

МИРОВАЯ ЭКОНОМИКА И МЕЖДУНАРОДНЫЕ ФИНАНСЫ

JEL: F00, F20, Q43

Sino-Russian transregional gas cooperation: Key issues

A. N. Steblyanskaya¹, Zhen Wang¹, S. V. Razmanova², N. I. Iskritskaya³

¹ Academy of Chinese Energy Strategy (ACES), China University of Petroleum, Beijing, 18 Fuxue Road, Changping District, Beijing, 102200, China

² Gazprom VNIIGAZ, Ukhta Branch Office, 1a, Sevastopolskaya ul., Ukhta, 169300, Komi Republic, Russian Federation

³ All-Russia Petroleum Research Exploration Institute (VNIGRI), 28, Salova ul., St. Petersburg, 192102, Russian Federation

For citation: Steblyanskaya A. N., Zhen Wang, Razmanova S. V., Iskritskaya N. I. Sino-Russian transregional gas cooperation: Key issues. *St Petersburg University Journal of Economic Studies*, 2018, vol. 34, issue 3, pp. 369–395. <https://doi.org/10.21638/spbu05.2018.302>

At present, such transregional projects as BRICS, Transatlantic trade and investment partnership, the Trans-Pacific partnership, APEC, Asia-European Forum, and the Eurasian Economic Union have been simultaneously initiated and implemented. This fact confirms that today the transregional level of international relations has acquired particular significance. The purpose of this paper is to scientifically substantiate target priorities concerning the growth of Russian-Chinese cooperation in the gas sector, as well as to identify existing problems and advantages that foster and impede transregional cooperation between China and Russia in the energy market. One sharp issue is that China wishes increasingly to diversify gas supply, moving from coal to natural gas as well as LNG and renewable energy to improve air quality. Will China choose to increase the Russian supply of natural gas suppliers? This study uses the transregionalism theoretical framework, and through this theory was provided the Russian and Chinese gas industry overview, was described the general framework and main cooperation gas projects between China and Russia, analyzed the developing trends of Russian gas export to China. Sino-Russian transregional gas cooperation model was developed on the base of Kuznetsov's transregional framework. It was proved that transregional cooperation could be under risks and uncertainties; nevertheless, positive mutual collaboration perspectives have a bright tendency.

Keywords: transregional theory, energy policy, Sino-Russian gas cooperation, natural gas production/consumption, natural gas export/import.

Introduction

Modern development of the global economy leads to growth in consumption of energy resources. In this case regional energy resources disproportions for the most number of regions isn't provided with the sufficient level of hydrocarbons. The same way, energy integration processes is a characteristic of the World economy' present stage and testifies a globalization energy market tendency by creating transregional economic relations contributing to the countries' development.

Research is devoted to Sino-Russian gas cooperation concerning evaluation of reserves, long-term production, and outlooks for consumption. Growth of the geopolitical influence of the People's Republic of China is the main factor for one of the key components of long-term political, global, and regional forecasting [Kuzyk, Titarenko, 2006]. China's steady economic growth also creates large incentives for Russia to seek energy cooperation. China became a major economic player, as its annual GDP growth has been staying at a rate higher than 7%. For example, in 2015 World GDP increased by 3.3%, but Chinese GDP increased by 6.9% [China Energy Outlook..., 2016].

It is estimated that China will surpass the United States in GDP between 2025 and 2030, and China's share of global GDP will be 24% in 2040. Thus, it would be foolish to neglect potential, economic, and energy cooperation with China. In contrast, in 2040 Russia's economy will account for only 3% of global GDP (Tab. 1).

Table 1. Changing shares of the countries in the global GDP, 2016–2040

Country	Rating by GDP (PPP) for 2016		Rating by GDP (PPP) for 2020		Rating by GDP (PPP) for 2040	
	Rating	Share in global GDP in 2016, %	Rating	Share in global GDP in 2020, %	Rating	Share in global GDP in 2040, %
China	1	18	1	29	1	24
USA	2	16	2	22	2	14
India	3	7	3	13	3	10
Japan	4	4	4	6	6	3
Germany	5	3	5	5	7	3
Russia	6	3	6	4	5	3
Brazil	7	3	8	4	4	2
Indonesia	8	3	7	4	9	2
UK	9	2	9	3	8	2
France	10	2	10	3	10	2

Sources: World Economic Outlook Database // International Monetary Fund. World Economic and Financial Surveys, 2017. URL: <http://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx> (accessed: 15.01.2017); Global and Russian Energy Outlook 2016 / eds A. A. Makarov, L. M. Grigoriev, T. A. Mitrova. M.: Energy Research Institute, Russian Academy of Sciences (ERI RAS), Analytical Center of the Government of the Russian Federation (ACRF), 2016. 199 p. URL: https://www.eriras.ru/files/forecast_2016.pdf (accessed: 09.01.2018).

From Russia's perspective, China's massive industrial and economic growth creates enormous demand for energy and natural resources. Russia's economy, which relies heavily on these exports, is now highly complementary to China's growth. It is in Russia's best interest to cooperate with China for its own economic growth.

World energy consumption is expected to increase by 34% between 2014 and 2035. Natural gas demand grows by 1.8%, making natural gas the fastest growing fossil fuel. The largest part of increases in energy demand is from emerging economies, with China accounting for 30% of this rate¹. In the Baseline Scenario 2040 forecast, global gas consumption will reach 5.3 tcm, 60% higher than the volume of gas consumed in 2010, with the main increase (81%) coming from developing countries. The environmental advantages of gas will support (but not determine) the growing role of gas market role in individual markets². Simultaneously, the gas industry is the most important sector for Russia's economy. Russia's significant weight in the global economy has historically been underpinned by its strong gas and oil production [Krukov, Tokarev, 2016]³.

Russia produces 16.3% of global gas. In 2016 Russia produced 579.4 bcm of gas, making it the world's second-largest gas producer after the US⁴. Russia has enough reserves to satisfy its own needs and to export for the long term. The potential for Russian gas production will depend mainly on access to global gas markets [Global trends..., 2013]. According to the Energy Strategy of the Russian Federation, until 2035 the export of gas will be increase significantly, from 209 bln.cub.m in 2014, to 317 bln.cub.m. in 2035. One of the main aims of the Strategy is "increasing gas exports to the Asian Market by 8–9 times and the share of exports to Asian countries will increase from 7% in 2014 (fact) to 44% in 2035"⁵. On the Chinese side, the main strategic goal is to import more clean energy.

The "Eastern focus" involves strengthening ties with China. Asian markets have become a strategic focus of export diversification, with the fastest progress achieved in relations with China. Russia is known for its abundance of oil and natural gas in Siberia and her Far Eastern Region; however, energy cooperation between these two countries did not appear to be significant until recent decades. Russian-Chinese cooperation boomed in 2013, including export contracts (Rosneft's contract with CNPC, preliminary agreements with Sinopec), JVs, and Chinese companies buying stakes in Russian projects (Sinopec's purchase of a 20% stake in NOVATEK's Yamal-LNG). In 2014 Gazprom signed a \$400 billion, 30-year gas export contract with China for annual deliveries of 38 bcm of gas, which may boost its non-CIS gas exports by almost 25% starting from 2019, and announced plans to renew negotiations for a further increase of gas exports to China using the West-

¹ Statistical Review of World Energy // BP Global. Energy economics. Statistical Review. June 2017. URL: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html> (accessed: 09.01.2018).

² Global and Russian energy outlook to 2040. M.: ERI RAS; ACRE, 2014. URL: https://www.eriras.ru/files/2014/forecast_2040_en.pdf (accessed: 09.01.2018).

³ Nazarov A. et al. Russian oil and gas. Basic industry overview // Gazprombank, 2003–2014. 18.06. 2014. 41 p. URL: http://www.gazprombank.ru/upload/iblock/5f5/gpb_og%20handbook_eng_180614.pdf (accessed: 09.01.2018).

⁴ Statistical Review of World Energy // BP Global. Energy economics. Statistical Review. June 2017. URL: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html> (accessed: 09.01.2018).

⁵ Global and Russian energy outlook to 2040. Moscow: ERI RAS; ACRE, 2014. URL: https://www.eriras.ru/files/2014/forecast_2040_en.pdf (accessed: 09.01.2018).

ern route⁶. On May 8, 2015 Gazprom and CNPC signed an agreement for pipeline gas supply from Russia to China (Power of Siberia-2 gas pipeline) in the amount of 30 billion cubic meters of gas a year from Western Siberian fields. On September 3, 2015 Gazprom and CNPC signed a Memorandum of Understanding for a project to supply gas to China from the Russian Far East⁷.

The main objective of the article is to substantiate the target priorities for the development of gas cooperation between Russia and China and to identify existing problems and advantages concerning Sino-Russia integration regarding gas. The main goals are:

1. To highlight the main priorities for Sino-Russia gas cooperation.
2. To identify problems and barriers for Sino-Russia gas cooperation.
3. To create a transregional model for Sino-Russia gas cooperation (on the basis of Kuznets' transregional framework).

1. Theoretical base for international economic interaction and cooperation for energy

There is no standard point of view about transregionalism in studies of international relations. One comes across various terms: transregionalism, interregionalism, crossregionalism, pan-regionalism, macroregionalization, network regionalism, global regionalization, and others [Kuznetsov, 2016]. The most widely used term is “interregionalism,” which was defined by Söderbaum as the “creation of interrelation process between two regions” [Söderbaum et al., 2006]. Reiterer defines “interregionalism” as contractual relations between regions [Reiterer, 2005]. Yeo regards this term as concerning processes of institutionalization between regions [Yeo, 2007]. Roloff considers “interregionalism” as a “process of extension of political, economic, and social relation links between international regions” [Roloff, 2006]. Russian scholars Koldunova and Voskresensky, unlike foreign colleagues, conceptualize “transregionalism” and “macroregionalization” as the creation of integrated processes between different regional clusters that are not bound to a geographic factor [Koldunova, 2010; World comprehensive regional studies, 2015]. Jürgen Rülland highlights the following functions of transregionalism [Rülland, 2002]:

- balancing and bandwagoning,
- institution-building,
- rationalizing,
- agenda-setting and controlling,
- identity-building,
- stabilization and development

This typology of functions reflects the approaches of different schools of international relations, although a number of functions can be added, such as desire to obtain short-

⁶ Nazarov A. et al. Russian oil and gas. Basic industry overview / Gazprombank, 2003–2014. 18.06. 2014. 41 p. URL: http://www.gazprombank.ru/upload/iblock/5f5/gpb_og%20handbook_eng_180614.pdf (accessed: 09.01.2018).

⁷ Alexey Miller: Russia and China signed the biggest contract in the entire history of Gazprom // Gazprom. Media. News and events. 21.05.2014. URL: <http://www.gazprom.com/press/news/2014/may/article191451/> (accessed: 09.01.2018); Gazprom delegation visits China // Gazprom. Media. News and events. 08.12. 2015. URL: <http://www.gazprom.com/press/news/2015/december/article254716/> (accessed: 09.01.2018).

term and strategic benefits, ensuring or expanding hegemony/leadership; increasing predictability by introducing new rules; promoting equitable and efficient allocation of resources, as well as intensifying cooperation aimed at ensuring growth, achieving common welfare, and solving global problems; ensuring global security; forming new regional (and institutional) identities; exchange of experience; initiating common projects; and achieving a new level of trust as well as the formation of global integrated regions of different levels of cohesion, interdependence, and competitiveness.

“Interregionalism” is considered as a process of dialog between two regional associations that is not yet institutionalized [Rülland, 2002]. At the same time, transregionalism represents the institutionalization of cooperation between different regions where the sides can be provided by both regional integration clusters as well as certain states. We suggest that transregional processes are the basis for Chinese-Russian gas cooperation today.

At the same time, economic integration might occur within the framework of internationalization, “...the newest form of internationalization of economic life, expressed ... in the form of an organic combination of two factors — the interweaving of private monopolies of different countries and the implementation of a coordinated state monopolistic policy in mutual economic relations between these countries and in relations with third countries...” [Popov, 2005]. In the 1990s the study of integration was associated with neoclassical institutionalists’ research. Neoclassical research is of particular interest for international economic integration, as their approaches substantiate causes of integration, as well as possible consequences [Blair et al, 1983]. Based on neoclassical theory, successful integration results in elimination of barriers to entry into markets of partner countries and in competition in the new common market, giving an impetus to economic development of member states of the integration association.

Against the background of ongoing discussions on the relationship between the global and the local regarding international economic integration, regional studies have great importance due to the high level of “regionalism” and “regionalization” gaining strength in transregional processes as the main countertrend and alternative to globalization. At present, the bulk of theoretical studies continue to focus on the transregional level of international interaction, which as the youngest approach provides a modest amount of empirical material (compared to other levels and megatrends). This fact requires not only qualitative studies in practical implementation of transregional projects, but also theoretical understanding of these processes and the formation new “transregional spaces” [Kuznetsov, 2016].

Transregionalism includes the interaction of regional associations and individual states belonging to different geographical regions. It can take different forms depending on actors involved. Regardless of whether regionalization and globalization are unidirectional or not, transregionalism appears to be a form of globalization within the framework of new regionalism, that is a form of globalization, that involves cooperation between regions as actors in the international system and individual states seeking to overcome geographical boundaries of interaction in order to ensure interests and create new economic, political, and social spaces.

Transregional cooperation becomes a specific area of foreign economic, political, environmental, cultural, educational, and other international activities carried out at the regional level and, covering common forms, differs in need and opportunities for their more active use. Other possible features include the presence and arrangement of borders, joint use of natural resources and collective solutions to problems of environmental safety,

wider mutual communication between populations of neighboring states, and personal connections of people. These can create a significantly high load on infrastructure. Transregional cooperation is a stable and developing system of relations between neighboring states, based on common principles and developing within the framework of coordinated strategies in accordance with international agreements on transregional cooperation.

The problem of transregional cooperation is especially important for Russian scholarship, which is at a state of theoretical development and is connected both with the novelty of this phenomenon and with the historically short period of Russia's involvement in the global processes of regionalization. Russian analysts face the challenge of embedding numerous "case-studies" of transregional cooperation in a broader theoretical structure. Currently, the format of cooperation and interaction between states has developed into a system of cross-border cooperation, and then into a system of transregional integration.

Development of cooperation between states and other actors has brought to life a whole system of intergovernmental and non-governmental organizations of global and regional importance. The growing interdependence of the world and the emergence and aggravation of global problems have greatly contributed to the expansion of multilateral cooperation into other spheres of life. Today, cooperation covers not only trade, customs regulations, border settlement, or military-political unions, but also finding adequate responses to environmental challenges, space exploration, sharing resources for common purposes, developing communication networks, energy collaboration, and so on.

Experts highlight two major achievements of the international cooperation theory.

First, the scholarly community has agreed on the concept of "inter-state cooperation." Following Cohen, many scholars understand cooperation as a situation where "some actors regulate their behavior in accordance with the actual or expected preferences of others, through the process of mutual coordination of policies." In other words, inter-state cooperation involves three elements: common objectives of partner states, expected benefits, and the reciprocal nature of those benefits. Energy trade between Russia and China involves a net type of interstate cooperation: negotiations, the subject of which is the distribution of the benefits of states from their interaction. (This is both the way to cooperation, and an indicator of its existence achieved as a result of discussion policy coordination.)

A second achievement in the area of inter-state cooperation has been hypotheses on the conditions under which cooperation among states becomes most likely. These hypotheses do not constitute a comprehensive theory of inter-state cooperation, but rather are a series of variables, each of which makes collaboration more likely. Analysis and empirical testing of these hypotheses can encourage the creation of a comprehensive theory, and, therefore, the further development of theory in international relations.

Today's world is witnessing the development of transregional ties between distinct regions and powers within the international system [Kuznetsov, 2016]. We argue that the development of transregional ties with China over energy can provide a useful example of transregional theory and can contribute to transregional theory.

2. Methodology

The theoretical base for this research is transregional theory. Methodologically, we use historical analogies and comparative analyses, as well as a systems approach. We consider the Chinese and Russian Energy Policy not separately, but as one of several important

structure-forming elements of a whole that exerts an impact on regional subsystems. We also build upon Kuznetsov's transregional model of Sino-Russia gas collaboration.

The main purpose of this article is to substantiate target priorities for development of gas cooperation between Russia and China, and identifying existing problems and advantages related to Sino-Russia integration in the sphere of natural gas. Overall, our research tasks are:

1. Highlighting the main priorities for Sino-Russia gas cooperation;
2. Identifying problems and barriers for Sino-Russia gas cooperation;
3. Creating a transregional model for Sino-Russia gas cooperation (based on Kuznetsov's transregional model).

Our data are drawn from or include: GDP, production, consumption, export, and import databases for China and Russia's gas sector, and forecasts reviews.

3. Overview of Russia' gas industry

3.1. Natural gas reserves, production, and consumption

The hydrocarbon industry has long been Russia's leading economic sector [Krukov, Tokarev, 2016]. In 2015 this sector accounted for 27 % of Russia's GDP, 63 % of the country's exports, and 43 % of total Federal budget revenue⁸. Russia owns the world's largest natural gas reserves, making up 932 fields according to the State Gas balance of the Russian Federation. Reserves are almost completely involved in development. In 2015 gas categories A+B+C1 consisted of 49.8 trillion cubic meters according to the Russian Federation State balance [Programme of development..., 2007]. Evaluation of gas reserves using international classification is approximately twice as low as that classification system used in Russia. Accordingly, BP claimed that in 2015 Russia's gas reserves were 32.6 trillion cubic meters. This difference in data is due to different methods of assessment. Russia currently uses a system for classifying reserves that was introduced in 2001⁹. This system inherited approaches proposed in the Soviet era, and primary classification criteria take into account geological and technical features of reserves. At the same time, this method pays no attention to economic development of gas fields. According to the Russian classification system, reserves are divided into net categories:

- A, B, C₁ — proven reserves
- C₂ — preliminary estimated reserves
- C₃ — potential reserves
- D₁, D₂ — forecasted reserves categories

SPE-PRMS, developed by the Society of Petroleum Engineers (SPE), is the most widely used PRMS classification of reserves. According to this classification, reserves are divided into three principal categories:

⁸ Results of work of fuel and energy complex of the Russian Federation in the first half of the year 2016. Prospects and tasks for 2016. Minister of Energy of the Russian Federation A. V. Novak // Ministry of energy of the Russian Federation. Reports and presentations. 07.04.2017. 48 p. URL: <http://minenergo.gov.ru/press/doklady/1709.t/html> (accessed: 09.01.2018).

⁹ The new "Reserves and resources classification of oil and combustible gases" was adopted by the Russian Federation Ministry of Natural Resources (official document No. 477 from 01.11.2013) and implemented as of 01.01.2016. However, oil and gas reserves and resources have not yet been recalculated using the under new classification scheme.

- Proven: probability of extraction no less than 90 %;
- Probable: probability of extraction no less than 50 %;
- Possible: probability of extraction no less than 10 %.

Proven reserves in turn are subdivided into the following categories:

- Proved, developed, producing (PDP): reserves that are currently being extracted from active wells;
- Proved, developed, non-producing (PDNP): reserves that can be extracted with negligible capital expenditure;
- Proven undeveloped reserves (PUD): reserves that must include capital expenditures, e.g. for drilling wells, to start production.

Classification of resources utilizes such criteria as achieving commercial significance and probability of geological confirmation of reserves. SEC requirements and standards were suggested by the US Securities Exchange Commission for the companies that have a stock exchange listing. These standards have their own particular characteristics: they take into consideration only proven reserves, the duration of licenses for field exploitation, and the plans for their development.

Natural gas amounts to about half of all the primary energy resources consumed in Russia. Gas plays an especially important role in power plants, which accounts for approximately 40 % of all gas consumed. Households consume account for 20 % of domestic natural gas consumption, and another third is consumed by industry, where the largest users are metallurgy and fertilizer production¹⁰. Domestic gas consumption has decreased over recent years: according to the Russian Federation Ministry of Energy, in 2015 supply

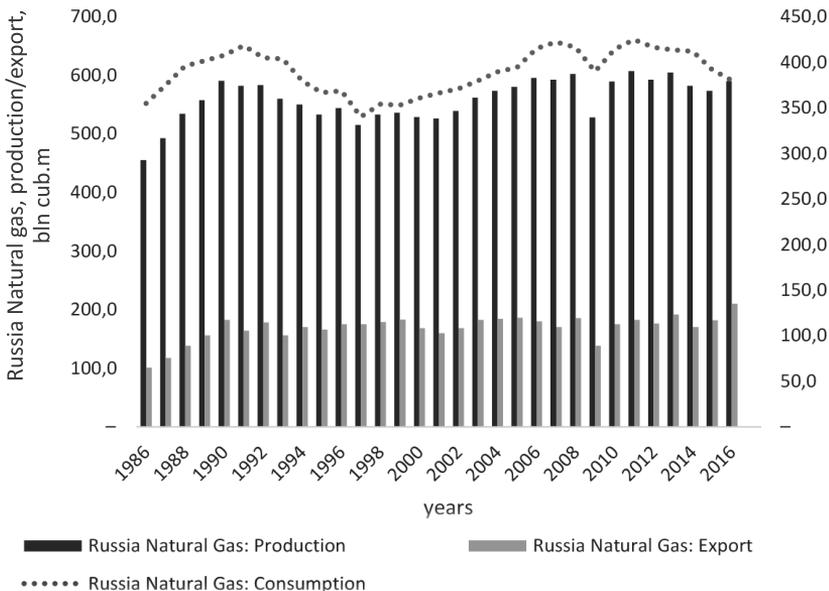


Fig. 1. Historical gas production and consumption in Russia, bn cub. m

Source: British Petroleum statistical review of World Energy 2017 // BP Global. Media. Speeches. 13.06.2017. URL: https://www.bp.com/content/dam/bp-country/de_ch/PDF/bp-statistical-review-of-world-energy-2017-full-report.pdf (accessed: 15.01.2018).

¹⁰ Global trends in oil and gas market to 2025. Lukoil, 2013. 64 p. URL: http://www.lukoil.be/pdf/trends_global_oil_eng.pdf (accessed: 09.01.2018).

of gas by domestic market dropped by 3.1 % (Fig 1), with the main decrease in consumption in the production of electricity and heat.

As is noted in Fig.1. Russia has great opportunities to export natural gas without damaging domestic demand. At a conference on plans to develop the gas industry by 2030, held in Novy Urengoi on October 11, 2010, Vladimir Putin stated, “Russia can and must meet growing gas demand, guarantee the stable supply of gas for domestic consumers, as well as maintain and expand Russia’s presence on global markets. To achieve this purpose, Russia have to increase gas production from current 650 billion cubic meters per year to one trillion per year, which is practically 1.5 times more. And Russia has every opportunity to do this.” Mr. Putin said that he believes that Russia has every chance to increase natural gas production to 1.650 trillion cubic meters a year.

Russia’s natural gas balance forecast is in Table 2:

Table 2. Russian Federation natural gas balance forecast till 2030, bln cub. m

Forecast, bln cub. M	Years			
	2015 (fact)	2020	2025	2030
Resources	49,8	996–1082	1024–1120	1035–1132
Includes Gas production, Russia	633,4	850– 941	871–974	876–981
Includes Gas production, East Siberia and Far East	47	77	87	89
Consumption	352,3	996–1082	1024–1120	1035–1132
Including domestic gas consumption		537–581	543–606	550–613
Including Export	192,5	299–344	317–343	317–343
Including export, Asian markets		25–50	25–50	25–50
Share of Asian countries in total balance, %	7	19	38	44

Sources: Programme for development in Eastern Siberia and Far East system of gas production, gas transportation and gas supply for the future gas export on the China and other Asia-Pacific countries // The Ministry of Industry and Energy of Russia. Order No. 340. 03.09.2007. URL: <http://base.consultant.ru/cons/cgi/online.cgi?req=doc;base=EXP;n=491137;frame=4800> (accessed: 09.01.2018); Energy Strategy of Russian Federation, President of Russian Federation Analytical Center. 1st Deputy Ministry of Energy of RF A. L. Teksler. Moscow, September 2015. URL: <http://minenergo.gov.ru/system/download/1913/2406> (accessed: 09.01.2018); British Petroleum statistical review of World Energy 2017 // BP Global. Media. Speeches. 13.06.2017. URL: https://www.bp.com/content/dam/bp-country/de_ch/PDF/bp-statistical-review-of-world-energy-2017-full-report.pdf (accessed: 15.01.2018).

3.2. Development of the East Russia gas complex

The majority of Russian reserves (over 60 %) are located in West Siberia. Geological and engineering conditions of this region are well-studied and the country has remaining gas reserves for almost a century. At present, companies are gradually beginning to develop reserves located in East Siberia and on the continental shelf. The resource potential for the production of natural gas is reliable and sufficient to guarantee both domestic and export demand. Because of this, Russian energy strategies until 2035 emphasize attention on increasing exports to China. There is also little doubt about the future ability to satisfy

demand¹¹. The major stream for this growth is cooperation between Russia and Asia-Pacific countries, especially China. In 2014 gas production in Siberia (including Siberian and Far East districts) reached 47 bln cub.m. Today, Eastern Siberia is the fastest growing gas province in Russia. In the long term (until 2035), the role of Siberia for Russia's gas industry will continue to grow. About 12 % of Russian natural gas reserves are concentrated in Eastern Siberian basins, including 11 % in the Leno-Tungusky NGB fields. Only perspective resources (categories C₃), localized in Eastern Siberia, exceed 6 trillion cubic meter. The degree of clarity for explored natural gas reserves in Eastern Siberia constitutes no more than 9 %, and in the Far East no more than 5 %, which allows for opening new considerable gas reserves in the region. Forecasts of gains in gas reserves in East Siberia and Far East would be 7 bln cub. m (4 bln cub. m for East Siberia, 3 bln cub. m for Far East) until 2030 [Programme of development..., 2007].

At present, gas extraction in Russia's eastern regions has been growing (Tab. 3). Gas production in Yakutia (based on the Chayandinskoye field, with gas reserves of 1.4 trillion cubic meters) will evolve as a unified complex along with production in the Irkutsk Region (based on the Kovyktinskoye field, with gas reserves of 2.5 trillion cubic meters). A gas pipeline will run through the Irkutsk region, the Republic of Sakha (Yakutia), and the Amur region. In the future, this might include the Sakhalin, Khabarovsk, and Vladivostok gas transmission system (GTS)¹² [Programme of development ..., 2007]. Eastern Siberia and the Far East thus provide significant reserves and prospective natural gas reserves allow the creation of new regional gas production centers. Production capabilities

Table 3. Gas production volume in Eastern Siberia and Far East 2010–2030, mln cub. m

Region \ Years	Years							
	2010	2011	2012	2013	2014	2015	2020	2030
Eastern Siberia	6	7	8	10	15	50	55	57
Far East	26	28	29	30	32	35	95	105
Total	32	35	37	40	47	85	150	162

Sources: The Programme of development in Eastern Siberia and Far East system of gas production, gas transportation and gas supply for the future gas export on the China and other Asia-Pacific countries // Ministry of Industry and Energy of Russia. Order No. 340 03.09.2007. URL: <http://base.consultant.ru/cons/cgi/online.cgi?req=doc;base=EXP;n=491137;frame=4800> (accessed: 09.01.2018); Kryukov V. A., Tokarev A. N. Possibilities of development of the Russian-Chinese cooperation in the oil and gas sphere // Forum of the high-level science centers on collaboration between people's Republic of China and the EEU. 14.06.2016. Harbin, 2016. P. 34–42.

¹¹ General Scheme of Development of Russian Gas industry for the period till 2030 // Ministry of Energy of the Russian Federation. The order of 06.06.2011 No. 213. URL: https://minenergo.gov.ru/sites/default/files/2016-07-05_Korrektirovka_generalnyh_shem_razvitiya_neftyanoy_i_gazovoy_otrasley_na_period_do_2035_goda.pdf (accessed: 09.01.2018).

¹² Alexey Miller: Russia and China signed the biggest contract in the entire history of Gazprom // Gazprom. Media. News and events. 21.05.2014. URL: <http://www.gazprom.com/press/news/2014/may/article191451/> (accessed: 09.01.2018); Gazprom delegation visits China // Gazprom. Media. News and events. 08.12.2015. URL: <http://www.gazprom.com/press/news/2015/december/article254716/> (accessed: 09.01.2018).

of these centers are based on existing confirmed reserves in unique and large deposits, and reserves have grown through active exploration¹³:

Hydrocarbon deposits of the Sakhalin sea shelf island (projects Sakhalin-1, Sakhalin-2, and promising blocks Sakhalin-3–6).

Liquefied Natural Gas (LNG) in Russia is made at a plant on Sakhalin Island belonging to the Sakhalin Energy Investment Company Ltd (half of whose shares belong to JSC Gazprom). The design capacity for the plant is 9.6 million tons of LNG per year, although in 2014 it produced 10.8 million tons of liquefied gas that was sent to Japan, Korea, China, Taiwan, and Thailand. Gazprom and the Shell company have considered the possibility of building a plant with the capacity to produce 15 million tons of LNG.

South-Tambeyskoye gas condensate field (Yamalo-Nenets Autonomous Okrug)

The planned capacity of the “Yamal LNG” third stage will be 16.5 million tons of LNG (about 23 billion m³). The first phase of the plant was launched in December 2017, with most of the gas already contracted by members of Yamal LNG: PJSC NOVATEK (50.1 per cent), French Total (20%) and CNPC (20%), and Silk Road Fund (9.9%). CNPC still has only one gas supply contract with Novatek, as most contractual obligations by CNPC are with Gazprom and Rosneft.

Salmanovskiy (Utrennee) oil and gas condensate and gas Gydanskoye condensate field (Yamalo-Nenets Autonomous Okrug).

Novatek also plans to carry out the Arctic LNG 2 project on the Gydan Peninsula. Its planned capacity is 20 million tons, while the cost of the project is estimated at \$10.0 billion, \$17 billion less than the cost for Yamal LNG. It is assumed that Total, CNPC, and Silk Road Fund will also be involved.

The Chayandinskoye oil and gas condensate field (Republic of Sakha [Yakutia]).

At 2015 Gazprom finished large-scale prospecting at the Chayanda oil-gas condensate field, which is considered as a first-priority gas source for deliveries to China by the pipeline “Power of Siberia.” Obtained data would allow construction of a three-dimensional field model to specify the geological structure of reserves. Commercial gas production is supposed to begin in 2018. At the Chayandinsky field, the expected maximum level of annual production will be 25 billion CBM of gas in 2022.

Kovykta gas condensate field (Irkutsk region).

Along with Chayanda, the Kovykta gas-condensate field, at present in a stage of trial development, would become a gas source for the “Power of Siberia” pipeline; in 2014 gas production was 7 million cubic meters.

Sobinski-Paiginskoye and Yurubcheno-Tokhomskoye oil and gas condensate field (Krasnoyarsk Region).

¹³ General Scheme of Development of Russian Gas industry for the period till 2030 // Ministry of Energy of the Russian Federation. The order of 06.06.2011 No. 213. URL: https://minenergo.gov.ru/sites/default/files/2016-07-05_Korrektirovka_generalnyh_shem_razvitiya_neftyanoy_i_gazovoy_otrasley_na_period_do_2035_goda.pdf / (accessed: 09.01.2018).

The supply of natural gas to China would allow for the diversification of Gazprom's natural gas export and would stimulate the development of gas transmission infrastructure in Russia's eastern regions¹⁴. Russia is known for an abundance of oil and natural gas in Siberia and the Far East; however, these resources have long been irrelevant to China, and energy cooperation between these two countries did not appear to be significant until recently. However, it could develop rapidly for the sake of Sino-Russia collaboration.

4. Overview of China's gas industry

4.1. Natural gas reserves, production, and consumption

Gas does not play a large role in China's energy mix at present. As a percentage of energy consumption, China has one of the lowest gas usage rates in the world, but has had to change for Chinese energy use to become cleaner. In the last five years, China's gas consumption, production, and imports have grown rapidly. In 2015, gas was 8% of China's mix and the government plans to achieve 12% by 2020 [Kutler, Schwartz, 2014]. China's gas consumption in 2014 was 1884 million cub. m, and this rose to 1973.2 million cub. m in 2015¹⁵.

China is the sixth largest natural gas producer, with its production tripling between 2005 and 2016 (Fig. 2). China's natural gas resource base is enormous, and China could potentially be a larger natural gas producer and consumer than at present [China Energy Outlook..., 2016]. Considerable investments in geological exploration allowed China to increase the own proven gas reserves; in 2016 year proven reserves were 5.4 trln cub. M¹⁶. China's territory has rather large natural gas reserves [Krukov, Tokarev, 2016]. In the future, China's gas production will only increase (Tab. 4), but this would be not enough to cover the country's energy requirements. Simultaneously, the Chinese authorities intend to increase natural gas imports by five times from 2015 to 2030. In 2015 53 billion cubic meters of gas were imported, and fifteen years later natural gas imports could rise to 270 billion cubic meters¹⁷. Gas production from major producing regions remained stable [Steblyanskaya et al., 2017a; Steblyanskaya et al., 2018].

On March 1, 2016, China's Energy Institute issued China Energy Outlook 2030s, which indicated that global total energy production will decrease because energy demand will slow down — but in China the situation is different¹⁸. China's gas consumption 2015 was

¹⁴ Alexey Miller: Russia and China signed the biggest contract in the entire history of Gazprom // Gazprom. Media. News and events. 21.05.2014. URL: <http://www.gazprom.com/press/news/2014/may/article191451/> (accessed: 09.01.2018); Gazprom delegation visits China // Gazprom. Media. News and events. 08.12.2015. URL: <http://www.gazprom.com/press/news/2015/december/article254716/> (accessed: 09.01.2018).

¹⁵ Shan Weiguo. CNPC Economics&Technology Research Institute. July, 2016. URL: https://www.ief.org/_resources/files/events/iac-meeting---cnpc/cnpc-presentation.pdf (accessed:19.06.2018).

¹⁶ BritishPetroleumstatisticalreviewofWorldEnergy2017//BPGlobal.Media.Speeches.13.06.2017.URL: https://www.bp.com/content/dam/bp-country/de_ch/PDF/bp-statistical-review-of-world-energy-2017-full-report.pdf (accessed: 15.01.2018).

¹⁷ Annual Report. 2016 // China National Petroleum Corporation. URL: <https://www.cnpc.com.cn/en/2014enbv/201504/99544ca9d50b4fb4bb610ec9570b0974/files/4f1cfc8cb2b6492999eaeba0f5b08262.pdf> (accessed: 09.01.2018).

¹⁸ China Energy Outlook 2030. Beijing: China Energy Research Society, Economy and Management Publishing house. April 2016. 262 p.

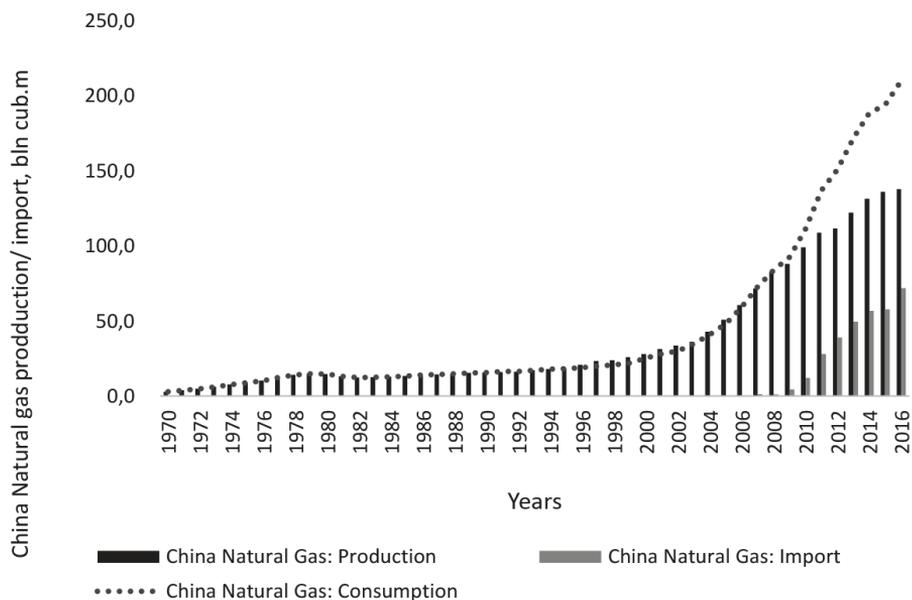


Fig. 2. Historical gas production, consumption and import, China (bln cub. m)

Source: British Petroleum statistical review of World Energy 2017 // BP Global. Media. Speeches. 13.06.2017. URL: https://www.bp.com/content/dam/bp-country/de_ch/PDF/bp-statistical-review-of-world-energy-2017-full-report.pdf (accessed: 15.01.2018).

Table 4. World and China natural gas supply by type, bln cub. m

By type	World							China						
	2000	2010	2015	2020	2030	2040	2050	2000	2010	2015	2020	2030	2040	2050
On Shore Conventional	1889	2310	2307	2413	2516	2550	2392	27	68	83	100	147	150	118
Off Shore	329	431	520	706	872	822	857	1	5	17	32	42	54	73
Tight Gas	92	175	192	242	477	672	800	0	20	25	37	59	49	36
Shale Gas	11	151	402	478	771	1027	1184	0	0	4	20	70	94	100
Coal Bed methane	43	59	57	74	104	143	174	0	1	4	14	26	36	42
Bio Gas	5	15	18	20	27	40	62	0	1	1	2	4	10	22
Others	2	2	2	13	26	35	37	0	0	1	11	24	33	35
Total	2371	3142	3500	3947	4793	5291	5506	28	95	135	216	372	426	426

Source: China Energy Outlook 2030. Beijing: China Energy Research Society, Economy and Management Publishing house, 2016. P. 38–41.

1932 million cubic meters and increased by 5.7 %; 2015 production was 1350 million cubic meters and increased by 5.6 % [China Energy Outlook..., 2016]. According to the State program “Energy strategy development until 2020,” China’s gas consumption will increase by 10 %. Development of cleaner energy means an increase in the share of natural gas in China’s energy balance. There are expectations that, un to 2020, China’s gas consumption will increase, production and export will remain stable, and prices will slow down [Wang et al., 2013]. Nevertheless, the period between 2013 and 2016 represents a milestone for China’s gas market, when China made arrangements to secure sufficient future pipeline gas imports, given the growing gap between national gas supply and demand [Xin Li, 2015].

4.2. Natural gas demand and import

Global energy consumption is expected to increase by 34 % between 2014 and 2035, with natural gas growing by 1.8 %. The increase in demand for gas comes from emerging economies, with China accounting for around 30 % of the total gas increase in demand. According to BP, China’s primary energy resource consumption increased from 3.1 % in 1980 to 5.9 % in 2016¹⁹. CNPC Economics and Research Institute declared that China’s primary energy demand will be higher by 2030 and more than double (Tab. 5), constantly growing until 2050.

With regards to global supply and demand of natural gas, China is a wildcard (Tab. 6). In 2014 China ranked sixth for pipeline imports. Natural gas imports in 2015 were 597.7 mln cub. M; there were no exports²⁰. Table 7 provides the structure of China’s natural gas imports by country, between 2007 and 2014. Currently, China’ gas import dependency is 30.97 % [Kutler, Schwartz, 2014]. Dependency on foreign will increase and by 2020 could be 21.4 % of total hydrocarbon imports, growing to 33.3 % in 2020 and 40 % in 2040 [China Energy Outlook..., 2016]. A less optimistic version is that by 2030 the degree of import dependence will reach 20 % of the total consumption level²¹. Central Asia, especially Turkmenistan, is China’s main source of natural gas imports via pipeline. China has built a large LNG import capacity.

Table 5. Primary energy demand, mln toe

Indicator	Years							
	2000	2010	2015	2020	2030	2040	2050	
China Primary Energy Demand	23	99	174	270	458	606	640	
World Primary Energy Demand	2094	2790	3112	3517	4233	4740	4986	
China in total, %	1	4	6	8	11	13	13	

S o u r c e: China Energy Outlook 2030. Beijing: China Energy Research Society (CERS), Economy and Management Publishing house, 2016. P. 38–41.

¹⁹ British Petroleum statistical review of World Energy 2017 // BP Global. Media. Speeches. 13.06.2017. URL: <http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html> (accessed: 09.01.2018).

²⁰ Shan Weiguo. CNPC Economics&Technology Research Institute. July, 2016. URL: https://www.ief.org/_resources/files/events/iac-meeting---cnpc/cnpc-presentation.pdf (accessed: 19.06.2018).

²¹ China Energy Outlook 2030. Beijing: China Energy Research Society (CERS), Economy and Management Publishing house, April 2016. 262 p.

Table 6. Natural gas demand forecasts till 2030, mln cub. m

Basic scenario	Years	Year of report/ forecast year	2010	2015	2020	2030
	Japanese Energy Economy Academy of science		2007	667		1600
American Energy report		2007	792	1047	1302	1981
Chinese Energy Ministry		2008		1211		2211
Chinese Oil and Gas Economy and Technology Research Institute		2006	1055	1489	1989	3822
Chinese Energy Department		2007	1210		3000	3900
Chinese Oil and Gas Economy and Technology Research Institute		2007	1146	1843	2455	3482
Chinese oil and gas Academy		2008	1165	2250	2860	4299

Source: Zheng J. Yan Q. China Energy long-term forecast (2030, 2050) and development strategy: electricity, oil and gas, nuclear energy and environment situation. China University of Petroleum press, 2011. 180 p.; The National Energy Research Group in long-term development strategy. Beijing: China Science press, 2011. 213 p. URL: http://www.sciencep.com/libservice/liuyan_list.php?1=1&curpage=72788 (accessed: 09.01.2018).

Table 7. Structure table of China's natural gas imports by source from 2007 to 2014, %

Import by source countries	Years							
	2007	2008	2009	2010	2011	2012	2013	2014
Turkmenistan				21.73	45.92	51.48	46.51	43.74
Qatar			7.24	10.15	10.32	16.35	17.76	15.71
Australia	85.05	81.47	63.31	32.83	16.12	11.69	9.34	8.90
Malaysia		0.26	11.85	9.92	6.96	6.08	6.98	6.99
Indonesia			9.73	14.25	8.80	7.94	6.39	5.96
Myanmar							0.41	5.14
Uzbekistan						0.36	5.51	4.17
Yemen				4.42	3.59	1.97	2.94	2.39
Equatorial Guinea		3.51	1.06	0.50	0.53		1.05	1.67
Nigeria	2.18	5.44	1.12	1.09	3.17	0.99	0.96	1.00
Kazakhstan							0.3	0.68
Papua New Guinea								0.67
Algeria	10.73	3.87				0.19	0.15	0.55
Spain								0.44
Russia			3.44	3.19	1.12	1.24		0.30
Oman	2.04		1.19			0.21		0.30

Import by source countries	Years							
	2007	2008	2009	2010	2011	2012	2013	2014
Angola							0.17	0.30
Norway								0.29
Egypt		5.45		0.49	0.79	0.96	1.12	0.28
Brunei Darussalam								0.27
Trinidad and Tobago			1.06	0.41	1.45	0.54	0.28	0.24
Other Countries				1.02	1.23		0.13	0.01

Source: Sun L. et al. (2016) *Sun Lingxuan, Wu Xiaoming, Li Jianping, etc.* Evolution and optimization of China's natural gas import spatial framework // *Natural gas industry*. 2016. Vol. 36, iss. 2. P. 55–58.

Kazakhstan is constructing the Beyneu-Bosa-Shymkent pipeline and will be able to export 5 billion cubic meters of gas annually to China. Further, in October 2013 the first pipeline gas began to run from Myanmar to China at a volume of around 12 billion cubic meters gas per year. At present, the share of gas in China's energy mix constitutes only 5.7%, which testifies to the high potential for expanding gas consumption in China over future years. China's gas imports from Central Asian could increase, specifically from Turkmenistan (China's largest supplier from the region), Uzbekistan, and Kazakhstan: over the next 5–10 years China will receive over 60 billion cubic meters of gas per year from these countries. By 2020 Central Asian gas annual pipeline capacity should increase to 80 billion cubic meters, and China would be able to satisfy 40% of gas import needs.

Exports from Malaysia and Indonesia would decline because of depletion of fields and growth in those countries' internal consumption. However, current suppliers from the Middle East — Qatar, Oman, and UAE — and Nigeria would face competition not only from new export LNG lines opening in Australia and East Africa, but also from the United States. Russian LNG projects also aim to gain this part of the market. As a result, the LNG market in Asia-Pacific countries will become increasingly saturated and competitive. OPEC countries in 2013 satisfied most of China's demand, but the country looks for diversification and delivery reliability. In the future, China can import oil not only from OPEC or Russia, but also from other regions. A similar situation is observed in the national natural gas market. China is inclined to diversify deliveries and chooses other regions for gas acquisition, such as imports from Eastern Siberia and Central Asia [Lazko, 2014].

5. Development of transregional Sino-Russia gas cooperation

Energy cooperation between Russia and China reached an historic peak. From a political perspective, energy cooperation between Russia and China is a result of stable political trust and diplomatic relationships [Krukov, Tokarev, 2016]. Russia and China are the largest neighboring countries; a promising and productive diplomatic relationship between these two countries is in the geopolitical strategic interests for both sides. Moreover, Russia and China had already developed a multi-dimensional cooperative mechanism prior to developing energy cooperation. Under the framework of the Shanghai Cooperation

Organization (SCO), Russia, China, Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan are capable of resolving regional security issues amongst themselves while providing military capability for regional stability. Meanwhile, cooperation between Russia and China on higher education, culture, and religion has brought progress in these areas for both countries. The Silk Road Economic Belt and the 21st-century Maritime Silk Road also promote a good relationship between China and Russia [China Gas industry analysis..., 2016]. It is easy to see that energy cooperation is only a part of a large package that Russia and China have been exchanging for several decades [China Gas industry analysis..., 2016].

Russia's natural gas consumption will not increase significantly, and China's consumption will remain greater in foreseeable future. Thus, Russia will be able to export a considerable quantity of natural gas to China (Tab. 8, Fig. 3).

According to the Energy Strategy of the Russian Federation, the export of gas will increase significantly, from 209 bln cub. m (2014) to 244 bln cub. m (2020, planned), 324 bln cub. m in 2025, and 317 bln cub. m in 2035. One main aim of the Strategy is "increasing gas export to the Asian Market by 8–9 times (from 14 to 128 bln.cub.m.), and the share of the Asian countries' export will increase from 7 % in 2014 (fact) to 44 % in 2015"²². The export of natural gas via pipeline from Russia to China will be up to 1000 mln.cub.m. in 2025 and 1300–1600 mln.cub.m. in 2030²³. Russia's share in the Chinese natural gas market will increase rapidly, up to 21 % by 2030 and 32 % by 2040 (authors' calculations based on the EIA forecast and the China Energy Research Group long-term development strategy forecasts). For forecasts on Russian gas to China via pipeline, see Fig. 4.

Table 8. Global natural gas production/consumption, net trade in natural gas by region by region, 2011–2040

Indicators	Trillion cubic feet					
	History	Forecast				
	2012	2020	2025	2030	2035	2040
Russia, production	21,8	21,9	23,4	25,9	29,3	31,8
Russia, consumption	15,7	15,3	15,8	16,2	16,5	16,0
Russia, net trade by Natural gas	-6,1	-6,6	-7,6	-9,7	-12,3	-15,6
China, production	3,7	7,2	11,1	14,2	16,7	18,7
China, consumption	5,1	9,1	13,5	17,6	22,7	27,5
China, net trade by Natural gas	1,4	2,1	2,4	3,4	6,0	8,9
Total World, production	119,7	134,0	149,4	167,5	185,4	202,4
Total World, consumption	119,8	133,2	149,1	166,6	185,2	203,3

Source: International Energy Outlook 2016 // US Energy Information Administration. DOE/EIA-0484 (2016). 11.05. 2016. URL: <http://www.eia.gov/forecasts/ieo/> (accessed: 13.01.2018).

²² Energy Strategy of Russian Federation, President of Russian Federation Analytical Center. 1st Deputy Ministry of Energy of RF A. L. Teksler. Moscow, September 2015. URL: <http://minenergo.gov.ru/system/download/1913/2406> (accessed: 09.01.2018).

²³ China Energy Outlook 2030. Beijing: China Energy Research Society (CERS), Economy and Management Publishing house, April 2016. 262 p.

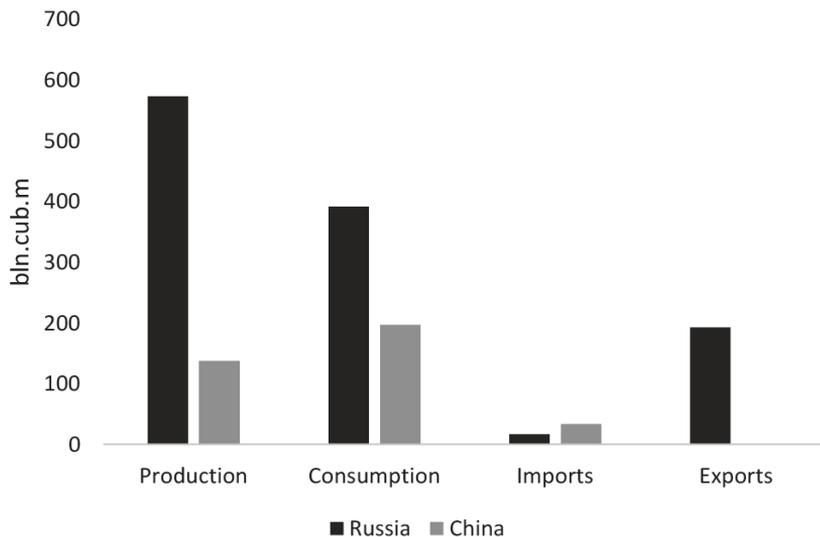


Fig. 3. China and Russia Natural Gas Data Comparison, 2016

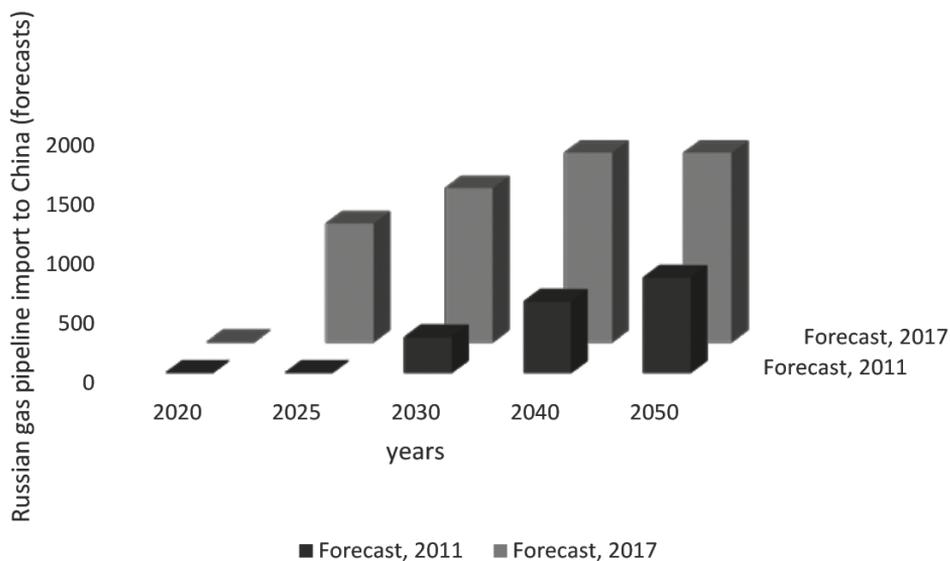


Fig. 4. Import Russian gas (pipeline) to China, forecast, mln cub. m
CNPC and Gazprom sign MOU on project cooperation

Sources: Zheng J., Yan Q. China Energy long-term forecast (2030, 2050) and development strategy: electricity, oil and gas, nuclear energy and environment situation. China University of Petroleum press, 2011. 180 p.; The National Energy Research Group in long-term development strategy. Beijing: China Science press, 2011. 213 p. URL: http://www.sciencep.com/libservice/liuyan_list.php?1=1&curpage=72788 (accessed: 09.01.2018); CEO (2016). China Energy Outlook 2030. China Energy Research Society (CERS), Economy and Management Publishing house, April 2016. 262 p. URL: www.E-mp.com.cn (accessed: 20.01.2018).

Interests on the Chinese side are connected with increasing the reliable delivery gas, which also will help solve a number of environmental problems. The east of the country will receive considerable social and economic benefits from developing the gas industry and Russia, in particular, will contribute to the development of gasification in the region. Further, creation of new centers of gas production will increase local employment. For the Russian gas industry this contract with China opens a new direction for deliveries.

Energy cooperation between Russia and China can have several positive effects for the region. First, energy cooperation will greatly increase Russia's foreign exchange earnings, improving the federal government's fiscal and budgetary positions and helping the recovery of the national economy at a faster pace. While East Siberia and Far East regions have been ignored for a long time, energy cooperation and the construction of pipelines across the region raises the possibility of job opportunities and economic prosperity to the local population; if realized, such prospects can reduce threats of political unrest in the region while providing the federal government with increased capability to deal with external concerns (i.e. territorial disputes with Japan). Second, energy cooperation will increase China's options for stable energy supply [Voloshin, Gerasimov, 2014]. Securing a supply of energy and maintaining market price at a relatively stable level will also help the legitimacy of China's Communist Party, as a popular survey has shown a correlation between living conditions of common people and popularity of the central government. Third, it is possible that Korea and Japan will participate in energy cooperation with Russia. This will help stabilize Northeast Asia while providing an opportunity for these countries to settle their territorial disputes with Russia. At the same time this will help Russia integrate into the regional economy and energy market that were not traditionally a part of Russia's grand plans. However, there is a risk that Russia could potentially dominate the regional energy market, and this could reduce stability if major regional players were placed in a position of conflict over energy, as Russia would be in a position to manipulate energy prices.

6. Research Limitations

Despite incentives that will promote energy cooperation between Russia and China, it is undeniable that several factors might impede energy cooperation in the near future. First, the positions of Russia and China in this arrangement are not equal. It is foreseeable that the international price of energy will remain at a relatively high level while China's energy demands for sustaining economic growth will not diminish; therefore, China might be forced to look to both Russia and OPEC members. China's continued energy demands will put Russia in an advantageous position. Russia as the seller and exporter has more options than China. The European Union has been Russia's largest energy importer, consuming more than 70 % of Russia's energy exports; the demand for energy in Europe, especially natural gas, most likely will not decline in the near future, even taking the Ukraine crisis into consideration, giving Russia the upper hand with China. Second, Russia's domestic environment might become an impediment to energy cooperation with China. Russia has been known for inconsistency in economic policy. While Russia is among the largest exporters of energy, FDI is not popular in some sectors. Foreign investment in the energy sector and other strategic industries is strictly prohibited by federal regulations.

At the same time, heavy tariffs and taxes are often imposed on foreign companies and investors. Local interest groups and various forms of influence can also play a significant role in Russia's economy. All these factors can influence Russia's cooperation with foreign countries including China.

For example, in the case of organizing exports of Russian natural gas, it is necessary to distinguish the following from major adverse factors [Steblyanskaya et al., 2017b]:

- The possibility of a decrease in growth rates of demand for natural gas in the foreign markets owing to climatic and/or economic changes that can lead to decrease in supply rates of the Russian gas for export;
- The possibility of a decrease in the share of the Russian gas in gas consumption in the European market, owing to aspiration of the European Union to diversify sources of gas;
- Substantial marketing risks in connection with high prices and other risks from global markets;
- Availability of competition by LNG delivered from other regions (Middle East, Australia, Indonesia, etc.);
- Possible competition between Russian energy suppliers;
- The high cost of development and transportation of Russian energy resources, requiring an appropriate level of export prices for return on investments; need to attract considerable investment for simultaneous implementation of several capital-intensive projects²⁴.

Third, one important challenge is that China is giving preference to diversifying energy deliveries [Lazko, 2014]. Further, exports such as jet kerosene, fuel oil, diesel and gasoline soared and imports decreased. Net diesel exports for the first time for the last 30 years exceeded gasoline and fuel oil imports and have dropped to the lowest level in 13 years. LNG market continues to expand and China is now the world's largest LNG importer [Tian, 2015]. China's biggest LNG vendors are Australia (78%) and Algeria (16.4%). Nigeria, Oman, and Russia make up 2.05%, 2.03%, and 1.4%, respectively. After 2017 Australia is able to transport 72 mln.t to the Pacific Rim market (80% of this amount already under contract) [Razmanova et al., 2015]. North America could be the largest unconventional gas producer. The maximum export volume of American gas is estimated to be 50–60 billion cubic meters, and, according to experts, most will go to the Pacific Rim and other markets. The share of gas in the American energy balance is predicted to rise from 31% to 38% by 2040 [Zavalny, 2016]. However, many experts are quite conservative regarding estimates of future growth in shale oil production, due to existing uncertainty about actual shale reserves²⁵. Other global regions are only in initial stages of geological exploration, and this entails great uncertainty regarding the potential for shale gas production. It is assumed that aside from North America, shale gas production will be carried out only in Argentina, China, India, South Africa, Australia, and Europe, and will not exceed 70 bcm in total by 2040. At the same time, gas production from new tra-

²⁴ General Scheme of Development of Russian Gas industry for the period till 2030 // Ministry of Energy of the Russian Federation. The order of 06.06.2011 No. 213. URL: <http://minenergo.gov.ru/> (accessed: 09.01.2018).

²⁵ Global trends in oil and gas market to 2025. Lukoil, 2013. 64 p. URL: http://www.lukoil.be/pdf/trends_global_oil_eng.pdf (accessed: 09.01.2018).

ditional fields will become more high-tech, with development of deep-water fields, fields with more complex geological structures, and fields located in harsh climatic conditions [Global and Russian..., 2016].

Because Russia shares a border with China, it is easy to import gas from Russia by pipeline. However, China is a large country and large energy consumer, and China needs to diversify sources to decrease dependence on any one supplier [Kutler, Schwartz, 2014; Liu Yi Jun, 2014]. So, Russian gas exports to China are linked to substantial risks caused by a restraining factor price/demand for energy carriers, competition of the Russian pipeline gas and Middle East, Australian and Indonesian LNG, and the high cost of development and transportation of Russian hydrocarbons that requires appropriate price levels. According to the Russian Federation Energy Strategy, one of the main aims is to increase LNG production by 5 times (from 14 to 74 bln m cub.), and increasing LNG share in total gas exports to 23 % by 2035²⁶. The Pacific Rim is one of the main markets for LNG from Gazprom. In 2014 about 60 % of the total amount of Gazprom's LNG was delivered to this region²⁷. Gazprom's LNG projects to the Asian region include: Sahalin-2 (operating plant) with 10 mln t, Vadivostok LPG (project) at 10 mln t, and Sahalin-2, line 3 (project) at 5 mln t. Another major gas project realized with participation by Chinese investors is the construction of an LNG plant located on the Yamal Peninsula, in Southern-Tambey field, that should have the capacity for 16.5 million tons of LNG per year. Russia proved probable shale gas reserves of 927 billion cubic meters. The contract provides delivery of 3 million tons of LNG per year within 20 years [Krukov, Tokarev, 2016].

Fourth, the main problem for Sino-China gas cooperation is a sharp decrease in world prices for hydrocarbons and uncertainty of their further dynamics²⁸. It doesn't mean that China does not want to import more gas, but price matters. Gas in China is more expensive than many other energy sources, and energy price reform is key to helping increase gas consumption in China [Kutler, Schwartz, 2014]. Of course, the Asian market has the world's highest prices for LNG: in 2013 the average gas price in the Asian market was \$570 per 1000 CBM, versus \$380 in the European market [Voloshin, Gerasimov, 2014]. However, a competitive analysis of Russian natural gas in the foreign market showed that Russian pipeline gas supply in the long term will be competitive [Programme..., 2007]. An analysis of Russian gas fields shows that there are available potential resources that can be produced at prices lower than \$4 per mmbtu by 2040 [Global and Russian..., 2016]. Russia Gas Export average price is \$317 th. cub. M²⁹. "Power of Siberia" contract gas price is \$350.87 th.cub.m, but real imports of 38 bln.cub.m.per year could mean an expected

²⁶ Energy Strategy of Russian Federation, President of Russian Federation Analytical Center, 1st Deputy Ministry of Energy of RF A. L. Teksler. Moscow, September 2015. URL: <http://minenergo.gov.ru/system/download/1913/2406> (accessed: 09.01.2018).

²⁷ Alexey Miller: Russia and China signed the biggest contract in the entire history of Gazprom // Gazprom. Media. News and events. 21.05.2014. URL: <http://www.gazprom.com/press/news/2014/may/article191451/> (accessed: 09.01.2018); Gazprom delegation visits China // Gazprom. Media. News and events. 08.12.2015. URL: <http://www.gazprom.com/press/news/2015/december/article254716/> (accessed: 09.01.2018).

²⁸ Energy Strategy of Russian Federation, President of Russian Federation Analytical Center, 1st Deputy Ministry of Energy of RF A. L. Teksler. Moscow, September 2015. URL: <http://minenergo.gov.ru/system/download/1913/2406> (accessed: 09.01. 2018).

²⁹ Statistical Data. Russian Federation Natural Resources // Energy ministry. Production, consumption and export oil and gas statistics. 2013, Jan. — 2016, Sept. URL: <http://minenergo.gov.ru/activity/statistic> (accessed: 19.06.2018).

price of \$250–300 th. cub. m. For example, the price for the Turkmenistan gas pipeline is around \$300–320 th. cub. m. In the medium-term, the close connection between gas prices and long-term contracts in the China market will persist.

7. Future research

It is plausible that both Russia and China will win due to dual cooperation. In Fig. 5 we can see a forecast by the Russian Academy of Sciences [Kuzyk, Titarenko, 2006] for the development of Russian and Chinese cumulative power, .

The “nine-parameter complex” considers the current situation and possible perspective scenarios for cooperation between the China and Russia to provide an overall assessment and forecast about the expansion of Russian-Chinese strategic interaction (Fig. 5). Categories for point totals are as follows: 8–10 points (superstate), 5–7 points (great power country), 2–4 points (regional power country), 1 (small country). Following this this model, the Russian Academy of Sciences drew the following conclusion: The optimal strategic choice for Russia for improvement of Russian-Chinese cooperation is a “best-practice” transition based on commercial trade and international relations of the two countries. The main positives of this choice are a long-awaited and powerful impulse to development of Siberia and the Far East, strengthening Russia in North-East Asia, and the Pacific Rim, and interaction of countries benefiting from globalization. Moreover, the development of energy cooperation would directly facilitate local economic development, transportation, and utilities in the regions. Further, energy cooperation between Russia

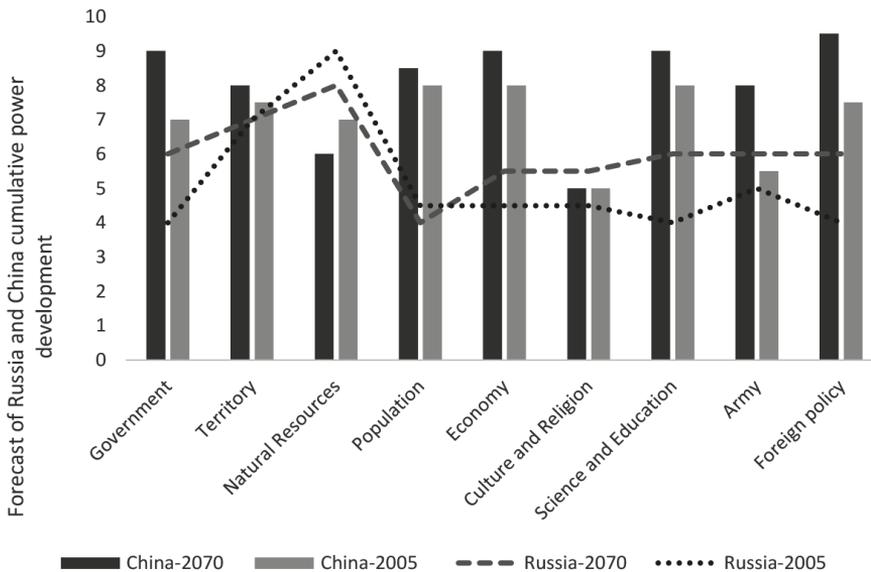


Fig. 5. Russia and China' cumulative power development forecast

Source: Kuzyk B. N., Titarenko M. L. China — Russia 2050: cooperation strategy. M.: Institute of economic strategy of RAS, 2006. P. 165–201.

and China would provide a useful example of useful transregional cooperation for other regional players [Kuzyk, Titarenko, 2006].

Further research would concern Energy Cooperation System Dynamics within the framework of transregional theory and interregional cooperation development. A number of factors affecting energy cooperation can be identified, factors classified in order of importance, and a forecast model built, showing which factor has the most impact on the future of Sino-Russia energy cooperation within the framework of international relations theory.

8. Discussion

Sino-Russia gas cooperation is stable according to distinctive features of stable systems of international relations, such as a) interactions are not constantly in doubt; b) there is a consensus about rules of competition between these participants; and c) relations are characterized by moderation.

Building on Kuznetsov's transregional framework model and using the case of Sino-Russia transregional gas cooperation (Fig. 6), we proposed priorities for Russia-China transregional gas cooperation and the following functions of energy transregionalism: institution-building, skills development for gas cooperation, cooperation in gas technology and safety development, creating conditions for trade and economic cooperation in gas sector, stabilization, balancing, and rationalizing.

From the business perspective, it is estimated that China will surpass the United States in GDP between 2025 and 2030, and in 2040 China's share of global GDP could be 24% [China Energy Outlook..., 2016; China Gas industry..., 2016] In this case it would be foolish to neglect potential economic and energy cooperation with China. Russia produces a surplus of gas, such that the next 30 years could be considered as "era of gas". However, Russia is at risk to miss opportunities to export gas to China, due in part to price/demand levels, high prices in the China market, competition from the Middle East and Australian and Indonesian LNG, and the high cost of development and transportation of

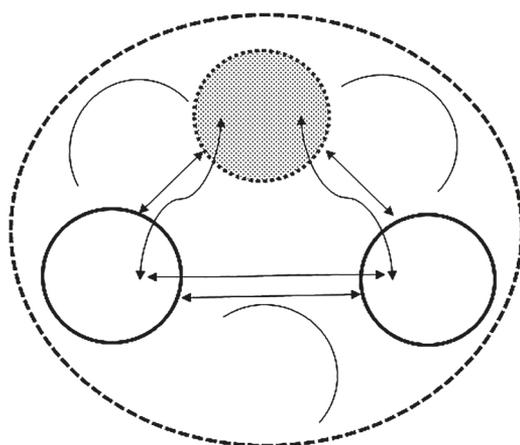


Fig. 6. Sino-Russia Trans-regional gas cooperation scheme (using Kuznetsov's transregional model)

the Russian hydrocarbons that requires an appropriate level of the prices. Nevertheless, we insist that Russia and China would both gain from dual cooperation. The main pluses of the choice “To be together” are providing a long- powerful impulse to development of Siberia and the Far East and real benefits from transregional cooperation.

Conclusion

China’s gas security faces a severe challenge because limited gas resources cannot meet soaring demand. As a result, China may not be able to achieve its targets for diversified energy consumption and reducing carbon emissions under current energy policies. At the same time, energy production is the leading sector of the Russian economy. Energy cooperation between Russia and China has developed at an incredible pace. From a political perspective, energy cooperation between Russia and China is a result of stable trust and the diplomatic relationship between the two countries. Russia and China are neighbors, and it is logical to assume that neighbors might try to create mutually beneficial relations. Despite incentives to promote further energy cooperation between Russia and China, it is undeniable that several factors might impede energy cooperation in the near future. First, the positions of Russia and China in this arrangement are not equal: it is foreseeable that the international price of energy will remain at a relatively high level while China’s energy needs for sustaining economic growth will not diminish; therefore, China might be forced to look to both Russia and OPEC to fulfill energy needs. Second, Russia’s domestic environment may become an impediment to energy cooperation. While Russia is among the largest exporters of energy, she is not particularly fond of FDI in some sectors. Foreign investment in the energy sector and other strategic industries is strictly prohibited by federal regulations. At the same time, heavy tariffs and taxes are often imposed on foreign companies and investors. Local interest groups and various forms of influence can also play a significant role in Russia’s economy. All these factors can influence Russia’s cooperation with foreign countries, including China. Moreover, another important issue is that China also wishes to diversify its gas suppliers. Whether China will choose Russia to be its main supplier remains an important question. Nevertheless, China is replacing coal with gas. In Russian-Chinese projects that are already in operation, it is essential to support uninterrupted transportation of gas.

References

- Blair R., Kaserman D. *Law and Economics of Vertikal Integration and Control*. New York: Academic Press, 1983. 224 p.
- China Energy Outlook 2030*. Beijing, China Energy Research Society (CERS), Economy and Management Publishing house, 2016. 262 p. [中国能源展望, 中国能源研究会 编著, 经济管理出版社, 吴, 2016年4月, 262页]. (In Chinese)
- China Gas industry analysis and sustainable development report: handbook (2015–2016)*. Beijing, China University of Petroleum, China oil and gas sustainable development center, 2016. 320 p. [中国油气产业发展分析与展望报告蓝皮书 (2015–2016), 中国石油企业协会, 中国石油大学中国油气产业发展研究中心, 中国石油大学中国油气产业发展研究中心, 中国石化出版社, 2009年3月, 320页]. (In Chinese)
- Energy Strategy of Russian Federation*, President of Russian Federation Analytical Center. 1st Deputy Ministry of Energy of RF A. L. Teksler. Moscow, September 2015. Available at: <http://minenergo.gov.ru/system/download/1913/2406> (accessed: 09.01.2018)
- Global and Russian Energy Outlook 2016*. Eds A. A. Makarov, L. M. Grigoriev, T. A. Mitrova. Moscow, Energy Research Institute, Russian Academy of Sciences (ERI RAS), Analytical Center of the Government of the

- Russian Federation (ACRF), 2016. 199 p. Available at: https://www.eriras.ru/files/forecast_2016.pdf (accessed: 09.01.2018).
- Global trends in oil and gas market to 2025*. Lukoil, 2013. 64 p. Available at: http://www.lukoil.be/pdf/trends_global_oil_eng.pdf (accessed: 09.01.2018).
- Koldunova E. Next-Time, at ASEM!: Theory and Practice of Interregional Relations: Russia, Take Note. *International Affairs*, Special Issue: Russia and ASEAN, 2010, pp. 23–28. Available at: https://interaffairs.ru/i/pdf_asean/4.pdf (accessed: 04.03.2018).
- Kryukov V. A., Tokarev A. N. Vozможnosti razvitiia rossiisko-kitaiskogo sotrudnichestva v neftegazovoi sfere [Possibilities of development of the Russian-Chinese cooperation in the oil and gas sphere]. *Forum nauchnykh tsentrov vysokogo urovnia po sotrudnichestvu mezhdou Kitaiskoi Narodnoi Respublikoi i EAES [Forum of the high-level science centers on collaboration between PEOPLE'S REPUBLIC OF CHINA and the EEU]*. 14.06.2016. Harbin, 2016, pp. 34–42. (In Russian)
- Kutler T., Schwartz L. *An interview with Chen Weidong*. The Outlook for a Chinese Pivot to Gas By Tom Kutler, Cutler International, LLC, and Laura Schwartz, The National Bureau of Asian Research. 24.07.2014. 4 p. Available at: http://www.nbr.org/downloads/pdfs/eta/Weidong_interview_072414.pdf (accessed: 04.03.2018).
- Kuznecov D. A. Transregionalism: Problems of Terminology and Conceptualization. *Policy Journal*, 2016, no. 2(23), pp. 14–25. Available at: [http://dx.doi.org/10.18611/2221-3279-2016-7-2\(23\)-14-25/](http://dx.doi.org/10.18611/2221-3279-2016-7-2(23)-14-25/) (accessed: 02.03.2018).
- Kuzyk B. N., Titarenko M. L. *Kitai — Rossiia 2050: strategiia sorazvitiia [China — Russia 2050: cooperation strategy]*. Moscow, Institute of economic strategy of RAS, 2006. 656 p. (In Russian)
- Lazko E. “Deloitte”. New reality of oil and gas sector. *Oil and Gas vertical*, 2014, no. 16, pp. 1–8.
- Liu Yi Jun. *Research on Sustainable Development of Natural Gas Industry Chain*. Beijing: Petroleum Industry Publishing house, 2014. 371 p. [刘毅军 (2014) 天然气产业链可持续发展研究, 石油工业出版社, 2014年9月, 371页]. (In Chinese)
- Popov A. A. *Integration of economic entities in the market economy: Candidate of science thesis*, 08.00.01. Voronezh: Voronezh State University, 2005. 212 p.
- Programma sozdaniia v Vostochnoi Sibiri i na Dal'nem Vostoke edinoi sistemy dobychi, transportirovki gaza i gazosnabzheniia s uchedom vozmozhnogo eksporta gaza na rynki Kitaia i drugikh stran Aziatsko-Tikhookeanskogo regiona [The Programme of development in Eastern Siberia and Far East system of gas production, gas transportation and gas supply for the future gas export on the China and other Asia-Pacific countries]. Ministerstvo promyshlennosti i energetiki RF, Prikaz No. 340 ot 03.09.2007 [The Ministry of Industry and Energy of Russia. Order N 340 03.09.2007]. Available at: <http://base.consultant.ru/cons/cgi/online.cgi?req=doc;base=EXP;n=491137;frame=4800> (accessed: 09.01.2018). (In Russian)
- Razmanova S. V., Machula I. A., Pisarenko Z. V. Forecasting modelling prices for China LPG. [Modelirovanie prognoznykh tsen na szhizhennyi prirodnyi gaz dlia KNR]. *Gazovaia promyshlennost' [Gas Industry]*, 2015, no. 8 (726), pp. 19–24. (In Russian)
- Reiterer M. Interregionalism: a New Diplomatic Tool, the European Experience with East Asia. *European Foreign Affairs Review*, 2006, vol. 25, issue 2, pp. 223–243.
- Roloff R. Interregionalism in Theoretical Perspective: State of Art, in: *Interregionalism and International Relations*. Ed. by Hänggi et al. Oxon: Routledge, 2006. 304 p.
- Rülland J. *The EU as an Inter- and Transregional Actor: Lessons for Global Governance from Europe's Relations with Asia, 2002*. 9 p. Available at: <https://digitalcollections.anu.edu.au/bitstream/1885/41658/3/ruland.pdf> (accessed: 04.03.2018).
- Söderbaum F., Langenhove V. L. The EU as an Global Actor and the Role of Interregionalism, in: *The EU as a Global Player: The Politics of Interregionalism*. Oxon, Routledge, 2013. 148 p.
- Steblyanskaya A., Wang Zh., Iskrikskaya N., Razmanova S., Sokolov A. Eksport rossiiskogo SPG v Kitai: konkurentnye preimushchestva i riski [Export of Russian LNG to China: competitive advantages and risks]. *Mineralnye resursy Rossii. Ekonomika i upravlenie [Mineral Resources of Russia. Economics & Management]*, 2017b, no. 5, pp. 72–76. (In Russian)
- Steblyanskaya A., Wang Zh., Iskrikskaya N., Razmanova S. Energy cooperation between BRICS Countries (I). *China oil and gas*, 2017 a, vol. 24, no. 4, pp. 56–60.
- Steblyanskaya A., Wang Zh., Iskrikskaya N., Razmanova S. Energy cooperation between BRICS Countries (II). *China oil and gas*, 2018, vol. 25, no. 4, pp. 55–63.
- Tian C. China's 2015 oil imports and exports. *International Petroleum Economics magazine*, 2015, vol. 4, pp. 56–50.
- Voloshin V. I., Gerasimov I. S. Russia in the foreign markets of natural gas: prospects. *Russian external economic journal*, 2014, vol. 11, no 11, pp. 27–41.

- Voskresensky A.D. *Mirovye kompleksnoe regionovedenie* [World comprehensive regional studies]. Ed. by A. D. Voskresensky. Moscow, Magistr, INFRA-M, 2015, 416 p. (In Russian)
- Wang J. L., Feng L. Y., Zhao L., Snowden S. China's natural gas: Resources, production and its impacts. *Energy Policy*, 2013, vol. 55, pp. 690–698.
- Xin Li. *Natural gas in China: a regional analysis*. Oxford, The Oxford Institute for the Energy Studies. November, 2015. 34 p.
- Yeo L. H. The Inter-regional Dimension of EU-Asia Relations: EU — ASEAN and the Asia — Europe Meeting (ASEM) Process. *European Studies*, 2007, no. 25, pp. 174.
- Zavalny P. N. *Mirovoi gazovyi rynek: osnovnye tendentsii i vozmozhnosti Rossiiskoi Federatsii po ego obespecheniiu prirodnym i szhizhennym gazom. Vystuplenie na natsional'nom neftegazovom forume, nedelia Rossiiskoi neftegazovoi promyshlennosti, 19–20.04.2016* [World gas market: the main tendencies and possibilities of the Russian Federation on its providing with the natural and liquefied gas. A performance at the National oil and gas forum, 19–20.04. 2016]. 12 p. Available at: <https://docplayer.ru/27911736-Mirovoy-gazovyy-rynek-osnovnye-tendentsii-i-vozmozhnosti-rossiiskoy-federacii-po-ego-obespecheniyu-prirodnym-i-szhizhennym-gazom.html> (accessed: 04.03.2018). (In Russian)
- Zheng J. Yan Q. *China Energy long-term forecast (2030, 2050) and development strategy: electricity, oil and gas, nuclear energy and environment situation*. China University of Petroleum press, 2011. 180 p.

Received: February 7, 2018

Accepted: June 25, 2018

Author's information:

Alina N. Steblyanskaya — Postgraduate; ASteblyanskaya@sina.com

Wang Zhen — PhD, Professor; wangzhen@cup.edu.cn

Svetlana V. Razmanova — Dr. Sci. in Economics; s.razmanova@sng.vniigaz.gazprom.ru

Nataliya I. Iskrikskaya — PhD in Economics; ni17@mail.ru

Китайско-Российское трансрегиональное газовое сотрудничество: ключевые вопросы

А. Н. Стеблянская¹, Ван Чжэнь¹, С. В. Разманова², Н. И. Искрицкая³

¹ Институт энергетических стратегий при Китайском университете нефти и газа, Пекин, 102200, КНР

² Филиал ООО «Газпром ВНИИГАЗ» в г. Ухта, Российская Федерация, 169300, Ухта, ул. Севастопольская, 1-а

³ Всероссийский нефтяной научно-исследовательский геологоразведочный институт (ВНИГРИ), Российская Федерация, 192102, Санкт-Петербург, ул. Салова, 28

Для цитирования: Steblyanskaya A. N., Zhen Wang, Razmanova S. V., Iskrikskaya N. I. Sino-Russian transregional gas cooperation: Key issues // Вестник Санкт-Петербургского университета. Экономика. 2018. Т. 34. Вып. 3. С. 369–395. <https://doi.org/10.21638/spbu05.2018.302>

В настоящее время практически одновременно инициированы и запущены такие проекты, как БРИКС, Трансатлантическое торговое и инвестиционное партнерство, Транстихоокеанское партнерство, Азиатско-Тихоокеанское экономическое сотрудничество (АТЭС), Форум «Азия — Европа», Евразийский экономический союз (ЕАЭС). Это свидетельствует о том, что трансрегиональный уровень международных отношений приобретает особую значимость. Цель исследования состоит в научном обосновании приоритетов российско-китайского сотрудничества в газовой сфере, а также в выявлении существующих проблем и перспектив в развитии отношений между Китаем и РФ на рынке энергоресурсов в контексте теории трансрегионального взаимодействия. Предметом изучения является сфера поставок российского газа на региональный рынок КНР. Сегодня Китай заинтересован в большей диверсификации поставок газа. Экологические

проблемы и обеспечение промышленности дешевой энергией являются причиной перехода КНР от угля к природному газу, а также к сжиженному природному газу и другим возобновляемым источникам энергии. Авторы статьи задаются вопросом: отдаст ли Китай предпочтение российским поставщикам природного газа? В статье представлен обзор газовой промышленности России и Китая, основные проекты сотрудничества между КНР и РФ в газовой сфере, структура экспорта и импорта газа, и тенденции экспорта российских углеводородов в Китай. На основе трансцендентальной теории Кузнецова предлагается модель межрегионального газового сотрудничества между Китаем и Россией, которая показывает, что трансрегиональное взаимодействие подвержено риску и неопределенности, но в то же время есть положительные возможности для взаимовыгодного сотрудничества как РФ, так и КНР.

Ключевые слова: трансрегиональная теория, энергетическая политика, китайско-российское сотрудничество, производство / потребление природного газа, экспорт / импорт природного газа.

Контактная информация:

Стеблянская Алина Николаевна — аспирант; ASteblyanskaya@sina.com

Чжэнь Ван — PhD, профессор; wangzhen@cup.edu.cn

Разманова Светлана Валерьевна — д-р. экон. наук, доц.; s.razmanova@sng.vniigaz.gazprom.ru

Искрицкая Наталья Ивановна — канд. экон. наук; n117@mail.ru