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COOPERATION BETWEEN CHINA, RUSSIA AND CENTRAL ASIAN COUNTRIES IN THE NATURAL GAS SECTOR

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Abstract. The purpose of this research is to analyze the background, development and impact of cooperation between China, Russia and Central Asian countries in the field of natural gas, and to propose suggestions for enhancing the effectiveness of mutually beneficial relations. The methods used in this research consist of induction and deduction method, data comparison and detailing analyzation. The graphical flowchart reflects the potential results of the proposed optimization of the Central Asian gas export strategy. Data analysis is used in this research for inspecting and analyzing data to discover useful information to get the conclusion. The results of the research indicate the Central Asia has great potential for exporting gas to China, but also faces a series of challenges. The risks of exporting Central Asian gas to China are mainly about the construction and maintenance of transnational gas pipelines, huge capital investments and strong competition in this direction. Cooperation between China, Russia and Central Asia can significantly increase the export potential of Central Asian gas and reduce the risk of uncertainty. According to the research, Central Asian countries can reduce supply risks and take the initiative in geopolitical relations by expanding their natural gas export potential. Modernizing and maximizing the potential of Central Asian gas exports to China can be achieved through cooperation with Russia to increase throughput and supply.

Keywords: natural gas, export, economy, energy strategy, Russia, Central Asia, China

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ҚЫТАЙ, РЕСЕЙ ЖӘНЕ ОРТАЛЫҚ АЗИЯ ЕЛДЕРІ АРАСЫНДАҒЫ ТАБИҒИ ГАЗ СЕКТОРЫНДАҒЫ ЫНТЫМАҚТАСТЫҚ

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Аннотация. Бұл зерттеудің мақсаты — Қытай, Ресей және Орталық Азия елдерінің табиғи газ саласындағы ынтымақтастығының негізін, дамуы мен әсерін талдау және өзара тиімді қатынастардың тиімділігін арттыру бойынша ұсыныстар беру. Осы зерттеуде қолданылатын әдістерге индукция және дедукция әдісі, деректерді салыстыру және егжей-тегжейлі талдау кіреді. Графикалық блок-схема Орталық Азия үшін газ экспортының стратегиясын оңтайландыру бойынша ұсынған әлеуетті нәтижелерді көрсетеді. Табиғи газды өндіру, тұтыну және Орталық Азия мен Ресейден экспорттау бойынша статистикалық деректерді жинау арқылы Қытайға құбыр арқылы газ импортының қазіргі жағдайымен бірге энергетикалық стратегияның бірін-бірі толықтыруын және табиғи газбен қамтамасыз етудің қауіпсіздігін анықтау, үш ел арасындағы ынтымақтастық аясындағы жеткізілімдерге байланысты талдау жүргізіледі. Зерттеу нәтижелері Орталық Азияның Қытайға газ экспорты үшін үлкен әлеуетке ие екенін көрсетеді, бірақ сонымен бірге бірқатар мәселелер де туындайды. Қытайға Орталық Азия газын экспорттау тәуекелдері негізінен трансұлттық газ құбырларының құрылысы мен қызмет көрсетуімен, орасан зор инвестициялармен және осы бағыттағы күшті бәсекелестікпен байланысты. Қытай, Ресей және Орталық Азия арасындағы ынтымақтастық Орталық Азия газының экспорттық әлеуетін едәуір арттырып, белгісіздік қаупін төмендетуі мүмкін. Зерттеулерге сәйкес, Орталық Азия елдері табиғи газдың экспорттық әлеуетін кеңейту арқылы жеткізу тәуекелдерін азайтып, геосаяси қатынастарда бастама көтере алады. Қытайға Орталық Азиялық газ экспортының әлеуетін жаңғырту мен барынша арттыруға Ресеймен ынтымақтастық арқылы өткізу қабілеті мен жеткізілімдерді ұлғайту арқылы қол жеткізуге болады.

Түйін сөздер: табиғи газ, экспорт, газ нарықтары, энергетикалық стратегия, Ресей, Орталық Азия, Қытай

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СОТРУДНИЧЕСТВО МЕЖДУ КИТАЕМ, РОССИЕЙ И СТРАНАМИ ЦЕНТРАЛЬНОЙ АЗИИ В СЕКТОРЕ ПРИРОДНОГО ГАЗА

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Аннотация. Целью данного исследования является анализ предпосылок, развития и влияния сотрудничества между Китаем, Россией и странами Центральной Азии в области природного газа, а также внесение предложений по повышению эффективности взаимовыгодных отношений. Методы, использованные в данном исследовании, включают метод индукции и дедукции, сравнение данных и детальный анализ. Графическая блок-схема отражает потенциальные результаты, предложенной оптимизации стратегии экспорта газа для Центральной Азии. Путем сбора статистических данных о добыче, потреблении и экспорте природного газа из Центральной Азии и России в сочетании с текущей ситуацией с импортом трубопроводного газа в Китай проводится анализ для определения взаимодополняемости энергетической стратегии и безопасности поставок природного газа в рамках сотрудничества между тремя странами. Результаты исследования показывают, что Центральная Азия обладает большим потенциалом для экспорта газа в Китай, но также сталкивается с рядом проблем. Риски экспорта центральноазиатского газа в Китай связаны главным образом со строительством и обслуживанием транснациональных газопроводов, огромными капиталовложениями и сильной конкуренцией в данном направлении. Сотрудничество между Китаем, Россией и Центральной Азией может значительно увеличить экспортный потенциал центральноазиатского газа и снизить риск неопределенности. Согласно исследованию, страны Центральной Азии могут снизить риски поставок и проявить инициативу в геополитических отношениях, расширив свой экспортный потенциал природного газа. Модернизация и максимизация потенциала экспорта центральноазиатского газа в Китай могут быть достигнуты за счет сотрудничества с Россией при увеличении пропускной способности и поставок.

Ключевые слова: природный газ, экспорт, газовые рынки, энергетическая стратегия, Россия, Центральная Азия, Китай

Introduction. Central Asia countries, in particular Turkmenistan, Kazakhstan and Uzbekistan, are globally important producers and exporters of natural gas. The rich natural gas resources of these countries have attracted multifaceted international cooperation, in which China and Russia are key partners. Central Asian countries have traditionally cooperated very closely with Russia, mainly due to infrastructure and political ties established since the Soviet Union. Russia, through its energy giants, such as Gazprom and Lukoil, controls the development and transportation of a large amount of Central Asian gas resources. Generally, Central Asian gas had been shipped to European markets through Russia's pipeline systems.

However, in recent years, with the development of China's economy and the rapid growth of China's energy consumption, Central Asian countries have begun to gradually redirect their gas exports to China. In the 2010s, China started energy consumption transition from coal to gas. Through the construction of the 'Central Asia – China' pipeline China imported natural gas directly from Central Asian countries. The 'Central Asia – China' pipeline begins from Turkmenistan, passes through Uzbekistan and Kazakhstan, eventually reaches western China. In 2023, Central Asia exported 36.3 billion m^3 gas to China through pipelines 'Central Asia – China', accounting for 53% of total Central Asian gas exports. As a result, the Central Asian countries have become less dependent on Russia as a transit country. After the Russian-Ukrainian conflict, Russia reduced its gas exports to Europe, endeavored to develop gas cooperation with Asian countries. Therefore, China is currently the most high-potential gas market for both Central Asia and Russia.

The goal of the research is to analyze the impact of the cooperation between Central Asia and Russia in the field of natural gas on Central Asian gas exports to China, with a view to providing a reference for the formulation of the natural gas export strategy in Central Asia and a basis for the optimization of Central Asia's natural gas export strategy. The analytical methods used in this research are based on quantitative data sources from government and international energy institutions. Analyzed data to determine the gas potential of Central Asian countries and Russia. The main data sources are the those published by National Statistical Bureaus and the world energy statistical review published by the International Energy Agency (IEA) and international energy corporations, such as British multinational oil and gas company British Petroleum and Italian energy company Eni.

The research results will help to understand the export potential of Central Asia and Russia in the field of natural gas, illustrate the opportunities and challenges of trilateral gas cooperation and provide recommendations for deepening the development of regional gas cooperation.

Literature review

At present, the cooperation between China, Russia and Central Asian countries in the field of natural gas is widely discussed. Lots of foreign experts and organizations are mainly concerned with the development of natural gas resources in Central Asia, export potential to other countries, market structure analysis and the strategic significance of cooperation with Russia.

The research by Simon Pirani from University of Oxford examines the natural gas production, the domestic market and export prospects of Central Asian countries. Over the past decade, China has replaced Russia as the main export destination for Central Asian gas. Central Asia has sufficient resources, but their effective development may require cooperation with other countries (Pirani, 2019:35). Export potential of Central Asian countries mentioned by Allaev, Toshov and Mukhammadsidiqov in their research: based on the current situation of Uzbekistan's energy industry, the direction of Uzbekistan's energy strategy is to diversify the energy balance structure of Republic to ensure the country's medium and long-term energy security (Allaev, et al, 2023: 47), (Mukhammadsidiqov, 2019: 533). Kutcherov and Mouraviev's research illustrates the significance of energy cooperation between Russia and Central Asia: Russian gas market has a long history of development, which is considered to be one of the largest and most influential markets in the world. The Russian gas market is characterized by its huge natural gas reserves, widespread pipeline infrastructure, and important role in global energy politics. It is a major participant in the international natural gas trade, with significant implications for energy security and geopolitics (Kutcherov, et al, 2020: 79). Countries with abundant natural resources, such as Russia, Kazakhstan, and Uzbekistan, seem to be in a better position, as their own fossil fuels ensure their energy needs. However, their gas exports are highly dependent on variable prices and political uncertainty (Mouraviev, 2021: 59).

Chinese expert Wang Haiyan from China National Petroleum Corporation (CNPC) conducted the following research on Central Asian natural gas exports to China in terms of specific projects, cooperation mechanisms, and geopolitical factors. In her point of view, she indicated that the cooperation between Central Asia and China in the field of natural gas is an important symbol of energy cooperation under the framework of 'One Belt and One Road" in recent years. The oil and gas cooperation between China and Central Asian countries tends to be more diversified in the political and economic fields in order to promote efficiency of energy sector (Wang, 2016: 76).

Materials and methods. The following research methods was used in this study:

Induction and deduction method used to form hypotheses and theories based on the observation.

To extract meaningful insights from data and achieve more reliable analytical results, we used observation and comparison method as a primary method of collecting information exact data from scientific publications, articles, and official government reports. Data analysis is used in this research for inspecting and analyzing data to discover useful information to get the conclusion. By collecting statistical data on natural gas production, consumption and exports from Central Asia and Russia, combined with the current situation of China's pipeline gas imports, the analysis is conducted to define the energy strategy complementarity and supply security of natural gas cooperation between the three countries. Construct flowchart to visually represent various outcomes and their associated risks and opportunities, aiding in decision analysis. Method comparative analysis refers to the comparison of two or more processes, datasets or other subjects.

Results. The results achieved from this research will use to explain the direction of gas cooperation between Russia and Central Asia countries, to analyze the models of gas cooperation and the impact on Central Asian gas exports to China. The major aim of this study is to analyze export-import relations in the natural gas sector between China, Russia and Central Asian countries in the current geopolitical tensions in the world, and to make recommendations for improving the effectiveness of mutually beneficial relations. To visualize the potential of the Central Asian gas market, we analyze the gas market of Turkmenistan, Kazakhstan and Uzbekistan. We list and compare the data of natural gas production, consumption and export of these countries from 2017 to 2022, from which we could explain the current state of the natural gas market and predict the future development.

Situation of gas market of Turkmenistan

If we analyze the Central Asian gas market, the gas market of Turkmenistan worth mentioning. Turkmenistan holds the largest natural gas reserves and production in Central Asia, once ensured the gas security of other CIS countries. For almost 20 years, Turkmenistan's gas production has remained at around 60 billion cubic meters, which demonstrates the country's strong gas potential. About 50% of the gas production gets from the largest gas field – Galkynysh gas field with an area of 1842 km^2 (Eni, 2023: 88). The operation in this gas field began in 2013, main participants is the Turkmen state company Turkmengaz, Chinese corporation CNPC and Turkish company Calik Enerji. The Abu Dhabi National Oil Company of the United Arab participated in the development of Galkynysh from 2023. The natural gas obtained from this gas field mainly exported to China through pipelines 'Central Asia – China'. The Bagtyarlyk gas field, which operated by CNPC under a production sharing agreement, contributes the gas exportation to China. Also, in Turkmenistan has numerous offshore gas fields in the Caspian Sea.

The changes of Turkmenistan's gas market from 2018 to 2023 are shown in Table 1.

From Table 1, we can find that both natural gas production and domestic consumption in Turkmenistan are on a positive trend, and such growth rates are compatible with each other. More than 50% gas exportation defined that the Turkmenistan's gas market currently has sufficient natural gas resources for export. Until 2015, Russia had been expanding its gas exports to Europe by importing Turkmen gas.

Table 1. The main indicators of Turkmenistan's natural gas market, 2018–2023

Years	2018	2019	2020	2021	2022	2023
Production (billion m^3)	61.5	63.2	66	79.3	78.3	76.3
Consumption (billion m^3)	28.4	27.7	34.3	36.8	37.5	36.8
Proportion, %	46	44	52	46	48	48
Total export (billion m^3)	**35.2**	**31.6**	**31.6**	**42**	**40.7**	**39.5**
Export to Russia (billion m^3)	0	0	3.8	10.5	4.7	4.7
Export to China (billion m^3)	33.3	31.6	27.2	31.5	32.9	30.5
Export to other CIS (billion m^3)	0	0	0.6	0	3.1	4.3
Noted – compiled by authors according to the data of the resource (Statistical Review of World Energy 2024, available at https://www.energyinst.org/statistical-review)						

After the world energy crisis in 2014, Russia stopped buying gas from Turkmenistan due to lower gas prices in Europe. After 2020 Russia resumed purchasing Turkmenistan's gas and exporting it to Europe after an outbreak of a world epidemic caused gas prices to soar. China and Turkmenistan signed a general agreement on gas cooperation in 2006 and officially export gas to China from 2009. According to the Chinese customs data, China imported Turkmen gas increased from 3.5 billion m^3 in 2009 to 32.9 billion m^3 in 2022 (National Bureau of Statistics of China, 2023). Currently, China is the largest and most important market for Turkmen gas. In view of gas construction plans in Turkmenistan, the future gas strategy of Turkmenistan also focuses on increasing gas exports to China.

Situation of gas market of Kazakhstan

Kazakhstan is the most active producer and exporter of oil and gas resources in Central Asia. Kazakhstan has been defined in previous studies mainly as a crude oil producer, and Kazakhstan's energy trade is also dominated by oil. Natural gas in Kazakhstan is not fully utilized as an 'add-on' to the oil industry. For now, Kazakhstan holds the total 2.3 trillion cubic meters proven reserves of natural gas according to international energy statistics. Most of the natural gas reserves in Kazakhstan are located in these crude oil and condensate fields, such as the Tengiz field, the Kashagan field, and the Karachaganak field. Until the mid-2010s, the volume reinjected to support pressure in oil reservoirs was in a similar range to that produced as sales gas (Pirani, et al, 2019: 36). The dynamics of Kazakhstan's natural gas market in recent 5 years are presented in Table 2 as below:

Table 2. The main indicators of Kazakhstan's natural gas market, 2018–2023

Years	2018	2019	2020	2021	2022	2023
Production (billion m^3)	39.2	33.5	30.6	26.7	27.6	30.8
Consumption (billion m^3)	16.7	19.7	17.7	21.6	21.7	21.4
Proportion, %	43	59	58	80	78	69
Total export (billion m^3)	**25.6**	**27.5**	**14**	**10.6**	**7.8**	**5.3**
Export to Russia (billion m^3)	19.9	20.6	7.1	4.9	3.4	0.7
Export to China (billion m^3)	5.4	6.5	6.8	5.6	4.4	4.6
Export to other CIS (billion m^3)	0.3	0.4	0.1	-	-	-
Noted – compiled by authors according to the data of the resource (Statistical Review of World Energy 2024, available at https://www.energyinst.org/statistical-review)						

According to the Table 2 we can see that in 2023 Kazakhstan produced 30.8 billion m^3 natural gas, domestic consumption reached a record high level of 21 billion m^3. Since Kazakhstan has not developed new gas fields in recent years, the production of natural gas is on a downward trend. At the same time, fast-growing domestic gas consumption has almost caught up with production.

The domestic consumption in Kazakhstan market is estimated to remain on the rise because of ongoing gasification switching from coal for electricity generation in 2020s. The level of gasification in Kazakhstan has not changed significantly in recent years, as the gas infrastructure is mostly concentrated in the western and southern

regions of the country. The lack of gas infrastructure in the northern and the eastern regions has not improved. As can be found based on data published by Ministry of Energy of the Republic of Kazakhstan, in 2022 level gasification in the western region accounted to 98.3%, in the southern region reached 76%, in the eastern region only has 1.3% and in the northern has 3.5% gasification in Astana (Bureau of national statistics of Republic of Kazakhstan, 2023).

Kazakhstan's natural gas pipeline system connects with Russia, Uzbekistan, Turkmenistan, and China. The Kazakhstan pipeline system can be broadly divided into three parts based on the pipeline arrangement:

1) ***Intergas Central Asia (ICA)*** consists of gas pipelines 'Middle Asia – Central', 'Soyuz', 'Saryark', etc. ICA performs export, domestic transportation, and transit of natural gas through the territory of Kazakhstan to Russia, Uzbekistan, and Turkmenistan.

2) ***Asian Gas Pipeline (AGP)*** means combination of branches 'A', 'B' and 'C' of pipelines 'Kazakhstan –China' (Kazakh part of the 'Central Asia-China' gas pipeline). AGP is aimed at ensuring export Kazakh gas and transit of Turkmen and Uzbek gas to China, as well as uninterrupted gas supply to the southern regions of Kazakhstan.

3) ***Beineu-Shymkent Pipeline (BSP)*** has strategic importance for Kazakhstan. It connects the western oil and gas fields with the southern regions of Kazakhstan, ensuring the natural gas supply to the domestic market. At the same time, it links the gas fields with the branch 'C' of the pipelines 'Kazakhstan –China', which helps to diversify export Kazakh gas.

Table 2 reflects the changes in Kazakhstan's natural gas trade with Russia. In 2023, Kazakhstan exported only 0.7 billion cubic meters of natural gas to Russia. As a result of the adjustment of its energy strategy, Kazakhstan reduced its plans to export natural gas to Russia and puts more gas on the domestic market.

Besides Russia, another important export market for Kazakhstan's natural gas is China. Energy cooperation between Kazakhstan and China launched from 1997, they have maintained only oil trade for more than 20 years. With the development of Kazakhstan's gas industry, the export of natural gas was increasing. According to the gas supply contract signed between KazTransGaz and CNPC, from 2019 Kazakhstan planned to export 10 billion m^3 per year natural gas to China in five years. Natural gas trade between Kazakhstan and China is realized through the 'Central Asia-China' gas pipeline system, which delivers gas to the western region of China.

However, the data on Kazakhstan's natural gas exports to China in recent years show that the rapid growth of domestic natural gas consumption has put Kazakhstan in a dilemma of energy security and energy exports. In 2023, Kazakhstan exported 4.6 billion m^3 of natural gas to China, a 30% decrease compared to 2019. Nowadays, in order to fulfill the gas supply contract China is the only market for Kazakhstan's gas exports (Table 2). JSC NC QazaqGaz signed with CNPC a new 3-years contract for gas exports to China in October 2023, benefiting from the development of new Anabai and Pridorozhnoye gas field.

Kazakhstan is the lifeblood of energy security in Central Asia, both in terms of

resource reserves and energy supply facilities. Kazakhstan already has gas pipelines connecting several major energy countries, and it has an irreplaceable position in Central Asian gas market.

Situation of gas market of Uzbekistan

Among the Central Asian countries, Uzbekistan has a high level of production comparable to that of Turkmenistan. Uzbekistan kept the gas production level at 50 – 58 billion m^3 each year in recent 15 years. Different from Kazakhstan, the most of gas production in Uzbekistan obtained from a bunch of small fields in Bukhara-Khiva region. Main natural gas operators in Uzbekistan account for state company Uzbekneftegaz, Russian companies Lukoil and Gazprom.

As aspect of energy consumption, Uzbekistan is under great pressure to secure energy supplies to domestic consumers and industries. Among these Central Asian countries, Uzbekistan has the largest population, which according to the World Bank in 2023 totaled 36 million. The population of Kazakhstan is about 20 million, that of Turkmenistan is only 10 million, and that of Uzbekistan is almost twice as large as that of other Central Asian countries. The situations of insufficient natural gas production and insufficient electricity led to high domestic gas consumption in Uzbekistan. The Table 3 demonstrated some main indicators of Uzbekistan's natural gas market.

Table 3 demonstrates that domestic gas consumption of Uzbekistan almost equal to production, which pointed to the risk of disruptions in exports. In 2010 Uzbekneftegaz signed a framework agreement on natural gas purchase and sale with CNPC, which promised supply 10 billion m^3 of natural gas to China every year. From 2021 year, Uzbekistan had interrupted natural gas supplies to other countries except China. Even though, the volume of Uzbek gas exports to China in 2022 had decreased unsurprisingly as domestic demand grows. The dilemma facing Uzbekistan is that Uzbekistan have signed contracts for the supply of 10 billion cubic meters gas to China, at the same time, export gas from Uzbekistan had to stop to against the seasonal peaks in domestic consumptions.

Table 3. The main indicators of Uzbekistan's natural gas market, 2018–2023

Years	2018	2019	2020	2021	2022	2023
Production (billion m^3)	58.3	57.5	47.1	50.9	48.9	44.2
Domestic consumption (billionm^3)	44.4	44.6	43.6	46.5	48.3	46.6
Proportion, %	76	78	92	91	98	105
Total export (billion m^3)	**14**	**13.2**	**4.6**	**4.5**	**2.5**	**1.2**
Export to Russia (billion m^3)	5.3	6.3	0.1	-	-	-
Export to China (billion m^3)	6.3	4.9	3.3	4.3	2.5	1.2
Export to Kazakhstan (billion m^3)	2.4	1.8	0.7	-	-	-
Noted – compiled by authors according to the data of the resource (Statistical Review of World Energy 2024, available at https://www.energyinst.org/statistical-review)						

After comparing the Table 1, 2 and 3, we can summarize the current situation in the Central Asian gas market. In terms of gas production, both Turkmenistan and

Uzbekistan have shown a more stable trend of production growth. Kazakhstan, while not as productive as Turkmenistan and Uzbekistan in gas production, has strategic pipeline systems to transport gas to China and Russia. In view of gas consumption, in Kazakhstan and Uzbekistan promotion of gasification reforms is conducive to accelerating the energy transition, but the countries also face the risk of gas shortages.

Based on the above analysis, all three countries have close cooperation with Russia and China in the gas sector. In particular, a considerable model of cooperation has been established with Russia in the field of natural gas.

Situation of gas market of Russia and cooperation between Central Asia and Russia

Russia is one of the world's largest exporters of natural gas, however Russian gas market has suffered significantly due to the economic sanctions imposed on Russia by the European countries. The current geopolitical situation has forced Russia to look for new markets and partners, especially in Asia. The dynamics of the Russian gas market can be derived from the changes in gas production, domestic consumption and exportation in last five years, which are presented in Table 4.

Table 4. The main indicators of Russian natural gas market, 2018–2023

Years	2018	2019	2020	2021	2022	2023
Production (billion m^3)	669.1	679	638.4	702.1	618.4	586.4
Consumption (billion m^3)	454.5	444.3	423.5	474.6	408	453.4
Proportion, %	68	65	66	67	66	77
Total export by pipeline (billion m^3)	**223**	**217.2**	**197.7**	**201.7**	**125.3**	**95.4**
Export to Europe (billion m^3)	193.8	188	167.7	167	85.4	49.8
Export to China (billion m^3)	-	0.3	3.9	7.6	14.7	21.3
Export to CIS (billion m^3)	29.2	28.9	26.1	27.1	25.3	24.3
Noted – compiled by authors according to the data of the resource (Statistical Review of World Energy 2024, available at https://www.energyinst.org/statistical-review)						

From the Table 4 we can see that natural gas consumption in Russia remains almost at a flat value, around 70% of total gas production, about one-third of gas production is used to keep exports stable. It indicates that Russia is capable to explore other markets with maintaining growth consumption of domestic market. Natural gas exports from Russia via advanced pipeline systems and in the liquid form of Liquefied natural gas (LNG). Russian pipeline systems were created in the Soviet Union period for providing gas sources to European and other CIS countries pipelines, like 'Yamal-Europe', 'Nord Stream-1', 'Blue stream' ensures the efficient gas volumes delivery to Europe.

To reduce dependence on Russian gas, European gas market continues to diversify sources of imports from Middle East and USA. Access to this traditional market exists more and more uncertainties for Russian gas traders. The natural gas supply to Europe from Russia significantly decreased in last two years, which caused by the Russia-Ukraine conflict. Asian gas market, especially Chinese gas market, became the new direction of Russian gas. Russia's pipeline gas exports to China grow from 0.3 billion m^3 in 2019 to 21.3 billion m^3 in 2023 (Table 4). The Russian energy

companies actively prepared the strategic re-direction toward Asia. The construction of gas pipeline 'Power of Siberia', LNG project Yamal, Sakhalin 2 aims at increasing the capacity of gas exports to major Asian countries, such as China, India, and Japan.

Russia strengthens cooperation with Central Asia countries to jointly develop natural gas projects and expand export markets to the rest of Asia. By analyzing Russian and Central Asia's gas exports (Table 1-4), we can summarize the cooperation between Central Asia and Russia in the field of natural gas as follows:

a) Gas infrastructure connectivity and development: Central Asia's gas pipeline system has been closely linked to Russia since Soviet period, and this linkage continues to play an important role in Asian market today. Central Asia countries more rely on pipeline systems through Russia for many of their gas exports. Although they have also made efforts to diversify their export routes.

b) Export cooperation: In the past, Central Asian gas exports to Europe were more dependent on Russian pipeline system. Russia could control both European and Central Asian gas market while earning transit fees. Asian gas demand has expanded rapidly in recent years, with China and India gaining attention as emerging gas market. The direction of cooperation between Central Asia and Russia has shifted from Europe to the Asian market.

c) Gas supply security: Long-term gas purchase contracts between Russia and Central Asian countries have increased the efficiency of gas pipeline system and guaranteed the security of gas supply. The stability of natural gas trade provides financial support for the Central Asian countries to continue developing their gas resources.

d) Technical cooperation: Russia has rich experience and advanced technology in the field of gas development, especially in offshore gas production and transportation. The Caspian Sea projects are important projects for future oil and gas exploration in the Central Asian countries, which currently do not have ability to develop on their own. Therefor the natural gas development of the Central Asian countries cannot process without Russia's help. In recent years, Russian energy companies (Gazprom, Lukoil) are actively involved in the development of natural gas in the Caspian Sea region with Central Asian countries, providing the necessary technical support to Central Asian oil and gas companies, like Turkmengaz and KazMunayGaz.

e) Political alliances: Cooperation between Russia and Central Asian countries in the gas sector is accompanied by extensive political and economic ties at the multilateral levels.

In recent years, with the changing dynamics of the global energy market and geopolitical evolution, the Central Asian countries and Russia are gradually adjusting their energy export strategy, trying to reduce their dependency on European gas market and develop new export markets and gas pipeline routes. For example, the 'Trilateral gas union', a joint venture of Kazakhstan, Uzbekistan and Russia, was formally established in 2023 to achieve this goal. Russia can delivery gas from the Yamal field to Kazakhstan and Uzbekistan via the pipeline 'Middle Asia – Central' for ensuring gas supplies to local market, while in exchange for the Russian gas re-export to China. For Central Asia, this new model of cooperation could enhance Central Asian gas exports to China and increase the utilization of gas facilities with Russia.

Discussions. By analyzing the Central Asian gas market, we can find that Central Asia has great potential for exporting gas to China, but also faces a series of challenges. China is one of the world's largest energy consumers, and as its economy continues to grow, demand for natural gas is expected to remain on the rise, providing a broad market for Central Asian natural gas. Meanwhile, the Chinese government is actively promoting the diversification of its energy consumption structure and increasing the share of natural gas. According to the National Bureau of Statistics (NBS), China consumed a total of 404.8 billion cubic meters of natural gas in 2023, of which 159.2 billion cubic meters were imported through pipelines and LNG.

It is worth mentioning that there are currently three major natural gas import pipelines in China: 'Central Asia – China' (Turkmenistan – Uzbekistan – Kazakhstan – China), 'Power of Siberia' (Russia – China), pipeline 'Myanmar – China'. Figure 1 presents the dynamics of pipeline gas exports to China by source.

Let's look at the dynamics of pipeline gas exports to China for the period 2018-2023 (Fig. 1).

From Figure 1 we can summarize the potential of Central Asian gas. On the one hand, Central Asian gas exports to China account for 68% of China's total pipeline gas imports. Central Asia has sufficient gas reserves that can provide energy to China in the long term. On the other hand, it is more straightforward and cost-effective to transport natural gas by pipeline thanks to geopolitical advantages.

The risk of Central Asian gas exports to China is mainly manifested in the transportation of natural gas over long distances. In particular, the construction and maintenance transnational gas pipelines require huge financial investments, special engineering designs for accommodating complex terrain and long construction cycles; China's natural gas market is not only dependent on Central Asia, but also includes several sources of supply such as Russia, Myanmar, Australia, which makes Central Asian gas face greater market competition.

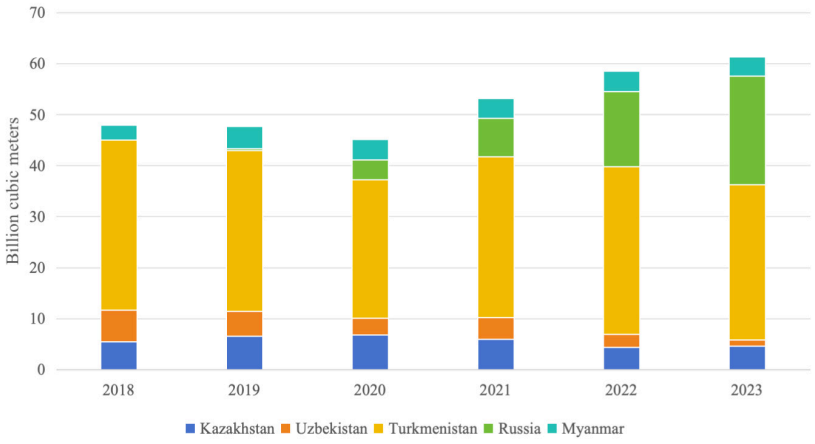

Figure 1. Dynamics of pipeline gas exports to China by source, 2018-2023

Note – compiled by authors according to the data of the resource (National Bureau of Statistics of PRC, available at http://www.stats.gov.cn)

The results obtained from the above analysis allow us to discuss the Central Asian gas export strategy. There is a huge potential for Central Asian gas exports to China, but a number of technical, political and market challenges need to be overcome to realize this potential. With the development of gas infrastructure and deeper cooperation with Russia, the status of Central Asian gas is expected to further increase in China's energy market.

The above analysis presents insights into the optimization of Central Asian gas export strategy from the following aspects of the cooperation between Central Asia and Russia in the natural gas sector (Fig. 2).

The flowchart analysis was used in order to completely analyze the impact of Central Asia's cooperation in the natural gas sector with Russia. The Figure 2 illustrates the impact of gas cooperation with Russia on Central Asian gas exports to China from the following aspects.

a. Market diversification: natural gas cooperation with Russia contributes to reducing Central Asia's dependence on any single market for gas, thereby balancing the needs of the Chinese and Russian markets. Diversified cooperation relationships allow Central Asian countries to respond more flexibly to variations in global energy demand and actively explore other Asian markets (such as India, Pakistan, Japan).

b. Price competition: in the future, Russia expects to deliver gas to China through the Central Asian gas pipeline systems, while at the same time, the Central Asian countries can have more bargaining power when negotiating transit fees with Russia and gas purchase prices with China. The multi-party cooperation could affect the price structure of the Asian gas market in the future.

c. Energy security: gas cooperation between Central Asia and Russia also helps to ensure energy security of China and Central Asia. On the one hand, the growing trend of domestic gas consumption in Central Asian countries requires cooperation with Russia to reduce the risk of gas shortages. On the other hand, China needs stable pipeline gas supplies from Central Asia and Russia in the context of trade frictions between the United States and China. Russian investments supported the construction and maintenance of gas infrastructure in the Central Asian countries and the development of the Asian energy economy, further enhancing the export capacity and increasing their geopolitical importance of Central Asian countries in the Asian region.

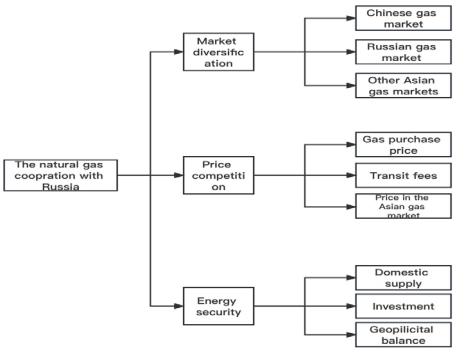

Figure 2. Flowchart of impact of Central Asian-Russia cooperation in the natural gas sector
Note – complied by the authors.

In general, the Central Asia-Russia cooperation in natural gas sector and their natural gas exports to China are complementary. In the process of mutual cooperation, the Central Asian countries usually seek to balance these relationships in order to maximize their national benefits, increase their revenues and improve their position in the international political economy. The energy export strategies of Central Asia countries are tended to continue to evolve and adapt in the future as the changes of global energy markets and geopolitical dynamics.

Conclusions. The above analysis provides us with the possibility to draw conclusions about the current situation of the Central Asian gas market. From the aspect of gas production, the Central Asian gas market is defined by high gas production in Turkmenistan and Uzbekistan and relatively low gas production in Kazakhstan. From the point of view of natural gas transportation, the Central Asian countries are continuously modernizing their pipeline systems through the construction of new gas pipelines to increase domestic supply and expand gas exports.

In terms of impact on export markets, the Central Asian countries are working to decrease their dependency on a single market. In recent years, in addition to Russian market, Asian markets, including China, have become important targets for the Central Asian countries. This has led to strengthening energy cooperation between Central Asia and Russia and China. In the past, the main export of Russian and Central Asian gas was to Europe, it reflects the fact that Russia has a dominant role in the transportation and sale of energy in Central Asia. Natural gas cooperation between Central Asia and Russia is not only on the economic level, but also involves political and strategic interests.

After 2020, in order to balance the energy demand, Central Asian countries basically stopped exporting gas to countries besides China. For example, despite several existing gas pipeline, Turkmenistan is actively building the new branch 'D' of gas pipeline 'Central Asia – China', which is aimed at focusing on expanding gas exports to China. At the same time, Russia is attempting to shift its gas exports from Europe to Asia, particularly to China. In terms of their strategy for exporting gas to the Chinese market, Central Asian countries can expand their gas export potential, reduce supply risks, and take the initiative in geopolitical relationships by cooperating with Russia.

The results of the research suggest that the natural gas export strategy of the Central Asian countries is an important part of their economic and political agenda and has far-reaching impact on their national security and international status. As global energy demand evolves, especially in the light of the rise of renewable energy sources and the challenges posed by climate change, these countries must constantly adapt their strategies to remain competitive and relevant. Upgrading and expansion of gas infrastructure through cooperation with Russia to increase transmission capacity and ensure maximization of Central Asian gas export potential to China.

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