Russian natural gas projects in the Arctic: A new hope for ailing exports?

Martin Jirušek[1,2], Tomáš Vlček[1*]

[1]*Department of International Relations and European Studies, Faculty of Social Studies, Masaryk University, Brno, Czech Republic*
[2]*International Institute of Political Science, Masaryk University, Brno, Czech Republic*

Abstract

The 2022 development of the Russian aggression in Ukraine has stirred up the long-silent waters of the European energy dimension. The European Union's (EU) reaction was strong and surprisingly swift in comparison with the lax response to the start of the war in 2014. The consequent geopolitical shifts could be compared to those of the early 1990s, and the changes in traditional demand – supply energy relations are especially radical. With Russian coal and crude oil imports under sanctions, the European Union also quickly turned away from Russian natural gas. Natural gas, being the key Russian energy export commodity, lies at the centre of this paper. In the wake of the invasion and the decrease in gas exports to Europe, and with the federal budget being largely dependent on revenues from primary commodity exports, it is clearly apparent that Russia needs to look for customers elsewhere. One of the apparent options is to tap into the Russian Arctic export potential. The primary aim of this paper is to analyse the Russian Arctic export potential and to evaluate its capacity to replace the lost volumes using liquefied natural gas (LNG) export facilities. The authors use diachronic comparative analysis to evaluate Russia's export capacities in the Arctic and compare them to the situation before the war and in the following years up to 2040. The authors are thus able to assess the potential and possible impact the new Arctic export facilities may have on Russia's ability to offset the lost European market.

Key words: Arctic, Russia, hydrocarbons, Russo-Ukraine war, pipelines, LNG

DOI: 10.5817/CPR2025-S-3

Received December 12, 2024, *accepted* September 26, 2025.
[*]Corresponding author: T. Vlček <tomas.vlcek@mail.muni.cz>
Acknowledgements: The article was written as a part of the project ARCTIC Centre for Human-to-Environment Oriented Studies: Impact of Climate Change and Human Activities in the Arctic, supported by the Masaryk University Grant Agency under MUNI/G/1540/2019.

Introduction

The Russian invasion of Ukraine in February 2022 was an unprecedented escalation of the Russian–Ukrainian war that started in 2014. This event marked changes unseen since the collapse of the Soviet Union, with the potential to reformat the security and economic structure in Eurasia and the world. The current security crisis is intertwined with long-term trends that will certainly affect the shape of the international system in the coming years. Fundamental changes in relations between countries and in supply chains – as well as in the field of climate policies, with a significant impact on the structure of European countries' energy sectors – are taking place not only in Europe. Many of the changes expected to occur over the next decade were, in many cases, accelerated by the events of 2022.

Shortly after the invasion, Europe came under tremendous pressure due to its substantial dependence on Russian natural gas supplies for heating and electricity. Even though there were other factors influencing the critical situation in 2022 – including shutdowns of nuclear reactors in France for various reasons, creating electricity scarcity, and Russian supply manipulations and curtailment of gas deliveries as early as 2021, leaving underground gas storage half-empty – the invasion itself and subsequent political developments were the main triggers for change in the European Union (EU). Although not the only factor in Europe's supply struggles, the Russian invasion was the final push, creating a 'perfect storm' – a crisis that prompted the EU to implement significant market reforms and turn away from Russia, its long-standing trade partner.

As a result, Europe's reliance on cheap Russian gas, also benefiting from inexpensive transportation via infrastructure built in 1980s-1990s, has been shaken. The idea of using Russian gas as an interim step on the EU's path to becoming a CO_2-neutral continent was swiftly rendered unviable. The subsequent reactions, namely the adoption of multiple sanction packages (fourteen at the time of writing) by the EU and unilateral sanctions by the USA, G7, individual EU member states and others, have the potential to affect EU–Russia energy relations for decades. It was the EU's high dependence on natural gas and infrastructural unpreparedness for increased LNG imports that initially left this commodity unsanctioned – unlike Russian coal, crude oil and petroleum products, as well as exports of Western technology for hydrocarbon production in Russia. Nevertheless, the majority of EU countries and buyers began actively moving away from Russian natural gas, opting instead for liquefied natural gas (LNG) imported from other countries via ships and LNG terminals.

The EU's drop in demand for Russian gas, along with further developments in 2022 that rendered many traditional export routes unavailable (Nord Stream, Yamal, part of the Ukraine transit), caused a substantial decrease in pipeline gas imports from Russia. In fact, in 2023, imports dropped to only 27 billion cubic metres (bcm), compared with 170 bcm in 2019 (Statista 2024a[24]). Only TurkStream and a limited part of the Ukraine transit remain in operation, significantly limiting Russia's export capacity to the EU. The EU's reaction was not only to secure new commodity contracts but also to enhance its infrastructure. Since February 2022, as much as 41.45 bcm of new LNG terminal capacity and 9.3 bcm of expanded capacity have been added in the EU (Jaller-Makarewicz et al. 2024).

In response to this development, Russia has been expanding its LNG export capacities as well – albeit primarily for export beyond the EU. As indicated above, the situation in the natural gas sector has been changing more slowly, and diversification has taken longer compared to the oil sec-

tor, due to the higher dependence on rigid physical infrastructure (*i.e.* pipelines). As a result, EU sanctions did not target Russian LNG until June 2024 (European Commission 2024[11]). Still, importing Russian LNG is not banned altogether, resulting in significantly higher EU imports of the commodity compared to pre-war levels. According to estimates, the EU likely purchased 52% of all Russian LNG exports between January and July 2023 – a share that exceeds the 49% recorded in 2022 and 39% in 2021 (Euronews 2023[10]). However, this increase cannot offset the fact that Russia lost a substantial portion of its former export market in the EU. In 2021, Russian gas accounted for 45% of EU imports, compared with less than 15% in 2023 (European Council and Council of the European Union 2024[12]).

Given the infrastructural constraints in pipeline exports from Russia, the country is expected to search for other customers and utilise its LNG export capacities to offset the lost market in the EU. Gazprom's revenues fell by nearly USD 7 billion between 2022 and 2023 (Financial Times 2024[13]), signalling issues in adaptation to the new economic and geopolitical reality. The Russian federal budget is largely dependent on revenues from primary commodity exports, mainly oil and gas – mineral products alone made up over 65% of all Russian exports in 2022 (Observatory of Economic Complexity 2023[21]) and over 60% in January 2024 (Statista 2024b[25]).

In fact, the problematic situation of recent years is already evident. While the Russian oil and gas industry's share in gross domestic product oscillated around 20%–21% in 2018/2019, it dropped to 15%–18% in 2022/2023 (Statista 2023[23]). The share of oil and gas revenue in the federal budget fell by 10% between 2019 and 2023 (Yermakov 2024a), and Russia's fossil fuel export revenue declined from approximately EUR 1 billion per day at the beginning of 2022 to around EUR 750 million at the start of 2024 (Centre for Research on Energy and Clean Air 2024[6]). Given how important revenues from hydrocarbon exports are for the Russian federal budget – and thus for the country's ability to project its national interest through foreign policy – it is expected that Russia must seek alternative export routes and new business partners.

One of the expected options is to unlock the Russian Arctic export potential, as outlined in the 2019 Russian Federation's 2035 energy strategy (Министерство энергетики РФ 2019[30]), which includes plans to develop large-scale production and export facilities in the Arctic zone of the Russian Federation (Yamal and Gydan Peninsulas). The Arctic potential is particularly important as it is geographically suitable to help evacuate gas from fields originally earmarked for Europe but now largely cut off from their former customers. More importantly, there are no other viable options for evacuating gas from this main production area apart from nearby LNG terminals in the Arctic, as there is no physical connection to the main prospective market – that is, Southeast Asia, and most notably China. Hence, the primary objective of this paper is to analyse the Russian Arctic potential and evaluate its capacity to replace lost export volumes to the EU.

The Arctic, as a security and geopolitical phenomenon, has been a frequent topic of research. It is climate change – the main cause of ice melting in the region – that opened the discussion, a few decades ago, around accessibility to potentially vast natural resources and access to them (Vlček et al. 2019). Estimates vary, as only limited on-site surveys have been conducted, but expectations suggest that up to 30% of the world's undiscovered natural gas, 16% of its undiscovered oil and 38% of natural gas liquids are hidden in the Arctic (Gauther et al. 2009, Nesheiwat 2021). The region's importance to Russia is clearly illustrated by the fact that Russia

possesses 60% of the Arctic coastline, and Arctic reserves account for 90% of Russia's hydrocarbon reserves (Chung 2024).

Consequently, some, for example, argue that it is precisely the abundant mineral resources in the Arctic that are linked to the region's conflict potential, while also noting that these resources may not be fully exploited for several decades (Janicki 2012). Others (Zia et al. 2015) analyse territorial disputes linked to hydrocarbon sources and melting ice – which brings the focus to Russia as a key player in the Arctic. The region's conflict potential and competing interests, resulting from Russia's assertive regional security, energy and military policies, are frequent subjects of scholarly analysis (Kharlampyeva 2012, Padrtová 2014, Baev 2015, Flake 2015, 2017; Boulègue 2019, Lackenbauer and Lalonde 2019, Lackenbauer and Sergunin 2022, Buchanan 2023).

The selected topic's relevance is thus quite clear; however, we aim at a more recent era, as post-2022 events and their image in academic research are mainly relevant for this paper, especially in relation to the Russian Arctic potential in its energy exports. The importance of Arctic energy reserves for Russia is discussed by (Romańczuk and Jędrzejewski 2021), who connect Russia's unprecedented interest in the development of Arctic production potential with the depletion of Soviet West Siberian fields and the country's search for their replacement in the traditional manner. The ability of Russia to redirect its natural gas flows away from the EU is slightly touched upon in (McWilliams et al. 2023), summarising that the situation will be more challenging for Russia than for Europe. The topic is also mentioned in a rather similar fashion in (Shagina 2022), while high uncertainty regarding the future of Russian LNG exports accompanies Moe's 2024 commentary (Moe 2024[18]). Another paper (Schreurs 2023) mainly focuses on the Western post-2022 experience and development. A highly relevant paper (Henderson et al. 2024) analyses the broader situation, though it does not focus on Arctic LNG specifically, and Astrov's research team (Astrov et al. 2022) examine in their detailed paper the broad economic impact of the Western reaction to Russia's invasion of Ukraine on Russia, the EU and Ukraine. Related environmental benefits of sanctioned exports of Russia's fossil fuels, such as reduced CO_2 and air pollutant emissions, are analysed in (Chepeliev et al. 2022), whereas the hazards of energy resource extraction in the Arctic are discussed in (Razmanova et al. 2023).

For the analysis of Russia's Arctic LNG export potential, we have mainly worked with primary sources and analytical papers to gain unobstructed knowledge of the Russian Arctic LNG infrastructural development. We used open sources and data from the project companies, publicly available statistical data, and reports by renowned consulting companies to construct the most realistic image of the situation in the Arctic vis-à-vis Russia's current and projected LNG exports.

Our paper fits well within current research topics and trends, as Russia's invasion of Ukraine has framed major geopolitical and structural changes in Europe's security of supply. Analyses of the impact, changes and supply potential of relevant players in the global arena are important, just as analyses of the impact on Russia's economy, energy sector and foreign policy are. As Russian natural gas imports into the EU decline, scrutiny of Russia's other export routes and capacities is only logical. As we have observed through the analysis of relevant research since 2022, there is no existing study or calculation of Russia's future Arctic LNG projects and their potential to compensate for the loss of pipeline exports to the EU – precisely the research gap this paper aims to address.

Material and Methods

For the purpose of this research, energy is understood as a source of economic power, which is transformed into a state's essential ability to exist and pursue its national interests in foreign policy (Gilpin 2001, pp. 17–19, 21–24; Klare 2004, Moran 2009, Ciută 2010). Hence, based on this theory, our research expects Russia to rapidly invest in opening alternative export routes for natural gas, being aware of the fundamental importance of the energy sector in the generation and projection of state power.

The primary target of this paper is to analyse the Russian Arctic LNG export potential and assess its capacity to compensate for the export volumes lost due to Europe's diversification away from Russian supplies in the wake of Russia's aggression against Ukraine. Hence, we seek to answer the following research question: Is the current and planned Russian LNG infrastructure in the Arctic able to compensate for the lost pipeline natural gas exports to the EU? In other words, will the Russian LNG capacity in the Arctic take over from the pipelines that supplied gas pre-invasion and are now left virtually unused?

The reason for focusing on LNG is straightforward. The natural gas that was being shipped to Europe originated from gas reserves in the northwestern part of Russia, with the Nadym–Pur–Taz province producing approximately 90% of Russia's total natural gas output (Henderson et al. 2024, p. 29). However, this area has historically been connected to pipelines heading to Europe, without any physical connection to China or other Asian markets, thus leaving no alternative for export reorientation other than LNG in the Arctic.

To answer the research question, we utilise quantitative data analysis through a descriptive diachronic comparative study – that is, an evaluation and cross-comparison of a phenomenon at various points in time, as described by, for example, John Gerring (Gerring 2007, pp. 21–28). Specifically, we aim to compare Russian natural gas export capacities across four points in time – t0, t1, t2, t3 and t4 – to answer the research question and provide a scenario for possible future development in the discussion chapter. We compare the situation in selected years, beginning with t0, in which Russian natural gas export capacities to Europe are scrutinised in detail to provide the baseline for further analysis.

As the world has recently experienced several major crises, we decided to set t0 in 2019 – the latest "business as usual" year, unaffected by Russia's invasion of Ukraine, supply manipulation, the EU's diversification efforts, the energy crisis, or the COVID-19 pandemic. To establish the reference point, we identified the volumes supplied to Europe, the infrastructure used, and the level of its utilisation.

The point t1 was set in 2023 as the first full year of the invasion, offering a clearer picture of the volumes lost compared to t0. Also, 2023 was the first full year post-invasion for which data were available at the time of writing. This gave us the volume that we needed to find new export outlets. That volume was then compared against new and unused Russian Arctic LNG export capacity to assess how much could be theoretically redirected.

The point t2 was set in 2025 to evaluate the situation in light of the potential cessation of gas transit via Ukraine. The point t3 was set in 2030 as a realistic horizon for the completion of planned or under-construction LNG facilities. Finally, t4 was set in 2040 – a year considered significant as major consumers, including China (the biggest prospective market for excess Russian gas), might begin to peak in demand (Meidan 2023, pp. 10–14). Therefore, we chose this year to assess

whether Russia could build sufficient capacity to offset the lost European markets fully by that point.

For this study, we will use the broader areal definition of the Arctic, which includes the High Arctic, Low Arctic and Sub-Arctic regions as well (BarentsWatch 2015[4]). The research is qualitative in nature, with data collected from open sources. We will be using relevant and comparable statistical information from, for example, the statistical agency of the European Union (Eurostat) and the European Network of Transmission System Operators for Gas (ENTSOG), as well as primary and secondary literature, including scholarly papers and analyses or reviews from various research institutions and think tanks. Given the limited reliability of Russian data – especially after 2022 – whenever such data are used, they will also be triangulated with Western literature.

Results

T_0 - 2019

In 2019, Europe was importing 170 bcm/y out of 200 bcm of pipeline gas exported from Russia that year, making it by far the most important market for Russian gas (Henderson et al. 2024, p. 34)[1]. The volume was supplied via several routes – mainly the Brotherhood pipeline via Ukraine, the Yamal Pipeline via Belarus, Nord Stream 1 via the Baltic Sea, and the TurkStream pipeline via Turkey[2]. Besides these main trunk pipelines, the volume was supplemented by minor supply lines, such as those to Finland and Latvia (ENTSOG 2024[9]).

Altogether, the transit pipeline system capable of delivering supplies from Russia could accommodate deliveries of about 250 bcm/y (ENTSOG 2024[9]). This figure includes the Ukrainian transit route, the Yamal Pipeline, the TurkStream pipeline, and the first string of the Nord Stream pipeline system, which was operational in 2019. At that time, the second string of the Nord Stream system – Nord Stream 2 – was under construction, with the potential to add another 55 bcm/y (Nord Stream n.d.[19]).

Overall, in t0, Russia, through its pipeline export monopolist Gazprom, held a prime position in the European market, with spare capacity and more to come in the form of the Nord Stream 2 pipeline. The Russian LNG infrastructure in the Arctic at the time consisted of Yamal LNG, which had three operating trains, each with an annual export capacity of approximately 7.6 bcm (Total Energies 2018[28]).

Given the market situation, the most likely scenario at the time was an increase in exports to Europe, as European domestic production was in decline and the ongoing shift from coal to cleaner energy sources was driving growth in gas demand. Given the abovementioned fact that the majority of Russian gas production was located in the northwestern part of Russia – with export infrastructure oriented towards Europe – Russia's Arctic LNG export potential was not perceived as a vital factor in the country's future gas exports. It should also be noted that in 2019, Russia was actively building the

[1] Although that was a solid number, assuming almost 40% of the European market, in absolute volume, deliveries peaked at a staggering 201 bcm/y in 2016 – 2018.

[2] Only one string of the TurkStream pipeline, with a capacity of approximately 16 bcm/y, is used to deliver natural gas to Europe. The other string delivers the commodity to Turkey.

Nord Stream 2 pipeline via the Baltic Sea, intended to provide a significant new evacuation route for gas from the Yamal Peninsula production region.

T_1 - 2023

Following the Russian full-scale invasion of Ukraine in February 2022, the volume of Russian supplies to Europe dwindled in 2023. Between February 2022 and November 2024 (the time of writing of this article), Russia's pipeline export capacity to Europe was reduced due to various events. Namely, the stoppage of flows via the Yamal Pipeline cut off some 33 bcm/y of transit capacity, and, most notably, Gazprom lost the Nord Stream 1 pipeline – which provided 55 bcm/y – as a result of the explosions in late September 2022[3]. On top of that, Ukrainian transit to Slovakia plummeted to an annual flow of less than 30 bcm. Hence, between t0 and t1, Russia's pipeline exports declined by over 110–120 bcm/y (Henderson et al. 2024, p. 3; Tsafos 2022[29]).

It was still unknown whether the transit via Ukraine and Slovakia would continue after December 2024 at the time of writing (autumn 2024). The only remaining customers buying natural gas from Gazprom on a long-term contract basis at that time were Slovakia and Austria, while Hungary and customers in the southeast of Europe were receiving their supplies via the TurkStream Pipeline and its extension through the region. Hence, it was unlikely that the volume delivered via the Ukraine–Central Europe route would come close to the nominal capacity of the transit corridor, should the transit be sustained. The likely scenario was utilisation at the 2023 level or below – just enough to meet the relatively low demand of the two long-term contracts, with a slight leeway above that for the short-term market.

Various scenarios were being considered regarding who would procure supplies after the transit contract ends in late 2024. As neither Russia nor Ukraine showed strong interest in prolonging the agreement, a third party might step in to procure supplies through Ukrainian territory. Regardless, the utilisation of the transit route was expected to remain between zero and the level of 2023 supplies (*i.e.* between 20 and 30 bcm/y), meaning that Gazprom's loss of transit capacity between t0 and t1 would remain the same or even increase – putting further pressure on Russia's ability to evacuate the stranded gas in the northwest of its territory[4].

In terms of LNG capacity, between t0 and t1, Russia recorded only a marginal increase, having brought the fourth train of the Yamal LNG facility into operation, increasing Russia's Arctic LNG export capacity by approximately 1.2 bcm/y (Elliot 2020[7]).

Crucially, the start of the Russian invasion of Ukraine impacted Russian LNG exports significantly, mainly because part of the LNG infrastructure relies on imported technologies, particularly from Western companies. A key project in this regard is Novatek's Arctic LNG 2, where heat exchangers, gas turbines and compressors were imported,

[3] On top of that, Gazprom likely lost the other supply line of the Nord Stream pipeline system – Nord Stream 2 – as well. Although, allegedly, one string of the Nord Stream 2 pipeline (approximately 27.5 bcm/y of transit capacity) was left intact.

[4] As mentioned above, after the war broke out, the gas flow via Ukraine to Slovakia stabilised at around 20 bcm/y – about 30 bcm/y lower than before the war and less than one-third of the route's capacity of approximately 77 bcm/y. A complete cessation of supplies via this route would increase the volume of lost Russian exports – and thus the volume needing an alternative – by another 20–30 bcm/y, to around 140 bcm/y.

with the US company Baker Hughes acting as the principal supplier (Yermakov 2024b, p. 6). By the time of the invasion in February 2022, Novatek had secured equipment for the first stage (train) of the Arctic LNG 2 facility, but not for the second and third stages. As sanctions were imposed and Western companies – including Baker Hughes – withdrew, it became apparent that Russian LNG projects would be significantly affected.

The second and third stages had to be substantially redesigned, and alternative technology was sourced from China. Although Novatek received a patent in 2023 for its own proprietary liquefaction technology, it is only suitable for small to medium-sized LNG plants and, therefore, would not significantly increase Russia's LNG export capacity. Importantly, it would also not be compatible with the scale and design of the planned Arctic projects (Afanasiev 2024[1]; NOVATEK 2023[20]).

T_2 - 2025

Based on the original plans, Arctic LNG 2 was slated to add significant capacity – over 27 bcm of annual LNG export potential. However, the project has been significantly delayed by sanctions, mainly those targeting the liquefaction technology mentioned above, as well as icebreaking vessels. Thus, it is not entirely unrealistic to question the timely addition of Arctic LNG 2 capacity to Russia's export portfolio. In fact, the start-up dates of almost all new Russian LNG export facilities are now uncertain.

Between t1 and t2, no new LNG facilities or expansions in LNG export capacity could be expected, apart from the first stage of Arctic LNG 2, with a capacity of 9.1 bcm/y. As mentioned in the previous section, the only projects in an advanced stage of development at the time of t2 were the second and third stages of the Arctic LNG 2 facility. However, due to delays in deploying liquefaction infrastructure caused by sanctions, it is not realistic to expect any of these projects to be completed within this timeframe.

Crucially for Russia's natural gas exports, the transit contract with Ukraine ends at the end of 2024, potentially increasing the loss of supplied volumes to Europe to nearly 140 bcm/y. This would leave even more stranded gas in Russia and increase pressure on projects aimed at evacuating that gas abroad.

T_3 - 2030

The years between t2 and t3 could potentially see the highest additions of new LNG capacity, with the Arctic 1 LNG terminal (ca. 27 bcm/y of export capacity), two stages of the Arctic 2 LNG terminal (9.1 bcm/y each)[5], and two stages of the Obsky LNG terminal (4.14 bcm/y each) (Argus Media 2021[3]; Interfax 2024[17]). Additionally, the Murmansk LNG project, with two stages – each with 9.4 bcm/y of annual export capacity – is allegedly also under consideration (Interfax 2023[16])[6].

Hence, the potentially added new LNG capacity between t2 and t3 could amount to over 70 bcm/y of export capacity, which is about 60% of the capacity lost after the war broke out. Combined with the capacity added between t1 and t2 (the first stage of Arctic LNG 2 with 9.1 bcm/y), the total capacity added after the war started would be around

[5] Provided the first stage is fully operational by 2025.

[6] Originally, the Murmansk LNG project was planned to include three trains, but it was reduced to two in July 2024 (Enerdata 2024[8]).

70% (or ca. 80 bcm/y) of the exports lost. That leaves around 40 bcm/y of the volume lost between t0 and t1, for which Russian producers would still need to find an alternative outlet beyond the planned LNG export capacity. Theoretically, part of this volume could be consumed within the Russian domestic market. However, it is crucial to recognise that the calculations above reflect a best-case scenario in which no delays occur – something that, based on experience so far, is somewhat unrealistic to expect.

For Russia to reach the lucrative Chinese market, there seem to be just a few options – and only two of them could relieve the gas left stranded in the northwest of Russia after losing much of the European market. Aside from the LNG build-up discussed above, there is the Power of Siberia 2 pipeline – a 2,600 km-long pipeline stretching from the Yamal Peninsula through central Russia and Mongolia to China – which could transport up to 50 bcm/y of gas to Asia. However, so far, the pipeline has remained only a proposal, with an unclear timeline, and the originally proposed start-up date of 2030 does not appear realistic (Glagol 2022[14]). It is evident that completing such a project even in peacetime would be an enormous task – doing so under the weight of sanctions imposed on Russia is a different challenge altogether. Furthermore, based on recent developments, it seems that China is not especially keen to incentivise the pipeline's development. On the contrary, earlier in 2024, China prioritised a new gas pipeline project from Turkmenistan over Power of Siberia 2, placing another obstacle in the path of the Russian project (Aizhu and Gurt 2023[2]).

The project most often cited as affected by sanctions has been Arctic LNG 2, where commissioning of the first train was delayed from 2023 to 2024, when limited operations began in the second half of the year (Afanasiev 2024[1]). The second train was being readied around that time, too, although progress was hampered by a lack of equipment and ice-class carriers resulting from sanctions (Afanasiev 2024[1]). The same applies to the adjacent Obsky LNG terminal. The facility was initially filed as an LNG terminal in 2019, reconfigured to produce ammonia, hydrogen and methanol in 2021, and then returned to the original LNG plan in 2022 – with operations estimated to begin in 2026 (Humpert 2022[15]). Lastly, the Murmansk LNG project appears somewhat enigmatic, as it is not entirely clear whether it is progressing or not (Reuters 2024[22]).

T4 – 2040

The t4 is a timeframe beyond any of the proposed or planned projects, or projects under construction. Therefore, the potential additions elaborated on in previous sections apply here as well, along with the potential setbacks. However, what is important to recognise is the factor of demand, especially in China. China is – and will remain – the determining factor and a litmus test for global LNG demand.

Based on known estimates and economic projections, the main global consumers' demand for fossil fuels, including China, could peak in the late 2030s or early 2040s (Meidan 2023, pp. 10–14). After that, the market for LNG is expected to plateau and, subsequently, begin to shrink – leaving less room for Russian LNG exports. Therefore, from the perspective of LNG export capacity and offsetting the loss of European markets, Russia needs to ramp up its LNG export capacity within the next 10 years, as the incentives to do so in the late 2030s will begin to disappear.

t	Change in export capacity (negative)	Change in export capacity (positive)	Net position
t0 (2019)	N/A	N/A	N/A
t1 (2023)	–120	+1.2	–119
t2 (2025)	0	+9.1	–110
t3 (2030)	0	+72.6	–38
t4 (2040)	0	+50	+12

Table 1. Change in Russia's export capacity. Compilation: The authors.

Discussion

The research showed that Russian Arctic LNG export capacity will play a significant role in Russia's gas export reorientation post-invasion. Theoretically, if all Russian LNG projects are built on time according to their plans, along with the Power of Siberia 2 pipeline, most of the gas originally earmarked for Europe could be redirected. However, such a scenario remains largely theoretical and unlikely. As the evaluation of individual Arctic LNG projects showed, all projects beyond the first stage of Arctic LNG 2 have been delayed or remain in early stages of development, effectively calling into question the future of Russian LNG export capacity.

Theoretically, the projects added after Russia lost approximately 120 bcm/y of gas exports to Europe in the wake of the invasion could offset around 70% of the lost volume (*i.e.* ca. 80 bcm/y). Combined with the Power of Siberia 2 pipeline – potentially offtaking up to an additional 50 bcm/y from the stranded gas in the northwest – the capacity would fall slightly short of the volume lost after the start of the war, including a potential complete cessation of Ukrainian transit post-2024. This would bring the total lost export volumes to approximately 130 bcm/y (*see* the section on the t1 point above).

Another factor speaking in favour of successfully offsetting the lost exports is the potential for increased domestic demand. In 2023, Russian domestic gas demand stood at 453 bcm – more than 100 bcm above demand in the EU. In addition, Russian domestic gas consumption has increased by 30 bcm since 2020, a year that marked a five-year low and highlighted the pandemic-induced demand slump (Statista 2024c, d[26,27]). In essence, the potential for expanding domestic gas demand is certainly present, particularly given the Kremlin's expected willingness to support domestic consumption through various policies and incentives. On the other hand, this expansion might be hindered by insufficient infrastructure and may take years to produce meaningful results.

What must be noted is that the analysis above reflects a best-case scenario for the construction of new Russian infrastructure – a scenario that is unlikely to materialise. As demonstrated in the case of Arctic LNG 2, new projects are already being delayed due to sanctions on technologies and the withdrawal of companies. As a result, these projects may be significantly delayed, scaled down, or even entirely redesigned.

A further factor is that t0, that is 2019, saw the highest share of imported Russian gas, with expectations of significant expansion amid Europe's rising gas demand. That almost certainly will not happen again. Although Europe's potential willingness to resume Russian supplies at some point in the future cannot be entirely ruled

out, it is not a likely scenario either. Even if Russian supplies were to return, they would face a markedly different market situation compared to the pre-war era.

After the Russian invasion began, European customers scrambled to find alternatives to Russian gas, as supplies were either stopped or considered undesirable. To replace Russian gas, European countries turned to existing suppliers but, most importantly, increased LNG imports from overseas. Combined with a significant decrease in consumption – from 397 bcm in 2021 to 319 bcm in 2023 – the months following the invasion showed that Europe could successfully reduce its reliance on Russian supplies (Statista 2024d[27]). Although Russian LNG supplies increased in recent years, they have not approached the volumes delivered via pipelines up to 2022 (Blakeway and Pravilschikov 2024[5]).

The bottom line is that, due to Europe's diversification following the invasion, the room for any potential increase in Russian gas supplies has shrunk. In fact, the majority of the demand that Gazprom relied on before the war has been met by other suppliers. Moreover, aside from LNG, there are very few routes by which Russian gas could reach Europe. With the Nord Stream pipeline system out of operation, and Poland showing little interest in reopening gas transit via the Yamal pipeline, the only remaining significant pipeline option is the Ukrainian transit – which, as mentioned above, does not appear to be a preferred option for either of the concerned parties.

Along with the sanctions hindering LNG export capacity development, a further obstacle to Russia's bet on LNG exports could be a crackdown on LNG vessels transporting the shipments or on the trading of Russian LNG itself. Much like in the oil sector, the EU has begun targeting specific vessels and transhipments of Russian LNG through EU ports to limit Russia's ability to benefit from LNG trade (European Commission 2024[11]). Although the situation in the transportation sector remains highly dynamic and Russia has managed to exploit loopholes in the sanction regime, it is safe to say that the sanctions could delay LNG infrastructure development and constrain exports – at least in the short- to mid-term outlook (Yafimava et al. 2024).

Last but not least, Russian LNG exporters are racing against time to reach lucrative markets in Southeast Asia, especially China. However, they face tough competition in the region, which puts some of their most ambitious projects to evacuate Arctic-based natural gas into question. Moreover, China's fossil fuel demand is expected to plateau in the late 2030s, further limiting Russia's potential for expansion into that market.

Conclusion

In this paper, we set out to answer the question of whether the upcoming Russian LNG infrastructure in the Arctic can compensate for the pipeline gas exports to the EU lost due to the war that Russia is waging in Ukraine. We used a diachronic comparative approach – in other words, we studied Russian LNG export capacities in the Arctic at various time points. For that purpose, we chose to compare the situation in 2019 with the expected situation in 2023, 2025, 2030, and 2040. The year 2019 was set as the starting point, as it was unaffected by the war or the global COVID-19 pandemic, both of which profoundly influenced industry development and global demand. The year 2023 was chosen as it provided complete statistics reflecting the wartime situation. The year 2025 was selected to assess the situation, given the potential cessation of gas transit via Ukraine – a former main supply route

for Russian gas to Europe. The next point in time, 2030, was chosen as a realistic horizon by which planned LNG facilities, or those under construction, could be completed. Finally, 2040 was selected as the point when global gas demand might peak, marking a pivotal moment for Russian natural gas development – and, effectively, a point after which the industry might enter decline.

The analysis confirmed that Russia has been expanding its LNG export capacity in an effort to improve its export position. The goal has been to reach new markets but also, particularly in recent years, to address the lost export volumes resulting from the war in Ukraine. In response to Russian aggression, European countries significantly reduced or completely stopped purchases of Russian gas, ending a decades-long trend. On top of this, Russia lost its major supply pipeline, which shipped natural gas via the Baltic Sea – the Nord Stream. Consequently, Russian gas exports to Europe plummeted, leaving significant gas volumes stranded in Russia with very limited options for redirection.

Given that, the most straightforward way to manage the supply overpressure is through the expansion of LNG export capacity in the Arctic. Here, Russia has been building or planning several large-scale projects that could target even remote Asian markets, where Russia lacks pipeline connections that would help evacuate the gas from the northeast.

The conducted analysis found that the new capacity planned for opening after the invasion in 2022 could replace the majority of the lost exports originally earmarked for Europe. The planned Power of Siberia 2 trunk pipeline could even redirect these stranded volumes elsewhere – all the way to the important Chinese market. However, the research also suggests that such a scenario is rather unlikely. The main hindrance is posed by delays and technological problems faced by the projects, particularly in recent years, due to sanctions on various equipment and technologies. A further complication could arise from the lack of connecting infrastructure within Russia.

Even if potentially higher domestic demand is factored in, by effectively shutting the door to Europe, Russia is left with one viable option – the Asian market. However, as foreshadowed above, the pivot to Asia is not without its challenges. LNG capacity is progressing only slowly, as shown above, and the LNG market is becoming increasingly competitive. Although Russian gas in Europe had been losing its formerly undisputed position, it was nonetheless operating within a stable and predictable environment. The Asian markets, by contrast, pose a different kind of challenge for Russian gas, particularly in the form of LNG. On top of this, the potentially instrumental Power of Siberia 2 pipeline is far from completion, and China does not appear especially eager to support the project. Lastly, China's hunger for fossil fuels may begin to abate in the foreseeable future, further undermining Russia's effort.

In conclusion, although the numbers may theoretically add up on paper, Russian gas will likely face serious challenges in trying to offset the lost European market. Even though the Arctic LNG projects will play a significant role in the future, they are unlikely to fully replace the volumes previously sent to Europe.

References

ASTROV, V., GHODSI, M., GRIEVESON, R., HOLZNER, M., KOCHNEV, A., LANDESMANN, M., PINDYUK, O., STEHRER, R., TVERDOSTUP, M. and BYKOVA, A. (2022): Russia's invasion of Ukraine: Assessment of the humanitarian, economic, and financial impact in the short and medium term. *International Economics and Economic Policy*, 2022(19): 331-381. doi: 10.1007/s10368-022-00546-5

BAEV, P. K. (2015): Russia's Arctic aspirations. *Arctic Security Matters Report*, 24: 51-56. doi: 10.2815/265208

BOULÈGUE, M. (2019): Russia's military posture in the Arctic managing hard power in a 'Low Tension' environment. *Chatham House Research Paper*, London, The Royal Institute of International Affairs. https://www.chathamhouse.org/sites/default/files/2019-06-28-Russia-Military-Arctic_0.pdf

BUCHANAN, E. (2023): *Red Arctic: Russian strategy under Putin*. Lanham, Rowman & Littlefield, 248 p.

CHEPELIEV, M., HERTEL, T. and VAN DER MENSBRUGGHE, D. (2022): Cutting Russia's fossil fuel exports: Short-term economic pain for long-term environmental gain. *The World Economy,* 2022(45): 3314-3343. doi: 10.1111/twec.13301

CHUNG, J. S. (2024): Review paper: The Arctic states and their energy resources. *Research in Marine Sciences*, 9(2): 452-461.

CIUTĂ, F. (2010): Conceptual notes on energy security: Total or banal security? *Security Dialogue*, 41(2): 123-144. doi: 10.1177/0967010610361596

FLAKE, L. E. (2015): Forecasting conflict in the Arctic: The historical context of Russia's security intentions. *Journal of Slavic Military Studies*, 28(1). doi: 10.1080/13518046.2015.998122

FLAKE, L. E. (2017): Contextualizing and disarming Russia's Arctic security posture. *Journal of Slavic Military Studies*, 30(1). doi:10.1080/13518046.2017.1271647

GAUTHER, D. L., BIRD, K. J., CHARPENTIER, R. R., GRANTZ, A., HOUSEKNECHT, D. W., KLETT, T. R., MOORE, T. E., PITMAN, J. K., SCHENK, C. J., SCHUENEMEYER, J. H., SØRENSEN, K., TENNYSON, M. E., VALIN, Z. C. and WANDREY, C. L. (2009): Assessment of undiscovered oil and gas in the Arctic. *Science*, 324(5931): 1175-1179. doi: 10.1126/science.1169467

GERRING, J. (2007): *Case study research: Principles and practices*. Cambridge, Cambridge University Press, 265 p.

GILPIN, R. (2001): *Global political economy: Understanding the international economic order*. Princeton, Princeton University Press, 440 p.

HENDERSON, J., YERMAKOV, V. and CONNOLLY, R. (2024): Outlook for Russia's oil and gas production and exports. *The Oxford Institute for Energy Studies Paper*, NG 189. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/03/NG-189-Outlook-for-Russias-oil-and-gas-improved-resolution.pdf

JALLER-MAKAREWICZ, A. M., RUSSI, S., SCULLY, J. and DOCHERTY, A. (2024): European LNG Tracker. *Institute for Energy Economics and Financial Analysis*. https://ieefa.org/european-lng-tracker-september-2024-update

JANICKI, W. (2012): Why do they need the Arctic? The First Partition of the Sea. *Arctic*, 65(1). doi: 10.14430/arctic4168

KHARLAMPYEVA, N. K. (2012): The transnational Arctic and Russia. *In*: H. Peimani (ed.): *Energy Security and Geopolitics in the Arctic: Challenges and Opportunities in the 21st century*. Singapore, World Scientific.

KLARE, M. T. (2004): *Blood and oil: The dangers and consequences of America's growing dependency on imported petroleum.* New York, Henry Holt & Co., 267 p.

LACKENBAUER, W., LALONDE, S. (2019, eds.): *Breaking the ice curtain? Russia, Canada, and Arctic security in a changing circumpolar world.* Calgary, Canadian Global Affairs Institute, 2019, 118 p.

LACKENBAUER, W., SERGUNIN, A. (2022): Canada's and Russia's security and defence strategies in the Arctic: A Comparative Analysis. *Arctic Review on Law and Politics*, 2022(13): 232-257. doi: 10.23865/arctic.v13.3243

McWilliams, B., Sgaravatti, G., Tagliapietra, S. and Zachmann, G. (2023): Can Europe live without Russian natural gas? *The World Economy*, 2023(46): 897-905. doi: 10.1111/twec.13393

Meidan, M. (2023): The outlook for China's fossil fuel consumption under the energy transition and its geopolitical implications. *The Oxford Institute for Energy Studies Paper*, CE8. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2023/06/CE8-The-outlook-for-Chinas-fossil-fuel-consumption.pdf

Moran, D. (2009): The Battlefield and the Marketplace: Two Cautionary Tales. *In*: D. Moran, J. A. Russel (eds.): *Energy Security and Global Politics: The Militarization of Resource Management*. New York, Routledge, pp. 19–33.

Nesheiwat, J. (2021): Why the Arctic matters. *EnergySource*, 2021 (July 17). https://www.atlanticcouncil.org/blogs/energysource/why-the-arctic-matters/

Padrtová, B. (2014): Russian military build-up in the Arctic: Strategic shift in the balance of power or bellicose rhetoric only? *In*: L. E. Heininen, H. Exner-Pirot and J. Plouffe (eds.): *Arctic Yearbook 2014*. Akureyri, Northern Research Forum, pp. 415–433. https://view.joomag.com/arctic-yearbook-2014/0329972001414484578

Razmanova, S., Pisarenko, Z., Nesterova, O., Toan, N. K. and Ivanov, L. (2023): Environmental hazards and risk identification in the Arctic shelf development as part of China and Russia energy interests. *Energies*, 2023(16). doi: 10.3390/en16041800

Romańczuk, M., Jędrzejewski, W. (2021): The rivalry over the Arctic strategic resources and Russia's role. *European Research Studies Journal*, XXIV(4): 217-226.

Schreurs, M. (2023): Implications of the Russian war on Ukraine for climate policy and the geopolitics of energy. *Canadian Journal of European and Russian Studies*, 16(2): 90-113.

Shagina, M. (2022): Russia's demise as an energy superpower. *Global Politics and Strategy*, 64(4): 105-110. doi: 10.1080/00396338.2022.2103261

Vlček, T., Bodišová, L. and Vencourová, Ž. (2019): The Northern Sea route: Oil transportation alternative for current sea lanes of communication? *Czech Journal of Political Science*, 26(1): 50-73. doi: 10.5817/PC2019-1-50

Yafimava, K., Ason, A., Sharples, J. and Stern, J. (2024): EU sanctions on Russian LNG: Choices and consequences. *The Oxford Institute for Energy Studies Energy Insight 156*. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/07/Insight-156-EU-sanctions-on-Russian-LNG.pdf

Yermakov, V. (2024a): Follow the money: Understanding Russia's oil and gas revenues. *Oxford Energy Comment*, March 2024: 1-14. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/03/Follow-the-Money-Russian-Oil.pdf

Yermakov, V. (2024b): Arctic LNG 2: The litmus test for sanctions against Russian LNG. *Oxford Energy Comment*, October 2024: 1-12. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/10/Arctic-LNG-2.pdf

Zia, A., Kelman, I. and Glantz, M. H. (2015): Arctic melting tests the united nations convention on the law of the sea. *In*: R. A. Pincus (ed.): *Diplomacy on Ice: Energy and the Environment in the Arctic and Antarctic*. Yale University Press, New Heaven, pp. 128–140.

Web sources / Other sources

[1] Afanasiev, V. (2024): Arctic LNG 2's second train nears commissioning after power plant arrival.
https://www.upstreamonline.com/energy-security/arctic-lng-2s-second-train-nears-commissioning-after-power-plant-arrival/2-1-1732100?zephr_sso_ott=hRHAEF

[2] Aizhu, C., Gurt, M. (2023): China prioritising Turkmenistan over Russia in next big pipeline project.
https://www.reuters.com/markets/commodities/china-prioritising-turkmenistan-over-russia-next-big-pipeline-project-2023-05-24/

[3] Argus Media (2021): Novatek sees LNG supply shortfall by 2030. https://www.argusmedia.com/en/news-and-insights/latest-market-news/2180636-novatek-sees-lng-supply-shortfall-by-2030

[4] BarentsWatch (2015): *What is the Arctic?* https://www.barentswatch.no/en/articles/what-is-the-arctic/

[5] Blakeway, A., Pravilschikov, N. (2024): Russian gas flows favoring Asia over NWE as LNG finds takers in Europe. https://www.spglobal.com/commodity-insights/en/news-research/latest-news/lng/102424-russian-gas-flows-favoring-asia-over-nwe-as-lng-finds-takers-in-europe

[6] Centre for Research on Energy and Clean Air (2024): *March 2024 – Monthly analysis of Russian fossil fuel exports and sanctions*. https://energyandcleanair.org/march-2024-monthly-analysis-of-russian-fossil-fuel-exports-and-sanctions/

[7] Elliot, S. (2020): Russia's Yamal LNG train 4 to produce first LNG in Q1 2021: Novatek CFO. https://www.spglobal.com/commodity-insights/en/news-research/latest-news/metals/120320-russias-yamal-lng-train-4-to-produce-first-lng-in-q1-2021-novatek-cfo

[8] Enerdata (2024): Novatek reduces Murmansk LNG project capacity to 13.6 Mt/year (Russia). https://www.enerdata.net/publications/daily-energy-news/novatek-reduces-murmansk-lng-project-capacity-136-mtyear-russia.html

[9] ENTSOG (2024): System Capacity Map 2024. https://www.entsog.eu/sites/default/files/2024-02/ENTSOG_GIE_SYSCAP_2024_Update%20Feb.pdf

[10] Euronews (2023): *EU purchases of Russian LNG up 40% compared to pre-war levels, new study finds*. https://www.euronews.com/my-europe/2023/08/30/eu-purchases-of-russian-lng-up-40-compared-to-pre-war-levels-new-study-finds

[11] European Commission (2024): EU adopts 14th package of sanctions against Russia for its continued illegal war against Ukraine, strengthening enforcement and anti-circumvention measures. https://ec.europa.eu/commission/presscorner/detail/en/ip_24_3423

[12] European Council and Council of the European Union (2024): *Where does the EU's gas come from*? https://www.consilium.europa.eu/en/infographics/eu-gas-supply/

[13] Financial Times (2024): *Gazprom plunges to worst loss in decades as sales to Europe collapse*. https://www.ft.com/content/f6ba327b-5200-4deb-ba95-fba3bbd6536a

[14] Glagol (2022): Газопровод "Сила Сибири - 2" пройдет через Черемхово, Зиму и Саянск. https://glagol38.ru/text/13-05-2022/004

[15] Humpert, M. (2022): Novatek To Boost LNG Capacity on Yamal Peninsula. https://www.highnorthnews.com/en/novatek-boost-lng-capacity-yamal-peninsula

[16] Interfax (2023): "НОВАТЭК" учредил ООО "Мурманск СПГ". https://www.interfax.ru/business/934521

[17] Interfax (2024): Arctic LNG 1 to build cargo terminal at Sabetta port. https://interfax.com/newsroom/top-stories/102667/

[18] Moe, A. (2024): *Russian Arctic LNG Exports: From Success to Uncertainty*. https://www.csis.org/analysis/arctic-energy-security#essay-1

[19] Nord Stream (n.d.). The Pipeline. https://www.nord-stream.com/the-project/pipeline/

[20] NOVATEK (2023): NOVATEK improves its Arctic Cascade Gas Liquefaction Technology. https://www.novatek.ru/en/press/releases/index.php?id_4=5669

[21] Observatory of Economic Complexity (2023): *Russia*. https://oec.world/en/profile/country/rus

[22] Reuters (2024): Novatek says it reconfigures Obsky LNG project to produce hydrogen, ammonia. https://www.reuters.com/business/energy/novatek-says-it-reconfigures-obsky-lng-project-produce-hydrogen-ammonia-2021-06-23/

[23] Statista (2023): *Share of the oil and gas industry in the gross domestic product (GDP) of Russia from 1st quarter 2017 to 2nd quarter 2023*. https://www.statista.com/statistics/1322102/gdp-share-oil-gas-sector-russia/

[24] Statista (2024a): *Imports of natural gas via pipelines to the European Union from Russia from 2019 to 2023*. https://www.statista.com/statistics/1384422/russian-pipeline-natural-gas-annual-imports-to-the-european-union/

[25] Statista (2024b): *Trade in Russia - statistics & facts*. https://www.statista.com/topics/5947/trade-in-russia/

[26] Statista (2024c): *Natural gas consumption in Russia from 2000 to 2023*. https://www.statista.com/statistics/265392/russian-natural-gas-consumption-in-cubic-meters/

[27] Statista (2024d): *Natural gas consumption in the European Union from 1998 to 2023*. https://www.statista.com/statistics/265406/natural-gas-consumption-in-the-eu-in-cubic-meters/

[28] Total Energies (2018): Russia: Yamal LNG Starts Up Train 3 Twelve Months Ahead of Schedule And Achieves Its Full Capacity. https://totalenergies.com/media/news/press-releases/russia-yamal-lng-starts-train-3-twelve-months-ahead-schedule-and-achieves-its-full-capacity

[29] Tsafos, N. (2022): Can Russia Execute a Gas Pivot to Asia? https://www.csis.org/analysis/can-russia-execute-gas-pivot-asia

[30] Министерство энергетики РФ (2019): *Энергетическая стратегия Российской Федерации на период до 2035 года*. https://minenergo.gov.ru/ministry/energy-strategy