastructure such as the LNG terminal, the Baltic Pipe and the FSRU facilities under construction.

222 *Conduct of Operations by the Navy*, DD-3.1(A), Ministry of National Defence, Doctrine and Training Centre of the Armed Forces, Bydgoszcz, 2018, p. 3–1.

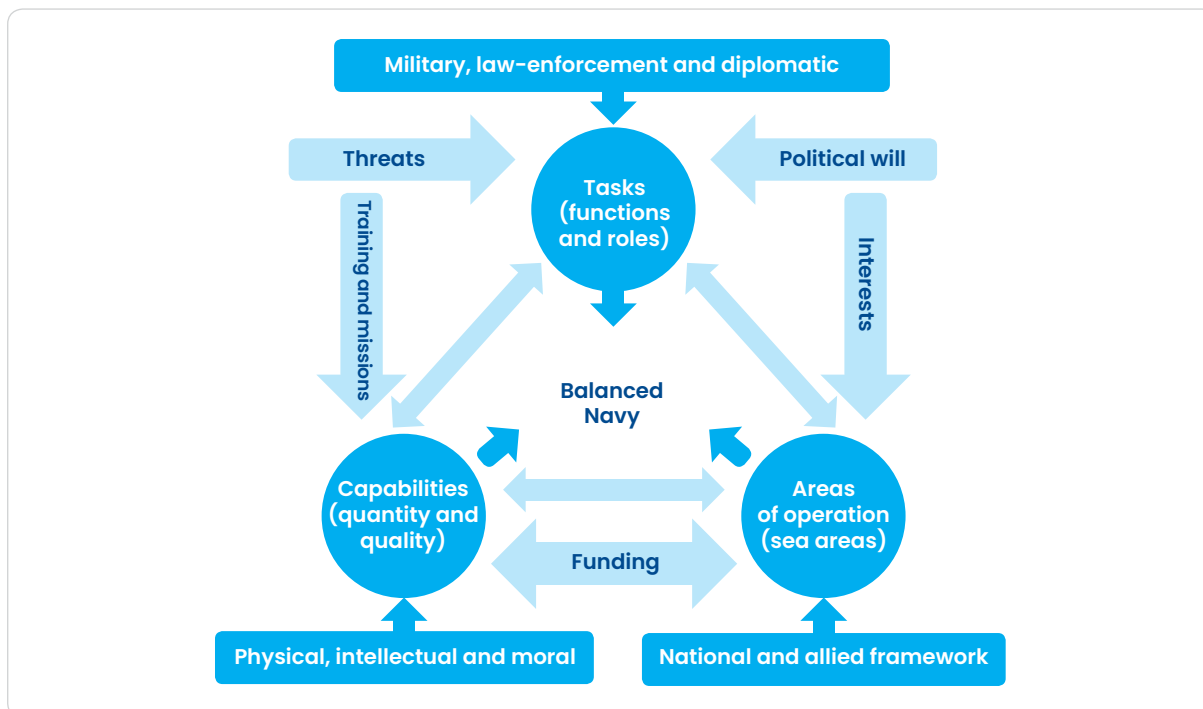
223 *Strategic Concept...*, op. cit., p. 18.

224 Council Decision (CFSP) 2024/583 of 8 February 2024 on a European Union maritime security operation to safeguard freedom of navigation in relation to the Red Sea crisis (EUNAVFOR ASPIDES).

225 US Department of War, *Austin Lauds Key Partnerships in Middle East*, [access: 18 February 2026: <https://www.war.gov/News/News-Stories/Article/Article/3622360/austin-lauds-key-partnerships-in-middle-east/>].

226 *Strategic Concept...*, op. cit., pp. 53–54.

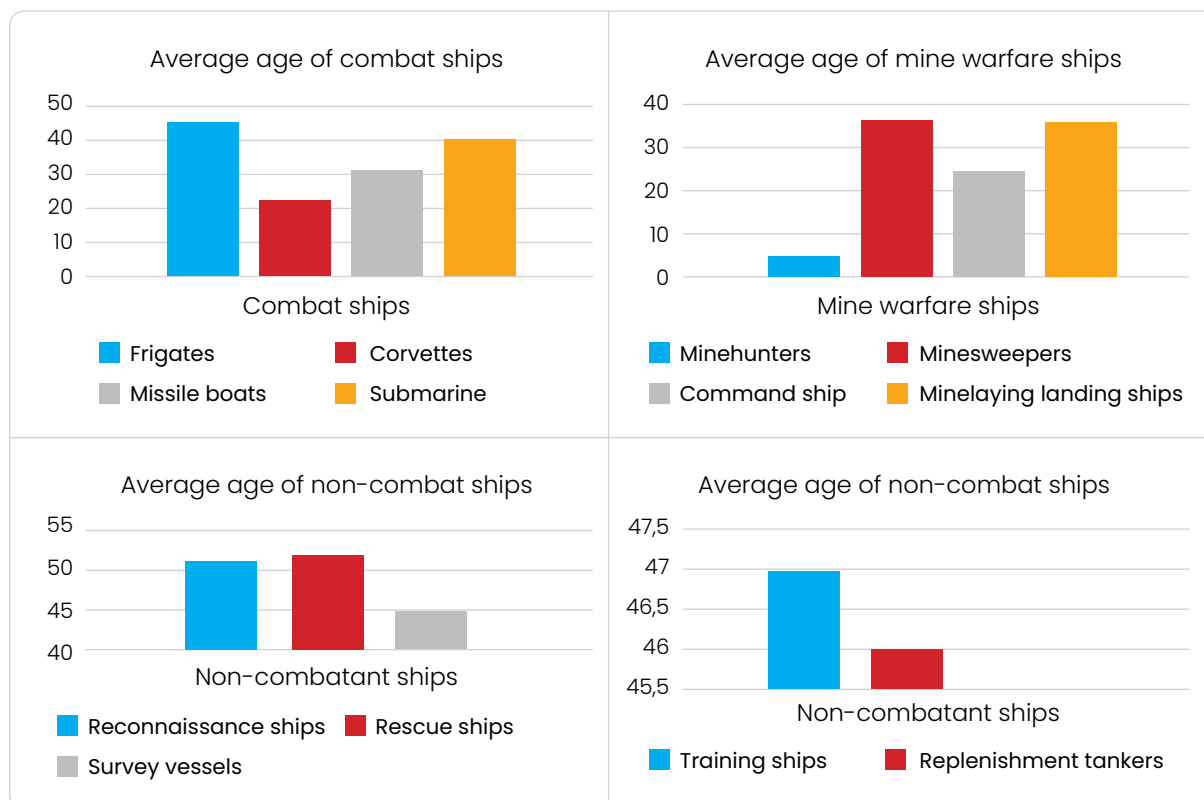
227 T. Szubrycht, *Modernisation and Expansion of the Navy: Selected Issues*, Polish Naval Academy, Gdynia, 2020, p. 51.

Fig. 41. Balanced maritime forces and their defining factors.

Source: Own study based on: T. Szubrycht, *Balancing maritime forces in the maritime policy of European NATO countries*, AON, Warsaw 2008 and T. Szubrycht, *Modernization and expansion ...*, op. cit. p. 45.

Until recently, the Polish Navy was described as the most neglected and underfunded branch of the Armed Forces. The absence of action and a coherent vision for the employment of naval forces—practically until the publication of the *Strategic Concept for the Maritime Security of the Republic of Poland*—resulted in the progressive deterioration of its principal combat platforms. The intended operational service life of warships, set at approximately 30 years, has been considerably exceeded. The average age of Polish Navy vessels is now well above this threshold. Despite intensive training and participation in NATO naval groups, their effective combat capabilities have steadily diminished. The naval branch of the Armed Forces retains only isolated pockets of modern capability, such as the Naval Missile Unit and individual systems installed aboard certain vessels, including the missile systems carried by Project 660M ships. Overall, the Navy's capabilities are assessed as limited and insufficient to guarantee the performance of the tasks assigned to it²²⁸. The objective of building a medium-category 'post-modern' fleet, as the model recommended for Poland, entails a qualitative transformation based on combat capabilities integrated into joint and allied force structures.

²²⁸ A. Makowski, 'Modernisation of the Polish Navy: A Contribution to the Debate', in B. Pączek (ed.), *45 Years of the Faculty of Command and Naval Operations: From Military Science to Security Studies*, Gdynia, 2024, p. 26.

Fig. 42. Age of navy vessels**Source:** Own study

The Polish Navy is being modernised through projects intended to expand capabilities in the following areas: force protection and survivability (Ratownik, Kijanka and Kormoran II), strike capabilities (Miecznik and Orka), reconnaissance (Delfin) and logistics. These capabilities must support both independent operations—primarily in the Baltic dimension—and allied operations conducted in the Baltic Sea and more distant regions of the world. The new Miecznik-class frigates will provide full interoperability and enable Poland to contribute meaningful combat capabilities to NATO's Standing Maritime Groups 1 and 2 (SNMG1 and SNMG2).

Tab. 10. Selected projects of the naval forces modernisation program.

Design	Vessels	Entry into service
<i>Swordfish</i>	ORP Wicher (274) – under construction ORP Burza (275) – under construction ORP Huragan (276) – preparation for construction	2029-2031
<i>Moray eel</i>	4 missile corvettes	2030-2035
<i>Ploughing</i>	3 submarines	After 2030
<i>Dolphin</i>	ORP Jerzy Różycki (261) – under construction ORP Henryk Zygalski (264) – under construction	2027-2028
<i>Lifeguard</i>	ORP Ratownik – under construction	2029
<i>Tadpole</i>	4 unmanned mine countermeasure systems	?

Source: Own study

The *Miecznik*-class frigates are based on Babcock International's Arrowhead 140 design and are among the largest vessels in their class (Table 11). Their principal tasks include:

- protecting and defending offshore infrastructure, including the Baltic Pipe, offshore wind farms and telecommunications infrastructure;
- conducting surveillance across extensive areas of the maritime domain;
- engaging surface, subsurface and airborne targets;
- protecting Polish and allied forces, including maritime transport;
- supporting humanitarian operations.

Tab. 11. Characteristics of the *Miecznik*-class frigates

	Key Vessel Specifications:	
	Total length [m]	138
	Max width [m]	20
	Height (1 deck) [m]	10
	Max displacement [t]	7,000
	Range [NM]	8,000
	Max speed[in]	28
	Crew	120 + 60

Source: Based on materials provided by PGZ Stocznia Wojenna

An analysis of the Polish Navy's current combat capabilities leads to clear and troubling conclusions. Its principal warships are ageing and heavily worn, reducing their operational effectiveness. With new vessels expected to enter service only in the coming years, this creates a dangerous interim period. The programme to acquire submarines as an interim measure may partly address this gap, but it also highlights the need for strategic planning of naval development. Naval programmes and long-term plans should be aligned with national policies, including energy security, so that Poland can make full use of its energy supply options and has the means to protect them.

The overlap between these maritime areas and one of the routes used to import natural gas is notable. It supports the case for Poland to play an active role in shaping security in distant regions, using appropriate naval capabilities. Seaborne gas transport through maritime *chokepoints* may remain under threat even after the most intense phase of a conflict has ended, particularly where the parties use asymmetric means, such as naval mines and suicide attacks, and environmental conditions favour such operations²²⁹. Naval mines, in particular, allow attackers to prolong a threat and escalate it at a time of their choosing.

5.2. Supply diversification and international partnerships

Poland's coastal location gives it an advantageous position relative to neighbouring countries in Central and Eastern Europe, including the capacity to re-export some 3–4 billion cubic metres of gas. This position should be seen as an opportunity, while also prompting consideration of the risks it entails. Potential measures to strengthen Poland's energy security in

²²⁹ R. Miętkiewicz, *Blockade of the Strait of Hormuz. Iran's Capabilities and Means*, 2026, [access: 17.03.2026, <https://theopportunity.pl/publikacje/12624-2/>]

relation to gas supplies include the following²³⁰:

- developing alternative routes for Norwegian gas through the Mallnow, GCP GAZ-SYSTEM/ONTRAS and Łasów interconnectors;
- further expanding LNG regasification capacity and adapting Polish ports to serve as energy hubs²³¹. The FSRU terminal and the planned capability to operate two regasification vessels simultaneously are expected to play a key role;
- importing LNG through terminals in the Netherlands and/or Belgium, using the expanded gas transmission capacity between the Netherlands and Germany;
- expanding connections along the strategic north-south axis through the Czech Republic, Slovakia, Hungary, Romania and Bulgaria. The corridor is intended to comprise a network of cross-border gas pipelines linking Central and Eastern European countries, from Świnoujście in Poland to the island of Krk in Croatia. Significant differences were, however, apparent in the approaches to Russia taken by the countries of the Visegrád Group (V4). The initiative also demonstrates how European Union mechanisms can be used effectively to finance strategic projects supporting security, supply diversification and climate policy. Particular emphasis was placed on developing Croatia's floating LNG terminal under the Three Seas Initiative. This form of cooperation may nevertheless be weakened by divergent energy-policy interests among its member states²³². Poland's dominant role and the uneven engagement of participating countries have also been identified as obstacles to achieving the initiative's objectives²³³.
- using Ukraine's gas storage capacity to help balance seasonal demand, while recognising that, during the ongoing war in Ukraine, transmission infrastructure supplying Poland could become a target of attack;

Building energy security among the countries of Central and Eastern Europe, for example within the framework of the Visegrád Group (V4), may prove challenging due to the differing relationships of its member states with the Russian Federation. Earlier concerns regarding the expansion of interconnections within the Visegrád Group, stemming from the positions of Hungary and the Czech Republic and their significant dependence on Russian energy supplies²³⁴ may be considered to have been partially alleviated following the outcome of the parliamentary elections in Hungary and the defeat of Viktor Orbán's government. The policy pursued by the new government points, on the one hand, towards a gradual diversification away from Russian energy supplies by 2035 and, on the other, reflects a pragmatic approach to relations with Russia resulting from the scale of existing economic interdependencies.

The return to power in the United States of a Donald Trump administration committed to promoting US liquefied natural gas exports, encapsulated in the well-known slogan "drill, baby,

230 M. Ruszel, Summary: "Conclusions – More Than the Sea Alone: The Baltic Sea as an Area Requiring Special Protection [in:] *Can the Sea Help? The Baltic Sea and Poland's Energy Security*, 2024, ed. Z. Nowak, pp. 57–61.

231 P. Mickiewicz, *Energy Security or Maritime Security? The Dilemma of Assessing Potential Threats to Poland's Security in the Baltic Sea in the Third Decade of the 21st Century*, *Nautologia*, 2024, Vol. LIX, 161, p. 75.

232 W. Jakóbiak, *The Energy Policy of the Visegrád Group and the Three Seas Initiative as a Complement to EU Policy*, Polish Research Centre of the Jagiellonian University, 2021.

233 T. Pawłuszko, A. Borówka, M. Gębska, J. Wilczek, *The Three Seas Initiative: Building a Region*, Report of the Institute of New Europe, 2023.

234 Ł. Ogrodnik, T. Pastucha, *Energy derussification of Poland's Visegrad partners*, Polish Institute of International Affairs, "PISM Bulletin", No. 130 (3133), [03.12.2025].

drill”²³⁵, was viewed as an opportunity for Poland to re-export LNG to other countries ²³⁶. The “shale revolution”, driven by the deployment of modern technologies including horizontal drilling and hydraulic fracturing, enabled the United States to emerge as the world’s leading producer and exporter of natural gas during the 2017–2021 period²³⁷. At the same time, it should be recognised that dependence on US gas supplies, particularly amid a changing paradigm in international relations, may increase Poland’s vulnerability to pressure in bilateral relations. In this context, Poland may be seen as a particularly attractive country in the region, offering opportunities for the allocation of high-value investments related to the development of nuclear energy, the procurement of US defence equipment, and the import and redistribution of US shale gas. The latter is associated with filling a substantial supply gap created by the displacement of Russian gas. A further challenge lies in assessing the long-term future of relations between European states and Russia. The debate encompasses a wide range of considerations, including both Europe’s position and its influence over the eventual conclusion of the Russo-Ukrainian war, as well as economic factors, including lobbying aimed at restoring energy cooperation²³⁸. Among the speculation circulating in 2025 regarding alleged US–Russian discussions on the possible reopening of the undamaged Nord Stream 2 pipeline string were also reports concerning the interest of selected European companies in resuming imports of Russian gas²³⁹.

5.3. Threats within the resilience framework

Threats to the continuity of maritime gas supplies are characterised by their broad geographical scope, encompassing infrastructure on the producer’s side, maritime transport routes and subsea pipelines, as well as regasification facilities on the receiving side. The LNG supply routes to Poland and the European Union have already been discussed above in Chapter Four.

At this point, however, particular attention should be paid to threats affecting gas infrastructure located along the Polish coast, as well as maritime assets used for the transportation of liquefied natural gas. The tense security environment in the Baltic Sea, combined with the practical use of the region as an area where divergent Russian and Western interests intersect—and, in practical terms, as an area for proxy confrontation—generates threats both to maritime transport and to infrastructure located ashore and offshore. Specialised terminals together with their associated infrastructure, including the LNG terminal in Świnoujście and the FSRU terminal in the Gulf of Gdańsk, are exposed to multiple threats originating from the land, maritime, air and cyber domains, although the latter is not considered here.

235 P. Zaleski, Perspectives of the Energy Policy of the 47th President of the USA – Donald Trump, K. Pulaski Foundation, 2025, [access: 20/03/2026: <https://pulaski.pl/perspektywy-polityki-energetycznej-47-prezydenta-usa-donalda-trumpa/6>].

236 Energy Security Center, *Trump 2.0. Are We Facing an Energy Counterrevolution?* [access: 19/03/2026: <https://zeop.pl/trump-2-0-czy-czeka-nas-kontrrewolucja-energetyczna/>].

237 M. Paszkowski, *The US Presidential Election and the Energy Security of Central European States*, Institute of Central Europe, IES Commentary, No. 1247 (222/2024), [03.12.2024].

238 M. Menkiszak, *Sometimes It's Better Not to Talk. The pitfalls of a potential dialogue between Europe and Russia*, OSW Commentary, Issue 710, [23/02/2026].

239 A. Łoskot-Strachota, *The EU Gas Market in 2025: Russian Raw Material, New US Policy and Strategic Uncertainties*, OSW Commentary, NUMBER 650, [14/03/2025].

The range of potential threats to LNG carriers navigating towards the Bay of Pomerania and the Świnoujście LNG terminal, as well as the Gulf of Gdańsk and the FSRU terminal, may include, inter alia:

- deliberate collisions involving vessels belonging to the so-called “shadow fleet”, disguised as incidents caused by failures of onboard systems, adverse weather conditions or similar circumstances;
- attacks involving unmanned surface vessels (USVs) and unmanned aerial vehicles (UAVs), as well as unmanned underwater vehicles (UUVs) when vessels are at anchor;
- attempts to seize a vessel through terrorist or piracy-related activities, or operations conducted by the intelligence or special services of a foreign state;
- mining of navigation routes and the creation of asymmetric threats originating from the shore;
- the placement of limpet mines on vessel hulls and improvised explosive devices on board LNG carriers.

Threats to specialist terminals (LNG, FSRUR) may take the form of²⁴⁰:

- terrorist attacks and acts of sabotage against infrastructure from the land;
- attempts to block access to the terminals from the sea (sinking the vessel on the approach fairway – cyclically deepened);
- threats in the lower hemisphere, including attacks by divers and underwater drones, and the laying of sea mines;
- surface and air drone attacks and attempts to violate protection zones.

Potential threats to subsea infrastructure, particularly gas pipelines, primarily include²⁴¹:

- dragging anchors or other devices with the intention of causing mechanical damage to infrastructure;
- other forms of violation of designated safety zones under the guise of, for example, fishing activity;
- the use of underwater sabotage teams to emplace explosive devices;
- the use of autonomous and remotely operated underwater vehicles to place explosive charges and map the location and routing of infrastructure. Platforms of this type may themselves also serve as mobile naval mines;
- the laying of naval mines and improvised devices in order to compel the coastal state or infrastructure owner to undertake mine-countermeasure operations and assume the associated operational risk.

Potential threats to offshore extraction infrastructure in the Baltic Sea may include, for example:

- violations of safety zones, including the 500-metre exclusion areas around installations, by military aircraft and surface vessels, including autonomous platforms;
- direct attacks on installations from the surface, air and underwater domains using autonomous platforms deployed from submarines or civilian vessels;

240 R. Miętiewicz, *The Use of Unmanned Surface Vessels in the Protection of Maritime Critical Infrastructure Facilities*, Naval Academy, Gdynia, 2018, p. 35.

241 R. Miętiewicz, *Hybrid threats in the Baltic Sea. The results of analysis of countermeasure options*, “Terrorism – Studies, Analyses, Prevention”, 2025, special edition: 35–70. [access: 26/08/2026: <https://doi.org/10.4467/27204383TER.25.014.21517>]

- acts of sabotage and deliberate ramming by vessels associated with the shadow fleet under the pretext of technical failure;
- attempts by special operations forces, including personnel operating under cover, to seize control of installations.

The list of potential threats remains open-ended. A highly determined adversary, combined with the availability of increasingly advanced technologies, particularly autonomous platforms, creates serious challenges both for operators of gas infrastructure and for LNG carriers. A defining feature of gas transportation through the maritime domain—whether by tanker or subsea pipeline—is the possibility of generating threats to Polish interests far beyond the country's national borders. To mitigate these challenges and risks, appropriate measures and capabilities should be developed.

5.4. Challenges in protecting maritime critical infrastructure: LNG carriers and terminals

The global security environment remains unstable and unpredictable. NATO regards Russia, with its ambition to reshape the Euro-Atlantic security architecture, as the most significant and enduring threat. Terrorism in all its forms presents another challenge, giving rise to a wide range of asymmetric threats. The world's oceans and seas also remain an arena for transnational crime, including piracy, attacks on shipping and critical maritime infrastructure, irregular migration, and trafficking in people, weapons and drugs. States and non-state actors can use these activities to undermine freedom of navigation and restrict access to sea lines of communication. Maintaining the required level of security also entails addressing climate change and its consequences, ranging from disputes over access to strategic raw materials, rare earth elements and sea lines of communication to rising sea levels along the coasts of member states. Emerging and disruptive technologies, including artificial intelligence, autonomous systems, quantum technologies and hypersonic weapons, also affect maritime security²⁴².

The economic security of the Alliance and its partners is linked to and dependent on the safe use of the maritime operational environment (the contribution of NATO forces). To maintain maritime security, NATO forces cooperate with national authorities, the private sector, international organizations, and non-governmental organizations. This cooperation serves to protect strategic interests, build stability among Allies, and contribute to reducing gaps in existing national civilian and/or military law enforcement capabilities²⁴³.

Maritime critical infrastructure, including specialised terminals and cross-border natural gas transmission infrastructure such as the Baltic Pipe, together with cryogenic LNG carriers, forms an essential part of the supply chain for this strategic commodity. These assets therefore require effective protection. In the case of LNG carriers, registration under the national flag, Polish command and a Polish crew are factors that help secure the state's authority

242 NATO, *Alliance Maritime Strategy*, [access: 08.02.2026: <https://www.nato.int/en/about-us/official-texts-and-resources/official-texts/2025/10/29/alliance-maritime-strategy>].

243 *Allied Joint Doctrine for Maritime Operations*, NATO standard AJP-3.1, Edition B, Version 1, 2025, NATO Standardization Office (NSO).

over the vessel and its ability to implement protective measures when threats arise. Under international law, a ship sailing on the high seas²⁴⁴ is subject to the exclusive jurisdiction of its flag state and to that state's laws²⁴⁵.

Developing naval forces as a means of responding to present and future challenges and threats requires the support of the public, whose taxes fund them. Even the most ambitious development plans, backed by determined, experienced and highly trained naval personnel, will not succeed without political will. Raising awareness among decision-makers and the public should therefore be a goal of public communication²⁴⁶.

Conclusions:

- The Polish Navy, which is undergoing extensive modernisation, has the capability to safeguard seaborne natural gas deliveries in the Baltic Sea, but only limited capacity to protect shipping routes beyond it.
- Threats to LNG deliveries may arise both in the Baltic Sea and elsewhere, including areas far from Polish naval bases. The wide range of threats to subsea pipelines, particularly the Baltic Pipe, forms part of hybrid conflict scenarios involving the underwater domain. Sea lines of communication and LNG carriers may be especially vulnerable to attack in areas of high geopolitical instability, such as the Red Sea, and at chokepoints such as the Strait of Hormuz and the Bab el-Mandeb Strait. A potential adversary can be expected to seek vulnerabilities in gas supplies to Poland, using methods associated with asymmetric warfare, including terrorism and sabotage, as well as elements of proxy warfare, such as the use of failed states' territory or foreign intelligence services.
- Russia's shadow fleet remains a significant potential source of threats to deliveries by LNG carriers and subsea pipelines. Its vessels could be used to sabotage underwater infrastructure, deliberately collide with ships or physically block access to specialised terminals, for example by sinking a vessel in an approach channel under the pretext of a breakdown.
- Threats to the security of natural gas supplies to Poland may be transboundary. Identifying vulnerabilities and assessing risks must therefore include potential incidents outside Polish territory, particularly in Denmark, Germany and Sweden.
- Securing the continuity of gas supplies to Poland requires multilateral, cross-sector and international cooperation among intelligence and security services, infrastructure operators, shipowners and the Armed Forces, particularly the Navy and Special Forces.
- During a period of temporarily rising demand for natural gas, Poland must diversify both its sources of imports and its means of delivery to strengthen its energy security.

244 Under Article 86 of the Convention, the high seas comprise all parts of the sea that are not included in the exclusive economic zone, territorial sea or internal waters of a state, or in the archipelagic waters of an archipelagic state.

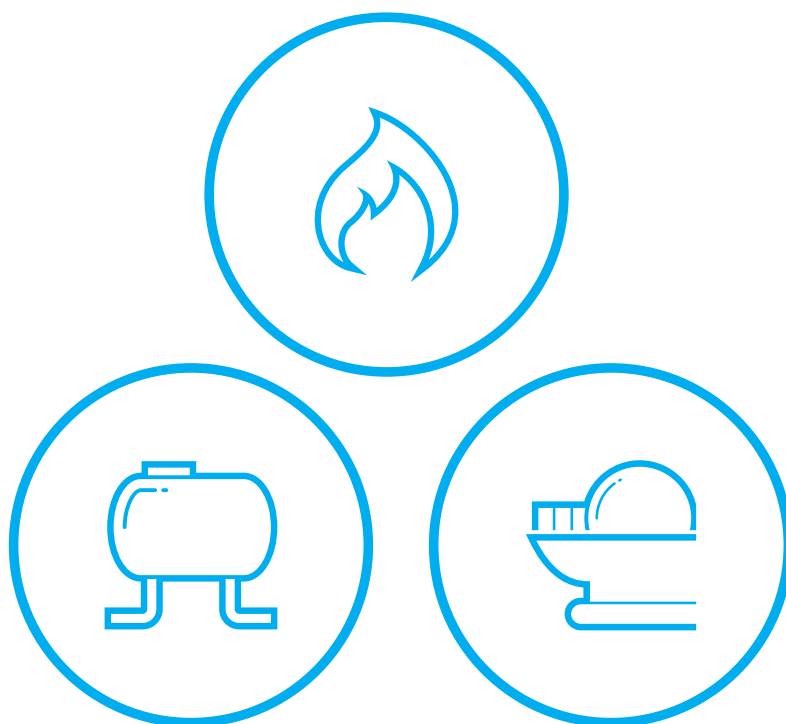
245 Article 92 of the United Nations Convention on the Law of the Sea, done at Montego Bay on 10 December 1982.

246 AK Blackley, *Towards a New Navalism for the Twenty-first Century*, *Proceedings*, 2021, Vol. 147/12/1426.

Seaborne supply offers considerable advantages, particularly for imports from distant producers. Attention must nevertheless be paid to vulnerabilities arising from possible attempts to obstruct deliveries in the Danish Straits through activities below the threshold of open conflict.

- Accelerating the energy transition away from fossil fuels should also be regarded as a way to strengthen the country's resilience to geopolitical disruptions that could interrupt supplies.





SUMMARY

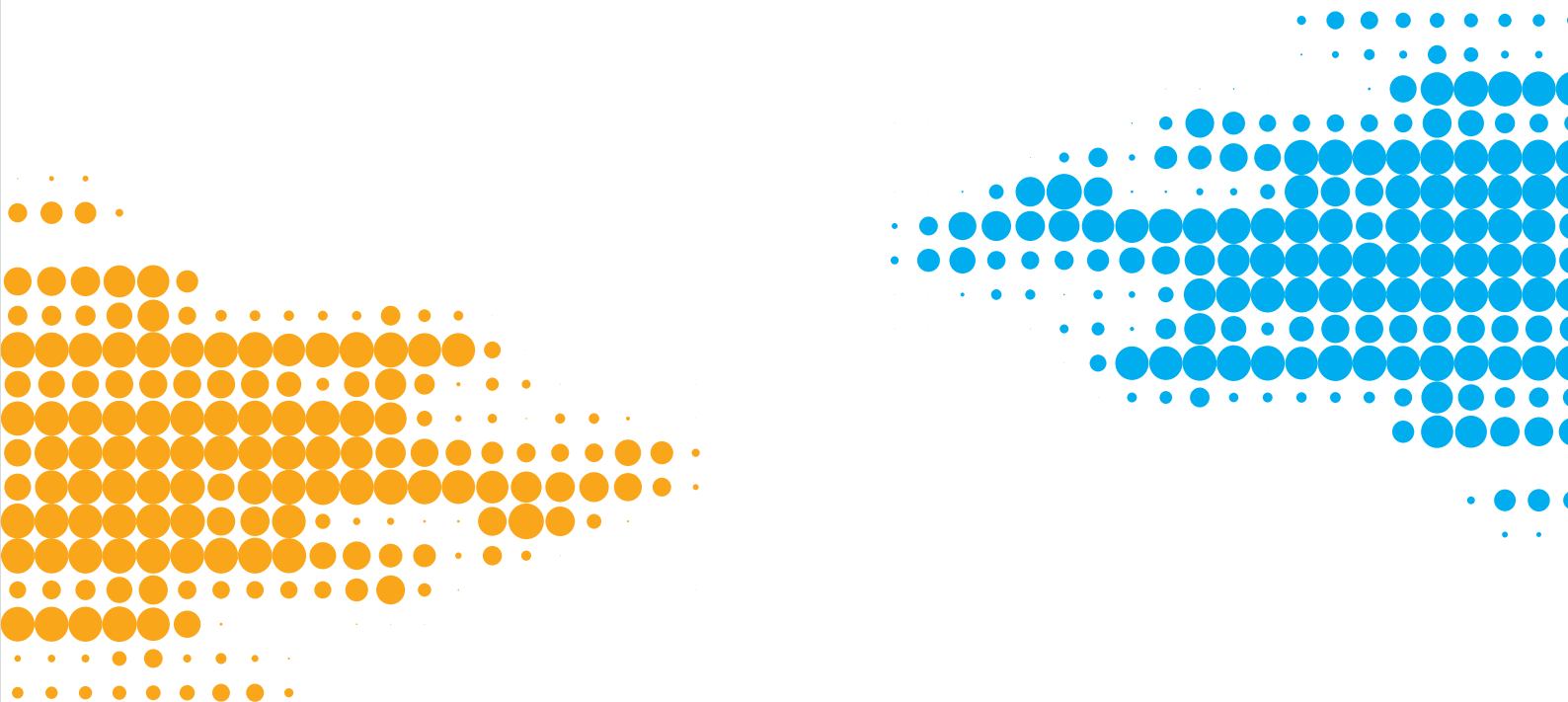
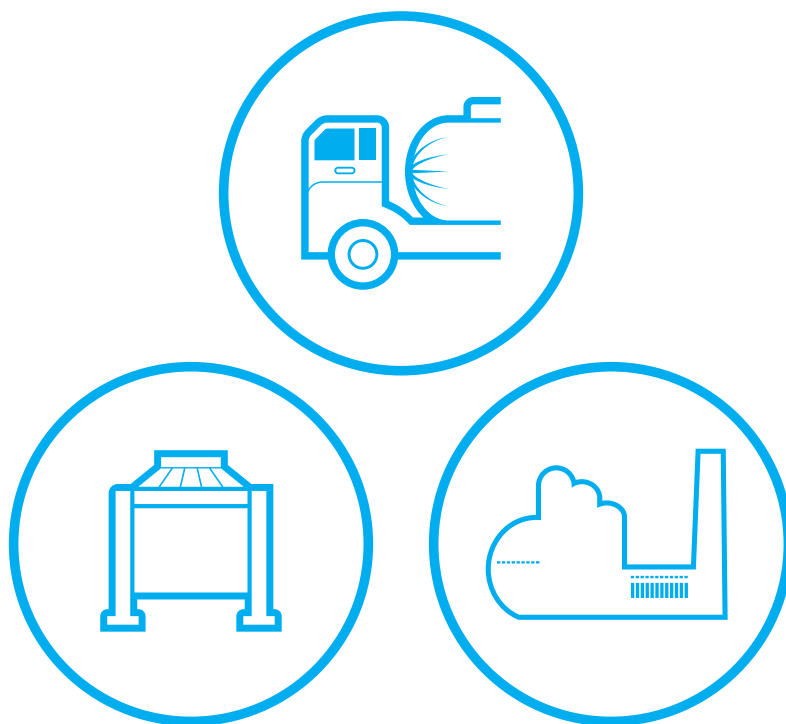
Summary

Poland's energy transition model, which aims to achieve climate neutrality, relies on natural gas as a transitional fuel. Gas is expected to provide stability during the lengthy process of changing how electricity and heat are generated. It has therefore become an important part of Poland's energy transition strategy. This raises concerns in the face of ongoing armed conflicts and energy crises, which have driven up prices and disrupted gas supplies to Europe. Poland must consequently secure its natural gas supplies and improve understanding of international political developments and energy markets. Alongside diversifying supply routes, it is equally important to meet domestic energy needs by strengthening national resilience and making the energy system as independent as possible.

Poland's transition must also maintain the secure operation of the energy system as low-emission technologies develop rapidly. The central challenge is to balance a sufficient number of dispatchable sources capable of balancing the system with the growing share of renewable energy and the electrification of the economy. This requires greater flexibility in the National Power System and careful planning of the roles of natural gas, energy storage and renewable gases during the transition.

- Following the crises of 2021–2022 and 2026, European gas markets remain under geopolitical pressure. Efforts to restore balance now rely on increased liquefied natural gas (LNG) deliveries rather than pipeline flows.
- The most significant change in supply is the lasting shift from pipeline gas to LNG. LNG has become a key means of balancing the market and linking regional systems into a single global market. The LNG sector also offers considerably greater flexibility and a wider range of supply options.
- After 2022, the gas market did not return to its previous pricing model. It entered a new period of greater price volatility, driven by global competition for LNG and continued dependence on complex geopolitical factors. LNG trade is highly vulnerable to shocks caused by international conflicts.
- In the medium term, the rapid expansion of LNG production capacity, particularly in the United States, will be a key factor shaping supply. It will also intensify competition and create a risk of dependence on one source at the expense of other supply routes.
- The direction of EU energy and climate policy on natural gas remains unchanged: its use in the energy system will face increasing charges and greater exposure to price fluctuations. In Poland's transition model, natural gas serves as a bridge fuel that works alongside renewable sources to stabilise the National Power System.

- Natural gas will play its greatest role in Poland's economy until the mid-2030s, as its share in electricity and heat generation rises and it supports the transition. During this period, Poland should diversify the technologies used in its energy sector and reduce its dependence on imported fossil fuels as far as possible.
- Electrification, improved energy efficiency and further development of renewable energy offer the greatest potential to reduce natural gas consumption.
- The growing number of periods marked by surplus electricity, negative prices and forced reductions in generation points to the need for rapid development of electricity and heat storage, demand-side management and modern balancing services.
- Poland has substantial potential to produce biomethane, which can be used in existing gas infrastructure. It could therefore play a key role in sectors that are difficult to electrify, although it will not completely replace fossil natural gas.
- Poland has restructured its gas imports, ending trade with Russia and increasing LNG deliveries under multiple contracts with different suppliers.
- Threats to natural gas deliveries by sea may arise both in the Baltic Sea and beyond it, particularly in the Persian Gulf, the Gulf of Aden and the Red Sea, as well as at choke-points such as the Strait of Hormuz and the Bab el-Mandeb Strait.
- The global LNG market, on which Poland now relies, operates amid sustained competition between global and regional powers. Geopolitical tensions will remain a persistent source of periodic crises that destabilise LNG trade and deliveries.



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The Lower Silesian Institute for Energy Studies (DISE), based in Wrocław, is a think-tank actively involved in energy security and energy transition issues in the strategic dimension, as well as concepts for the operation of energy markets, business models for energy companies and industrial energy consumers, and also the effectiveness of infrastructure projects.

DISE is made up of an interdisciplinary group of academics and active managers occupying managerial positions in key companies in the energy sector. Our experts are characterised by a combination of theoretical knowledge and practical experience in managing the largest economic entities in Poland, which allows us to identify barriers and challenges in the Polish energy sector on the pages of numerous popular-scientific publications, analyses and expert opinions. DISE experts critically analyse the current situation in the energy market and formulate strategic recommendations in the form of analytical studies and comprehensive reports. The DISE team focuses, in particular, on renewable energy, low-carbon energy, especially nuclear technology, the use of natural gas and renewable gases, as reflected in four reports published to date, carried out in cooperation with important climate and energy organisations and major Polish oil and energy companies.

We also provide substantive support to Polish and EU parliamentarians. We organise the annual Energy Congresses in Wrocław, an international highly respected forum of debates among policy makers, politicians and energy industry practitioners, aimed at jointly developing solutions for the security and transformation of the Polish energy sector. An important area of DISE's activity is education, i.e. activities aimed primarily at raising the competence of energy industry managers. Combining the expertise and long-term experience of DISE experts with best practices of leading foreign energy sector entities, we organise study tours to learn about the latest technical solutions in energy infrastructure facilities around the world (e.g. offshore wind farms, gas terminals or hydrogen facilities). The value of the study tours organised is the transfer of knowledge during seminars and learning about the cutting edge technologies and experiences in infrastructure operation. We also provide workshops and training for young people to raise public awareness of renewable energy, prosumerism and responsible energy management (e.g. classes in energy clusters). We firmly believe that our activities are changing the face of the Polish energy sector for the better and are initiating desirable legal changes for energy investments with future generations in mind.

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