Economic conditions of the Arctic natural gas transportation system

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Abstract. The paper considers Russia’s position in the system of European energy policy on the natural gas market. We have analyzed the interest in natural gas exports in the context of maintaining the energy security of EU countries, stimulating in turn the interest towards the Arctic oil and gas reserves as a means of increasing supplies. We have established the role that diversification of transportation means plays in ensuring exports. We have described the capacities of the main pipelines transporting gas to the EU countries. We have substantiated why investments should be made into establishing and improving the transport infrastructure in the Arctic, specifically, developing the routes for transporting natural gas.

1. Introduction

Control over resources, primarily hydrocarbons, is a pressing problem of world politics as global and national reserves continue to decline. Geopolitics of the 21st century is increasingly oriented towards economy and energy as the driving factors, giving rise to a new form that is energy geopolitics.

The world community faces major challenges coming from the interactions in the Arctic, concerning the development of the Arctic seas and preserving energy security. Energy geopolitics plays a pivotal role for the energy relations with the countries of the European Union, the Asia-Pacific region and the USA.

The United States has territories in the Arctic and is one of the strongest players in the energy market. The USA is one of the leaders in hydrocarbon production and reserves [1], so it can influence the geopolitical situation in the world, in particular, through dubious methods of geopolitical struggle, in both international law and the market economy. China is another major player; even though it does not have its own territories in the Arctic, it is still regarded as a ‘polar great power’ [2]. The country’s strategy of ‘soft power’ consists in employing predominantly economic instruments, e.g., concluding bilateral agreements with the Arctic states and participating in projects of large energy companies [3,4].

The main countries operating in the energy market are fighting not only for control over hydrocarbon deposits but also for transportation routes. The strategies used by major players in the energy market affect the socio-economic growth of the Arctic region and the development of the Arctic seas. In the long run, this has economic, social and environmental consequences for the entire world community, which makes the chosen topic all the more important.

2. Russia in the system of energy policy in the Arctic
The global economic crisis of 2008 changed the balance of power: the economic influence of traditional centers of power (USA, EU countries, Japan) weakened, while the new developing countries with transition economies grew stronger. The problem of ensuring energy security is gaining importance along with traditional geopolitical challenges (global economy and finance, environment, education, security, threats of international terrorism).

Energy security covers processes not only in the energy sector but also in economics and ecology. While economic security characterizes the state of the economy when the interests of the individuals, society, and the state are protected, the goal of energy security is to guarantee that the individuals, society, and the state are protected from shortages of fuel and energy resources, acting as an economic and political category [5].

Concerns about future energy supplies coming at a time when the Arctic ice is declining have stimulated interest in Arctic oil and gas reserves as a means of increasing exports. Ref. [6] considered using the deposits in the Barents Sea as a new contribution to ensuring the energy security of the EU. Challenges in achieving energy security, the goals of the UK policy towards the Arctic, and how it might change after Brexit were discussed in [7].

Notably, the Arctic is regarded not only as a source of reserves, including energy or a potential zone of commercial navigation but also as a source of conflict because of its strategic importance [8]. The economic and political relations between the Arctic states themselves and between the Arctic states and the countries located far from the Arctic are the predominant factors shaping the interest towards developing the seas [9], including the shelf [10], as well as issues of achieving energy security. Conflicts of interests often arise even between strategic partners regarding problems of Arctic development, in particular, using the Northern Sea Route [11], [12].

It is the general consensus that the energy potential of the Arctic is a source of energy security for the countries bordering the region [13]. Russia is one of the most important energy resource operators in the Arctic, with significant economic and political interests in the region. The deposits developed on the Arctic shelf serve as a breeding ground for introducing new innovative models [14] for exploring territories and testing innovative technologies [15]. The Arctic is becoming a region of innovation [16] for the world community, providing incentives for forming new strategic alliances. For example, China is active in the Arctic not so much because it needs to export energy resources as to gain access to the Northern Sea Route, attractive for transporting goods to Europe. China's presence in the Arctic grows through participation in large-scale investment projects, including Russian infrastructure projects. Yamal LNG and Arctic LNG 2, industrial complexes for production and transportation of liquefied natural gas, are examples of such projects. The first stage of the Yamal LNG project was launched in 2017. Initial investments were made by Novatek (50.1%), Total and China National Petroleum Corporation (20% each), Silk Road Fund Co Ltd (9.9%).

Zelianin [17] argues that as the geopolitical significance of the Arctic will inevitably grow in the future, territorial conflicts may escalate in the region. Russia’s initiative, which was not adopted by the EU countries, comprised a set of measures aimed at establishing an energy security system in Europe for achieving sustainability of international energy markets, attracting investments in key sectors of energy production, increasing energy efficiency, providing equal access to energy services. Russian experts also proposed to create an international gas consortium.

A similar initiative consisting of global energy projects is currently under way in the Asia-Pacific market, allowing to engage the natural gas reserves, explored and mined by Russian companies in the fields in the Russian Arctic zone, previously inaccessible from an economic standpoint (due to lack of innovative technologies and technical solutions requiring increased investments and operating costs).

Russia’s attempt to position itself as a key energy supplier to the EU has stimulated European countries to diversify energy resources and find new routes to transport them. In 2007, the European Commission identified the key obstacles hindering a competitive and open energy market, including restricted access to infrastructure and divided national markets. Adopted by the European Parliament in 2009, the Third Energy Package (TEP) establishes the Agency for the Cooperation of Energy Regulators and stipulates a set of directives regulating the ownership and use of gas pipelines and
electric networks. The goal of TEP is to reduce EU’s dependence on Russia as the key supplier of energy (mainly natural gas) to the EU integrated market. TEP is based on the principle of separation. EU countries can choose one of three options for reforming their distribution networks:

- forced ownership unbundling for vertically integrated holdings: (sale of transport networks to an independent operator);
- extracting companies may retain ownership of transport networks, but the networks are managed by specially created ‘independent system operators’;
- vertically integrated corporations may preserve their structure if they are controlled by a ‘supervisory body’.

Global politics had diverse effects on Russian-European cooperation in the field of electric power, reached a peak in 2014–2015: through relations between state leaders, sanctions by the US, the EU and their allies, canceling of the South Stream project. The actions of partners in the European gas market engendered a paradigm shift from Russia, in particular, modernization of the existing model of hydrocarbon export (primarily natural gas). This involved diversification of directions and means for transportation of natural gas, restructuring of assets, expansion of sales models used, including participation in short-term trading and tendering, as well as revision of long-term contracts, including changing the pricing mechanisms and shipping terms.

3. Russia’s position on the European gas market

Recent years have seen a steady increase in world trade of natural gas, both pipeline and LNG. The governing factors for the demand for Russian gas from European countries include, in addition to GDP growth rates of the purchasing countries, EU’s policies regulating the transition to environmentally friendly economy, as well as price competition in the natural gas market. Russia’s capability to supply natural gas depends on the actual growth in production of natural gas in the country. Data on Russia’s exports of natural gas, including to EU countries, are given in Table 1. The notable increase in LNG exports confirms the diversification of transportation means.

| Year | Export (total) pipeline | Export (total) LNG | Export (to EU) pipeline | Export (to EU) LNG |
|------|------------------------|-------------------|------------------------|-------------------|
| 2014 | 189.6                  | 13.6              | 152.0                  | -                 |
| 2015 | 194.2                  | 14.6              | 150.0                  | -                 |
| 2016 | 202.0                  | 14.6              | 155.8                  | -                 |
| 2017 | 219.7                  | 15.4              | 159.0                  | 0.1               |
| 2018 | 223                    | 24.9              | 164.4                  | 6.8               |
| 2019*| 209.9                  | 39                | 162.2                  | 18                |

*Forecast data from the Ministry of Energy, Ministry of Economic Development, ICIS.

As evident from Table 1, LNG exports have increased, that is, in addition to increased exports of Gazprom’s pipeline gas to EU markets, there is an increase in LNG exports from the Yamal and Sakhalin projects. As of the end of 2018, Russia was one of the three world leaders in terms of LNG production growth, following the USA and Australia. Growth rate of LNG exports from Russia amounted to 1.15 for 2014–2018 (compared to 2.75 for the USA for the same period and to 1.29 for Australia). LNG exports to EU countries are growing rapidly (the growth rate was 179 for the period from 2017 to 2019).

The abrupt rise in the growth rate happened because new plants for liquefaction of natural gas and new LNG terminals, including Yamal LNG, were put into operation in 2018. The 2019 growth in demand for LNG in Europe was expected, primarily due to the environmental component and the decline in the EU’s own production of natural gas. According to ICIS, the supply of LNG to EU countries reached 105 billion cubic meters (76 million tons) in 2019, increasing by 55% compared to
2018. The share of exports in the global LNG market increased from 13% to 21%. LNG from Russia amounted to over 17% in the total volume of exports to Europe in 2019.

Even though pipeline gas exports decreased slightly, the increase in exports of Russian LNG to Europe meant that Russia managed to repeat its 2018 records in production and export of gas.

If the political component is excluded from consideration, the comparative costs of production and export of natural gas are the key issues in diversification and modernization of the European infrastructure for gas transportation. Russia has great competitive advantages in the European market assuming that there are no changes in the political climate.

Increased competition for European gas markets did not prevent Russia from providing about 47.5% of European natural gas imports in 2019. Let us carry out comparative analysis of the throughput capacity of export pipelines through Ukraine and Belarus (Table 2).

| Route/Gas pipeline | Countries | Capacity/ transitin 2018 | Operator |
|--------------------|-----------|--------------------------|----------|
| 1. Pipeline passing through Ukraine | | | |
| Soyuz pipeline Orenburg–Uralsk–Alek... | Ukraine–Slovakia–EU countries | 26 | GTS Operator of Ukraine LCC (Main Gas Pipelines of Ukraine JSC, 100%) |
| Urengoy–Pomary–Uzhhorod pipeline | Ukraine–Slovakia–EU countries | 28 | |
| Progress pipeline | Ukraine–Slovakia–EU countries | 26 | |
| Yamburg–Uzhhorod | Ukraine–Slovakia–EU countries | 17 | |
| Dolya–Uzhhorod (2 lines) | Ukraine–Slovakia–EU countries | 13 | |
| Uzhhorod–Berehove (2 lines) | Ukraine–Hungary–Serbia–Bosnia | 5 | |
| Komarno(Dolya)–Drozdovychi (2 lines) | Ukraine–Poland | 2 | |
| Satu Mare (Dolya)–Khust | Ukraine–Romania | 25 | |
| Trans–Balkan pipeline | Ukraine–Romania, Bulgaria, Greece, Turkey, Northern Macedonia | 2 | |
| Ananyiv–Tiraspol–Izmail, Shebelinka–Izmail (3 lines)* | | 142/87 | |
| Through Ukraine, total: | | | |
| 2. Pipeline passing through Belarus | | | |
| Yamal–Europe pipeline (Torzhok–Kondratki –Frankfurt (Oder))** | Belarus–Poland–EU countries–United Kingdom | 32.9 | Operator: Gazprom Transgaz Belarus OJSC (PJSC Gazprom, 100%) |
GTS of Belarus (Northern Lights Pipeline)  
Torzhok–Minsk–Ivatsevichy (3 lines)  
Kobryn–Brest–state border  
Torzhok–Dolyna  
Minsk–Vilnius–Kaunas–Kalinigrad  
Ivatsevichy–Dolyna  
Vawkavysk–state border  

Through Belarus, total 83.9/42.3***  

3. Other pipelines  

| Pipeline | Country | Country | Capacity (Gt) |
|----------|---------|---------|---------------|
| St Peterburg–Vyborg (2 lines) | Finland | | 6/2.62 |
| North Stream | Germany | | 55/57.8**** |
| Blue Stream (Berehove) Turk Stream (2 lines) | Turkey | Turkey–Bulgaria–North Macedonia–Greece–Serbia | 16/13.3 31.5 |

Analysis of Table 2 shows that 10.7 billion cubic meters were delivered to Turkey in 2018 (via the Trans-Balkan pipeline). The total volume of gas exports to Turkey via the Blue Stream and the Trans-Balkan pipeline amounted to 24 billion cubic meters in 2018. Gas exports via the Trans-Balkan Pipeline stopped from January 1, 2020, after the launch of the Turk Stream; currently only small volumes (about 5 million cubic meters per day) are exported to Romania via the pipeline.

The contract for gas transit to Europe through Poland via the Yamal-Europe pipeline ends in May 2020. The volume of production capacities of GTS of Belarus at entry point is 51 billion cubic meters (excluding the Yamal-Europe pipeline with a capacity of 32.9 billion cubic meters). Yamal-Europe is the main pipeline for transit of gas to Europe, operating at nearly 100%.

Capacities of the Nord Stream project were exceeded by 2.8 billion cubic meters in 2018. Turk Stream was officially launched on January 8, 2020. The first line is intended for exports to Turkey; the second started gas exports to Bulgaria, Northern Macedonia and Greece. After the Bulgarian section of the Turk Stream is completed by the end of 2020, natural gas will be exported to Serbia and in transit to Hungary, Bosnia and Herzegovina, Kosovo and Metohija. It can be seen from Table 2 that the export dependence of Russia on transit of natural gas through Ukraine is reduced as gas flows have been redirected. It is still unclear whether the contract with Poland on transit of gas through the Yamal-Europe pipeline will be concluded (the previous contract ends on May 18, 2020).

The role of the US in the European gas market is also changing. Firstly, the United States will be incapable of retaining the competitive advantages in trade in liquefied natural gas, and, secondly, bound to lose the opportunity to influence the European gas market through Ukraine. As for Ukraine, as Nord Stream 2 is launched and the Turk Stream starts operating at full capacity, it loses its
monopoly as a transit state. The GTS of Ukraine will become an auxiliary for Gazprom, allowing the company to dictate its terms to the Ukrainian side in the future.

This means that investments should be made into improving the transport infrastructure in the Arctic, in particular, the routes for transporting natural gas.

The most important conditions for establishing an economically feasible system for transporting natural resources from the Arctic are flexibility and adaptability to the changing situation on world energy markets. Further diversification of the means and directions of transportation of natural gas is necessary for these purposes.

Fluctuations in the demand on the world energy markets are traditionally associated with fluctuations in the GDP growth rate, population growth and urbanization, as well as the share of working population and the variability in the structure of final demand. The key factors affecting supply are the dynamics of prices for energy resources, as well as data on stocks and technologies, both currently used and potentially available, affecting the future possibilities for expanding production.

Another trend is the increasing centralization and concentration of energy supply. The reasons for this are constant growth of the population on the one hand and mass migration of rural population to cities on the other hand.

Moreover, accelerating negative phenomena associated with climate change, and the need for environmental protection have resulted in more stringent legislation adopted, contributing to the promotion of energy-efficient technologies reducing energy consumption.

According to the basic scenario, the growth rate of global energy consumption will decrease, and the average per capita energy consumption will decrease as well. This trend is already noticeable in countries such as Japan, the UK, and France. Regional distribution will also change, energy consumption centers will shift to developing countries with rapidly growing urban populations (China, India), and per capita energy consumption will increase.

However, major research organizations specializing in long-term forecasts do not suggest that radical changes may happen in the world energy market due to new technologies emerging or new territories developed in the period until 2040.

To summarize, let us describe a number of factors hindering the development of a system for transporting gas from the Arctic:

- relatively high cost of Arctic natural gas. The weighted average cost of gas production amounted to $20 per 1000 cubic meters in 2016 (including cheaper fields outside the Arctic). The average cost of production has grown by five times in fifteen years, from $4 per 1000 cubic meters in 2000.
- the Arctic is far away from major consumers, bringing the challenge of reducing the transport costs.
- considerable range of energy prices and their high volatility: this is largely because there is no common competitive market for natural gas, currently artificially divided into local (regional) gas markets.
- establishing a system for transporting liquefied gas is becoming one of the leading market trends.

Finally, Russian natural gas, including that exported from Arctic fields, can become highly competitive only by focusing on innovative methods of gas production and transportation to end consumers.

4. Results
Geopolitically, Russia and Europe are bound for close strategic cooperation in the gas sector between business, political institutions and non-governmental organizations in order to ensure energy security and stable economic development. Despite conflicts, Russia and the EU countries are driven by a common desire to increase transparency, predictability and stability of the gas market, improve the investment climate in all parts of the chain from exploration, production and processing to sales of natural gas to consumers.
The new geopolitical conditions imply that new forms of mutually beneficial cooperation should be established in the global gas market, with mechanisms for balancing the market developed, aimed at finding mutually acceptable solutions accommodating the interests of all parties.

The search for new avenues and tools for mutually beneficial cooperation should continue despite geopolitical differences, financial and technological sanctions. Pursuing a policy aimed at diversifying the routes and methods for delivering natural gas to European consumers, Russia demonstrates a responsible business approach based on the fundamental principles of pragmatism and reliability.

As new technologies emerge, the competitiveness of Russian natural gas produced in the Arctic fields will increase, mainly thanks to innovative means of delivery to end consumers.

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